Build a Yagi for 17 and 12 Meters | 36

QST

DIGITAL EDITION

ARRL The National Association for Amateur Radio®
February 2022 www.arrl.org
DEVOTED ENTIRELY TO AMATEUR RADIO

Microwave Excitement

QST Reviews

RigExpert AA-2000
ZOOM 0.1 — 2000 MHz
Antenna and Cable Analyzer

CSN Technologies S.A.T.
Satellite Tracker/Controller

Geochron Digital Atlas 2
4K World Clock

Par EndFedz EFT-10/20/40
Trail Friendly EFHW Antenna

The Best of the Best

A Superb All-around Wide-Coverage Transceiver

FT-991A 100W
HF/50/144/430MHz TRANSCEIVER

- Includes HF through UHF with one Radio
- Supports SSB/CW/AM/FM and C4FM digital
- IF Roofing Filters produce Excellent Shape Factor
- IF DSP enables Superb Interference Rejection
- Built in Real-Time Spectrum Scope Display
- 3.5-inch TFT Color Touch Panel Display
- 100 Watts (2 Meter & 70 Centimeter: 50 Watts) of Solid Performance

* External Speaker SP-10: Optional

The New Standard High Performance SDR Transceiver

FTDX10 100W
HF/50MHz TRANSCEIVER

* External Speaker SP-30: Optional

- Hybrid SDR Receiver (Narrow Band SDR & Direct Sampling SDR)
- 9MHz Down Conversion Receiver Configuration
- IF Roofing Filters produce Excellent Shape Factor
- IF DSP enables Superb Interference Rejection
- 5-inch TFT Color Touch Panel with 3DSS*1 Visual Display
- Superior Operating Performance by means of the MPVD*3

The World Leading HF Transceiver with Hybrid SDR

In Homage to the Founder of Yaesu – Sako Hasegawa JA1MP

FTDX101MP 200W
HF/50MHz TRANSCEIVER

The Ultimate

FTDX101D 100W
HF/50MHz TRANSCEIVER

- Dual Hybrid SDR Receivers (Narrow Band SDR & Direct Sampling SDR)
- 9MHz Down Conversion Receiver Configuration
- IF Roofing Filters produce Excellent Shape Factor
- VC-Tune (Variable Capacitor Tuning) Signal Peaking
- IF DSP enables Superb Interference Rejection
- 7-inch TFT Color Touch Panel with 3DSS*1 Visual Display
- Superior Operating Performance by means of ABI*2 & MPVD*3

* Microphone M-1: Optional

* Photo shows the FTDX101MP

*1 3DSS: 3-Dimensional Spectrum Stream *2 ABI: Active Band Indicator *3 MPVD: Multi-Purpose VFO Outer Dial

YAESU The radio

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**

Specifications subject to change without notice. Some accessories and/or options may be standard in certain areas. Frequency coverage may differ in some countries. Check with your local Yaesu Dealer for specific details.

The Best of the Best

Narrow Band SDR Transceiver

FTDX10

Unrivaled RF Performance
Narrow Band SDR Technology is the Revolution

Inheriting the performance of the FTDX101, which is validated to exceed HF transceivers in laboratories around the world.

The most advanced digital narrow band SDR technology is combined with the RF Front-End engineering, such as the low noise-figure RF amplifier and the very sharp shape factor roofing filter designs that Yaesu has incorporated over the years, resulting in unsurpassed HF receiver performance.

Equipped with the latest MPVD feature, and 3DSS visual display to deliver superior Operability and Visibility.

A New Legend in HF Transceivers debuts

HF/50MHz TRANSCEIVER

FTDX10 100W

- The image is shown with an optional third party external display that may be connected using a DVI-D digital cable.
- Shown with Optional External Speaker SP-30.

YAESU
The radio

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**

Specifications subject to change without notice. Some accessories and/or options may be standard in certain areas. Frequency coverage may differ in some countries. Check with your local Yaesu Dealer for specific details.

MA-6B 6-Band Beam

Small Footprint -- Big Signal

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

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

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

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

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

MA-5B, $759.95. Like MA-6B but five bands: 20/17/15/12/10 Meters. 12 and 17 Meters is a single element trapped dipole. ***See cushcraftamateur.com*** *for gain figures.*

Cushcraft 10, 15 & 20 Meter Tribander Beams

Only the best tri-band antennas become DX classics, which is why the Cushcraft World-Ranger A4S, A3S, and A3WS go to the head of the class. For more than 30 years, these pace-setting performers have taken on the world's most demanding operating conditions and proven themselves every time. The key to success comes from attention to basics. For example, element length and spacing has been carefully refined over time, and high-power traps are still hand-made and individually tuned using laboratory-grade instruments. All this attention to detail means low SWR, wide bandwidth, optimum directivity, and high efficiency -- important performance characteristics you rely on to maintain regular schedules, rack up impressive contest scores, and grow your collection of rare QSLs!

It goes without saying that the World-Ranger lineup is also famous for its rugged construction. In fact, the majority of these antennas sold years ago are still in service today! Conservative mechanical design, rugged over-sized components, stainless-steel hardware, and aircraft-grade 6063 make all the difference.

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

Cushcraft R9 . . . *80-6 Meters* *80 Meters . . . No Radials . . . 1500W*

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

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

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

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

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

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

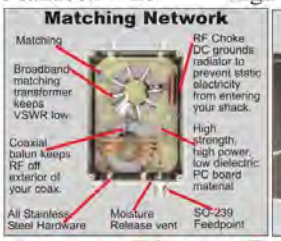
Rugged Construction: Thick fiberglass insulators, all-stainless steel hardware and 6063 aircraft-aluminum tubing is double or triple walled at key stress points to handle anything Mother Nature can dish out.

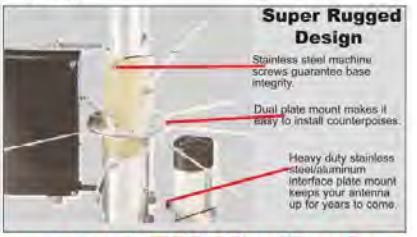
31.5 feet tall, 25 lbs. Mounting mast 1.25 to 2 in. Wind surface is 4 square feet.

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

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

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





Cushcraft Dual Band Yagis

One Yagi for Dual-Band FM Radios

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

Cushcraft Famous *Ringo* Compact FM Verticals

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

***Free* Cushcraft Catalog**
and Nearest Dealer . . . 662-323-5803
Call your dealer for your best price!

Cushcraft
Amateur Radio Antennas
308 Industrial Park Road, Starkville, MS 39759 USA
Open: 8-4:30 CST, Mon.-Fri. ***Add Shipping.***
• **Sales/Tech:** 662-323-5803 • **FAX:** 662-323-6551
http://www.cushcraftamateur.com

Prices/specifications subject to change without notice/obligation. © Cushcraft®, 2022.

Cushcraft . . . Keeping you in touch around the globe!

Visit 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

February 2022 ♦ Volume 106 ♦ Number 2

David A. Minster, NA2AA
Publisher

Becky R. Schoenfeld, W1BXY
Editorial Director

Bob Lee, KN6PXS
Managing Editor

Caroline Kenney
Leanna Figlewski
Assistant Editors

Bart Jahnke, W9JJ
Radiosport & Regulatory Information Manager

Rick Lindquist, WW1ME
Happenings

Paul Cianciolo, W1VLF
Product Review Lab Testing

Steve Ford, WB8IMY
Mark J. Wilson, K1RO
Al Brogdon, W1AB
Bernie McClenny, W3UR
H. Ward Silver, NØAX
Dave Casler, KEØOG
Paul Wade, W1GHZ
Jon Jones, NØJK
Rick Palm, K1CE
Barry Shackleford, W6YE
Kai Siwiak, KE4PT
Bruce Draper, AA5B
Phil Salas, AD5X
John Stanley, K4ERO
Contributing Editors

Michelle Bloom, WB1ENT
Production Supervisor

Jodi Morin, KA1JPA
Assistant Production Supervisor

Maty Weinberg, KB1EIB
Production Coordinator

David Pingree, N1NAS
Senior Technical Illustrator

Janet Rocco, W1JLR
Advertising Sales Manager

Bob Inderbitzen, NQ1R
Public Relations and Innovation Director

Yvette Vinci, KC1AIM
Member Services Manager

Steve Ewald, WV1X
Field Organization Supervisor

9 **Second Century**
Diversity and Inclusion: Driving Amateur Radio's Growth

30 **A Compact 630-Meter Active Loop Antenna**
Salvatore DeFrancesco, K1RGO

34 **A Wi-Fi Antenna Rotator Compass**
Giovanni Carboni, IZ5PQT

36 **12- and 17-Meter Antenna Design**
Joe Reisert, W1JR

39 **Product Review**
Mark Wilson, K1RO
RigExpert AA-2000 ZOOM 0.1 – 2000 MHz Antenna and Cable Analyzer; CSN Technologies S.A.T. Satellite Tracker/Controller; Geochron Digital Atlas 2 4K World Clock; Par EndFedz EFT-10/20/40 Trail Friendly EFHW Antenna

56 **Mountain Topping: A New Way to Make DX Contacts**
Joe Guy, KM4BFU

59 **Maintaining Privacy in a Public Hobby**
Don Keith, N4KC

62 **Meet the Mentor: A Virtual Mentorship Program**
Don Evans, K3ZR

65 **Planning Your First DXpedition**
Al Rovner, K7AR

68 **ARRL Seeks Nominations for 2022 Awards**

76 **2021 ARRL 10 GHz and Up Contest Results**
Rus Healy, K2UA

78 **2021 ARRL 222 MHz and Up Distance Contest Results**
Paul Bourque, N1SFE

87 **A Look Back: March 1972**

Columns

Ask Dave 51
Celebrating Our Legacy 93
Classic Radio 94
Contest Corral 75
Correspondence 24
Eclectic Technology 55
Happenings 69
Hints & Hacks 53
How's DX? 80
Member Spotlight 13
Public Service 73
Up Front 20
The World Above 50 MHz 82
100, 50, and 25 Years Ago 96

Departments

ARRL Section Managers 16
Certificate of Code Proficiency Recipients 86
Convention and Hamfest Calendar 85
Feedback 54
Field Organization Reports 74
Guide to ARRL Member Benefits 14
Ham Ads 124
Index of Advertisers 126, 127
Officers, Division Directors, and Staff 15
QST Cover Plaque Award 61
Silent Keys 97
Special Event Stations 84
Strays 67
This Month in *QEX* 33
Volunteer Monitor Program Report 77
W1AW Qualifying Runs 86
W1AW Schedule 79
W1AW's QSL File 28

Our Cover
We're all happy when we get new equipment, so there's no mistaking the smile on the face of Bill Rogers, K2TER, as he fires up his new 10 and 24 GHz microwave gear for the 2021 ARRL 10 GHz and Up Contest. Check out the results of the event on page 76 of this issue. [Chris Shalvoy, K2CS, photo]

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**

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

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

US & Possessions: Membership in ARRL, including a 1-year subscription to *QST*, is available to individuals at $49. Licensed radio amateurs age 21 and under and the eldest licensee in the household may qualify for the rate of $25. Life Membership, including a subscription to *QST* is available at $1,225.* Membership includes $21 per year for subscription to *QST*. Membership and *QST* cannot be separated. Libraries and institutions, $49 per year. Single copies $6.95.

International
To compensate for additional postage for mailing outside the US, the following rates apply:

Canada: Membership in ARRL, including a 1-year subscription to *QST*, $62, payable in US funds. Life Membership, including a subscription to *QST* is available at $1,550.* Libraries and institutions, $62 per year.

All Other Countries: Membership in ARRL, including a 1-year subscription to *QST*, $76, payable in US funds. Life Membership, including a subscription to *QST*, is available at $1,900.* Libraries and institutions, $76 per year.

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

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

Membership in ARRL, including a 1-year subscription to Digital *QST* only, is available to Canadian and International members at $49.

Copyright © 2021 by the American Radio Relay League Inc. Title registered at the US Patent Office. International copyright secured. All rights reserved. Quedan reservados todos los derechos. Printed in the USA.

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.

*Payment arrangements available. Please write for details.

In order to ensure prompt delivery, we ask that you periodically check the address information on your mailing label. If you find any inaccuracies, please contact the Circulation Department at **circulation@arrl.org** or **860-594-0200** immediately. Thank you for your assistance.

Reprints and permissions:
permission@arrl.org

Details of our Online Privacy Policy can be found at
www.arrl.org/online-privacy-policy.

Telephone: **860-594-0200**
Fax: **860-594-0259**

RigExpert

Antenna analyzers

Push the boundaries with Top-of-the-line Antenna and Cable Analyzer

- Up to 2 GHz
- Big sunlight readable Blanview® display
- No calibration is required prior to use
- Multilingual user friendly interface with built-in Helper
- Bluetooth to communicate with the mobile app

You are under the RigExpertCare™ protection

2 YEARS GUARANTEE

HF	HF	VHF	VHF	UHF	UHF	UHF	UHF
AA-35 ZOOM	AA-55 ZOOM	AA-230 ZOOM	Stick 230	Stick Pro	AA-650 ZOOM	AA-1500 ZOOM	AA-2000 ZOOM

Every job needs the right tool

rigexpert.com

PROBLEM SOLVED!!

40M Monoband Yagi
30M Monoband Yagi
20M Monoband Yagi
17M Monoband Yagi
15M Monoband Yagi
12M Monoband Yagi
10M Monoband Yagi
6M Monoband Yagi

✓ SteppIR Yagi

Take advantage of Solar Cycle 25 –the best band conditions in years are here!

STEP UP TO STEPPIR, AN OPTIMIZED, MONOBAND YAGI ON EVERY FREQUENCY!

steppIR ANTENNA SYSTEMS

www.steppir.com
425-453-1910

20TH ANNIVERSARY steppIR

DIAMOND ANTENNA

diamondantenna.net

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!

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!

Here is a small sample of our wide variety of antennas

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

The Standard By Which All Others Are Judged

RF PARTS™ COMPANY

Diamond Antenna is a division of RF Parts Company

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

Second Century

Diversity and Inclusion: Driving Amateur Radio's Growth

My column this month is a collection of thoughts as expressed to members who wrote in with concerns covering diversity, the recruitment of youth, and editorial choices we have made — that I have made — over the past year. These are subjects that bring out strong feelings and opinions. Please spend a few moments with me as I cover these topics.

Amateur radio, as we know, is a diverse hobby. It provides us with vast expanses of spectrum, which encourages variety in our technical investigations and use. We have developed all manner of modes, from CW (my favorite) to voice and data modes that, again, support great variety in our types of operating. The greatest form of diversity our hobby provides, though, is that of the expansive reach of people it includes from across the spectrums of age, gender, ethnicity, religion, sexual orientation, and ability. Perhaps this has to do with the fact that most times, our transmissions encourage anyone from anywhere to answer our call!

Just as our radio signals know and respect no borders, neither does diversity in amateur radio. I recently attended the kick-off session for the IARU Region 1 strategy conference. It was astonishing to see how well the conference was attended from many dozens of countries across the region, spanning Europe, Africa, and the Middle East. Just looking at the smiling faces and the eagerness with which the attendees were engaged underscored a fundamental principle of "the amateur's unique ability to enhance international goodwill" [FCC § 97.1(e)].

The first conclusion I can draw from this, is that we need to stop drawing imaginary local, regional, or national boundaries when determining the diversity of our community. We truly need to think internationally, and this is in our DNA! Since 1925, we have been holding hands as a global community to protect and expand our radio privileges. To this day the International Amateur Radio Union, and the role that ARRL plays as its International Secretariat, is rich with diversity, collaboration, and inclusion that aids in the fulfillment of its mission.

I was on a Zoom call recently with some college students and recent college grads. The moderator asked everyone to please rename themselves, if they hadn't already, to show their name, call sign, and pronouns. Yes, their personal pronouns (she/her, they/them, he/him). The students who hadn't already done so apologized for the gaffe, and adjusted their on-screen names. I sat thinking: how in the world would this be received by all those hams saying that ARRL needs to bring many more young people into the hobby? The generational culture gaps have never been wider — that I am aware of. This isn't just long hair and outdoor rock concerts. These are fundamental belief systems intended to create an inclusive environment. I suspect some Baby Boomers, Gen Xers, and even some Gen Yers may struggle with choosing to relate to this new way to connect with each other. Some may feel they can't, some even may decide they won't. I admit, it isn't easy for everyone.

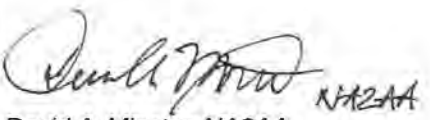
The second conclusion I've reached is that asking for more youth in amateur radio represents a cultural challenge: the young people today are not the young people of *your* youth. Who they are as people is different. What they are looking for from our hobby is different. The time pressure of being digitally connected and always "being on" is different. The real-time nature of how young people consume content is different. Even their shifting opinions and preferences relating to social media are different from just a year ago! Amateur radio must recognize and embrace these differences — and dynamically adapt to accommodate them!

I respect the wide points of view on the matter of diversity. I am very aware of how these changes will be met with discomfort in the coming years. I hope that as a member, you'll hang in there whenever and wherever they appear within the hobby — including the pages of *QST* and elsewhere.

The final conclusion is that this is a challenge for our radio clubs and our teachers: you represent the best places and the best people to lead us as a community, with regard to setting the example for engaging youth and embracing diversity. We've been busy at ARRL HQ, strengthening our team in Field Services and in Education & Learning. These will be the principal areas of focus where we move diversity to the top of the agenda and keep it there as we look to grow amateur radio and grow ARRL.

We'll be looking for you at the ARRL National Convention and HamCation in Orlando this month. If you're there, look around. In what ways could we help attract more people, from across our differences, to our common passion for radio?

Be radio active! Be the connector that grows the hobby! And if you have a friend who isn't an ARRL member, encourage them to consider joining.



David A. Minster, NA2AA
Chief Executive Officer

Free Catalog/Dealers/Manuals Online – Visit: www.hy-gain.com or call toll-free 800-973-6572

The First Choice of Hams Around the World!

hy-gain® Antennas

AV-680

80-6 Meters

hy-gain's new AV-680 adds 75/80 Meters with no radials!

Includes 40, 30, 20, 17, 15, 12, 10 and 6 Meters operation with low 17 degree radiation angle and omni-directional world-wide coverage. No ground or radials needed. Handles full 1500 Watts key down continuous for two minutes.

Highly Efficient
The AV-680 uses quarter wave stubs on 6, 10, 12 and 17 Meters and very efficient end loading coil and capacity hats on 15, 20, 30, 40 and 80 Meters -- no traps. End loading allows efficient operation with a low profile. Resonators are placed in parallel not in series.

Each band individually tunable
Extra wide low VSWR bandwidth. End fed with broadband matching unit. Single coax cable feed. Automatic bandswitching.

Sleek and low-profile
Low 2.9 sq. ft. wind surface area. Small footprint for mounting easily on decks, roofs and patios. 26 feet, 18.5 lbs.

Built-to-last
High wind survival of 65 mph. Broadband matching unit made from all Teflon® insulated wire. Aircraft quality aluminum tubing, stainless steel hardware.

hy-gain verticals are the best built, best performing and best priced multiband verticals available today.

hy-gain® warranty
Two year limited warranty. All replacement parts in stock.

ATB-75, $119.95. Tilt base for hy-gain AV-680/AV-640 and AV-620 verticals.

AGK-8, $99.95. Guy Kit, three point non-conductive guy system for hy-gain AV-680/AV-640 and AV-620 verticals.

AV-640, $659.95. 8 bands: 40, 30, 20, 17, 15, 12, 10, 6 Meters. 25.5 ft., 17.5 lbs.

AV-620, $599.95. 6 bands: 20, 17, 15, 12, 10, 6 Meters. 22.5 ft., 10.5 lbs.

Inside of Matching Unit

hy-gain® **Antennas, Rotators & Towers** 308 Industrial Pk Rd, Starkville, MS 39759 USA
Sales/Tech: (662) 323-9538 ■ **FAX:** (662) 323-5803 Open 8-4:30 CST, Mon.-Fri.

Add shipping. Prices and specifications subject to change. ©2022 hy-gain.

AV680_031413_QST_121021DS

It's a Great Gift...

No matter the QTH, this Mag Loop Antenna is for you.

- Quick Setup
- No Tower (6' is plenty high)
- No Radials Required
- Deploy in Backyard, Balcony, Loft
- No HOA Hassles
- Very Low Noise
- Auto Tuned for Best SWR
- 80m to 10m Models

No Compromises
Retaining all the great features of our HG3 PRO model, the new HG3 QRO high power (1.5 KW) model (shown here), raises the bar again in magnetic loop antenna (MLA) performance. It covers 80*-10 meters. Adding the optional second radiator loop (two turns), allows full power operation on 80 meters.

Unrivaled Tuning Capability
Shown below is the high Q vacuum capacitor with a 45,000-step resolution stepper motor. This delivers an unprecedented 511 Hz tuning resolution and allows the operator to set his/her band preferences.This is very helpful when making QSOs under non-ideal and crowded band conditions.

New HG3 *plus* Controller
It is completely redesigned. It controls both the HG3 PRO and HG3 QRO MLA models and the AR1 Rotator. It remotely tunes 3.5-30 MHz with stepper motor precision and resolution. *RapidTune* automatically scans each band for the lowest SWR and works with most HF radios.

HG3 QRO

- 1.5 KW PEP
- High Q Vacuum Cap
- 45K Step Resolution
- Auto assist tuning
- 40m-10m standard
- 80m-30m add-on loop

Stepper Motor Positioned High Q Vacuum Cap

preciseRf
www.preciserf.com

For all our Magnetic Loop Antennas and the new 80m-30m MLA, check preciseRF.com

13690 Wisteria Dr. NE Aurora, OR 97002
• ph: 503-915-2490 • preciserf.com •
* Some items may be optional • © 2021

Adv 12 201 QST

Quicksilver Radio

In these tough times, we're here to help you with Quality, Service & Value!

WHY CRIMP?

- ✓ Solid mechanical & electrical connection
- ✓ No melted dielectric
- ✓ Connect all the braid, not just a few strands
- ✓ High reliability
- ✓ More info on our website

Antenna Gear

Ultimate Crimp Kit™

Soldering Tools

Connectors & Adapters

Crimp-Ons

Excellent quality, no bargain basement stuff here. Adapters & connectors for most types of connections.

FREE SHIPPING on all orders over $73.00 to any United States address.

USA Made Coax

Premium Bury Flex, USA-400 & USA-240 coax jumpers with your choice of UHF, Type N, BNC, SMA, TNC & Mini-UHF Connectors.

HAMMO-CAN™ Go Box

Ready to go, a complete VHF-UHF station in a box. Get them with or without radios installed. Fits most FM mobiles & several HF radios, too.

New Item!! HybridDX™ HF antenna. Get on 80M in less than 80 ft.

www.qsradio.com

Leanna Figlewski, lfiglewski@arrl.org

Member Spotlight

Walter Holmes, K5WH

Ever since Walter Holmes, K5WH, earned his license in 1977, mentorship has been an important part of his ham radio journey. The guidance he received from several mentors as a new ham inspired him to help other newcomers.

A Career in Technology

For 36 years, Walter worked as an infrastructure support engineer for Compaq and HP® (Hewlett-Packard Company). As part of IT management in the global system support areas, he worked with people from countries around the world via video conferencing. He believes that ham radio contributed to this success by setting him up for the ability to communicate with diverse teams.

Starting an Online Mentorship Program

Once Walter retired 3 years ago, he noticed that many mentors in his community didn't have the time to teach other hams. In an effort to prevent people from having to wait weeks for the next club meeting to get their questions answered, he decided to utilize his years of experience in video conferencing to elevate the level of mentorship in his community. "It just made sense to me that we needed to leverage this type of medium and help the common ham much more directly and rapidly, before the idea of ham radio or some new operating mode was extinguished from their minds," he said.

When setting up the *Zoom*® meetings, Walter wanted to make sure that the sessions were open 24/7 to any and all hams, whether they had questions about trying a new digital mode, getting on the air, or just wanted to listen in. "I wanted it to be a landing zone for anyone wanting to learn, share, demonstrate, and interact with others," he said. Walter explained that sometimes they create breakout rooms for separate sessions, if there are several hams who want to mentor or who have questions.

Common topics discussed include Digital Mobile Radio (DMR), Yaesu System Fusion, Digital Smart Technology for Amateur Radio (D-STAR), HF analog, multiple HF digital modes for data and voice, satellite communications, and antennas. However, all ham radio-related questions are welcomed.

Mentorship is a significant part of the ham radio community and could make or break someone's experience with radio. "One of the most memorable examples of what really drives me to do this, is when someone mentioned a ham that was terribly frustrated when trying to understand how to set up their DMR and HF radios, to the point [where their radios] were already listed on eBay," he shared. "After about 1 hour in one of our sessions, we had his radios all set up, including the HF radio programmed with digital mode software. He was making contacts so well, that he pulled all the gear off the sale list and has been a very active ham for a couple years now."

Although members of local Texas clubs, such as Northwestern Amateur Radio Society (NARS) and Brazos Valley Amateur Radio Club, regularly attend these virtual sessions, hams from anywhere in the world can attend. Walter explained that hams from AMSAT, Tucson Amateur Packet Radio (TAPR), and ARRL members from all over the US often participate. You can join one of these mentorship sessions any time of day or night, by visiting **https://us02web.zoom.us/j/2815436502?pwd=dGZ2VkFGei9LUHBRT1p0V2szaG1OUT09**.

Other Mentorship Ventures

Mentoring hams virtually isn't the only way that Walter stays active in the amateur radio community, and his countless efforts helping hams on digital modes and multimode hotspots were part of what earned him the 2020 Ham of the Year award from NARS, as his work created a lot of interest in the club.

He also enjoys contacting satellites in low Earth orbit and helping other hams get active in this aspect of the hobby. "With so much interest in the digital modes, I felt we could use some common places to collaborate with DMR, [System Fusion], and D-STAR," he said. "So, a few years ago I secured a DMR talkgroup for AMSAT (98006), created [System Fusion] Reflector 11689 for US-AMSAT, and AMSAT D-STAR reflectors REFSAT, DCSSAT, XRFSAT, and XLXSAT, all using Module C, for creating a landing zone for satellite enthusiasts to catch up before and after the short satellite contacts."

Walter is also involved with the South Texas Balloon Launch Team, which launches several high-altitude and floater balloons throughout the year with multiple payloads. He enjoys contributing to his local amateur radio groups to keep hams active and engaged.

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.

- **Magazines | www.arrl.org/qst** and **www.arrl.org/ota**
  Members in the US receive a choice of print magazine: *QST*, ARRL's membership journal (12 monthly issues), or *On the Air*, our new magazine for new and beginner-to-intermediate-level radio amateurs (6 bimonthly issues). All members can access the digital editions of *QST*, *On the Air*, *QEX*, and *NCJ* from a web browser and apps available for iOS, Android, and Kindle Fire devices. Members need a valid ARRL account to access ARRL's digital magazines, the Archives and Periodicals Search, and the Product Review Archive.
- **E-Newsletters | www.arrl.org/myARRL**
  Subscribe to the weekly **ARRL Letter** and a variety of other ARRL e-newsletters and announcements.
- **New! The ARRL Current Email Newsletter**
  Members can elect to receive this monthly email within their online profile. Each issue provides a reminder of the available digital magazine issues and highlights articles from all four digital publications, along with podcast overviews, benefit updates, product and publication specials, and more.
- **New! ARRL Learning Network**
  www.arrl.org/arrl-learning-network
  This 30-minute webinar series features member-volunteers covering a variety of topics: technology, operating, and public service. Live presentations are recorded for viewing later.
- **Email Forwarding Service**
  Email sent to your **arrl.net** address will be forwarded to any email account you specify.

Technical Information Service | www.arrl.org/tis

Call or email our expert ARRL Technical Information Service specialists for answers to all 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. **ARRL's Volunteer Counsel** and **Volunteer Consulting Engineer** programs open the door to assistance with antenna regulation and zoning issues.

Group Benefits* | www.arrl.org/benefits

- **ARRL Ham Radio Equipment Insurance Plan**
- **Liberty Mutual Auto and Home Insurance**
  *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, Mon. – Fri. 8 AM to 5 PM ET 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**
Twitter: **@arrl, @w1aw, @arrl_ares**
Instagram and Instagram TV: **@arrlhq**
YouTube: **ARRLHQ**
LinkedIn: **https://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 1463, Little Rock, AR 72203
501-988-2527; **k5ur@arrl.org**

First Vice President
Michael N. Raisbeck, K1TWF*
85 High St.
Chelmsford, MA 01824
978-250-1235; **k1twf@arrl.org**

Second Vice President
Bob Vallio, W6RGG
18655 Sheffield Rd.
Castro Valley, CA 94546
510-537-6704; **w6rgg@arrl.org**

International Affairs Vice President
Rodney J. 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
Rick Niswander, K7GM

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
Ed Hare, W1RFI

Membership, Marketing, & Communications Director
Kathleen Callahan, KC1MBY

Member Services Manager
Yvette Vinci, KC1AIM

Advertising Sales Manager
Janet Rocco, W1JLR

Publications & Editorial Manager
Becky R. Schoenfeld, W1BXY

Education & Learning Manager
Steve Goodgame, K5ATA

Development Manager
Melissa Stemmer, KA7CLO

Director of Public Relations & Innovation
Bob Inderbitzen, NQ1R

Controller
Thomas Bell, KC1MHQ

Luci Goodwin
Human Resources Manager

*Executive Committee Member

Atlantic Division

www.atldiv.org
Tom Abernethy, W3TOM*
P.O. Box 73, Accokeek, MD 20607
301-257-6225; **w3tom@arrl.org**

Vice Director: **Robert B. Famiglio, K3RF**
P.O. Box 9, Media, PA 19063
610-359-7300; **k3rf@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
507-433-5835; **ac0w@arrl.org**

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

Delta Division

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

arrl-greatlakes.org
Dale Williams, WA8EFK*
291 Outer Dr., Dundee, MI 48131
734-529-3232; **wa8efk@arrl.org**

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

Hudson Division

www.hudson.arrl.org
Ria Jairam, N2RJ
P.O. Box 73, Sussex, NJ 07461
973-594-6275; **n2rj@arrl.org**

Vice Director: **William Hudzik, W2UDT**
111 Preston Dr., Gillette, NJ 07933
908-580-0493; **w2udt@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 the 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
Mike Ritz, W7VO
33643 Burma Rd., Scappoose, OR 97056
503-987-1269; **w7vo@arrl.org**

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

Pacific Division

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

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

Roanoke Division

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: **James Schilling, KG4JSZ**
44 Joel Massey Rd., Haines City, FL 33844
407-504-2629; **kg4jsz@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

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 Section Manager 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 Section Manager 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 Section Manager 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: Vacant
Eastern Pennsylvania: George Miller, W3GWM, 293 Woods Rd., Wyalusing, PA 18853 570-250-1007; **w3gwm@arrl.org**
Maryland-DC: Marty Pittinger, KB3MXM, 4 Pegram Rd., Owings Mills, MD 21117 410-356-7899; **kb3mxm@arrl.org**
Northern New York: Thomas Dick, KF2GC, 11 Jenkins St., Saranac Lake, NY 12983 518-891-0508; **kf2gc@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: James Merry, Jr., KC9RPX, 7332 W. Mustang Dr., Ellettsville, IN 47429 812-391-2661; **kc9rpx@arrl.org**
Wisconsin: Patrick Moretti, KA1RB, W349S3970 Waterville Rd., Dousman, WI 53118-9786 262-354-2997; **ka1rb@arrl.org**

Dakota Division MN, ND, SD

Minnesota: Bill Mitchell, AEØEE, 2120 Aldrich Ave. S., Apt. 208, Minneapolis, MN 55405 510-529-5658; **ae0ee@arrl.org**
North Dakota: Richard Budd, WØTF, 4951 64th St. NE, York, ND 58386-9304 701-466-2028; **w0tf@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: John Mark Robertson, K5JMR, 201 Madewood Ct., Bossier City, LA 71111-6325 318-572-7917; **k5jmr@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: Steve Morgan, W4NHO, 1124 W. 12th St., Owensboro, KY 42301-2975 270-926-4451; **w4nho@arrl.org**
Michigan: Les Butler, W8MSP, P.O. Box 237, Gregory, MI 48137-0237 517-861-6325; **w8msp@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 913-757-3758; **kb0dti@arrl.org**
Missouri: Cecil Higgins, ACØHA, 27995 County Rd. 220, Hermitage, MO 65668-8493 417-399-5027; **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: Charles I. Motes, Jr., K1DFS, 22 Woodside Ln., Plainville, CT 06062 860-747-6377; **k1dfs@arrl.org**
Eastern Massachusetts: Tom Walsh, K1TW, 9 Wildwood Dr., Bedford, MA 01730 781-275-5882; **k1tw@arrl.org**
Maine: Philip Duggan, N1EP, 195 Kansas Rd., Milbridge, ME 04658-3120 207-598-5397; **n1ep@arrl.org**
New Hampshire: Peter Stohrer, K1PJS, 9 Gladstone St., Concord, NH 03301-3130 603-345-1470; **k1pjs@arrl.org**
Rhode Island: Bob Beaudet, W1YRC, 30 Rocky Crest Rd., Cumberland, RI 02864 401-333-2129; **w1yrc@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: Paul Stiles, KF7SOJ, 5427 Deadwood Dr., Billings, MT 59105 406-671-7092; **kf7soj@arrl.org**
Oregon: David Kidd, KA7OZO, 21760 S. Larkspur Ave., Oregon City, OR 97045-9164 503-320-3484; **ka7ozo@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, SV, SF, SJV, SCV

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: Joe Speroni, AHØA, 278 Kapiolani Blvd. #502, Honolulu, HI 96826 808-955-2496; **ah0a@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: Bill Hillendahl, KH6GJV, P.O. Box 4151, Santa Rosa, CA 95402-4151 707-544-4944; **kh6gjv@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: Marc Tarplee, N4UFP, 4406 Deer Run, Rock Hill, SC 29732-9258 803-327-4978; **n4ufp@arrl.org**
Virginia: Carl A. Clements, W4CAC, 4500 Wake Forest Rd., Portsmouth, VA 23703-4413; 757-235-4813; **w4cac@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: Robert Wareham, NØESQ, 300 Plaza Dr., Ste. 200, Highlands Ranch, CO 80129 720-592-0394; **n0esq@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: Rick Breininger, N1TEK, 240 W. Railroad Ave., Green River, WY 82935 307-707-4010; **n1tek@arrl.org**

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

Alabama: Roger Parsons, KK4UDU, 5791 Birmingport Rd., Mulga, AL 35118-9670 206-641-9063; **kk4udu@arrl.org**
Georgia: Vacant
Northern Florida: Kevin J. Bess, KK4BFN, 908 Flagler Ave., Edgewater, FL 32132-2124 386-547-2838; **kk4bfn@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. 251, 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, SDG, SB

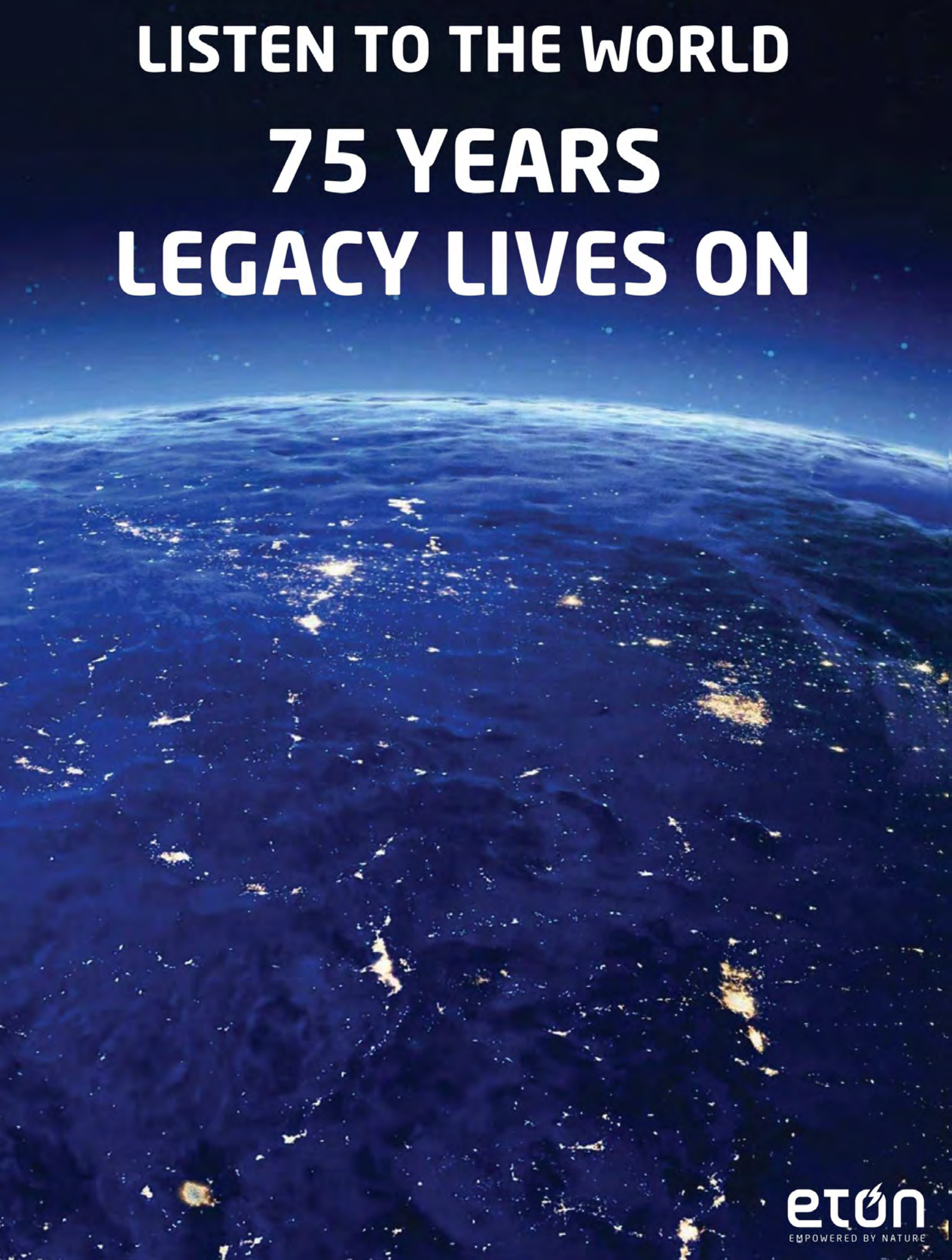
Arizona: Rick Paquette, W7RAP, 1600 W. Sunkist Rd., Tucson, AZ 85755-9561 520-425-6877; **w7rap@arrl.org**
Los Angeles: Diana Feinberg, AI6DF, P.O. Box 4678, Palos Verdes Peninsula, CA 90274-9618 310-544-2917; **ai6df@arrl.org**
Orange: Bob Turner, W6RHK, P.O. Box 973, Perris, CA 92572 951-236-8975; **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, 5607 Sunshine Dr., Apt. 219, Austin, TX 78756 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**

LISTEN TO THE WORLD

75 YEARS LEGACY LIVES ON



eton
EMPOWERED BY NATURE

LISTEN TO THE WORLD

- Frequency coverage: 100-30,000 KHz, includes Shortwave, medium wave AM broadcast band and long wave; 76-90, 87-108
- Reception modes: AM, FM-stereo, Single Sideband (selectable USB/LSB), Aircraft
- Programmable memories: 500 user programmable with alpha labeling plus 1200 user definable country memories, for a total of 1700
- Dual conversion super heterodyne circuit: results in minimized interference through superior selectivity
- Digital Phase Lock Loop (PLL) synthesized tuning with Direct Digital Synthesis (DDS) for drift-free frequency stability and finest tuning resolution
- Tuning modes: variable-rate tuning knob, direct keypad frequency entry, up/down push buttons and auto-tuning
- Single sideband synchronous AM detector: selectable USB/LSB or double sideband to minimize adjacent frequency interference and fading distortion of AM signals
- Selectable bandwidths: 7.0, 4.0, 2.5 kHz for excellent selectivity
- Digital display: large 5.7 inch square, 240 x 320 pixel, dot matrix display- shows all modes and selected functions
- Display backlighting: evenly lit backlight enables display viewing under all lighting conditions
- High dynamic range: allowing for detection of weak signals in the presence of strong signals
- Dual programmable clocks with WWV Auto-Setting
- Stereo line-level input: allows listening to other devices such as a CD player through the Elite Satellit
- External antenna connection for the addition of auxiliary antennas, e.g. professionally engineered Shortwave antennas; long-wire Shortwave antennas; specialized AM broadcast band antennas for enthusiasts of AM DX'ing; FM broadcast band antennas
- Separate, continuous bass and treble tone controls
- Selectable AGC (Automatic Gain Control): fast and slow mode
- Built-in antenna: telescopic antenna for AM, FM and Shortwave reception
- Power source: 4 D batteries (not included) or AC adapter (included)
- Leather case with craftsman stitching
- 3 color LCD screen
- Radio Data System (RDS)

- AM/FM/LW/SW bands
- FM with RDS (Radio Data System)
- Single sideband (SSB) with +/1 kHz tuning
- VHF Aircraft band
- Automatic or Manual Digital Tuning
- FM stereo/mono selection
- Electronic/volume/treble/bass control
- Sync detector with selectable sideband
- Direct key-in meter band for SW
- 700 memory stations
- PLL synthesized dual conversion receiver
- Local/DX switch
- Local/world time zones
- Clock/Alarm/Sleep Timer with time backup
- Rich orange LCD display
- Reset/Lock button
- FM telescopic antenna
- Power supply: Inclided AC adapter or 4 AA batteries (sold separately)
- Leather case with craftsman stitching

universal radio inc.

Hammacher Schlemmer

CAR·TOYS

Authorized Dealers

eton
EMPOWERED BY NATURE

LISTEN TO THE WORLD

Unbelieveable Memory

The classic look & style to match

On every wavelength

Elite 750

- AM/FM/LW/SW bands
- Aircraft Band
- Set 9/10 KHz AM tuning; set FM tuning range
- Single-Side Band (SSB)
- 360 degree rotate AM antenna
- Auto/Manual/Direct frequency key-in and station memory tuning
- Auto Tuning Storage function (ATS) for FM/AM/Shortwave
- 1000 station memories (each band 100 memories, 500 customizable)
- Dual alarm clock function
- Line in socket (can be used as speaker for MP3)
- Line out socket (radio broadcasting can be transferred to other device)
- External antenna jacks for both AM/FM
- Power source: DC input (6V) power supply included t

Authorized Dealers

EMPOWERED BY NATURE

LISTEN TO THE WORLD

Weighted tactile coarse or fine dial-in-dial tuning

- AM/FM/SW bands
- FM with RDS (Radio Data System)
- Dial-in-dial coarse/ narrow digital tuning
- Treble/bass control
- RF gain control
- Wide/narrow bandwidth selection
- 50 memory stations
- Bluetooth® ready
- External AM/FM/SW antenna connections
- Local/DX switch
- Rich orange LCD display
- Line-in/line-out and headphone jacks
- FM telescopic antenna
- Carrying strap
- Reset/lock button
- Powered by included 7V DC power adapter or 4D batteries (sold separately)
- Vegan leather case with craftsman stitching (sold separately)

Access to news - at home or abroad

- AM/FM/LW/SW bands
- Automatic or manual digital tuning
- Auto tuning storage (ATS) function
- 500 memory stations
- Local/world time setting
- Sleep timer
- Single alarm clock (by radio or buzzer)
- Snooze
- Rich orange LCD display
- Earphone jack (3.5mm)
- FM telescopic antenna
- Reset/lock function
- Power supply: AC adapter or 4 AA Batteries (sold separately)
- Elegant leather case with craftsman stitching
- DAB+ Internationally

Lee Valley PREFERRED Living Adorama

Authorized Dealers

eton
EMPOWERED BY NATURE

Pull Out the Muscle!

Hear the roar and feel the POWER! Get that POWER you need to really bust through the pileups, win a few contests, work the world!!! Ameritron amplifiers will go a long way towards making those dreams a reality. We've got an amplifier for every budget!

AMERITRON . . . 800 Watts . . . $1499!

More hams use Ameritron AL-811/H amplifiers than any other amplifier in the world!

AL-811H
$1499 Suggested Retail
4-Tubes, 800 Watts

AL-811
$1399 Suggested Retail
3-Tubes, 600 Watts

Only the Ameritron AL-811H gives you four *fully neutralized* 811A transmitting tubes. You get absolute stability and superb performance on higher bands that can't be matched by un-neutralized tubes.

You get a quiet desktop linear that's so compact it'll slide right into your operating position -- you'll hardly know it's there . . . until QRM sets in. And you can conveniently plug it into your nearest 120 VAC outlet -- no special wiring needed.

You get all HF band coverage (with license) -- including WARC and most MARS bands at 100% rated output. Ameritron's *Adapt-A-Volt*™ hi-silicon core power transformer has a special buck-boost winding that lets you compensate for high/low power line voltages.

You also get efficient full size heavy duty tank coils, slug tuned input coils, operate/standby switch, transmit LED, ALC, dual illuminated meters, QSK with optional QSK-5, pressurized cooling that you can hardly hear, full height computer grade filter capacitors and more. 13¾Wx8Hx16D inches.

AL-811, $1399.
Like AL-811H, but has three 811A tubes, 600 Watts output.

AMERITRON *no tune* Solid State Amplifiers

ALS-500M 500 Watt Mobile Amp

ALS-500M
$1199 Suggested Retail
500 Watts PEP/ 400 W

CW output, 1.5-22 MHz, instant bandswitching, no tuning, no warm-up. SWR, load fault, thermal overload protected. On/Off/Bypass switch, Remote on/off control. DC current meter. qquiet fan. 13.8 VDC. 9Wx3½Hx15D in., 7 lbs. **ALS-500RC, $84,** Remote Head.

ALS-606S 600 Watt 160-6M Amp

600 Watts PEP/ 500W
ALS-606S
$2399 Suggested Retail

CW output, 160-6M with automatic instant bandswitching. Desktop. 9¾Wx7Hx14½D".14.2 lbs. Only 4 dB below 1500W -- less than an S-unit! **ALS-606, $2599,** like ALS-606S above, but has transformer power supply.

Desktop Kilowatt Amplifier

AL-80B
$2399 Suggested Retail

Whisper quiet *desktop* amp plugs into 120 VAC to give *full* kilowatt SSB PEP output. Ameritron's exclusive *DynamicALC*™ doubles average SSB power out and *Instantaneous RF Bias*™ gives cooler operation. All HF bands. 850 Watts CW out, 500 Watts RTTY out, extra heavy duty power supply, 3-500G tube, 70% efficiency, tuned input, Pi/Pi-L output, inrush current protection, dual Cross-Needle meters, QSK compatible, 48 lbs. 14Wx8½Hx15½D". **2-year Ameritron warranty.**

ALS-1306 1200W 1.5-54 MHz Amp

ALS-1306
$3999 Suggested Retail

Ameritron's *highest power* solid state FET amplifier gives you automatic bandswitching! Get 1200W PEP output on all bands, including 6-Meters. No tuning, no warm-up, no tubes to baby and no fuss! Eight rugged MRF-150 power FET's give outstanding reliability. Just 100 Watts drive gives full rated power MHz. Compact 10Wx6½Hx18D in., just 22 lbs. **ALS-1300, $3499.** Like ALS-1306 but less automatic bandswitching and 6-M coverage.

Near Legal Limit ™ Amplifier

AL-572
$2399 Suggested Retail

Near Legal Limit™ amp gives you 1300W PEP SSB power output for *60%* of the price of a full legal limit amp! Four rugged 572B tubes. Instant 3-second warm-up, 120 VAC. Desktop 14½Wx8½Hx15½D". 160-15M. 1000 Watt CW output. Tuned input, instantaneous RF Bias, dynamic ALC, parasitic killer, inrush protection, cross-needle meters, multi-voltage transformer.

HF Amps with 3CX800A7 tube

AL-800
$4199 1 tube, 1250 W Suggested Retail

AL-800H
$5399 2 tubes, 1.5 kW *Plus Eimac*(R) *tubes*

Desktop 3CX-800A7 tubes cover 160-15M, WARC bands. Adjustable slug tuned input, grid protection, ALC control, vernier reduction drives, hefty 32 lb. transformer, high capacitance computer grade filter capacitors. Multi-voltage, dual cross-needle meters. 14¼Wx8½Hx16½D".

AMERITRON *full legal limit* amplifiers

AMERITRON legal limit amps use a super heavy duty power transformers capable of 2.5 kW!

Most powerful -- *3CX1500/8877*

AL-1500F
$5999 *3CX1500/8877* Tube

AL-1500
$6999 *Eimac*(R) tube

Ameritron's *most powerful* amplifier uses the herculean 3CX1500/8877 ceramic tube. 65 watts gives full legal output -- loafing with a 2500W power supply.

Toughest -- *3CX1200Z7*

AL-1200
$5999 Suggested Retail

Ham radio's *toughest* tube -- the *Eimac*(R) 3CX1200Z7. 50-Watt control grid dissipation. Super heavy duty power supply loafs at legal power -- delivers more than 2500 Watts PEP two tone output for a 1/2 hour.

Classic -- *Dual 3-500Gs*

AL-82
$3999 Suggested Retail

Gives full legal output using a *pair* of *genuine* 3-500Gs. Competing linears using 3-500Gs *can't* give you 1500 Watts because their lightweight power supplies *can't* use these tubes to their full potential.

Ameritron brings you the finest high power accessories!

ARB-704 amp-to-rig interface . . . $89

Protects rig from keying line transients. Easy rig hookup.

ADL-1500 Dummy Load with oil . . . $119

Oil-cooled, 50 Ohms. 1500W/5 minutes. SWR< 1.2, 30 MHz. Low to 400 MHz.

ADL-2500 fan-cooled Dry Dummy Load, $299

Whisper quiet, 2.5 kW/1 min. on, 10 off. 300W continuous. Low SWR.

ATP-100 Tuning Pulser . . . $99

Safely tune up.Full power, best linearity. Prevent over-heating, tube and power supply stress.

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
http://www.ameritron.com

Prices and specifications subject to change without notice. (R)*2022 Ameritron.*

Epic PWRgate

DC Power Management Has Never Been so Epic

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 or direct solar panel MPPT battery charging.
- MPPT charging provides the maximum power out of a solar panel.

Easily 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/QST222

West Mountain RADIO

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

Power, Redefined.

Make Waves With The New Elecraft KPA1500 Amplifier

The KPA1500 solid-state amplifier won't take over your entire desktop. The KPA1500's dimensions are the same as the newest member of our K-Line, the K4 high performance Direct Sampling SDR, at only 4.5 x 13.5 x 11.5" (HWD; 11.5 x 34 x 29 cm). The lightweight companion power supply can be placed on the floor or in any other convenient location.

The KPA1500 was designed with the serious operator in mind. Its no-nonsense front panel shows all important parameters at a glance, with a high-contrast 32-character LCD and fast, bright LED bar graphs. Band switching is instantaneous, via control inputs or RF sensing. Protection and monitoring circuitry is extensive and foolproof, letting you focus on the job at hand — breaking pileups and overcoming the most difficult operating conditions. And it wouldn't be an Elecraft amp without robust PIN-diode T/R switching. Like our KPA500, the KPA1500 offers fast QSK without a noisy relay.

The amplifier's rugged internal ATU can handle full power with load SWR up to 3:1, while a wider matching range is allowed at lower power, including up to 10:1 in standby mode.

When it's time to make waves, you can rely on the compact, quiet, highly integrated Elecraft KPA1500.

KPA1500 Features

- 1500 W
- Very compact design
- Fast, silent PIN diode T/R switching
- Built-in Antenna Tuner with dual antenna jacks
- Compatible with nearly any transceiver – custom cables available
- 160-6 meters

Separate remote-controlled power supply

The Elecraft "twins": high-performance K4 transceiver and matching KPA1500 amp

CE

ELECRAFT®

For complete features and specifications, go to **elecraft.com** | sales@elecraft.com | 831-763-4211

Up Front

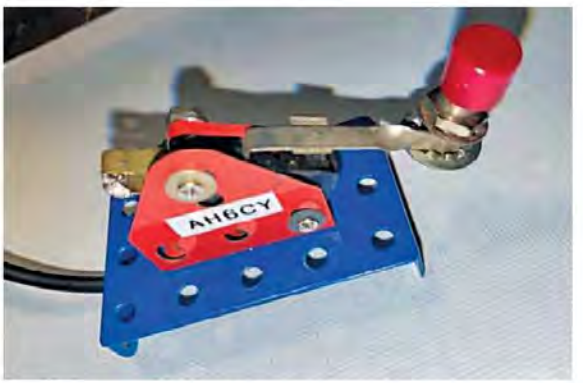
Adventuring with Amateur Radio

Gary Reuter, W1CEK, took his handheld transceiver on his climb on the Lion Head Trail up Mount Washington in New Hampshire. His radio had all the local repeaters programmed in. In case of emergency, the handheld transceiver is great backup for spotty cellphone service.

Repurposing Old Kids' Toys

As a grandfather, Hiroki Kato, AH6CY, has many old ERECTOR® sets and LEGO® pieces left behind from now-grown grandchildren. Hiroki decided to use these pieces for a few ham projects.

This enclosure was built from ERECTOR Set parts and based on Harold Smith's, KE6TI, "The DC2020 Receiver," from the October 2021 issue of *QST*.



Hiroki built a very simple straight key, using a micro switch and a single ERECTOR Set piece for the base.

Hiroki built a magnetic loop antenna controller inside a LEGO box he made. With the hinge pieces, he can open and close the top cover easily.

EVERYWHERE MEANS EVERYWHERE.

As the pioneers of software-defined radios, we didn't set out to change the course of the entire amateur radio industry, but it kind of turned out that way. 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 technology partner on the planet. We revolutionize for the love of amateur radio and the community that goes along with it. We aim higher and look farther in hopes of creating tools and solutions for things we can't even see just yet. We are your best partner to Find Everywhere. **FlexRadio.com**

FlexRadio

Find Everywhere

THROW A DART AT A MAP. THEN HAVE A MEANINGFUL CONVERSATION WITH THE DART.

6400 | 6400M | 6600 | 6600M | 6700 | MAESTRO

BridgeCom SYSTEMS

Take Your DMR Overland

Experience the New AnyTone AT-D578UVIII PLUS Tri-Band 50w DMR Mobile!

"Sturdy, solid, and satisfying!!!
This is a great radio! Has lots of power, works great on DMR and FM.
Has very good audio in and out of the radio.
Also has a very effective fan... Great radio!
Good job AnyTone! Six out of five stars!"
Justus -W4JMD

"Absolutely love this radio!
Just received my AT-D578UVIII today along with the SuperCode Plug.
After watching the BridgeCom University instructions for startup,
I was able to make my first QSO on this radio within about an hour.
No other mobile DMR compares in my opinion...
Love BridgeCom's products and service!"
Glenn -KI5DIP

EXCLUSIVE QST OFFER

Use offer code QSTMOBILE50 at checkout to receive:
- A FREE 20 minute DMR expert setup call
- A FREE Super Codeplug

SUPER CODEPLUG

...a $140 value, yours free!

BridgeCom SYSTEMS
816-532-8451
sales@bridgecomsystems.com

SCAN TO GET DETAILS

CALL: 816-532-8451
For More Information

BridgeCom SYSTEMS®

Dummy Proof DMR

Join the 14,730+ hams on DMR using BridgeCom University! Let us help you Learn everything you need to easily become a DMR expert and Fast-Track your DMR radio results using the best DMR HT on the market

The AnyTone AT-D878UVII Plus Dual Band DMR Handheld w/ BridgeCom University.

"Love my radio and the university is awesome. Highly recommend both"
George -K0GDR

"I must admit I was sceptical at first about getting this handheld due to DMR being totally foreign to me, but after watching fellow hams use their handhelds, and the great videos out there I bit the bullet and bought one. I am totally impressed as to how easy once you understand the basics, this handheld is to operate. I am now looking at buying more DMR "stuff". I have been licenced since 1986 and an Extra since 1990. I thought I was set in my ways as far as Ham Radio goes. This has opened up a whole new avenue of communications for me."
Mark -WF3F

"Unprecedented service and support endless resources for your experience. They bend over back words for the customer unheard of today."
Richard -N5FPT

EXCLUSIVE QST OFFER

Use offer code QSTMOBILE50 at checkout to receive:

- A FREE 20 minute DMR expert setup call
- A FREE Super Codeplug

SUPER CODEPLUG

...a $140 value, yours free!

BridgeCom SYSTEMS®
816-532-8451
sales@bridgecomsystems.com

SCAN TO GET DETAILS

CALL: 816-532-8451
For More Information

Correspondence

Letters from Our Members

Celebrating Diversity in Ham Radio

I was delighted to read about the experiences of Maggie and Gwen in the October 2021 issue's "Member Spotlight" column. It's refreshing to see more diversity in our hobby and to read about how ham radio has been therapeutic to someone with disabilities. I hope their story is the beginning of creating more gender diversity in ham radio.

As a CW operator, I never hear the voice, tone, or inflections of the people I chat with. For all I know, the operator on the other end may be incapable of verbal speech. This hobby has so many outlets for inclusion. I look forward to reading more stories about the truly amazing people throughout our hobby!

Sean Sanderson, KD6MPY
Jacksonville, Vermont

Looking Back on Working in the ARRL Lab

Reading "A Look Back" in the August 2021 issue brought back many memories. The summer before the October 1971 issue was published, I was 17 years old and working my dream job in the ARRL Lab. I had the privilege of working with Doug DeMaw, W1FB; Lew McCoy, W1ICP; Doug Blakeslee, W1KLK, and Ed Tilton, W1HDQ, all of whom are still revered today.

I kept them busy by designing several circuit boards in reverse and creating a fair amount of smoke, but they taught me well. One memory that I treasure was learning W1FB's prototyping technique. He would solder all of a circuit's components into a ball, then turn the power on. He always said, "If it works like this, it will work on a circuit board!" W1FB was unforgettable, as were his projects and his sense of humor.

I was assigned the task of filling out the logbook featured on the cover of the aforementioned issue of *QST*, and included my dad's call sign, W1AFF. When the issue arrived in the mail, it was one of the neatest presents that I could've ever given him: his name on the cover of *QST*!

It's pretty amazing to see where our hobby stands now, some 50 years later.

Rick Liftig, WA1ISD
West Hartford, Connecticut

Useful DX Contesting Tips

The "Contest Season 2021 – 2022" special insert in the November issue was very informative. I enjoyed reading about the tips and tools that can help hams with their personal goals and make a contest enjoyable.

Although most of the photos in the insert show well-arranged stations, you don't need a big station to successfully operate during a contest. You can do so with a modest 100 W radio, power supply, and a pair of antennas, which is what my station looks like.

My goal for big contests is to see how many states/countries I can contact. And most of all, to have fun! If you make some contacts and a lot of stations suddenly appear, be sure to thank to the ham who posted you on a DX cluster.

Also, try exploring small international contests, as they might help you earn the country you need for your DXCC count. It's a good feeling when the other station thanks you for a new multiplier.

Most importantly, don't forget to send your log. You never know if you qualify for a certificate.

Angel Santana, WP3GW
Trujillo Alto, Puerto Rico

A Program Proposal for Farms

Amateur radio offers multiple programs to get hams out of their shacks and into nature, such as Summits on the Air (SOTA), Parks on the Air® (POTA), Islands On The Air (IOTA), ARRL Field Day, and many others. Most of these programs have an infrastructure, like a website, a list of rules, and awards.

My article, "Starting Your Own Parks on the Air Program," published in the June 2018 issue, talks about the Vermont State Parks on the Air events that fit into the two competing park activation programs: POTA and World Wide Flora & Fauna (WWFF). I would like to propose another program, called Farms on the Air (FOTA).

If you're a ham who owns a farm, get on the air somewhere on your farmland, either in your shack or at a more remote spot. On my farm, I have an antenna (160 through 10 meters) strung between two trees. I run my mobile radio, a Kenwood TS-480, from my car through an Elecraft KPA500 amplifier. Both are run by a Honda generator. From now on, I'll be operating as a FOTA.

The statutes in your state will define a farm. In Vermont, you must have a minimum of 25 acres of land. You should give your farm a name if it doesn't already have one. I have QSL cards made up specifically for this program and will send them out if the request comes with a SASE. If other participants want to do more, that's up to them.

There's only one rule: you must actually own a farm. Don't drive onto someone else's land and start transmitting. I'm hoping this program can help to celebrate farm owners who are also hams. My guess is that's a small number.

My intent is for FOTA to be free from excessive rules and not require large amounts of time and money for regulations and website development/costs. If you make a contact with a farm, ask for a QSL card!

Bob Henneberger, K1BIF
Colchester, Vermont

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

Get on the Air with Top Brands from DX Engineering!

DX ENGINEERING

Exceptional Gear from DX Engineering

Our in-house team of Hams designs and engineers DX Engineering branded equipment, from vertical antennas to advanced design thrust bearings, baluns to receive antenna phasing systems, radial plates to coax connectors. DX Engineering also produces Butternut vertical antennas, Clifton Laboratories products, TransWorld portable HF antennas, Comtek gear, and trusted equipment from Top Ten Devices—all backed by the best support staff in the industry. **Enter "DXE" at DXEngineering.com.**

Noise Cancellation and Audio Enhancement Products

bhi

BHD-EQ20

By harnessing cutting-edge digital signal processing technology, bhi noise cancellation and audio enhancement products make it easier for you to discern weak audio signals and increase your radio listening enjoyment. Choose from DSP and extension speakers, DSP devices, and the ParaPro EQ20 Parametric Equalizer, which allows you to adjust any part of the frequency range to customize receive audio to suit your own hearing. **Enter "bhi" at DXEngineering.com.**

Loop Antennas

Ciro Mazzoni Radiocomunicazioni

DX Engineering carries HOA-friendly Loop Antennas by I3VHF, manufactured by Italy's Ciro Mazzoni. The 78" diameter MIDI Loop covers 80 to 20 meters. The popular 39.8" diameter BABY Loop and the Stealth Loop are great for working 40 to 10 meters when you have limited space. The Stealth Loop features a typical SWR of 1.3:1 and measures 54" x 19.6" x 10.2", making it easy to hide. All three antennas include the ATU 2.0 Automatic Tuning Unit. **Enter "MZZ" at DXEngineering.com.**

WiMo and EAntenna Products

WiMo

EA ANTENNA

EAntenna is well known for its lineup of rugged HF and VHF antennas, including Yagi, log periodic, rotatable dipole, and vertical models. These antennas combine cutting-edge computer modeling optimization with robust mechanical and electrical designs to deliver high performance at a budget-friendly price. EAntenna products are now manufactured by WiMo, Germany's largest Amateur Radio supplier. WiMo also manufactures more than 50 models of Kelemen high-efficiency, wide-bandwidth monoband or multiband dipoles and omni-directional antennas available at DX Engineering. Also check out WiMo's APRS modules, QRM Eliminator, and other gear. **Enter "EAntenna," "Kelemen," or "WiMo" at DXEngineering.com.**

OptiBeam Antennas

Proven in stations around the globe, OptiBeam's German-engineered, handcrafted directional monoband and multiband Yagi and log cell Yagi antennas deliver the highest possible gain, cleanest radiation patterns, optimum band coverage, and power handling without compromise. Many popular models are in stock and ready for fast shipment. **Enter "OptiBeam" at DXEngineering.com.**

InnovAntennas

InnovAntennas.com

DX Engineering is pleased to be the exclusive North American dealer for finely crafted Yagis, multiband HF beams, rotable dipoles, and log periodic antennas from InnovAntennas, each one the result of extensive testing and modeling to ensure stellar performance. Antennas are built with top-grade materials, including aircraft aluminum booms and elements, UV-resistant insulators, and stainless steel hardware. InnovAntenna's DXR antennas feature low maintenance; sturdy construction in a manageable size; no hairpins, traps, or matching links; and only one feedline for all bands. **Enter "InnovAntennas" at DXEngineering.com.**

HF, VHF, and UHF Amplifiers

RM ITALY

For more than 40 years, RM Italy has made versatile and compact amplifiers for base, mobile, and handheld radios. The company's high standards can be seen in everything it produces, from the 300W output BLA350 Plus HF Linear Amplifiers to models (LA-144/145) for maximizing the reach of your HTs. **Enter "RM Italy" at DXEngineering.com.**

Hamplus

HAMPLUS

HPY-MBD-8F

Hamplus makes innovative RF and control switching components tailored to the Amateur Radio community. The Hamplus line includes rotator switches, smart control consoles, and antenna switches that can read data from the radio and memorize antenna selections. DX and contest stations worldwide depend on Hamplus for proven results. In an exclusive arrangement, North American operators can enjoy the same advantage by ordering Hamplus products through DX Engineering. **Enter "Hamplus" at DXEngineering.com.**

YAESU ICOM KENWOOD ALINCO HA8KF MAGNETIC PADDLE PHONEMA Bushcomm HF Antenna Systems LBS LOW BAND SYSTEMS

DX Engineering's Amateur Radio Blog for New and Experienced Hams. ON ALL BANDS

DX® ENGINEERING

Ordering (via phone) Country Code: +1
9 am to midnight ET, Monday-Friday
9 am to 5 pm ET, Weekends

Phone or e-mail Tech Support: 330-572-3200
9 am to 7 pm ET, Monday-Friday
9 am to 5 pm ET, Saturday

Ohio Curbside Pickup:
9 am to 8 pm ET, Monday-Saturday
9 am to 7 pm ET, Sunday

Nevada Curbside Pickup:
9 am to 7 pm PT, Monday-Sunday

800-777-0703 | DXEngineering.com

ON ALL BANDS

We're All Elmers Here! Ask us at: Elmer@DXEngineering.com
Email Support 24/7/365 at DXEngineering@DXEngineering.com

YouTube

Advertorial

Building a Crystal Radio Kit Changed My Life, and Now I'm Passing the Torch to The Next Generation!

(5 Minute Read)

When I was younger, I spent a lot of time with my uncle who was very much into analog electronics. I would especially look forward to the winter breaks as I would typically spend them with him and my grandmother. One night after he returned home from work, I remember him bringing home a mysterious box full of parts. I was intrigued to say the least!

When I asked him what was in the box, he said it's called a "Crystal Radio Kit". My mind raced with excitement and I couldn't wait to crack into the box and begin building whatever it was. What happened next changed my life forever!

When we finally finished building the kit, he put the earpiece into my ear, and began turning a dial on the unit. To my amazement I could hear someone's voice. I was stunned, where was this voice coming from? After all, there were no batteries, how could I be hearing anything? What he said next really blew my mind. He said, the voice and the power were coming from radio waves which were invisible to the naked eye.

Not only were those some of the best memories of my life, but from that moment forward, I knew I wanted to study everything I could about electronics. In fact, it led to a successful career as an electrical engineer. Now that I'm older and have nieces and nephews of my own, I knew that I wanted to pass this excitement and knowledge to the next generation. But how? Electronics today are far more complicated than they were when I was starting out decades ago.

After a bit of googling, I ran across something called Arduino. It's a super simple to use electronics platform which allows anyone to build some truly incredible projects. It's coded in a basic form of a language called C.

With the winter months ahead of us, I wanted to get my hands on an Arduino based kit so that I could spend some quality time with my nephew and pass the torch to the next generation. Luckily, I keep all my past issues of QST magazine and happened to see a review of a product called the Dr.Duino Explorer which is an Arduino compatible kit. (January 2021, page 48)

After reading this review, I knew that this was exactly what I was looking for. It comes as a DIY style kit accompanied by a superb set of step-by-step online instructions that teach you about the Arduino as you build it. PLUS, for a limited time, when you order your own Explorer Edition from www.DoctorDuino.com, you'll even get access to an Arduino crash course for FREE!

It's perfect for jump starting your Arduino journey, by teaching you what you can and can't do with Arduino, and ends with you creating your very own Morse code machine! I'd hurry though, because ever since it was featured in QST, these kits are hard to get your hands on.

DR.DUINO™ **MAKES THE PERFECT GIFT!**

BECOME AN ELECTRONICS MASTER FASTER!

WITH DR.DUINO

FOR BEGINNERS OR PROS

It's perfect for quick prototyping and diving right into the world of Arduino© without a breadboard.

ARDUINO© UNO & NANO COMPATIBLE SHIELDS.

Pioneer edition

LEARNING PLATFORM

LEARNING KIT
Perfect for getting started with Arduino®!

SIMULATOR
Begin coding even before your hardware arrives.

Explorer Edition

PROTOTYPING PLATFORM

TEST FIXTURE
Easily accessible & probe friendly pins.

DEBUGGER
Quickly troubleshoot hardware vs. code issues.

As seen in QST Magazine January 2021
Page 48 Product Review Section

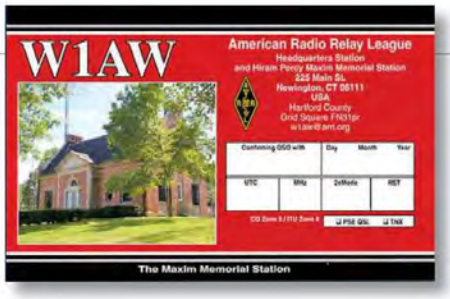
«The Dr.Duino Explorer Edition is a well-designed development, prototyping and troubleshooting platform»
Revied by Glen Popiel, KW5GP

SPECIAL WINTER BONUS
GET A FREE ARDUINO CRASH COURSE WITH EVERY KIT!

AVAILABLE AT **www.DoctorDuino.com**

W1AW's QSL File

Every month, W1AW receives hundreds of QSL cards from hams all over the world, confirming contact with the Hiram Percy Maxim Memorial Station at ARRL Headquarters. Maybe you'll recognize an on-air friend — or even yourself — among these cards.



The Legend Continues

The TS-590SG

Back in 1973, Kenwood introduced the first affordable HF radio to the world, the legendary TS-520... 27 years later, the TS-570D and the TS-570S with 6 meters were by far the most popular HF and HF+6 transceivers on the market.

Be witness to the evolution of KENWOOD's pride and joy - the TS-590S HF transceiver - pushing performance and technology to its utmost limit, with the receiver configured to capitalize on roofing filter performance and IF AGC controlled through advanced DSP technology. Enter the TS-590SG. A new generation of high performance transceiver, with the type of high level response to meet DX'ers needs.

Don't be fooled by big boxes, high price tags, complex operation and broken promises. As Kenwood continues to build outstanding products with unparalleled performance and great value, it's no surprise Kenwood is rated as one of the leading choices for HF radios.

It's not too late to own an HF legend because we still build them today.

KENWOOD

Customer Support: (310) 639-4200
Fax: (310) 537-8235

www.kenwood.com/usa

ISO9001 Registered

ADS#36419

A Compact

630-Meter Active Loop Antenna

Null out local noise for better reception on 472 – 479 kHz.

Salvatore DeFrancesco, K1RGO

Since the new MF and LF bands became available, I prefer to operate the more practical 630-meter band. I operate CW and QRSS and I am finding challenges with interference, especially fading. I use my homebrew transverter and a Yaesu FTDX-1200 with my loaded 630-meter antenna. For receiving, loose coupling my small active E-field probe to the 630-meter loading coil was quite noisy, as is the LF Engineering L-400B's E-field probe alone (see the LF Engineering L-400B Active Gain Antenna specifications sheet at **https://www.lfengineering.com/files/pdf/L-400B_inst.pdf**). I needed a better receive antenna for sure.

I developed a compact loop for fixed or portable use. I settled on a design using RG-174 coaxial cable with a single gap, which is similar to the method described in *The ARRL Antenna Book* (24th ed., Section 5.2), but I used a different method of feeding the amplifier. With the split-shielded balanced output, I fed an amplifier with high impedance (Z) input. The amplifier output matches a 50 Ω coax to the receiver.

Loop Design Description

For the 630-meter band, I calculated the loop size and the approximate resonant point for an intermediate quality factor (Q value). My design had an 8-inch diameter and 12 turns of RG-174 coaxial cable with a ½-inch cut in the center of the outer shield. Any slight variation in the capacitance per foot will affect the resonance point, which is adjusted by tuning (as described later).

Because this is a balanced loop, I needed a 1:1 balun at the input of the chosen amplifier. I used a 2-channel field-effect transistor (FET) amplifier circuit with a gain of 30 dB on a 3 × 1.5-inch circuit board. To power up and couple to the receiver, a simple bias T is all that was required. At the input, T1, I used a three-color (blue, yellow, black) #28 wrapping wire with a trifilar winding on a FT-50A-75 ferrite toroid to create a 1:1 balun at the preamplifier input, Q1. A J113 junction-gate field-effect transistor (JFET) drives the amplifier, Q2, which is a BS170 metal–oxide–semiconductor field-effect transistor (MOSFET). With the combination of T2 (a bifilar wound toroidal transformer), Q2 creates a phantom power two-wire feed. A simple bias T requires 12 to 15 V to power the amplifier at 35 to 40 mA.

Loop Construction

To wind the loop, cut a 26-foot long length of RG-174 coax. At the center (13 feet), cut away a gap in the shield approximately ½ inch long. Find a mandrel of 8 inches in diameter to wind around.

I used a tapered plastic pail, marked the 8-inch diameter, and put evenly spaced double-backed tape around the periphery. Wind a tight bundle of 12 turns, then tape the turns together at 4 evenly spaced posi-

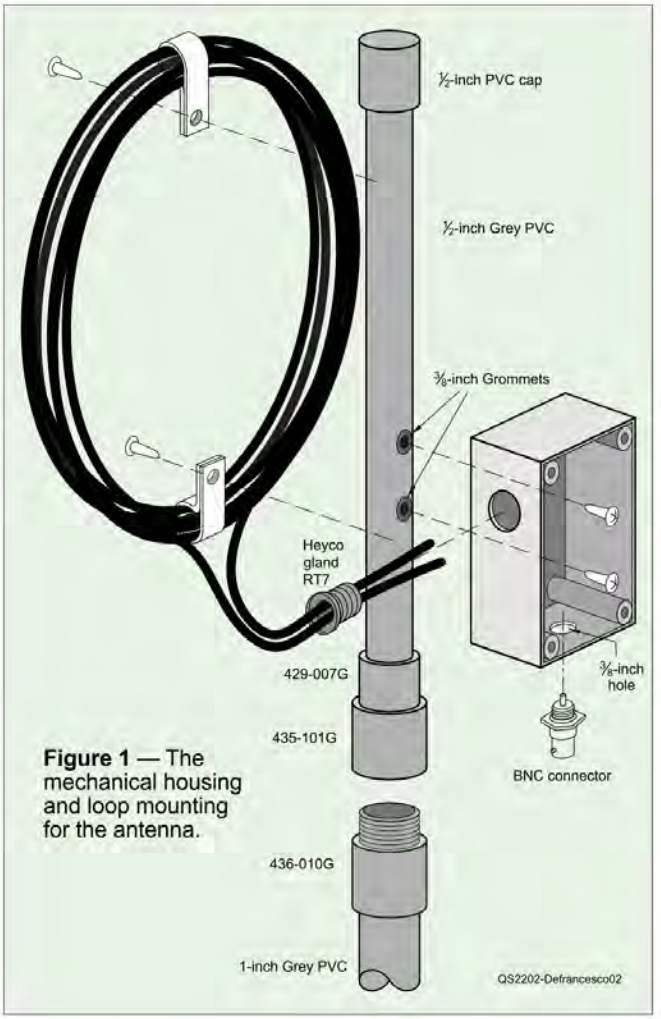


Figure 1 — The mechanical housing and loop mounting for the antenna.

Figure 2 — The circuit board is mounted in the waterproof enclosure.

tions around the periphery of the bundled loop. Align the cut shield to the side opposite of where the coax end leads cross, and seal the shield cut with Goop. When completed, wind a spiral wrap tightly around the loop to secure it. I suggest black polyethylene ¼-inch spiral wrap by Alpha Wire.

To house the amplifier, I used a small water-tight aluminum enclosure (Hammond 1590WG). You can use an equivalent box, depending on your amplifier board, but it must be non-magnetic. Remove the front cover, and mark a spot on the upper left side of the box, centered front to back and 0.85 inch from the top edge. There, drill a 29/64-inch hole and cut threads in it with a ½-20NF tap. This will accommodate the Heyco RT7 cable gland (Heyco part number V3444), which will pass the ends of the antenna loop RG-174 coax into the box while keeping moisture out. An alternative to using the gland is to drill two small holes to pass the coax through, then sealing the holes with Goop.

Drill a ⅜-inch hole for the BNC connector centered at the bottom. Drill two holes centered offset 1-inch from each end, using #6 × ¾-inch self-taping screws. Sandwich in the grommets RG 375-8-3A (or equivalent with a 0.273-inch thickness) and use Goop (see Figure 1). Before installing the loop amplifier, place a 3.25 × 1.5-inch sheet of mylar (or equivalent) insulator between the circuit board and housing. Now you can solder the loop connections to the circuit board. The materials needed for the mounting and housing can be found in Table 1.

Testing and Tuning

For testing, I used an oscilloscope, a signal generator with an 8-inch radiating loop antenna, an analyzer, and an RF millivoltmeter. I connected a 50 Ω load to the output of the bias T. I then mounted the 630-meter loop 18 inches away from the radiating loop and adjusted various signal levels on the signal generator for evaluation. Tuning was easy. I set the generator to 475 kHz, and I installed SAT (Select At Test) C3 (see Figure 5) for a peak on the oscilloscope. C3 tuned in nicely with 220 pF. A check of the bandwidth proved it to be flat within 1 dB in the 472 to 479 kHz pass band. On the RF millivoltmeter, I found the 1 dB compression point to be 13 dBm, the and maximum linear output

Table 1 — Mounting and Housing Parts

¼-inch Spiral wrap, 48 inches long
¾-inch Schedule 40 PVC coupling socket
1-inch Schedule 40 PVC female adapter
1-inch Schedule 40 PVC male Adaptor
¾-inch Schedule 40 PVC pipe, 10 inches long
Hammond Manufacturing 3.94 × 1.97 × 0.83-inch box
Waterproof gland Mouser pn/836-3444
⅜-inch Neoprene grommets RG 375-8-3A, or similar
Tube of Goop

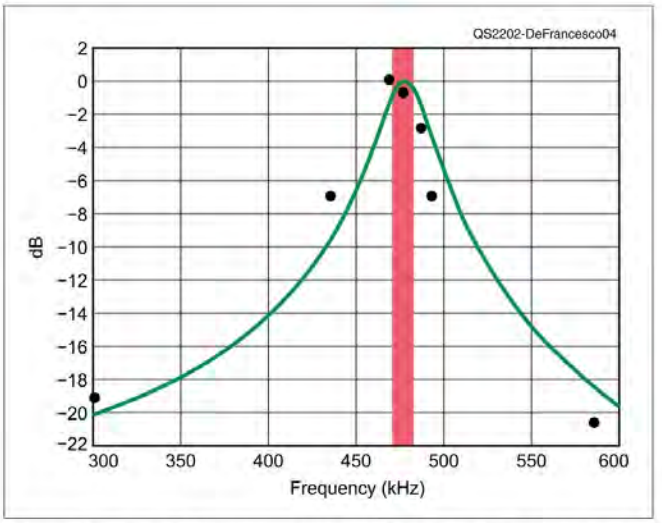


Figure 3 — The frequency response of the loop. The green curve is the calculated response, and the black dots are the measured response. The pink area indicates the amateur band limits.

was 6 to 7 dBm. On the analyzer, I tried a two-tone IP3 test, and I really had to crank up the signal generator to see the third-order blips. I estimated >30 dBm for IP3, then I did a quick test for nulls. On the scope, I could sharply null out the test signal completely.

Figure 5 — The loop is shown with handle coupling and the base mount.

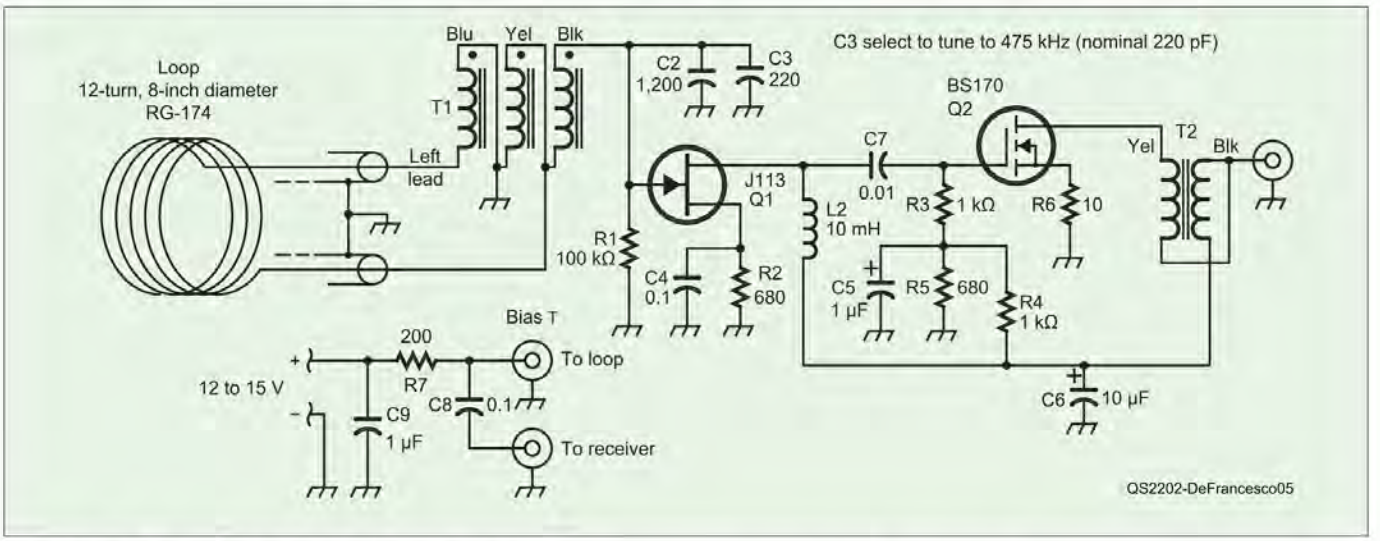
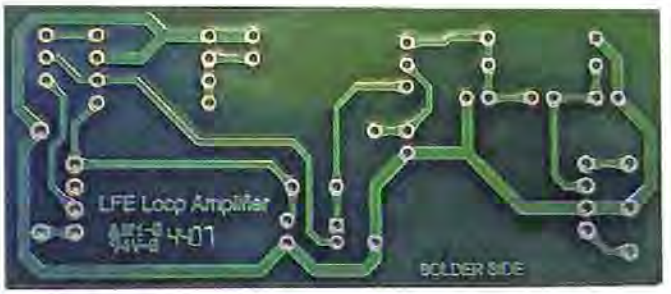


Figure 4 — A schematic diagram of the loop and amplifier.

L2 — 10 mH choke (mouser.com)
R1 — 100 K resistor (mouser.com)
R2, R5 — 680 Ω resistor (mouser.com)
R3, R4 — 1 K resistor (mouser.com)
R6 — 10 Ω resistor (mouser.com)
R7 — 200 Ω resistor (mouser.com)
C2 — 1,200 pF capacitor (Digi-Key)
C3 — 220 pF capacitor (Digi-Key)
C4, C8 — 0.1 uF X7R capacitor (mouser.com)
C5, C9 — 1 µF tantalum capacitor (mouser.com)
C6 — 10 µF electrolytic capacitor (mouser.com)
C7 — 0.01 µF X7R capacitor (mouser.com)
Q1 — J113 FET (mouser.com)
Q2 — BS170 MOSFET (mouser.com)
T1 — 18 turns trifilar wound #28 AWG, on FT-50A-75 core
T2 — 18 turns bifilar wound #28 AWG, on FT-50A-75 core



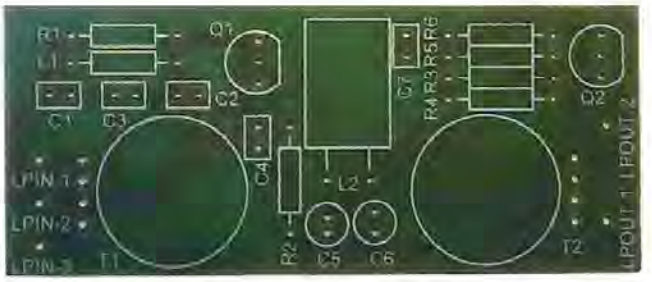


Figure 6 — A PC board is available. Contact the author for details.

A receiver can also be used to tune the loop to center band and either lightly couple to the signal generator set at 475 kHz and tune for a maximum S-meter reading, or tune for maximum noise at this frequency.

Operation

On the 630-meter band, I compared the loop to two other antennas — my LF L-400B E-field probe and my broadly resonant 6-inch E-field probe lightly coupled to the 630-meter loading coil on my 160-meter inverted **V**.

The result was a pleasant surprise. I had a much lower local noise level that I was able to null out. I also noticed the weaker digital mode signals were out of the noise. Both E-field probes were quite noisy and signals on the L-400B were weaker than with the coupled E-field probe. The loop had almost as much signal output as the coupled probe scheme, but it had a much better signal-to-noise ratio.

Testing with a few CW contacts, I found that the loop outperformed the E-field probes. The sharp nulls worked nicely on strong noise and interference.

The new compact active loop is now my main receiving antenna for 630 meters. The loop can also be used from the AM broadcast band down to 20 kHz. These results showed less sensitivity but had usable signal levels. Hopefully this project can inspire more CW 630-meter activity.

Amateur Extra-class licensee Salvatore DeFrancesco, K1RGO, has been licensed as since 1961. He held positions in microwave communications, biomedical electronics, RF cable/connectors MIL specifications testing. He worked in the aerospace industry for 19 years, developing vibration test instrumentation, and accelerometers for the F-119 jet engine, A3 missile system and a multimode monitoring system for Wright Patterson AFB. Sal has written various articles and holds three patents. He founded LF Engineering Co., which he still operates, after retiring from his work with Yale University's physics department. Sal can be reached at **lfengineering.com**.

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

All ARRL members can now enjoy the online edition of *QEX* as a member benefit. Coming up in the January/February 2022 and future *QEX* issues, are articles and technical notes on a range of amateur radio topics. These are at the top of the queue.

- Tim Czerwonka, WO9U, creates custom keyboards using QMK firmware.
- Lynn Hansen, KU7Q, describes automation options for the CTR2 HMI.
- Chuck MacCluer, W8MQW, describes sequencing of antenna change-over relays.
- Eric Nichols, KL7AJ, Technical Note on Mesh Analysis.
- Philip Cassady, K7PEC, reveals the effects of height and ground parameters on a dipole.
- In his essay series, Eric Nichols, KL7AJ, describes angular frequency.
- John Stanley, K4ERO, shows that loss on a line with SWR can be lower than on a matched line.
- Peter DeNeef, AE7PD, estimates the field power density from a parabolic dish antenna.
- Alan Victor, W4AMV, investigates transformer-coupled tuned-impedance transforming circuits.

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

Would you like to write for *QEX*? We pay $50 per published page for full articles and *QEX* Technical Notes. Get more information and an Author Guide at **www.arrl.org/qex-author-guide**. If you prefer postal mail, send a business-size self-addressed, stamped (US postage) envelope to: *QEX* Author Guide, c/o Maty Weinberg, ARRL, 225 Main St., Newington, CT 06111.

A Wi-Fi Antenna Rotator Compass

Build a precise smartphone readout compass for your rotatable antenna.

Giovanni Carboni, IZ5PQT

This antenna-mounted magnetic compass system is inexpensive and easy to implement (see Figure 1). Two basic components are used — a Honeywell HMC5883L magnetic field sensor and an Arduino MKR WiFi 1010 microcontroller board. The HMC5883L is a surface-mount, multi-chip module with an I2C serial interface designed for low-field magnetic sensing. It includes the high-resolution HMC118X series magneto-resistive sensor, and an application-specific integrated circuit (ASIC) containing amplification, automatic degaussing strap drivers, offset cancellation, and a 12-bit analog-to-digital converter (ADC) that enables 1- to 2-degree compass heading accuracy.

Figure 1 — The magnetic compass is mounted on rotatable mast.

The HMC5883L sends its data about the Earth's magnetic field to the MKR 1010 board via an I2C serial bus. The MKR 1010 decodes the data and provides the compass readout through its built-in Wi-Fi module and antenna. The MKR 1010 board is powered with 5 V and then provides 3.3 V to the HMC5883L. The total current drain at 5 V is 115 mA. The wiring diagram is shown in Figure 2.

The compass is mounted inside a 4 × 4 × 2-inch plastic waterproof electrical junction box (see Figure 3). The two boards attach to the inside of the cover. The MKR 1010 board plugs into two female header strips whose pins are soldered to a scrap breadboard that is fastened to the cover with hot glue. Ensure that the MKR 1010 board's USB connector is not obstructed. The HMC5883L is held in place with double-sided tape. Four wires connect the MKR 1010 and HMC5883L boards — V_{CC}, GND, SDA, and SCL (all clearly marked on the MKR 1010 pins). I used a breakout board made by Olimex (available from **mouser.com**), so I wouldn't have to solder to the HMC5883L chip. I did not use the supplied ribbon cable. I just plugged short jumper wires into the connector pins. The dc input comes through a SO-239 socket mounted on the box. A 7805 regulator and single-pole, double-throw (SPDT) switch mount inside the box. The switch permits operation from either a higher voltage external power supply using a LM7805 regulator, or 5 V directly from a cell

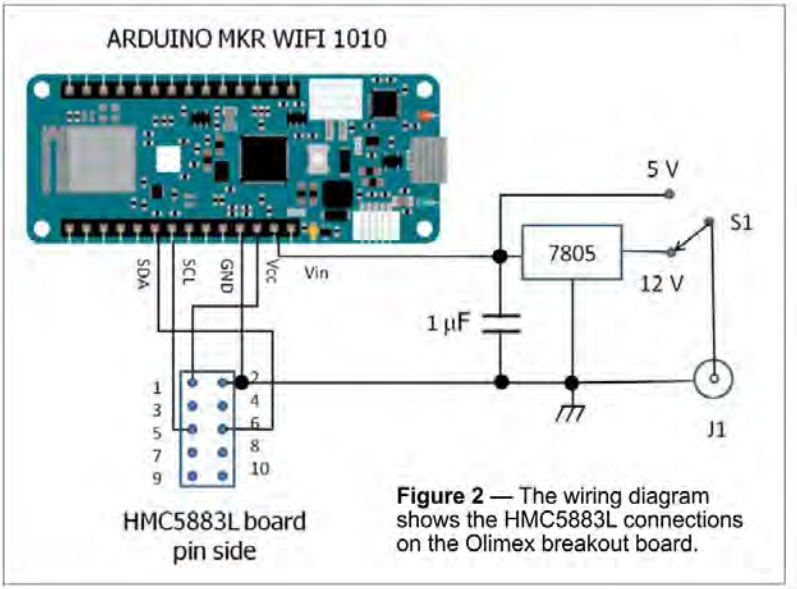


Figure 2 — The wiring diagram shows the HMC5883L connections on the Olimex breakout board.

◀ **Figure 3** — The MKR1010 (mounted on scrap perf board) and the HMC5883L boards are attached to the cover. The LM7805 regulator with the heatsink and the toggle switch are mounted in the main box. An SO-239 is the dc supply connector. The arrow indicates the compass orientation.

```
*** WIFI COMPASS ***
Heading: 308°
Heading: 309°
Heading: 309°
Heading: 309°
Heading: 308°
```

▲ **Figure 4** — The compass headings are displayed on the smartphone screen using the Termius terminal app.

phone power pack or charger. The LM7805 needs a small heatsink, as it dissipates about 0.8 W at 12 V.

The box is attached to a 4 × 6-inch, **L**-shaped aluminum plate (iron or steel plates would distort the compass reading). A **U**-bolt allows fastening the box to the antenna mast, as you can see in Figure 1.

Software

Download the software from **https://www.televideo.ws/index.php/wifi-magnetic-compass**. The program (or *sketch*, in Arduino-speak) *MKR_Telnet_Compass.ino* is a cut-and-paste of two existing pieces of software. The program setup section configures and starts the Telnet server. With the server enabled, the code obtains the compass data from the routine *getHeading()* and continuously writes it to the server for transmission. To install the sketch, open the Arduino IDE on your PC. Go to the **BOARDS MANAGER** and search for and install **ARDUINO AVR BOARDS**. Then install *Arduino SAMD (32-bits ARM Cortex-M0+) Boards.* From the menu, click **ARDUINO MKR WIFI 1010**. Connect the Arduino to your PC via a USB cable and select the proper COM port. Open the sketch *MKR_Telnet_Compass.ino* and install **WIFININA**, **ADAFRUIT HMC5883 UNIFIED**, and **ADAFRUIT UNIFIED SENSOR** via the **LIBRARY MANAGER**. Now configure the Wi-Fi network in the sketch. In the IDE, click on the **ARDUINO_SECRETS.H** tab. Choose a name for your Wi-Fi network and load the sketch into the Arduino.

Now, scan for local Wi-Fi networks with your smartphone and check that *mkr-net* is on air. The IP address should default to 192.168.4.1 port 23. The USB cable can now be disconnected. The sketch allows correction of the compass reading to compensate for the magnetic declination or misalignment of the of the antenna with the HMC5883 board. Because I mounted the HMC5883L upside down on the underside of the cover, I reversed one of the axes in the software decoding routine.

Using the Wi-Fi Antenna Rotator Compass

The compass heading is transmitted over the network using the Telnet protocol. Your phone's Wi-Fi must be connected to *mkr-net* and have a Telnet terminal app installed. For dedicated use, you may wish to use an old smartphone. I use Termius for Android phones, and iTerminal for iPhones. Configure the terminal app to use Telnet (not SSH), connecting with IP address 192.168.4.1:23. Once you hit **CONNECT**, the compass heading will scroll continuously on the screen (see Figure 4).

I tested the compass on the mast of a three-element HF beam at an RF power level of 200 W, with no RFI problems noted. But be warned — with higher powers, your results may vary.

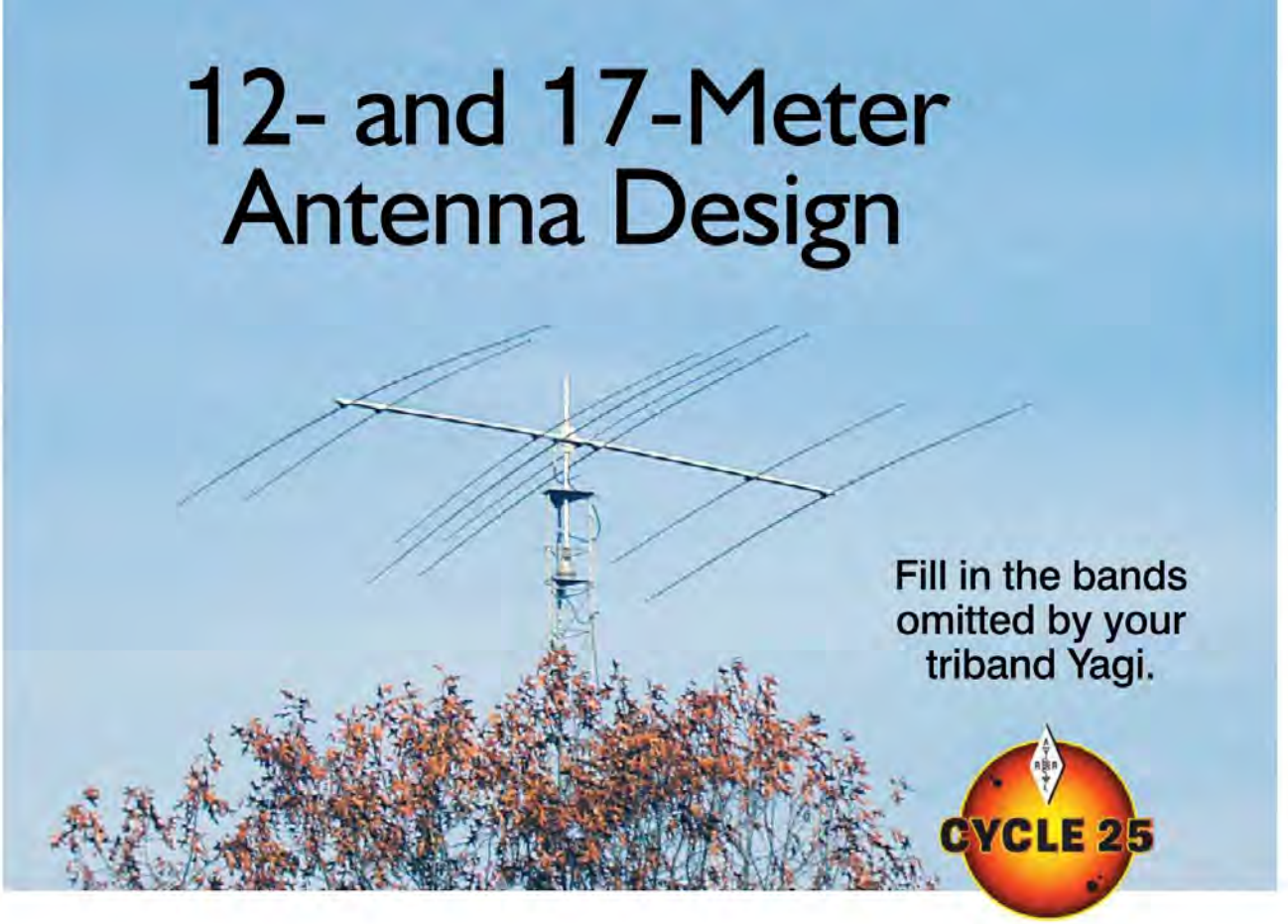
The MKR Wi-Fi 1010 has a range of about 300 feet outdoors. However, if the receiving smartphone is inside a building, the range will be reduced. In this case, I had very good success with a Wi-Fi range extender, which was strategically placed in sight of both the compass and the shack.

All photos by the author.

Giovanni Carboni, IZ5PQT, was first licensed in 2009. After serving many years as a researcher in experimental high-energy physics, he became a professor of physics at Tor Vergata University in Rome. Now retired, Giovanni lives in Pisa, where he enjoys operating digital modes, VHF meteor scatter, and experimenting with antennas and wide-spectrum homebrewing. You can reach Giovanni at **iz5pqt@gmail.com**.

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

12- and 17-Meter Antenna Design



Joe Reisert, W1JR

High-frequency (HF) radio propagation is changing for the better as we start Solar Cycle 25. Antennas for HF operation are plentiful, but they don't usually include the 12- and 17-meter bands. It's time to fix that. Constructing a dual-band Yagi antenna that covers the 12- and 17-meter bands can be easy and convenient.

Antenna Modeling

Antenna modeling and optimization requires time, skill, patience, and experience. Optimized three- and four-element Yagi antennas with clean patterns, good gain, and bandwidth can be scaled for 12 or 17 meters from designs for other bands. (For more information, see my 1998 article on "Yagi/Uda Antenna Design" from *Communications Quarterly Magazine*.) These Yagis use a direct feed, requiring no additional impedance matching devices. The designs were verified using Roy Lewallen's, W7EL, *EZNEC* software (**https://www.eznec.com**).

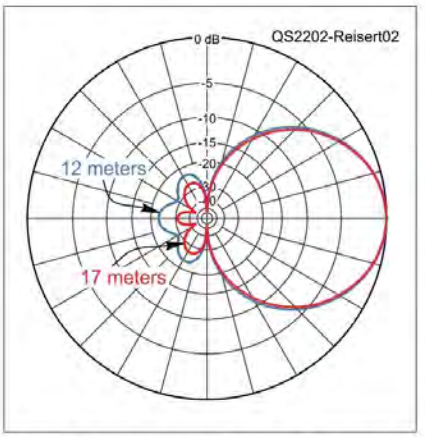


Figure 1 — Radiation plots on 12 and 17 meters.

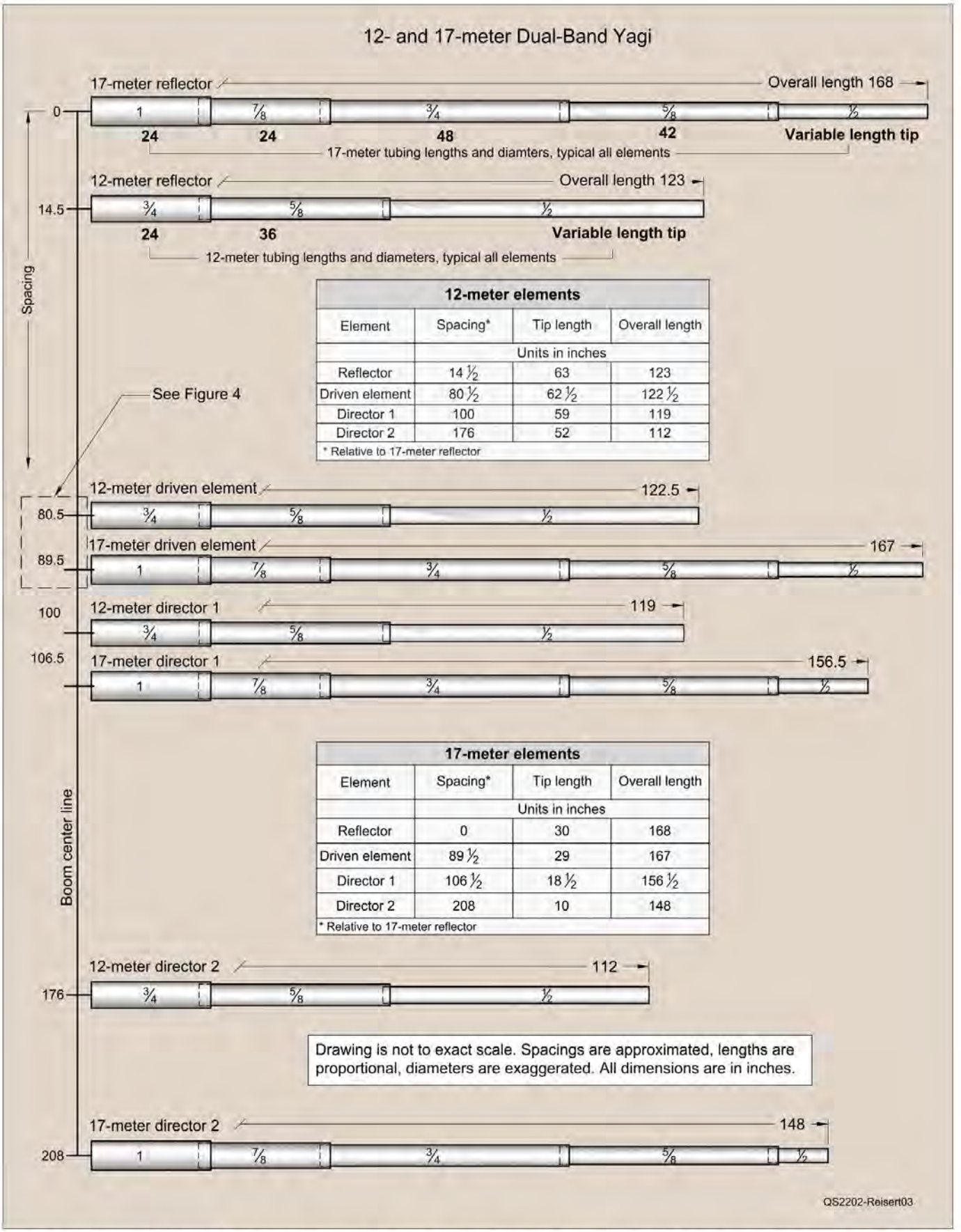
A 12/17-Meter Dual-Band Yagi

With the aid of antenna optimization and modeling software available from Dan Maguire, AC6LA, at **https://ac6la.com**, I designed and optimized a dual-band Yagi based on a single-band design. The performance equals that of a single four-element Yagi, all on the same boom and with a single feed (see photo above).

Typical gain of an optimized dual-band Yagi is around 8 dBi, with a front-to-back ratio greater than 20 dB, with an SWR below 1.3:1 on both bands. The final results were verified using *EZNEC* software and on-the-air tests. The radiation patterns (see Figure 1) show that the beam widths are about 64°.

Construction

Figure 2 shows the construction details of half the antenna with the 18-foot boom centered on the vertical line on the left. I recommend that you use a 2-inch-diameter boom and follow the details closely to duplicate the performance. Figure 2 also shows recom-



12-meter elements

Element	Spacing*	Tip length	Overall length
	Units in inches		
Reflector	14 ½	63	123
Driven element	80 ½	62 ½	122 ½
Director 1	100	59	119
Director 2	176	52	112

* Relative to 17-meter reflector

17-meter elements

Element	Spacing*	Tip length	Overall length
	Units in inches		
Reflector	0	30	168
Driven element	89 ½	29	167
Director 1	106 ½	18 ½	156 ½
Director 2	208	10	148

* Relative to 17-meter reflector

Figure 2 — Overall mechanical layout of the antenna. Tubing sizes for elements range from ½ to 1 inch on 17 meters, and ½ to ¾ inch on 12 meters, and the recommended element lengths for both bands are shown. A 2 – 3 inch overlap is recommended at the element joints.

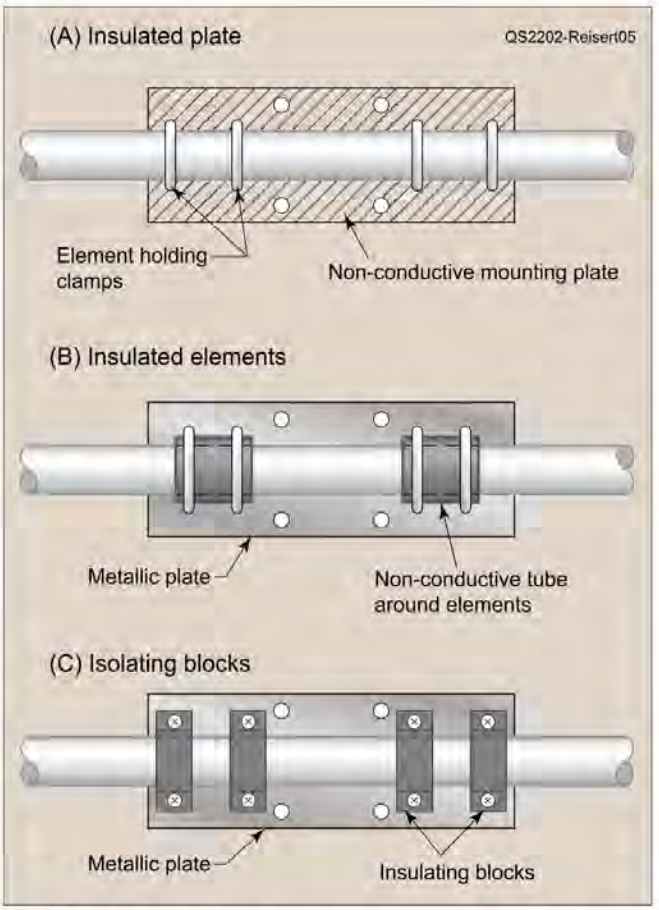


Figure 3 — Three ways of mounting the non-driven elements. Elements are continuous across and insulated from the boom. The boom, not shown, is vertically centered and fastened to the mounting plate.

mended element details. I also recommend that you use at least 2 to 3 inches of overlap at the element joint, as seen in Figure 2.

All elements are insulated from the boom, as shown in Figure 3. The fed elements and all other elements should be mounted on insulated blocks (see Figure 3). Attaching elements directly to the boom can alter performance, especially where dimensions are critical. Figure 4 shows the details of the feed system. Use a balun at the feed point to prevent feed line radiation. My simple and efficient balun uses a toroid with a 2.4-inch outside diameter and Type-43 (Fair-Rite 594303801) or Type-61 (Fair-Rite 5961003801) ferrite material, as instructed in an article from the September 1978 issue of *Ham Radio Magazine*.

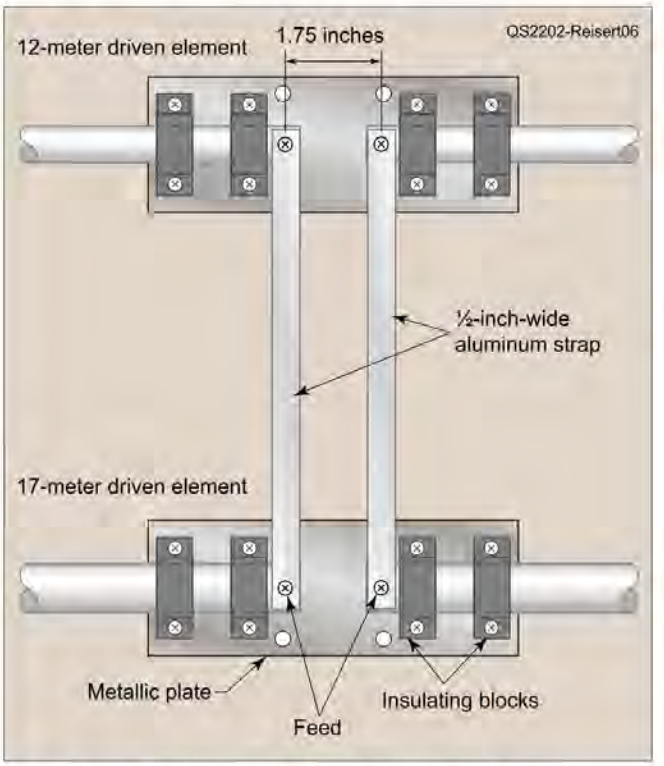


Figure 4 — The recommended feed element details.

Summary

I've used this 12/17-meter dual-band Yagi extensively, and I verified its performance on the air. It is compact, so it can easily be added on the same mast with a triband Yagi. I recommend a vertical separation of 8 to 10 feet from any other Yagi. I hope to see you on the 12- and 17-meter bands.

ARRL Life Member and Amateur Extra-class licensee Joe Reisert, W1JR, was first licensed in 1951. He received his AAS degree in Electronic Technology from SUNY (State University of NY) at Farmingdale in 1956. Joe has been employed by Sperry, IBM, Lockheed Missiles and Space, Fairchild Microwave, The MITRE Corp., Wang Labs, and Cushcraft. In 1992, he formed Antennaco, Inc. and designed and manufactured commercial antennas for VHF, UHF, and microwave communications. Joe is interested in DX from HF through microwaves, and was an early pioneer in the 1970s on EME. He earned DXCC 392/340, DX Challenge 3171, 13BWAS, 11BDXCC, and DXCC 160 meters with over 314 confirmed, and was inducted into the CQ DX Hall of Fame (2014). Joe has served on the ARRL DX Advisory Committee and was the Chairman of the VHF/UHF Advisory Committee. He has published over 150 technical papers and given over 125 invited talks on various amateur radio subjects. You can reach Joe at **w1jr@arrl.net**.

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

VOTE
If you enjoyed this article, cast your vote at www.arrl.org/cover-plaque-poll

Mark J. Wilson, K1RO, k1ro@arrl.org

Product Review

RigExpert AA-2000 ZOOM 0.1 – 2000 MHz Antenna and Cable Analyzer

Reviewed by Phil Salas, AD5X
ad5x@arrl.net

The AA-2000 ZOOM is RigExpert's latest and most capable antenna analyzer. Like all of the RigExpert antenna analyzers, the AA-2000 ZOOM is a single-port vector network analyzer (VNA). It provides signed, complex impedance measurements of RF loads from 100 kHz to 2 GHz with a frequency resolution of 1 kHz.

Bottom Line

The AA-2000 ZOOM is a flexible, accurate and easy to use antenna analyzer for those who need analyzer capabilities up to 2 GHz.

Overview

The AA-2000 ZOOM is a bit larger than other ZOOM models. The measurement port is a Type-N female connector, but a UHF-to-N adapter is included for the more common PL-259 interface used by hams in the HF and VHF ranges. Also included are the user manual, a USB cable for computer interfacing, three 2,700 mAh NiMH AA-size batteries, an external NiMH AA-size battery charger, a carrying case, and a carrying strap.

You can substitute 1.2 – 3.7 V lithium or alkaline AA batteries for the NiMH batteries. Depleted NiMH batteries take about 6 hours to charge with the included charger, and a battery indicator on the main menu shows the battery status. When a computer is connected, power is provided though the USB connection and the battery display is replaced by a USB icon.

Internal memory provides for the storage and recall of measured parameters in a variety of formats. All information is displayed on a 2 × 1.5 inch, 800 × 480 pixel Blanview color TFT-LCD screen, which provides high-contrast, crisp images even in bright sunlight. When the analyzer is connected to your computer, additional data recording and analysis capabilities, as well as firmware updates, are available. Table 1 summarizes the AA-2000 ZOOM specifications.

Initial Setup

Before using the AA-2000 ZOOM for the first time, visit the RigExpert website and download and install the *AntScope2* software (Windows, macOS, or Linux versions are available) and the *Flash Tool* for Windows or macOS. Connect the AA-2000 ZOOM USB cable to your computer, which automatically powers on the AA-2000 ZOOM. Now open the downloaded *Flash Tool* file and the *Flash Tool* will determine if there is newer firmware available, and — if so — will update the firmware automatically. *AntScope2* permits importing and viewing data from the AA-2000 ZOOM's memory and provides real-time control of the analyzer.

An *Antscope* app is available for Android and iOS devices. The AA-2000 ZOOM has a built-in Bluetooth feature for communicating with mobile devices.

Table 1
AA-2000 ZOOM Manufacturer's Specifications

Frequency range: 0.1 to 2,000 MHz with 1 kHz resolution for 25, 50, 75, 100, 150, 200, 300, 450, and 600 Ω systems.
SWR measurement range: 1 to 100 in numerical modes, 1 to 10 in chart modes.
Memories: 250
RF output: Square wave, 0.1 to 2,000 MHz, at –10 dBm into 50 Ω.
Operating temperature: 32 – 104 °F.
Dimensions: 9 × 3.9 × 2 inches. Weight: 15.6 oz. with battery.

Measurement Capabilities

The AA-2000 ZOOM menus and keypad markings are self-explanatory, so you will rarely need to refer to the manual. The user interface is very similar to other RigExpert ZOOM series analyzers, so if you've used one of these before, the AA-2000 ZOOM will be very familiar. You can select a single-frequency display, a swept-frequency display, a Smith chart display, or a time domain reflectometer (TDR) display.

The single-frequency modes let you select displays of SWR, impedance (Z, R, and X), or the equivalent series and parallel representation of an impedance. The MultiSWR display shows the measured SWR on five different frequencies, making it ideal to look at resonances on a multiband antenna.

The swept-frequency modes display SWR, return loss, or impedance (R/X), and all the graphical displays can be expanded with the ZOOM feature for enhanced reading accuracy. The ZOOM capability permits you to scan a wide frequency range, after which you can use the left/right arrow keys to center the frequency of interest, and then use the up/down arrow keys to zoom in or out in order to see more or less detail from the scan.

With its constant, stable output, the AA-2000 ZOOM is suitable for receiver sensitivity testing when used with a good step attenuator, keeping in mind that the output waveform is a square wave with multiple harmonics. The AA-2000 ZOOM can zero-out a transmission line for making accurate remote antenna feed point impedance measurements if open/source/load calibration standards are available.

Other useful features available in the AA-2000 ZOOM include the ability to measure cable length, cable loss, velocity factor, and characteristic impedance. The TDR function is useful for finding discontinuities in your antenna system. One use for this is to determine the physical length of coax to any of your antennas, just by leaving the antenna end of the coaxial feed line disconnected.

Using the AA-2000 ZOOM

I used the **ALL PARAMS** (All Parameters) mode for some basic measurements. I first checked the 10 MHz output frequency against the 10 MHz WWV signal, and I could not discern any difference in frequency between the two. Next, I checked the output level over the full frequency range using my Mini-Circuits PWR-6GHS+ power sensor. It measured –9 dBm ±0.5 dB from 1.8 – 450 MHz, dropping to –11.1 dBm at 1 GHz and –14.6 dBm at 2 GHz.

Table 2 displays the measured open-circuit impedance of the AA-2000 ZOOM. This gives an indication of the impedance magnitude you can accurately measure as a function of frequency. I found these measurements interesting, as all other antenna analyzers I've reviewed measure a high open-circuit impedance (several thousand ohms) at low frequencies, but the measured impedance drops off to low values (hundreds of ohms) at the high end of the instrument's range. The AA-2000 ZOOM measures virtually the same high open-circuit impedance across its entire range.

Next I compared return loss (RL) measurements of various loads using the AA-2000 ZOOM and my Array Solutions VNAuhf vector network analyzer. I have found the VNAuhf to be similar in accuracy to an HP/Agilent 8722D VNA over the frequency range covered by the VNAuhf. However, I cannot measure frequencies above 1200 MHz with the VNAuhf.

For these measurements, I used return loss instead of SWR because return loss is the preferred measurement method on the higher frequencies. You can easily convert return loss to SWR using online calculators.

First I measured return loss using a precision 50 Ω load (see Table 3) and then I measured several open and shorted microwave attenuators of 6 dB (12 dB return loss) and 3 dB (6 dB return loss). Return loss measurements were also made using a 2 dB attenuator (4 dB return loss), although the attenuator is only specified to 500 MHz. These measurements are shown in Table 4. As you can see in the tables, the measurement discrepancies between the AA-2000 ZOOM and

Table 2
AA-2000 ZOOM Measured Open Circuit Impedance

Frequency (MHz)	Output (Z) (Ω)	Frequency (MHz)	Output (Z) (Ω)
1.8	2,400	222	2,300
14	2,400	450	2,000
28	2,400	915	1,800
50	2,300	1,250	1,600
146	2,300	2,000	1,900

Table 3
Return Loss Measurements with a Precision 50 Ω Load
Measurements with the AA-2000 ZOOM compared to Array Solutions VNAuhf

Freq. (MHz)	*Return Loss (dB)* AA-2000	VNAuhf	Freq. (MHz)	*Return Loss (dB)* AA-2000	VNAuhf
146	52	58	915	31	42
222	45	51	1,200	29	36
440	38	48	2,000	28	n/a

VNAuhf are not significant, especially when considering these very high frequencies. Also, you can see that the 2 dB attenuator is definitely not a microwave attenuator!

For my final test I used a 222 MHz series resistive/capacitive (R/C) complex load with an SWR of approximately 2:1. The AA-2000 ZOOM and VNAuhf measurement provided almost identical measurements.

VHF/UHF Capabilities

I normally like to show SWR curves of my home station antennas. However, the AA-2000 ZOOM gave exactly the same HF antenna displays as shown in my reviews of the AA-55 ZOOM and AA-230 ZOOM. Rather than duplicating this information, I decided to highlight some of the higher-frequency capabilities of the AA-2000 ZOOM.

Figure 1 shows the SWR of a 2-meter band-pass filter on the AA-2000 ZOOM screen, and Figure 2 shows the *AntScope2* display of the return loss of that same filter.

Figure 3 shows the SWR of a 440-MHz mobile antenna on the AA-2000 ZOOM screen. Figure 4 is an *AntScope2* display of the 440 MHz antenna's return loss.

Finally, amateurs share the 902 – 905 MHz band with ISM (industrial, scientific, and medical) users. I looked at an ISM filter with the AA-2000 ZOOM. Figures 5 and 6 show *Antscope2* filter scans of the filter's SWR and return loss.

It is nice to be able to look at the input impedance, SWR, and return loss of a filter. But wouldn't it be nice to be able to look at a filter's transmission characteristic? To do this, connect the filter's output to a spectrum analyzer set for **MAX HOLD**. Set the AA-2000 ZOOM for **SWR CHART**, set the desired sweep range, and press **OK**. You will now see the filter's passband response. Figure 7 shows the ISM band-pass filter's response using this method with my Siglent SSA3021X spectrum analyzer. The markers show the 902 and 928 MHz frequency limits of this amateur band. If you don't already have a spectrum analyzer, consider the

Figure 1 — SWR sweep of a 2-meter band-pass filter observed on the AA-2000 ZOOM screen.

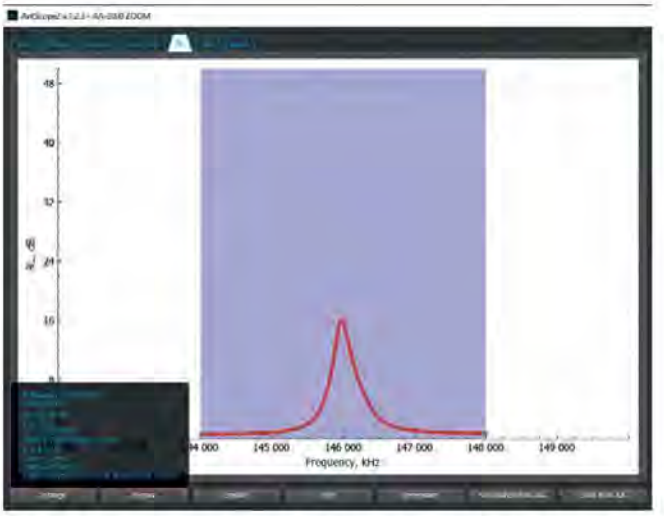


Figure 2 — Antscope2 display of the return loss of the 2-meter band-pass filter.

Table 4
Return Loss Measurements with Low and High Impedance (Z) Loads
Measurements with the AA-2000 ZOOM compared to Array Solutions VNAuhf

	12 dB Return Loss		*6 dB Return Loss*		*4 dB Return Loss*	
Freq. (MHz)	Low Z AA-2000/ VNAuhf	High Z AA-2000/ VNAuhf	Low Z AA-2000/ VNAuhf	High Z AA-2000/ VNAuhf	Low Z AA-2000/ VNAuhf	High Z AA-2000/ VNAuhf
1.8	12.3/12.3	11.9/12.1	7.0/7.0	5.6/5.3	3.8/3.8	3.6/3.3
14	12.3/12.3	12.0/12.1	7.0/7.0	5.6/5.3	3.9/3.8	3.6/3.4
50	12.4/12.3	11.5/12.1	7.0/6.9	5.6/5.3	3.9/3.9	3.7/3.4
146	12.4/12.3	11.7/12.1	6.9/6.8	5.7/5.4	3.8/3.7	3.8/3.5
222	12.4/12.2	12.1/12.2	6.8/6.7	5.7/5.4	3.7/3.5	4.0/3.8
440	12.3/11.8	12.4/12.9	6.4/6.2	6.2/5.4	3.8/3.3	3.8/3.8
915	12.5/11.3	12.2/14.1	5.9/5.4	7.3/7.3	4.2/4.0	4.5/3.3
1200	12.8/12.0	12.7/13.0	6.5/6.0	7.5/8.8	3.8/4.3	6.0/6.2
2000	15.2/—	12.6/—	9.8/NA	5.6/—	2.0/—	8.4/—

— VNAuhf does not cover this frequency range

inexpensive tinySA handheld spectrum analyzer that I reviewed in the March 2021 issue of *QST*. The latest firmware includes the **MAX HOLD** function.

Conclusion

The AA-2000 ZOOM is an accurate antenna, transmission line, and component analyzer tool with capabilities up to 2 GHz. You can investigate the AA-2000 ZOOM further by downloading the manual from RigExpert's website. See **www.arrl.org/qst-in-depth** for additional illustrations and information about the AA-2000 ZOOM.

Manufacturer: RigExpert Ukraine. For a list of US distributors, see **www.rigexpert.com**. Price: $1100.

Figure 3 — SWR sweep of a 440 MHz mobile antenna observed on the AA-2000 ZOOM screen.

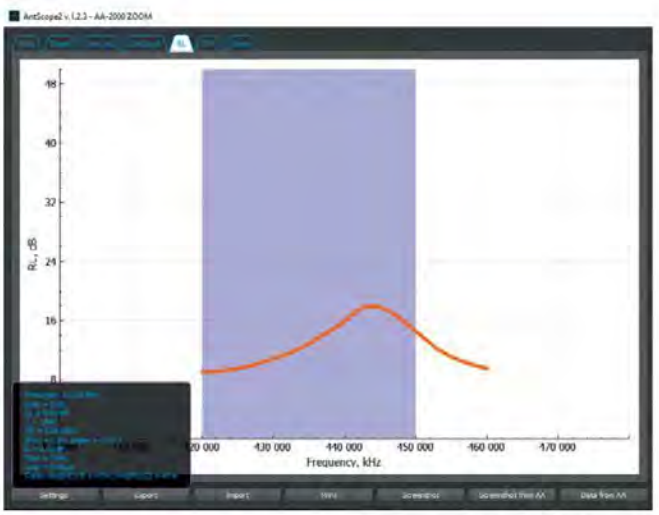


Figure 4 — *Antscope2* display of the return loss of the 440 MHz mobile antenna.

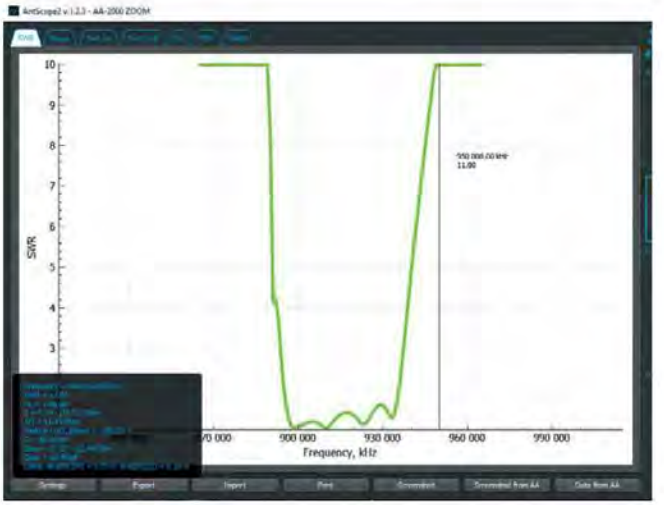


Figure 5 — SWR sweep of a 900 MHz ISM filter in *Antscope2*.

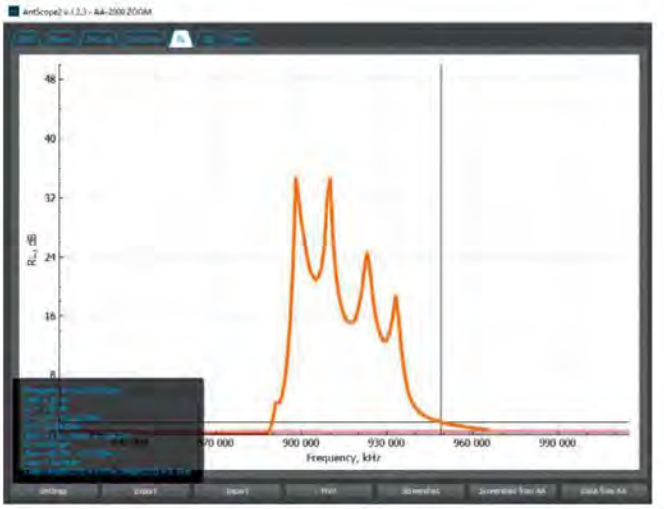


Figure 6 — Return loss sweep of a 900 MHz ISM filter in *Antscope2*.

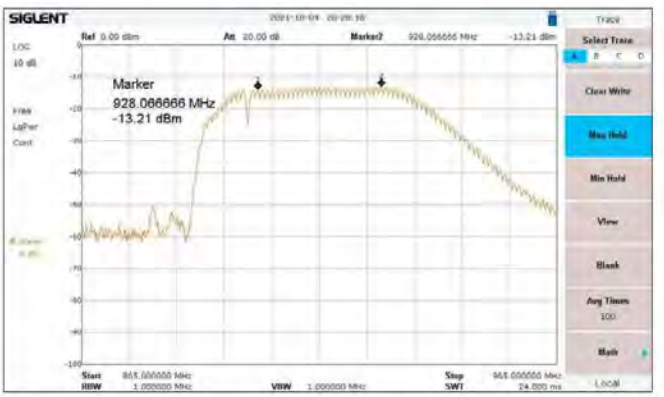


Figure 7 — Transmission response of the 900 MHz ISM filter using the AA-2000 ZOOM as a signal source and a spectrum analyzer to observe the test results.

CSN Technologies S.A.T. Satellite Tracker/Controller

Reviewed by Carl Estey, WA0CQG
carl@esteys.net

Chasing amateur radio satellites (also known as "birds") in the 1990s required quite a bit of effort. You needed an expensive multimode transceiver, receiving preamplifiers, two pretty big antennas, two rotators, and at least three hands to use it all!

A lot has changed. VHF/UHF transceivers such as the Icom IC-9700 operate on a wide variety of modes and have features built in that make satellite contacts a delight. Antenna rotators such as the Yaesu G-5500 adjust both azimuth (side to side) and elevation (up and down) in a single unit and connect to controllers and computers. Although antennas have not changed a lot, the advent of low earth orbit (LEO) satellites allows small- to moderate-sized antennas to work well.

The real trick to satellite hunting is knowing what birds will be available, when they will appear, and where to point the antenna. The S.A.T. (Self-contained Antenna Tracker) from CSN Technologies can automate this for you. This device, about the size of two decks of playing cards side by side, works with Icom radios with built-in satellite capability, including the IC-9700, IC-9100, IC-910H, and IC-820H/821H, and with Yaesu G-5400 and G-5500 "az/el" rotators.

Simple Setup

Navigating the S.A.T. is done via its built-in Wi-Fi interface through any web browser on virtually any phone, tablet, or personal computer. It periodically needs an internet connection to download the latest satellite orbital data element sets for active satellites, from AMSAT or elsewhere. You can set the schedule for updates, and if its tracking data is current, the S.A.T. operates as a standalone device at home or in the field.

The S.A.T. powers on initially in Access Point mode, offering a Wi-Fi network with an SSID of "Rotator_XXXXXXXXXX" (where XXXXXXXXXX is the device's serial number) with an IP address of 192.168.4.1, as indicated on the LCD display. Connect your computer, phone, or device to the Wi-Fi network of the S.A.T. and navigate a browser to its IP address; the S.A.T. dashboard will open in the browser. At the Network panel you can connect the S.A.T. to a local 2.4 GHz Wi-Fi network so it will download the latest satellite data via the internet.

The S.A.T. has a micro-USB connector for a 5 V power supply or computer USB port. It also has a 3.5-millimeter **RADIO** port that connects to the Icom transceiver's CI-V port. A mini-DIN **ROTATOR** jack is for connecting to the **EXTERNAL CONTROL** jack on the rotator control box.

The **RELAY** jack brings forth the common, normally open, and normally closed contacts from an internal relay, which activates when the satellite about to come into view reaches 3° below the horizon, just before AOS (acquisition of signal), and stays closed until LOS (loss of signal).

Using the cables included, it was easy to connect the S.A.T. to my Icom IC-9700 and my Yaesu G-5500 rotator control box. The manual includes instructions on calibrating the rotator for use with the S.A.T. That completes the hardware hookup, and the user is almost ready to enjoy satellite operation.

Bottom Line

The S.A.T. from CSN Technologies combines satellite tracking, rotator control, and radio control into one compact, standalone package. The colorful and useful control and display screens are accessed by a web browser via the S.A.T.'s built-in Wi-Fi feature.

Figure 8 — The Dashboard displays a wide variety of useful information for tracking and using satellites.

The Display and the Dashboard

In the top photo of this review, the S.A.T. LCD display shows the orbital data for an upcoming pass. At the top line, the target's azimuth heading is 304.76° and the elevation is –12.45° (still below the horizon). The second line shows the time of AOS (when it will come within range), 10:58 PM. The third line shows that the target is 4106.4 kilometers away and moving at 6.6 kilometers per second. Finally, the bottom line shows that we're tracking the International Space Station (ISS).

While the display shows the basics, the real command center is the browser-based **DASHBOARD**, which provides access to maps and charts, radio settings, and a tracking display (see Figure 8). The **DASHBOARD** allows the user to select which satellite to track and what transponder to listen for — beacons, telemetry, images, or voice.

The **TRACK** display (see Figure 9) shows vital information about the satellite, including:

- The name of the satellite being tracked, such as ISS, AO-91, RS-44, CAS-4A, etc.
- The satellite's current position and your antenna heading (az/el).
- The satellite's range (distance from your location) in kilometers and miles.
- AOS (Acquisition of Signal) time — when you should start hearing the satellite.
- LOS (Loss of Signal) time and position — when you will stop hearing the satellite, and at what heading from your location.
- Maximum satellite elevation during the pass.
- Current date and time.

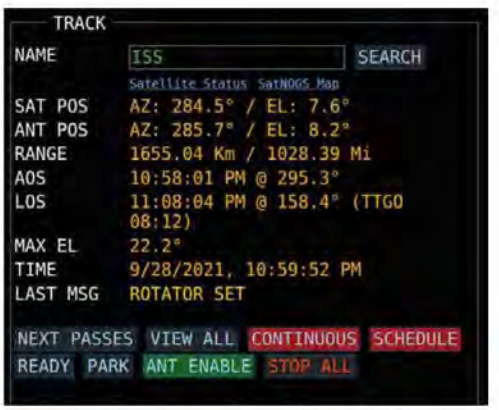


Figure 9 — The Track screen shows details of a satellite pass.

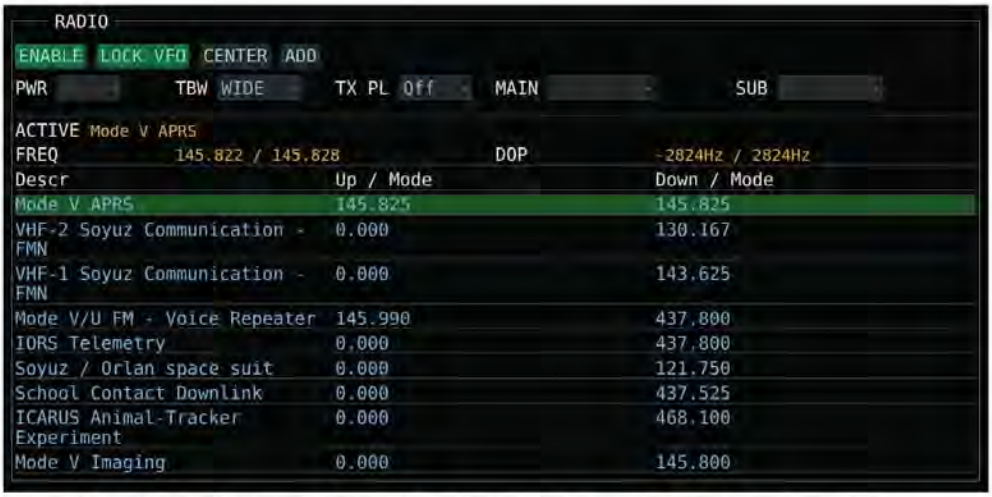


Figure 10 — The Radio screen shows information on bands, modes, and other transceiver parameters based on the satellite transponder of interest.

The **RADIO** panel (see Figure 10) displays settings and information needed to use transponders available on the selected satellite. When radio control is enabled, the S.A.T. automatically sets transmit and receive frequencies, Doppler offset, mode (such as CW, USB, or LSB), transmit power level and bandwidth (if applicable), and access (PL) tone.

The **MAP** panel shows the current orbital track of the satellite, as well as the position of your antennas.

The S.A.T. in Use

The S.A.T. dashboard information helps you decide which satellite to try, as well as at what time and in what direction to expect it. I find that passes of one of my favorite birds, RS-44, are very difficult to work when their maximum elevation is only 12 degrees or less.

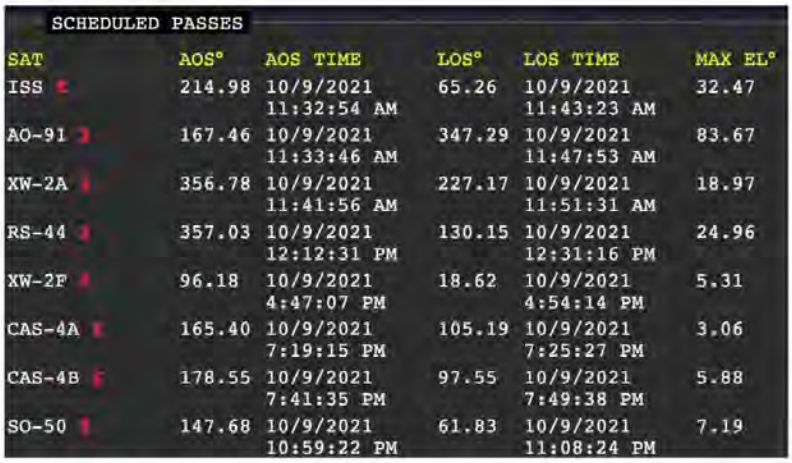


Figure 11 — The Scheduled Passes screen shows information about upcoming passes available for your location.

Some passes, on the other hand, are nearly overhead and have been terrific. The S.A.T. can help me judge whether I should try the next pass or perhaps wait for a later, better one.

Clicking the **NEXT PASSES** button in the **TRACK** panel brings up a display of the next eight satellites that will be in view, and they are color coded to indicate the ease of contacting them: from green (the easiest), to dark brown (most difficult). Also displayed for each are AOS time, LOS time, duration in minutes, and maximum elevation. The **SCHEDULED PASSES** panel, also accessed from the **TRACK** panel lets you assemble and follow a lineup of satellites (see Figure 11). You can have the S.A.T. alert you in advance of their passes.

The S.A.T. even includes a convenient built-in logging program. It creates an ADIF file that can be uploaded to ARRL's Logbook of The World or other logging programs.

Wrapping It All Up

There are many options for satellite tracking programs and rotator control hardware. In my experience, none are as easy as the S.A.T. With a compatible Icom transceiver and Yaesu rotator, the S.A.T. is everything you need for using ham radio satellites, all in one unit. The CSN Technologies support team has been terrific, with fast email responses and Zoom sessions as needed.

The S.A.T. has made bird hunting fun again — and simple. In my first 2 weeks using it, I worked through six amateur satellites to make more than 200 contacts in five countries, 32 states, and 64 grid squares. This is as exciting as my first days in ham radio, as a Novice in 1962! (Thanks to Keith Bush, AC2MI, of CSN Technologies for providing the high-resolution images for this review.)

Manufacturer: CSN Technologies, **www.csntechnologies.net**. Price: $190.

Geochron Digital Atlas 2 4K World Clock

Bottom Line

The Geochron Atlas 2 4K world clock works with any 4K or high-definition TV and creates a useful station showpiece. The optional Ham Radio Bundle includes some interesting features for hams.

Reviewed by Pascal Villeneuve, VA2PV
va2pv@arrl.net

The Geochron world clock has been admired by hams since the 1960s. A mechanical masterpiece with 300 moving parts, it's still manufactured today. Some of us have been dreaming for years about owning one, but the price ($2,300 to $3,600 depending on features and frame material) put it beyond our budgets. Now, for a fraction of the price, we can own a digital version with similar appearance and features.

In the September 2018 issue of *QST*, I reviewed the first digital 4K world clock from Geochron. With the digital hardware and its 4K video resolution (3840 × 2160 pixels), it was possible to scale the world-famous mechanical Geochron world clock to any size 4K TV. (It's also compatible with standard high-definition TVs, though with lower image quality.) Geochron has introduced a new version, the Atlas 2, with upgraded digital hardware. This review covers the new Atlas 2 hardware, with a focus on some new features available as a premium ham radio bundle subscription package.

What is That Map?

I have a dedicated 55-inch 4K TV for the Geochron in my station (see Figure 12). It sits atop my radio shelves, and the first question I get from people watching my videos, or from anyone visiting my station, is, "What's the cool world map on the large TV behind you?" This has been the *piece de resistance* of my radio station ever since. (Search YouTube for "VA2PV" to find my channel.) Keep in mind that even an inexpensive TV works fine with the Geochron Digital Atlas 2, since it doesn't need a high refresh rate; the image moves very slowly. There are a lot of choices in the $300 – $400 range for 55-inch 4K TVs, or in the $200 – $300 range for a 43-inch version.

Overview

The Geochron Digital Atlas 2 4K displays the Earth with sunrise and sunset rendered in real time. The device is a small computer that plugs directly into any HDMI port on your TV via a short cable. It offers several standard base maps, including a ham radio map set with DXCC country prefixes and CQ zones. There are several data layers, with some using live updates from the internet. Layers can be turned on and off and adjusted by the viewer using the included remote. It's very simple to set up and operate. Since the display is always slowly moving with the Earth's rotation and image burn-in isn't a problem with LED TVs, like it was with older technology, you can have it on all the time. Mine has been running continuously for more than a year with no issues.

The Atlas 2 hardware is a sturdy, fanless mini PC using a quad-core processor with 4 GB of RAM and 64 GB of internal storage. For online updates and real-time data used in some of the displays, it supports 802.11a/b/g Wi-Fi or an ethernet port for a wired connection to the internet via your home network. This unit can work with any HD display and will adjust its resolution accordingly, but a 4K display is strongly recommended for getting the full benefit of the high-quality images.

The box includes the Geochron mini PC, a 5 V dc power supply, an 18-inch HDMI extension cable, a remote control with a USB dongle in the battery com-

Figure 12— The Geochron Atlas 2 4K is displayed on a 55-inch 4K monitor in VA2PV's ham station.

partment, two AAA batteries for the remote, a USB adapter, and a quick start manual. The hardware has many ports, but since it's a dedicated unit you only need to connect power, the HDMI cable to your TV/monitor, the USB dongle for the remote, and either Wi-Fi or ethernet for connection to your network. Note that Geochron recommends letting the Atlas 2 hang from the TV by the HDMI cable, to allow good air circulation on all sides for cooling.

Most of the data layers in the software are included with the package. The Ham Radio Bundle and the Earthquake Premium Layer are not included and have subscription fees, though they have free trial periods. I'll discuss the Ham Radio Bundle later.

Clock accuracy is specified to be within 500 milliseconds with an internet connection, and on-the-fly time adjustments can be made to local time zones. You can also display the UTC and local time and date simultaneously using the 12-hour or 24-hour format. Local and UTC time can be configured independently.

Initial Setup

When turning the Geochron Digital Atlas 2 4K on for the first time, you must connect to the internet, using the Wi-Fi or ethernet connection and the menu button on the remote. The network settings are in the **INTERNET** menu tab; you can select **WIRED** or **WIFI**. If **WIFI** is selected, it will show you the available networks. Select one and enter your password. All this can be done with the remote.

When the network is set, select the **SYSTEM** tab and verify that you have the latest software version by selecting **DOWNLOAD SYSTEM UPDATE** and pressing **OK** on the remote. Then it will look for updates, and if there's one available it will update itself automatically. If not, it tells you it's up to date.

Next, select your time zone under the **TIME** tab. You can leave the menu and return to the map to locate the letter at the top of the screen for your time zone. For my time zone (Montreal) it's Zone R. Go back to the **TIME** tab, select the letter associated with your time zone, and find your closest large city in the list. I found and selected America/Montreal. Initial setup is completed.

Personal Preferences

The next step is to set up your personal preferences. There are many screen layout options and layers that can be customized, and the display can get too crowded to be of much use if too many are activated, so this step is important for enjoying the Geochron to the fullest. The main menu offers nine options (tabs), versus six in the original Geochron Digital version reviewed in 2018. From left to right, the tabs are **GENERAL**, **LAYERS**, **PINS**, **LIVE**, **PREMIUM**, **INTERNET**, **TIME**, **SYSTEM**, and **HELP**.

- The **GENERAL** menu tab offers six choices for the background map. Of course, I selected the Ham Radio 4K map. From this tab you can also convert the map to grayscale mode, which is useful for better viewing certain color layers. You can turn the analemma (the figure 8 shape in the middle of the map) on or off, which shows the current sun position with respect to the winter and summer solstices and fall and spring equinoxes. You can activate a night mode (automatic or manual dimmer), and also view a quick video demo showing a full year in a few seconds.
- In the **LAYERS** tab, you can adjust the night opacity, the terminator line (grayline), the human light display, and add some layers such as shipping lanes, air traffic, air pollution, and population density. You can also select the **DEMO** mode and configure the unit to toggle among all these layers using the current active map, or even toggle between different maps. The toggle delay is adjustable in 30-second increments.
- From the **PINS** tab, you can add up to 50 personalized pins on the map with adjustable size (for all) and the local time right under the pin if you wish.

- All selections under the LIVE tab are included with the Geochron Atlas 2 4K at no added charge and display on the map specific layers of information from the internet. Some examples are the number of COVID-19 cases per region; or global weather satellite overlays, including precipitation, wind speed, barometric pressure, temperature, and cloud cover. You can show the live location, updated every second, of the Hubble Space Telescope, the ISS (International Space Station), and more than 400 satellites. There's also a live commercial aviation layer, a display of moon phase, location of undersea cables, and more. Of course, any live features require a permanent internet connection for the Geochron, but it only uses 10-20 MB per hour.
- In the **HELP** tab, you will find tutorial videos that you can watch to help you understand and customize your Geochron.

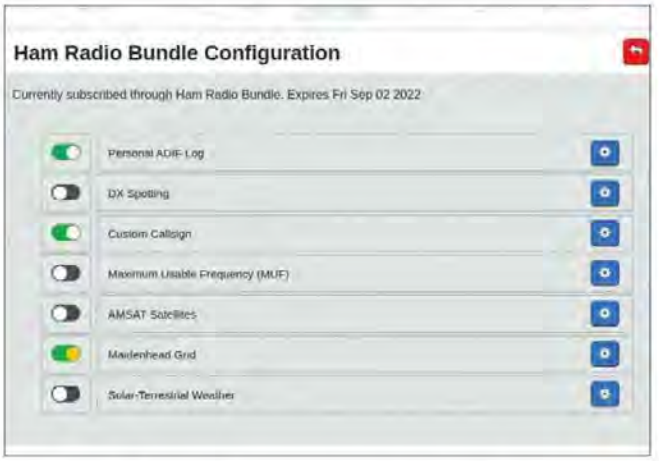


Figure 13 — This menu allows setting up features from the premium Ham Radio Bundle.

Ham Radio Bundle

The **PREMIUM** menu is for accessing special features available at extra cost. The current owner of Geochron is Patrick Bolan, KJ7ZSU, and he's been listening to requests for ham radio features from the community. They recently introduced the Ham Radio Bundle subscription service, which costs $6.99 per month or $69.99 for a year. Here are some of the ham radio features currently available (see Figure 13):

- ADIF Call Log — Displays call signs of up to 1000 stations you have contacted, based on ADIF log files you upload through Geochron's website. You can select the contacts to display based on parameters such as band, call sign or country of station worked, or time of contact (last hour, last day, last week and so on). This is the modern equivalent of sticking pins into a world map to show stations you've contacted.
- Live DX Propagation — Based on DX cluster and Reverse Beacon Network spots and updated every 10 minutes, this feature displays the call sign and location of the spotted station with a line connecting to the location of the station originating the spot. Data can be filtered by band.
- Call Sign Display — You can add your call sign to the clock screen above the Geochron logo. Font, type size, and color are all adjustable.
- Maximum Usable Frequency — Shows the MUF, displayed on the topographic and heat map overlays.
- AMSAT Satellite Tracking — Location of current amateur satellites with FM and/or linear transponders, with a footprint circle to help you know when they are within range.

Figure 14 — The Geochron Atlas 2 4K screen customized with VA2PV's ham radio setup, including DX spots, propagation forecasts, and their call sign.

- Maidenhead Grid — Overlays the Maidenhead fields (the first two characters of a grid locator — DN, EN, FN and so on).
- Solar terrestrial data and aurora forecast.

When I downloaded my latest DX contacts from ARRL's Logbook of The World (LoTW) and uploaded the ADIF file to the Geochron website, I got an error message. I had to edit the the file to get it to display properly. On the other hand, my FT8 log from *WSJT-X* worked instantly without modification. The ADIF files generated by most logging software should work without any issues. Geochron informed us that they plan to add automatic sync with the **QRZ.com** logbook in early 2022. Another upgrade slated for 2022 is a global Air Quality Premium Layer, which will track eight pollutants.

Figure 14 shows how I have customized the Geochron screen for my station using features in the Ham Radio Bundle.

Conclusion

In my 2018 review of the first version of the Geochron Digital 4K, I said "I think the Geochron 4K offers a lot of useful information, and it is a nice addition to the shack. I would not be surprised if they add new features specifically for hams."

The latest version, with faster and more capable hardware, adds many features requested by hams. The subscription fee may be a showstopper for some, but I find the features to be worth the cost. The fees help Geochron maintain the special ham radio features, and perhaps they will develop more applications for ham radio in the future.

The original Geochron Digital was upgradable to benefit from more features and to improve the speed and stability, and it will always work and look nice, but its hardware capabilities are limited compared to the Atlas 2. You'll need the power of the current hardware to run the Ham Radio Bundle.

Although you can customize your Geochron Digital Atlas 2 4K to make it more readable, some layers could be improved so you can digest the information at a glance. They have made a lot of improvements since I first got my Geochron Digital in 2018, so I suspect that we'll see more features and improvements over time. Additional illustrations for this review are available at **www.arrl.org/qst-in-depth** and a video is available on my YouTube channel.

Manufacturer: Geochron LLC, 365 S Broadway St, Estacada, OR 97023; **www.geochron.com/ham-radio-4k**. Price: Geochron Digital Atlas 2 4K, $449. Ham Radio Bundle subscription fee, $6.99 monthly or $69.99 annually. Requires a user-supplied 4K or HD TV for display.

Par EndFedz EFT-10/20/40 Trail Friendly EFHW Antenna

Reviewed by Mark Wilson, K1RO
k1ro@arrl.org

The end-fed half-wave (EFHW) antenna is especially popular among portable operators and those with limited space. As the name implies, the basic design is ½-wavelength of wire fed at one end, rather than in the center like a conventional dipole. This means that it can be supported at one end by a tree or mast, with the wire sloping toward the feed point near the ground. It can also be installed vertically or horizontally, depending on the available supports.

Lightweight and Compact

Par EndFedz antennas have been around for many years and are currently made by Vibroplex. They are available for a wide variety of bands and power levels. The EFT-10/20/40 Trail Friendly

antenna reviewed here operates on 10, 20, and 40 meters and is rated at up to 25 W. It's intended for portable operators looking for a compact, lightweight antenna to carry while hiking.

The EFT-10/20/40 is 41 feet long and weighs about 4 ounces, according to my postal scale. It's made from

#22 AWG stranded wire with a tough polyethylene jacket. The feed point of an EFHW is high impedance, so it requires a matching transformer — typically a 49:1 impedance transformation —for use with a 50 Ω feed line. The matching transformer included with the EFT-10/20/40 is inside a sealed plastic box with a BNC connector for the feed line on one end and a stainless steel post on the other for the antenna wire.

The radiating element consists of 33 feet of wire, then a choke and winder assembly, then another 8 feet of wire, and finally a small plastic insulator for attaching a support rope (see Figure 15). The choke isolates the 33-foot section (½ wavelength on 20 meters and 1 wavelength on 10 meters) and also offers enough inductance to shorten the antenna for 40 meter operation. The total length is 41 feet, rather than 66 feet for a typical half-wave 40-meter antenna. EFHW antennas require a counterpoise to stabilize the feed point impedance, and the Par antennas use the outer surface of the coaxial feed line for this purpose.

On the Air

The EFT-10/20/40 is fully assembled. Just add a feed line and some rope to support the ends. I used the antenna in a sloping configuration at a couple of local parks. I tossed an arborist's throw weight and small diameter rope about 25 feet into a tree, hauled up the end of the EFHW, and tied the other end to a tree branch about 5 feet off the ground. I used a 25 foot length of RG-58 feed line, but tiny RG-174 would be fine for a short run if weight is an issue. Vibroplex sells some lightweight, 2 millimeter diameter antenna rope for applications like this. The choke is integrated with a convenient winder, and the package includes a hook-and-loop strap to keep it from unraveling. The antenna fits in a jacket pocket, and I found it easy to unwind and install.

The EFT-10/20/40 tuning was pretty close, right out of the box. Following the instructions, I shortened the end of the antenna by about 2 inches to bring the SWR under 2:1 from 7.0 to 7.25 MHz. Without any further adjustment, the SWR measured 1.3:0 or less across the entire 20 meter band, and 1.8:1 or less from 28.0 to 29.0 MHz. Using about 20 W, I was able to make contacts on CW and FT8 on all three bands. It was especially nice to have a 10-meter antenna available because the band was open to the West Coast during my operation. Figure 16 shows part of a PSKreporter map showing stations receiving my FT8 signals.

The manual notes that you can modify this antenna to work on any band between 60 meters and 10 meters by removing the factory radiator and attaching a ½ wavelength piece of wire to the screw post on the matching transformer. Replacement parts are available.

Manufacturer: Vibroplex, 1001 N. Broadway St., Knoxville, TN 37917; **www.vibroplex.com**. Price: $90.

Bottom Line

The Par EndFedz EFT-10/20/40 fits in a pocket and is easy to install in the field for low-power portable operation. Its SWR bandwidth on 10, 20, and 40 meters is wide enough for CW, FT8, and SSB operation on all three bands.

Figure 15 — The EFT-10/20/40 end insulator, choke/winder, and matching transformer.

Figure 16 — This portion of a PSKreporter map shows stations across North America receiving my FT8 signals during a portable operation with the EFT-10/20/40. The icons are pink for 10 meters, orange for 20 meters, and blue for 40 meters. Not shown are several dozen hits in Europe on 20 meters.

Dave Casler, KEØOG, askdave@arrl.org

Ask Dave

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

Mystery Baluns, Reviving a Radio, Dipoles, and More on Splatter

Determining a Balun or Unun's Ratio

Q Jim, KJ3P, of Pennsylvania, asks, "I have a commercially made balun in my junk box that I once used for a while and would like to again, but the label has faded. It's either 1:1 or 4:1. Is there any test I can do to find out?

A Absolutely, and you probably have the required equipment in your ham shack already. You need a resistance of known value — use a resistor, or even your dummy load — as well as an antenna analyzer. Place the known resistance across the output terminals of the balun, then connect the antenna analyzer as though you were measuring SWR; I recommend sweeping across a wide section of the 80-meter band. The analyzer will typically measure and display both the resistance and the reactance. Especially in the HF bands, the reactance should be very low, but we're just interested in the resistance measurement. My test setup in Figure 1 uses a 100 Ω resistor. On this 4:1 balun we would expect a reading of approximately 25 Ω. The antenna analyzer actually reads 28 Ω, which is close enough to confirm that the balun is 4:1, as indicated on the label. With a 1:1 balun, we would expect a reading approximately equal to the value of the resistance.

Figure 1 — This simple test setup lets you quickly determine a transformer-based balun's impedance ratio. It consists of an antenna analyzer (here, an MFJ-259B), the balun (here, a Balun Designs Model 4124t 4:1), and an inexpensive 100 Ω resistor. I separately confirmed the value of the resistor (99.6 Ω). The impedance ratio of the balun is equal to the value of the test resistor divided by the measured system resistance — here, a result of 4:1.

Please note that ham-radio-quality test gear is usually inexpensive and may give results that are only close to the expected value. As you tune the antenna analyzer across the HF band, you will see some variations in the measured values of resistance and reactance. That is why a low band such as 80 meters is ideal for the measurements, and in sweeping across a wide enough spectrum you should get an idea of what the measured resistance tends to level off at, so you can ignore possible frequency-related aberrations. It should be easy and obvious to tell whether the balun is 1:1 or 4:1.

You can find a video that shows this measurement process on the ARRL YouTube channel at **https://bit.ly/3z2MBMI**.

Bringing a Swan Back to Life

Q Don Casillo, KD5UGY, asks: "I am trying to repair a Swan 750CW HF transceiver that emits smoke. I have a schematic with pin-to-chassis voltages, but need a list of tube-pin-to-chassis resistances. Can you help?"

A I'm very sorry; I don't have a ready answer for you. But if the unit is smoking, unplug it and leave the power off until you have found the cause.

Old radios often suffer from component aging. Resistors, for example, can drift to values wildly different from what is marked on them. But capacitors, more than anything, can pose the biggest problems. Radio restorers often replace all the capacitors with modern components as their first step. This is sometimes a big job.

There is a magazine called *Electric Radio*, that covers restoration of old radios, right back to the earliest days of radio. The web address is **www.ERMAG.com**. They publish six issues a year and have an extensive history. I would suggest looking through the classified ads. Any subscriber can put in one ad per issue, including a request for help. You'll find a gold mine of information, including contacts to people who restore units similar to yours. There are also classified ads of vendors who have radio schematics and testing information.

Good luck with your restoration and stay safe!

Splatter Redux

Q Steve Johnston, WD8DAS, asks: "Could what appears to be splatter actually be a problem in the receiver?"

A Yes indeed, Steve. While transmitter splatter can be heard far and wide in any receiver listening in, a receiver can, if a strong local signal manages to penetrate the radio's RF and IF filters, also react locally in a manner that resembles splatter, even if the transmitted signals themselves are clean. Modern radios are less prone to this, but it can still occur. We sometimes call this problem "fundamental overload," meaning that an incoming signal is so strong that the receiver simply cannot reject it even though it is not tuned to that frequency. The resulting artifacts can be loud enough to completely obliterate the desired signal. This is why receivers have attenuators. Most have a fixed (typically 20 dB) or variable attenuator selectable on the front panel that will reduce the strength of incoming signals. The receiver's front end is then much more effective at rejecting the undesired ones.

I had exactly this problem as a Novice operator back in 1975. My Heathkit receiver had no attenuator built in and was getting blasted by a very strong nearby signal. Although I built an attenuator using instructions in my copy of *The ARRL Handbook*, my results were mixed because the offending signal was no longer a problem, but all the other signals were weaker as well. It turned out that the problematic signal was from another Novice operator who lived only about a mile away. We quickly became good friends, being both in our mid 20s and having many similar interests. After we both got our General licenses, I got a new Yaesu FT-201 radio, which didn't have the overload problems the Heathkit had.

Another trick, with a directional antenna, is to find a direction where it is less sensitive to the strong unwanted signal but still sensitive enough to pick up the desired one well. The antenna's null might attenuate the strong signal enough to prevent overloading of the receiver's RF and IF signal chain.

So in conclusion, if you experience something that seems like splatter from an overly strong signal, try attenuating it first, or even point your antenna in a different direction.

The Most Basic of Antennas is the Half-wave Dipole

Q Curtis Smith, KG4YYY, asks: "Why do we only hear of half-wavelength or quarter-wavelength antennas, instead of full-wavelength?"

A Good question, Curtis. The basic antenna is the resonant half-wave dipole, which has the beneficial property that if you feed it at the center, with the two elements each a quarter-wavelength long, the feed point impedance has no reactance and is purely resistive. Thus, it is easy to match for maximum power transfer from the transmitter via a coaxial feedline. But on a full-wavelength dipole, a center feed location is actually an extremely high impedance point. Let's look at Figure 2, which depicts the rms RF voltage and current on a half-wave dipole. At the ends of the dipole the current is zero because it has nowhere further to go, but the voltage is at a maximum. Conversely, at the center feed point, the current is at a maximum, but the voltage is at its lowest. The ends of the dipole therefore have a high ratio of voltage to current; that's the very definition of a high impedance. At the center feed point of the dipole the relationship of the voltage and current is reversed, resulting in a low impedance ranging from 30 to 70 Ω, depending on the antenna's height. If you move the feed point off center, the impedance will change; if the feed point is all the way at the end — known as an end-fed Zepp antenna — the impedance there will be very high, and a nice 49-to-1 voltage balun should match it well. Note that the dipole can be fed anywhere along its length if you match the impedance at that spot. Off-center fed dipoles use this to advantage for covering multiple bands.

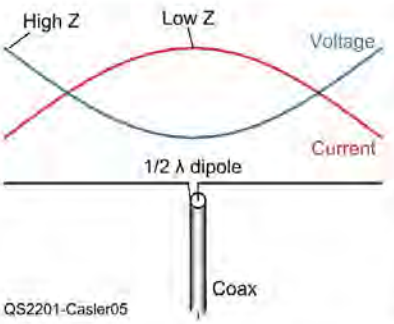


Figure 2 — The voltage and current distribution along a center-fed half-wave dipole antenna. As Ohm's Law dictates, the impedance is high where the voltage-to-current ratio is high (at the ends), and low where the ratio is low (at the center feed point).

Note that if you have a half-wave antenna design for one band and you feed it a signal that is twice the frequency of that band — for example, a 40-meter half-wave dipole fed with 14.225 MHz, a 20-meter frequency — the antenna will appear to be a full wavelength long, and therefore will not work well.

Off-center-fed dipoles have become popular over the last couple decades, and hams use some fun tricks to successfully load them on multiple bands.

So why half wave? It's just the way nature works. You'll find half-wave radiators in many forms, and not just electromagnetic ones like antennas. Flutes and open-end organ pipes, for example, are half-wavelength acoustic radiators.

Send your questions to **askdave@arrl.org**, or fill out the form at **www.ke0og.net/ask-dave**. 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.

Hints & Hacks

A DIY Tool for Measuring AC Current; Soup Can Alignment; Standoffs for Balanced Lines

A Line Splitter to Measure AC Current

To measure ac current with a clamp-on ammeter, many amateurs resort to purchasing a so-called "line splitter" accessory. However, you can save some money by simply making your own in just a few minutes.

I fashioned a line splitter with nothing more than a short length (about 12 inches) of #14 AWG extension cord, an ac plug, and a socket. When fabricating this type of device, be sure to use a wire gauge sufficient to carry the current to be measured. As shown in Figure 1, the outer jacket of the extension cord is stripped away to reveal the three individual wires inside: ground (green), hot (black), and neutral (white). Install the plug and socket in the usual manner.

Figure 1 — The outer jacket of the extension cord is stripped away to reveal the ground (green), hot (black), and neutral (white) wires.

To measure ac current, clamp the ammeter to either of the current-carrying wires, black or white (see Figure 2). The 6.8 A reading on the ammeter was the current draw of an electric toaster. — *73, Terry White, VE5TLW,* **twhite@sasktel.net**.

Figure 2 — To measure ac current, clamp the ammeter around either of the current-carrying wires (black or white).

Yagi Boom-to-Element Alignment

While assembling Yagi antennas for various bands over the years, I've always struggled with aligning the elements and squaring them with the boom, whether by eyeball or with a level.

Recently, I purchased a Cushcraft LFA-6M4EL 6-meter Yagi and set about assembling it in my family room on sawhorses, saving the long element parts for later so I could get it out the back door. The familiar problem of aligning the elements with the boom quickly arose. After I marked the boom exactly where each element was to go, and loosely putting it all together, I decided there had to be a better way.

From the pantry I grabbed six cans of soup, making sure that all were the same size. I placed one pair of cans under the reflector assembly, another pair at the last director, and the third pair at a mid-element (see Figure 3). After double checking the reflector's position on the boom, I tightened all three assemblies. This became the reference.

Keeping the first two pairs of cans in place at the reflector and last director, I then moved the other two cans from one element to another while I aligned each one and tightened its bolts. All the element-to-boom assemblies were perfectly aligned.

Figure 3 — Identically sized soup cans become tools to ensure proper boom-to-element alignment.

With the antenna still resting on the soup cans, I mounted the boom to mast bracket. To align the bracket, I put a three-foot piece of two-inch aluminum tubing in the clamps and used a small level to get it perfectly vertical, while being careful not to disturb the soup cans.

The Yagi will go up on the tower soon, and I have no doubt that it will look as good as the pictures. For antennas that are too big for indoor assembly, simply apply this technique on a larger surface, like a good, flat cement garage or carport floor. — *73, Glenn Kurzenknabe, K3SWZ,* **k3swz@arrl.net**

Standoffs for 450 Ω Balanced Line

While relocating the feed line for my doublet antenna, I needed standoffs for the 1-inch balanced line, so that I could route the line under the eaves of my house and up a wall.

It's always a challenge to find reasonably priced standoffs for balanced line. I usually shop for antenna insulators in the electric fence section of a local farm supply store, Blain's Farm and Fleet (**www.farmandfleet.com/electric-fence-insulators/**), and on their website I found a selection of Dare post insulators intended to hold electric fence wire. Two possibilities stood out: a 5-inch yellow post insulator and a 3.5-inch black one. Opting for the 3.5-inch insulators, I ordered two bags of 10, and in a few days, I was mounting my feed line. (Note: the availability by size and color tends to vary from time to time.)

Figure 4 — The 3.5-inch insulator comes with a **U**-bolt for fastening to a vertical or horizontal pipe.

Figure 5 — The insulators can also be nailed into a wood base as shown on this mockup.

This type of insulator includes a **U**-bolt to fasten it to a vertical or horizontal pipe, so it can work on a tower leg about 1 to 2 inches in diameter (Figure 4). I did not need the **U**-bolts because I used wood screws to fasten the insulators in place. The base can be oriented with its long axis either parallel or perpendicular to the feed line (see Figure 5). The 5-inch insulators can attach to a wood surface with nails or screws. — *73, John Dewey, KA9CAR,* **ka9car@arrl.net**

"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 "Attn: Hints and Hacks" at ARRL Headquarters, 225 Main St., Newington, CT 06111, or via email 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.

Feedback

■ In the November 2021 "How's DX?" column, some information was missing regarding the November 2022 3Y0J Bouvet Island DXpedition. It should be noted that the operating location will be 80 meters (250 feet) from the sea, and the operating site will be on a cliff some 5 – 10 meters (15 – 30 feet) above the Cape Fie Beach.

Steve Ford, WB8IMY, wb8imy@arrl.net

Eclectic Technology

Sampling Aircraft Data at HF Frequencies

Many amateurs are aware of the Aircraft Communications Addressing and Reporting System, better known as *ACARS*. It is a digital datalink for exchanging short messages between aircraft and ground stations.

If you own a radio that can receive from about 136 to 137 MHz, you'll occasionally hear the buzzing ACARS transmissions, and there is software available to decode and display the information. What may not be widely known, however, is that aircraft also use HF frequencies with a data system called *HF-ACARS* to communicate over long distances, such as during transoceanic flights. These transmissions take place between aircraft and ground stations on a variety of frequencies (see Table 1).

Eavesdropping on HF-ACARS

It is surprisingly easy to receive and decode these transmissions, especially those from the powerful ground stations. All you need is an HF SSB receiver and some software. There are several programs available, but one of my favorites is *PC-HFDL* for Windows by Charles Brain, G4GUO. This shareware application uses the sound device in your transceiver, interface, or computer to process the received audio and extract the information. If you operate HF digital modes such as FT8, you already have all the hardware you'll need.

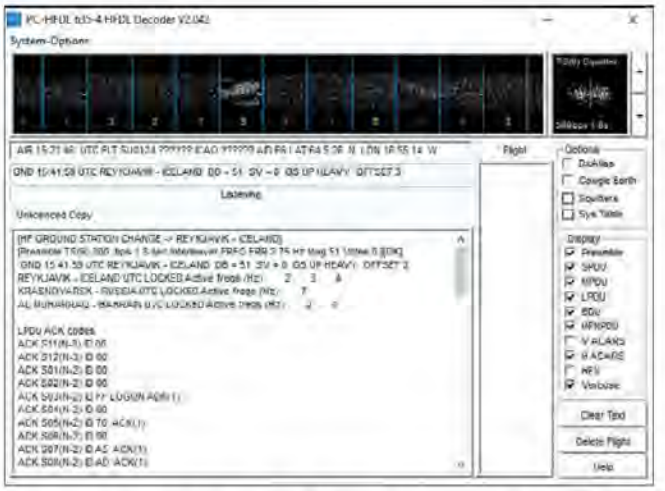


Figure 1 — Monitoring an HF-ACARS transmission from the Reykjavik, Iceland ground station using *PC-HFDL*.

You'll find the *PC-HFDL* software at **www.chbrain.dircon.co.uk**. Scroll to the bottom of the page for the download link. *PC-HFDL* is free to evaluate for a limited time, but for long-term use you will need to purchase a license for $35.

I've managed to decode exchanges with several ground stations, depending on propagation. From my home in New England, one of the strongest is the station in Reykjavik, Iceland (see Figure 1). There is also a station in New York state that I can pick up on 5652 kHz, when ground-wave conditions are favorable.

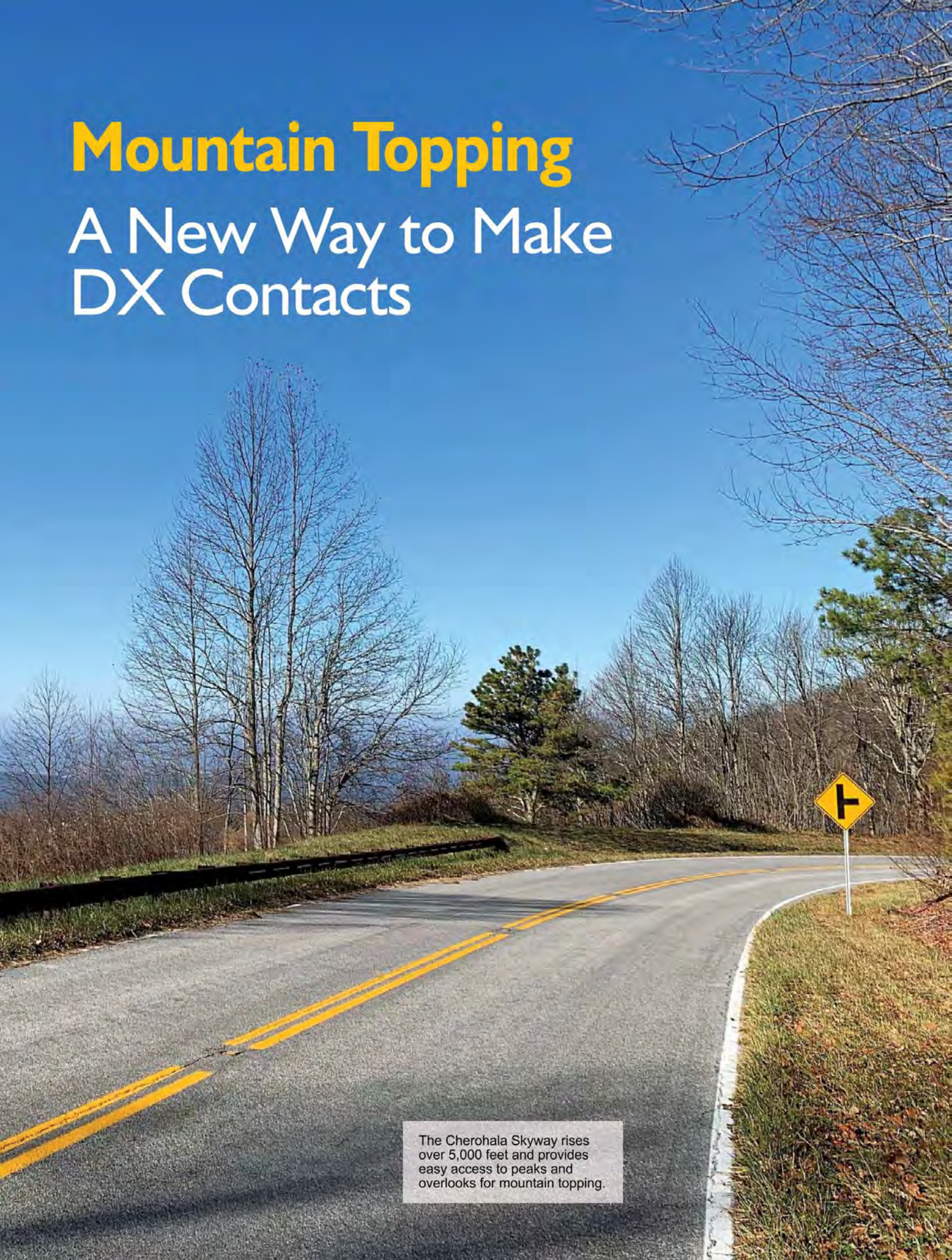
Table 1

HF-ACARS Ground Stations

Location	Frequencies (kHz, USB)
San Francisco, CA	5508 6559 8927 10081 11327 13276 17919 21934
Molokai, HI	5514 6565 8912 8936 10027 11312 11348 13276 13312 13324 17919 21937
Reykjavik, Iceland	3900 5720 6712 8977 11184 15025 17985
Riverhead, NY	5652 6661 8912 11387 13276 17919 21931
Auckland, New Zealand	5583 6535 8921 10084 13351 17916
Hat Yai, Thailand	5655 6535 8825 10066 13270 17928 21949
Shannon, Ireland	2998 3455 5547 6532 8843 8942 10081 11384
Johannesburg, South Africa	3016 4681 5529 8834 11321 13321 17922 21949
Barrow, AK	2944 2992 3007 3497 4654 4687 5529 5538 5544 6646 8927 8936 10027 10093 11354 17919 17934 21928 21937
Muan, South Korea	2941 5502 6619 8939 10060 13342 17958 21931
Albrook, Panama	5589 6589 8894 10063 13264 17901
Santa Cruz, Bolivia	4660 6628 8957 11318 13315 17916 21997
Krasnoyarsk, Russia	5622 6596 8886 10087 13321 17912 21990
Al Muharraq, Bahrain	5544 8885 10075 13354 17967 21982
Agana, Guam	5451 6652 8927 11306 13312 17919 21928
Canarias, Spain	6529 8948 11348 13303 17928 21955

Mountain Topping

A New Way to Make DX Contacts



The Cherohala Skyway rises over 5,000 feet and provides easy access to peaks and overlooks for mountain topping.

These Tennessee hams meet regularly to operate in groups on nearby summits in the southeastern region of the state.

Joe Guy, KM4BFU

Over the past year, a group of hams associated with the McMinn County Amateur Radio Club (MCARC) in Athens, Tennessee, have been participating in what they refer to as "mountain topping." For these organized activities, participants divide into small groups and bring their ham radio equipment to selected summits and overlooks. The day is spent operating, experimenting, socializing, and communicating with hams all over eastern Tennessee, northern Georgia, and beyond. Since the first expedition in the fall of 2020, mountain topping has grown to attract hams from several clubs in Tennessee.

Local Summits and Overlooks

Tellico Plains, the gateway to the southern portion of the Cherokee National Forest, is also the western terminus of the Cherohala Skyway, a National Scenic Byway threading over 40 miles up, over, and through the Southern Appalachians between Tellico Plains, Tennessee, and Robbinsville, North Carolina, connecting the Cherokee and Nantahala national forests. With most of the skyway in Tennessee, these amateurs can easily access overlooks and summits like Turkey Creek Mountain (3,488 feet), Beech Gap (4,980 feet), and Hooper Bald (5,429 feet) in their vehicles.Gravel service roads can be taken to more remote summits in the southern portion of the Cherokee National Forest, such as Buck Bald (2,348 feet), Beaverdam Bald (4,259 feet), Waucheesi Mountain (3,625 feet), and Oswald Dome (3,022 feet).

Thirty miles south of the Cherohala Skyway, one of the mountain topping groups operated at Oswald Dome. Will Davis, KO4LRQ, operated on the 2-meter band, as well as Winlink.

Various Group Operations

On the morning of February 20, 2021, the MCARC group assembled in Tellico Plains and went north up the skyway, while other groups set out for peaks toward the south. I followed along, stopping to visit with each group.

The first MCARC group I came upon was Gary Eiff, W3GME; his wife Mary Ann Eiff, W8MAE, and some new hams, who set up at the Turkey Creek Mountain overlook on the west side of Flats Mountain, just above the Indian Boundary Recreation Area. They quickly set up a solar power bank and operated on VHF, HF, and Winlink. The early morning HF propagation was exceptionally good on this day — Gary and Mary Ann made a contact with a station in the Netherlands!

Mountain topping offers technical challenges for hams. "Necessary equipment, antennas, or accessories get forgotten; go-boxes sometimes fail to work as intended, and operating skills are rusty. Recognizing my own need to test, refine, and improve my equipment and skills, this met all my desires, plus the company of ham friends to share the experience with," Gary said. "I can honestly say that no other activity has resulted in greater learning and improvement in my equipment and operating skills, than has resulted from participating in mountain topping."

It's also an opportunity to be visible and interact with the public. As the day went on, people would often stop at each of the group locations with questions about ham radio.

A few miles farther on the skyway, I found current MCARC President Paul Eakin, KJ4G, along with Kenny Witt, KC4OJS, and newly licensed ham Matt Thayer, KO4IYW, who set up their group operation at Beech Gap at an elevation of 4,460 feet. Paul wanted to provide hams who stopped by with an opportunity to try 2-meter SSB. Kenny operated Automatic Packet Reporting System (APRS) and Winlink, and all three operated 2-meter FM. Matt made his first long-distance contact (using simplex at 5 W) with Jason Oleham, KM4ACK, who was on a ridge in Middle Tennessee, located 114 miles to the east. Quite a first long-distance QRP contact for a new ham!

Sid Averett, KM4BBV, operated on Winlink as part of the group at Hooper Bald.

"Mountain topping, [ARRL] Field Day, SOTA, Islands [On The Air], POTA, and VHF roving are the most enjoyable ham radio events to be involved in," Paul said. "There are many challenges to overcome, many Murphy's Law issues to contend with. The planning, designing the station, packing it all up, and getting to the site are very important. The on-the-air contacts [seal] the enjoyment."

Paul helped me with 2-meter SSB, which I had never operated before. I contacted Bob Lear, W4ZST, near Dahlonega, Georgia, nearly 100 miles away. Paul added that the best USB contact their group made was Ben Lowe, K4QF, near Scottsboro, Alabama, around 130 miles away.

Kenny was one of the first in the MCARC group to encourage mountain topping, saying that his favorite aspect was spending time with friends and helping them achieve their radio goals. He mentioned another group about 10 miles south on Oswald Dome, consisting of MCARC member Will Davis, KO4LRQ, as well as Jeff Lewallen, KO4BAH, and Jesse Rogers, W4JUU, of the Cleveland Amateur Radio Club in Tennessee.

"I'm amazed at the number of area stations who are aware of our trip to the mountains, and endeavored to participate in making contact with us," Kenny said. "I have never worked so many stations on 2-meter FM. Sometimes I can't leave my truck…because I have to answer a calling station, one right after another.'"

The most elevated group was at one of the highest points on the Cherohala Skyway, and included Sid Averett, KM4BBV; Dale Williams, N4KDW; Jodie Brantley, N4JLB, with his girlfriend Wendy Bowman, and new ham Bill Farmer, K4BGF, who set up their stations in the parking lot of Hooper Bald at 5,294 feet, just inside North Carolina. Bill operated 2 meters with his newly built copper dipole, while Sid and Dale operated with 2 meters, 70 centimeters, HF, and Winlink.

"For me, the experience is setting up and operating radios in the field," Dale shared. Mountain topping provides hams with the ability to learn how to problem-solve and fix their equipment, allowing them to acquire the knowledge needed to help with emergency communications. "It also gives us the opportunity to help out new hams with their equipment and operating skills," he explained.

Initiating Your Own Activities

This activity can be done anywhere. If you live in a metropolitan area without any mountains nearby, you can use buildings as high points of operation. If you don't have mountains or tall buildings in your area, you could spread out in flatlands.

You don't have to be on a summit overlook to enjoy the action of mountain topping. Many hams, including Bob Miller, KC4KUZ, and my dad, Dan Guy, KM4KYV, made several contacts with the mountain toppers from their home stations.

A DXpedition doesn't have to be a time- and money-consuming trip to the other side of the globe. Activities like mountain topping prove that an expedition can be done right in your backyard.

Conclusion

Mountain topping continues to grow in popularity for hams in our region. Most of all, the activity creates an environment of fellowship and enjoyment in a beautiful atmosphere, and gives us the opportunity to find ways to operate, overcome challenges, and enjoy the hobby.

All photos by the author.

Joe Guy, KM4BFU, is an author and a member of the McMinn County Amateur Radio Club (MCARC) in Tennessee. He currently serves as sheriff in McMinn County. He can be reached at **guyjd@hotmail.com**.

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

VOTE
If you enjoyed this article, cast your vote at www.arrl.org/cover-plaque-poll

Maintaining Privacy in a Public Hobby

Even though ham radio call signs expose personal information, there are steps you can take to mitigate just how much information is publicly available.

Don Keith, N4KC

It's a challenge to maintain privacy in a world with such a large digital presence, as a lot of personal information is easily accessible to anyone with internet access. This is especially true for amateur radio operators, due to the public nature of their call signs. Lack of privacy can put anyone, ham radio operator or otherwise, at risk for being targeted by cyber-criminals, spammers, phishing practitioners, identity thieves, and hackers, to name a few.

Public Access to Your Personal Information

According to §97.23 of Part 97 of the FCC rules, hams are required by law to provide a valid mailing address when applying for their amateur radio license. Any licensed entity must have their current address accessible to the public, whether they're a commercial broadcast station, a plumbing company with a two-way license, or a ham radio operator. A physical address or PO Box number is acceptable. This information becomes part of your FCC record and is freely available to anyone who accesses the Universal Licensing System (ULS) on the FCC's website to search for call signs. Additional information that's accessible is your license class, when you earned or last renewed your license, and when your license expires.

This information can be used to contact you when you first earn your license, when it's time to renew your license, when there's going to be a hamfest in your area, or if companies believe you may be interested in goods or services that they offer to hams.

But that isn't the only place your address is publicly available. Many entities regularly download that same database from the FCC and make it available for access. That includes websites such as **www.qrz.com**, **www.qrzcq.com**, **www.hamcall.net**, **www.hamqth.com**, **www.hamdata.com**, and the FCC License Data Search on ARRL's website (**www.arrl.org/advanced-call-sign-search**). Several phone apps that contain this data are available on your mobile device, too. Additionally, Radio Amateur Callbook has been making this information available, originally by book and now by CD, since 1920. The information comes from the FCC database, as well as other licensing agencies around the world. Some publishers of logging software also offer free downloads of the ULS database into their systems for instant access when you type in or log a call sign.

Note that some websites, including **www.qrz.com**, allow you to request that your full address not be included. You can check the privacy policy on the website for more information. Others only make addresses available to those who purchase a paid subscription. Sometimes, however, even if your address isn't visible, the website may still offer a link to a map showing the location of your address, which might provide a satellite image of your property.

With that, anyone who knows your name, address, or call sign and has access to the internet can view your social media activity, how much you paid for your home and when you bought it, your comments and personal details on online forums, access your personal website (if you have one), and more.

Ways to Protect Personal Information

Even though it's nearly impossible to keep all of your personal information off of the internet in the digital age, there are some steps you can take to mitigate the exposure that comes from being a ham.

Acquire a PO Box

One way you can try to maintain some privacy is by purchasing a PO Box to provide to the FCC, instead of using your personal address. This can be done at either a government post office or at any number of

vendors who offer this service. Cost is minimal, but you still must be able to physically go there to check for mail. You can have your mail automatically forwarded from your PO Box to your home address, but this is usually an additional fee. Some vendors may allow you to use their street address with a suite or department number, and they can also forward mail to you.

But remember, you're required by federal law to provide the FCC with your correct mailing address. You'll need to know what mailbox you'll be using when you first apply for an amateur radio license, or you'll need to modify your existing license as soon as possible after acquiring your mailbox. You can apply for your ham radio license or modify your current mailing address by filling out the NCVEC 605 Form, available at **www.arrl.org/fcc-forms**. You can also do so electronically on the ULS website, at **www.fcc.gov/wireless/systems-utilities/universal-licensing-system**. If you're modifying an existing address in the ULS, it can take some time to propagate the information to all of the places where your address might be displayed. For example, some websites and vendors download the FCC database daily, while others only do so sporadically. Some vendors may respond quickly to your request to delete or change your address, while others might take months.

Don't Display Your Call Sign on Your Car

Keeping your call sign off of your vehicle, such as on the license plate, is another way to try and maintain some privacy. Even though a screwdriver antenna on your car's bumper or a ¼-wave magnet-mount antenna on the roof may make it obvious that you're a ham, no one can search your call sign from seeing this equipment. Most states include "amateur radio" on call letter license plates for vehicles, making it easier for someone to figure out that the license characters are your call sign, regardless of having any antennas on your car.

Many hams are proud to display their call signs on a custom vanity plate, or on their state's official ham radio plate, such as the New York plate shown here. If you're concerned about privacy, however, you may want to get a PO Box to use as your official address with the FCC, to prevent people from obtaining your home address via your call sign.

Some hams go the route of displaying their call sign via car decals, or a license plate that's not an official ham radio plate, as seen here on the vehicle of Lisa Neuscheler, KC1YL. Lisa said that when she was first licensed, she was worried about her address being public, but that she's never had a problem. "Only amateur radio ops would know that my license plate is a call sign," she said.

Be Mindful about What You Post Online

It's important to pay attention to what you post online, specifically on the websites that allow you to share personal information in addition to your call sign. It's fun to learn more about the people we chat with on the air, but keep in mind that anyone, including non-hams, can see it. All they need to know is your call.

The same caution applies to social media, as the personal information shared on these platforms can be accessible to people beyond who you're connected with on the platforms.

The National Cybersecurity Alliance offers tips at **www.staysafeonline.org** that can help you protect your privacy on social media, such as:

- **What you post will last forever:** Be aware that when you post a picture or message online, you may also be inadvertently sharing personal details with strangers about yourself and your family members — like where you live.
- **Own your online presence:** It's okay to limit who can see your information and what you share. Learn about and use privacy and security settings on your favorite websites.
- **Configure and maintain security settings:** Every time you sign up for a new account, download a new app, or get a new device, immediately configure the privacy and security settings to your comfort level for

information sharing. Regularly check these settings (at least once a year) to make sure they are still configured to your comfort.

Privacy Protip: Use the Bureau

Utilize your local QSL bureau to exchange QSL cards. Routing mail through the bureau decreases the number of people who have access to your address. — *Sarah Ward, KS4RAH*

If you're concerned about who has access to your mailing address, be sure to read the privacy statements on amateur radio websites that provide this information, or directly contact the owners to learn about their policy on removing your address from their website. Unfortunately, there's nothing to be done regarding the FCC ULS listing being freely available to whoever wants to access it.

Conclusion

Any additional threat to your privacy from obtaining an amateur radio license is small. However, you should be aware of what your exposure is so that you can mitigate what you can and take steps to protect yourself, your identity, your family, and your possessions.

Don Keith, N4KC, has been an active ham for more than 50 years, is an Amateur Extra-class licensee, and is an ARRL member. He's a former award-winning broadcast personality and journalist and received the ARRL Bill Leonard Award in 2015. Don is a best-selling author and has published more than 35 books. He writes extensively on World War II history and his novel, *Firing Point*, was the basis for the major motion picture *Hunter Killer*, starring Gerard Butler and Gary Oldman. Don has also written several books about getting started in amateur radio and getting the most out of the hobby. He posts many articles on his ham website, **www.n4kc.com**, and his author website is **www.donkeith.com**. Don can be reached at **n4kc@bellsouth.net**.

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

VOTE
If you enjoyed this article, cast your vote at www.arrl.org/cover-plaque-poll

Congratulations

November 2021
QST Cover Plaque Award Winner

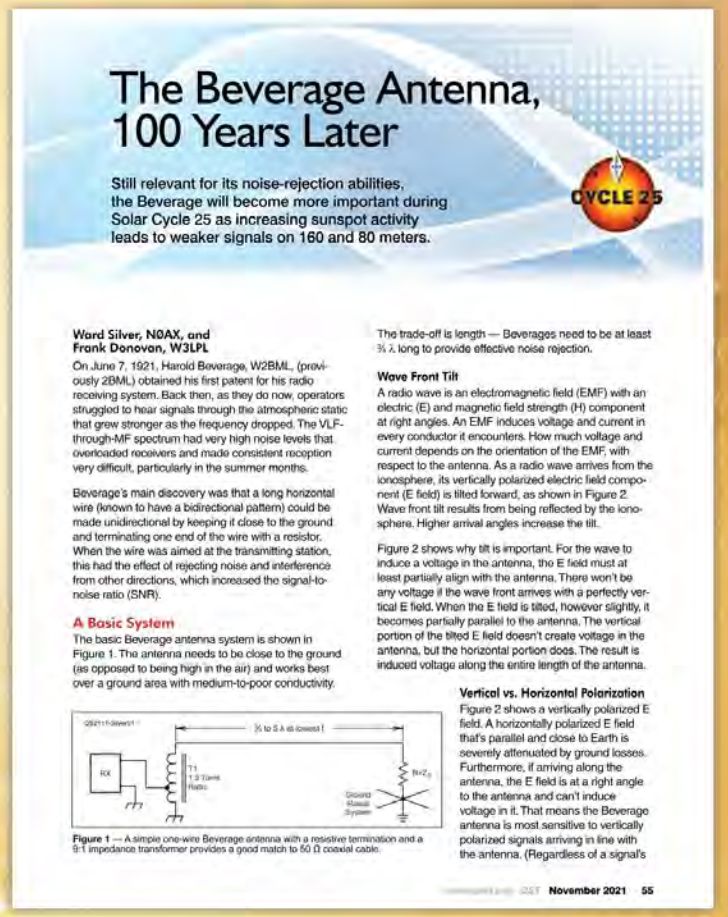
Ward Silver, N0AX
and Frank Donovan, W3LPL

In their article, "The Beverage Antenna, 100 Years Later," Ward Silver, N0AX, and Frank Donovan, W3LPL, explain why the Beverage antenna will become more important during Solar Cycle 25.

QST Cover Plaque Awards are given to the author or authors of the most popular article in each issue. *You* choose the winners by casting your vote online at

www.arrl.org/cover-plaque-poll

Log in now and choose your favorite article in this issue!



The Beverage Antenna, 100 Years Later

Still relevant for its noise-rejection abilities, the Beverage will become more important during Solar Cycle 25 as increasing sunspot activity leads to weaker signals on 160 and 80 meters.

CYCLE 25

Ward Silver, N0AX, and Frank Donovan, W3LPL

On June 7, 1921, Harold Beverage, W2BML, (previously 2BML) obtained his first patent for his radio receiving system. Back then, as they do now, operators struggled to hear signals through the atmospheric static that grew stronger as the frequency dropped. The VLF-through-MF spectrum had very high noise levels that overloaded receivers and made consistent reception very difficult, particularly in the summer months.

Beverage's main discovery was that a long horizontal wire (known to have a bidirectional pattern) could be made unidirectional by keeping it close to the ground and terminating one end of the wire with a resistor. When the wire was aimed at the transmitting station, this had the effect of rejecting noise and interference from other directions, which increased the signal-to-noise ratio (SNR).

A Basic System

The basic Beverage antenna system is shown in Figure 1. The antenna needs to be close to the ground (as opposed to being high in the air) and works best over a ground area with medium-to-poor conductivity.

The trade-off is length — Beverages need to be at least ¾ λ long to provide effective noise rejection.

Wave Front Tilt

A radio wave is an electromagnetic field (EMF) with an electric (E) and magnetic field strength (H) component at right angles. An EMF induces voltage and current in every conductor it encounters. How much voltage and current depends on the orientation of the EMF with respect to the antenna. As a radio wave arrives from the ionosphere, its vertically polarized electric field component (E field) is tilted forward, as shown in Figure 2. Wave front tilt results from being reflected by the ionosphere. Higher arrival angles increase the tilt.

Figure 2 shows why tilt is important. For the wave to induce a voltage in the antenna, the E field must at least partially align with the antenna. There won't be any voltage if the wave front arrives with a perfectly vertical E field. When the E field is tilted, however slightly, it becomes partially parallel to the antenna. The vertical portion of the tilted E field doesn't create voltage in the antenna, but the horizontal portion does. The result is induced voltage along the entire length of the antenna.

Vertical vs. Horizontal Polarization

Figure 2 shows a vertically polarized E field. A horizontally polarized E field that's parallel and close to Earth is severely attenuated by ground losses. Furthermore, if arriving along the antenna, the E field is at a right angle to the antenna and can't induce voltage in it. That means the Beverage antenna is most sensitive to vertically polarized signals arriving in line with the antenna. (Regardless of a signal's

Figure 1 — A simple one-wire Beverage antenna with a resistive termination and a 9:1 impedance transformer provides a good match to 50 Ω coaxial cable.

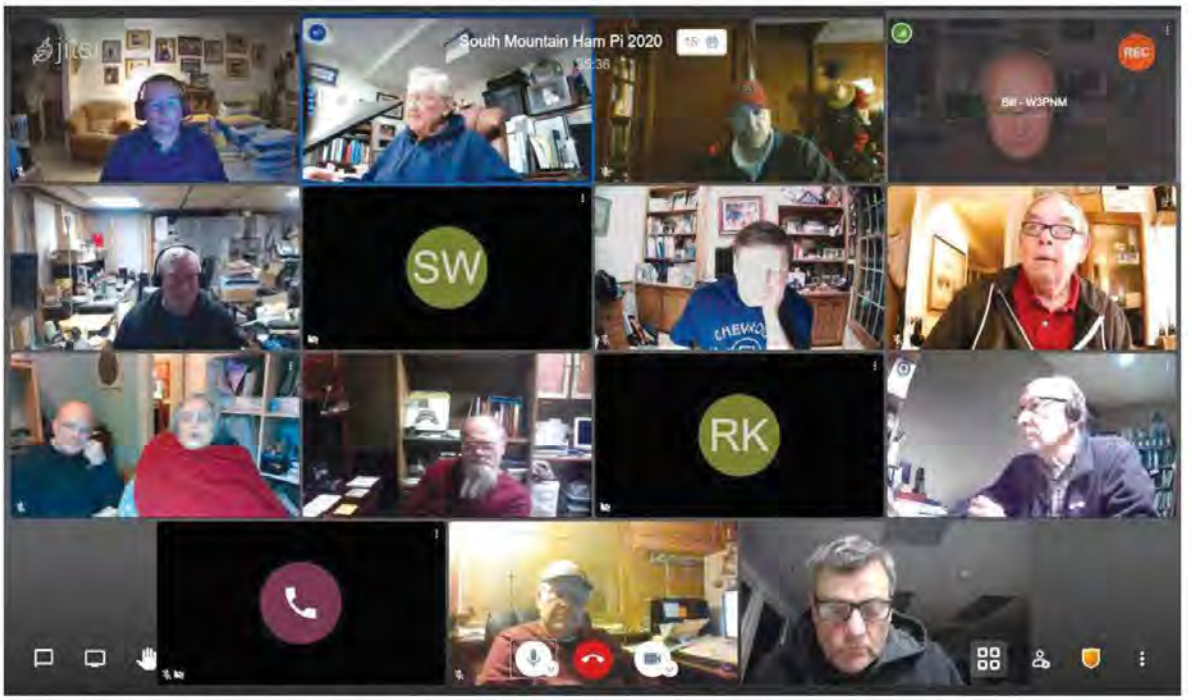
Meet the Mentor
A Virtual Mentorship Program

This Pennsylvania radio club found a way to continue mentoring its members and creating enthusiasm for the hobby, while overcoming the challenges of COVID-19.

Don Evans, K3ZR

Despite the COVID-19 gathering restrictions imposed in 2020, South Mountain Radio Amateurs (SMRA), an ARRL Special Service Club, effectively found a way to not only attract new hams to the club, but to keep them motivated within the hobby. SMRA is located in South Central Pennsylvania and has over 100 members. During the pandemic, more people became interested in the hobby and many radio clubs experienced membership growth, despite a significant decline in member participation opportunities.

SMRA President Jack Himes, NC3O, explained the ensuing challenge: "We have a steady flow of new hams from our Volunteer Examiners program by offering free membership into our club to every person who passes any level of their radio license [exam]," he said. "We also have [mentors] and our own continuing education programs, but when we were reduced to once-a-month virtual general meetings, trying to get the new hams to meet the experienced ones was the challenge." Jack added that emails and phone calls by their mentors were unsuccessful, because they no longer had a safe way to fulfill the expectations of new hams during the pandemic.



On the first Tuesday of every month, members of the South Mountain Radio Amateurs (SMRA) meet virtually for their Meet the Mentor program.

A Need for Change

New members are the key to growth in any organization, and mentors sustain that growth. Prior to the pandemic, new and experienced ham connections were made at SMRA general meetings, which often led to shack visits at home, resulting in lasting friendships. Additionally, there were QRP outings, traffic nets, project builds, and volunteer communication activities.

When activities were cancelled in 2020 because of the pandemic, SMRA needed to figure out how they could thrive in such unusual circumstances, and how hams could continue to encourage each other and explore ideas.

John Jaminet, W3HMS, a key club member, educator, and active mentor, recognized the immediate need to come up with an idea to provide new hams with support and camaraderie, while there was an increased interest in the hobby. Together with late SMRA Vice President Ed Crossley, W3SMF (SK), they recognized that new hams often didn't know where or how to seek assistance. Aware that many knowledgeable hams were willing to share their time and experiences, John came up with a plan to create a virtual monthly mentoring meeting called Meet the Mentor. The purpose of the meeting is threefold: to help new hams gain confidence and excitement talking on the air, to boost enthusiasm within SMRA, and to instill basic amateur radio skills.

During the SMRA's Meet the Mentor virtual program sessions, three mentors share 5-to-10-minute presentations on a variety of ham radio topics chosen for that month's meeting.

John had predicted that the virtual meetings would "fan the flames of radio excitement," and he was right!

The Meeting Format

Meet the Mentor virtual meetings are held on the first Tuesday of every month at 2300 UTC. John calls the meeting to order and introduces the participating mentors (there are usually about four in each session). Patti Single, KC3CDL, one of SMRA's Monday night net controllers, encourages attendees to join the Monday net and practice getting on the air. New hams then introduce themselves by their first name and call sign. The meeting continues with "show and tell," which is utilized to elaborate on new equipment size, usage, and basic functions, which also allows new hams the opportunity to ask questions about their own gear. Then, three mentors each share a 5-to-10-minute presentation on varying ham radio topics that were chosen for discussion from a prior session. A question-and-answer discussion occurs at the end of each presentation. New hams are encouraged to ask questions, not only on the topics covered that evening, but on any aspect of the hobby that interests them.

Before ending the virtual meeting, participants are asked to share their recent technical activities or accomplishments. Often, a member recounts a DX contact, a goal they achieved, a YouTube channel they recommend, or a recent purchase. The meetings generally last 2 hours.

Several mentors in the virtual meetings are assigned to be "jargon catchers," who will stop a conversation to explain commonly used ham phrases and acronyms, such as 73, QRP, ARRL, Field Day, and more. Beginner hams have found this to be helpful. These mentors also serve as "question/chat watchers," to ensure that discussions are paused to address incoming questions from the chat feature.

Question Examples

During a recent meeting, one of the mentors — Glenn Kurzenknabe, K3SWZ — presented an overview of ham radio test equipment. He began by explaining what kinds of basic equipment every ham should purchase and become familiar with, including volt-ohm-milliammeters (VOM) and antenna tuners. He also discussed how testing equipment has developed over the years. Participants responded with numerous questions. Deb Robinson, KC3RTP, asked whether analog or digital test equipment was recommended.

Glenn noted that choosing to use the analog needle and scale or a digital readout is a personal preference, and detailed the cost and accuracy of both. When a VNA was mentioned, one of the jargon catchers — Scott Walker, N3SW — was quick to explain that the acronym stood for "vector network analyzer," and provided a brief commentary about the instrument.

During these virtual meetings, teamwork plays a significant role to ensure successful presentations and discussions. At one meeting, a new ham — Bonnie Golla, KC3SFO — asked about the effectiveness of using drones to attach antennas to tall trees. The discussion focused on using expensive drones with sufficient lift and a remote apparatus to release the paracord on or over the tree. I suggested using an antenna launcher (also known as a spud gun) and shared information from an article I read about a pneumatic antenna launcher. Bob Raker, WØBR, one of the mentors, expressed that he has one and explained how he uses his homemade spud guns. It was a lively discussion, enhanced by the graphic provided by IT moderator Karl Gardner, W3KBG.

The synergy and creativity of SMRA members and mentors has enabled Meet the Mentor to grow into the quality program that it is today. Additionally, the program creatively experiments with methods to generate interest and questions from newer hams. Currently, a $10 Amazon gift certificate is awarded to the person with the best question. SMRA President Himes determines the winner, and he recently said, "The questions keep getting better as the new hams are thinking about questions ahead of time and how to phrase them properly."

An Additional Forum

With over 70 recipients on SMRA's general club email list, it became necessary to better manage the abundance of questions and answers that were being passed back and forth via email. The solution was to use the email groups service Groups.io, and limit its usage to those who were interested in Meet the Mentor. SMRA was already successfully using Groups.io for their Executive Board, Volunteer Examiners, and emergency communications group.

Looking Ahead

Meet the Mentor has been going strong since its inception in November 2020. A recent poll completed by the program's attendees reveals that, due to the convenience of the online program, there's a desire for it to continue, even as COVID-19 gathering restrictions are lifted.

John reflected on the program, stating, "Our presenters have done a superb job of giving professional-level *PowerPoint* presentations, covering topics that new hams want and need to learn. The questions from new members and the super important follow-up questions have really gotten to the core of many tech issues," he said. "More simply put, [Meet the Mentor] is 'give-back time' for veteran hams that will pay big dividends in the long run." New amateur Ed Otto, KC3RFX, noted, "I love the sessions. [I] saw a couple presentations on the web and so I joined the club. I am pleased with the club and how willing everyone [is to share] great information. I have a good head start because of [Meet the Mentor]. I hope to contribute one day soon to [the program] and SMRA."

Only time will tell what is in store for the future of Meet the Mentor. Surely, home shack visits will resume, as will the resulting camaraderie. This program was created out of necessity by a few hams with a united love for the hobby and an interest in keeping it growing, and has been an overwhelming success.

This article is dedicated to the memory of my mentor and friend, Ed Crossley, W3SMF (SK), who was a professional educator and an active ham for over 62 years. He was an honorable man who enjoyed teaching the skills of successful DXing with his Icom IC-7300 and 75-foot-long wire antenna. He and his spouse Joyce Crossley, K3APE, always enjoyed operating together. Thank you, dear friend. You are missed.

All photos by the author.

Don Evans, K3ZR, discovered ham radio in 1967 at the age of 12, after witnessing his best friends' grandfather, Otto Wold, operate his radio. Him and his brother worked to save enough money to purchase a Knight-Kit Star Roamer shortwave radio receiver. Otto became his mentor and assisted him with his Novice-class license exam.

Forty-three years later, after a career move to Pennsylvania, Don attended the South Mountain Radio Amateurs (SMRA) Field Day, where he met several devoted, knowledgeable hams. In 2010, he joined SMRA, where top-notch mentors helped him to pass the Technician- and General-class license exams. Several years later, he earned his Amateur Extra-class license.

Don served as president of SMRA from 2014 – 2018 and continues to serve as a voting member of the club's Executive Board. Currently, he is a Contact Volunteer Examiner, administering examinations for W5YI-VEC. He retired in 2019, and enjoys all things pertaining to amateur radio, as well as having more time to devote to the hobby and mentoring SMRA amateurs. Don can be reached at **k3zr@arrl.net**.

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

Planning Your First DXpedition

If you've ever worked a DX station in a contest or DXpedition, and said to yourself, "I'd like to do that," this article will give you the basics of DXpeditioning from a hotel or vacation rental, from planning the operation, to QSLing once you're back at home.

Al Rovner, K7AR

There are many reasons for wanting to try a DXpedition of your own. You may want to increase your operating skills by learning how to handle a pileup. You may want the opportunity to give callers a new band or mode entity. You may be trying to win a contest category — a goal that will require you to pay attention to where you're travelling to, and when. Or you may simply want to experience the excitement of being the DX, whether you make 25 contacts or 2,000. They're all valid reasons. Here's how to go about it.

Where to Go, and When

For a first-time DXpeditioner, renting a location (or *QTH*) from a fellow ham is a good option. In this case most, if not all, equipment is already at your destination. There is no tried-and-true way to locate rental QTHs, but talking with other DXers helps. There are websites that categorize rental QTHs, such as **www.dx-holiday.com** or even **airbnb.com**, but the listings can be out of date. Figure 1 shows the setup at the Rarotonga QTH of Andy Duncan, E51AND, who provided a great deal of equipment to visiting hams when he was living in the Cook Islands.

Figure 1 — Operating from the well-equipped shack of Andy, E51AND (the shack is no longer available, unfortunately). The Elecraft K3 and laptop are mine, all other equipment is Andy's. This photo is from my second trip to Rarotonga.

If you plan to operate from a hotel, always inform the hotel about your plans. Introduce yourself as an amateur radio operator and ask for permission to install temporary antennas. The key word is *temporary*. I like to invite the hotel manager or staff to visit my shack so I can demonstrate ham radio to them and be a good ambassador of the hobby.

Several factors can affect the dates of your DXpedition. Some locations have high and low seasons, with the cost varying widely. The Caribbean has a hurricane season, which might be best to avoid. And if you are travelling for a contest, you may need to reserve your location a year or more in advance, due to demand from other contesters.

Arranging for Licensing

It's important to be properly licensed for your DXpedition. You want to operate legally, of course, and you want your DXpedition to count for DXCC credit. You also may need to show your license to customs when you enter or leave the country.

Contact the Telecom Department for your selected location, and ask how to apply for a temporary amateur radio license. Most temporary licenses are valid for 1 year and may incur a small fee. For many

Figure 2 — The shack at FO/K7AR in the Austral Islands. Lots of equipment in a tiny space!

Figure 3 —Packing the antennas for travel.

license applications, you will need to provide a list of specific equipment you will be using. They may also request expected power output, emission modes, and your operating location. Generally, you will also need to include a copy of your passport and home license.

It's also helpful to contact a local ham or someone who has recently operated from your desired location, and ask for their insight on the licensing process and fees.

Selecting and Packing Equipment

The equipment you bring will depend upon your operating strategy and your goals. You should be prepared to bring most of your home station with you, including a laptop, transceiver, amplifier, antenna tuner, power supply, headset, an audio interface for RTTY or FT8, a paddle or keyer, footswitch for SSB, any necessary tools, and all the connecting cables for the station. If this sounds like a lot of equipment, you're right, it is! Figure 2 shows my shack at FO/K7AR, with barely enough space to fit all the equipment on the small desk provided.

I use vertical antennas because they're relatively easy to travel with, and assemble quickly. Figure 3 shows a golf case I use, with my SteppIR CrankIR portable antenna disassembled, fiberglass masts, the components for a 160-meter antenna, and some of the 1-gallon bags I use for transporting cabling. Figure 4 shows the assembled CrankIR on the beach in the Austral Islands.

You'll also need to think about power. Whatever your final destination is, double check what type of ac power outlets are present, and what the line voltage is. For example, the Cook Islands use Australian outlets at 240 V ac. French Polynesia uses European outlets at 240 V ac.

I recommend setting your voltage switches in advance, and testing locally to be sure the equipment works properly at different line voltages. I also recommend bringing an extension cord (with the correct adapter) in order to reach faraway outlets.

If you plan on shipping equipment in advance, check with the hotel or resort first and ask for permission. For your first DXpedition, a simpler approach may be better, such as coiling up a wire antenna and tossing it in your suitcase. On my most recent expedition to Micronesia, I shipped most of my equipment via the US Postal Service. This is an expensive option, but it was so convenient to have most of the items waiting at the hotel for me.

Publicizing your DXpedition

One of the key steps for success is to let the DX community know the details of your trip, including the dates, call sign, bands and modes, and the equipment you'll be using. Letting *The Daily DX* and sites like **DX-World.net** know about your DXpedition provides publicity, and gets the community ready to look for you.

Dealing with Customs Officials

The expression "honesty is the best policy" applies when taking your equipment through customs, both at the DX and US ends of your DXpedition. If I'm questioned, I politely explain that I'm an amateur radio operator, and I'm carrying antenna components and radio equipment. This presents an opportunity to show my license to the customs official. Remaining calm and polite always works for me.

Logging and QSLing

I use *N1MM+* for all logging activities. It works well, and now offers integration with WSJT, so FT8 contacts can be logged in the same log as CW and SSB contacts.

I try to upload my logs to Club Log once or twice per day. You can also set up Club Log to transfer your QSOs to Logbook of The World (LoTW) when you perform your daily uploads. I have had good luck enabling OQRS on Club Log right after my expedi-

Figure 4 — The CrankIR on the beach at FO/K7AR with nothing in the way but water. The tripod was in the water at high tide. The sandbags are present due to high winds knocking the antenna over.

tion is over. Club Log does the work of vetting QSL requests, and you just have to print mailing and QSL labels.

Meeting Local Hams

One of the best parts of going on a DXpedition is meeting local hams. In addition to friendship and camaraderie, local hams can offer suggestions on local attractions and restaurants, and maybe even supply spares for forgotten or broken equipment. I've found that local hams enjoy meeting visitors as much as I enjoy meeting them.

In Conclusion

I hope some of these tips and suggestions help you get started on your first DXpedition. But I have a warning. Once you go on your first DXpedition, you're going to want to go somewhere every year!

Photos courtesy of the author.

Al Rovner, K7AR, has gone on many DXpeditions since 1987 and has operated from locations in the Caribbean, Central America, Europe, the Middle East, and the Pacific. Al is an active DXer and contester with 353 confirmed DXCC entities. He can be reached at **k7ar@arrl.net**.

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

VOTE
If you enjoyed this article, cast your vote at www.arrl.org/cover-plaque-poll

Strays

Ed O'Neill, MØTZX, is a CW operator and is looking for other CW enthusiasts to contribute to an interview-based book he is writing. "It occurs to me that the amateur radio community is rapidly losing its oldest CW operators to time. When these early operators pass, we lose the opportunity to hear their anecdotes and observations," O'Neill said. Throughout 2022, O'Neill will be conducting interviews with elder CW operators and compiling their stories for publication. If any *QST* readers are interested or know someone who should be included, contact O'Neill at **m0tzx@yahoo.com**.

QST Congratulates...

■Larry Schroeder, K9VOA, on the publication of his book *Facing Fear: The True Story of Evelyn Frechette*. Well-known today as the companion of notorious gangster John Dillinger, Evelyn "Billie" Frechette was a Native American born in 1907 and hit hard by the Great Depression. Schroeder reveals how she "faced the unthinkable." The book is available on Amazon in Kindle, hardcover, or paperback formats.

■Alan D. Kline, KB1DJ, president of Lynn Ladder and Scaffolding, for being awarded the William T. Ayres Founder Award by the Scaffold Access Industry Association. The Ayres Founder award is given annually to an association board member who has shown devotion to promoting and supporting the association's programs. A veteran of the association's board of directors for over 10 years, Kline is the liaison with the Massachusetts Department of Labor and Industries and with New England Region One OSHA offices.

ARRL Seeks Nominations for 2022 Awards

Do you know someone worthy of an award? These awards have upcoming nomination deadlines.

ARRL places high importance on recognizing individuals and teams that exemplify the spirit and ideals of Amateur Radio. The nominating period is now open for several awards, including ARRL's premier award to honor a young licensee. For more information on each award, rules on qualifications, nomination instructions, and selection criteria, please visit **www.arrl.org/arrl-award-nominations**.

Education Awards

Hiram Percy Maxim Memorial Award

Named for the Founding President of ARRL, this award goes to a licensed radio amateur under age 21 who has made exemplary contributions to Amateur Radio and the local community. Nominees must be current ARRL members. **Nomination deadline: March 31, 2022.**

2021 Hiram Percy Maxim Memorial Award winner, Katherine Forson, KT5KMF, was recognized for her community service as a ham and for promoting Amateur Radio participation among young people. [Michael Brown, W5MDB, photo]

ARRL Herb S. Brier Instructor of the Year Award

Honoring Herb S. Brier, W9AD (SK), ARRL sponsors this award in conjunction with the Lake County Indiana Amateur Radio Club to recognize the very best in Amateur Radio instruction and recruitment. The award goes to a licensed radio amateur and ARRL member who is an ARRL-registered volunteer instructor or ARRL-registered professional classroom teacher. **Nomination deadline: March 15, 2022.**

Technical Awards

ARRL Microwave Development Award

This award recognizes a radio amateur or group of radio amateurs who contribute to the development of the amateur radio microwave bands. **Nomination deadline: March 31, 2022.**

ARRL Technical Service Award

This award recognizes a radio amateur or group of radio amateurs who provide amateur radio technical assistance or training to others. **Nomination deadline: March 31, 2022.**

ARRL Technical Innovation Award

This award recognizes a radio amateur or group of radio amateurs who develop and apply new technical ideas or techniques in amateur radio. **Nomination deadline: March 31, 2022.**

Public Relations Awards

ARRL Philip J. McGan Memorial Silver Antenna Award

Honoring Phil McGan, WA2MBQ (SK), this award recognizes a radio amateur and ARRL member who has demonstrated leadership in successfully promoting Amateur Radio to the public. **Nomination deadline: March 31, 2022.**

ARRL Bill Leonard Award

Honoring Bill Leonard, W2SKE (SK), three annual awards are given to professional journalists or journalistic teams whose outstanding coverage highlights the enjoyment, importance, and public service contribution of the Amateur Radio Service. The award is given in three media categories; audio, visual, and print. **Nomination deadline: March 31, 2022.**

Distinguished Service Award

Knight Distinguished Service Award

Honoring Joe T. Knight, W5PDY (SK), the award recognizes exceptional contributions by a Section Manager to the health and vitality of ARRL. **Nomination deadline: March 31, 2022** (for consideration during July ARRL Board meeting).

Rick Lindquist, WW1ME, ww1me@arrl.org

New Directors in Two ARRL Divisions Took Their Seats in January

New Directors in the ARRL New England and Roanoke Divisions elected in November began 3-year terms on January 1 and took their seats at the Board of Directors' January meeting.

In the New England Division, Fred Kemmerer, AB1OC, of Hollis, New Hampshire, was the top vote-getter in a three-way race. He received 1,147 votes to defeat incumbent Director Fred Hopengarten, K1VR, with 1,054 votes, and past Director Tom Frenaye, K1KI, who received 1,026 votes. Kemmerer has not previously held an ARRL leadership position.

New England Division Vice Director Phil Temples, K9HI, was not opposed for re-election.

Fred Kemmerer, AB1OC

Jim Boehner, N2ZZ

In the Roanoke Division, the winner of a three-way race there was past director Jim Boehner, N2ZZ, of Aiken, South Carolina, with 1,612 votes. He outpolled incumbent Director Bud Hippisley, W2RU, who picked up 809 votes, and a second challenger, Marvin Hoffman, WA4NC, who received 1,294 votes. Boehner was elected as ARRL Roanoke Division Vice Director in 2009, and he succeeded former ARRL Roanoke Division Director Dennis Bodson, W4PWF (SK), after he stepped down in 2015.

No one challenged Roanoke Division Vice Director Bill Morine, N2COP, and he was elected for a new term.

Incumbent Directors and Vice Directors in three other ARRL Division ran unopposed in the 2021 election cycle and were elected to new terms starting on January 1.

- In the Central Division: Director Carl Luetzelschwab, K9LA, and Vice Director Brent Walls, N9BA.
- In the Hudson Division: Director Ria Jairam, N2RJ, and Vice Director Bill Hudzik, W2UDT.
- In the Northwestern Division: Director Mike Ritz, W7VO, and Vice Director Mark Tharp, KB7HDX.

Dayton Hamvention Expects to Be Live Event in 2022

Dayton Hamvention® organizers are planning to mount the first in-person show in 2022, following 2 years of COVID-related cancellations. The event is set for May 20 – 22 at the Greene County Fairgrounds and Expo Center in Xenia, Ohio. Hamvention General Chairman Rick Allnutt, WS8G, said committees have been meeting, and volunteers are committed to making up for the time lost to pandemic cancellations. The Hamvention website (**https://hamvention.org**) is already accepting bookings from vendors and inside exhibitors, and individual visitors can already buy tickets, which Allnutt said, "are all printed and ready to go."

Nominations for the 2022 Hamvention Awards opened on November 1. Hamvention seeks "the best of the best" nominees for its Technical Achievement, Special Achievement, Amateur of the Year, and Club of the Year awards. Nominations close on February 15, 2022. Submit nomination forms to **awards@hamventuon.com**, or send them via USPS to Hamvention Awards Committee, Box 964, Dayton, OH 45401-0964.

Contest University (CTU) will take place on May 19 in conjunction with the annual Hamvention Contest Super Suite activities, which will be moving to the Hope Hotel in Dayton.

ARRL Author, *QST* Technical Editor Joel Hallas, W1ZR, SK

Joel Hallas, W1ZR (SK)

Retired *QST* Technical Editor Joel R. Hallas, W1ZR, of Westport, Connecticut, died on November 25. An ARRL member, he was 79. Hallas retired in 2013 but remained active as a contributing editor, handling the popular "The Doctor is In" column in *QST* and the podcast of the same name. He had been a radio amateur since 1955.

"Joel was not only brilliant, he shared that brilliance with the ham radio community in a way that taught innumerable hams things they needed to know in order to experience success and enjoyment," said ARRL Publications and Editorial Department Manager Becky Schoenfeld, W1BXY. "He was a fine mind, a generous mentor and colleague, and a consummate gentleman. He will be missed."

Retired ARRL Publications Manager Steve Ford, WB8IMY, recalled Hallas as "an iconic figure in amateur radio media as a prolific author of *QST* articles and ARRL books, and even in the audio podcast community."

Hallas authored seven books about communications technology, published by ARRL. His titles include *Basic Radio*; *Basic Antennas*; *The ARRL Guide to Antenna Tuners*; *Hamspeak*; *The Care and Feeding of Transmission Lines*; *Understanding Your Antenna Analyzer*, and *The Radio Amateur's Workshop*.

Hallas earned his bachelor's in electrical engineering from the University of Connecticut and an MSEE from Northeastern University. He previously had worked for Raytheon as a radar systems engineer and for GTE as a nuclear weapons effects (electromagnetic pulse) analyst and as a satellite and terrestrial communications systems engineer, as well as for IBM and AT&T. He also taught at the college level.

Hallas enjoyed sailing, as described in the July 2009 issue of *QST*. He and his 24-foot sloop *Windfall* — fully equipped with a ham station that used the insulated backstay as an HF antenna — graced the front cover.

Survivors include his wife of 58 years, Nancy, W1NCY.

ARRL Executive Committee Meets

The ARRL Executive Committee met on October 25 in virtual session, with President Rick Roderick, K5UR, presiding.

In his report, CEO David Minster, NA2AA, noted that the revised ARRL *Articles of Incorporation* approved during the July 2021 Board meeting had been filed with the State of Connecticut. Minster also said ARRL is expecting an increase in the price it pays for paper, effective in February 2022. He said it's not yet clear whether the impact of the increase in paper costs would be short- or long-term.

CEO Minster reported he had met with ARRL Field Services Manager Mike Walters, W8ZY, on October 22 at Bradley International Airport near Hartford, Connecticut, to observe ARRL participation in an emergency management exercise. Walters participated in all 3 days of the exercise on behalf of ARRL.

ARRL FCC Counsel David Siddall, K3ZJ, discussed recent efforts at the FCC and on Capitol Hill advocating FCC action on long-pending proceedings that address Amateur Radio concerns. Siddall also addressed new legislation pending before Congress that would set deadlines for the allocation of additional spectrum below 3.45 GHz to commercial 5G providers. He described ARRL's efforts to obtain support for allowing continued sharing below 3.45 GHz on a non-interference basis.

FCC Counsel Siddall noted an FCC *Notice of Proposed Rulemaking* (PS Docket 21-346) that is looking into ways of improving communications resiliency and recovery during hurricanes and other disasters. He said ARRL had submitted reports to FCC staff during and immediately following Hurricane Ida.

Siddall further noted the progress of the ARRL RF Safety Committee in addressing and clarifying issues concerning amateur compliance with FCC RF exposure rules and appropriate updates to the related FCC bulletin. He concluded that the work of the Committee, under the leadership of Greg Lapin, N9GL, will benefit every amateur in the future to more readily assess RF exposure compliance and to make any adjustments needed.

West Gulf Division Director, EC member, and Chairman of the Legislative Advocacy Committee, John Robert Stratton, N5AUS, updated the EC on the status of a resolution introduced in Congress by US Representative Debbie Lesko of Arizona to declare April 18 as National Amateur Radio Operators' Day.

Director Stratton also advised the EC that the Legal Structure Review Committee was reviewing the *Articles of Association*, *By-Laws*, and Standing Orders with an eye toward recommending any needed changes at the January 2022 Board meeting.

The Executive Committee was scheduled to meet again on December 13.

Fall ARRL Section Manager Election Results

The only contested seat for Section Manager (SM) in the fall election cycle was in Kansas, where incumbent Ron Cowan, KBØDTI, of La Cygne, came out on top in the two-person race. Cowan outpolled challenger Lloyd Colston, KC5FM, of Arkansas City, 260 to 225. Ballots were counted on November 23 at ARRL Headquarters. Cowan has served as Kansas SM since 2003. His new 2-year term began on January 1, 2022.

In Alabama, Roger Parsons, KK4UDU, of Mulga, became the new SM on January 1, 2022. Parsons was the only nominee for the position. He has been an Assistant Section Manager and a District Emergency Coordinator. Incumbent SM JVann Martin, W4JVM, who has served as the Alabama SM since 2016, decided not to run for a new term.

In Michigan, Les Butler, W8MSP, of Gregory, became the new SM on January 1, 2022. He was the only nominee to submit a petition by the nomination deadline. Butler will succeed incumbent Michigan SM Jim Kvochick, K8JK, whose job will take him out of the state. Kvochick has been Michigan SM since 2018.

In Delaware, the SM position remains open, and a resolicitation for nominees will be issued this winter for an 18-month term beginning on July 1, 2022. No nominating petitions were submitted before the deadline in September. Incumbent SM Mark Stillman, KA3JUJ, is leaving Delaware after serving as its SM since 2020.

These incumbent SMs faced no opposition and were elected to new terms that began on January 1, 2022: David Stevens, KL7EB (Alaska); Mike Patterson, N6JGA (East Bay); Bill Mader, K8TE (New Mexico); John Kitchens, NS6X (Santa Barbara); David Thomas, KM4NYI (Tennessee), and Raymond Lajoie, AA1SE (Western Massachusetts).

An interim SM was appointed in Maine, effective December 1, 2021, after incumbent SM Robert Gould, N1WJO, resigned, having served since July 2020. ARRL Field Services Manager Mike Walters, W8ZY, appointed Phil Duggan, N1EP, of Milbridge as interim SM to complete the current term, which ends on June 30, 2022. Duggan is a retired US Navy electronics technician chief and active in emergency communications. He served previously as Maine Section Emergency Coordinator. Duggan is active in promoting amateur radio, especially among youth.

Nominating petitions for the next Maine SM term of office are due at ARRL Headquarters no later than March 4, 2022. See the January 2022 issue of *QST* for the nomination announcement, or visit **www.arrl.org/section-terms-nomination-information** for more details.

Russia's Destruction of an Orbiting Satellite Raises Space Debris Concerns

Russia's testing of an anti-satellite weapon on November 15, destroying Kosmos-1408, one of its own old and now-defunct satellites, has resulted in an orbiting debris field. The weapon test prompted the seven International Space Station (ISS) crew members, including one Russian cosmonaut, to take cover in their crew capsules for several hours, in case they had to abandon the station.

The proliferation of spacecraft in Earth orbit has greatly increased the possibility of collision with space debris. [Photo courtesy of **www.nasa.gov**]

The danger of damage to the ISS or an orbiting satellite aside, tracking a debris field that could include thousands of pieces, in order to head off collisions, is a special concern. AMSAT President Robert Bankston, KE4AL, said that Russia's action will pose a threat to all activities in low Earth orbit for years to come, placing satellites and human spaceflight missions at risk.

"Space is already crowded, but now there are at least 1,500 trackable fragments and, possibly, hundreds of thousands of smaller, yet still-threatening, pieces of debris in low Earth orbit," Bankston said. "While space stations have the capability to move out of the way, with sufficient notice, most satellites in low Earth orbit, including those designed, built, launched, and operated by AMSAT, do not. As such, they face greater risk of catastrophic destruction or degraded mission functionality, if struck by fragments from Russia's destruction of Kosmos-1408."

Bankston said AMSAT is closely monitoring the situation and hoping for the best.

Senate Confirms FCC Chairwoman Jessica Rosenworcel for a New Term

On December 7, the US Senate voted 68 – 31 to confirm FCC Chairwoman Jessica Rosenworcel for a new term on the Commission. President Joe Biden appointed Rosenworcel as Chair of the FCC in late October. Following the confirmation vote, Rosenworcel expressed her appreciation. "People across the country count on the FCC to support the connections they need for work, learning, healthcare, and access to the information we require to make decisions about our lives, our communities, and our country. I look forward to working with the Administration, my colleagues on the Commission and FCC staff, members of Congress, and the public to make the promise of modern communications a reality for everyone, everywhere."

As of mid-December, the nomination of a fifth commissioner remained pending before the Senate. A hearing was held in the Senate Commerce, Science, and Transportation Committee on President Biden's nominee, Gigi Sohn, for the remaining Democratic seat, but no Committee or Senate votes were scheduled.

WSJT-X Development Group Partner Bill Somerville, G4WJS, SK

Bill Somerville, G4WJS, a key member of the *WSJT-X* development group — where FT8 and other cutting-edge digital amateur radio technology has originated — died in early December. He was in his mid-60s, and his death was unexpected. The development group founder, Joe Taylor, K1JT, called Somerville "a dear friend and very close colleague." He said that Somerville was the first to join with him in 2013 to form a core development group for *WSJT-X*, then in its digital infancy.

Bill Somerville, G4WJS (left), and Joe Taylor, K1JT (right), held the RSGB Wortley-Talbot Trophy in 2018 for the most outstanding experimental work in amateur radio. The RSGB President at that time, Nick Henwood, G3RWF (center), assisted. [Photo courtesy of RSGB]

"Bill has been closely involved with *WSJT-X* and related software projects ever since," Taylor said. "Our free, open-source software could not have achieved its extensive worldwide popularity and influence in ham radio without Bill's essential contributions."

Somerville collaborated with Taylor and Steve Franke, K9AN — the third member of the *WSJT-X* development group — to author articles for *QST* and *QEX* about FT8 and other *WSJT-X* protocols. The trio won the October 2017 *QST* Cover Plaque Award. They also received the Dayton Hamvention® Technical Achievement Award in 2020, and the ARRL Doug DeMaw, W1FB, Technical Excellence Award in 2021. Taylor said Somerville, "devoted countless hours to program support, patiently answering user's questions on *WSJT*-related forums."

An active radio amateur, he also applied his programming expertise to such projects as setting up an SO2R (single operator, two radio) station and enhancing his station's automated processes.

Section Manager Nomination Notice

To all ARRL members in Illinois, Indiana, Maine, Northern Florida, Oregon, Santa Clara Valley, Vermont, and Wisconsin. You are hereby solicited for nominating petitions pursuant to an election for Section Manager (SM). Incumbents are listed on page 16 of this issue.

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

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

We suggest the following format:

(Place and Date)

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

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

(Signature _____ Call Sign _____ City _____ ZIP _____)

Any candidate for the office of Section Manager must be a resident of the Section, an amateur radio licensee of Technician class or higher, and a full member of ARRL for a continuous term of at least 2 years immediately preceding receipt of a nominating petition. Petitions must be received at Headquarters by 4 PM Eastern Time on March 4, 2022. If more than one member is nominated in a single Section, ballots will be mailed from Headquarters no later than April 1, 2022, to full members of record as of March 4, 2022, which is the closing date for nominations. Returns will be counted May 24, 2022. Section Managers elected as a result of the above procedure will take office July 1, 2022.

If only one valid petition is received from a Section, that nominee shall be declared elected without opposition for a 2-year term beginning July 1, 2022. If no petitions are received from a Section by the specified closing date, such Section will be resolicited in the July *QST*. A Section Manager elected through the resolicitation will serve a term of 18 months. A Section Manager vacancy occurring between elections is filled through appointment by the Field Services Manager. — *Mike Walters, W8ZY, Field Services Manager*

SM Nomination Petition Resolicitation

Because no nomination petitions were received for the Delaware Section Manager election by the nomination deadline of September 10, 2021, nominations are hereby resolicited. See above for details.

Rick Palm, K1CE, k1ce@arrl.net

Public Service

ARRL to Host Emergency Communications Track at National Convention

A panel of nationally recognized subject-matter experts and trainers will conduct an emergency communications workshop in conjunction with the 2022 ARRL National Convention at Orlando HamCation® in Florida on February 10, at the Doubletree by Hilton Orlando at SeaWorld. Speakers from around the country will present at the day-long event, making it a fantastic learning opportunity for novice and veteran public service-oriented operators alike.

Presenters will cover current events and topics in the realm of amateur radio emergency communication techniques and hardware/software, which have both evolved dramatically with the nation's massive investment in emergency management since the events of Hurricane Katrina (2005) and September 11 (2001). Radio amateurs have become an integral part of the interoperability picture. Here's a summary of presentations that attendees can expect from Training Track #2: Emergency Communications Academy.

Presentations and Goals

Introductions and goals for the training track will be addressed by ARRL Field Services Manager Mike Walters, W8ZY, a former administrator for the Red Cross emergency communications group *Winlink* Thursday, along with Lead Instructor Gordon Gibby, KX4Z, who has been an educator-trainer and exercise coordinator for the Amateur Radio Emergency Service® (ARES®) and other pro-

Event Educators and Trainers

Gordon Gibby, M.D., KX4Z, is the Lead Instructor for Training Track #2: Emergency Communications Academy of the ARRL National Convention at Orlando HamCation®. He discovered ham radio as a teenager, when he built a Heathkit radio project. Gordon attended the Georgia Institute for Technology (Georgia Tech) and the University of Illinois for electrical engineering and pre-med studies. He worked as an anesthesiologist, and in retirement he has taught electronics and radio theory, as well as high school science classes. "Learning how to lay out printed circuit boards made a huge improvement in my ability to provide projects for a growing ham radio club, and getting my first spectrum analyzer made mixers come alive," he said. Gibby is a member of the SHAred RESources (SHARES) HF radio program and is a *Winlink* HF/VHF sysop.

Helen Straughn, WC4FSU, was first licensed in 1978. Amateur radio led her to an 18-year career as a public safety communicator with the Florida State University and Tallahassee police departments. Her main interests are traffic handling and emergency communications. Helen is the manager for the Florida Phone Traffic Net, and was appointed as the ARRL Northern Florida Section Traffic Manager in 2020, promoting the growth of ARES and traffic nets.

Earl McDow, K4ZSW, started his ham radio journey in sixth grade with a foxhole radio and crystal radio upgrade, and he built or modified surplus radios. McDow has been active in Boy Scouts for 65 years, and his first merit badge was the Radio Merit Badge. He was active in amateur radio until his sophomore year in computer engineering at the University of Tennessee, where he studied semiconductors. McDow worked in medical research for computer data acquisition and analysis, and later, in the Oak Ridge National Laboratory (ORNL) in Tennessee. He regained his interest in ham radio in 2018. Now, his interest is in digital radio technology and emergency communications.

C. Matthew Curtin, KD8TTE, is the founder of the BLACK SWAN net exercise and training program that has pioneered interoperability among agencies and nongovernment organizations. He serves as a warrant officer in the Signal Section at the 4th Civil Support and Sustainment Brigade (CSSB) at the Ohio Military Reserve. Curtin has held appointments in the ARRL Ohio Section, such as Assistant Section Emergency Coordinator and Emergency Coordinator, and is currently designated as both an Official Emergency Station (OES) and Official Relay Station (ORS). He recently completed his seventh term as Net Manager of the Central Ohio Traffic Net, and is affiliated with Radio Relay International and the SHAred RESources (SHARES) HF radio program. Professionally, he leads a nationwide consulting practice in cybersecurity and forensic data analysis at Interhack Corporation in Columbus, Ohio.

grams in the southeast. The major goals of the program are to help students learn the skills and proper roles that allow them to be an asset (not a liability) when responding to incidents to assist served entities, and to help them track their training progress and credentials by using the Position Task Books for ARRL ARES, AUXCOMM, and other programs.

C. Matthew Curtin, KD8TTE, host of the popular YouTube channel for emergency communications training, *KD8TTE* (**www.youtube.com/c/KD8TTE**), will start things off with an overview of amateur radio responses to disasters, such as how communication works with layers of networks and interchanges. He'll cover communication theory and practice, emergency mode operations, and the operating skills needed to perform communication functions.

Curtin, along with Helen Straughn, WC4FSU, ARRL Northern Florida Section Traffic Manager, will present, "Basic Voice Traffic Handling: Mechanics of a Radiogram Transfer — Origination, Sending, Receiving, and Delivery." After that, one of Florida ARES's experienced trainers, Leland Gallup, AA3YB, will join Curtin for a hands-on traffic handling session, which will be an actual traffic net for net/message transaction practice and capturing Incident Command System (ICS)-213 Forms into radiograms. Participants should bring an analog VHF FM radio to gain maximum benefit from this session.

Forums and Discussions

Walters, ARRL Section Emergency Coordinators, and possibly a new ARRL Emergency Management Director will conduct the "ARRL ARES Forum," to answer questions about what ARES is and how to join, as well as host an open forum for questions and comments.

Gallup will conduct, "AUXCOMM — Integrating Amateur Emergency Service Groups," which will be followed by an open forum for more questions and answers.

Gibby and associated mentors will demonstrate the benefits of *Winlink* emergency communication tools and entertain a discussion on one of the most important data communications modes developed in recent times. *Amateur Radio Digital Open Protocol* (*ARDOP*), the *VARA* protocol, and the *Radio Mail Server* (*RMS*) *Packet* hybrid internet/HF radio gateway system will be covered.

A presentation on emergency antennas will include basic guidance on field-expedient antenna systems, near vertical incidence skywave (NVIS) propagation, and RF exposure compliance, and will be conducted by Curtin and Gibby. Following this forum will be a presentation on emergency power by Earl McDow, K4ZSW, and ARRL Northern Florida Assistant Section Manager Jeff Capehart, W4UFL. The day will end with a brief summary by Rick Palm, K1CE, *QST* "Public Service" column author, *The ARES Letter* editor, and retired ARRL Field Services Manager and national ARES Program Administrator.

Meet ARRL Officials

The ARRL National Convention Luncheon will begin at noon, which will include networking and a keynote speech from ARRL Chief Executive Officer David Minster, NA2AA.

You can register for the ARRL National Convention Program, training tracks, and the National Convention Luncheon at **www.arrl.org/expo**.

Field Organization Reports

November 2021

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**.

1028
WA7PTM

465
WA3EZN

425
N9VC

358
W7PAT

354
KE8BYC

320
W7EES

ND8W

305
AD8CM

249
KB3YRU

245
KT2D

W8DJG

235
KD2NMG

234
WA2CCN

230
W9GRG

219
NI2W

196
WØPZD

190
W3GWM

186
KD2LPM

180
KB3YYC

173
KK6GXG

170
W2PH
WO2H
N2LC

165
K9LGU

K3JL
N5MKY

164
WV5Q

160
KC9FXE

158
WM2C
KD8UUB

155
N8SY

AI9F

154
W8IM

150
W4DNA

140
WM5N
N3KRX
K4IWW
WB9QPM
KK3F

138
KB5PGY

135
N2DW
W3YVQ

134
KM8V

133
K8AMH

130
WA4VGZ
AC0KQ
K3FAZ
KD2GRS
WK4WC
N1LL
N2JBA
KD8ZCM
KV8Z
KO4OL
KW1U

125
AG9G
KB8PGW
KE5YTA
KF5OMH

121
KC8T

120
WC4FSU
NX9K
WB9WKO
KA9QWC
KB2RTZ
KC8YVF
KY2D

117
WD8USA

116
KG5NNA

115
KA9IKK
KD8KBX
N1TF

112
K8MDA
K2VTT

110
WA1URS
AD4DO
WA3QLW
K6HTN
KDØHHN
KE4DRF
N3SW
WB8TQZ
KC8WH
KA9MZJ
KB2QO
W2AH
N1IQI
W1RVY
W2ZXN
KA5AZK
KF5IOU

109
AC8NP

107
KB1TCE
KB8RCR

105
W4CMH
W2PAX
K5OB

104
K8RDN

103
W9EEU

100
W1KX
WB4RJW
KZ8Q
KN9P
WB8SIQ
AC8RV
AA3SB
K3YAK
W3CJD
N1LAH
AK2Z
KB2YAA

95
KFØBPN

94
WB8YYS

90
KM4WHO
KB9GO
KØWAV
AA7BM
KJ7BHO
K3MIY
WX2DX
AA3N
W3KX
W4TTO
N3XMB
N4ZM
K8ED
KL7RF
K8KRA
N8MRS
KB8HJJ
WB4ZDU
KB3MXK
KA2HZP
KC1KVY
KD2POP

89
KC1HHO

87
AB9ZA

86
N2TSO
WA1LPM

85
N6IET
KB3IN
WB3FTQ

84
KU1U
WB2ZEX

83
KT4WX

82
W7PHX
KA2GOQ

81
K6JT

80
AJ7B
KR4ST
KT5SR
KF7GC
W9BGJ
KE8CEH
W8GSR
KD2JKV
N3ARB

79
K2EAG
KR2HWK

78
KØFBS
KN4AAG

76
KD2QAR

75
K4FHR
WB6NCT
K7OED
W5XX
KA2JFU

74
NØUMP
W3ZR

73
N3RB

71
KB6RAU
KC1MSN

70
KE8DON
KA1G
K2IE

The following stations qualified for PSHR in September, 2021, but were not listed in this column last month: KB5PGY 200, KT5SR 118, KA9IKK 90, WM5N 150, KE4DRF 180, K5OB 135, W5LIC 93.

Section Traffic Manager Reports

The following Section Traffic Managers reported: AR, AZ, CO, DE, EMA, ENY, EPA, IL, IN, KY, LA, LAX, MDC, MI, MO, NC, ND, NFL, NLI, NM, NNJ, NTX, OH, OR, SD, SFL, SNJ, SJV, STX, TN, WCF, WMA, WPA, WI, WWA, WY.

Section Emergency Coordinator Reports

The following Section Emergency Coordinators reported: AR, ENY, EPA, EWA, KY, MDC, ME, MI, MO, MS, NFL, ND, NLI, NNJ, NNY, NV, PAC, SCV, STX, TN, UT, VA, VI, 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.

KK3F 1,828, NX9K 1,265, WB9WKO 956, K6HTN 889, N9CK 790, KW1U 680.

The following stations qualified for BPL in October 2021, but were not listed in this column last month: WB9WKO 1,637, N9CK 1,258.

Bruce Draper, AA5B, aa5b.corral@gmail.com

Contest Corral

February 2022

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

Start - Finish				Bands	Contest Name	Mode	Exchange	Sponsor's Website
Date	Time	Date	Time					
2	1700	2	2000	144	VHF-UHF FT8 Activity Contest	Dig	4-char grid square	ft8activity.eu/index.php/en
2	2000	2	2100	3.5	UKEICC 80-Meter Contest	Ph	6-char grid square	ukeicc.com/80m-rules.php
3	0000	4	0300	7	Walk for the Bacon QRP Contest	CW	Max 13 WPM; RST, SPC, name, mbr or power	qrpcontest.com/pigwalk40
3	1800	3	2200	28	NRAU 10-Meter Activity Contest	CW Ph Dig	RS(T), 6-char grid square	nrrlcontest.no
3	2000	3	2200	1.8-50	SKCC Sprint Europe	CW	RST, SPC, name, mbr or "none"	www.skccgroup.com
5	0000	6	2359	1.8-UHF	Vermont QSO Party	CW Ph Dig	RS(T), VT county or SPC	www.ranv.org/vtqso.html
5	0001	6	2359	28	10-10 International Winter Contest, SSB	Ph	Name, mbr or "0," SPC	www.ten-ten.org
5	0600	5	1800	1.8-28	EurAsia HF Championship	CW Ph	RS(T), 6-char grid square	www.eurasia-contest.com
5	1200	6	1200	3.5-28, 144	F9AA Cup, CW	CW	RST, serial	www.site.urc.asso.fr
5	1200	6	2359	3.5-28	Mexico RTTY International Contest	Dig	RST, XE state or serial	www.rtty.fmre.mx
5	1400	5	2359	1.8-28	Minnesota QSO Party	CW Ph Dig	Name, MN county or SPC	www.w0aa.org/mnqp-rules
5	1400	5	2359	1.8-28	FYBO Winter QRP Sprint	CW Ph Dig	RS(T), SPC, name, power, temperature	arizonascqrpions.apps-1and1.com
5	1600	5	1800	3.5-28	FISTS Saturday Sprint	CW	RST, SPC, name, mbr or "0"	fistsna.org/operating.html#sprints
5	1600	5	1900	3.5	AGCW Straight Key Party	CW	RST, serial, class, name, age	alt.agcw.de/index.php/en
5	1600	6	2359	1.8-28	British Columbia QSO Party	CW Ph	RS(T), BC district or SPC	orcadxcc.org/bcqp_rules.html
5	1800	6	1800	1.8-28	European Union DX Contest	CW Ph	RS(T), EU region or ITU zone	eudxcc.altervista.org/eu-dx-contest
5	2300	6	0300	3.5-14	North American Sprint, CW	CW	Other's call, your call, serial, name, SPC	ncjweb.com
6	1400	9	0800	1.8-144	Classic Exchange, CW	CW	Name, RST, SPC, rig information	www.classicexchange.org
7	1630	7	1729	3.5, 7	OK1WC Memorial (MWC)	CW	RST, serial	memorial-ok1wc.cz
7	2000	7	2130	3.5	RSGB 80-Meter Club Championship, SSB	Ph	RS, serial	www.rsgbcc.org/hf
8	0200	8	0400	3.5-28	ARS Spartan Sprint	CW	RST, SPC, power	arsqrp.blogspot.com
9	0130	9	0330	3.5-14	NAQCC CW Sprint	CW	RST, SPC, mbr or power	naqcc.info
9	1700	9	2000	432	VHF-UHF FT8 Activity Contest	Dig	4-char grid square	ft8activity.eu/index.php/en
12	0000	13	2359	3.5-28	CQ WW RTTY WPX Contest	Dig	RST, serial	cqwpxrtty.com/rules.htm
12	1100	12	1300	7, 14	Asia-Pacific Spring Sprint, CW	CW	RST, serial	jsfc.org/apsprint/aprule.txt
12	1200	13	1200	1.8-28	Dutch PACC Contest	CW Ph	RS(T), PA province or serial	pacc.veron.nl
12	1200	13	2359	1.8-50	SKCC Weekend Sprintathon	CW	RST, SPC, name, mbr or "none"	www.skccgroup.com
12	1200	13	2359	1.8	KCJ Topband Contest	CW	RST, JA prefecture or continent code	www.kcj-cw.com
12	1400	14	0200	All	YLRL YL-OM Contest	CW Ph Dig	Serial, RS(T), SPC	ylrl.org/wp/yl-om-contest
12	1500	13	1500	1.8-28	OMISS QSO Party	Ph	RS, SPC, mbr (if any)	omiss.net/Facelift/qsoparty.php
12	1900	12	2300	1.8	RSGB 1.8 MHz Contest	CW	RST, serial, UK district code (if UK)	www.rsgbcc.org/hf
12	2300	13	2300	1.8-14	AWA Amplitude Modulation QSO Party	Ph	Name, SPC	antiquewireless.org
13	1300	13	1700	3.5, 7	Balkan HF Contest	CW Ph	RS(T), serial	arabih.ba
14	0000	14	2359	1.8-7	PODXS 070 Club Valentine Sprint	Dig	Name, OM or YL, SPC	www.podxs070.com
14	0100	14	0259	3.5-14	CQC Winter QSO Party	CW	RST, SPC	www.coloradoqrpclub.org
14	0100	14	0300	1.8-28	4 States QRP Group Second Sunday	CW Ph	RS(T), SPC, mbr or power	www.4sqrp.com
14	1300	18	2359	All (no WARC)	ARRL School Club Roundup	CW Ph Dig	RS(T), class (I/C/S), SPC	arrl.org/school-club-roundup
14	1630	14	1729	3.5, 7	OK1WC Memorial (MWC)	CW	RST, serial	memorial-ok1wc.cz
16	1900	16	2030	3.5	AGCW Semi-Automatic Key Evening	CW	RST, serial, year first used a bug	alt.agcw.de/index.php/en
16	2000	16	2130	3.5	RSGB 80-Meter Club Championship, Data	Dig	RST, serial	www.rsgbcc.org/hf
17	0000	18	0300	14	Walk for the Bacon QRP Contest	CW	Max 13 WPM; RST, SPC, name, mbr or power	qrpcontest.com/pigwalk20
19	0000	20	2359	1.8-28	ARRL International DX Contest, CW	CW	RST, state or province; DX: power	www.arrl.org/arrl-dx
19	1200	20	1159	1.8-28	Russian PSK WW Contest	Dig	RST, oblast or serial	rdrclub.ru/russian-ww-psk-contest
19	1900	19	2059	1.8-28	Feld Hell Sprint	Dig	RST, mbr, SPC, grid	sites.google.com/site/feldhellclub
20	2100	20	2300	3.5-28	FISTS Sunday Sprint	CW	RST, SPC, name, mbr or "0"	fistsna.org/operating.html#sprints
20	2300	21	0100	1.8-28	Run for the Bacon QRP Contest	CW	RST, SPC, mbr or power	qrpcontest.com/pigrun
21	1630	21	1729	3.5, 7	OK1WC Memorial (MWC)	CW	RST, serial	memorial-ok1wc.cz
23	0000	23	0200	1.8-50	SKCC Sprint	CW	RST, SPC, name, mbr or "none"	www.skccgroup.com
23	2000	23	2100	3.5	UKEICC 80-Meter Contest	CW	6-char grid square	www.ukeicc.com/80m-rules.php
24	2000	24	2130	3.5	RSGB 80-Meter Club Championship, CW	CW	RST, serial	www.rsgbcc.org/hf
25	2200	27	2200	1.8	CQ 160-Meter Contest, SSB	Ph	RS, SP or CQ zone	cq160.com/rules.htm
26	0600	27	1800	3.5-28	REF Contest, SSB	Ph	RS, French department or serial	concours.r-e-f.org/reglements
26	1200	27	1200	3.5-28	FTn DX Contest	Dig	4-char grid square	europeanft8club.wordpress.com
26	1300	27	1300	3.5-28	UBA DX Contest, CW	CW	RST, serial, ON province (if ON)	www.uba.be/en
26	1500	27	0159	1.8-50	South Carolina QSO Party	CW Ph Dig	RS(T), SC county or SPC	scqso.com
26	1800	27	0559	3.5-28	North American QSO Party, RTTY	Dig	Name, SPC+DC	www.ncjweb.com
26	1800	27	0559	3.5-28	NA Collegiate Championship, RTTY	Dig	Name, SPC+DC	www.w9smc.com/nacc
27	1400	27	1700	3.5-28	High Speed Club CW Contest	CW	RST, mbr or "NM"	www.highspeedclub.org
27	1500	28	0100	3.5-144	North Carolina QSO Party	CW Ph Dig	NC county or "SPC"	ncqsoparty.org/rules
28	1630	28	1729	3.5, 7	OK1WC Memorial (MWC)	CW	RST, serial	memorial-ok1wc.cz
28	2000	28	2130	3.5-14	RSGB FT4 Contest	Dig	4-char grid square	www.rsgbcc.org/hf

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 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.*

Rus Healy, K2UA, k2ua@arrl.net

2021 ARRL 10 GHz and Up Contest Results

This year's ARRL 10 GHz and Up Contest took place August 21 – 22 and September 18 – 19, 2021.

Logs Received by Call Area

Call Area	Entries
W0	13
W1	22
W2	15
W3	6
W4	7
W5	8
W6	19
W7	9
W8	13
W9	16
VE	9

Top Ten Scores

10 GHz Only		10 GHz and Up	
Call	Score	Call	Score
WB0LJC	56,268	VA3ELE	50,889
WA6CDR	46,987	K2DH	50,299
VE3KH	40,253	K2UA	50,092
KB8U	38,310	VA3TO	46,908
AF1T	38,214	K9PW	41,295
W1MKY	36,485	K6ML	40,368
N6RMJ	33,121	N9JIM	36,118
W0ZQ	31,840	W6QIW	33,566
KA9VVQ	31,199	K1RZ	31,818
W9FZ	31,199	VE2UG	31,504

Top Unique Call Leaders

10 GHz		10 GHz and Up	
Call	Unique Calls	Call	Unique Calls
AF1T	49	K2DH	61
W1MKY	48	K2UA	61
VE3KH	47	K1RZ	46
W2RMA	41	N2MG	45
K3WHC	37	W1GHZ	45
WA6CDR	37	K9PW	42
KA2LIM	35	K8ZR	40
VE3EG	35	VA3ELE	39
N5BF	33	VA3TO	38
N6RMJ	33	W6QIW	37

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.

Bill Rogers, K2TER, operated his new 10 and 24 GHz microwave gear in the 2021 ARRL 10 GHz and Up Contest. His best DX for the event was a pair of 445-kilometer 10 GHz contacts with Dale Clement, AF1T, and Mickie Clement, W1MKY, on Martha's Vineyard in Massachusetts. [Chris Shalvoy, K2CS, photo]

Call Area Leaders

10 GHz		10 GHz and Up	
Call	**Score**	**Call**	**Score**
Area 0		**Area 0**	
WB0LJC	56,268	AF4JF	1,921
W0ZQ	31,840	WA0CNS	1,232
N0KP	23,739		
W0GHZ	11,621		
KC0P	9,739		
Area 1		**Area 1**	
AF1T	38,214	W1GHZ	27,367
W1MKY	36,485	N1JEZ	16,771
W1AIM	13,280	K1OR	11,159
KA1NKD	12,744	WA1MBA	9,293
W1FKF	12,000	KA1OJ	8,960
Area 2		**Area 2**	
KA2LIM	17,452	K2DH	50,299
N3RG	9,645	K2UA	50,092
K2CS	7,746	K0SM	27,434
N2JMH	4,664	N2WK	25,933
NU2F	4,568	N2MG	22,344
Area 3		**Area 3**	
W2RMA	26,420	K1RZ	31,818
K3WHC	20,744		
WA3PTV	6,550		
W3HMS	1,927		
K3WGR	1,356		
Area 4			
N9ZL	5,165		
W3IP	1,672		
K4QF	677		
AG4V	500		
KO4GQT	397		
KN4WNC	397		
Area 5		**Area 5**	
W5VY	5,678	WQ5S	15,848
AA5AM	5,500	W5LUA	8,676
WA5TKU	2,323	AA5C	7,460
W5AFY	1,844		
KI5CKM	572		
Area 6		**Area 6**	
KN6OUL	29,219	K6ML	40,368
N5BF	21,963	N9JIM	36,118
W6DL	19,399	W6QIW	33,566
K1CT	10,514	K6MG	20,184
AG6KG	7,422	WA6QDP	19,931
Area 7			
WA6CDR	46,987		
N6RMJ	33,121		
AD7OI	3,961		
KI7GVT	3,467		
W7GLF	952		
Area 8		**Area 8**	
KB8U	38,310	K8ZR	28,167
W8RU	5,152	K2YAZ	16,679
N8IUP	892	KB8VAO	14,092
KB8JNE	256	WA8VPD	11,246
KC8VGG	101	WB8TGY	7,820
Area 9		**Area 9**	
KA9VVQ	31,199	K9PW	41,295
W9FZ	31,199	AA9IL	16,182
WA9TT	20,785	K9TMS	14,189
WA2VOI	15,583	W9XA	9,862
K0KFC	14,886	W9SZ	8,139
Area 15 (Canada)		**Area 15 (Canada)**	
VE3KH	40,253	VA3ELE	50,889
VE3EG	21,935	VA3TO	46,908
VE3FN	11,681	VE2UG	31,504
VE7FYC	549	VE3SMA	31,106
VE7JH	160		

Best Terrestrial DX by Band

Call	Band	Distance (km)
WA6CDR/K6MG	10 GHz	746
K2DH/K2UA/VE3SMA	24 GHz	238
N1JEZ/WA1MBA/KA1OJ/W1EX	47 GHz	126
N1JEZ/WA1MBA	75 GHz	126
WB8TGY/W8MMM/WA8VPD	123 GHz	11

Top Ten QSO Leaders

10 GHz	
Call	**Total QSOs**
WB0LJC	247
VE3KH	162
KB8U	156
W9FZ	151
KA9VVQ	151
W0ZQ	145
WA6CDR	120
N6RMJ	118
AF1T	118
W1MKY	113
10 GHz and Up	
K9PW	241
VA3ELE	239
VA3TO	230
K2UA	223
K2DH	221
VE3SMA	167
K8ZR	165
VE2UG	162
K6ML	161
N2WK	140

Best DX by Band in Kilometers

10 GHz		47 GHz	
Call	**Best DX**	**Call**	**Best DX**
WA6CDR	746	N1JEZ	126
K6MG	746	WA1MBA	126
AF1T	710	KA1OJ	126
VE3KH	710	W1EX	126
WA6QDP	650	K9PW	122
W5LUA	643	K8ZR	122
W1MKY	640	K2UA	104
WA3PTV	640	K2DH	104
AA5C	636	VA3TO	98
VE3FN	629	VA3ELE	98
		VE2UG	98
24 GHz		**75 GHz**	
Call	**Best DX**	**Call**	**Best DX**
K2DH	238	N1JEZ	126
K2UA	238	WA1MBA	126
VE3SMA	238	KA1OJ	85
K6ML	201	W1EX	85
N9JIM	197	K8ZR	19
W6QIW	197	K9PW	19
WA6QDP	196	KB8VAO	19
N2MG	175	WB8TGY	11
N2WK	175	**123 GHz**	
WA8VPD	174	**Call**	**Best DX**
K9PW	174	WB8TGY	11
WB8TGY	174	W8MMM	11
		WA8VPD	11
		AF4JF	4
		KB8VAO	4
		WA0CNS	4
		K8ZR	4

The next ARRL 10 GHz and Up Contest will be held August 20 – 21 and September 17 – 18, 2022.

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 November 2021 activity report of the VM Program.

♦Operators in Ardmore, Tennessee; Lithonia, Georgia; Coconut Creek and Miramar, Florida, and East Bridgewater, Massachusetts, were issued advisories regarding excessive bandwidth, contrary to FCC rules. The operators were transmitting on SSB with bandwidths of 8 to 9 kHz.

♦Advisories were issued to operators in Northridge (Los Angeles) and Hemet, California, for interference to repeaters. Both operators had been requested by the repeater trustees to cease using the repeaters. The advisory issued to the Northridge operator cited broadcasting and failure to identify, and it informed him that the FCC was requested not to grant his upcoming renewal application unless the case was resolved.

♦An advisory was issued to an operator in Powell, Wyoming, for transmitting overdriven FT8 signals that resulted in spurious emissions. The operator has since corrected the problem.

♦General-class operators in Bartonville, Illinois, and St. Clair, Michigan, were issued advisories for operation in the Amateur Extra-class portion of 40 meters. A Technician-class licensee in Windber, Pennsylvania, was issued an advisory for operating in the General-class portion of 75 meters.

♦One case was referred to the FCC for enforcement action and review of a license renewal application. The FCC referred two cases to the VM Program.

♦Totals for VM monitoring during October were 2,939 hours on HF frequencies, and 3,282 hours on VHF frequencies and above, for a total of 6,221 hours. That is the highest number of hours monitoring since the inception of the VM Program. — *Thanks to Volunteer Monitor Program Administrator Riley Hollingsworth, K4ZDH*

Paul Bourque, N1SFE, n1sfe@arrl.org

2021 ARRL 222 MHz and Up Distance Contest Results

This year's event was held August 7 – 8, 2021.

Regional Winners

Regions are defined in the contest rules (**www.arrl.org/222-mhz-and-up-distance-contest**). Category key: R — Rover; SOF — Single Operator, Fixed, and MOF — Multioperator, Fixed.

Region	Category	Call	Score
1	SOF	N7KSI	4,351
2	No Entries		
3	R	K6MI/R	26,142
	SOF	W6TV (W6YEP, op)	43,279
4	No Entries		
5	R	WR5O/R	950
	SOF	W7JET	3,473
	MOF	KC5MVZ	1,418
6	SOF	WB0HHM	1,161
7	R	AF4JF/R	224
	SOF	WQ0P	12,053
8	SOF	W5VY	7,937
9	R	K9JK/R	31,409
	SOF	K2DRH	94,196
10	R	K9PW/R	132,972
	SOF	K0AWU	38,022
11	R	NN3Q/R	42,921
	SOF	K2YAZ	63,762
12	R	AG4V/R	29,602
	SOF	N4JQQ	9,386
13	R	NV4B/R	24,422
	SOF	N4SVC	42,825
14	R	W2RMA/R	33,856
	SOF	K1RZ	143,089
	MOF	K4QF	2,637
15	R	K0BAK/R	5,566
	SOF	K3TUF	44,423
	MOF	N3NGE	51,795
16	R	K1DS/R	25,503
	SOF	K1TEO	144,416
17	No Entries		
18	No Entries		

Affiliated Club Competition

Club	Score	Entries
Medium		
Mt. Airy VHF Radio Club	556,177	14
North East Weak Signal Group	313,443	10
Northern Lights Radio Society	155,582	10
Society of Midwest Contesters	139,960	4
Rochester VHF Group	120,981	6
The Ontario VHF Assn.	74,700	3
Pacific Northwest VHF Society	22,142	11
Southern California Contest Club	10,484	3

Top Ten Scores

Single Operator, Fixed		Multioperator, Fixed		Rover	
K1TEO	144,416	N3NGE	51,795	K9PW/R	132,972
K1RZ	143,089	N2NT	18,646	NN3Q/R	42,921
K2DRH	94,196	K4QF	2,637	W2RMA/R	33,856
K2YAZ	63,762	KC5MVZ	1,418	K9JK/R	31,409
AF1T	47,529			AG4V/R	29,602
K1WHS	45,522			K6MI/R	26,142
K3TUF	44,423			K1DS/R	25,503
N2WK	43,811			N1SV/R	24,912
N1JEZ	43,398			NV4B/R	24,422
WZ1V	43,332			KN6PRZ/R	17,668

The next ARRL 222 MHz and Up Distance Contest will be held August 6 – 7, 2022.

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.

Christopher Arthur, NV4B/R, operated from Colbert Mountain in Colbert County, Alabama, during the 2021 ARRL 222 MHz and Up Distance Contest. He operated on the 222, 432, and 1296 MHz bands, earning him a top-ten finish in the Rover category. [Christopher Arthur, NV4B, photo]

W1AW Schedule

PAC	MTN	CENT	EAST	UTC	MON	TUE	WED	THU	FRI
6 AM	7 AM	8 AM	9 AM	1400		FAST CODE	SLOW CODE	FAST CODE	SLOW CODE
7 AM-1 PM	8 AM-2 PM	9 AM-3 PM	10 AM-4 PM	1500-1700 1800-2045	VISITING OPERATOR TIME (12 PM-1 PM CLOSED FOR LUNCH)				
1 PM	2 PM	3 PM	4 PM	2100	FAST CODE	SLOW CODE	FAST CODE	SLOW CODE	FAST CODE
2 PM	3 PM	4 PM	5 PM	2200	CODE BULLETIN				
3 PM	4 PM	5 PM	6 PM	2300	DIGITAL BULLETIN				
4 PM	5 PM	6 PM	7 PM	0000	SLOW CODE	FAST CODE	SLOW CODE	FAST CODE	SLOW CODE
5 PM	6 PM	7 PM	8 PM	0100	CODE BULLETIN				
6 PM	7 PM	8 PM	9 PM	0200	DIGITAL BULLETIN				
6^{45} PM	7^{45} PM	8^{45} PM	9^{45} PM	0245	VOICE BULLETIN				
7 PM	8 PM	9 PM	10 PM	0300	FAST CODE	SLOW CODE	FAST CODE	SLOW CODE	FAST CODE
8 PM	9 PM	10 PM	11 PM	0400	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.

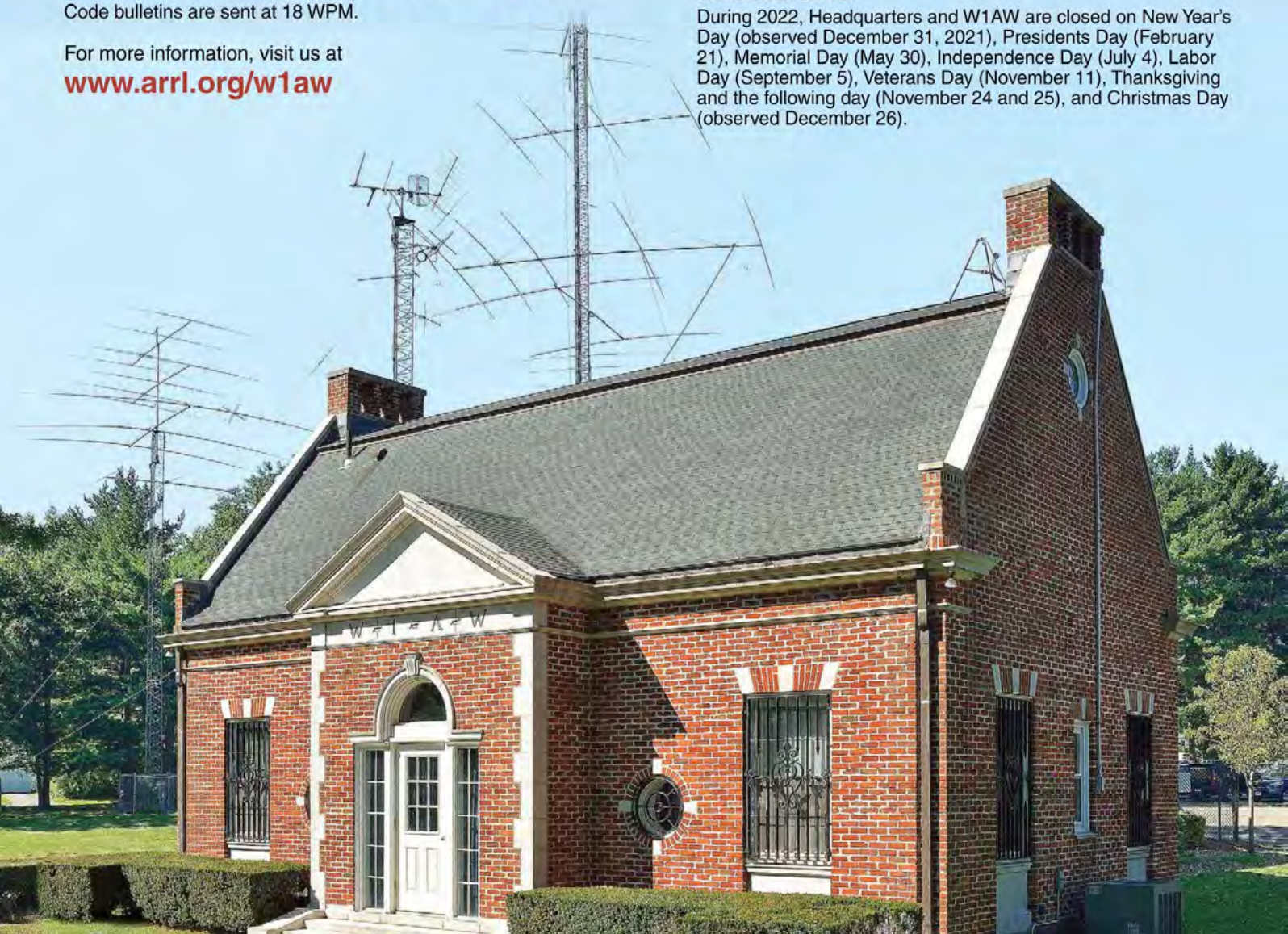
Keplerian elements for many amateur satellites will be sent on the regular digital frequencies on Tuesdays and Fridays at 6:30 PM Eastern time using Baudot and PSK31.

♦ 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 noon and 1 PM 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 2022, Headquarters and W1AW are closed on New Year's Day (observed December 31, 2021), Presidents Day (February 21), Memorial Day (May 30), Independence Day (July 4), Labor Day (September 5), Veterans Day (November 11), Thanksgiving and the following day (November 24 and 25), and Christmas Day (observed December 26).



Bernie McClenny, W3UR, w3ur@arrl.org

How's DX?

DXpedition Updates Amid COVID-19

Since February 2020, DX operations have been occurring less frequently due to the COVID-19 pandemic. However, over the past few months, DXpeditioners and DXers have been keeping the HF bands alive and active with DX, and all three of the African DXpeditions that were announced in the October 2021 "How's DX?" column have taken place.

One of those DXpedition groups was the Russian DXpedition Team (RU DX Team), who made it to their DXpedition location of the Kingdom of Eswatini, 3DAØ (formerly known as Swaziland), as 3DAØRU, and immediately afterward they went on a surprise visit to Lesotho, 7P8RU. From 3DAØ they made 94,513 contacts, quickly followed by 85,876 contacts from 7P, for a grand total of 180,389 contacts in just under 30 days of operating. Additionally, Yuris Petersons, YL2GM; Jack Shahov, YL2KA; Sasha Ananyev, UT7UV; Pavlo Glazunov, UUØJR; Vlad Ananyev, UW7RV, and Wlad Wolodymir, US7IGN, surprised the community with an unannounced operation in Lesotho as 3DAØWW, from October 13 – 25. They made 31,381 contacts.

The Czech DXpedition group made it to São Tomé, where they activated S9OK, making an incredible 107,545 contacts in just 2 weeks. The unique contacts, the number of actual stations who worked this DXpedition on one or more bands, was 21,376. The number of contacts made on each mode were: 44,618 on CW; 25,391 on FT8; 22,182 on SSB; 13,653 on FT4; 1,676 on RTTY, and 25 on PSK.

And finally, the much-anticipated DXpedition in October was with the Italian DX Team (IDXT), who were extremely successful from Bubaque Island (AF-020) in Guinea-Bissau as J5HKT (making 30,907 contacts) and J5T (making 40,530 contacts), with a total of 71,437 contacts in a matter of 2 weeks. The number of contacts they made on each mode were: 30,907 on FT8; 21,149 on CW; 18,944 on SSB, and 437 on RTTY.

The next stop by IDXT is expected to be in spring 2022, from the Central African Republic as TL8AA (operating CW, SSB, and RTTY) and TL8ZZ (operating FT8). Check your favorite DX outlet for updates.

Another notable DXpedition that took place in October 2021, was that of the Tifariti Dx Gang, led by Toni Gonzalez, EA5RM. He and his "DX Friends" operated from San Cristobal Island in the Galápagos Islands, as HD8R from October 25 to November 6, including participating in the CQ World Wide DX SSB Contest, making 111,860 contacts. The mode breakdown was 44,527 contacts on CW; 34,109 on SSB; 32,411 on FT8, and 813 on RTTY. They also managed to work just over 200 contacts on 6 meters.

I'm writing this month's column just a few weeks before the much-anticipated 3YØI DXpedition by Dom Grzyb, 3Z9DX, to Bouvet Island. It was still on track to take place around mid-December 2021.

DX News from around the Globe

By the time this issue of *QST* goes to print, some of the scheduled DXpeditions mentioned below may have already begun.

9J — Zambia

Mario Ragagli, IK1MYT, is back in Lusaka, Zambia, until June 2022. Listen on the air for him using his Yaesu FT-897D transceiver and homebrew vertical and long-wire antennas. He will be on 40, 20, 17, 15, and 10 meters as 9J2MYT. Once he's back home in Italy this summer, he'll print QSL cards, which will be available via Giorgio Laconi, IZ3KVD.

A QSL card from Mario Ragagli, IK1MYT, in Lusaka, Zambia.

Robert Kasca, S53R, is currently stationed in Kathmandu, Nepal, and active as 9N7AA. [Robert Kasca, S53R, photo].

9N — Nepal

Robert Kasca, S53R, has started his next multi-year work assignment with the United Nations World Food Programme (WFP) in Kathmandu, Nepal. He was issued the call sign 9N7AA and has begun "limited operation." He set up at a temporary location with some "basic accessories" and his two Kenwood TS-590SG radios, and is using a small multiband vertical antenna. Once he's at his permanent location, he plans to erect an Ultrabeam WiMo two-element Yagi antenna for 40 through 6 meters on a high-rise building at 25 meters high (approximately 7 stories). Because of limited space, he's trying to figure out how to set up an antenna for 80 and 160 meters. Sixty meters (5 MHz) is not authorized in Nepal. The new location has "a clear shot towards EU and US," but "messy power lines and all kinds of manmade interference is a serious problem in densely populated Kathmandu," he said. As with all Robert's operations, contacts will be uploaded weekly to Club Log and Logbook of The World (LoTW). QSL direct only to Slavko Celarc, S57DX, or the Online QSL Requests (OQRS).

D6 — Comoros

As of December 2021, members of the Radio Club de Provins, F6KOP, planned a DXpedition at the Indian Ocean's Comoro Island. Originally this was to have taken place in mid-to-late January 2022, but has now been pushed back to late 2022. There are expected to be 12 operators and five stations for activity on 1.8 through 28 MHz on CW, SSB, RTTY, FT4, and FT8, along with satellite QO-100 operation. A special call was requested. D6 ranks number 66 in Oceania, 73 on the west coast of the US, and number 75 in South America. Updates can be found on their website, at **https://comores2022.wordpress.com**.

E5/S — South Cook Islands

Originally scheduled to take place in October 2021, but delayed until mid-January 2022, Pete Leng, ZL4TE, was expected to be on Rarotonga "and maybe a couple of days in Aitutaki," as E51RMP. The original plan was cancelled due to COVID-19.

FG — Guadeloupe

Members of the Radio-Club Du Bassin Minier á Montceau les Mines, F6KJS, including French operators Didier Cadot, F6BCW; Monnet Pascal, F1MNQ; Meulnet Michel, F5LRL; Pierre, F1TCV, along with Keith Charles Witney, VE7KW, planned to operate with special call TO6S from Terre-de-Haut in les Saintes (NA-114) from January 20 to February 1. For more information, visit their website at **https://les-saintes.f6kjs.fr** and Facebook page at **www.facebook.com/DXpÇdition-TO6S-102954718850959**. QSL via F6KJS.

V3 — Belize

Contester Bill Kollenbaum, K4XS, is in Consejo Shores through March 2022. He's been issued the call V31XX for day-to-day operations, and V3X for contests. Listen for him on all bands on SSB and CW. Direct QSL only, to K4XS with SASE or SAE and US dollars to cover postage.

V5 — Namibia

Gunter Hartmann, DK2WH, is back in Omaruru until March 2022, and will be operating as V51WH. He will use special call V55Y during contests. QSL via DK2WH.

VK9/N — Norfolk Island

Nick Hacko, VK2DX, has moved to Norfolk Island and expects to be there for several years. He is now operating as VK9DX, mostly on CW with some FT8 and SSB on 80 through 10 meters. In the future, he hopes to be on 160 and 6 meters Earth-moon-Earth (EME).

Z2 — Zimbabwe

Originally scheduled for December 1 – 15, 2021, and then changed to February 3 – 20, 2022, Tom Hubert, DL7BO, and Tom Freimann, DJ6TF, are scheduled to head to Harare, to operate as Z220 and Z21A, respectively. They expect to be on CW, SSB, FT8, and FT4, using a pair of Icom IC-7300s and an amplifier. Listen for them on 1.8 through 28 MHz. For the low bands, they'll use an 18 meter ground plane antenna. QSL for both is via DJ6TF, except those in Ukraine, which is via Vladimir Latyshenko, UY5ZZ.

Wrap-Up

That's it for this month. A special thanks to 9J2MYT, 9N7AA, V31XX, V51WH, VK9DX, and ZL4TE for helping to make this month's column possible. 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

The World Above 50 MHz

Effective Portable 50 MHz Antennas for Grid Activations

With the popularity of the Fred Fish Memorial Award (FFMA), many people are activating grids for award seekers. With warmer spring weather on the way, this may be a good time to plan a portable operation. A practical antenna size, ease in setting up, reasonable gain, and easy transport are some considerations for 6-meter portable use.

The Cushcraft LFA Yagi

The Cushcraft four-element LFA Yagi for 6 meters was used by the successful KN4JX/KC4PDN rover grid activity in October 2021. This LFA Yagi is based on the GØKSC loop-fed array design and features low noise on receiving. The gain is listed at 10.7 dBi (about 8.5 dB over a dipole). It is an effective antenna at a reasonable size on a 13-foot boom for portable use. The list price is $360.

M2 6M-3SS

This entry from M2 is a nice three-element Yagi. The gain is listed at 8.1 dBi (about 2 dB less than claimed for the Cushcraft antenna). It lists at $260. It is fairly easy to set up in the field with a 6-foot boom, though there are some small parts that can get lost. It takes me about 15 minutes to put it together.

Moxon

Par Electronics sold the SM-50, a Moxon antenna for 50 MHz. It has a claimed gain of 5.8 dBi, so it is almost an S-unit down from the Cushcraft four-element LFA Yagi. A Moxon antenna is basically a two-element Yagi with a radiator and reflector and is about 75% of a full-size two-element Yagi. It has a higher front-to-back patten than a regular two-element Yagi. It weighs only 3 pounds with a turning radius of less than 4 feet. It goes together in less than 5 minutes. It can be a good choice for a pop-up rover, whether you are trying to activate many grids or if you're on a casual vacation operation. Dave Schaubert, NJØW, is a fan of it. A complete review of this antenna is in the March 2004 issue of *QST*.

Omni-loop

This is an omnidirectional antenna. Either attach it to your vehicle or pull it out of the trunk and put on a short mast. It is quick and easy to set up. They work, but the gain is about 1 dB lower than a dipole. The omni-loop would be effective for sporadic E during the summer, but it lacks the gain for consistent meteor scatter or weak sporadic E.

NJØW Grid Expedition

Dave Schaubert, NJØW, conducted successful rover operation on 50 MHz for FFMA enthusiasts in late November 2021, before the Thanksgiving Holiday. He activated a number of grids, including DM47, DN63, and DN73. He used the Moxon Yagi.

Solar Cycle 25 Carrington Event

A number of powerful X-class solar flares have occurred during fall 2021, as Solar Cycle 25 activity picked up. More powerful flares than these have taken place, such as the Carrington Event of 1859, during which aurora was seen in the South Pacific and in Cuba, and it sparked electrical fires. The Carrington Event was not a singular case, either. A solar storm of comparable strength took place in May 1921 during Solar Cycle 15. It was known as the "New York Railroad Storm" and was the most intense CME impact and solar storm of the 20th century, but even more powerful solar geomagnetic storms have taken place.

A "Super Flare CME" struck the Earth in 775 AD. Evidence for this was discovered by Fusa Miyake of the Nagoya University in Japan. It was over 100 times stronger than the Carrington Event. Further research by a group led by Nicolas Brehm in Zurich have identified more super flares that took place in 7176 BC and 5259 BC. These super flare CMEs are now called *Miyake events*, in honor of Professor Miyake.

Researchers discovered evidence that these flares have occurred based on analysis of Beryllium 10 spikes noted in ice core samples. They followed up with Carbon 14 measurements in tree rings, which gave them the year the super flares took place.

A Carrington Event taking place today could destroy orbiting satellites, disrupt GPS, and damage undersea cables and internet infrastructure on the ground. A Royal Academy of Engineering Report in 2013 discusses the risks further (**https://www.raeng.org.uk/publications/reports/space-weather-summary-report**).

While a Carrington-level event could cause internet infrastructure collapse, a super flare CME 100 times stronger would destroy power grids and could erase all computer records. The chances of a Miyake Event appear remote, but some solar scientists feel the odds of a Carrington-level event may be as much as 15% in Solar Cycle 25. Amateur radio could play an important role in communications should a Carrington Event occur. In the meantime, X-class solar flares may cause CMEs that support VHF propagation.

On the Bands

50 MHz. Sporadic E made some appearances in November 2021. Some of the sporadic-E openings linked south to TEP (trans-equatorial propagation). On November 10, Ray, W9VHF (EN71), worked five stations in Brazil. NØLL was on from EN01 on November 22, and he made six contacts on MSK144. On November 25, there was E_s from the Midwest to Texas, and NE5U used it to his advantage while active in rare grid EL19 (see Figure 1). Ron, K3FR (FM18), worked W5LDA (EM15) on Q65 and others on FT8, including WDØBGZ (EN00).

Figure 2 — On November 16, tropospheric propagation was present from Kansas, Nebraska, and South Dakota to Texas and Mexico. [**www.dxmaps.com**]

144 MHz. Strong tropospheric openings were created by a wave cyclone that took place in November. KE8FN (EN80) decoded XE2KK (DL96) on November 8. On November 16, tropo appeared from Kansas, Nebraska, and South Dakota south to Texas and Mexico (see Figure 2). XE2OR (DL98) made contacts with KF0M (EM17), WQ0P (EM19), and me (NØJK, EM28) on FT8 around 1640Z. WB5TUF (EL29) and other Gulf Coast stations were active as well. Wave cyclones can appear in February. K7ULS (DN41) was busy on 2-meter EME November 13 and 14, working ZL2MQ in New Zealand.

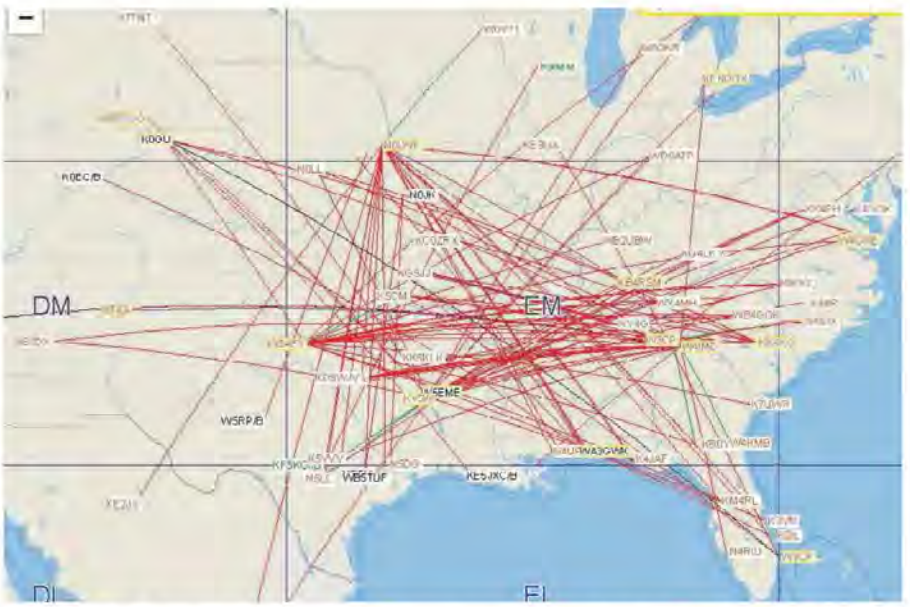


Figure 1 — On November 25, NE5U operated from grid EL19 and made contacts using the E_s opening from the Midwest to Texas. [**www.dxmaps.com**]

Figure 3 — David Olean, K1WHS, used his 222 MHz EME array to work WQØP. [David Olean, K1WHS, photo]

222 MHz. Greg, WQ0P (EM19), worked K1WHS (FN43) EME on November 13 (see Figure 3).

432 MHz. KY4G (EM64) worked KO4MA (EL88) and WB4OMG (EL98) on FT8 on October 28, using a "portable station set up in his driveway." W9VHF (EN71) worked K5DOG (EM00) +8 dB on FT8. Gary, KE8FD (EN80), also worked K5DOG.

Here and There

The best dates for EME (Earth-moon-Earth, aka moonbounce) contacts in February (lowest degradation) are February 2 – 4 and 14 – 18. W7GJ operated successfully at TX7MB and FO/W7GJ, using the Q65 mode on 6 meters.

Special Event Stations

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

Feb. 5, 1200Z – 2000Z, W5O, Dade City, FL. Traveler's Rest Amateur Radio Club. **Traveler's Rest RV Resort and Golf Course 50th Anniversary**. 7.240 14.240. Certificate. K4TRR Anniversary, 29129 Johnston Rd. Lot 09-03, Dade City, FL 33523. **k4trrinfo@gmail.com**

Feb. 5, 1400Z – 2200Z, K5R, Rockwall, TX. Rockwall Amateur Radio Club. **Republic of Texas Central National Road**. 14.050 14.074 14.265; CW, FT-8, and SSB. QSL. Rockwall Amateur Radio Club, P.O. Box 1791, Rockwall, TX 75087. *QSL card also available for download.* **sites.google.com/site/rarck5rkw**

Feb. 5 – Feb. 13, 1500Z – 2300Z, W4HHH, Ellijay, GA. Ellijay Amateur Radio Society. **25th Anniversary**. 7.171 14.171. Certificate & QSL. Ellijay Amateur Radio Society, 78 N. Garrett Branch Rd., Ellijay, GA 30536. *W4HHH will transmit on 10, 12, 15, 17, 20, 40, 80, and 160 meters off and on throughout the event. Certificate will indicate which of the several operators are contacted; participants can try for a clean sweep and contact all EARS operators.* **www.w4hhh.org**

Feb. 7 – Feb. 14, 1200Z – 0600Z, W9L/K9L, Lerna, IL. National Trail Amateur Radio Club. **Abraham Lincoln's Birthday**. 7.250 14.250; all bands all modes. QSL. National Trail Amateur Radio Club, Attn.: Lincoln's Birthday, P.O. Box 903, Effingham, IL 62401. *K9L will be managed by multiple club members running from home; W9L will only be used on location at the farm owned by President Lincoln's father and stepmother.* **www.nationaltrailarc.org**

Feb. 7 – Feb. 20, 1000Z – 2100Z, W1G, Wheelwright, MA. GERATOL Worked All States Net. **50th Anniversary**. 3.668 during net time; 20- and 40-meter SSB. QSL. Kevin Lynch, P.O. Box 124, Wheelwright, MA 01094. **www.geratol.net**

Feb. 12, 1500Z – 2100Z, W0ARC, Washington, IA. Washington Area Amateur Radio Club, Inc. **Washington's Birthday**. 7.250 14.250. QSL. Mark Lukins, 802 N. 2nd Ave., Washington, IA 52353. **www.waarc.net**

Feb. 13 – Feb. 20, 0600Z – 0600Z, W9WCA, Junction City, WI. Wood County ARES/RACES. **Wisconsin SimCom 2022**. 3.970 7.250 14.250; Allstar 52770/EchoLink W9WCA-L. QSL. Wood County ARES/RACES, Attn: SimCom SES, 5421 Madison Cir., Wisconsin Rapids, WI 54494. **kb9stb@gmail.com**

Feb. 16 – Feb. 20, 0000Z – 2359Z, N4DAB, Daytona Beach, FL. Daytona Beach CERT Amateur Radio Team. **2022 Speedweek/ Daytona 500**. 7.074 7.255 14.074 14.255. Certificate. Steve Szabo, WB4OMM, Trustee, 536 Central Park Blvd., Ponce Inlet, FL 32127. **n4dab@n4dab.com** *or* **www.n4dab.com**

Feb. 17, 1400Z – 1900Z, N4HLH, Sullivan's Island, SC. Trident Amateur Radio Club. **HL *Hunley* Commemoration and Special Event**. 7.262 14.262. QSL. QSL Manager, P.O. Box 60732, North Charleston, SC 29419. **www.tridenthams.org/hl-hunley**

Feb. 19, 1400Z – 2000Z, W1M, Russell, MA. Western Massachusetts Council, Scouts BSA. **Scouts BSA WHOA Weekend**. 7.190 10.115 14.060 14.290. QSL. Tom Barker, WA1HRH, 329 Faraway Rd., Whitefield, NH 03598. *Paper logging. QSL via SASE and eQSL.*

Feb. 19, 1600Z – 2000Z, W5BMC, Patterson, LA. Bayouland Emergency Amateur Radio Service. **Cajun Coast Eagle Expo**. 7.250 14.250 EchoLink W5BMC-R 507010. QSL. Deborah Price, N5FMI, 708 Front St., Morgan City, LA 70380.

Feb. 19 – Feb. 20, 1700Z – 1000Z, K4US, Alexandria, VA. Mount Vernon Amateur Radio Club. **George Washington's Birthday**. 7.040 14.074 14.260. QSL. MVARC, P.O. Box 7234, Alexandria, VA 22307. *Held on the grounds of his Virginia home at the Mt. Vernon Greenhouse.* **mvarc.org**

Feb. 19 – Feb. 21, 1400Z – 2359Z, W4A, Greenville, NC. Bright Leaf Amateur Radio Club. **Voice of America 80th Anniversary of the First Broadcast Overseas**. 3.880 7.280 14.280. Certificate & QSL. Bright Leaf Amateur Radio Club, c/o Eddie R. Campbell, W4JNC, 2421 Cobb Dail Rd., Farmville, NC 27828. *W3V and W8O also participating.* **www.w4amc.com**

Feb. 19 – Feb. 21, 1400Z – 2359Z, W3V, Washington, DC. Voice of America Amateur Radio Club. **Voice of America 80th Anniversary of the First Broadcast Overseas.** 3.880 7.280 14.280. Certificate & QSL. Voice of America Amateur Radio Club, 330 Independence Ave. SW, Rm 2525-croft, Washington, DC 20237-0073. *W8O and W4A also participating.* **www.qsl.net/k3voa**

Feb. 19 – Feb. 21, 1400Z – 2359Z, W8O, West Chester, OH. West Chester Amateur Radio Association. **Voice of America 80th Anniversary of the First Broadcast Overseas**. 3.880 7.280 14.280. Certificate & QSL. West Chester Amateur Radio Association, 8070 Tylersville Rd., West Chester, OH 45069. *W3V and W4A also participating.* **www.wc8voa.org**

Feb. 19 – Feb. 21, 1600Z – 2300Z, W0JH, Stillwater, MN. Stillwater, Amateur Radio Association. **Ice Station W0JH (Frozen Lake Portable)**. 3.860 7.260 14.260 21.360. Certificate. **IceStation2022@radioham.org**. *Grid square EN34. Certificates will only be sent via email as a PDF.* **www.qrz.com/db/w0jh** *or* **www.radioham.org**

Feb. 20 – Feb. 22, 1900Z – 2359Z, WS7G, George, WA. Columbia Basin DX Club. **George Washington's Birthday**. 3.855 7.222 14.322. Certificate & QSL. Brian Nielson, 11650 Road 1 SE, Moses Lake, WA 98837. **cbn.homestead.com/WS7G.html**

Feb. 25 – Feb. 26, 1422Z – 1422Z, W4BSF, Huntsville, TN. Big South Fork Amateur Radio Club/Scott County ARES. **75th Anniversary of Decommissioning USS *Tennessee* (BB43)**. 14.250. Certificate & QSL. Big South Fork Amateur Radio Club, P.O. Box 5029, Oneida, TN 37841-5029. *Operating from the USS* Tennessee *(BB-43) Museum in Huntsville, TN. Spotting, QSL/certificate information and to learn more about the USS* Tennessee *see*: **www.qrz.com/db/w4bsf** *or* **www.bsfarc.com**

Feb. 26, 1400Z – 2200Z, W0EBB, Leavenworth, KS. Kickapoo QRP Amateur Radio Club. **18th Annual *Freeze Your Keys* Winter Operating Event**. 7.035 7.240 14.058 14.325 QSL. Gary Auchard, 34058 16th St., Leavenworth, KS 66048. **w0mna74@gmail.com**

Certificates and QSL cards: To obtain a certificate, 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, send a self-addressed, stamped business-size envelope along with your QSL card and QSO information. *Some clubs may ask for a nominal fee to cover the cost of the certificate or QSL. Request will be made on air during the event or on the club's website.

Steve Ewald, WV1X, sewald@arrl.org; www.arrl.org/hamfests-and-conventions-calendar

Convention and Hamfest Calendar

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

Abbreviations

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

ARRL SOUTHWESTERN DIVISION CONVENTION

February 18 – 19, Yuma, Arizona
D F H Q R S T V
Fri. noon – 5 PM, Sat. 9 AM – 4 PM. *Spr:* Yuma Amateur Radio Hamfest Organization. Yuma County Fairgrounds, 2520 E. 32nd St. *TI:* 146.840 (88.5 Hz). *Adm:* $10. **yumahamfest.org**

Arkansas (Hoxie) — Feb. 12 D F H R S V

8 AM; Setup Fri. Feb. 11, 3 PM. *Spr:* Lawrence County ARC. Hoxie Service Center, 500 SW Lawrence. *TI:* 147.045. *Adm:* $5. Email: **w5wec@suddenlink.net**

Colorado (Brighton) — Feb. 20 D F R V

9 AM – 1 PM. *Spr:* Aurora Repeater Association & Rocky Mountain Ham Radio. Adams County Fairgrounds Exhibition Hall, 9755 Henderson Rd. *TI:* 147.15 (100 Hz). *Adm:* $5. **n0ara.org**

Florida (Punta Gorda) — Mar. 5 D F H Q R S T V

7:30 AM – 1 PM. *Spr:* Peace River Radio Association. Ridge Harbor, 30337 Cedar St. *TI:* 147.255. *Adm:* $7. **PRRA.club**

Florida (Sebring) — Feb. 19 F H R T

8 AM – 1 PM. *Spr:* Highlands County ARC. First Baptist Church of Lake Josephine. 111 Lake Josephine Dr. *TI:* 147.045 (100 Hz) or 442.350 (100 Hz) linked repeaters. *Adm:* $5. **highlandsamateurradio.com**

TECHCON

February 25 – 26, Winter Haven, Florida
H R S
Fri. 1 PM – 5 PM, Sat. 9 AM – 5 PM. *Spr:* ARRL West Central Florida Section. Polk County Emergency Operations Center, 1890 Jim Keene Blvd., Winter Haven, FL 33880. *TI:* 146.985, 443.900, 444.625, 444.950 (127.3 Hz). *Adm:* Free. **arrlwcf.org/wcf-special-events/wcftechconference/**

Indiana (Dugger) — Feb. 26 D F H R V

8 AM – 12:01 PM. *Spr:* Dugger ARC. Dugger Comm Building. 840 Hicum St. *TI:* 146.775 (136.5 Hz). *Adm:* $8. Email: **jonolvey@gmail.com**

Kentucky (Cave City) — Mar. 5 D F H R S T V

7:30 AM. *Spr:* Mammoth Cave ARC. Cave City Convention Center, 502 Mammoth Cave St. *TI:* 146.94. *Adm:* $5. **ky4x.org**

Maine (Augusta) — Feb. 12 F H R S V

8 AM – noon. *Spr:* Augusta ARC. Calumet Club, 334 West River Rd. *TI:* 146.70 (100 Hz), 146.52. *Adm:* $5. **w1tlc.org**

Michigan (Negaunee) — Feb. 5 F H R

9 AM – 1 PM. *Spr:* Hiawatha ARA. Negaunee Township Community Center, 42 M-35. *TI:* 147.270 (100 Hz). *Adm:* $5. **qsl.net/k8lod**

Michigan (Redford) — Feb. 26 D F H R

9 AM – 1 PM. *Spr:* Livonia ARC. VFW Post 345, 27345 Schoolcraft Rd. *TI:* 145.35 (100 Hz). *Adm:* $5. **livoniaarc.com/larc-annual-swap-and-shop/**

Michigan (Traverse City) — Feb. 12 F H R V

8 AM – noon. *Spr:* Cherryland ARC. St. Francis High School Gymnasium, 123 E 11th St. *TI:* 146.86 (114.8 Hz). *Adm:* $5. **CherrylandARC.com**

Minnesota (Saint Cloud) — Feb. 12 D H Q R V

9 AM – 1 PM. *Spr:* St. Cloud ARC. St. Cloud Armory, 1710 Veteran's Dr. *TI:* 147.015 (100 Hz). *Adm:* $10. **w0sv.club/hamfest**

New York (Hicksville) — Feb. 27 D F H Q R S V

9 AM. *Spr:* Long Island Mobile ARC. Levittown Hall, 201 Levittown Parkway. *TI:* 146.850 (136.5 Hz). *Adm:* $6. Email: **k2knb@arrl.net**

New York (Online) — Jan. 30

8:30 AM – 1 PM. *Spr:* Long Island Mobile ARC. Virtual via Zoom. *Adm:* Free. **limarc.org**

Oklahoma (Sayre) — Mar. 5 D F H R V

8 AM. *Spr:* West Central Oklahoma ARC. Beckham County Activity Center, 310 East Main St. *TI:* 146.76 (88.5 Hz). *Adm:* $5. **sites.google.com/view/wcoarc/home**

South Dakota (Rapid City) — Feb. 19 F H Q R S V

8 AM – noon. *Spr:* Black Hills ARC. Faith Lutheran Church, 17 Indiana St. *TI:* 146.93 (146.2 Hz). *Adm:* Free. **w0blk.com**

Texas (Harlingen) — Feb. 26 F H R V

8 AM – 11:30 AM. *Spr:* Rio ARC. Sunshine RV Resort, 1900 Grace Ave. *TI:* 146.70 (114.8 Hz). *Adm:* Free. Email: **guhor@live.com**

Texas (Orange) — Feb. 26 D F H R S T V

7:30 AM – 2 PM. *Spr:* Orange ARC, Jefferson County ARC, Beaumont ARC. Orange County Convention and Expo Center, 11475 FM 1442. *TI:* 147.180 (103.5 Hz). *Adm:* $8. **www.qsl.net/w5nd/index_files/HAMFEST%20INFO/**

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 bene-fits, 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 **March 1** to be listed in the **May** 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**.

Certificate of Code Proficiency

Recipients

Sponsored by
VIBROPLEX
www.vibroplex.com

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

August 2021

Christopher E. Johnson,WB9FXW	10
Charles E. Ruotolo, KA8VYG	10
George A. Stickney, W7BXW	10
Kenneth G. Koenig, KK6XI	15
Donald W. Brown, WØAF	20
Victor Denisov, N6DVS	20
Ronald L. Edwards, KE8NCJ	20
David W. Hibbard, NKØK	20
Richard B. Dervan, N1RBD	25

September 2021

Mark D. Nill, W5AT	10
Joseph M. Pagurko, KA9IIE	10
Christopher E. Johnson, WB9FXW	15
Mark D. Nill, W5AT	15
Daniel A. Bostick, KG5SSB	20
George W. Fletcher, AD5CQ	20
William Howard, N4MU	20
Mark D. Nill, W5AT	20
John F. Wasciuk, WA8TON	20
Walter Bilous, K3DQB	25
Stan Dicks, W4AG	30

October 2021

Floyd E. Cureton, Jr., WO5S	10
Jay G. Lewis, KA3LNA	10
Harold D. Craft, Jr., AA2JQ	15
David M. Hartley, WQ7F	15
John W. Mellars, WA2MIB	15
Sean Walberg, KN4ZMA	15
Joni Zornes, AA4WA	15
George J. Cosmetis, WA3CCI	20
Dewey L. Edwards, Jr., K4CAB	20
Christopher E. Johnson, WB9FXW	20

November 2021

Timothy S. Jacobson, N9CD	10
James W. Carter, K7IOL	15
Joseph DeMattei, Jr., KD4RXB	15
John Gaynor, N3DNA	15
Joel P. Tilley, KC1PNJ	15
Kirk S. Goddard, AG7YM	20
Russell Rzemien, WA1FCC	20
Michael L. Rohwedder, WU9D	35

Congratulations to all the recipients.

February 2022 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.

February Qualifying Runs will be transmitted by W1AW in Newington, Connecticut at the times shown at 1.802.5, 3.581.5, 7.047.5, 14.047.5, 18.097.5, 21.067.5, 28.067.5, 50.350, and 147.555 MHz. The West Coast Qualifying Runs will be transmitted by KH6TU on Wednesday, February 23 at 6 PM HST (0400 UTC on February 24) on 7047.5 and 14047.5 kHz. Unless indicated otherwise, sending speeds are from 10 to 40 WPM.

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

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

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

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

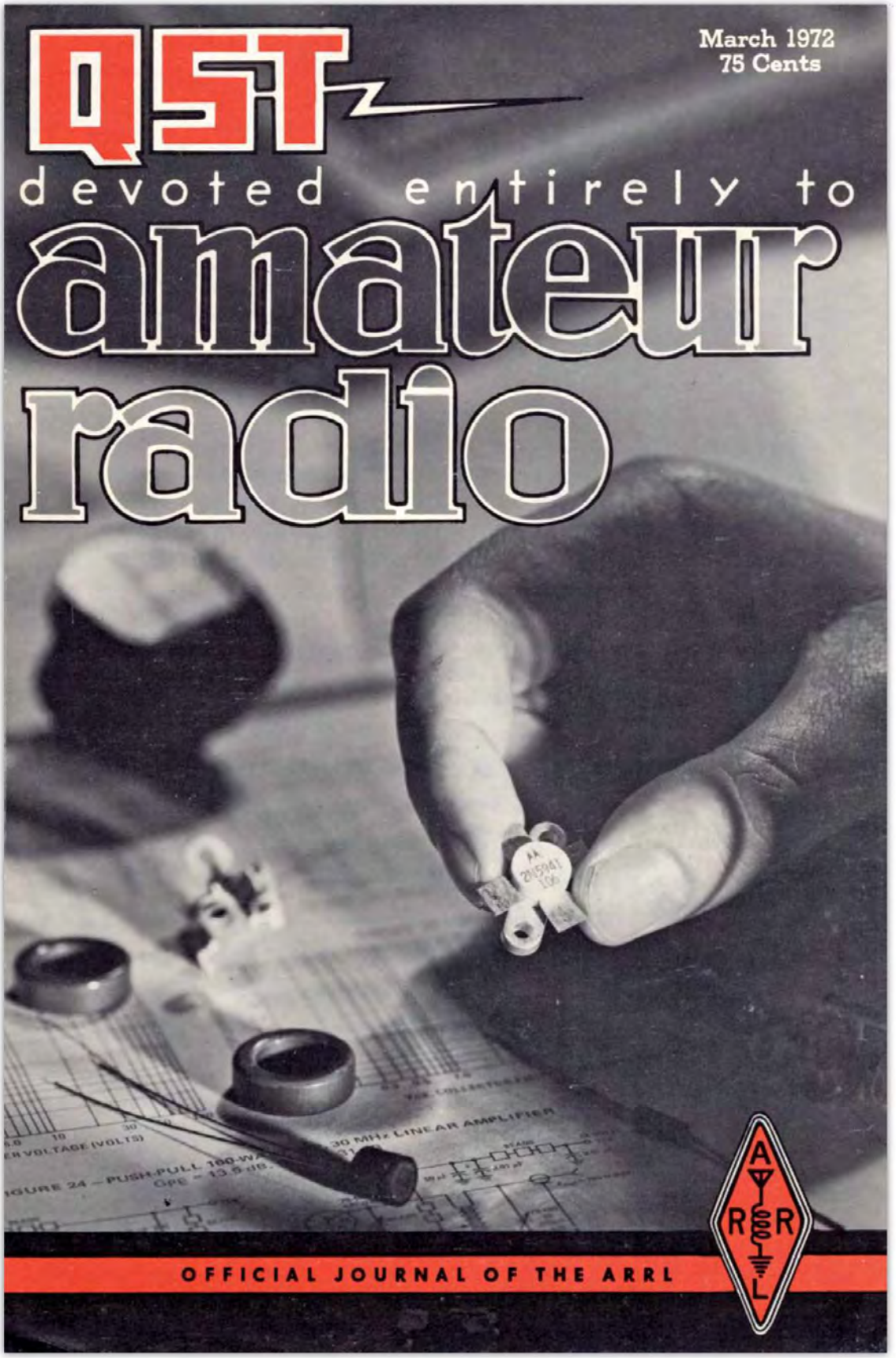
For more information about Qualifying Runs, please visit **www.arrl.org/qualifying-run-schedule**.

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

W1AW Qualifying Runs — February 2022
(All times are in Eastern Standard Time)

Monday	Tuesday	Wednesday	Thursday	Friday
	2/1 7 PM – 0000Z **(2/2 – UTC)** 35 – 10 WPM	**2/2** 4 PM – 2100Z 10 – 35 WPM	**2/3** 10 PM – 0300Z **(2/4 – UTC)** 10 – 40 WPM	**2/4** 9 AM – 1400Z 10 – 35 WPM
	2/8 4 PM – 2100Z 10 – 35 WPM	**2/9** 7 PM – 0000Z **(2/10 – UTC)** 10 – 40 WPM	**2/10** 9 AM – 1400Z 35 – 10 WPM	**2/11** 10 PM – 0300Z **(2/12 – UTC)** 10 – 35 WPM
	2/15 9 AM – 1400Z 10 – 35 WPM	**2/16** 10 PM – 0300Z **(2/17 – UTC)** 35 – 10 WPM	**2/17** 7 PM – 0000Z **(2/18 – UTC)** 10 – 35 WPM	**2/18** 4 PM – 2100Z 10 – 40 WPM
	2/22 10 PM – 0300Z **(2/23 – UTC)** 10 – 40 WPM		**2/24** 4 PM – 2100Z 35 – 10 WPM	**2/25** 7 PM – 0000Z **(2/26 – UTC)** 10 – 35 WPM

A Look Back


QST
March 1972
75 Cents
devoted entirely to
amateur
radio
OFFICIAL JOURNAL OF THE ARRL

A Dual-Voltage Medium-Current Power Supply for Repeaters

BY ROBERT M. MYERS,* W1FBY

FM ACTIVITY, through the use of repeaters on the vhf bands, has become one of the most popular modes of phone operation. Many repeater committees have assembled conglomerates of surplus land-mobile service transmitting and receiving equipment in order to realize maximum efficiency and effectiveness from available gear. The merging of many individual units into a properly functioning repeater system can create some *unique* power-supply requirements. The device shown in the photographs may be easily adapted to individual needs for *odd* voltages encountered in some setups.

The Circuit

A full-wave bridge rectifier is connected to the secondary of a 24-volt step-down transformer, T1, shown in Fig. 1. The power supply is protected against voltage transient spikes by a 120-volt Thyrector, VR2. A three-wire ac line cord is necessary to assure a proper ground connection for the chassis (safety first!). Since this power supply is part of a hill-top outdoor installation, it is essential that all of the chassis in the system be properly grounded to eliminate a shock hazard for anyone performing maintenance on the system (especially while standing on wet ground!).

The output of the bridge rectifier delivers 28-volts dc to four of the panel-mounted jacks, and to the series regulator transistor, Q1, whose base bias is determined by the value of VR1. This bias level establishes a reference for the regulated-voltage output appearing at the 12-volt terminals. If a different regulated voltage is desired, the value of VR1 may be changed. Zener-diode voltage ratings of 6 through 18 may be used without any other circuit changes. The value of R2 is chosen to allow a suitable Zener-diode current. R3 is a bleeder resistor and C3 is an rf bypass capacitor which is connected from the emitter of Q1 to ground. L1 and L2, along with the associated bypass capacitors, prevent rf energy from entering the supply and upsetting the regulator. VR3 protects the 28-volt line from spikes generated by the relay coils in a repeater control system.

Construction

A Bud aluminum chassis, 5 X 10 X 3 inches, contains all of the components. The large computer-grade electrolytic capacitors are mounted on 1/4-inch diameter rubber grommets to insulate the positive terminal from chassis ground. A bottom cover is used to protect the internally mounted components against the dirt and moisture usually encountered in an outdoor installation.

There are no special wiring techniques or precautions needed. Bus wire interconnects all of the grounded binding posts and then is attached to the negative terminal of each electrolytic capacitor. The chassis can be used as a ground return for all of the negative leads if the unit is not subjected to an outdoor environment.

All of the jacks are mounted on the front of the chassis. There are four sets of connectors for 28 volts and two sets for 12 volts regulated. Two fuse holders are included; one contains a spare 1-ampere fuse. Although a power-indicator lamp is not

* Asst. Technical Editor, *QST*.

Bottom view of the power supply. RFC1 and RFC2 are located at the upper left.

QST for

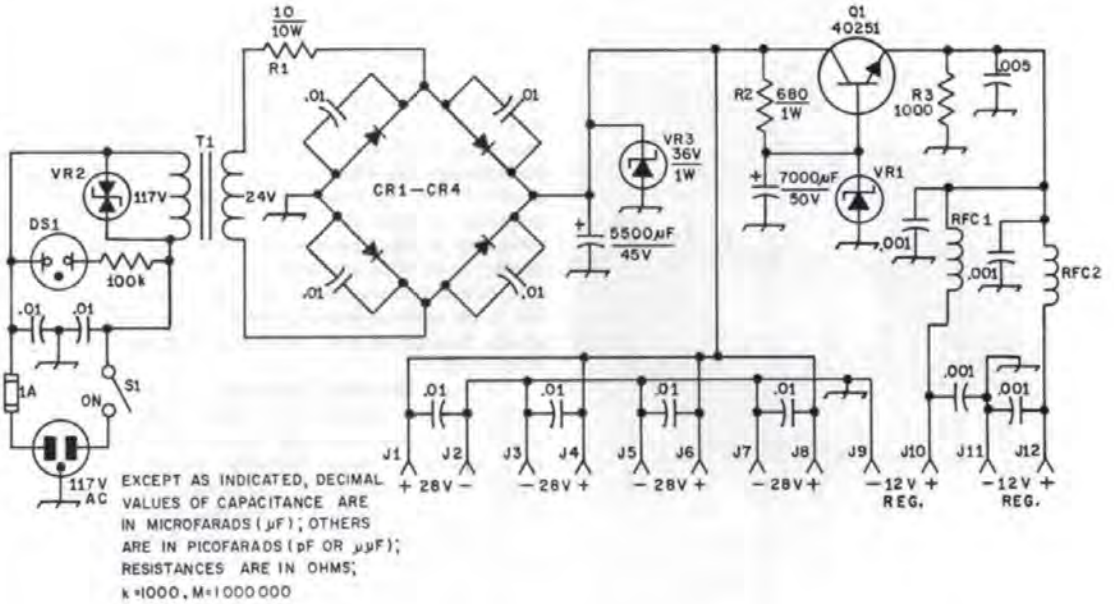


Fig. 1 — Circuit diagram of the dual-voltage power supply. Capacitances are in μF; capacitors marked with polarity are electrolytic. Component designations not listed below are for text reference.

CR1-CR4, incl. — 1000 PRV, 2.5 A (Mallory M2.5A or equiv.).
DS1 — Neon indicator lamp, 117-volt (Leecraft 32-211 or equiv.).
RFC1, RFC2 — 2.8 μH; 10 turns No. 20 enam. wire, 1/4-inch OD.
S1 — Spst toggle.
T1 — 117-volt primary; secondary 24 V at 2 A (Knight 54 D 4140, Hammond 165 M 25, or equiv.).
VR1 — Zener Diode, 13 V, 1 W (Motorola 1N3023 or equiv.).
VR2 — Transient voltage suppressor, 120-volt rating (General Electric 6RS20SP4B4).
VR3 — Zener diode, 36 V, 1 W (Motorola 1N4753 or equiv.).

necessary for an unmanned remote transmitter, it does provide a quick visual indication of the fuse status when station maintenance is necessary.

The series regulator, Q1, must be mounted on the chassis with insulating hardware. A thin layer of silicone grease on both sides of the mica washer will aid in the transfer of heat to the chassis. During normal operation, the transistor does not get hot.

Installation and Operation

Connections to the three-way binding posts may be made in any convenient manner. *Caution*: A short circuit at the regulated-voltage output terminals could damage Q1. The builder may wish to add a current-limiting resistor in the output line of pass transistor Q1. The ohmic and wattage values will depend upon the current taken from the supply. By adding the resistance between the emitter of Q1 and RFC2 one can prevent destruction of Q1 during overcurrent periods.

This supply is rated at 1 ampere for continuous operation. Of course, this design could be enlarged upon by increasing the current rating of the transformer and diodes.

In Conclusion

The power supply described here is used to provide operating voltage for several pieces of repeater equipment – a solid-state preamplifier, timing relays, and various control relays. The emphasis has been placed on good filtering, transient protection, and long life. All of the foregoing considerations are of paramount importance if reliable operation is expected from that fm repeater system you are building. QST

Strays

Stolen Equipment:

Aerotone mobile unit, model 6M 355 LT, SN 685064. Anyone with information is requested to contact the Penn Central RR Police Dept., Room 1750, Grand Central Terminal, 15 Vanderbilt Ave., New York, NY 10017.

— • • • —

Stolen on January 25, a 2-meter fm Standard transmitter, SRC-806M, SN 102703. Clem Mathias, 3134 Coronado Ave., Imperial Beach, CA 92032.

— • • • —

Lafayette HA-410 10-meter transceiver, model 10014. The unit has modifications inside that owner can identify. Reward. Gerald A. Macari, WA2KDB, 29 Carriage Dr., Kings Park, NY 11754.

The Growing Use of Foreign Languages by American Amateurs

BY C. J. SLETTEN,* W1YLV

EXCHANGING SIGNAL reports in a foreign language is very similar to working a DX station in code. One can rather easily memorize and send the standard information and anticipate much of the reply. We have all worked foreign stations whose knowledge of English was very limited indeed, restricting the "conversation" to the standard phrases and reports. Many of us unwittingly have provided Italian, Russian, and German amateurs with English lessons.

Operating a phone in a foreign language is an exciting sport and it requires a certain amount of practice, skill, and showmanship. As a matter of fact, it is not uncommon these days to hear very fluent Spanish from Ws and Ks on 15 meters. Occasionally some sharp operators switch from German to French to English with good understandability in all three languages. The bravest are even making out in Japanese and Russian. Unlike proficiency in code, language skills are useful for travel and social life. This new dimension in radio provides an ideal language laboratory for the internationally-minded set.

Avoid Pitfalls

There are a few pitfalls in this game, however, that ought to be regarded. The adequate mastery of a foreign language is a man-sized job even with high motivation. These motor skills come only with drill. For the man interested only in greetings and rudimentary exchange of signal reports or for DX hunting, distinguishing the call letters is always tricky and requires patient listening, familiarity with phonetic words, and learning special patterns of expression. Then there is the embarassment of finding that your QSO partner really speaks good English after you have struggled valiantly in a strange tongue. Bad pronunciation is probably the worst crime committed by English speakers. Audio-lingual experience with native speakers is necessary to get some feeling for the language and acquire confidence that comes with successful two-way communication.

It is not too difficult, either, to memorize a very impressive idiomatic little QSO which triggers a torrent of high-speed comments that you cannot begin to decipher! The man with a couple of semesters of training has a big advantage in vocabulary building. Listening practice helps too – especially foreign language news broadcasts.

With the large growth in technologically-advancing nations an increase in the use of foreign languages is to be expected. Most all operators are anxious to learn English, which is likely to continue to be the *lingua franca* of the amateur bands for a long time. Many of the foreign operators are willing to exchange practice in English for practice in German, French, Spanish, etc. If one is polite, modest, and helpful with a very imperfect knowledge of other languages he can often make some new friends while getting hours of pleasant practice in a target language.

Many high schools and colleges offer night courses for adults in foreign languages. Records, tapes and cassettes are available in most book or large department stores. A limited number of audio-lingual aids presenting the special jargon of amateur radio are also available along with standard QSOs and conversation drill. For example, a basic QSO in Spanish or German might go something like this:

English

HK2ABC, this is KA1CD calling. How do you copy me? Go ahead.

KA1CD from HK2ABC. I copy you very well. Your signals are Q5 and S9 here. My name is John. My address is Box 112, 10 Main Street. How do you receive me in New England tonight? KA1CD, HK2ABC is standing by.

HK2ABC, here is KA1CD. Solid copy. Your signal is also Q5 and S9. My name is Bob. Please send me your QSL card via the bureau. Thanks for the contact. Seventy-three. KA1CD is off and clear with HK2ABC. Good night, John.

Spanish

HK2ABC, Aqui KA1CD llamando a HK2ABC. Como me escucha? Adelante.

KA1CD de HK2ABC. Le copio muy bien. Su senal es Q5 y S9 aqui. Me llamo Juan. Mi direccion es Buzon 112, Calle Major, 10. Que tal me escucha en Nueva Inglaterra esta noche? KA1CD, HK2ABC a la escucha.

HK2ABC aqui KA1CD. Ciento por ciento. Su senal tambien es Q5 y S9. Mi nombre es Bob. Por favor, envieme su tarjeta de QSL via bureau. Muchas gracias por el contacto. Setenta y tres. KA1CD termina su transmision para HK2ABC. Buenas noches, Juan.

German

DK2ABC hier ruft KA1CD. Konnen Sie mich aufnehmen? Bitte kommen.

KA1CD von DK2ABC. Ich kann Sie sehr gut aufnehmen. Ihre Signale sind hier Q5 und S9. Mein Name ist Hans. Meine Adresse ist Postfach 112, Hauptstrasse, 10. Wie ist mein Signal heute abend in Neuengland? KA1CD, DK2ABC geht auf Empfang fur Sie.

DK2ABC hier kommt KA1CD zuruck. Alles gut hier herubergekommen. Ihr Rapport ist auch Q5 und S9. Ich heisse Bob. Bitte senden Sie Ihre QSL uber das Buro. Ich danke Ihnen fur die Verbindung. Siebenundsiebzig. Damit beendet KA1CD das QSO mit DK2ABC. Guten Abend, Hans.

Don't be surprised, then, to hear your friends exchanging reports in one of the principal world languages other than English. These linguistic efforts are making our amateur fraternity a friendlier and more truly international spaceship society. QST

*Box 53, Acton, MA 01720

To *QST* – Gentlemen: I thought I would write and tell you how much my sister Camille, WB8KUV, and I, WB8HEZ, enjoy your magazine. There's a mad dash to the mailbox for your magazine. I am ten years old and my sister is 12. We operate my father's rig. My dad is WA8OWU. Enclosed is a picture of ourselves. – *Gregory Ameriguian*

Strays

Last January, the University of Washington ARC, W7YD, and Chuck Hagey, WA7MEQ, handled the communications for a radio chess match between the Seattle Chess Club and the Spokane Inland Empire Chess Club. Four boards were accommodated, with Spokane winning 2-1/2 – 1-1/2. Operators were WA7OXQ and WA7QQY for the Seattle end and WA7MEQ at Spokane. The photograph shows the action at the University of Washington station.

Here's a real "his and hers" pairing – W4HE and K4SHE, who, despite their friendly embrace, met for the first time at the recent Gaithersburg, Maryland Hamfest. *(Photo via W4DSW)*

Three generations of hams. Monica Haley, WN3RJQ, is shown here with her father, WØNOW/3, and grandfather, WØPQP, (both Extra Class). With WØNOW/3 being a pilot at Andrews Air Force Base, the group can be found regularly holding schedules.

The crowd pleaser

Working portable is never more enjoyable than when you're working with Yaesu's incomparable FT-101. It's a 30-pound power package, with 260 watts PEP SSB, 180 watts CW and 80 watts AM input power. Plus 0.3 microvolts receiving sensitivity, with a 10 db signal-to noise ratio.

The FT-101 includes a noise blanker. And built-in 117 VAC, 12 VDC power supplies. As well as built-in VOX, 25 KHz and 100 KHz calibrators, the WWV 10 MHz band and a high-Q permeability tuned RF stage. Plus a ±5 KHz clarifier.

The FT-101 is all solid-state, except for finals and driver. It's equally at home in your shack or on a mountain-top. Or on a Sunday afternoon outing.

We'll be glad to send you a detailed brochure on the FT-101. Or, for only $559.95, we'll send you the rig.

You'll have a crowd pleaser on your hands. Including the crowd of hams out there who'll copy you loud and clear.

SPECTRONICS WEST
Dept. Q, 1491 E. 28th, Signal Hill, Ca. 90806 / (213) 426-2593

SPECTRONICS EAST
Dept. Q, Box 1457, Stow, Ohio 44224 / (216) 923-4567

☐ Please send detailed information on all Yaesu products.

☐ Enclosed find $_____

Please send model(s)_____

Name_____

Address_____

City_____ State_____ Zip_____

All prices F.O.B. Signal Hill, Ca. Q-4

Master Charge and BankAmericard accepted.

Celebrating Our Legacy

Remembering My Radio Projects

When I was in the Boy Scouts of America in 1956, I wanted to become a First Class Scout, but I had to learn Morse code first. After 2 days of practicing with my little key attached to a buzzer, I had learned the alphabet, numbers, and punctuation. I was really slow, but I knew Morse code.

I worked in a field picking beans one summer to save up $34.95 to buy a Heathkit DX-20 50 W transmitter. I earned my Novice-class license in 1957 at the age of 14, before I earned my Conditional license, which allowed the same privileges as a General-class license, and the exam was administered by two local hams. This license was available for hams who couldn't travel to the FCC field office to take the exam. With my Conditional license, I was allowed to use much more of the 40-meter band. I checked *The ARRL Handbook* for a suitable variable frequency oscillator (VFO) circuit and built one using junk parts. I bought silver mica capacitors that compensated for temperature changes, so that the VFO wouldn't drift in frequency. Everything worked, and I even talked to stations in Japan from my home in Oregon!

Someone had given me a Zenith Trans-Oceanic vacuum-tube radio that had a large circular dial and a weighted tuner, and I was able to operate on the 80-, 40-, and 20-meter bands with it. It didn't have a beat frequency oscillator (BFO), but when I tuned the IF cans, I accidentally sent one of the circuits into oscillation and created BFO! I discovered that the top screw of that IF can was "hot," so I secured a wire to it with clay and moved the wire to control the BFO injection, which allowed me to hear code.

I built a screen grid modulator from more junk parts that I had, to use for AM phone transmissions. However, my tests showed very little modulation because my Heathkit DX-20 had a 6DQ6 amplifier, whose screen grid was connected internally to the suppressor grid. I then built a plate modulator using 2E26 vacuum tubes, only to discover that plate modulation doubles the voltage of the power supply, blowing out the supply of my DX-20. A generous ham gave me a hefty power supply, which I used as an outboard supply. I could then use my modulator to talk on AM on the 40-meter band.

Without amateur radio I never would've learned electronics, which led to a fulfilling career in software engineering, as well as a lifelong hobby.

Howard C. Anderson, K7AZA
Mesa, Arizona

A Tribute to My Mentor

Ivo Depenbrock, W8BAE (SK), worked in the parts department at Steinberg's, an electronics store in Cincinnati, Ohio. He was asked to push the expensive products, but Ivo still made sure there were bargains for kids, such as military surplus 1625 power tubes for 25 cents and 125-foot spools of Gibson Girl antenna wire for 90 cents. My high school was just a couple of blocks away from Steinberg's, and our radio club members visited the store often during lunch, as well as after school.

Ivo's flea-power transmitter built into a BC-746-A tuning unit, which included a 7045 kHz FT-243 crystal, 1684 (IBM 6J6) tube, amplifier tuning capacitor, and plug-in coil.

In the summer of 1954, Ivo went camping and brought his National SW-3 receiver and a homebrew "flea-power" transmitter that he built into a cigar box, which used a 6SN7 dual triode as a Pierce oscillator and amplifier. I contacted Ivo on his little rig. He later briefed me on the circuit and sold me a World War II surplus BC-746-A pogo stick transmitter-receiver tuning unit, which could be rebuilt into a copy of his radio by using a 6J6 miniature tube instead of the larger 6SN7 octal. That little radio was my introduction to the fun of running QRP with a 4.5 W max input to the final. I contacted stations as far as Cuba on 40 meters!

I still have Ivo's little radio, along with plug-in coils for 80 and 40 meters. I also have an unconverted tuning unit that I would like to one day build into a tri-tet or grid-plate crystal oscillator using a 6AQ5, 6CL6, or 5763 tube for coverage on 80 through 20 meters. I also acquired a National SW-3 receiver some years ago, to complete my reconstruction of Ivo's 1954 camping station. I regularly use his radio during the Classic Exchange (CX) event, which encourages participants to use vintage gear.

Ivo has long since become a Silent Key, but I'm grateful for his help and inspiration when I was a young ham.

James T. Hanlon, W8KGI
Sandia Park, New Mexico
Life Member

Send reminiscences of your early days in radio to "Celebrating Our Legacy," ARRL, 225 Main St., Newington, CT 06111 or **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.

John Ellis, NP2B, john.np2b@gmail.com

The WRL Globe Scout

World Radio Laboratories (WRL) was founded by Leo Meyerson, WØGFQ (SK), in Council Bluffs, Iowa, in the late 1940s. In direct competition with the E.F. Johnson Company and a few others, WRL produced amateur radio equipment in both factory-wired and kit form under the Globe and Galaxy brand names.

The Globe Scout

The WRL Globe Scout was the entry point for many hams in the 1950s. While WRL made a few transmitters in the late 1940s with plug-in coils, the most recognizable Globe Scouts took shape around 1953, starting with the 50 W CW and 40 W AM band-switched Model 40A (see Figure 1). They all used the 6146 final tube, which was a bigger, more robust version of the 2E26. The 6146 tube had high plate dissipation (25 W) and high usable frequency. It was compact, and inexpensive for its day, at only $4.95.

Globe Scout Modulators

All of the Globe Scout models were crystal controlled (see Figure 2). They especially appealed to the Novice-class operators, whose transmitters were restricted by the FCC to 75 W with crystal control. WRL made a companion model 755 variable frequency oscillator (VFO), which would adequately drive the Scout. The Globe VFO also had the advantage of having its own power supply, which didn't change voltage when the transmitter was keyed.

Figure 1 — The Globe Scout Model 40A. [Bruce Vaughan, NR5Q (SK), photo]

Figure 2 — The crystals used in the Globe Scout. [**www.universal-radio.com**]

Amplitude modulation (AM) was the most popular type of HF phone operation in the 1950s, as opposed to FM or SSB. The Globe Scout used a technique called *Heising modulation*, which involved using an ordinary iron (power supply-type) choke to decouple the dc power supply from the modulator, thereby feeding the final tube with modulated plate voltage (see Figure 3). This worked, but you could never achieve full modulation, and because Heising modulation was generally used for economic reasons, the rest of the audio chain was generally compromised as well.

Other radios of the time used *screen modulation*, which generated AM by modulating the screen grid of the final amplifier. While screen modulation worked and was certainly cost effective, the Johnson Ranger was by far the best sounding with its push-pull 6L6s as the audio modulator and a real modulation transformer, but it cost three times more than the Globe Scout.

Globe Scouts were also cathode keyed, which was an easy and practical method of keying the radio in CW. However, it could be dangerous, as it put several hundred volts across the key terminals. I learned this the hard way, during my first contact using a used Globe Scout. Other radios, such as the Johnson Ranger, had grid block keying, which eliminated the shock hazard on the key terminals.

Globe Scout Tube Lineup

All of the Globe Scout models had the same tube lineup. A 6V6 served as an oscillator if you used a crystal, or a buffer if you used an external VFO, along with a 6146 final amplifier. A 6SJ7 served as the first speech amplifier, followed by a 6C5 into a single 6L6 modulator. A 5U4G or 5U4GB tube served as the rectifier. There were no solid-state devices used in the rig. In the late '50s, WRL came out with two models of the

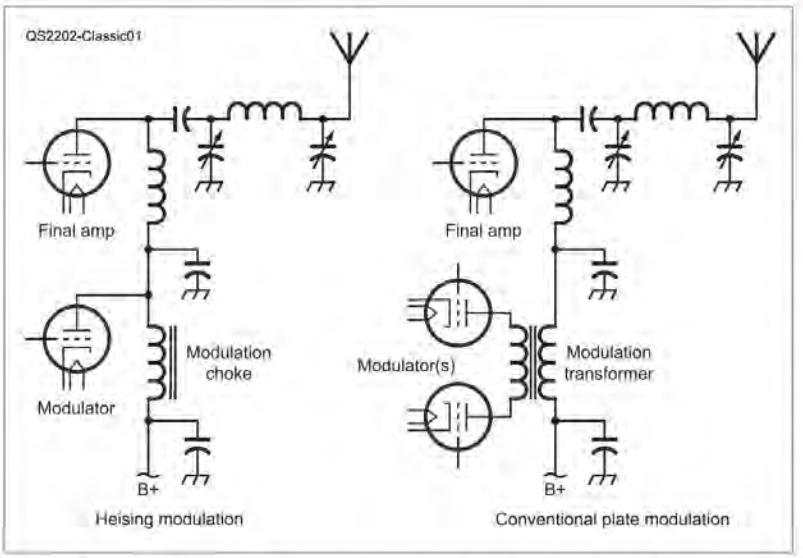


Figure 3 — Heising modulation (left) compared with conventional Class B high-level modulation (right). Note the use of the choke instead of the transformer.

Figure 4 — The front panel of the Globe Scout Model 680. **[www.universal-radio.com]**

Globe Scout, the Model 66, which covered 160 through 10 meters, and the Model 680 (see Figure 4), which covered 80 through 6 meters in an effort to capture some of the Technician-class market. In these models, the two octal-based audio tubes were replaced by a single 6U8A, which used the same circuit, though housed in a single, nine-pin miniature tube envelope.

Getting the Globe Scout on the air took a bit more effort than with rigs today. There was an antenna changeover relay, with a couple of additional sets of contacts that could also control another relay. The antenna changeover relay switched the antenna from the receiver to the transmitter, while the other contacts muted the receiver during transmit and turned on the VFO. For safety reasons, it was also important to ground everything, because most 1950s-era equipment did not have polarized ac plugs.

Tuning the Globe Scout

Tuning the rig required care and attention. The pi network output circuit had a very wide range, and it would tune almost any load. Most rigs did not have an RF output meter; you tuned the rig by dipping the final plate current and increasing the loading until you achieved the desired plate current while maintaining acceptable grid current. Assuming the final amplifier was properly neutralized, output power was maximized by tuning it in that manner. Operators were well advised to use an antenna that was somewhere near resonance, or else the final amplifier might act as a doubler or even a tripler, resulting in a nice signal at two or three times the desired frequency. Many Novices tried using 40-meter dipoles on 80 meters, resulting in nice interference-free signals in the 7400 kHz range, just above the top end of 40 meters.

To operate the rig properly, a ham had to learn another quirk about the oscillator control knob on the Globe Scout: to use a 40-meter VFO or crystal on 20 meters, it had to be positioned at 10 o'clock, while using the same crystal or VFO on 15 meters required that the knob be set at 2 o'clock.

Other WRL Products

WRL had a fairly complete product line, including the Globe Chief, a CW rig that used two 807 final amplifier tubes instead of only one like the Viking Adventurer or the Knight T-50. Like the Globe Scout, it was crystal controlled but it ran 90 W, and it appealed primarily to the Novice-class operators. WRL did, however, have an accessory modulator, enabling the rig to be used for phone operation. WRL also made the Globe Champion to compete with the Johnson Valiant in the 250 W AM market and the Globe King, a 500 W, 300 pound rack mount radio to compete with the Johnson 500.

In the late '60s and early '70s, the market changed from separate transmitters and receivers to a single box idea, the transceiver, which was less expensive than buying separate units. Collins and Swan were the leading manufacturers with these radios. WRL tried to compete in that market with their Galaxy brand of transceivers, but the big three Japanese companies appeared on the scene with their superior products. By the mid-1970s, WRL/Galaxy, National, Hallicrafters, E.F. Johnson, and others had disappeared from the amateur radio market, paving the way for a whole new generation of products.

100, 50, and 25 Years Ago

February 1922

- The cover photo shows the antennas of 1HX.
- The editorial notes that the complete report on the transatlantic tests is published in this issue.
- The lead article is "The Story of the Transatlantics," written by The Editor.
- Paul F. Godley, 2ZE, presents the "Official Report on the Second Transatlantic Tests."
- "Station 1BCG" is a paper presented by George E. Burghard at a meeting of the Radio Club of America.
- Robert C. Higgy discusses "Practical Radio Amplification."
- The "Who's Who in Amateur Wireless" column introduces readers to Bob Trump and Robert C. Higgy.
- The "Amateur Radio Stations" column describes and pictures 4GL (Savannah, Georgia), 2BB (Ossining, New York), and 2WM (Ridgewood, Long Island).

February 1972

- The cover photo shows Douglas A. Blakeslee, W1KLK, in the ARRL Lab, as he checks out the performance of an SSB transmitter.
- The editorial discusses ARRL's Technical Information Service that's available to members.
- Jerry Hall, K1PLP, and Robert M. Myers, W1FBY, discuss "The CRUD-O-Ject: An Audio Filter for Hum and Squeal Rejection."
- David L. Courtier-Dutton, G3FPQ, presents "Some Notes on a 7-MHz Linear-Loaded Quad."
- Calvin R. Graf, W5LFM, and Marvin R. Clinch, K2BYM, offer Part II of "High-Frequency Atmospheric Noise."
- Doug DeMaw, W1CER, writes about "A New Face for the Carfone FM Rig."
- Douglas A. Blakeslee, W1KLK, and Peter Zilliox, WA3EQK, report on "A Hybrid Quacker Box: A 90-Watt SSB Transmitter for 14 MHz."
- H. H. Rugg, VE2HN, offers Part I of "The VE2HN Digital CQer Using NAND Logic."
- Douglas A. Blakeslee, W1KLK, describes how to build "An Experimental Receiver for 75-Meter DX Work."
- Lewis G. McCoy, W1ICP, writes about "Converting the Pip-Squeak to 220 MHz."

February 1997

- The cover photo shows the antenna field of Radio Club Rosario, LU4FM, in Rosario, Argentina.
- The editorial gives readers "More on Little LEOs."
- In "See the Signals You Hear," Donald Cox, AA3EK, tells readers how to use their computer as a spectrum analyzer.
- Bill VanRemmen, KA2WFJ, presents "A Pocket-Size, Direct-Reading VHF SWR Meter."
- Jeff Otterson, N1KDO; Peter Gailunas, KA1OKQ, and Rich Cox, N1LTL, explain how to "Build a $60 Talking Repeater Controller."
- Tom McShane, NW6P, talks about "MediShare International."
- Gil McElroy, VE1PKD, relates an interesting bit of history, in "The Collins 45A—How Arthur Collins Met Robert Goddard."
- Matt Minney, N8PGI, asks, "Are Radios More Expensive Today?," and provides readers with the answer.
- Steve Ford, WB8IMY, and Zack Lau, W1VT, offer Part 2 of "Get Ready for Phase 3D!"
- Lorraine Y. Aubert, KE6WHJ, reports on "Field Day from the Summit of Mt San Jacinto."
- Bryan Suits, WB8WKN, describes operating from the edge of space, in "New Heights for ATV."
- J. Robert Witmer, W3RW, writes about "Wire Gain Antennas for 6 Meters."

Silent Keys

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

K1AC **Meeves**, Donald L. "Don," Stratham, NH
KA1EPT **Menditto**, Dominick J., Cary Plantation, ME
KM1G **Booth**, Richard A., Pawcatuck, CT
W1HBO **Ochs**, Howard B., Vassalboro, ME
K1HYI **Titcomb**, Sheldon M., East Longmeadow, MA
KJ1KJ **Johnston**, Kenneth A., Duxbury, MA
•KB1LHH **Treanor**, Ronald J., Cumberland, RI
N1NQE **Niesz**, Helga F., Hamden, CT
♦W1WRV **White**, Edward W., Northborough, MA
♦W1ZR **Hallas**, Joel R., Westport, CT
W2AKD **Davidsons**, Aivars K., Syracuse, NY
♦K2ASP **Kane**, Philip M., Beaverton, OR
N2ERT **Spriggs**, Theodore F., Jr.,Carlsbad, CA
KL2GD **Baker**, Alice L., Anchorage, AK
W2GDS **Halpern**, Arnold L., Long Branch, NJ
KC2GFT **Colson**, Rita F., Baldwinsville, NY
K2IUK **MacLean**, Donald J. "Jack," Franklin, NC
W2JLH **Howard**, John L., Woodland Park, NJ
WB2SHX **Coleman**, Patrick F., Stockholm, NJ
•KA2TRM **Moore**, Lenore H., Burlington, NJ
K2VDP **Lippincott**, Samuel E., Moorestown, NJ
KB2YCN **Smink**, Edward, Seneca Falls, NY
K3CNI **Chromy**, John W., Jr., Wilmington, DE
•K3DT **Rowland**, Henry B., Ticonderoga, NY
KB3EGP **Hyland**, Francis J., Smyrna, DE
N3IDA **Belicka**, George K., Sr., Lebanon, PA
WB3IVH **Raker**, William B., Newark, DE
KB3JGI **Woods**, Joseph W. "Joe," Hebron, MD
N3JQM **Shatto**, Neil R., Jr, West Hanover Township, PA
♦N3KB **Badger**, Kent A., Buffalo Township, PA
KE3L **Dent**, Gavin W., Roanoke, VA
N3TDT **Fait**, Donald H., Jefferson Hills, PA
♦N3TG **Free**, William T., Jr., Fairfax, VA
AB4AQ **Elliott**, Robert L., Lexington, NC
N4AR **Maxson**, William T., Nicholasville, KY
WA4BVW **Woodard**, Kenneth E., Sr., Landrum, SC
WA4CBI **De La Campa**, Joseph, Miami, FL
K4CRD **Cox**, Richard E., Grifton, NC
•KD4EIL **Burnside**, Charles A., Jr., Newport News, VA
♦N4ENE **Purifoy**, David L., Jr., New Bern, NC
K4EQQ **LaPierre**, Carmen M., Evans, GA
KI4EZA **Clemons**, Roy C., Florence, AL
K4FJS **Pegg**, Raymond E., McMinnville, TN
W4GRL **Leach**, Glen R., Cleveland, TN
♦WA4IAX **Byzet**, John, Tupelo, MS
K4IRT **Judson**, Paul F., Lexington, SC
KT4JQ **Geissinger**, Richard C., Delray Beach, FL
KC4KVI **Finley**, Michael D. "Mickey," Georgetown, TN
W4LEW **Best**, George L. "Lew," Richmond, VA
K4LYL **Lewis**, Larry Y., Forest, VA
♦WB4PCS **McAllister**, Wilton M., Clover, SC
KJ4RKB **Hinkle**, Brian K. "Red," Salem, AL
WA4SEX **O'Brien**, Donna, Dallas, GA
KI4SP **Belew**, Jackson A., Jr., "Jack," Florence, AL
K4SWJ **McDowell**, William D., Griffin, GA
N4TIY **Haynes**, Betty J., Millbrook, AL
KF4TVF **Higdon**, William L. "Bill," Cleveland, TN
W4UFO **Mills**, Noble B., II, "Nobby," Statesville, NC
•W4UJV **Soltow**, Dewey R., Vienna, VA
•KF4VO **Guthrie**, Truman F., Gadsden, AL
•WA4VYS **Shealy**, Thomas C., Prosperity, SC
N4WIV **Czerniak**, Lonnie J., Staunton, VA
N4ZWH **Partin**, Jane M., Beaufort, NC
WB5AKR **Clark**, Larry G., Meridian, MS
K5BBA **Baker**, Earle M., Jr., Vicksburg, MS
N5BEO **McMillan**, Billy G., Lucedale, MS
KD5BQT **Burris**, Danny R., Smithdale, MS
WD5CAB **Graham**, Donald C., Zavalla, TX
N5CU **Chavez**, David, San Antonio, TX
KC5DHW **Enderlin**, Milton B., Bartlesville, OK
KU5JFR **Remark**, John F., Manvel, TX
KS5L **Riska**, Robert D., Carrollton, TX
N5NBG **Hare**, Clyde, Horn Lake, MS
•KD5OIH **Palk**, Artie F., Sand Springs, OK
♦AE5PB **Bisdorf**, Paul L., Jr., Broken Arrow, OK
W5PVR **Kirkland**, Robert M., White City, MI
•KB5PZ **Sutherland**, Larry D., Cedar Rapids, IA
•AC5TW **Bryn**, Stanley L., Socorro, NM
♦KC5YM **De Sain**, Patricia S. "Pat," Longview, TX
W6ARK **Denny**, Roger M., Garden Grove, CA
KC6ASY **Kotten**, Thomas, Paso Robles, CA
KC6CMK **Woollomes**, James P., Menlo Park, CA
KG6EQ **Danielson**, John A., La Canada, CA
AH6HK **Rasmussen**, Anton C. "Tony," Lodi, CA
KF6HSS **Wolske**, Stephen R., Chico, CA
WB6IYP **Gingerich**, William F. "Bill," Bonanza, OR
W6JSP **Holzapfel**, Mark E., San Diego, CA
N6PRT **Ferreira**, Douglas H., San Ramon, CA
KC6RIZ **Jefferson**, Marth M. "Marty," Bodfish, CA
KE6RPY **Navarro**, William F. "Bill," Sugarloaf, CA
K6SJA **Cupp**, Richard F., Chula Vista, CA
KA6TZW **Williams**, Ivanna L., Atwater, CA
♦K6VNX **Turriff**, Arlen T., San Gabriel, CA
♦•W6ZXI **Thatcher**, Reginald, Gulf Shores, AL
N7CFA **Hayes**, Edward C., Vancouver, WA
KF7ETS **Gilliland**, Donald E., Pullman, WA
KE7GMG **McGhehey**, Jeremiah I., Carmen, ID
N7IFG **Fanshaw**, Samuel D., III, Garden Valley, ID
W7ISJ **Furfaro**, Blase J. "Joe," Tucson, AZ
KE7NSN **Sirrine**, Gordon G., Sandy, UT
KA7RCT **Stephens**, William D., Jr., Gordo, AL
N7RKF **Bruening**, Mark R., Sandy, UT
W7SMB **Barmore**, Sylvia M., Sandy, OR
KA7TFH **Jones**, Dwayne L., Reno, NV
•WJ7V **Snyder**, Raymond H., Lander, WY
K7VHE **Gardina**, Darold, Sierra Vista, AZ
WG7Y **Davis**, Robert E. "Bob," Gillette, WY
AD7ZW **Swasey**, Douglas R. "Reed," Mountain Home, UT
KA8DJZ **Chamberlain**, Gary J., Wadsworth, OH
KX8GCS **Fischer**, Gene, Xenia, OH
KD8DMB **Haselberger**, Thomas J., Decatur, MI
•W8GTJ **Romito**, Roland R., Mayfield, OH
KD8IXP **Bruey**, Alfred J., Jackson, MI
WR8J **Belville**, Carlin J., Leroy, MI
WA8JTB **Carter**, Gerald W. "Carter," Toledo, OH
♦WB8KKU **Anderson**, Gene V., Port Clinton, OH
N8LGQ **Drushal**, Kenneth M., Bristol, VA
K8MOM **Hungate**, Cheryl L., Marion, IA
NY8R **Gramza**, Leroy F., Manistee, MI
N8RNA **Rumley**, Rex B., Columbus, OH
KA8SKF **Suter**, Roger C., Friendly, WV
WA8TVI **Whitehouse**, Timothy Z., Louisville, OH
N9CLE **Dieter**, Walter T. "Wally," Tomahawk, WI
W9EC **Lischka**, Raymond J., Lompoc, CA
W9JFM **Heinrich**, Daniel C., Algoma, WI
W9KQN **Burby**, John J., Jr., Wausau, WI
K9KY **Fox**, Lloyd R., Richmond, IN
KE9MG **Giguere**, Francis, Bradley, IL
•WA9MMM **Uhley**, Lee B., Sr., Belleville, IL
♦KC9MRW **Draeger**, Neil J., La Farge, WI
KB9NNT **Agnew**, Byron L., Camden, MI
•K9OWQ **Peterson**, William V. "Pete," Tinley Park, IL
K9QBL **Everhart**, Billie B., Carpentersville, IL
KJ9R **Randle**, Joseph P., Fort Wayne, IN
WB9YCI **Kimble**, Ronald W., Villa Park, IL
W9YEL **Brower**, Paul E., Columbia City, IN
•KA9YRZ **Salter**, Henry A., Chillicothe, IL
KC0AZK **Huber**, Anthony D. "Tony," Topeka, KS
W0BUW **Van Horn**, Boyd L., Rosston, OK
KD0COG **Johnson**, Don, Littleton, CO
♦KB0EA **Martin**, John R., Byrnes Mill, MO
WA0FEV **Janssen**, Leland L. "Lee," Saint Louis, MO
W0IC **Maer**, Claude .M., Jr., Denver, CO
♦•KC0KTG **Avery**, James P., Boulder, CO
N0KYS **Schweppe**, Earl J., Lawrence, KS
K0LXE **Morey**, Darrold W., Sioux Falls, SD
KC0POF **Eckler**, Penelope E., Lawrence, KS
•KC0PWC **Augustus**, Dee A., Lawrence, KS
W0REF **Wilson**, David H., Denver, CO
•N0RSR **Flint**, Robert W., Olathe, KS
KB0ZPP **Earley**, Gail A., Topeka, KS
K0ZSR **Layher**, Howard L., Colorado Springs, CO
VE1VCI **Taylor**, Merle W., Antigonish, NS, Canada
VE3EIK **Brennan**, Patrick J., Hamilton, ON, Canada
DJ6LE **Danzeisen**, Klaus Otto, Munich, Bavaria, Germany

♦ Life Member, ARRL
♦ Maxim Society
♦ Current Diamond Club
• 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

HRO Florida Now Open!

IC-9700 | *All Mode Tri-Band Transceiver*

• VHF/UHF/1.2GHz • Direct Sampling Now Enters the VHF/UHF Arena • 4.3" Touch Screen Color TFT LCD • Real-Time, High-Speed Spectrum Scope & Waterfall Display • Smooth Satellite Operation

IC-7851 | *HF/50MHz Transceiver*

• 1.2kHz "Optimum" roofing filter • New local oscillator design • Improved phase noise • Improved spectrum scope • Dual scope function • Enhanced mouse operation for spectrum scope

IC-7300 | *HF/50MHz Transceiver*

• RF Direct Sampling System • New "IP+" Function • Class Leading RMDR and Phase Noise Characteristics • 15 Discrete Band-Pass Filters • Built-In Automatic Antenna Tuner

IC-7610 | *HF/50 MHz All Mode Transceiver*

• Large 7-inch color display with high resolution real-time spectrum scope and waterfall • Independent direct sampling receivers capable of receiving two bands/two modes simultaneously

IC-R8600 | *Wideband SDR Receiver*

10 kHz to 3 GHz Super Wideband Coverage • Real-time Spectrum Scope w/Waterfall Function • Remote Control Function through IP Network or USB Cable • Decodes Digital Incl P25, NXDN™, D-STAR • SD Card Slot for Receiver Recorder

IC-718 | *HF Transceiver*

• 160-10M** • 100W • 12V operation • Simple to use • CW Keyer Built-in • One touch band switching • Direct frequency input • VOX Built-in • Band stacking register • IF shift • 101 memories

IC-705 | *HF/50/144/430 MHz All Mode Transceiver*

• RF Direct Sampling • Real-Time Spectrum Scope and Waterfall Display • Large Color Touch Screen • Supports QRP/QRPp • Bluetooth® and Wireless LAN Built-in

IC-7100 | *All Mode Transceiver*

• HF/50/144/430/440 MHz Multi-band, Multi-mode, IF DSP • D-STAR DV Mode (Digital Voice + Data) • Intuitive Touch Screen Interface • Built-in RTTY Functions

IC-2730A | *VHF/UHF Dual Band Transceiver*

• VHF/VHF, UHF/UHF simultaneous receive • 50 watts of output on VHF and UHF • Optional VS-3 Bluetooth® headset • Easy-to-See large white backlight LCD • Controller attachment to the main Unit

ID-5100A Deluxe

VHF/UHF Dual Band Digital Transceiver

• Analog FM/D-Star DV Mode • SD Card Slot for Voice & Data Storage • 50W Output on VHF/UHF Bands • Integrated GPS Receiver • AM Airband Dualwatch

ID-4100A | *VHF/UHF Dual Band Digital Xcvr*

• Compact, Detachable Controller for Flexible Installation • DV/FM Near Repeater Search Function • Apps for iOS™ and Android™ devices • Wireless Operation with VS-3 & UT-137 Bluetooth® Headset & Module • MicroSD Card Slot

IC-2300H | *VHF FM Transceiver*

• 65W RF Output Power • 4.5W Audio Output • MIL-STD 810 G Specifications • 207 alphanumeric Memory Channels • Built-in CTCSS/DTCS Encode/Decode • DMS

IC-V86 | *VHF 7W HT*

• 7W OutputPower Plus New Antenna Provides 1.5 Times More Coverage • More Audio, 1500 mW Audio Output • IP54 & MIL-STD 810G–Rugged Design Against Dust & Water • 19 Hours of Long Lasting Battery Life • 200 Memory Channels, 1 Call Channel & 6 Scan Edges

IC-R30 | *Digital/Analog Wideband Xcvr*

• 100 kHz to 3.3 GHz Super Wideband Coverage • P25 (Phase 1), NXDNTM, dPMRTM, D-STAR Mode • 2.3" Large LCD Display & Intuitive User Interface • MicroSD Card Slot for Voice & Data Storage • USB Charging & PC Connection

NEW

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

- **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**

ICOM

ANAHEIM, CA (800) 854-6046	**SACRAMENTO, CA** (877) 892-1745	**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
PLANO, TX (877) 455-8750	**SAN DIEGO, CA** (877) 520-9623	**DENVER, CO** (800) 444-9476	**ATLANTA, GA** (800) 444-7927	**NEW CASTLE, DE** (800) 644-4476	**SALEM, NH** (800) 444-0047	**WWW.HAMRADIO.COM**

**Except 60M Band. The Icom logo is a registered trademark of Icom Inc. Toll-free including Hawaii, Alaska and Canada. All HRO 800-lines can assist you if the first line you call is busy, you may call another. Prices, specifications and descriptions subject to change without notice.

HAM RADIO OUTLET®

WWW.HAMRADIO.COM

*Free Shipping and Fast Delivery!

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-891 | *HF+50 MHz All Mode Mobile Transceiver*

Rugged Construction in an Ultra Compact Body • Stable 100 Watt Output with Efficient Dual Internal Fans • 32-Bit IF DSP Provides Effective and Optimized QRM Rejection • 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 Reliable Output Power • Real Dual Band Operation (V+V, U+U, V+U, U+V) • 2-inch High-Res 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*

• Massive heatsink guarantees 80 watts of solid RF power • Loud 3 watts of audio output for noisy environments • Large 6 digit backlit LCD display for excellent visibility • 200 memory channels for serious users

FT-818ND | *HF/6M/2M/440 All Mode Portable Xcvr*

• Ultra-Compact/Portable • Multi-Color Easy to See LCD • 208 Memory Channels/10 Memory Groups • Built-in Electronic Keyer • Internal Battery Operation Capability • Two Antenna Connectors • Built-in High Stability Oscillator ±0.5 ppm

FTM-400XD | *2M/440 Mobile*

• Color display-green, blue, orange, purple, gray • GPS/APRS • Packet 1200/9600 bd ready • Spectrum scope • Bluetooth • MicroSD slot • 500 memory per band

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
- FAX – All store locations
- ONLINE – WWW.HAMRADIO.COM
- MAIL – All store locations

YAESU
The radio

FOLLOW HRO ON SOCIAL MEDIA

twitter.com/HamRadioOutlet
facebook.com/HROHamRadioOutlet
instagram.com/HamRadioOutlet
youtube.com/HamRadioOutlet

* On most orders over $100 in the continential US. (Rural Locations excluded.) Contact HRO for promotion details. Toll-free including Hawaii, Alaska and Canada. All HRO 800-lines can assist you. If the first line you call is busy, you may call another. Prices, specifications and descriptions subject to change without notice.

reDiscover Radio

in Orlando in February!

Orlando HamCation® and 2022 ARRL National Convention

February 10–13, 2022
Orlando, Florida

Join ARRL as we celebrate the 75th, diamond anniversary, of Orlando HamCation – one of the largest annually-held ham radio conventions.

ARRL National Convention Programs Thursday, February 10

Arrive early and take part in ARRL's all-day workshops prior to Orlando HamCation. Join friends and experts for an opportunity to learn and discuss topics in depth.

Special Full-Day Program at the DoubleTree by Hilton Hotel Orlando at SeaWorld

All-Day Training Tracks (choose one):

- Contest University
- Emergency Communications Academy
- Technology Academy
- Hands-On *Handbook*

Includes Luncheon featuring keynote by ARRL CEO David Minster, NA2AA

Advanced Registration is required.
Register Now at **www.arrl.org/expo**

ORLANDO HamCation®

Friday, Saturday, and Sunday, February 11–13
Central Florida Fairgrounds

- Check out the latest in amateur radio electronics, accessories, and gear.
- Stroll through the largest tailgate in the southeast.
- Catch a great lecture or forum.
- Find great deals in our swap building.
- Visit the large ARRL exhibit area with program representatives and membership store.
- Bring the family and spend some time having fun in the sun before or after HamCation.

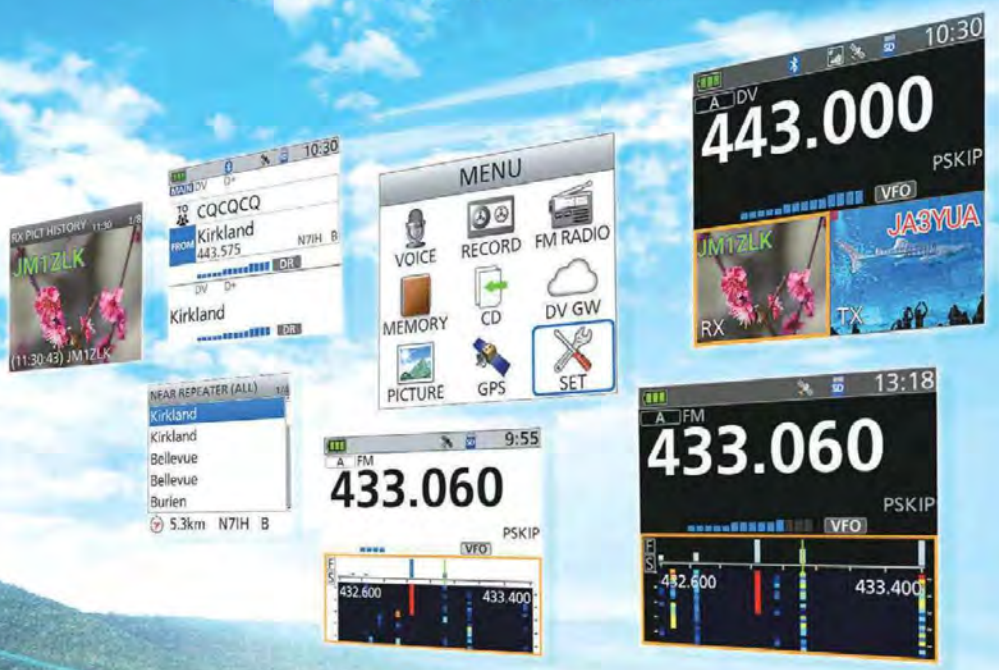
Learn more and buy your tickets today at **www.hamcation.com**

NEW

ID-52A

2m/70cm Analog/Digital Transceiver

Made in Japan
Quality you can trust



Waterfall Display

See Band Conditions Instantly

- Multi-function Analog/D-STAR 2m/70cm
- 2.3" Color Display with Waterfall band scope
- Dual D-STAR receive
- VV/VU/UU receive capability
- Bluetooth® enabled

▲ ID-52A & Repeaters Shipping Now ▼

ID-RP2010V	2m Analog/D-STAR Repeater
ID-RP4010V	70cm Analog/D-STAR Repeater
ID-RP1200VD	23cm Analog/D-STAR or DD Repeater

www.icomamerica.com/amateur
sales@icomamerica.com

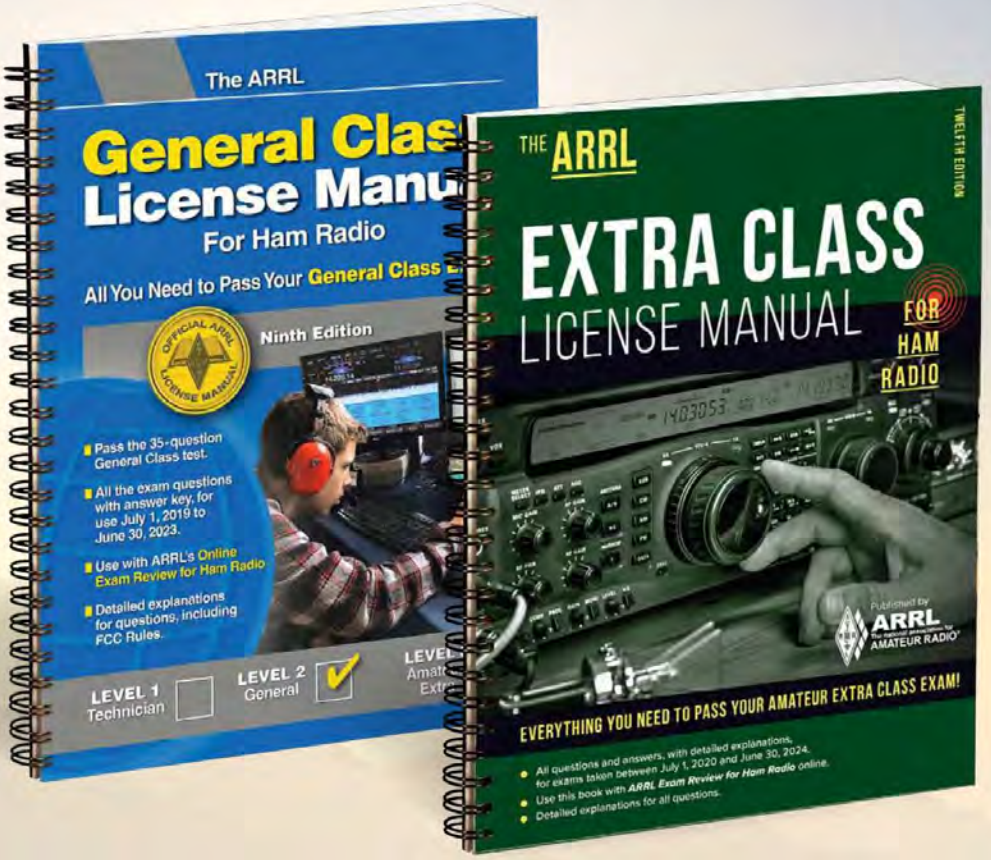
For the love of **ham radio.**

ICOM®

©2022 Icom America Inc. The Icom logo is a registered trademark of Icom Inc. All other trademark remain the property of their respective owners. All specifications are subject to change without notice or obligation. 31488

Upgrade in the New Year!

If you're looking to advance your emergency communications skills or get more enjoyment from ham radio, upgrade your license with ARRL License Manuals.



- An expert approach to studying that breaks down difficult concepts
- Detailed answers to questions, making studying more efficient
- A complete glossary for quick reference of new terms

ARRL License Manuals have all the exam questions with answer key and explanation, so there are no surprises on exam day! Take the next step and work toward upgrading today.

Level 2: The ARRL General Class License Manual

ARRL Item No. 1069 / Retail $32.95

Level 3: The ARRL Extra Class License Manual

ARRL Item No. 1311 / Retail $32.95

www.arrl.org/shop

ARRL
The National Association for Amateur Radio®

hy-gain Rotators

. . . the first choice of hams around the world!

HAM-IV

The most popular rotator in the world!

For medium communications arrays up to 15 sq. ft. wind load area. 5-second brake delay, Test/Calibrate function. Low temperature grease permits normal operation down to -30° F. Alloy ring gear for extra strength up to 100,000 PSI for maximum reliability. *Precision* indicator potentiometer. Ferrite beads reduce RF susceptibility. Cinch plug + 8-pin plug at control box. Dual 98 ball bearing race for load bearing strength, electric locking steel wedge brake prevents wind induced movement. North/South center of rotation scale on meter, low voltage control, max mast $2^{1}/_{16}$".

HAM-IV **$799.95**

HAM-VI **$1099.95** with DCU-2

HAM-VII **$1299.95** *with DCU-3*

TAILTWISTER SERIES II

For large medium antenna arrays up to 20 sq. ft. wind load. 5-second brake delay, Test/Calibrate functions. Low temp grease, tough alloy ring gear, indicator potentiometer, ferrite beads on potentiometer wires, weatherproof AMP connectors plus 8-pin plug at control, triple bearing race (138 ball bearings) for large load bearing, electric locking steel wedge brake, North/South center of rotation scale meter, low voltage control, $2^{1}/_{16}$" mast.

MSHD, $159.95. Above tower heavy duty mast support. Accepts $1^{7}/_{8}$-$2^{5}/_{8}$" OD.

T-2X **$999.95**

T-2XD2 **$1129.95** with DCU-2

T-2XD3 **$1199.95** with DCU-3

CD-45II

For antenna arrays up to 8.5 sq. feet mounted inside tower or 5 sq. ft. with mast adapter. Low temperature grease good to -30 F degrees. *New* Test/Calibrate function. Bell rotator design gives total weather protection, dual 58 ball bearing race gives proven support. Die-cast ring gear, stamped steel gear drive, heavy duty, trouble free gear train, North center scale, lighted directional indicator, 8-pin plug/socket on control unit, snap-action control switches, low voltage control, safe operation, takes maximum mast size to $2^{1}/_{16}$ inches. MSLD light duty lower mast support included.

CD-45II **$599.95**

HAM IV and HAM V Rotator Specifications	
Wind Load capacity (inside tower)	15 square feet
Wind Load (w/mast adapter)	**7.5 square feet**
Turning Power	800 in.-lbs.
Brake Power	**5000 in.-lbs.**
Brake Construction	Electric Wedge
Bearing Assembly	**dual race/96 ball bearings**
Mounting Hardware	Clamp plate/steel U-bolts
Control Cable Conductors	**8**
Shipping Weight	26 lbs.
Effective Moment (in tower)	**2800 ft.-lbs.**

TAILTWISTER Rotator Specifications	
Wind load capacity (inside tower)	20 square feet
Wind Load (w/ mast adapter)	**10 square feet**
Turning Power	1000 in.-lbs.
Brake Power	**9000** in.-lbs.
Brake Construction	Electric Wedge
Bearing Assembly	**Triple race/138 ball brngs**
Mounting Hardware	Clamp plate/steel U-bolts
Control Cable Conductors	**8**
Shipping Weight	31 lbs.
Effective Moment (in tower)	**3400 ft.-lbs.**

CD-45II Rotator Specifications	
Wind load capacity (inside tower)	8.5 square feet
Wind Load (w/ mast adapter)	**5.0 square feet**
Turning Power	600 in.-lbs.
Brake Power	**800 in.-lbs.**
Brake Construction	Disc Brake
Bearing Assembly	**Dual race/48 ball brings**
Mounting Hardware	Clamp plate/steel U-bolts
Control Cable Conductors	**8**
Shipping Weight	22 lbs.
Effective Moment (in tower)	**1200 ft.-lbs.**

Hy-Gain Programmable DCU-3
Digital Rotator Controller
DCU-3 -- $599.95

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

Press a memory button or dial in your beam heading or let *Ham Radio Deluxe* (or other) take control. Your antenna auto rotates precisely and safely to your DX.

DCU-3 automatically jogs your antenna free and safely unlocks it before rotating begins *(great for older rotators with "sticky" brakes)* then turns off your motor before reaching its final heading. Your antenna *gently* coasts to a stop before the brake re-locks -- greatly reducing damaging overshoots and extending rotator life. Simply press *Left* and *Right* buttons for *full* manual control and fine tuning. Bright blue LCD shows current, dialed-in and computer controlled beam headings in one degree increments and your call.

Calibrate lets you accurately match your display to your *true* beam heading. Has USB/RS-232 ports for computer control. Adjustable LCD sleep time. Field upgradeable firmware. 8.5Wx4.3H x9D".

110 VAC. Order DCU-3X for 220 VAC.

DCU-2 Digital Rotator Controller --$519.95
Like DCU-3, but less programmable memories. 110 VAC.
Order DCU-2X, for 220 VAC.

AR-40 -- $499.95

For compact antenna arrays and large FM/TV up to 3.0 square feet wind load area.

Dual 12 ball bearing race. Automatic position sensor never needs resetting. Fully automatic control -- just dial and touch for desired location. Solid state, low voltage control, safe, silent operation. $2^{1}/_{16}$" max mast. MSLD low mast included.

AR-40 Rotator Specifications	
Wind load capacity (inside tower)	3.0 square feet
Wind Load (w/ mast adapter)	**1.5 square feet**
Turning Power	350 in.-lbs.
Brake Power	**450 in.-lbs.**
Brake Construction	Disc Brake
Bearing Assembly	**Dual race/12 ball bearings**
Mounting Hardware	Clamp plate/steel bolts
Control Cable Conductors	**5**
Shipping Weight	14 lbs.
Effective Moment (in tower)	**300 ft.-lbs.**

Replace your Yaesu Rotator Controller

YRC-1 - $429.95

Hygain YRC-1 -- more features, more robust, far less prone to lightning damage. Costs less than repairing!

Easy-to-use -- dial in your beam heading and tap GOTO button, Exclusive 180 degree *AutoReversal*™ for fast longpath operation. All DCU-2 features. Bright blue LCD shows current, dialed-in, computer controlled beam headings, call. USB port for computer control. Extra heavy-duty AC power supply. Fast variable DC motor minimises overshoot. Intuitive menu. Field upgradeable. For Yaesu G-800/1000/2800/G450/650. AC or DC motors.

YRC-3, $519.95. Like YRC-1 and adds 6 memories.

AR-500 Rotator/Controller -- $199.95

UHF/VHF/6-Meter, MFJ-1886 Rotator/Controller and Remote. For use of small VHF/UHF/6M, TV, FM, the MFJ-1886 wide band receiving loop and other lightweight ham antennas. Rotator is built in a weather proof one piece cast aluminum housing with precision metal gears, steel thrust bearings and automatic braking. Includes rotator, controller, remote, clamps, and all hardware. AR-500 remembers up to 12 directions even after a power outage! Use remote control or direct console. Displays location and relative position.

hy-gain **Antennas, Rotators & Towers** 308 Industrial Pk. Rd, Starkville, MS 39759 USA

Sales/Tech: (662) 323-9538 **FAX:** (662) 323-5803 Open 8-4:30 CST, Mon.-Fri.

Add Shipping. Prices and specifications subject to change. © 2022 *Hy-Gain*

TIMEWAVE TECHNOLOGY INC.

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

*NEW! ANC-4+

ANC-4+ Antenna Noise Canceller

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

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!

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!*

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

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

- 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 Magnetic Loop Antennas

MFJ 36-inch magnetic loop antenna lets you operate 7 to 22 MHz or 10 to 30 MHz continuously -- including the WARC and MARS bands! Easily handles a full 150 Watts on SSB/CW/Digital for any transceiver.

Ideal for limited space. Apartments, small lots, motor homes, attics, trailers.

Work exciting DX with low angle radiation and local close-in contacts with high angle radiation when mounted vertically.

Super easy-to-use! MFJ remote control auto tunes to your desired band. Fast/slow tune buttons, Cross-Needle SWR/Wattmeter 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 -- gives you highest possible 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 protection.

MFJ-1782, $609.95. Like MFJ-1786 but has fast/slow tune manual control.

MFJ-1780, $399.95. 20-10 Meters, 150 Watt *Portable* *24x24x24" box fan loop with carry handle.* Fast/slow tune control. *See QST July 2019.*

***New* 40-15M and 30-10M 300W *High Efficiency* Welded Loop Antennas**

Carry it anywhere! Easy carry handle, fold-out feet, tripod mount bracket. Portable, lightweight 36x36x4". Deluxe semi-auto controller with SWR/Wattmeter, no control line needed. Welded Low loss *butterfly* air-variable capacitor. 300W SSB.

MFJ-1784, $719.95. 40-15 Meters.

MFJ-1783, $669.95. 30-10 Meters.

Build your own Mag loop!

Motorized Butterfly Capacitors

Super low loss butterfly capacitors, no rotating contacts, all plates welded with no mechanical electrical contacts. Anti-backlash mechanism. DC motor with gear reduction box. Handles at least 150 Watts SSB/CW/Digital.

1. **p/n: 282-1786, $189.95.** 11-128 pF.
2. **p/n: 282-1788, $249.95.** 15-260 pF.
3. **p/n: 80-1786-2SM, $249.95.** Auto band selecting remote controller with SWR/Wattmeter.
4. **p/n: 80-1782-2, $79.95.** Manual remote control, fast/slow tune buttons.

Butterfly Capacitors

5. **MFJ-19, $79.95.** 12-67 pF.
6. **MFJ-23, $109.95.** 18-136pF.
7. **p/n: 729-0142, $19.95.** 6:1 vernier gear reduction drive for loop tuning capacitor.
8. ***36-inch Aluminum Circular Loop with Integrated welded capacitor and mast mounting brackets*** **p/n: 10-1786-11, $129.95.** 1.05 inch OD heavy duty tubing.

MFJ Magnetic Loop Tuners, 150 Watts

Turns wire or coax into a small, high efficiency multi-band transmitting magnetic loop antenna!

Work the world 3.5 to 30 MHz with a *full 150 Watts* SSB/CW/Digital. No ground, radials or counterpoises needed.

New larger matching capacitor is 313 pF. Increases matching range. Butterfly capacitor has no rotating contacts.

Very quiet receiving antenna -- you'll hardly notice static crashes. High-Q reduces QRM, overloading, harmonics. Perfect for apartments, antenna restricted areas and portable operation.

A 13' wire loop covers 30-20 Meters (4' for 17-10M; 7' for 20-15M; 28' for 60-40M; 50' for 80M). Tune *any* shape loop -- circle, square, rectangle, *etc.*

A wire length gives about 1.5 to 1 frequency range (i.e.7-10, 18-28 MHz).

Easy-Carry handle. Mount for PVC Cross loop support on cabinet top. Included tripod/mast mount.

MFJ-58B, $69.95

PVC Cross Loop support. 60-40M 20-15M 17-10M loop wires, wire clips.

A. MFJ-936C, $359.95. Antenna current meter, Cross-Needle SWR/Wattmeter. 9¼Wx5½Hx9½D".

B. MFJ-935C, $309.95. Antenna current meter. 6¼Wx5½Hx9½D".

C. MFJ-933C, $259.95. 6¼Wx5½Hx9½D".

MFJ Low-Noise Receiving Mag Loop

Clearly hear signals 50 KHz to 30 MHz you never knew existed. Power line noise and static disappears. Rotating MFJ-1886 eliminates interfering signals or greatly peaks desired signals. Excellent antenna and preamplifier balance gives deep null. Gives excellent strong and weak signal performance without overload. Fully protected state-of-the-art push-pull Gali MMICs preamplifier gives you high dynamic range, low IMD and 25 dB of low noise gain. Use inside or outside.

QRP Mag Loop Tuner

MFJ-9232 $79.95

Turns wire around a bookcase, window, tree, etc. *into a small, high efficiency transmitting loop antenna!* Operate 40-10 Meters with included flexible wire loop (80/60 Meters with your bigger loop). No counterpoises, radials, ground needed. 25 Watts. Very quiet reception. Hi-Q reduces QRM, overload, harmonics. Great for apartments, antenna restrictions, portable ops.

VIDEOS: https://m.youtube.com/results?search_query=MFJ-9232

Antenna Rotator

AR-500 $199.95

Perfect for magnetic loops, VHF/UHF, small HF beams, TV, FM antennas. Weather-proof cast aluminum housing with precision all metal gears, steel thrust bearings and automatic braking. Includes rotator, controller, remote control, clamps, hardware. 12 Memories. Digital display. 110/220 VAC.

MFJ Tripods/Masts

Strong, black *steel* triangular braced base. Non-skid feet, strong mast locks.

MFJ-1919, $129.95, Supports 100 lbs. Extends a *whopping* 7.8 ft. Base spreads up to 4.8 sq. ft. 1.4" dia. mast. Collapses to 54" by 6" diameter. 9¾ lbs.

MFJ-1919EX, $199.95. Tripod *plus* mast. 18' extended. 5' collapsed. 1/8" wall, 3/4" dia. top, 1½" dia. bottom.15 lbs.

MFJ-1918, $89.95, 6'extended. 38" collapsed, 6¾ lbs.

MFJ-1918EX, $129.95. Small tripod with extension mast. 9½', 3.8 ft. collapsed. ¾"top, 1" bottom. 6.5 lbs.

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.

Add shipping. Prices and specifications subject to change. (c) 2021 MFJ Enterprises, Inc.
• 1 Year No Matter What™ warranty • 30 day money back guarantee (less s/h) on orders direct from MFJ
made in USA

- **Highest Gain** Proprietary Design Improvement
- **Lowest SWR** Verified In *CQ Magazine*
- **Wider Bandwidth**
- **Lifetime Guarantee**
- **Everything You Need** for a Fully Functional Antenna

VHQ HEX

VHQHEX.COM
THE KING OF HEX BEAMS

MENTION CODE QST1121 FOR $100 DISCOUNT OFFER EXPIRES 1/21/22
sales@vhqhex.com Tel 603-731-7935 Fax 603-784-5036

Let's bring these radios back!
TS-930 & TS-940 Supply Upgrade Kits

Easy to install, Proven Track Record & Guaranteed!

New TS-930 switching supply & AVR Board

k6iok.com
Compudigital Industries

Radio Direction Finder
KN2C DF2020T Kit
Useful for 100~1000MHz
Map Plotting Program
On Google Earth™
with GPS Data
On Sale $398
www.kn2c.us

Dual Band 2M/440 and other models

EmComm, Satellite work, long distance simplex and repeater use.

Elk Antennas
Log-Periodic Antennas for the Radio Amateur
Jim@ElkAntennas.com
www.ElkAntennas.com

ALFA ROTATORS
Alfa Radio Ltd. 780-466-5779

High Torque • Self braking worm drive USB
720 degrees programmable limits simple wiring
13.8 to 18 Volt small footprint for controller

WWW.ALFARADIO.CA
sales@alfaradio.ca

Eventide honors the many Radio Amateurs who are involved in public safety

Many hams serve in professional roles, installing, supporting and operating communications systems including P25 radio, 911, Dispatch and LTE.

Other hams have professional or volunteer roles in policing, firefighting, rescue, emergency medical services and more.

Additionally, thousands of hams are equipped and ready to provide reliable emergency communications whenever needed.

THANK YOU!

NexLog DX SERIES
COMMUNICATIONS RECORDERS

Public safety agencies and other mission-critical communications users worldwide trust Eventide's NexLog recording solutions to reliably capture, store, and reconstruct their important voice communications.

Eventide®
Founded & managed by hams
Little Ferry, New Jersey USA
eventidecommunications.com

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, $79.95. 30 Watts.
40-10 Meters, 66 feet:
MFJ-1984HP, $109.95. 800 Watts.
MFJ-1984MP, $89.95. 300 Watts.
MFJ-1984LP, $69.95. 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, $99.95.102 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, $114.95. 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, $114.95. 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, $289.95. 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, $319.95. Includes 8 hamsticks for 75/40/20/15 M.
MFJ-2100, $139.95. 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, $359.95. 6 bands: 40/20/15/10/6/2M, 12 feet.
MFJ-1797, $389.95. 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, $479.95.10 bands: 80/40/30/20/17/15/12/10/6/2M. 20 ft.
MFJ-1799X, $429.95. Like MFJ-1799, but less 80M.

MFJ 43-foot Vertical, 160-6 Meter

MFJ-2990,$429.95. 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, $239.95. 7-55 MHz. *Full-size* 20-6 Meter dipole, 40M air loading coil. Two 17 ft. telescopic whips, 28" collapsed.

MFJ-915, $59.95 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, $59.95 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, $59.95, 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, $29.95. 400W.
MFJ-272, $44.95. 1500W. Gas discharge tube shunts 5000 amps peak.< 0.1 dB loss. 1 GHz. SO-239s.

2-Position Antenna Switch

MFJ-1702C, $74.95. 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.
Add shipping. Prices and specifications subject to change. (c) 2017 MFJ Enterprises, Inc.
• 1 Year No Matter What™ warranty • 30 day money back guarantee (less s/h) on orders direct from MFJ
made in USA

Great Service Incredible DX

BeLoud.US
Work DX or be DX!

Low Cost Amateur Radio Remote

www.BeLoud.US
803-566-7388
BeloudUS@gmail.com

WOLF RIVER COILS LLC
SILVER BULLET ANTENNA PRODUCTS

WOLF RIVER COILS LLC

Silver Bullet Antenna
STAINLESS STEEL ANTENNA COILS FOR HOME, MOBILE OR STEALTH

- Vertical Antenna Easy Set up and Take down
- Odophone Dipole Antenna
- TIA System (Take It Along) Quick Set up
- TIA SOTA for the Backpacker
- Stainless Steel collapsible whips 213, 102, 78 inches

See You at Hamcation
Orlando FL
February 11-13
Booth 56 & 57

www.wrcoils.com

ADVANCED SPECIALTIES INC.
YAESU
The radio
www.advancedspecialties.net
BIG ONLINE CATALOG

VX-6R
Triband
Submersible
Hand Held

FTM-300DR
Dual-Band Digital

AMATEUR RADIO EQUIPMENT & ACCESSORIES · SCANNERS
ANLI · COMET · UNIDEN · YAESU
(201)-VHF-2067
114 Essex Street, Lodi, NJ 07644
Closed Sunday & Monday

PROMOTING THE USE OF TEN METERS SINCE 1962
Ten-Ten International Net, Inc.
Awards - QSO Parties - Special Events - Paperchasing
NETS DAILY (except Sunday) on 28.380 and 28.800 at 1800z
CHECK US OUT ON THE WEB
www.ten-ten.org / www.10-10.org
1349 Vernon Ter San Mateo CA 94402-3331

LARGE Tactical Radio Carrier

Fits: K3s
KPA500
IC-7200
IC-7300
FT-991A
FT-450
FT-857
FT-897
+Others
Tac-Comm.com

WA3RNC
TR-25 40/20-Meter CW Transceiver Kit
See Dec. 2021 Product Review, page 35

www.wa3rnc.com

Tigertronics *SignaLink™ USB*

When it comes to sound card interfaces, nothing beats the ***SignaLink USB's*** combination of performance, value, and ease of use! Whether you're new to Digital operation, or an experienced user, the ***SignaLink USB's*** built-in sound card, front panel controls, and simplified installation will get the job done right the first time—and without breaking the bank! The ***SignaLink USB*** supports virtually all sound card digital and voice modes, and works with virtually all radios. It is fully assembled (**made in the USA!**) and comes complete with printed manual, software, and all cables. Visit our website today and see what all the buzz is about!

Operate the WSJT-X FT8 mode plus most other sound card modes including PSK31, Olivia, SSTV, RTTY, VARA and CW to name a few!

Tigertronics
Grants Pass, Oregon
(800) 822-9722
(541) 474-6700

Order your SignaLink today at
www.tigertronics.com

Tigertronics 154 Hillview Drive Grants Pass, Oregon 97527

Got Noise?!

MFJ has answers

Noise-Cancellers Wipe Out Interference

Null out all types of noise!!! Severe power line noise from arcing transformers and insulators, fluorescent lamps, dimmers, touch controlled lamps, computers, TV birdies, lightning, garage door openers, electric drills, motors, industrial processes. It's much more effective than a noise blanker because interference much stronger than a desired signal can be completely removed without affecting the desired signal. All modes -- SSB, AM, CW, FM, frequences from BCB to lower VHF.

Null out strong QRM on top of weak rare DX ! Null out a strong local ham or AM broadcast station to prevent your expensive receiver from overloading.

Use as an adjustable phasing network. Combine two antennas to give you a powerful receive station and have a variety of directional patterns.

MFJ-1026 **$269.95**

MFJ-1026 simply plugs between your transmitting antenna and your transceiver. To null, you adjust the amplitude and phase potentiometer controls for a minimum S-meter reading or low noise. To peak, push reverse.

Use built-in active or external antenna. *Constant Amplitude Phase Control™* makes nulling super easy -- snag that rare DX you have missed.

RF-sense T/R switch auto bypasses your rig when you transmit. Adjustable T/R delay time. Use 12 VDC or 110 VAC with **MFJ-1312D, $26.95.** 6½X1½X6¼ inches.

MFJ-1025, $239.95. Like MFJ-1026, less the built-in active antenna. Use external antenna connection.

MFJ *Ultrasonic* Receiver with parabolic reflector *pinpoints* power line noise

HF and VHF operation can be affected by noise, makes it hard to hear weak stations, adds to fatigue. Often, noise comes from power lines. Power companies are willing to help with issues, but don't have equipment or trained personnel to locate it. MFJ aids in finding noise generated by corona discharge and arcing components. Acoustic receiver is tuned to 40 KHz. 18" diameter plastic dish gives a narrow beamwidth to pinpoint noise sources less than 12" at 50 feet. Also listen to nature: bats, birds, and insects!

MFJ-5008 **$249.95**

MFJ Power Line Noise Finder

MFJ-852 **$159.95**

Walk or drive around with these *handheld* power line noise meters to search out leaky insulators, loose hardware and corroded ground lines quickly. Track noise right down to the pole,transformer or insulator, or other source. Operates in 135 MHz region where activity is minimum and radiation from corona/arcing is more localized. 0.3 uV sensitivity and wide-range AGC for noise level meter -- *over 70 dB!*

MFJ-1767, $129.95. Adds 3-element beam to MFJ-852.

MFJ-856, $209.95. Combination of MFJ-852 noise finder and MFJ-1767 three-element beam antenna.

MFJ Low-Noise Receiving Mag Loop

Clearly hear signals 50 KHz to 30 MHz you never knew existed. Power line noise and static disappears. Rotating the MFJ-1886 eliminates interfering signals or greatly peaks desired signals. Excellent antenna and preamplifier balance gives deep null. Gives excellent strong and weak signal performance without overload. Fully protected state-of-the-art push-pull Gali MMICs preamplifier gives high dynamic range, low IMD and 25 dB of low noise gain. Use inside or outside.

Reduce Harmonics, Avoid TVI with MFJ Low Pass Filters

Suppress TVI, RFI, telephone, other interference by reducing unwanted harmonics to your antenna. Your HF signal still passes through with low loss so you snag that rare DX! *Keep the wife and neighbors happy!*

MFJ-702B, $59.95. 200W. SWR below 1.5 to 30 MHz.

MFJ-704, $124.95. 1500W. SWR below 1.3 to 30 MHz.

MFJ-705, $179.95. 2500W. SWR below 1.3 to 30 MHz.

MFJ Clamp-on RF Ammeters

MFJ-854 **$159.95**

Clamp-On RF Ammeters quickly snap over wires and cables to measure RF currents flowing in antenna elements, radials, ground wires and on outside of coax. Tune counterpoises, radials, ground systems. Study/optimize antennas for peak performance. Find peaks/nulls. MFJ-854 has five calibrated ranges to 3 Amperes, including sensitive 30 mA range.

MFJ-853, $99.95. Like MFJ-854, Ranges: 0.3, 1, 3 A. Mini size.

MFJ-853H, $99.95. 3/10/30 A ranges.

MFJ-805, $139.95. Check RFI on cables up to 1/4" dia. VLF to VHF.

MFJ AC Line Filter/Protector

MFJ-1164B **$104.95**

Filters and reduces AC power line RFI, hash, noise, transients, surges generated by computers, motors, RF transmitters, static/lightning by 30 db and up to 60-80 dB with ground. Fast, *nano-second* overvoltage protection. Provides inductive isolation, capacitive decoupling, RFI rejection, overvoltage protection of common mode, differential signals. Rejects/shunts undesired signals to ground. 12Wx3½Hx2D".

Ferrite RFI Suppression Chokes

MFJ-700A4, $21.95. .275" diameter 4-Pack
MFJ-700B4, $21.95. .402" diameter. 4-Pack
MFJ-700C4, $34.95. .528" diameter 4-Pack
MFJ-700D4, $39.95. .750" diameter 4-Pack

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.

Add shipping. Prices and specifications subject to change. (c) 2021 MFJ Enterprises, Inc.
• 1 Year No Matter What™ warranty • 30 day money back guarantee (less s/h) on orders direct from MFJ

EXPERT LINEARS America LLC

Authorized Distributor for

SPE

Linear Amplifiers for the Americas

ExpertLinears.com

Fully Automatic Solid State Amplifiers!

EXPERT 1.5K-FA ★EXpert 2K-FA

EXPERT 1.3K-FA

THE MOST TECHNOLOGICALLY ADVANCED IN THE WORLD!

Built-in Power supply & Fully Automatic Antenna Tuner - Fully Remoteable 160M thru 6M - All Ham Bands

ELA Offers

SALES & EXPERT SERVICE

★SPE Factory Trained over 9 years

★Warranty/Non Warranty Service

★Order Cables kc5pcb2@Att.net

See Hamfest EVENTS ON OUR WEBSITE

EXPERT LINEARS AMERICA, LLC

PO Box 1224
Magnolia, TX 77353
281-259-7877

ExpertLinears@Att.Net

Morse Made Easy!™

DMX-40 Transceiver

Dual Mode: Autonomous QRP 3-5 watt 40M SDR transceiver, and a decoder/encoder **transceiver assistant**, both with **best-in-class decoding** for reliable operation in any band condition! Color touch screen GUI, keyboard and manual key entry plus practice key timing analyzer. 10 frequency memories, 28 function & help screens, 3 built-in RPL programs for 4-way call & answer cybernetic automation. 12 user RPL programs to add features and recast operating style to match the user SOP.

PreppComm

www.PreppComm.com

eric@AF7YQ.com

DTMF decoder board with eight relays

Remote control eight devices via radio audio. Password protection against unauthorized entry. Unique board ID. Comes assembled **with relays.** 4.5" x 2.5".

Intuitive Circuits, LLC
Voice: (248) 588-4400
http://www.icircuits.com

DTMF-8 $119.00
Visa • MC • Prepayment

Fun and affordable kits from Pacific Antenna

See our selection of quality Kits starting at $5

www.qrpkits.com

STOP RFI NOW

RFI Kits—Home/Mobile/Portable

Audio/home theater, AM/FM Broadcast, Marine/RV, Ham Radio, Consumer Electronics, Computer, Solar, Garage Door, Grow Lights, HVAC, LED, Ethernet/ Cable TV/DSL, Appliances

Ferrites—Toroid Rings, Snap-on, Slip-on—all sizes

Noise Filters—*for AC/DC power, coax noise filters, wall wart, generator, inverter, battery charger*

Antennas, Chokes, Transformers

BULLET™ End Fed, OCF, Loop antennas from QRP to Kilowatts, Termination Resistors for BBTD, T2FD 1:1 to 81:1 Baluns/Ununs to 5 KW, 100 KHz-180 MHz

On-line Tutorials *show how to stop RFI from 100 KHz to 2 GHz - OEM, Dealer, Group Quantity Pricing, Monthly Specials, Download Free RFI Tip Sheet*

Palomar-Engineers®.com

760-747-3343

Inspiration... Exploration... Experimentation

Amateur Radio on the International Space Station—

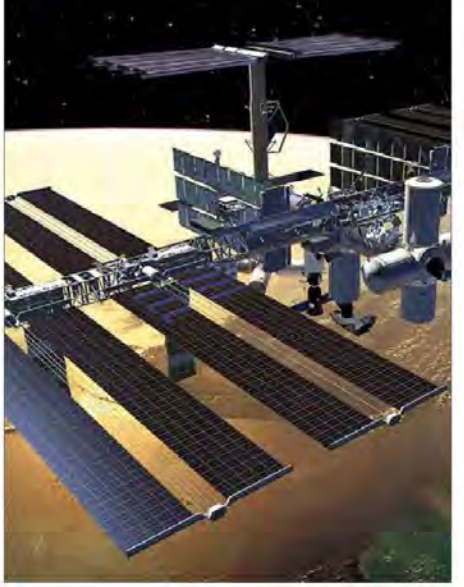
ARISS

- Licensed hams (like you!) contact the ISS via Amateur Radio voice, packet/APRS, SSTV, and digital TV
- Students interview astronauts in space and learn about life in space, space research, and radio science
- Hams on the ground experiment with space communications
- Amateur Radio supports NASA by providing ISS backup communications

Your donations will help support continuing operations and Amateur Radio equipment upgrades on the ISS.

Receive an ARISS Challenge Coin for a donation of $100 or more

Go to www.ariss.org and click on "Donate" to help keep Amateur Radio in space!



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-SDR-S, $149.95. 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, $64.95. 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
$139.95

Untuned Indoor SDR Active Antenna

MFJ-1022, $99.95.

Hear weak, noisy VLF to UHF signals. Noise-less feedback gives excellent low noise reception. Handles strong signals.

Active OutdoorAntenna

MFJ-1024
$209.95

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 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-1040C
$159.95

MFJ LW/MW/SW SDR Preselector/Tuner

Highly rated series-tuned MFJ boosts your desired signals while greatly rejecting interference and preventing serious overload.

MFJ-956
$109.95

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

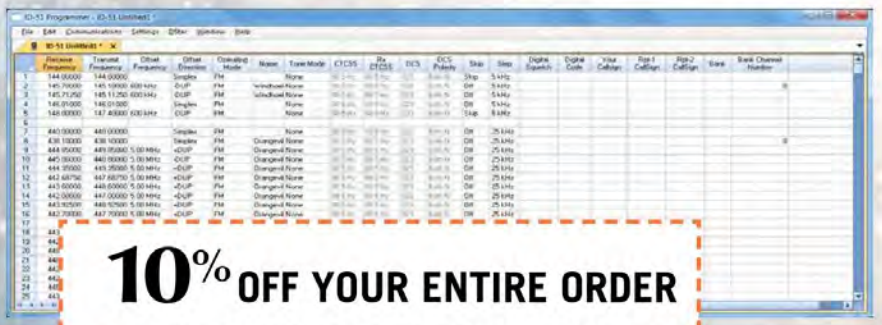
MFJ-1707B
$139.95.

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.

Add shipping. Prices and specifications subject to change. (c) 2021 MFJ Enterprises, Inc.
• 1 Year No Matter What™ warranty • 30 day money back guarantee (less s/h) on orders direct from MFJ

Discover a Better Way to Program Your Radio



10% OFF YOUR ENTIRE ORDER

Use coupon code **HAMCATION2022** at time of payment.

www.rtsystemsinc.com

Offer good February 11 - 20, 2022.

"Everything you've ever wanted is on the other side of fear."
– George Addair

~~502~~
496 unique radio Programmers... Check for your radio model at:
www.rtsystems.com

Available from RT Systems or Your Local Radio Dealer
800-476-0719 | www.rtsystems.com
Personal Assistance Mon.-Fri. 8:00-6:00 EST

No CD Drive? ... No Problem
- Get your RT Systems programmer by electronic download immediately after purchase.
- Use any Internet connection to retrieve the setup files.
- Repeated downloads allowed for your use.

Stop wasting time with other programmers.

- Explore all your radio can do by seeing the features on the computer screen.
- Options you struggle to set from the face of the radio can be set up and saved in the Programmer, then easily transferred to the radio.

rt SYSTEMS

HAMMOND

MANUFACTURING FOR RADIO SINCE THE BEGINNING

PETER W. DAHL CO. CUSTOM TRANSFORMERS

- Racks & Cabinets, Shelves, Panels, Outlet Strips
- Small Cases & Project Boxes
- Transformers

RACKS & CABINETS

TRANSFORMERS

SMALL CASES

Technical Data, Drawings, List of Stocking Distributors:
www.hammondmfg.com

Mark Your Calendar!

2022 FIELD DAY

June 25–26, 2022

arrl.org/FieldDay

Free Dealer/Catalog/Manuals/Instructions -- Visit: www.mfjenterprises.com or call toll-free 800-647-1800

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 **$229.95**

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 inches. **MFJ-4416BRC, $119.95.** Booster Remote Control.

Super Heavy Duty Battery Booster

MFJ-4418 **$279.95**

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 **$89.95**

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 **$69.95**

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 **$21.95**

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 **$69.95**

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 **$124.95**

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 **$29.95**

Protect your expensive equipment from lightning induced surges on 50 Ohm coax. Use for transceivers up to 400 Watts, 1000 MHz. **MFJ-272, $44.95.** 1.5 kW.

MFJ 30-Amp Power Supply

MFJ-4230MV **$144.95**

World's most compact 30 Amp switching power supply. Switchable Volt/Amp meter. Adjustable 4 to 16 VDC output. Select 120/240 VAC input. 5Wx2½Hx6D in., 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, $349.95.** Relative RF antenna current and Cross-needle SWR/Wattmeter. **MFJ-933C, $249.95.** Like MFJ-935C, no meter.

MFJ Field Strength Meter

MFJ-801 **$44.95**

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 **$79.95**

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 **$27.96** 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 Artificial RF Ground

MFJ-931 **$149.95**

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 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, $26.95.

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.

Add shipping. Prices and specifications subject to change. (c) 2021 MFJ Enterprises, Inc.
• 1 Year No Matter What™ warranty • 30 day money back guarantee (less s/h) on orders direct from MFJ

RF Connectors and Adapters

DIN – BNC
C – FME
Low Pim
MC – MCX
MUHF
N – QMA
SMA – SMB
TNC
UHF & More

Attenuators
Loads & Terminations
Component Parts
Hardware
Mic & Headset Jacks
Mounts
Feet – Knobs
Speakers & Surge Protectors
Test Gear Parts
Gadgets – Tools

www.W5SWL.com

DMMCheck Plus

New L/C Board Option
10% off with promo code "ARRL"

Precision Reference Standard
Test the accuracy of your digital and analog meters, oscilloscopes and other equipment.
Resistance : .1%, 10ppm, 100Ω, 1.00KΩ, 10.00KΩ, and 100.0KΩ
DC voltage : 5V, ±0.007% precision voltage reference
DC current : 1mA, ±0.1%
AC voltage : 5V RMS, bipolar (+5V, -5V) square wave, ±0.1%
AC current : 1mA RMS, ±0.2%
Frequency : 100Hz, ±0.02% signal source (2nd freq. option)
Duty Cycle : 100Hz, 5V RMS, signal source @ 50% ±0.05%
New Inductance/Capacitance Reference Option
www.DMMCheckplus.com

HONDA GENERATORS

MOTOSPORTS OF UKIAH
"By hams, for hams" • K2HZO • KM6LLL
EU2200i 10% more powerful... just as light and as quiet as previous model.
Microcomputer-controlled sinewave inverter: clean sine wave– making it ideal for use with frequency-sensitive electrical equipment such as computers and radio equipment
Eco-Throttle: only runs at necessary speed to power what you are running – reduces noise and fuel consumption!
Clean, Quiet, Portable power!
New Model! Lowest Prices!!
(800)-832-7365
www.hondashop.com
Free Shipping!! (In the continental 48 states)
CA residents add 7.375 tax
Please read your Owner's Manual and all labels before operation.

"THE COAXMAN"
Quality Coax and Wire for Amateur Radio
Amateur Radio Coax, Baluns, Assemblies of Any Length, Wireman Coax, Antenna Wires & Accessories
www.coaxman.com
orders@coaxman.com
Clear Signal Products, LLC
405-376-9473

Air Boss Antenna Launcher
www.olahtechnologies.com
See Video
For when you want your antenna on top
$89.99
Free shipping to lower 48
olahtechnologies@gmail.com

MOSLEY ANTENNAS ...built to last!

AIRCRAFT GRADE ALUMINUM ELEMENTS & BOOMS and STAINLESS STEEL HARDWARE
STRONG!
AVERAGE IN USE LIFE OF 27+ YEARS WITHOUT MAINTENANCE

Mosley "Shorty 40"
The SF-402-A is a heavy duty, smaller 2 element for 40 meters!
SMALLER In Size - BIG in Performance!
SF-402-A
* NO MEASURING
* PRE-DRILLED
* COLOR CODED
* 2 YEAR WARRANTY
* 14 FOOT BOOM
* LESS THAN 48 LBS. ASSEMBLED

Call 800-325-4016
to REQUEST A CATALOG or E-mail from our Website
FIND MORE *Mosley* designs at www.mosley-electronics.com

"Best thing since sliced bread!"

More hams use MFJ analyzers than all others in the world!

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, $26.95. Rugged metal cabinet, 4x2x6¾". **MFJ-249D, $329.95.**

MFJ-249D does everything MFJ-259D does with digital display only.

MFJ-269D . . . 280 KHz - 230 MHz plus 415-470 MHz, 12-bit A/D

New and improved. Now covers 280 KHz to 230 MHz and 415 to 470 MHz and 2200 Meter band!

Instantly gives you a complete picture of your antenna.

Read SWR, return loss, reflect-ion coefficient, match efficiency at any frequency simultaneously.

Read Complex Impedance (100 KHz to 230 MHz) as series equivalent resistance and reactance (Rs+jXs) or as magnitude (Z) and phase (degrees). Also reads parallel equivalent resistance and reactance (Rp+jXp).

Determine velocity factor, coax loss in dB, length of coax and *distance to short or open in feet (it's like a built-in TDR).*

Coax Calculator™ calculates coax line length in feet given degrees and vice versa for any frequency, velocity factor.

Measure SWR and loss of coax with *any* characteristic impedance (280 KHz to 230 MHz) from 10 to over 600 Ohms.

Measures inductance in uH and capacitance in pF at RF frequencies, 100 KHz to 230 MHz.

High contrast LCD gives precision readings and two side-by-side analog meters make antenna adjustments smooth and easy.

12-bit A/D converter gives much better accuracy and resolution than common 8-bits -- *MFJ-269D exclusive!*

Built-in frequency counter, battery saver, low battery warning, Ni-Mh/NiCd charge circuit. 4Wx2Dx6¾", 2 lbs. Use ten aA batteries or 110 VAC with MFJ-1312D, $26.95.

New! MFJ-269D **$449.95**

MFJ-269DPRO™ SWR Analyzer

MFJ-269DPro, $489.95. Like MFJ-269D, but UHF range covers *430 to 520 MHz*. For commercial work.

MFJ-223 1-60 MHz Color Graphic VNA Analyzer

MFJ-223 **$349.95**

This *pocket-sized wonder* breaks the mold for analyzer design with user-friendly convenience, top notch accuracy, and a vivid TFT multi-color display. Don't let the size fool you, it's packed with VNA features and performance you need!

- **Single-frequency** and *swept-frequency* operation
- **Truly accurate** SWR, R, X, and Z measurements
- **Seamless DDS** coverage, 100-Hz resolution from 1-60 MHz
- **Smooth "skip-free"** encoder tunes fast or slow without missing a step
- **Powerful +5-dBm** stimulus generator
- **Field-strength meter**
- **DDS generator** precision signal source
- **Vivid 1600-pixel/inch** color graphics on a 2x2 inch non-glare TFT screen

MFJ-225 1.5-180 MHz *continuous* Two-Port Graphic Analyzer

MFJ-225 **$349.95**

Out in the field, the MFJ-225 is a compact completely *self-contained handheld graphing analyzer.* On the bench it becomes a full-fledged two-port (S21) desktop machine when teamed up with your PC. Using powerful IG-miniVNA freeware, you'll run de-tailed data analysis and print out stunning color-graphic plots to document your work! Built-in back-lighted *3-inch LCD graphic* display. Make fine adjustments using full-screen easy-to-view SWR bargraph, capture vivid swept displays for SWR, impedance, re-turn loss, phase angle, more. DDS generator.

SWR Analyzer Accessories

A. **MFJ-29D/MFJ-39D, $44.95.** Carrying Pouch for MFJ-259D/269D.

B. **MFJ-92AA10, $44.95.** 10-Pk 2500 mAh Ni-MH Supercells.

C. **MFJ-66, $44.95.** Dip coils, set of two covers 1.8-230 MHz.

D. **MFJ-731, $134.95.** Tunable Analyzer Filter, 1.8-30 MHz, for strong RF fields.

E. **MFJ-917, $54.95.** 1:1 Current balun for SWR Analyzers to test balanced line antennas, other loads.

F. **MFJ-7737, $8.95.** PL-259 to BNC Female.

G. **MFJ-7727, $8.95.** 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.

Add shipping. Prices and specifications subject to change. (c) 2021 MFJ Enterprises, Inc.

• 1 Year No Matter What™ warranty • 30 day money back guarantee (less s/h) on orders direct from MFJ

Yuma Hamfest
& Southwestern Division Convention
Yuma, Arizona
Feb. 18 & 19, 2022

Yuma County Fairgrounds
2520 East 32nd Street, Yuma, Arizona

www.yumahamfest.org

Check the Website for Additional Information

Gates Open for Camping Thursday, 2 pm Vendor Setup Friday, 7 pm - Noon	Event Hours Friday, Noon - 5 pm Saturday, 8 am - 5 pm	BBQ Dinner & Prize Drawings Saturday Night 6:00 - 8:30 pm

Vendors and Exhibitors
Hourly Door Prizes
Consignment Sales
License Testing
On-site RV Camping
Buzzard BBQ
ARRL Speakers
Transmitter Hunt
Near Space Balloon Launch

Tailgating (Swap Meet)
$10 Admission
DXCC Card Checks
Full Seminar Schedule
$27,000 + Grand Prizes
Admission Prizes
Hospitality Area
Antenna Clinic
On-site Food Concessions

W1AW/7 Special Event Station
Email: info@yumahamfest.org

Free Catalog/Dealers/Manuals Online – Visit: www.mfjenterprises.com or call toll-free 800-647-1800

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

MFJ 1500 Watt Remote Auto Tuner

Place this MFJ-998RT remote tuner at your antenna to match high SWR antennas/long coaxes -- greatly reduce losses for high efficiency

. . . Match 12-1600 Ohms, 1.5 kW, SSB/CW/Digital, 1.8-30 MHz . . . Match coax/wire antennas . . . Weather-sealed . . . Remotely powered thru coax . . . Amplifier, radio, tuner protection . . . Output static/lightning protection . . . StickyTune™ always tunes when power folds back . . . DC power jack . . .

MFJ-998RT
$919.95

Bottom Chassis

Inside View

Tune your antenna at your antenna

Get greatly reduced losses and high efficiencies with long coax runs and high SWR antennas with this new MFJ-998RT 1.5 kW Remote Antenna Tuner.

Weather-Sealed

A tough, durable weather-sealed ABS cabinet with over-lapping lips, sealing gasket and stainless steel chassis protects the MFJ-998RT from all kinds of weather.

No Power Cable Needed!

No power cable needed -- remotely powered through coax. Includes MFJ-4117 Bias-Tee with on/off switch for station end of coax. Has 12 VDC jack for power cable, if desired.

Fully Protected

MFJ exclusive algorithms protect your tuner, radio and RF power amplifier from damage.

Automatic inductor and capacitor limiting prevents tuning extreme loads which can destroy your tuner.

Your tuner will not tune if more than 75 Watts with SWR greater than 3:1 is applied or if more than 125 Watts is applied.

Tuner output is static electricity and lightning induced surge protected.

MFJ exclusive StickyTune™

Very high SWR can fold back transmitter power and prevent tuning caused by extreme differences in loads (example: changing bands and other conditions).

But MFJ exclusive StickyTune™ always tunes with a simple on/off power cycle and re-transmit.

Tunes Coax fed and Wire Antennas

Tunes both coax fed and wire antennas. Has ceramic feed-through insulator for wire antennas. 2 kV Teflon® insulated SO-239 – prevents arcing from high SWR.

High Power, Highly Efficient

A highly efficient L-network matches 6-1600 Ohms at full 1500 Watts legal limit SSB/CW and Digital, 1.8 to 30 MHz with Hi-Q Ls, Cs.

MFJ-998RT Learns as you Operate

As you operate, the MFJ-998RT automatically tunes for minimum SWR and remembers your frequency and tuner settings. The next time you operate on that frequency and antenna, its tuner solution is restored in milliseconds and you're ready to operate!

Highly Intelligent, Ultra-fast Tuning

MFJ InstantRecall™ recalls stored tuning solutions from 10,000 memories. For new frequencies, MFJ Intelli-Tune™ measures your antenna impedance and instantly determines the correct matching components. If antenna impedances cannot be measured, MFJ AdaptiveSearch™ searches only the relevant components that can match your antenna giving you ultra-fast tuning.

Field upgradeable firmware. Requires 12-15 VDC at 1.4 Amps maximum or 110 VAC with optional **MFJ-1316, $39.95**. Weighs 9.5 lbs. $13\frac{1}{4}$W x $6\frac{3}{4}$H x $17\frac{1}{2}$D inches.

600W Remote IntelliTuner™

MFJ-994BRT – perfect for 600 Watt SSB/CW amplifiers like Ameritron's AL-811/ ALS-600/ALS-500M. Matches 12-800 Ohms. Coax/wire antennas, 1.8-30 MHz. Fully weather-sealed for outdoor use. Remotely powered through coax. Tough, durable, built-to-last cabinet, $9\frac{1}{4}$W x 3H x $14\frac{1}{4}$D inches, 4 lbs. Includes MFJ-4117 BiasTee Power Injector.

MFJ-994BRT
$509.95

200W Remote IntelliTuner™

MFJ-926B, 200 Watts SSB/CW/Digital, 6-1600 Ohms, Coax/wire antennas, 1.8-30 MHz. Includes BiasTee.

MFJ-926B $379.95

300W Remote IntelliTuner™

MFJ-993BRT handles 300 Watts SSB/CW and digital.Has extra-wide 6-1600 Ohm impedances. Coax/ wire antennas, 1.8-30 MHz. Fully weather-sealed for remote outdoor or marine use. Remotely powered through coax. Tough, durable, built-to-last cabinet measures $9\frac{1}{4}$W x 3H x $14\frac{1}{4}$D inches. Weighs just 4 pounds. Includes MFJ-4117 BiasTee Power Injector.

MFJ-993BRT
$389.95

MFJ No Matter What™ Warranty

One year **No Matter What**™ Warranty
30 Day Money Back Guarentee
(less s/h) on orders direct from MFJ.

160-6 Meters 43 foot Vertical Antenna

Operate all bands 160-6 Meters at full 1500 Watts with this self-supporting, 43 foot high performance vertical! Assembles in less than an hour. Low profile blends in with sky and trees -- barely see it. Entire length radiates. Exceptional low angle DX performance on 160-20 Meters and very good performance on 17-6 Meters. Telescope it shorter for more effective low angle radiation on 17-6 M if desired. One of these wide range MFJ automatic tuners at the antenna easily matches all bands 160-6 Meters. There's no physical tuning adjustments on the antenna -- you simply put it up! Requires ground system, at least one radial, more the better. Includes balun and base mount. **MFJ-1932, $44.95**. All band ground radial system.

MFJ-2990
$399.95

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.

Add shipping. Prices and specifications subject to change. ©2021 MFJ Enterprises, Inc.
• 1 Year No Matter WhatTM warranty • 30 day money back guarantee (less s/h) on orders direct from MFJ

MFJ_998RT_061512_101421DS

LDG

410-586-2177

LIVE!

The Best LDG Tuner EVER?

600W PEP - 1 to 54 MHz 10:1 Tuning Range

JOIN SUBSCRIBE

681,600 VIEWS!

LDGElectronics.com

Still Struggling With Your 20-Year-Old Repeater Controller?

More Power, More Features Less Money

State-of-the-Art Repeater Controllers and Accessories

Arcom

Aurora, OR 97002 (503) 678-6182

www.arcomcontrollers.com

www.SwapMyRigs.com

Modular Rig VGA-Cable Mobile Separation Kit

Swap rigs without ever changing cables.
One cable replaces three regardless of make or model.
$89.99 complete with 15' VGA cable.

AE4S, LLC

THE WIREMAN, INC™

"CERTIFIED QUALITY"

800-727-WIRE (9473)

Still, going strong after 35 years! The "**Keywords**" for "Certified Quality" Wire, Cable, Connectors, Accessories,and customer service. See it all at www.thewireman.com

Tech Help: 864-895-4195 or info@thewireman.com

SOUTHWEST US? Call 405-376-9473

TOP WIREMAN dealer **CLEAR SIGNAL PRODUCTS**

www.coaxman.com • orders@coaxman.com

Gear Up for

CYCLE 25

arrl.org/shop/Cycle-25

We stock the rugged 1KW transistor and parts for the 2M and 88-108MHz amplifier designs. We also stock the NXP MRF101 LDMOS transistors.

RF TRANSFORMERS 2—54MHz

RF2000

COAX WIRE

FLEXIBLE
TC-12 - 10.7 ohm
TC-18 - 17.1 ohm
TC-20 - 18.6 ohm
TC-22 - 21.7 ohm
TC-24 - 26.8 ohm
SM250-50 50 ohm

SEMI-RIGID
UT-141C-25 25 ohm
260-4118-0000 25 ohm

CCI Communication Concepts, Inc.

508 Millstone Drive, Beavercreek, OH 45434-5840

Email: cci.dayton@pobox.com

www.communication-concepts.com

Phone (937) 426-8600

Established in 1979

Type "U"
2 to 300MHz

Free Catalog/Dealers/Manuals Online – Visit: www.mfjenterprises.com or call toll-free 800-647-1800

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

MFJ Tuners

Ham Radio's Most Popular 300 Watt Antenna Tuner

More hams use MFJ-949s than any other antenna tuner in the world!

Why? Because the world's leading tuner has earned a worldwide reputation for being able to match just about anything.

Full 1.8-30 MHz Operation

Tune your antenna for minimum SWR! Works 1.8-30 MHz on dipoles, verticals, inverted vees, random wires, beams, mobile whips, shortwave receiving antennas...Use coax, random wire, balanced lines. Has heavy-duty 4:1 balun for balanced lines.

Custom inductor switch

Custom designed inductor switch, 1000 volt tuning capacitors, Teflon® insulating washers and proper L/C ratio gives you arc-free no worries operation up to 300 Watts PEP transceiver input power.

The MFJ-949E inductor switch was custom designed to withstand the extremely high RF voltages and currents that are developed in your tuner.

MFJ-949E **$249.95**

8-Position Antenna switch

Antenna switch lets you select two coax fed antennas, random wire/balanced line or dummy load through your MFJ-949E or direct to your transceiver.

Lighted Cross-Needle Meter

Full size 3-inch lighted Cross-Needle Meter. Lets you easily read SWR, peak or average forward and reflected power simultaneously. Has 300 Watt or 30 Watt ranges.

QRM-Free PreTune™

MFJ's QRM-Free PreTune™ lets you pre-tune your MFJ-949E off-the-air into its built-in dummy load! Makes tuning your actual antenna faster and easier.

Plus Much More!

Full size built-in non-inductive 50 Ohm dummy load, scratch-proof Lexan multi-colored front panel, $10^5/_8$ x $3^1/_2$ x 7 inches. Superior cabinet construction and more!

MFJ-948, $219.95. Econo version MFJ-949E. Has all features except for dummy load.

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.

More hams use MFJ tuners than all other tuners in the world!

MFJ-989D Legal Limit Tuner

MFJ-989D **$499.95**

New, improved MFJ- 989D legal limit antenna tuner gives you better efficiency, lower losses and a new true peak reading meter. Easily handles full 1500 Watts SSB/CW, 1.8-30 MHz, including MARS/WARC bands. Six position antenna switch, dummy load. New 500 pF air variable capacitors. New improved AirCore™ Roller Inductor. New high voltage current balun. New crank knob. $12^7/_8$W x 6H x $11^5/_8$D inches.

MFJ-986 Two knob Differential-T™

MFJ-986 **$449.95**

Two knob tuning (differential capacitor and AirCore™ roller inductor) makes tuning foolproof and easier than ever. Gives minimum SWR at only one setting. Handles 3 KW PEP SSB amplifier input power (1.5 KW output). Gear-driven turns counter, lighted peak/average Cross- Needle SWR/Wattmeter, antenna switch, balun. 1.8 to 30 MHz. $10^3/_4$W x $4^1/_2$H x 15 in.

MFJ-962D Compact kW Tuner

MFJ-962D **$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, pk/avg lighted Cross-Needle SWR/Wattmeter, antenna switch, balun, Lexan front, 1.8-30MHz. $10^3/_4$ x $4^1/_2$ x $10^7/_8$ in.

MFJ-969 300W Roller Inductor Tuner

Superb, AirCore™ Roller Inductor tuning. Covers 6 Meters thru 160 Meters! 300 Watts PEP SSB. Active true peak reading lighted Cross-Needle SWR Wattmeter, QRM-Free PreTune™, antenna switch, dummy load, 4:1 balun, Lexan front panel. $10^1/_2$W x $3^1/_2$H x $9^1/_2$D inches.

MFJ-969 **$299.95**

MFJ-941E Super Value Tuner

Most for your money! 300 Watts PEP, 1.8-30 MHZ, lighted Cross-Needle SWR/Wattmeter, 8 position antenna switch, 4:1 balun, 1000 volt capacitors, Lexan front panel. $10^1/_2$W x $2^1/_2$H x 7D in. **MFJ-941EK, $179.95.** Tuner Kit -- Build your own!

MFJ-941E **$199.95**

MFJ-945E HF/6M Mobile Tuner

Extends your mobile antenna bandwidth so you don't have to stop, go outside and adjust your antenna. Tiny 8 x 2 x 6 in. Lighted Cross-Needle SWR/Wattmeter. Lamp and bypass switches. Covers 1.8-30 MHz and 6 Meters. 300 Watts PEP. **MFJ-20, $13.95**, mobile mount.

MFJ-945E **$189.95**

MFJ-971 Portable/QRP Tuner

Tunes coax, balanced lines, random wire 1.8-30 MHz. Cross-Needle Meter. SWR, 30/300 or 6 Watt QRP ranges. Matches popular MFJ transceivers. Tiny 6 x $6^1/_2$ x $2^1/_2$ in.

MFJ-971 **$179.95**

MFJ-901B Smallest Versa Tuner

MFJ's smallest (5 x 2 x 6 in.) and most affordable wide range 200 Watt PEP Versa tuner. Covers 1.8 to 30 MHz. Great for matching solid state rigs to linear amps.

MFJ-901B **$149.95**

MFJ-902B Tiny Travel Tuner

Tiny $4^1/_2$ x $2^1/_4$ x 3 inches, 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. $7^1/_4$ x $2^1/_4$ x $2^3/_4$ inches.

MFJ-902B **$149.95**

MFJ-16010 Random Wire Tuner

Operate all bands anywhere with MFJ's reversible L-network. Turns random wire into powerful transmitting antenna. 1.8-30 MHz. 200 Watts PEP. Tiny 2 x 3 x 4 in.

MFJ-16010 **$104.95**

MFJ-9201 QRPocket™ Tuner

80-10 Meters, 25 Watts. 12 position inductor, tune/bypass switch, wide-range T-network, BNCs. 4W x $2^5/_8$H x $1^1/_2$D inches. **MFJ-9201, $74.95**

MFJ-9201 **$74.95**

MFJ-921/924 VHF/UHF Tuners

MFJ-921 covers 2 Meters/220 MHz. **MFJ-924** covers 440 MHz. SWR/Wattmeter. 8 x $2^1/_2$ x 3 in.

MFJ-921/924 **$124.95**

MFJ-931 Artificial RF Ground

Eliminates RF hot spots, RF feedback, TVI/RFI, weak signals caused by poor RF grounding. Creates artificial RF ground or electrically places far away RF ground directly at rig. **MFJ-934, $279.95**, Artificial ground/300 Watt Tuner/Cross-Needle SWR/Wattmeter.

MFJ-931 **$139.95**

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.

Add shipping. Prices and specifications subject to change. ©2021 MFJ Enterprises, Inc.
• 1 Year No Matter What™ warranty • 30 day money back guarantee (less s/h) on orders direct from MFJ

ARRL Handbook

2022

Current, Comprehensive, & Complete

The ARRL Handbook **is your complete guide to radio experimentation, discovery, and innovation.**

New Projects:

3D Printing for Ham Radio Construction

—

Battery Selection for Portable Operation

—

Solid-State Amplifier Linearity

—

Safe Practices for Antenna and Tower Work

Available in:

SIX-VOLUME BOOK SET
$59.95

SOFT COVER BOOK
$49.95

Order online at arrl.org/shop

ARRL
The National Association for Amateur Radio®

MFJ Portable Antennas!

Cover HF bands with one single EFHW, 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, $79.95. *30 Watts* QRP, 80-10 Meters. 132 feet.
MFJ-1984LP, $69.95. *30 Watts* QRP, 40-10 Meters. 66 feet.

17' Stainless Steel Telescopic Whip

MFJ-1979, $74.95. Premium stainless steel, 17 feet ext., 27" collapsed. Adjust length for full 1/4 wave antenna on 20-2M. Use MFJ-67 loading coil for 30/40/60/80M. For 3/8-24 standard mounts.

33' Telescopic *Portable* Mast

MFJ-1910, $109.95. Fiberglass. 3¾ ft collapse, 3.3 lbs.

BigEAR™ Dipole

MFJ-2289, $249.95. 7-55 MHz portable, 34' ext., 28" collapsed, balun, 1kW, 30/40M coil.

BigStick™ Vertical

MFJ-2286, $149.95. 7-55 MHz 17' ext., 28" collapsed, mount, counterpoise, 30/40M coil, 1kW.

BigEar™ Combo

MFJ-2289PKG, $369.95. BigEAR, tripod/mast. Canvas carry bag, padding, pockets, handle.

Single-band Rotatable mini Dipoles

MFJ-22XX, $79.95. Lightweight *true balanced* mini-dipoles for portable and space limited use. Choose: 75/60/40/30/20/17/15/12/10/6 Meters. Includes two HF sticks of your choice and dipole mount.

MFJ-347, $29.95. *True isolated balanced* dipole mount only. 1.25" mast size.

4-Band *Octopus* Antenna *Hub*

MFJ-2100, $139.95. *Turns pairs of hamsticks into four fully balanced dipole antennas in minutes!* Any bands: 80-2M, 440 MHz. Balun, single coax feed, no antenna tuner needed. Perfect for fiberglass pole on tripod at any height. Eight 3/8-24 connectors for antennas.

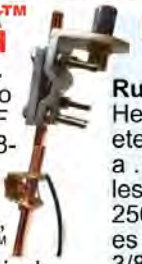
MFJ *Walk-About* 80-6M Antenna

MFJ-1899T, $109.95. Operate 80-6 Meters/WARC bands. BNC attaches directly to your Yaesu FT-817, Elecraft KX1/2/3, Icom IC-705, Xiegu G-90, X5105. 12" loading coil with wander lead. 10-section telescopic whip, 52" ext., 7" collapsed. Whip unscrews for easy carry and storage. 25 Watts.

MFJ-7703, $9.95. BNC/PL-259 right angle adapter.

MFJ *QuickStik™* Mount/Ground

MFJ-1936T, $49.95. Push into ground up to 4 ft., attach any HF/VHF/UHF antenna with 3/8-24 connector like a hamstick or whip, attach coax to SO-239, operate! Use *QuickStik™* as *ground* and/or use included 25 ft. counterpoise wire.



10-band 80-2M *Mobile/Portable*

MFJ-1699T/S, $89.95 HF: 80-10 Meters, VHF: 6 and 2 Meters. Low SWR, 200 Watts. Wander lead changes bands. Maximum height is 49.5 inches. 3/8-24 or PL-259. Whip unscrews at base for quick storage.

Hamsticks! Choose: 75/40/30/20/17/15/12/10/6 Meters. **$24.95-$34.95 each.**

MFJ Mobile HF Hamsticks

Rugged Construction. Heavy-duty 4', 3/8" diameter fiberglass base with a .125" diameter stainless steel whip. Handles 250 Watts PEP. Collapses to 4 feet for storage. 3/8x24. 75/40/30/20/17/15/10/6M. $24.95-$34.95

MFJ 10-40 Meters *Portable* Antenna

MFJ-1621, $139.95. 40-10M, telescoping whip: 54" extended, 22" collapsed. Tuner, field strength meter, 50' coax. 200W SSB/CW.

Box Fan Mag Loop

MFJ-1780, $419.95. Portable 2x2 ft. Carry handle. 14-30 MHz *continuous*. 150W SSB/CW. High efficiency *true mag loop*, no rotating contact *butterfly capacitor*, all welded. Fast/slow tune remote control.

Portable MFJ Tripods and Tripod/Masts

Black *steel* base forms strong braced equilateral triangles on a side. Non-skid feet, strong, mast locks.
MFJ-1919, $119.95. 9¾ lbs. Holds 100 lbs. 1.4" dia. mast extends 7.8 ft. Base spreads to 4.8 ft. 54"x6" dia. collapsed.
MFJ-1919EX, $189.95. Tripod *plus* 18' fiberglass mast. 5' collapsed. 1/8" wall, 3/4" dia. top, 1½" dia. bottom. 15 lbs.
MFJ-1918, $79.95. Tripod: 6' ext. 38" collapsed, 6¾ lbs.
MFJ-1918EX, $119.95. Smaller tripod with 9½' fiberglass mast. 3.8 ft. collapsed, ¾"top, 1" bottom. 6.5 lbs.

MFJ *QRPocket™* *Loop Tuner*

MFJ-9232, $79.95. Drape a wire around a bookcase, window, tree or other and attach to this MFJ QRP Loop Antenna Tuner. It becomes a 25 Watt multi-band transmitting magnetic loop! 40-10 Meters with included flexible wire loop. No ground, radials or needed.

QRP Antenna Tuner

MFJ-9201, $74.95. *Tunes any antenna* 80-10 Meters, 25 W. 12-position hi-Q inductor, tune/bypass, antenna and transmitting matching variable capacitors, BNC connectors. Tiny 4Wx2⅝Hx1½D inches -- MFJ-9201, rig and antennas easily fit into a backpack or briefcase for vacation, SOTA, hikes, etc.

MFJ Manual Tuner

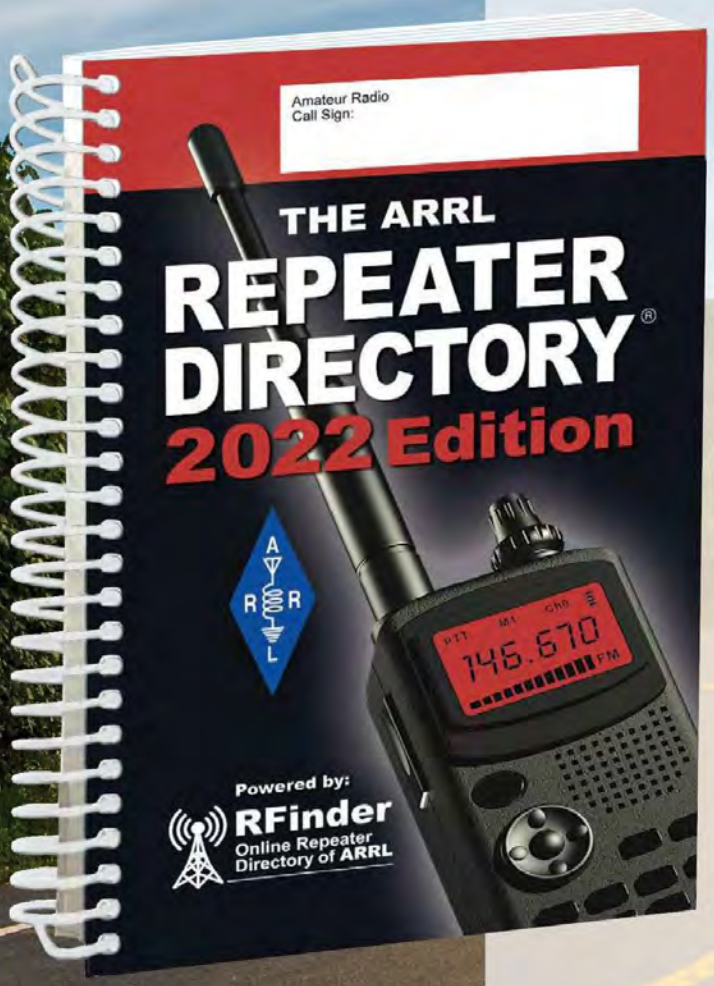
MFJ-945E, $189.95. 1.8- 60 MHz, 300 Watts PEP. Tunes coax-fed antennas and random wires. Lighted cross-needle SWR/forward and reflected Wattmeter. Bypass switch bypasses tuner. SO-239, wing nut post for ground. Efficient, low loss airwound inductor. Small, 8Wx2Hx6D inches.

200W Auto Tuner

MFJ-939, $199.95. Plug and play auto tuner for Icom, Yaesu, Kenwood and others. Automatically tunes any antenna ultra-fast! 20,000 Virtual antenna memories, matches 6-1600 Ohms, 1.8-30 MHz, 2 to 200 Watts SSB/CW. Radio interface cable included, 2-year MFJ warranty. 6½Wx1⅝Hx7½D".

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.
Add shipping. Prices and specifications subject to change. (c) 2021 MFJ Enterprises, Inc.
• 1 Year No Matter What™ warranty • 30 day money back guarantee (less s/h) on orders direct from MFJ
made in USA

Locate Repeater Frequencies While Traveling!



The ARRL Repeater Directory® **is a perfect addition to any emergency "go-kit." Refer to it whenever you're on the move or want to find local activity.**

The 2022 edition includes:

- 24,000+ 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

Retail $19.95

Order online at arrl.org/shop

ARRL The National Association for Amateur Radio®

Reach for the Sky Mister!

MFJ **Get that antenna up where it belongs, high in the sky with MFJ *heavy-duty* Telescopic Masts and accessories. We got all you need for temporary, portable or permanent antenna installations.**

Portable, telescoping high-strength fiberglass masts extend way up into the sky! Just pull out sections and lock.

Choose Lightweight-Light-Duty or Super-Strong Thick-Wall models -- 10 to 50 feet long. Each collapses to an easy-to-carry size for true portablilty.

For quick put-up and take-down, light-duty models have Twist & Lock sections and heavy-duty thick wall models use military style *QuickClamps*™ or stainless steel hose clamps.

Use them for traveling, camping, at hotels, hamfests, field day, DX-peditions. Put up full size full performance inverted Vee, dipole or vertical antenna in minutes at heights that will snag you real DX.

Use multiple telescoping masts to make loops, quads, rotatable dipoles even beams.

← *Light Duty Lightweight Fiberglass Masts*

So lightweight you can take them anywhere!

MFJ's most popular MFJ-1910 is 33 feet long, 3.3 lbs.

MFJ-1910, $109.95. 33 ft., light duty w/top tie ring.
MFJ-1911, $119.95. 20 ft., light duty w/top tie ring.
MFJ-1913, $119.95. 28 ft., lightweight w/top tie ring.
MFJ-1915, $159.95. 25 ft., for heavier duty use.
MFJ-1916, $189.95. 34 ft., for heavier duty use.
MFJ-1917, $199.95. 43 ft., heavier duty w/top tie ring.

Super-strong .125" Thick-Wall Fiberglass Masts

Use for temporary or permanent wire antennas, small beams or verticals. **Best seller** is 48 ft. long, just 24 lbs.

Heavy Duty Models: All have QuickClamps™

MFJ-1908HD, $309.95 is 48' ext., 7.75-ft. collapsed, has 2½" OD bottom, 1" OD top, seven 7.75-ft. sections, 24 lbs.
MFJ-1906HD, $269.95 is 38' extended, 6 feet collapsed, has 2½" OD bottom, 1" OD top, seven 6-foot sections, 24 lbs.
MFJ-1904HD, $199.95 is 25' extended, 4 feet collapsed, has 2½" OD bottom, 1" OD top, seven 4-foot sections, 14 lbs.
MFJ-1904H, $189.95. 22' ext., 5' collapsed, 9 lbs. 2½" OD.
MFJ-1902H, $159.95, 10' ext., 38" collapsed, 5 lbs. 2½" OD

Standard Models: H models have QuickClamps™

MFJ-1906, $179.95/MFJ-1906H, $239.95, 33 feet, ext., 6 ft. collapsed, six 6-ft. sections, 13 lbs. 2" bottom, 3/4" top OD.
MFJ-1908, $219.95/MFJ-1908H, $269.95, 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, $89.95. 5 Military Quick*Clamps*™. Fit 3/4" to 2" OD.
MFJ-13HD, $89.95. Extra set clamps, 1- 2½" masts.

Mast Guy Ring Sets

Fits masts 3/4" to 1¼" dia OD. **MFJ-2830X, $15.95,** *fiberglass*; **MFJ-2840X, $19.95,** *aluminum.*

Left: *Stainless Steel Hose Clamps* recommended for permanent installations. Fiberglass is slotted.

Right: UV protected Military grade *QuickClamps*.Guy 2 levels when fully extended.

18' Telescopic Mast/Tripod

MFJ-1919EX, $199.95. ***Put your antennas up high anywhere with this super-strong* 18 foot telescoping fiberglass mast and MFJ-1919 heavy duty steel tripod. *QuickClamps™ lower mast to 5 feet. Mast has thick 1/8 in. wall, .75" top, 1.5" bottom dia. 15 lbs. Steel tripod has braced triangle base, non-skid feet, mast lock.***

MFJ-1918EX, $129.95. **MFJ-1918** *tripod with 9.5 ft. telescoping fiberglass mast.* 3.8 feet collapsed. 6.5 lbs.

Tripods Only

MFJ-1921, $209.95, *Giant tripod* base spreads to 8 feet! Supports massive antennas. Adjustable length non-skid legs accommodates uneven ground surfaces. Optional foot anchors, *see bottom right* 14 lbs.

MFJ-1919, $119.95, *Large tripod* base spreads to 4.8 ft. Support 100 pounds. 7.8 ft, 9.75 lbs.

MFJ-1918, $79.95, *Smaller tripod* base spreads to 2.75 ft. Support 66 lbs. 6.75 lbs.

80-6 Meter Antenna

3.8 ft. fiberglass mast telescopes to a 31ft. self-supporting *high performance* 80-6 Meter vertical antenna in minutes!

1/4 wave performance on 40M, 1/2 wave on 20M. High-Q air wound loading coil. Use antenna tuner for 30/20/15/12/10/6 M. 600W SSB/CW.

Use as temporary, portable or permanent antenna for home, RVs, camping, field day, hamfest, DX-pedition.

Includes four 12 foot radials. Current balun reduces feedline radiation and pattern distortion.

MFJ-2980 **$139.95** 40-6 Meters

MFJ-2982 **$189.95** 80-6 Meters

MFJ *"HamStick"* Isolated Dipole

Build your own 80-6 Meter *mini*-dipole using two HF mobile whips! MFJ-347 *isolates* dipole elements. Lets you use a balun to give a *true balanced dipole.* Prevents pattern distortion, noise pickup and RFI radiation from RF on coax shield. Solid aluminum. Use masts up to 1¼" OD.

MFJ-347 **$29.95**

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

MFJ-1907 **$59.95**

Mount *multiple* HF/VHF hamsticks, verticals, dipoles vertically or horizontally on your balcony. High-strength aircraft aluminum extends out 14". Two U-bolts mount to 1½"dia.

Tripod Anchors

MFJ-1905, $44.95. Securely anchor your tripods to the ground with these 3 *stainless steel* foot braces and your stakes. For high winds, unlevel ground. Fits legs to 1½"OD.

Portable Mast Supports

MFJ-1912, $119.95. 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, $109.95. 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.

Add shipping. Prices and specifications subject to change. (c) 2021 MFJ Enterprises, Inc.
• 1 Year No Matter What™ warranty • 30 day money back guarantee (less s/h) on orders direct from MFJ

Ham Ads

Please contact the Advertising Department at 860-594-0255 or hamads@arrl.org for further information or to submit your ad.

For information on placing a Classified Ad:
www.arrl.org/ham-ads-classified-rules-and-rates

QST Ham Ads on the Web
Updated Monthly!
www.arrl.org/ham-ad-listing

Club/Hamfests/Nets

159 Counties That's how many Georgia has. Work them all and get the free "Worked All Georgia" award. https://atlantaradioclub.org/worked-all-georgia-award.html. Get missing counties during the Georgia QSO Party in April: https://gaqsoparty.com/

CW INSTRUCTION via internet video conference classes. VISIT longislandcwclub.org

DFW HAM RADIO EXPO 2022. Visit www.DFWham.com for info. AB5L

Friend of BILL W meets Tue on 7.185 & 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.

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.

Ham Home in Colorado (Elbert County) 5 acres, five towers. w6oal@aol.com for details

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

Need a NEW QTH on Florida's east coast? Contact Greg Bowman, N4EN, Realtor Associate, Pioneer Properties USA, Melbourne FL. 321-305-9142

Operate N4USA in Virginia's high Blue Ridge Mountains www.n4usa.com

Waterfront home near Savannah, 2.17 acres, 24-hour deep water at dock, 2 boat lifts, 30 ft tower. No HOA. Room for more towers. Tall trees for Zepps. https://vimeo.com/610853082. W9TZ post.

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

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 kk4ww

QSLCards/Call Sign Novelties

WWW.THESIGNMAN.COM 225.757.1545

Amateur Radio Active Patches Deputypatch.com

CALLSIGN PLAQUES www.HamPlaques.com

Engraving, **QSL's,** Memo's, Stamps, Plaques since 1962, Full-Service Printing. Samples. WA2WAO@CornerPress.com www.CornerPress.com 425 286-5952

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.

General

#1 AMATEUR CALLSIGN DVD! HamCall contains over 2,400,000 world-wide callsigns, 10,400,000 archive callsigns. Supported by most logging programs. Six FREE monthly internet updates and HamCall.net Gold online access included. Visa/MC/Discover 800-282-5628 http://hamcall.net

#1 Amateur website for useful links and downloadable information: www.kb9at.com

AMSAT - WHO DECIDES THE FUTURE OF AMATEUR RADIO IN SPACE? YOU DO! Since 1969 AMSAT has pioneered dozens of spacecraft that have brought operating enjoyment to thousands. Your membership in AMSAT will support exciting projects planned for launch in the years to come. In addition, you'll receive the bimonthly AMSAT Journal and substantial discounts on software distributed by AMSAT. Join now! From the US call toll free at (888) 322-6728. From all other locations call 1-301-822-4376. Or visit the AMSAT Web site at www.amsat.org AMSAT®, 10605 Concord St, #304 Kensington MD 20895, USA.

A Valentine Gift for Her. She'll love the story of the Harkins -- Harold and Sabrina -- persevering through the pandemic -- with a glimpse into the world of amateur radio. **Sidewalk Sale Across America** by Peg Nichols. Available from Amazon. KQ0VQO@arrl.org

ATTENTION YAESU-FT 10218,000hrs, 25yrs, 800+ FT-102's Repaired. Have all parts. AM and Roofing Filters available. 25/hr, parts at cost. 954-961-2034 NC4L www.w8kvk.com/nc4l

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

"Flaunt your call! www.**HAMFLAGS**.com"

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.

Get the F.C.C. "Commercial" Radiotelephone License: The highest-class Telecommunications Certification! Fast, inexpensive, Guaranteed Home-Study. Command Productions. **www.LicenseTraining.com** Free info: (800) 932-4268

HAM KITS for sale at www.HecKits.com L/C Meter, SWR Bridge, ESR Meter, 2-Tone Gen, FET DIP Meter.

Help with International Goodwill www.n4usa.org

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/

LEARN CODE by Hypnosis, www.success-is-easy.com 561-302-7731

LED DESK SIGN - www.Gifts4Hams.com

MicroLog-By-WA0H .. Easy to use logging program .. Free download .. **www.wa0h.com**

NW9 ALLIANCE LLC - Adapters, coax, connectors, and Passive microwave components. NW9ALLIANCELLC2@GMX.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 847-836-9148; www.farcircuits.net; mail@farcircuits.net

RF CONNECTORS & GADGETS - Parts - Products and More! www.W5SWL.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**

ROTARY FUNCTION SWITCH REPAIRS and rebuilding. Small and large, late model and vintage types. Free estimates. **Joe, KC3JDL 215-801-4362**

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

WANTED: - Auto CR/LF Kit or parts for teletype mode 32 ASR. mkelly917@yahoo.com or 904-288-7024.

Xcellent **Amateur** and **Monitor Logging** from **DXtreme!** Click **www.dxtreme.com**

Alpha Delta Radio Communications, LLC

The Leader of the "Pack"

39 YEARS — Superior Customer Service — Continuous Product Innovation

Industry Leading
Surge Protected Coax Antenna Switches.

Low Loss with excellent Co-Channel Isolation.
Models DELTA-2B/N and DELTA-4B/N have been granted NSN numbers by the Defense Logistics Agency (DLA) for use in ALL U.S. and NATO applications, worldwide.
Cage Code 389A5. Made in the U.S. in our ISO-9001 certified production facility.

The Alpha Delta **Model ASC Antenna Selector Console** desk top coax switch series brings a new level of versatility and convenience to your station operation. This series retains all the features and specifications of the precision 4 position DELTA-4B series (see WEB site for DELTA-4B specs, pictures and info), including ARC-PLUG™ module surge protection, in a desk top console that will sit right next to your equipment on your desk without having to be secured or bolted down. "Non-slip" feet attached for best stability.

The console features a powder coated steel housing and a solid brass ground buss, with #10 wire attachment hardware, across the rear of the housing providing a common ground point for all station equipment and accessories.

- **Model ASC-4B**;..... $159.00 ea.
  Desk console, same as DELTA-4B
- **Model ASC-4B/N**;..... $169.00 ea.
  Desk console, same as DELTA-4B/N

Our standard surge protected coax switch line (see WEB site for details):

- **Model DELTA-2B**; ..... $79.00 ea.
  2 position, UHF connectors, 500 MHz
- **Model DELTA-2B/N**; ..... $95.00 ea.
  2 position, N connectors, 1.3 GHz
- **Model DELTA-2B/TNC**;..... $120.00 ea.
  2 position,TNC connectors, 1.3 GHz
- **Model DELTA-4B**; ..... $110.00 ea.
  4 position, UHF connectors, 500 MHz
- **Model DELTA-4B/N**; ..... $120.00 ea.
  4 position, N connectors, 1.3 GHz
- **Model D4 ARC PLUG**; ..... $9.00 ea.

Also available from Alpha Delta dealers.

www.alphadeltaradio.com
for product technical details, installation requirements, pricing, dealers and contact information

Air Boss Antenna Launcher
www.olahtechnologies.com
See Video
For when you want your antenna on top
$89.99
Free shipping to lower 48
olahtechnologies@gmail.com

LDG Electronics

REMOTE TUNERS
DESKTOP TUNERS
ZERO POWER TUNERS

Z-100Plus/IC-705
Zero Power Antenna Tuner
125 Watt power handling, 2000 memories
Full tunes take an average of only 6 seconds.
Now includes 8 AA heavy duty batteries, stereo interface cable, and BNC to PL-259 coax cable.

Z-100A
Plug & Play Operation
Features 10:1 SWR tuning range that matches dipoles, verticals, end-fed wires, G5RVs or even an off-center fed. Goes anywhere with your HF radio... desktops, parks, islands, or tall summits.

For These LDG Products And More Visit:

HAM RADIO OUTLET
50 YEARS
WWW.HAMRADIO.COM

BevFlex-4X
Low Band RX Antenna System

Configure as a switchable, bi-directional Beverage, BOG, Flag, EWE, or VE3DO low noise receive antenna system. Build the optimal version to fit your location. Feed the Beverage and BOG configurations at the point closest to the shack, not just at the ends.

Also antenna switching, CW keyers, PC-radio digital modes interface, and more!

www.unifiedmicro.com — UM Unified Microsystems

WA3RNC
TR-25 40/20-Meter CW Transceiver Kit
See Dec. 2021 Product Review, page 35

www.wa3rnc.com

HEATHKIT: A GUIDE TO THE AMATEUR RADIO PRODUCTS

All New Expanded Third Edition of the classic book by Chuck Penson, WA7ZZE

- Lists ***every*** ham radio kit Heath ever made with photos, specs, tubes, and more
- More than 300 products
- More than 1000 photos and diagrams
- Also includes CB radios, clocks, and weather equipment, and a 60-page introduction and history of the company

This 3.5 pound, one inch thick, 426 page book is the ultimate reference source. Written for collectors, buyers, sellers, users, and anyone who loves Heathkits.

Download a sample and order at wa7zze.com

Professional

SuperbHeadsets.com
800-634-0094
Warren Gregoire & Associates, Lafayette, CA – Since 1986

Advertising Department Staff:
Janet Rocco, W1JLR, |
Advertising Sales Manager

QST Index of

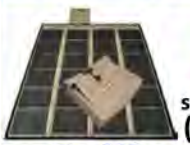
Advanced Specialties – www.advancedspecialties.net 108
AirBoss/Olah Technologies – www.olahtechnologies.com 114, 125
Alpha Delta Radio Communications, LLC – www.alphadeltaradio.com 125
Alfa Radio Ltd – www.alfaradio.ca 106
Ameritron – **www.ameritron.com** 17
Arcom Communications – www.arcomcontrollers.com 118
ARISS – www.arris-usa.org/donate 110
ARRL – www.arrl.org 102, 108, 112, 118, 120, 122
BeLoud.US – www.beloud.us 108
Bioenno Power – www.bioennopower.com 126
BridgeCom Systems – www.BridgeComSystems.com ..... 22, 23, Cover III
California Peripherals & Components, Inc. – www.Californiapc.com .. 126
Clear Signal Products, Inc. – www.coaxman.com 114
Communication Concepts, Inc. – www.communication-concepts.com 118
Cushcraft – www.cushcraftamateur.com 2
Diamond Antenna – www.diamondantenna.net 8
DMMCheckPlus – www.DMMCheckPlus.com 114
Dr.Duino – www.Dr.Duino.com 26, 27
Elecraft – www.elecraft.com 19
Elk Antennas – www.ElkAntennas.com 106
Eventide – www.eventidecommunications.com 106
Expert Linears America, LLC – www.ExpertLinears.com 110
FlexRadio Systems – www.flex-radio.com 21
Global TSCM Group, Inc. – www.kn2c.us 106
Ham Ads – www.arrl.org/ham-ad-listing 124
Ham Radio Outlet – www.hamradio.com 98, 99
Hammond Mfg. Co. – www.hammondmfg.com 112
Heathkit: A Guide to the Amateur Radio Products. – www.wa7zze.com 126
Hy-Gain – www.hy-gain.com 10, 103
ICOM America – www.icomamerica.com 101
Intuitive Circuits, LLC – www.icircuits.com 110
K6IOK – www.k6iok.com 106

TUBES

- 100% Tested
- 1-year Warranty
- Matched Groups

800-421-4219 (ext 119)
www.PentaLabs.com

LiFePO4 Batteries
Bioenno Power®
sale@bioennopower.com
(888) 336-7864
www.bioennopower.com

Foldable Solar Panels

PowerFilm. Made in the USA SOLAR
5 to 220 Watts
sales@californiapc.com
(877) 487-1213
CaliforniaPC.com

Contact Information:

Toll Free: 800-243-7768
Fax: 860-594-4285
E-mail: ads@arrl.org
Web: www.arrl.org/ads

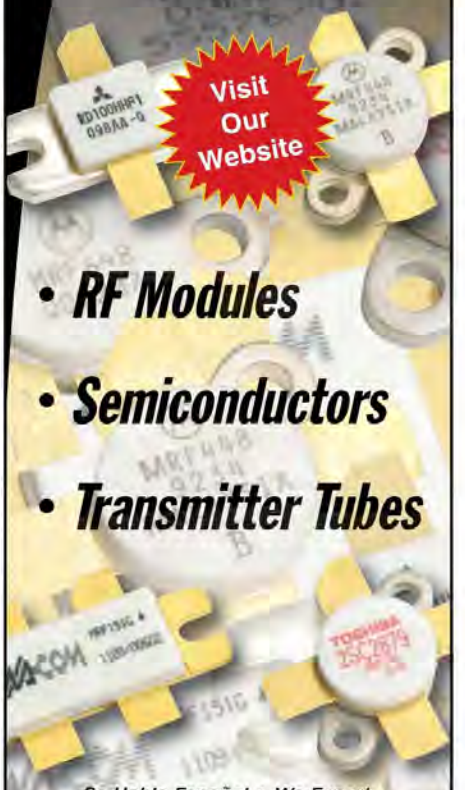
Additional advertising information is available on the web at:
www.arrl.org/ads

Advertisers

Kenwood Communications – www.kenwood.com/usa/ ..... Cover IV, 29
LDG Electronics – www.ldgelectronics.com 118, 125
MFJ Enterprises – www.mfjenterprises.com 105, 107, 109, 111, 113, 115, 117, 119, 121, 123
Mosley Electronics – www.mosley-electronics.com 114
Motosports of Ukiah – www.hondashop.com 114
NCG Company – www.natcommgroup.com 3
OCI-Olds Communications Inc. – www.ocicom.com 127
Orlando Hamcation® – www.hamcation.com 100
Pacific Antenna – www.qrpkits.com 110
Palomar Engineers – www.Palomar-Engineers.com 110
PreciseRF – http://preciserf.com 11
Penta Laboratories – www.pentalabs.com 126
PreppComm – www.preppcomm.com 110
Quicksilver Radio Products – www.qsradio.com 12
Rig Expert Ukraine LTD – www.rigexpert.com 6
RF Parts Company – www.rfparts.com 127
RT Systems – www.rtsystems.com 112
SteppIR Communications Systems – www.steppir.com 7
SwapMyRigs – www.swapmyrigs.com 118
Tac-Comm – www.tac-comm.com 108
Ten-Ten International Net, Inc. – www.ten-ten.org 108
Tigertronics – www.tigertronics.com 108
Timewave Technology, Inc. – www.timewave.com 104
Unified Microsystems – www.unifiedmicro.com 125
VHQ Hex Antenna Products – www.vhqhex.com 106
WA3RNC – www.wa3rnc.com 126
W5SWL Electronics – www.w5swl.com 114
Warren Gregoire & Associates – www.superbheadsets.com 126
West Mountain Radio – www.westmountainradio.com 18
Wireman – www.coaxman.com 118
Yaesu USA – www.yaesu.com ..... Cover II, 1
Yuma Hamfest – www.yumahamfest.org 116

Filters
Ham - Commercial - Band Pass
www.ocicom.com

From MILLIWATTS To KILOWATTS℠
In Stock Now!
Semiconductors for Manufacturing and Servicing Communications Equipment



- *RF Modules*
- *Semiconductors*
- *Transmitter Tubes*

Se Habla Español • We Export

Phone: 760-744-0700
Toll-Free: 800-737-2787
(Orders only) 800-RF PARTS
Website: www.rfparts.com
Fax: 760-744-1943
888-744-1943
Email: rfp@rfparts.com

VISA MasterCard American Express Cards

RF PARTS COMPANY

Leave a Lasting Legacy

The ARRL Legacy Circle recognizes the foresight and generosity of those individuals who have planned support for ARRL through wills, trusts, life insurance gifts and other planned giving opportunities.

Your gift to the Legacy Circle helps to ensure that ARRL and amateur radio continue to thrive for generations to come.

Share Your Plans

Have you already made a legacy gift for the future of ARRL? If so, please let us know your plans so we can thank you and welcome you to **The Legacy Circle**.

How to Give

Your Legacy Circle gift may consist of:

- Bequests to ARRL through a will or living trust
- Life income gifts, such as charitable gift annuities and charitable trusts
- Naming ARRL as the beneficiary of a life insurance policy
- IRA as a charitable bequest

Bequests made through a will or trust are the most popular planned gift, the easiest to make, and costs nothing during the donor's lifetime.

Why Give

Individuals who take this special step to make a planned gift as part of our Legacy Circle are acknowledged in several public and private ways-from a custom engraved brick in The Diamond Terrace to donor event invitations, and more.

Additional benefits of planned giving include:

- You have use of the designated assets until after your passing.
- You have the flexibility in determining what kinds of assets and how much you would like to leave.
- You may reduce your taxable estate without any immediate expenditure.

We look forward to working with you and your advisors to ensure that your gift will become an enduring and meaningful legacy for years to come.

CONTACT INFORMATION: Melissa Stemmer, Development Manager | mstemmer@arrl.org | 860-594-0348

ARRL is a 501(c)(3) not-for-profit corporation. Legal name American Radio Relay League, Inc., Tax ID # 06-6000004

BridgeCom SYSTEMS®

Done For You DMR Radio

The Plug & Play Promise:

"If you order the Plug and Play Package, we promise you will get on the air and make a DMR contact the first day you set up your package, GUARANTEED, or we will give you a 100% refund and send you a prepaid return shipping label!"

"True plug and play! Plugged it in, turned it on and it worked. First QSO in 2 minutes... success and it looks good too. Fast service, company easy to deal with, and kept me updated at all times via email and phone. Great experience."

Christopher -KB1VKC

EXCLUSIVE QST OFFER

Use offer code QSTMOBILE50 at checkout to receive:

- A FREE 20 minute DMR expert setup call
- A FREE Super Codeplug

SUPER CODEPLUG

...a $140 value, yours free!

DMR Plug & Play Premium Package. AnyTone D878UVII Plus Dual-Band DMR HT W/Skybridge Plus Dual-Band DMR Hotspot

BridgeCom SYSTEMS®
816-532-8451
sales@bridgecomsystems.com

SCAN TO GET DETAILS

CALL: 816-532-8451
For More Information

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