Ask Dave! Dave Casler, KEØOG, Answers Your Questions in His New Column for *QST*! | **50**

QST

DIGITAL EDITION

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July 2021 www.arrl.org
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Focus on EmComm

QST Reviews

Icom IC-R30 Portable Communications Receiver

HecKits QRP Wattmeter Kit

K1EL Systems WKmini USB CW Keyer

Garmin inReach Mini Satellite Communications Device

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

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CA 90630 (714) 827-7600

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The radio... YAESU

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An Innovative Multi-band, Multi-mode Transceiver within an Ultra Compact Body

- Rugged construction in a Compact Mobile Package (6.1"W × 2.0"H × 8.6"D)
- Stable 100 Watts of RF Power Output with efficient Dual Internal Fans
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- Enhanced Operating Features:
  - Large diameter Main Tuning Dial (1.6") with Torque adjustment
  - Pop-up Menus for quick and easy operation
  - Large Transmit/Receive indicator
  - Three Programmable Front Panel Function Keys
- Especially designed FC-50 External Antenna Tuner (option)

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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.

Cushcraft...Keeping You in Touch Around the Globe

Cushcraft Antennas

R9

80-6 Meters! No Radials!

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 and poor band conditions.

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

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

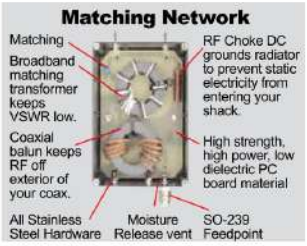
Rugged Construction: Thick fiberglass insulators, all stainless steel hardware and 6063 aircraft-aluminum tubing is double or triple walled at key stress points to handle anything Mother Nature can dish out.

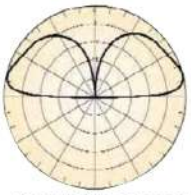
31.5 feet tall, 25 lbs. Mounting mast 1.25 to 2 inches. Wind surface area is 4 square feet.

R8, $599.95. Like R9 antenna but less 75/80 Meters.

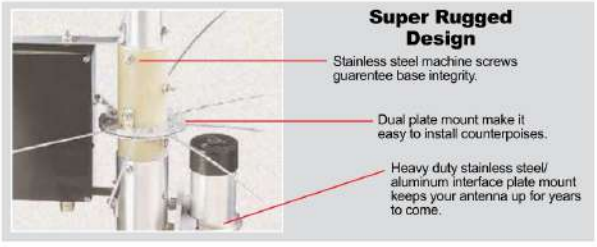
R-8TB, $99.95. Tilt-base lets you tilt your antenna up/down easily by yourself to work on.

R-8GK, $79.95. Three-point guy kit for high winds.





Omni-Directional
Low angle radiation gives incredible worldwide DX.



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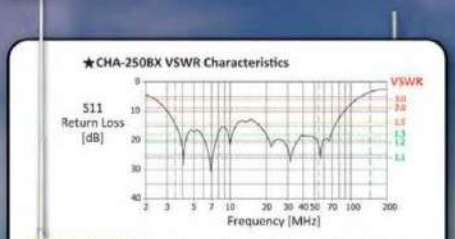
Life is a JOURNEY. Enjoy the ride!



CHA-250B - *No Antenna Tuner Needed!*

CTC-50M *Window Gap Jumper*
No more drilling or open windows!

Base Antennas

❶ C★MET CHA-250B BROADBAND 80M THROUGH 6M VERTICAL ANTENNA

A newly designed broadband vertical with NO GROUND RADIALS. EXTREMELY easy to assemble, requires no tuning or adjustments and VSWR is under 1.5:1 from 3.5-57MHz! • TX: 3.5MHz – 57MHz • RX: 2.0– 90MHz • VSWR is 1.5:1 or less, continuous • Max Power: 250W SSB/125W FM• Impedance: 50 Ohm • Length: 23' 5" • Weight: 7 lbs. 1 oz. • Conn: SO-239 • Mast Req'd: 1" – 2" dia. • Max wind speed: 67MPH

❷ C★MET GP-3 DUAL-BAND 146/446MHZ BASE REPEATER ANTENNA

Wavelength: 146MHz 6/8 wave • 446MHz 5/8 wave x 3 • Max Pwr: 200W • Length: 5'11"• Weight: 2lbs. 9ozs. • Conn: Gold-plated SO-239 • Construction: Single-piece fiberglass

❸ C★MET GP-6 DUAL-BAND 146/446MHZ BASE REPEATER ANTENNA

Wavelength: 146MHz 5/8 wave x 2 • 446MHz 5/8 wave x 5 • Max Pwr: 200W • Length: 10'2"• Weight: 3lbs. 8ozs. • Conn: Gold-plated SO-239 • Construction: Fiberglass, 2 Sections

❹ C★MET GP-9 / GP-9N DUAL-BAND 146/446MHZ BASE REPEATER ANTENNA

BEST SELLER! • Wavelength: 146MHz 5/8 wave x 3 • 446MHz 5/8 wave x 8 • Max Pwr: 200W• Length: 16' 9"" • Weight: 5lbs. 11ozs. • Conn: GP-9 Gold-plated SO-239 • GP-9N Gold-plated N-type female • Construction: Fiberglass, 3 Sections

❺ C★MET CX-333 TRI-BAND 146/220/446MHZ BASE REPEATER ANTENNA

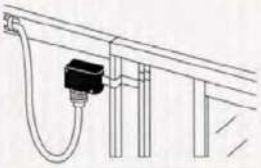
Wavelength: 146MHz 5/8 wave x 2 • 220MHz 5/8 wave x 3• 446MHz 5/8 wave x 5 • Max Pwr: 120W • Length: 10'2" • Weight: 3lbs. 1oz.• Conn: Gold-plated SO-239 • Construction: Fiberglass, 2 Sections

❻ C★MET GP-15 TRI-BAND 52/146/446MHZ BASE REPEATER ANTENNA

Wavelength: 52MHz 5/8 wave • 146MHz 5/8 wave x 2 • 446MHz 5/8 wave x 4 • Max Pwr: 150W • Length: 7'11" • Weight: 3lbs. 1oz. • Conn: Gold-plated SO-239• 2MHz band-width after tuning (6M) • Construction: Single-piece fiberglass

❼ C★MET CTC-50M WINDOW GAP JUMPER

Avoid drilling holes or leaving windows open/unlocked. Flat coax easily forms to window frame. Low loss SO-239 on each end, 15 inch length.
• Max Pwr: **HF** 100W PEP / **VHF** 60W FM / **UHF** 40W FM / **900-1300 MHz** 10W FM



CAA-500MarkII

1.8-500MHz Antenna analyzer

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

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

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

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Shoulder strap included.

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QST

Contents

July 2021 ♦ Volume 105 ♦ Number 7

Columns

Departments

Our Cover

Each year, about 150 hams support communications at the US Marine Corps Marathon. In recent years, the rapid evolution of technology has paved the way for the use of AREDN at the event. In our cover photo, Damon Schaefer, K9CQB, installs the 5.8 GHz sector node — one of three sector nodes that provided coverage for the 2019 marathon — at the Arlington General District Court in Arlington, Virginia. Learn more about the setup in "AREDN at the US Marine Corps Marathon," by Mark D. Braunstein, WA4KFZ, in this issue. [Mark Braunstein, WA4KFZ, photo]

Digital and Mobile Editions

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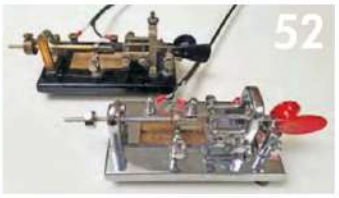

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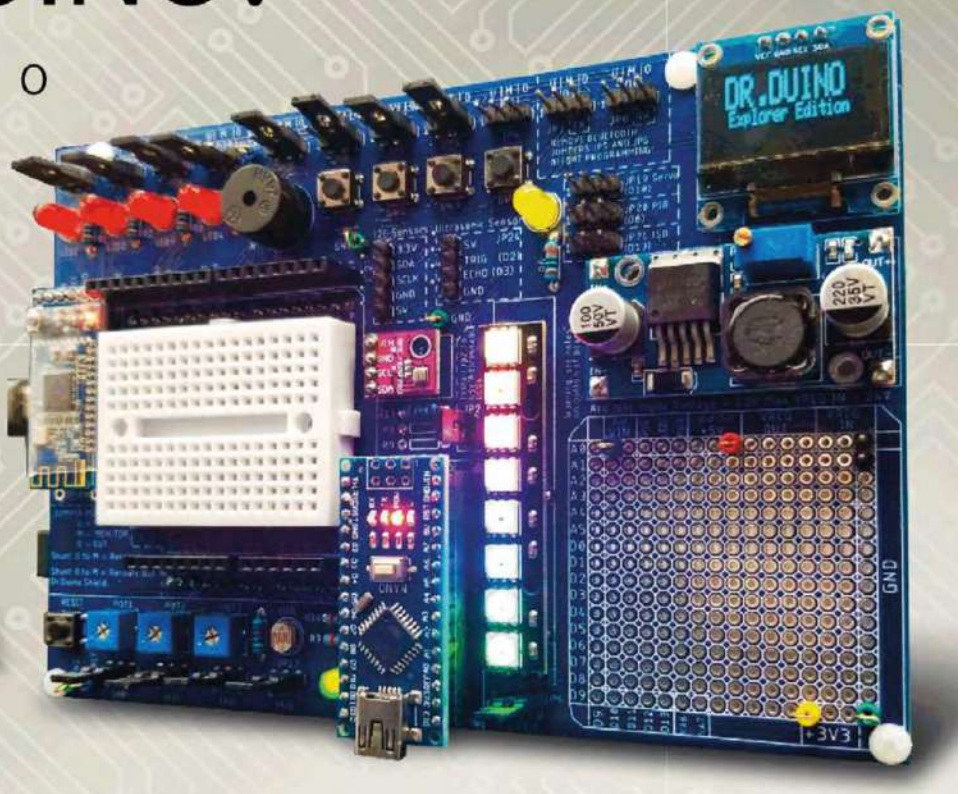

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Begin coding even before your hardware arrives.

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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

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DIAMOND ANTENNA

diamondantenna.net

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

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

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

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

X700HNA Special Features:

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

Here is a small sample of our wide variety of antennas

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

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

Second Century

EmComm: It's In Our Purpose!

Emergency communications — EmComm — is in the spotlight this month in both QST *and* On the Air *magazines as we begin the 2021 hurricane, tornado, and wildfire season. Let's look at why this is important, not just for some hams, but for all hams!*

The ARRL Board knows the importance of emergency communications, and is creating a committee focused on its guidance and oversight. EmComm is also a critical element of the spectrum privileges we enjoy. FCC Part 97 provides us with the fundamental purpose of the Amateur Radio Service, and it doesn't mean that amateur radio equals public service! FCC Part 2.1c refers to the term "Service" as "the transmission, emission and/or reception of radio waves for specific telecommunication purposes." The Amateur Radio Service means much more than that. In just five simple principles, the FCC puts forward what it expects of us:

Recognition and enhancement of the value of the amateur service to the public as a voluntary noncommercial communication service, particularly with respect to providing emergency communications.

There are a few noteworthy things to unpack from this principle. The first is that it is our responsibility to make sure that the public at large understands the *value* of amateur radio. This is where our Section Managers and Public Information Coordinators/Officers come in. Social media can also play an important role here. The second point is that amateur radio is voluntary — it is your choice to participate — and it is noncommercial, meaning you're not getting paid, as it is your *avocation*, not your vocation. The third is that among all the ways we participate in demonstrating the value of amateur radio to the public, providing emergency communications is of particular importance! Every year, there are communities that find themselves in an unexpected disaster situation, with a disruption to commercial communications and/or power systems. Well-trained amateur radio operators respond with an emergency communications capability *when all else fails*.

Continuation and extension of the amateur's proven ability to contribute to the advancement of the radio art.

This simple statement reinforces the fact that hams have proven their ability to innovate in the advancement of the state of the art. Today, much of the innovation we see is an expansion into software-defined radio, shack automation, remote access, connectivity embedded into radios and amplifiers, and weak signal modes. Think about how networking technologies like AREDN and Winlink may factor into EmComm in the future.

Encouragement and improvement of the amateur service through rules which provide for advancing skills in both the communication and technical phases of the art.

The FCC believes that, within the rules of Part 97, they have provided adequate support for hams to advance the state of the art. There's also an implication that there may be room to amend the rules to support new initiatives that can drive innovation. A good example is the use of various digital modes in support of EmComm. As we continue to develop new technologies, we can go — and have gone — to the FCC for reconsideration of sections of Part 97 that need to evolve.

Expansion of the existing reservoir within the amateur radio service of trained operators, technicians, and electronics experts.

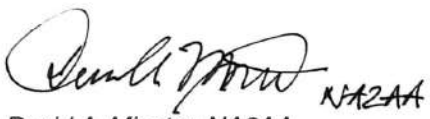
ARRL is focused on rolling out our Learning Center platform to grow the community of trained EmComm operators. Your involvement in any on-the-air activities that improve your ability to copy signals and make contacts (e.g. nets, contests, POTA, etc.) helps meet this principle.

Continuation and extension of the amateur's unique ability to enhance international goodwill.

From our leadership and involvement in the IARU, to the relationships we enjoy with radio amateurs around the world, to putting boots on the ground in places like Abaco Island, Bahamas after Hurricane Dorian, we play a vital role fostering international goodwill. Radio signals recognize no boundaries and connect us all into one big community.

Taking the time to invest in training for yourself and readiness for your station will prepare you for the potential challenges this summer.

So, get prepared! Get more involved in meeting these five fundamental principles of our hobby, be radio active, be that connector with local hams, and stay safe!



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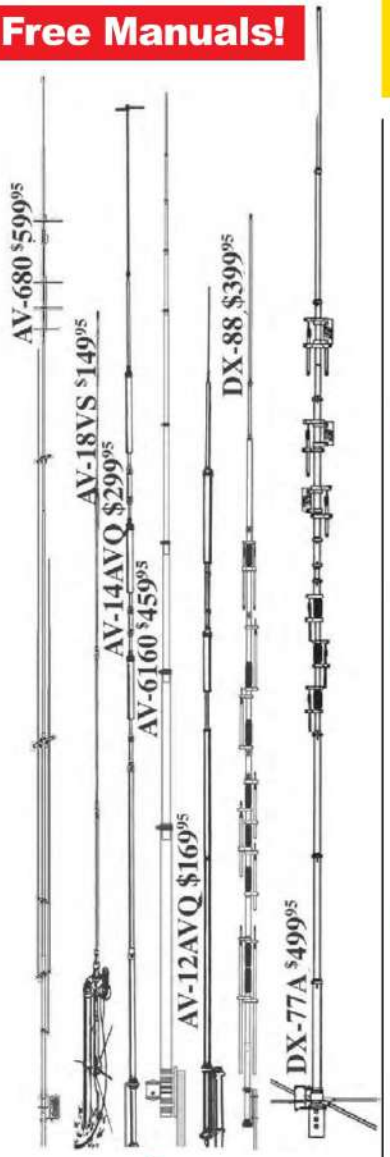

hy-gain® Classics

All hy-gain multi-band vertical antennas are entirely self supporting -- no guys required.

They offer remarkable DX performance with their extremely low angle of radiation and omnidirectional pattern.

All handle 1500 Watts PEP SSB, have low SWR, automatic bandswitching (except AV-18VS) and include a 12-inch heavy duty mast support bracket (except AV-18HT).

Heavy duty, slotted, tapered swaged, aircraft aluminum tubing with full circumference compression clamps is used for radiators.

Includes all stainless steel hardware. Recessed SO-239 prevents moisture damage.

hy-gain verticals go up easily with just hand tools and their cost is surprisingly low.

Two-year limited warranty.

Self-supporting – no guys required . . . Remarkable DX performance – low angle radiation, omnidirectional . . . Handles 1500 Watts . . . Low SWR . . . Automatic band switching . . . Aircraft quality aluminum tubing . . . Stainless steel hardware. . . Recessed SO-239 connector . . . Two year limited Warranty . . .

AV-680, $599.95. (80, 40, 30, 20, 17, 15,12, 10, 6 Meters). 26 ft., 18.5 lbs.
No ground or radials needed.
Low 17 degree radiation angle and omni-directional gives world-wide DX. 2-minute 1500 Watts key down. 1/4 wave stubs on 6/10/12/17 M and efficient end loading coil/ capacity hats on 15/20/30/40/80 M gives automatic band switching. Wide SWR bandwidth. Teflon® wire broadband matching unit. Low 2.9 sq. ft. wind surface. Mounts on decks, roofs, patios. 65 mph wind survival. Aircraft aluminum tubing, stainless steel hardware.
AV-640, $499.95. (40, 30, 20, 17, 15, 12, 10, 6 Meters). 25.5 feet, 17.5 pounds.
AV-620, $399.95. 20/17/15/12/10/6M. 22.5 ft.

AV-18VS, $149.95. (80, 40, 30, 20, 17, 15, 12, 10 Meters). 18 ft., 4 lbs.
Covers 80-10 Meters continuous, 1500 Watts PEP.
Easily change bands by manually moving bandchange wire at base loading coil. Also ideal for shortwave listening. Sleek, low profile. Tiny footprint mounts anywhere on 1.5-1.625" diameter mast driven into ground. Requires at least one radial. Tapered 6063-T6 aircraft aluminum. Stainless steel hardware. 80 MPH wind survival.

AV-14AVQ, $229.95. (40, 20, 15, 10 Meters). 18 ft., 9 lbs.
Quickly work DX instantly with automatic bandswitching!
Omni-directional low angle DX antenna is self supporting. 1500 Watts PEP. Air dielectric Hy-Q™ traps give full 1/4 wave performance with broadbanding top hat. SWR< 2:1. Ground or roof mount. Requires radials. 6063-T6 aircraft aluminum tubing, stainless steel hardware. 80 MPH wind survival. DC ground. Heavy duty bracket with recessed SO-239 mounts on 1.5-1.625" dia. mast.
MK-80, $99.95. 80M add-on kit. **AV-14RMQ, $119.95**. Roof mount kit.

AV-6160, $459.95. (160, 80, 40, 30, 20, 17, 15, 12, 10, 6 Meters). 43 ft., 20 lbs.
Low profile, self-supporting 43 foot vertical assembles in less than an hour!
Blends in with sky and trees. Entire length radiates to give exceptionally low angle 160-20 Meters DX, great performance on 17-6 M. Wide range automatic or manual antenna tuner at rig easily matches all bands. No physical adjustments. Optimized balun design allows direct coax feed. **AV-6110, $349.95**. 1.5 kW matching network improves efficiency on 160/80 Meters.

AV-12AVQ, $169.95. (20, 15, 10 Meters). 13 ft., 9 lbs.
Automatic bandswitching, omnidirectional, low angle DX antenna. self-supporting. 1500 Watts.
Hy-Q™ traps give full 1/4 wave performance with broadbanding top hat. SWR less than 2:1. Ground or roof mount. Requires radials. **AV-14RMQ, $119.95** roof mount.

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No ground radials required!
Off-center-fed Windom has 55% greater bandwidth than competitive verticals. Tiltable base. Each band independently tunable.

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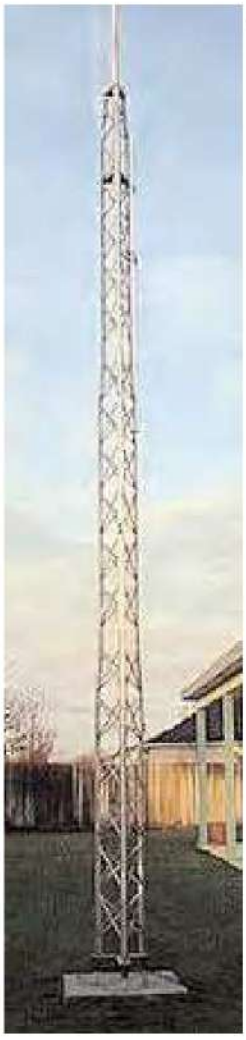

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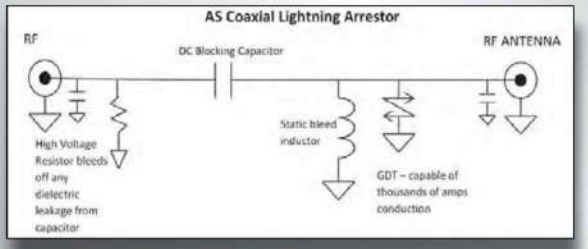

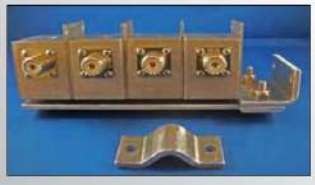

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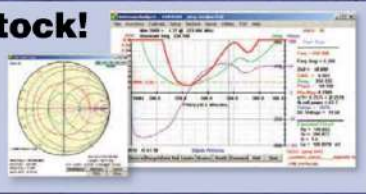
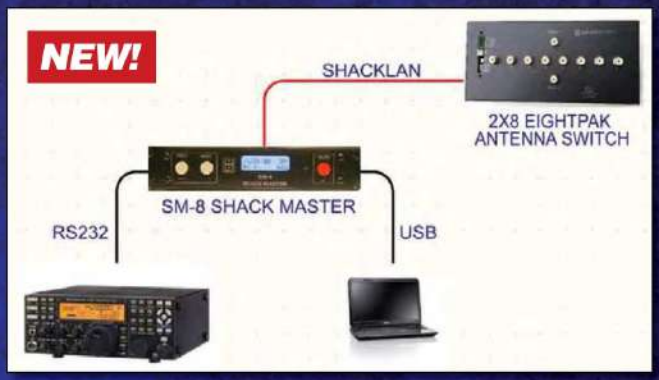


Hamation Station Automation

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

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



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

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Caroline Kenney, ckenney@arrl.org

Member Spotlight

Lahra "Flip" Svare, KT9X

Sicilian-American Lahra "Flip" Svare, KT9X, earned her nickname "Flip" at 16 years old when she rolled her 1964 Chevy Malibu four times. Her adventurous nature has not dimmed in the years since. She's had a versatile career, is adept at many ham radio activities, and enjoys a broad range of hobbies. There isn't much Flip cannot do.

Early Careers

Flip has hopped between many career paths. She worked as a fire chief, a sheriff's posse member, a bond enforcement agent, an emergency communications coordinator, a search and rescue volunteer, a commercial EPDM roofer, a web programmer, and an IT professional. She explained, "I need challenge, and when a job stops being fulfilling, I move on. I never wanted a career, but rather something that would challenge my mind."

Her work as a search and rescue (SAR) volunteer and a fire chief were her favorite jobs, but both were volunteer positions, and she was still running her internet business and managing properties at the same time. She said, "I enjoyed the logistics of SAR and fire and helping coordinate the many groups involved in rescues." Even with so much going on professionally, Flip made ham radio a priority.

First licensed in 1994, Flip is now an Amateur Extra-class licensee, and over the past 27 years, Flip has worked to intertwine ham radio operating with her career choices. She said, "My best career choices revolved around radio in one form or another, especially my work with search and rescue, the sheriff's posse, and fire service in Montana."

Lahra "Flip" Svare, KT9X, calls herself a "Sicilian-American, ham radio operator, Harley biker chick, gamer, author, and musician." [Lahra Svare, KT9X, photo]

Always Learning

Retirement offered Flip "a great transition to more of the fun side of radio," she said. Now she's able to enjoy contesting, participating in nets, getting involved in various club activities, and working on improving her station.

Flip said ham radio offers challenges for her to tackle, especially Morse code, which she wanted to learn from an early age. She said, "I'm still very focused on ham radio and CW in particular. It is consistently challenging and yet fun in the same moment. I like to run the CWops CWTs [CW Tests] and the Straight Key Century Club Sprints, and am always working on improving my CW skills."

She is dedicated to self-study and always looking for new things to learn. She's taken most of the Emergency Communications and FEMA classes, and she is always looking to improve her Morse code speed. She also tries to foster a love of learning in others. She is a Volunteer Examiner for three different VECs and has written articles and blog posts promoting ham radio.

She is a member of the Long Island CW Club (LICW), the Straight Key Century Club (SKCC), CWops, and the Quarter Century Wireless Association. With the help of mentor Howard Bernstein, WB2UZE, one of the founders of the LICW, she learned to use her CW bug and to decode other bugs better. Now she is able to lead some classes at LICW, and she has recently earned her 35 WPM Certificate of Code Proficiency, which she has been working toward for several years.

Retirement

Flip now lives a quieter life with her best friend and husband, Doc, N9DRS. "No more pagers or late-night emergency calls," she said. Still, she keeps herself busy with playing music and writing her own songs. Music has always been a passion for her, and she has been playing acoustic guitar for over 51 years.

She also enjoys traveling and operating ham radio from her RV, where she and her husband live full time in Pahrump, Nevada. Flip said it was difficult to set up a full HF ham radio station in the RV, but of course, Flip was up for the challenge. She said, "We have a great setup now and I enjoy being on the radio almost every day." You can catch her on the air contesting, DXing, ragchewing, participating in HF nets, and talking to far-away friends.

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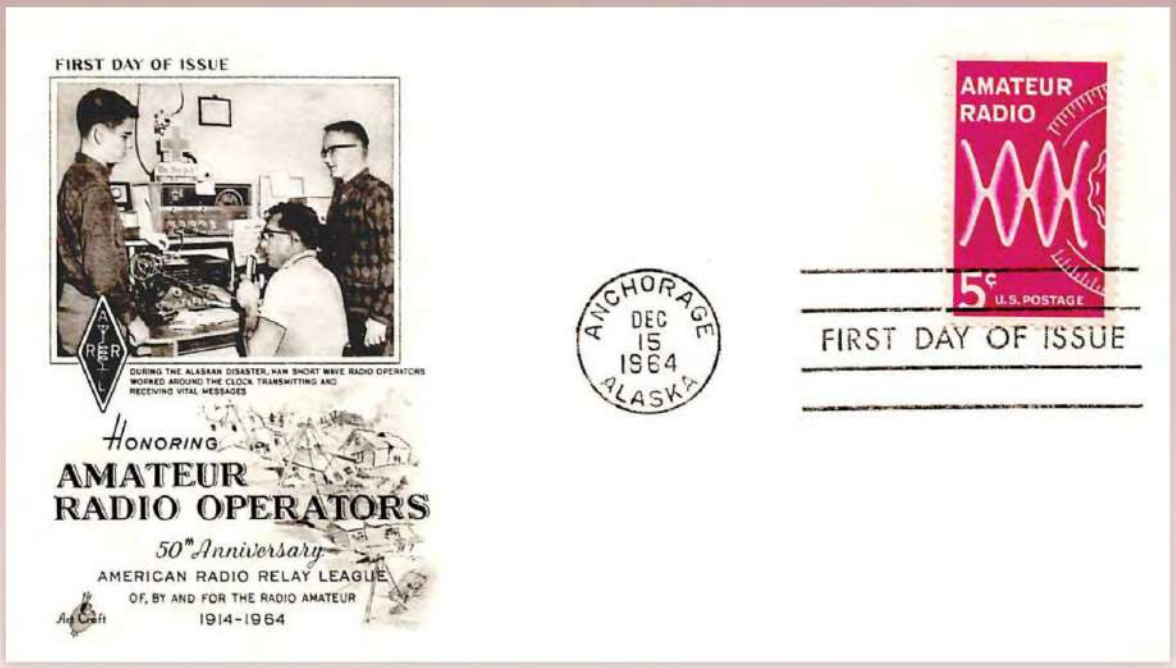
Up Front



Honoring Ham Radio's Response to the 1964 Alaskan Earthquake

Bil Paul, KD6JUI, found this First Day of Issue envelope among his collection of QSL cards. The Post Office Department (as it was called back then) issued a stamp honoring the 50th anniversary of ARRL in December 1964. The caption under the photo says, "During the Alaskan disaster, ham short wave radio operators worked around the clock transmitting and receiving vital messages." This refers to the March 1964 9.2-magnitude earthquake and the resulting tsunami in southern Alaska, which killed an estimated 131 people. It remains the second-most-powerful earthquake in recorded world history.

Recreating a 1961 Station

George W. Deitz, KN3PAT, has recreated the station he shared with his dad in 1961, including a Hallicrafters HT-32B transmitter, and the matching SX-115 receiver. The Hallicrafters HT-32B had to be replaced, but the SX-115 is the original from 1961. George uses them on a daily basis, mostly on 40 and 20 meters on CW.

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Correspondence

Letters from Our Members

Remote Operation From Home

I've been operating my station via remote links since the early 1990s, and have set up a station at my work location in an industrial park. Remote operating has enhanced my ham radio experience without being very expensive.

Most of my remote operation now is done at home with a simple operating location I set up in the family room. I used the remote capabilities of the radio control and logging software *TRX-Manager*, running some wires for the paddle down to my gear in the basement. I later added a control head from an old Icom IC-706MKIIg and ran a remote head cable into the basement, which I can also operate from my car using a second IC-706MKIIg control head connected to Wi-Fi. When I want to operate low-band SSB or participate in contests, I have a setup in an isolated corner of the house, where I use a FlexRadio Maestro control head. I also have separate setups for RTTY and digital modes, using a small computer monitor.

I hope I've opened your eyes to some of the non-traditional remote operating possibilities. I built my systems around the radios I had, and you can too!

Fred Glenn, K9SO
Powers Lake, Wisconsin
Life Member

A Future Adventure

I enjoyed reading the "Eclectic Tech" column about *MySondy GO* in the April issue. It should garner a lot of attention from amateurs who are drawn to this kind of adventure and challenge.

After contacting someone at my local National Oceanic and Atmospheric Association (NOAA) office, I learned that there are only a few National Weather Service (NSW) weather forecast offices currently using 403 MHz. They're transitioning to that frequency range, but don't expect it to be completed until 2023. At present, transmissions are in the 1670 MHz range. The representative at my local NOAA office mentioned that the radiosondes they fly from their NWS station are at 1676 MHz.

If you succeed in wrangling the drivers and flash the firmware on a suitable ESP32 LoRa device, you may still find yourself waiting unless you're in an area of the US that has already transitioned to these frequencies.

Kudos to Mirko Dalmonte, IZ4PNN, for developing *MySondy GO*. I look forward to using his ingenious package in a few years.

Scott Yost, NM8R
Kalkaska, Michigan

Long Contact Morse Code Signals

I think it would be beneficial to create a new Morse code prosign. I'd like to use something that signals whether or not you're interested in a long conversation. I suggest "CQ RC" (for "ragchew"). I think this could prevent some hams from feeling offended when they don't receive the longer contact they're hoping for, and allow those in a hurry to keep moving and seeking out new contacts.

Ĝan Ŭesli Starling, KY8D
Port Sheldon, Michigan

Figuring Out My Station's RF Exposure

As of May 3, the FCC instated new rules for RF exposure limits due to concerns over electromagnetic radiation. I didn't know whether or not my station was going to be exempt under these new rules, or even how to figure that out. And if it wasn't exempt, I didn't know what I was going to do with all of my equipment. I was especially nervous I would miss out on Solar Cycle 25.

However, I was able to use the RF Safety Calculator on ARRL's RF Exposure resource web page (**www.arrl.org/rf-exposure.com**) and thankfully, my equipment passed. Thanks for making it so easy and informative!

Chet Peugh, NK9Y
Chadwick, Illinois
Life Member

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.

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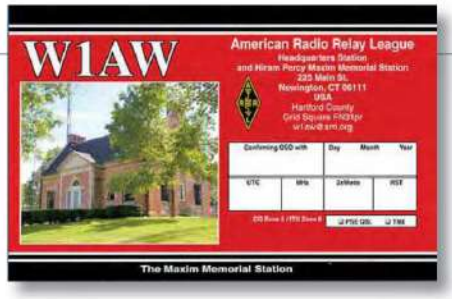

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A Sensitive Field Strength Meter for Foxhunting

A new use for a popular circuit.

Woody White, KZ4AK

An article from the June 2001 issue of *QST*, "Simple RF-Power Measurement," by Les Hayward, W7ZOI, and Bob Larkin, W7PUA, introduced me to the AD8307, an integrated circuit from Analog Devices. Available in an eight-pin dual inline package (DIP), the logarithmic amplifier/detector works from dc to 500 MHz. It produces a dc output proportional to the logarithm of RF power input. Connected to a calibrated meter, it makes a decent log power meter.

I built a meter with a digital readout that works from –80 dBm (.01 nW) to +12 dBm (16 mW). With over 80 dB of range, it seems to work as well as my old lab-grade power meter.

In the September 2008 issue of *QST*, Steve, N2PON, describes a similar meter with a digital readout. Both of these articles can be accessed at **www.arrl.org/arrl-periodicals-archive-search**, free for ARRL members.

Necessities for Foxhunting

I ordered two of the AD8307 chips. With foxhunts in my future, I decided to use the spare chip in a very simple field strength meter (FSM). My digital meter would have worked, but signal trends are harder to follow on digital readouts than with an analog meter.

I have been in several foxhunts over the years, and although I was very close to the hidden transmitter, I could not find it. In spite of using good attenuators, the poorly shielded handheld transceiver/mobile receiver would saturate. There is no way to get a fix on the transmitter when this happens. Extra shielding on the receiver when near the hidden transmitter can help, but it isn't very convenient, and often, the shielding is not good enough. That's where a sensitive, wide dynamic range FSM can take over.

Be aware that the FSM front end is wide open and provides no selectivity. Any RF energy will register, up to about 500 MHz. This is great for a general-purpose FSM, but it's a bit confusing when used for foxhunting. Signals that aren't from the hidden transmitter may come and go. A narrow bandwidth antenna will provide some selectivity, and a simple band-pass filter between the antenna and the FSM helps. However, strong signals could register on the meter by bypassing the antenna and filter and leaking directly into the FSM box. To minimize this, I plan to build a circuit board shield around the AD8307 circuit.

My power meter, as built from the 2001 *QST* article, "Simple RF-Power Measurement," by Les Hayward, W7ZOI, and Bob Larkin, W7PUA. [Woody White, KZ4AK, photo]

HAMSPEAK

Foxhunting: A contest where participants try to locate a hidden transmitter. The transmitter is the *fox* and those trying to find it are the *hunters*.

Circuit Simplifications

For foxhunting, only relative readings matter, so I could take a few shortcuts. For more sensitivity, I left out the 50 Ω resistor at the AD8307 input. With no termination resistor, the input is 1,000 – 2,000 Ω. If you need a 50 Ω termination, add it externally using a BNC T adapter and a BNC 50 Ω load. Unlike in my digital power meter, there is a short run of coax to the input of the chip. If this coax is not properly terminated, it may affect the readings at high frequencies. My coax is short and seems to work fine. The circuit is built on unetched PC board with a "dead bug" style. For operation up to UHF, use small monolithic ceramic capacitors, and keep all leads very short. Almost any 5 V regulator and rail-to-rail, single supply op-amp can be used. Diode D2, type-2N2001 or similar, is for reverse-battery protection. A conventional single-turn carbon potentiometer can be used in place of the 20-turn precision unit, but ease of setting and stability may suffer. The LED (D1) with dropping resistor R10, reminds me the unit is on. The 9 V drain is about 30 mA total, so an alkaline battery should provide 16 hours of operating time.

I used a 250 µA meter scaled 0 – 40 that I had on hand. With a sensitive meter (50 µA or less), you may not have to use the op-amp buffer, just the right series resistor. The AD8307 output ranges from about 0.2 to about 2.5 V at 200 µA at full output. My meter needed a buffer circuit. With the buffer amp shown, full-scale output from the AD8307 will drive the amp output to about 5 V.

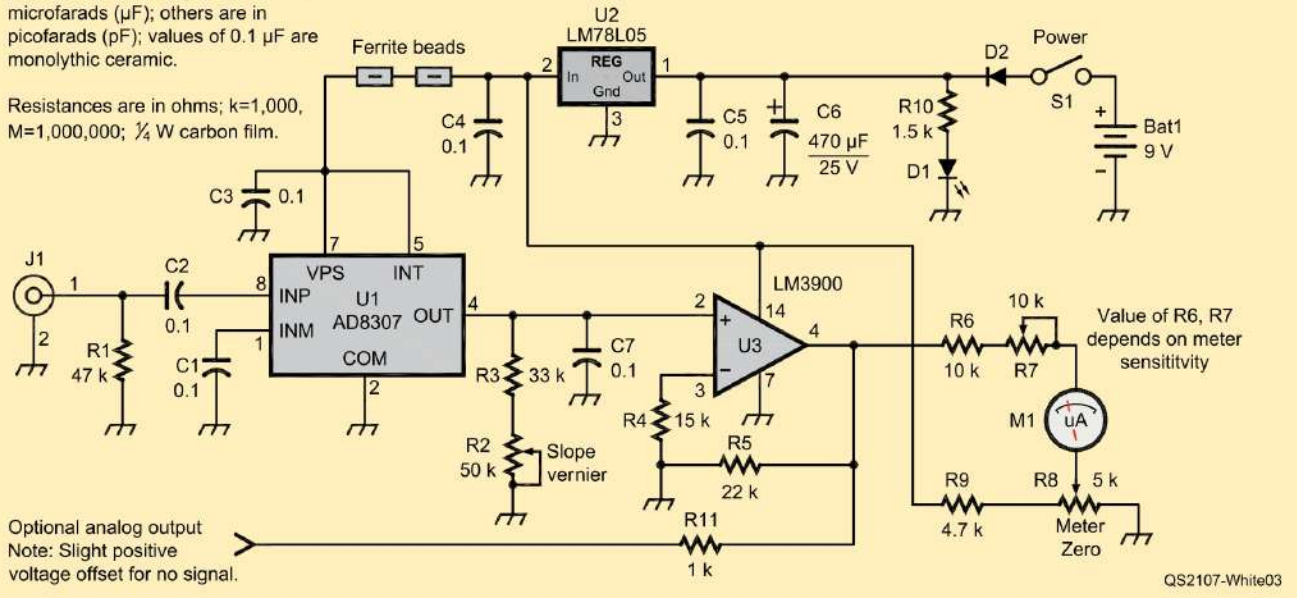
With a VHF "rubber duck" antenna connected to the rear BNC connector, stray RF around the house registers from 0 to 3 on the meter (with no known transmitters running). It reaches full-scale with a 2-meter hidden transmitter a few feet away. Once you get that close, you should easily find the fox.

The field strength meter version. [Woody White, KZ4AK, photo]

Amateur Extra-class licensee Woody White, KZ4AK, was first licensed in the mid-1960s. He has been homebrewing amateur equipment since he was first licensed. More details of this project and some of his other projects can be seen in the amateur radio section of his website (**www.kz4ak.com**). He is active from 160 meters to 70 centimeters, mostly working FT8. Before retiring, Woody worked for the Research and Development divisions of nuclear energy firms for over 45 years. For 30 years, he ran their scanning electron microscope labs. Woody can be reached at **woody@kz4ak.com**.

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

The field strength meter schematic diagram.



An Overvoltage Protection Circuit

This circuit uses a series pass device to disconnect the power supply from the load in the event of an overvoltage condition.

Ralph Gable, WA2PUX

I designed an overvoltage protection (OVP) device for use between my 13.8 V dc, 35 A Pyramid PS-35 power supply and the load. The circuit uses a series pass device that disconnects the power supply from the load. The design operates around the following parameters:

- Overvoltage set point of 15 V (adjustable)
- Maximum normal operating current of 35 A
- Minimum input voltage of 10 V dc
- Maximum input voltage of 25 V dc
- Optional latching in OVP mode
- Input and output active indicator
- Visual and audible overvoltage alarm indicators

I chose a P-channel power MOSFET (see Figure 1) with a maximum drain current capability of 78 A, a maximum **ON** resistance of 6.6 mΩ at 39 A drain current and 10 V gate voltage, with a maximum power dissipation of 40 W.

This power MOSFET is either **ON** or **OFF**, so the power dissipation is relatively low. The gate of the MOSFET is controlled by a high-speed voltage comparator. To further speed things up, I used a 1 nF capacitor across the resistor responsible for reporting the overvoltage condition and the one responsible for controlling the MOSFET.

In normal operation, the MOSFET is turned on with $V_{GS} > 10$ V. At the maximum design current of 35 A, the MOSFET would have to dissipate about 8 W as the worst case.

In the case of an overvoltage condition, the series pass MOSFET is simply shut off, removing power from whatever equipment is being powered by it.

You can choose to add the diode (D7) to enable latching mode. In that case, the voltage comparator reference is pulled low when the alarm annunciator activates, ensuring that the input has to be essentially removed before the OVP mode can be exited. Capacitor C9 prevents the unit from going into a latched OVP mode at startup or in the case of transient events.

Testing of the OVP device shutoff speed is described on the *QST* in Depth web page at **www.arrl.org/QST-in-Depth**. Based on my testing, I am comfortable saying that this OVP device responds within about 12 μs of an overvoltage event.

Building the OVP Device

See the schematic in Figure 1. Set potentiometer R12 to its center position before you power up the circuit. Then set the threshold voltage to 15 V. The five-way binding posts are rated at 35 A. I use the braided shield from some small coax to connect the ground on the board. Additional images and build details, including Gerber files for the PCB, are on the *QST* in Depth web page.

Keep the leads really short for anything that is associated with the speed of response, especially anything associated with Pins 1 and 4 of the comparator.

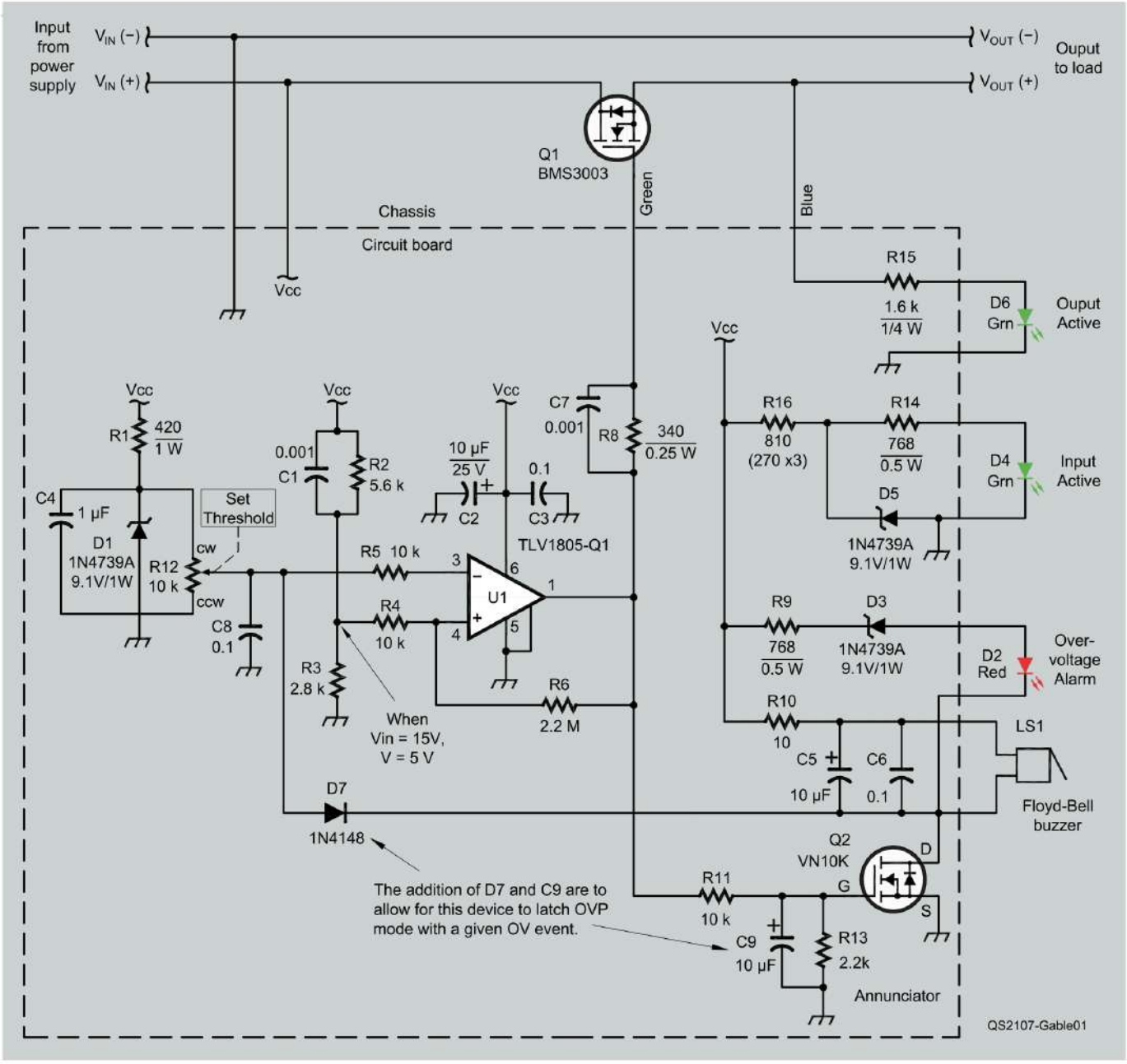


Figure 1 — The schematic diagram and bill of materials.

C1, C7 — 1 nF, 100 V, ceramic
C2, C5, C9 — 10 µF, 50 V, ceramic
C3, C6, C8 — 0.1 µF, 50 V, ceramic
C4 — 1 µF, 25 V, ceramic
D1, D3, D5 — 1N4739ATR, Zener diode, 9.1 V, 1 W, 5%; ON Semiconductor
D2 — Red LED
D4, D6 — Green LED
D7 — 1N4148 or equivalent general-purpose switching diode
LS1 — MB-09-530-S or equivalent buzzer, 5 – 30 V dc; Floyd Bell
Q1 — BMS3003-1E, MOSFET, P channel; ON Semiconductor
Q2 — VN10KN3-G, MOSFET, N channel; Microchip
R1 — 402 Ω, 1 W (or greater) 1% metal film resistor, CPF1402R00FEEE6; Vishay
R2 — 5.6 kΩ, 0.25 W (or greater), 1% resistor
R3 — 2.8 kΩ, 0.25 W, 1% resistor
R4, R5, R11 — 10 kΩ, 0.25 W, 1% resistor
R6 — 2.2 MΩ, 0.25 W, 1% resistor
R8 — 340 Ω, 0.4 W (or greater) 1% resistor, SFR2500003400FR500; Vishay
R9, R14 — 768 Ω, 0.6 W (or greater) 1% resistor, MRS25000C7680FCT00; Vishay
R10 — 10 Ω, 0.25 W (or greater) resistor
R12 — 10 kΩ, 0.1 W (or greater) trimmer potentiometer
R13 — 2.2 kΩ, 0.25 W resistor
R15 — 1.6 kΩ, 0.25 W (or greater) resistor
R16 — 810 Ω, 0.75 W (or greater) resistor [or three 270 Ω, 0.25 W resistors in series]
U1 — TLV1805-Q1, high-speed comparator; TI
Heatsink — scrap box item
Misc. — Five-way binding posts rated at 35 A; two red, two black

Amateur Extra-class licensee Ralph Gable, WA2PUX, was first licensed in 1970. He retired in 2019 from a 20-year career in electronics engineering product development. Ralph maintains a YouTube channel, "Electronics for the Inquisitive Experimenter." You can reach Ralph at **wa2pux@gmail.com**.

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

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

Product Review

Icom IC-R30 Portable Communications Receiver

Reviewed by Steve Ford, WB8IMY
wb8imy@arrl.net

Wide-coverage reception is common these days. Transceivers of all types, including some low-cost models, routinely boast of extended receive ranges. It's even possible to turn your computer into a dc-to-daylight software-defined receiver with a bit of free software and an inexpensive USB dongle.

Less common are wide-coverage, dedicated receivers that don't depend on assistance from any other devices, including computers. Fewer still are the radios designed to bring optimum performance to the task of receiving signals, while being so compact they fit in a coat pocket with room to spare. The Icom IC-R30 is one of these rare creatures.

The IC-R30 covers 100 kHz to 3.5 GHz in a handheld package that weighs just over 10 ounces with the battery and the antenna, and it does so with performance that rivals radios several times its size. Within its broad coverage, you can listen to AM, SSB, CW, FM (wide and narrow), D-STAR, NXDN, and APCO 25 (Phase 1) communications. The IC-R30 also offers the ability to monitor digital private mobile radio (dPMR) and digital convenience radio (DCR), although you'll only find those signals in Europe and Japan, respectively.

Bottom Line

Icom's IC-R30 handheld receiver covers a wide range of bands from LF through microwaves, with reception of a wide range of analog and digital modes.

Out of the Box

The IC-R30 is supplied with a 27-inch telescoping antenna that is more articulated than an ordinary whip. It rotates at two separate points near the base, allowing you to position the antenna exactly where you need it, even if that means collapsed and slung down along the side of the radio. The antenna screws into a female SMA connector, which also allows you to connect an external antenna with an appropriate adapter.

The package also includes a drop-in charger. Slide the radio into the charger and wait for the green LED to indicate that its lithium-ion battery is charged and ready to go.

I was pleasantly surprised to discover a USB cable in the box as well. Many radio manufacturers require users to source their own USB cables, but Icom made an exception with the IC-R30. The USB connection is particularly useful in this radio, as we'll discuss later.

Table 1
Icom IC-R30, serial number 16002021

Manufacturer's Specifications	Measured in the ARRL Lab
Frequency coverage: Receive only, 100 kHz to 822 MHz. 851 to 867 MHz, and 896 to 3305 MHz (cellular blocked).	As specified.
Modes of operation: *A Band ≤1,300 MHz:* FM, FM-N, WFM, AM, AM-N, LSB, USB, CW, CW-R, D-STAR (DV), P25, dPMR, NXDN-VN, NXDN-N, DCR. *A Band, >1,300 MHz:* FM, FM-N, WFM, AM, AM-N. *B Band:* FM, FM-N, AM, AM-N, D-STAR (DV), P25, dPMR, NXDN-VN, NXDN-N, DCR.	As specified (-N = narrow).
Power requirement: 3.6 V dc (supplied battery), charged via USB cable. 330 mA (typical), 200 mA (standby), 100 mA (power saving). BP-293 battery case (3 AA cells) optional.	With supplied battery (4.1 V dc, full charge): At maximum volume, backlights on, 560 mA; backlights off, 500 mA; standby, lights off, 226 mA; battery saver on, 130 mA.
Receiver	**Receiver Dynamic Testing**
SSB/CW sensitivity: 10 dB S/N, 495 kHz – 1.9 MHz, 0.4 µV; 1.9 – 148 MHz, 0.25 µV; 430 – 450 MHz, 0.32 µV.	Noise floor (MDS), CW mode: 137 kHz, –120 dBm; 475 kHz, –128 dBm; 1.0 MHz, –134 dBm; 3.5 – 70 MHz amateur bands, –137 dBm; 144, 222, and 432 MHz, –138 dBm; 902 MHz, –137 dBm; 1296 MHz, –128 dBm.
AM sensitivity: 10 dB S/N, 495 kHz – 1.9 MHz, 2.2 µV; 1.9 – 30 and 118 – 136 MHz, 1.4 µV.	10 dB (S+N)/N, 1 kHz tone, 30% modulation: *Frequency AM AM-N Frequency AM AM-N* 0.198 MHz 2.75 µV 2.26 µV 15.1 MHz 0.63 µV 0.53 µV 1.020 MHz 0.81 µV 0.66 µV 29.0 MHz 0.78 µV 0.64 µV 3.885 MHz 0.58 µV 0.46 µV 50.4 MHz 0.58 µV 0.48 µV 6.160 MHz 0.53 µV 0.47 µV 120.0 MHz 0.78 µV 0.63 µV 7.490 MHz 0.52 µV 0.44 µV 144.4 MHz 0.53 µV 0.43 µV
FM sensitivity: 12 dB SINAD, 3.5 kHz deviation, 28 – 222 MHz, 0.4 µV; 222 – 1300 MHz, 0.56 µV; 1300 – 2700 MHz, 1.8 µV; 2700 – 3305 MHz, 18 µV. WFM (wide FM), 76 – 108 MHz, 1.8 µV.	For 12 dB SINAD, 3 kHz deviation, 1 kHz tone: *Frequency FM FM-N Frequency FM FM-N* 29 MHz 0.23 µV 0.21 µV 223 MHz 0.14 µV 0.13 µV 52 MHz 0.16 µV 0.14 µV 440 MHz 0.14 µV 0.13 µV 70 MHz 0.18 µV 0.16 µV 902 MHz 0.22 µV 0.21 µV 100 MHz 0.67 µV (FM Wide) 1.3 GHz 0.40 µV 0.22 µV 146 MHz 0.14 µV 0.13 µV 2.0 GHz 0.71 µV 0.65 µV 162 MHz 0.14 µV 0.13 µV 3.0 GHz 1.68 µV 1.46 µV
S-meter sensitivity: Not specified.	For full-scale bar graph reading: 14 MHz, 1.33 µV; 50 MHz, 1.48 µV; 146 MHz, 2.75 µV; 440 MHz, 2.37 µV; 902 MHz, 1.99 µV; 1296 MHz, 2.63 µV; 2 GHz, 3.59 µV; 3 GHz, 4.16 µV.
Blocking gain compression dynamic range: Not specified.	At 14 MHz, 20 kHz spacing, 88 dB.*
Reciprocal mixing dynamic range: Not specified.	At 14 MHz, 20 kHz spacing, 65 dB.*
Two-tone, third-order IMD dynamic range: Not specified.	20 kHz spacing: 14 MHz, 66 dB; 50 MHz, 75 dB; 144 MHz, 67 dB; 432 MHz, 58 dB.
Second-order intercept point: Not specified.	14 MHz, –11 dBm; 21 MHz, –5 dBm; 50 MHz, +29 dBm; 144 MHz, +43 dBm; 432 MHz, +23 dBm.
FM adjacent channel rejection: Not specified.	20 kHz spacing, FM/FM-N: 29 MHz, 58/62 dB; 52, 146, 440 MHz, 59/63 dB.
FM two-tone, third-order IMD dynamic range: Not specified.	20 kHz spacing, FM/FM-N: 29 MHz, 58/62 dB,† 52, 146, 440 MHz, 59/63 dB.† 10 MHz spacing, FM/FN-N: 29 MHz, 65/62 dB; 52 MHz, 69/75 dB; 146 MHz, 56/60 dB; 440 MHz, 61/67 dB.
Squelch sensitivity: AM, 495 kHz – 1.9 MHz, 2.2 µV; 1.9 – 30 and 118 – 136 MHz, 1.4 µV. FM, 28 – 222 MHz, 0.4 µV; 222 – 1300 MHz, 0.56 µV; 1300 – 2700 MHz, 1.8 µV; 2700 – 3305 MHz, 18 µV. WFM (wide FM), 76 – 108 MHz, 5.6 µV.	Minimum to maximum squelch range: FM, 29 MHz, 0.38 – 1.13 µV; 52 MHz, 0.34 – 1.08 µV; 146 MHz, 0.73 – 2.26 µV; 440 MHz, 0.51 – 1.57 µV. FM narrow, 29 MHz, 0.43 – 1.32 µV; 52 MHz, 0.4 – 1.29 µV; 146 MHz, 0.88 – 2.72 µV; 440 MHz, 0.6 – 1.88 µV.
IF/audio response: Not specified.	Range at –6 dB points: CW, 375 – 1825 Hz; USB, 462 – 2562 Hz; LSB, 242 – 2625 Hz; AM: 350 – 4245 Hz.

Size (height, width, depth, including protrusions): 6.2 × 2.3 × 1.2 inches. Antenna length, 7.2 inches collapsed, 27.7 inches extended. Weight: 10.4 ounces with battery and antenna.

*AGC could not be disabled for this test (AGC is normally disabled during dynamic range testing).
†Measurement was noise limited to the value indicated.

The ARRL Laboratory charged the IC-R30 for testing prior to sending it to me, so there was little else to do but remove it from the box, attach the antenna, and turn it on. Using just the telescoping antenna indoors, I didn't expect much on the signal front. I tapped the direct frequency entry button on the keypad, punched in 10 MHz, and then selected the AM mode. I was immediately greeted by the dulcet tones of National Institute of Standards and Technology station WWV coming in loud and clear.

I wanted to know how the IC-R30 and its indoor antenna would handle the challenge of 40-meter amateur SSB. After switching to lower sideband and entering 7.255 MHz, I was pleased to hear the East Coast Amateur Radio Service (ECARS) net. This initial test took place while seated on the first floor living room of an aluminum-sided house. I was impressed.

SSB demodulation was crisp, clear, and stable, every bit the match for my regular station transceiver. Moving down to CW, reception was equally impressive, although the IC-R30 lacks the ability to adjust the IF or audio bandwidths for a narrow CW passband.

I dialed in 7.074 MHz USB and ran an audio cable from the earphone jack to the microphone input on my laptop. After booting up the *WSJT-X* software and making a few adjustments, I found myself decoding all the FT8 signals I could see in the waterfall display.

Because I hadn't yet opened the manual (yes, I am one of those people), I discovered one feature entirely by accident. While adjusting the side buttons to increase the volume, my finger strayed briefly onto the power button. The IC-R30 startled me by speaking aloud and announcing the frequency and mode. A quick press is all it takes to trigger it. This would be especially helpful for the visually impaired.

As I explored further, I discovered that like any communications receiver worthy of the label, the IC-R30 includes adjustable RF gain and a multi-step attenuator. These functions really come in handy when you connect the radio to an external antenna. The IC-R30 is designed to expect lower signal levels from the telescoping whip antenna, so it is prone to overload when you connect a superior skyhook. When listening to medium-wave AM, the radio relies on its internal ferrite bar antenna, but even with this antenna, the front end can overload.

The IC-R30 adds a capable automatic noise-limiting function and a separate noise blanker. The noise limiter is available when listening to AM, while the blanker is intended for SSB and CW.

Dual-Watch and Band Scope

The IC-R30 can receive two separate signals simultaneously with its dual-watch functionality, and it will show both frequencies in its 2 × 1.5 inch display as A or B bands that you can designate as either the main or subband (see Figure 1). You can listen to any frequency or mode on the A band, but only the 108, 146, 370, and 440 MHz segments on the B band.

There is a band scope you can activate within whichever band you've selected as the main band. It can sweep once, or continuously, through a range centered on the display frequency. The sweep range is equivalent to 15 times whatever you've chosen for the tuning step. The IC-R30 doesn't provide a touchscreen display, so the only way to stop the sweep and select an interesting-looking signal spike is to push the **CLEAR** button and then twist the dial to move the sweep marker to the target.

Memory Cards and Audio Files

On the side of the IC-R30, you'll find a slot for a microSD memory card. The radio uses this card to store various types of data, including frequency memories and audio files. You must supply a card for use with the receiver, but these are inexpensive and widely available. For this review, I used an 8 GB card.

You can remove the memory card and read the contents on your computer by placing the card in a USB adapter. However, in the IC-R30, you have an easier option — and this is where the USB cable comes into play.

Figure 1 — Receiving SSB on 20 meters on one VFO, and D-STAR on 70 centimeters with the other VFO.

If you attach the USB cable between the IC-R30 and your computer, your computer will recognize the radio's memory card as it would any other storage device, such as a disk drive. In my case, the computer decided that the IC-R30 would be Drive E. All I had to do was open Windows *Explorer*, and I could access everything on the card and write to the card as well. That's much more convenient than physically swapping cards and adapters.

As a bonus, the IC-R30 battery can recharge through the USB connection. The amount of power available at USB ports can vary, so some may be better chargers than others. I tried a few USB options, and while the battery charged in all cases, charging seemed faster with the dedicated Icom charger.

In addition to an automatic reception log, anything you can hear can be recorded and stored to the card for later playback, either through the radio itself or your computer. The IC-R30 stores audio in WAV format, which can result in some large files, but my 8 GB memory card had plenty of room.

There is software available from both Icom (available through dealers) and RT Systems (**www.rtsystemsinc.com**) that you can use to manage the IC-R30's memory contents. With all the available memories and frequencies (and modes) the radio can store, software makes it much easier to manage.

I didn't have an opportunity to try either software package during this review, but I performed one experiment with interesting results. In the memory menu, there is an option to export the memory contents as a CSV (comma-separated values) file. I did this, and then attempted to import the result into Microsoft *Excel*. It worked, and I was able to view and edit the memories in *Excel*, save the file, and then successfully load it back into the IC-R30. Using the Icom or RT Systems software would have been far more elegant, but it was great to see that there is an alternative.

GPS Receiver

As long as we're discussing memory card storage, this is a good time to introduce the fact that the IC-R30 has a built-in Global Positioning System (GPS) receiver. The GPS receiver seemed to be quite sensitive, and it was able to obtain a position fix quickly — even when I was using it indoors with just a window to access the open sky (see Figure 2).

The IC-R30 GPS can be used like any other GPS receiver to determine your position and log your travels. The GPS data can be saved to the memory card and exported for use in other applications, such as *Google Earth*.

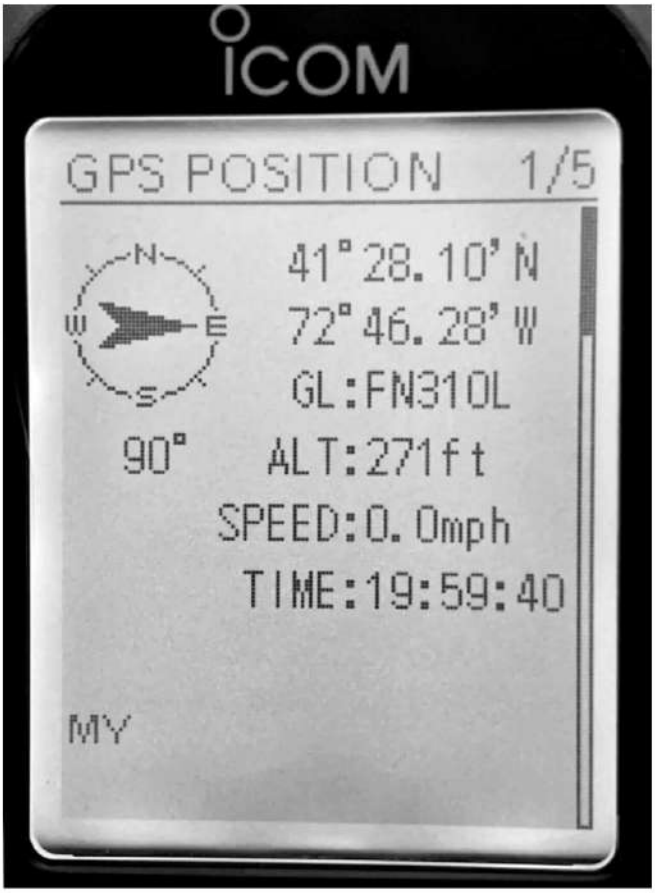


Figure 2 — The built-in GPS receiver seemed quite sensitive.

GPS logging has a practical application that I didn't discover until I had used the radio for a while. If you're roaming the countryside and tracking local signals, it helps to know where you were at a given time. Audio recordings are tagged with the date and time, making it possible to match recordings with your GPS log.

VHF and Beyond

The Icom IC-R30 truly excels in the world above 50 MHz. In particular, its scanning features are among the best I've seen in a long time. You can set up various types of scans and even combine them if necessary. For example, I set up one scan to search for analog FM signals between 146 and 148 MHz, and saved it with the memory label "2M FM." A while later, I configured a scan to look for D-STAR activity between 444 and 450 MHz and labeled it "DSTAR 444."

With the scan configurations stored in memory, I could trigger one or the other any time I wished. Moreover, I

could link the scans, repeatedly running the 2-meter FM sweep, followed by the 70-centimeter D-STAR scan.

The IC-R30 also offers a write-to-memory scan that sweeps through a given range and stores every active frequency in memory. To avoid storing a collection of annoying interference, you can activate the radio's Voice Squelch Control (VSC) that attempts to differentiate between voice activity and random noise. I found the VSC worked remarkably well at identifying real signals.

There was plenty of D-STAR activity to monitor in my area, but finding NXDN signals was a challenge. I did manage to briefly catch a ham NXDN repeater in action, but I had to be very patient.

Monitoring P25 presented a different challenge. My local police and fire departments use P25, but they are on trunking systems, where signals quickly appear and disappear on various frequencies. There are receivers that attempt to decode trunking control signals and track the frequency jumps accordingly, but the IC-R30 doesn't include this capability. Also, more public service agencies are switching to encrypted P25 systems. I turned up a few of these and heard nothing but gibberish.

The IC-R30 lacks the ability to decode digital mobile radio (DMR) signals, which is unfortunate given the rapid growth of amateur activity on that mode. It would have been interesting to eavesdrop on amateur radio DMR repeaters, and commercial operations as well. I wasn't able to use it to monitor any of the System Fusion C4FM activity in my area either.

Figure 3 — You can control the IC-R30 via a free Icom app for either your iOS or Android mobile device.

Bluetooth Audio and Remote Control

The IC-R30 offers wireless Bluetooth connectivity for whatever devices you care to pair it with. I tried it with a pair of wireless headphones, and it was flawless.

The radio can also use its Bluetooth connection for remote smartphone or tablet control via either an iOS or an Android app. Both apps are available free of charge. For the review, I installed the iOS app in my smartphone and had no difficulty connecting to the IC-R30 (see Figure 3). From any location in my home, I was able to select frequencies, modes, and more.

The app doesn't stream the receive audio from the radio, which was initially disappointing. Then I remembered that many Bluetooth devices can support more than one simultaneous connection. So, I reconnected my wireless headphones to the IC-R30 and was delighted to discover that I could listen to signals and use the app to control the radio at the same time. Occasionally, the app control link would drop when I was doing something more involved than simply changing frequencies, but I was able to quickly reestablish the link. The audio stream was never interrupted during the control dropouts.

Conclusion

I'll be the first to admit that the IC-R30 is expensive. On the other hand, it helps to remember that you're paying for a marvel of the engineering art that has been squeezed into a remarkably small package. Yes, the lack of DMR may be a shortcoming for some, but for others, the IC-R30 will more than compensate with its array of features and outstanding performance.

Manufacturer: Icom America, 12421 Willows Rd. NE, Kirkland, WA 98034; **www.icomamerica.com**. Price: $600.

HecKits QRP Wattmeter Kit

Reviewed by Paul Danzer, N1II
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The HecKits QRP Wattmeter kit is specified for use from 2 to 30 MHz and has three power measurement ranges: 100 mW, 1 W, and 10 W. It comes with a custom aluminum case that is drilled for all of the controls and connectors, but is otherwise unfinished and unlabeled. A printable template for front- and back-panel labels is supplied if you wish to glue it on (I didn't try that). The unit can be powered by an internal 9 V battery or an external 12 V dc power supply.

Overview

The case measures approximately 4.7 × 4 × 4 inches (height, width, depth). The left-hand knob on the front panel selects forward or reverse power, and the right-hand knob selects the power range. The LED below the meter glows blue when the unit is turned on.

The rear panel (see Figure 4) has two miniature toggle switches. One selects peak or average power reading, and the other selects the internal battery or coaxial external dc power connector. The BNC connectors are for connection to the transceiver and dummy load or antenna.

The design uses a directional coupler that you make from two identical pieces of thin coaxial cable and two toroid cores. There are two identical sections to the coupler, one selectable for forward power and the other for reverse power. Directional couplers of this general design are described in detail in the "Test Equipment and Measurements" chapter of *The ARRL Handbook* and the "Antenna and Transmission Line Measurements" chapter of *The ARRL Antenna Book*.

For average power measurements, the output of the directional coupler is sent through a 1N34A germanium diode, op amps, and a variable resistor to an ammeter. The gain is set so the voltage from the directional coupler reads full scale, 10 W, on the meter. On the other two scales (1 W and 100 mW), the directional coupler voltage and a fixed voltage are added in one of the op amps to provide full-scale readings. These voltage additions are set during the brief alignment procedure.

For SSB peak power measurements, the directional coupler output produces a modulated dc signal. An additional op amp rectifies and integrates the modulated signal.

Putting It Together

The kit consists of a main PC board, a small PC board for the 9 V dc regulator and bypass capacitors, and several parts mounted on the front and rear panels (see Figure 5).

The manual is supplied as a PDF emailed from HecKits. I found it handy to print several of the color illustrations. To keep track of where I was in the assembly procedure, I made an additional copy of the PC board layout and lightly colored over each part as I mounted it in the main board.

Before starting the build, I copied the main parts list from the instruction manual, overlaid it on a piece of

Bottom Line

The HecKits QRP Wattmeter offers 10 W, 1 W, and 100 mW measurement scales and covers 2 to 30 MHz. It's accurate over its specified power ranges after calibration, which is best done using another power meter of known accuracy.

Figure 4 — The rear-panel switches select peak/average power readings and internal battery/external dc power. The BNC connectors are for the transceiver and load or antenna.

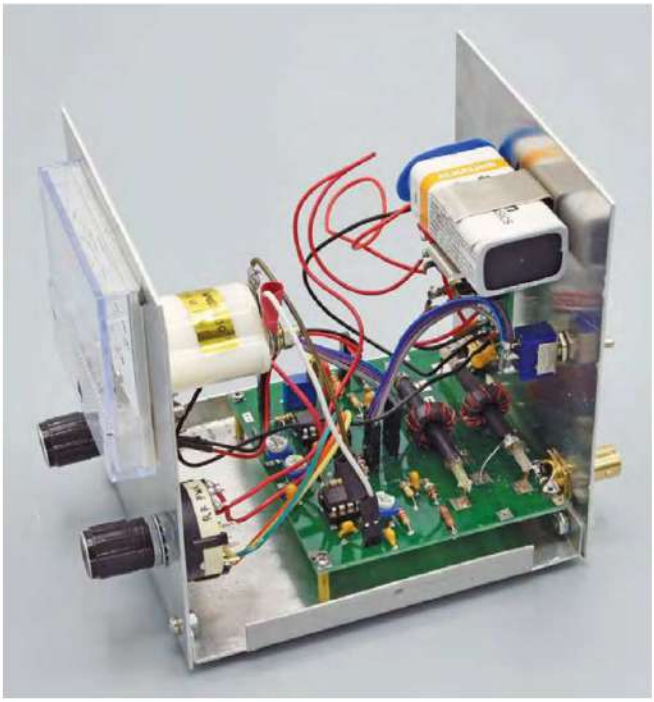

Figure 5 — The main PC board mounts on the bottom of the case, with the small regulator PC board and 9 V battery on the rear panel. The switches and meter connect to headers on the main PC board, and the BNC connectors are soldered directly to the board.

foam board, sorted the small parts by value, and inserted them in the foam-backed list. The resistors all use the standard color codes. The capacitors are quite small and may be marked in values with industrial coding — for example, 10 µF is marked as 106, and 2.2 µF is marked as 225. The manual includes information on identifying components, but you should measure the value if you're in doubt.

The PC board is good quality, with solder mask and some component labels. All components go on the front of the PC board. Several sets of two-pin and three-pin headers are used to connect to the meter and various connectors and controls on the front and rear panels.

Very specific directions are given to wire the two front-panel switches. While they look identical from the outside, one is set for two positions and the other for four positions. They are hand-marked in pen and cannot be interchanged. A ring detent sets the number of allowable positions. If this ring loosens, the manual explains how to reset the detent. A color photo is used to explain the switch wiring.

You must also wire the two toroids. They are identical, with 12 turns of wire on each. You can start at one end and wind all 12 turns, or if you wish, start in the middle and wind six turns on each side. You may find it easier to uniformly space the turns with the six-turn approach. The wire used for the toroids is enamel-covered. You can just tin the ends, and the burnt enamel will simply wipe off.

Before mounting the board in the case, there is one modification I would suggest. If you expect to use the 9 V battery for power, consider mounting the battery clip on the outside of the rear panel instead of the inside. You will have to drill a hole and mount a grommet to carry the battery connecter leads through the rear panel, but with this modification you won't have to open the case every time you replace the battery.

Final Steps

The instruction manual shows two options for calibrating the meter. One method compares readings on the HecKits meter with a wattmeter of known accuracy. Because of component tolerances and variations between the 1N34A diodes used in the coupler, this method will give the best accuracy.

The other method uses a digital multimeter to measure very precise calibration voltages at a test point on the PC board. (These values are for 14.25 MHz, according to the manual.) Install the 9 V battery and a removable jumper used for the calibration mode. Set the unit to measure 10 W average forward power and adjust a multiturn variable resistor for 2.118 V at the test point. Then adjust another variable resistor for a 10 W full-scale reading. Repeat these steps with 0.679 V for the 1 W scale and 0.214 V for the 100 mW scale. Finally, remove the test jumper.

I calibrated the review unit using a multimeter and sent it to the ARRL Lab for evaluation. Test Engineer Bob Allison, WB1GCM, compared readings with the Lab's calibrated HP-437B micro-wattmeter and attenuator test setup. Bob found that at 14 MHz, the HecKits meter read about 25% lower than the Lab's instrument. After recalibrating the HecKits meter to match the Lab setup, Bob found measurements to be very accurate across the power settings. Actual calibration voltages for the review unit measured 2.546, 0.805, and 0.243 V, but this will likely vary from unit to unit.

At this point, you can connect the HecKits wattmeter to your QRP transceiver and measure the output power. You can also calculate the SWR on your feed line using the forward and reflected power values and one of the online calculators. Some additional photos of the kit components and construction are available from **www.arrl.org/qst-in-depth**.

Manufacturer: HecKits, 1302 Highland Dr., Cedar Park, TX 78613; **heckits.com**. Price: $120 plus shipping.

K1EL Systems WKmini USB CW Keyer

Reviewed by Mark Wilson, K1RO
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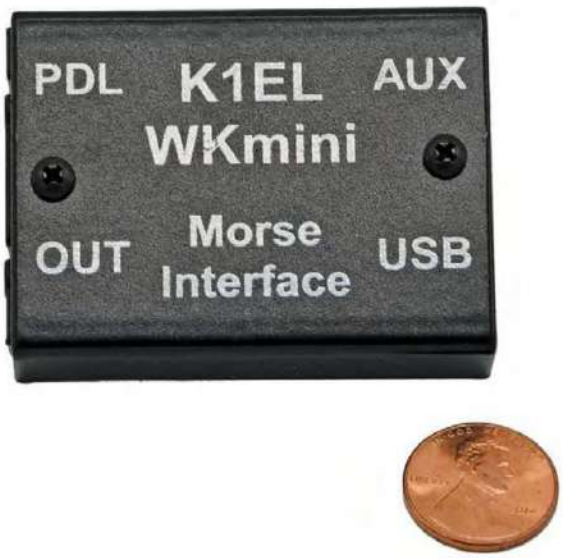
While putting together a portable station for outdoor operating, I acquired a laptop for logging and operating digital modes, such as FT8. For many years, I have used a K1EL Systems WKUSB Winkeyer in my home station. The keyer plugs into a computer USB port and sends perfectly timed CW from many logging and contesting programs, regardless of what other tasks the computer may be performing at the same time.

In looking for a similar solution for my portable station, I found that K1EL Systems has a slimmed-down option — the WKmini. This tiny device offers many of the features of my desktop keyer in a sturdy aluminum case measuring just ⅝ × 2¼ × 1¾ inches. The WKmini has no switches, no pushbuttons for the memories, no speed control, no monitor speaker, and no internal batteries. Everything is controlled by the host software, the transceiver provides the sidetone, and power comes from the USB port. Table 2 shows some of the WKmini's features.

Setting It Up

On the left side, the WKmini has two ⅛-inch stereo phone jacks. One is for the keyer paddle, the other for output to the transceiver. The ring terminal on the output jack can set in software as another keyer output, or as a PTT switch, or for FSK RTTY keying with the latest WinKeyer firmware (more on this later). The right side has an auxiliary jack that is not used, and a mini-B USB jack for connection to the computer. For convenience, I ordered the optional cable set, which includes a USB cable, a cable with ⅛-inch stereo plugs on each end, and a ⅛-inch to ¼-inch stereo adapter for the CW key jack on my radio.



The WKmini uses an FTDI USB driver, and the first step before plugging the WKmini into your PC is to install the driver if it's not already present in your system. The manual offers detailed instructions for locating and installing the driver. Once the driver is installed and the WKmini plugged in, the keyer will be available on a virtual COM port. Although you can locate COM ports using the Windows Device Manager, K1EL Systems offers a utility called *WKscan* that

Bottom Line

K1EL's WKmini is a slimmed-down version of the popular USB WinKeyer for applications where a computer provides power and software control of the settings and messages. Deleting the speed control, message pushbuttons, sidetone speaker, and internal batteries shrinks the WKmini package considerably.

Table 2
Selected WKmini Features

Adjustable speed 5 to 99 WPM
Adjustable weighting
Adjustable keying compensation
Adjustable letter spacing
Adjustable dit/dah ratio
Optional auto spacing
160-character input buffer
Adjustable PTT lead in and tail delays
Iambic A, B, Ultimatic, and bug paddle modes
RTTY FSK transmit with WK3.1
Solid-state relay output rated at 60 V at 200 mA
Metal enclosure with RFI filtering
ESD protection on paddle input
Meets FCC and CE emissions requirements

▲**Figure 6** — The optional cable kit includes a USB cable, a keying cable, and an adapter for the typical ¼-inch key jack.

displays all serial ports in the system. In my case, it showed up as **com4 - WKmini 31.2**, and so COM 4 is the serial port where my applications need to look for the Winkeyer.

K1EL also offers a utility called *WK3demo* that you can use to adjust keyer parameters and store and send messages (see Figures 7 and 8). This worked great for exploring the various keyer settings.

On the Air

The WKmini uses an optically coupled solid-state relay rated at up to 60 V and 200 mA for keying the radio, so it will handle any modern transceiver. The paddle input dits and dahs can be swapped to match your wiring, and the keyer supports iambic A and B, Ultimatic, and bug modes.

K1EL's website lists more than three dozen ham radio logging, contesting, and Morse code programs that are WinKeyer-compatible. The manual includes detailed, well-illustrated instructions for setting up the WKmini with *N1MM+ Logger*, *Ham Radio Deluxe*, *N3FJP AC Log*, *fldigi*, and *MRP40*. I quickly set up *AC Log* and *WriteLog* on my laptop to use the WinKeyer on COM4 for sending CW, with the logging apps controlling the CW sending speed and memory message contents. Some applications, such as *AC Log*, allow control of weighting and other keyer parameters.

An interesting feature of WinKeyer version 3.1 is the ability to generate an FSK (frequency shift keying) signal for RTTY operation. In the RTTY mode, the ring terminal (PTT) of the output jack connects to the FSK keying input on your transceiver (usually found on one of the multi-pin accessory jacks). The manual includes

▶**Figure 7** — K1EL's *WK3demo* software offers an easy way to check out the WKmini's many features. It can even be used as a memory keyer to record and play messages. The lower (larger) window shows text to be sent, and it appears in the upper window as it is sent. *WK3demo* Version 4 also supports the FSK RTTY keying features added in WinKeyer Version 3.1.

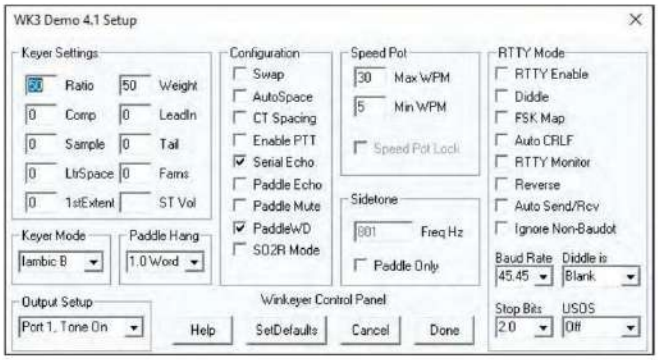


Figure 8 — The *WK3demo* Version 4 setup screen for adjusting both CW and RTTY keying parameters. Some compatible logging and CW programs offer similar setup screens.

detailed instructions for setting up *N1MM+ Logger*, *fldigi*, and *WK3demo V4* to use the WKmini for sending FSK RTTY. You'll still need a RTTY decoder for receiving, for example *N1MM+ Logger* integrated with *MMTTY* or *2-Tone*, or *fldigi*'s built-in RTTY decoder. Some transceivers have RTTY decoders built in as well.

The WKmini instruction manual is excellent. Along with the utilities and support files available from K1EL's website, you should have no trouble setting up and using the WKmini to generate perfect CW. Firmware can be updated via the USB cable as new versions become available.

Manufacturer: K1EL Systems, **www.k1elsystems.com.** Price: $64 plus shipping; $74 with a cable kit.

Garmin inReach Mini Satellite Communications Device

Reviewed by Bruce Prior, N7RR
n7rr@hotmail.com

A crucial part of our radio amateur heritage is helping other people in distress. When people depend on us to transmit and deliver an accurate emergency message, we accept the challenge.

I enjoy backcountry hiking and operating from portable locations for Summits on the Air (SOTA), often in remote areas that are out of cell phone range. Even non-emergency messages can be important for friends and family, such as getting delayed, experiencing bad weather, or having a flat tire.

The inReach Mini, shown at actual size. [Photo courtesy of Garmin International]

Global Satellite Communications

Because of the combination of the Amateur Packet Reporting System (APRS) and FM and skywave (HF) amateur radio gear in my backpack, I initially avoided adopting global satellite communications. With the appearance of a shirt-pocket satellite communicator, the Garmin inReach Mini, I decided to take the plunge and carry the small device on my backcountry adventures. Including the antenna, the Mini's dimensions are 3.9 × 2.04 × 1.03 inches, and it weighs 3.5 ounces.

No license is required for inReach users. In contrast with amateur radio, inReach devices will not operate without paying subscription fees. All inReach subscription plans begin with a $19.95 subscription activation fee. The cheapest contract fee is $143.40 per year for a bare-bones Safety Plan. It's $299.40 per year for a Recreation Plan, and $599.40 per year for an Expedition Plan. For more details about the various plans, visit Garmin's website and look under the "Outdoor Recreation" tab.

The inReach system uses the Iridium satellite constellation. The 66 active Iridium satellites are placed in near-polar orbits in six orbital planes, which means that they are somewhat easier to access the closer the user is located to the North Pole or the South Pole, but the system still operates satisfactorily on or near the equator. Those low-Earth orbit (LEO) satellites use frequencies between 1.616 GHz and 1.6265 GHz. Propagation in that spectrum can be attenuated under dense forest cover and in deep valleys, which means that users may have to wait a short spell until another satellite appears.

Bottom Line

Garmin's inReach Mini satellite communications device offers a safety net for amateurs hiking and operating portable from remote locations for programs such as Summits on the Air (SOTA).

Help in an Emergency

Emergencies don't just happen in the backcountry. They can take place at home or work or while traveling. Carrying an inReach device routinely means that we can use it wherever we find ourselves, and that's especially helpful in areas without cell phone coverage.

The most notable feature of an inReach device is the recessed SOS button, which initiates a text dialogue with the International Emergency Rescue Coordination Center (IERCC) in 210 languages or dialects. IERCC dispatchers can notify local authorities about a rescue request. With more information received from a user, rescue missions can be better prepared to render appropriate assistance. Any inReach owner can request rescue services for other people.

SOS should be invoked only for a genuine emergency. In some jurisdictions, rescues can be expensive for rescued people, so Garmin also sells rescue insurance packages. Rescue insurance is also available to members of the American Alpine Club for human-powered backcountry activities.

Using the inReach Mini

When I was first getting started with inReach, I accidentally set the wrong language in my Mini, so I had to reset the unit. Instructions for resetting are printed permanently on the back of the Mini. Instructions for both sending an SOS alert and for canceling such an alert are also printed on the device.

A GPS receiver in the inReach Mini keeps track of the user's location, plus speed and direction of travel. Waypoints with geographical coordinates and elevations can be saved. Routes of travel can be recorded and reversed for a return trip. Access to the Garmin Earthmate app with topographical maps for smartphones is included with the purchase of any inReach device. Garmin also sponsors an internet facility called MapShare to share routes with others.

Messages can be composed directly on the inReach Mini in uppercase and lowercase, but a limited number of buttons makes text composition time consuming. An inReach unit can be paired with a smartphone via Bluetooth to make manual data entry more efficient. The maximum text length for inReach messages is 160 characters, including recipient contact information. Longer texts need to be divided into more than one message.

Standard messages can be composed ahead of time on the Garmin Explore website and are then synchronized with the handheld device. An inReach owner can send unique text messages to other inReach units, to email addresses, to telephone texting facilities, and to social media. Communication is entirely via text.

You can store three preset messages to be sent multiple times at no extra cost. Here are my three preset messages:

- Heading to planned destination. All is well.
- Staying here overnight. All is well.
- Coming home soon. All is well.

Quick text messages can be saved on a handheld unit to make composition more efficient. I use the inReach Safety Plan, so I am limited to 10 routine sent and received messages per month without extra charge. I have defined the following additional quick text messages for convenience:

- Will be delayed one day or more. All is well.
- Continuing to another SOTA summit. All is well.
- Vehicle trouble. Please dispatch tow truck to this location.
- Thirsty. Please dispatch water to this location.
- Hungry. Please dispatch food to this location.
- Shivering cold. Please dispatch sleeping bag & dry clothes & shelter to this location.
- Injured. Cannot move from this location. Request evacuation.
- Badly sick. Request either medical treatment at this location or evacuation.
- Helicopter landing OK at this location.
- Helicopter landing not possible at this location. Long cable required for rescue.

Clicking the link on a recipient's computer shows the inReach location on a map. Clicking + or – increases or decreases the map scale. Clicking **MORE** yields location coordinates, speed, course, elevation, and battery condition for the inReach device. Text conversations can take place among specified inReach users, even if they are located very far from each other.

Owners of an inReach device can also receive text messages from designated sources, but those received messages are charged modest fees which accrue to the owner's inReach account. Messages include location information about the sender, and specified inReach users can navigate to that location. Basic or premium weather forecasts keyed to a specific location are available.

Figure 9 — N7RR's backcountry station includes an Elecraft KX2 for HF operation, a Kenwood TH-D72 dual-band handheld with APRS, RAVPower USB power bank, Garmin inReach Mini, as well as a canister of extremely effective bear spray to defend himself against North American predators like cougars and bears. [Margaret Prior, K7MWP, photo]

Battery Life

The rechargeable lithium-ion inReach Mini battery is limited to 1.25 Ah capacity. There are a number of ways to increase battery life, but I don't want to get caught in the backcountry with my device drained of power. So, I carry an external rechargeable battery that weighs considerably more than the Mini itself (15.3 ounces), but it is fairly economical. It's called the RAVPower 32000 mAh three-port USB power bank (see **www.ravpower.com**). That external battery can recharge the Mini and other devices, such as smartphones and headlamps. Figure 9 shows the gear I typically carry on a backcountry operation.

Final Thoughts

Using inReach is not amateur radio, but it can enhance other activities, and in a true emergency, the device could be crucial without the time delay of setting up a skywave amateur radio antenna, finding an accessible amateur repeater, or checking into an amateur traffic net. For non-emergency situations, radio amateurs have many more ways of communicating than inReach users do. I encourage any outdoor enthusiast to earn an amateur radio license.

I also recommend that hams carry a 2-meter handheld while enjoying the outdoors. Signals at 2 meters can penetrate forested regions better than UHF or microwaves, and 2-meter repeaters are usually available near urban areas. For FM simplex operating, the 146.52 MHz national calling frequency is available. The adventure FM simplex frequency is 146.58 MHz, and off-road 4 × 4 drivers often use 146.46 MHz, but that frequency is used as a repeater output in some areas.

For radio amateurs and non-radio amateurs alike, a satellite communicator like the Garmin inReach Mini could be vital. With one of the higher-level plans that include more text messages and more transmitted tracking points, backcountry SOTA operators have a way for hunters to track their progress or to send a spot announcing that they are on the air.

Manufacturer: Garmin International, 1200 E. 151st St., Olathe, KS 66062; **www.garmin.com**. Available from many retailers and online sources. Price: $350 (requires additional subscription for service).

Dave Casler, KEØOG, askdave@arrl.org

Ask Dave

Welcome to QST*'s newest column, "Ask Dave," by ham radio YouTuber Dave Casler, KEØOG. Dave's popular channel — which is also called "Ask Dave" — is a trove of technical information, earning it the alternate title, "Ham Radio Answers." In his first* QST *column, Dave introduces himself and lets you know how to submit questions for him to answer.*

When I was a brand-new Novice-class licensee, I had many questions. One was how long my coax was supposed to be. The answer I was given, usually with a laugh, was, "long enough to reach the antenna!" I was certain the old-timers at the local club were pulling my leg. As it turned out, the answer really is "long enough to reach the antenna," and it isn't a joke, but rather the kind of question a beginner would ask.

I still remember how I felt when my question was treated as a joke. I vowed I would never take someone else's question the same way. In fact, it's a basic tenet of how I look at ham radio: treat all questions as sincere.

Ham Radio Background

I got into ham radio at Brigham Young University, where I was studying mathematics. Our club, W7OHR (now N7BYU), had its own station in the student union, equipped with Drake Twins — a very nice station for the time. There were always other students around to give me answers, and finally, with just a few months before graduating, I was an official Novice, call sign WN7AIU. My parents gave me a Heathkit HW-16 kit as a graduation present, but once I left the safety of the college campus, I had no mentor to go to with questions. I learned to solder on my own (it was a miracle the HW-16 came to life). I dove into ham radio with gusto, and before long I had my General- and Advanced-class licenses. I upgraded my radio to a Yaesu FT-201 and had a ball.

However, ham radio got pushed aside for a stint in the US Air Force, a wife and family, and jobs in the civilian world. I worked for Northrop (where I was Vice President of the employee radio club), then IBM. When we moved to Colorado in 1987, my call became KEØOG.

Sharing the Answers

In the 1990s, I was approached by a retired kindergarten teacher, Ellie Van Winkle, NØQCX (SK), about helping to teach a youth group called the Boulder Amateur Radio Club Junior Division (BARC Junior; see my article, "BARC Juniors, An Auxiliary Youth Club Success Story that You Can Duplicate," in the September 1997 issue of *QST* for more info). I was with the group for 10 years and watched as it brought ham radio to hundreds of youth, including my two children, as well as my wife.

Several of these kids were from my church congregation. One thing led to another, and I was soon teaching adult members of the congregation. We developed a unique partnership with BARC and opened the classes and Volunteer Examiner (VE) testing to the public. For a while, we were the most prolific VE team in Colorado. This spread to sister congregations, and before long, my students became teachers themselves. We set up a local 2-meter net, so new hams could practice their skills, including taking turns at being net control. That net, formed over 20 years ago, is still going today.

YouTube Channel and Exam Prep Guides

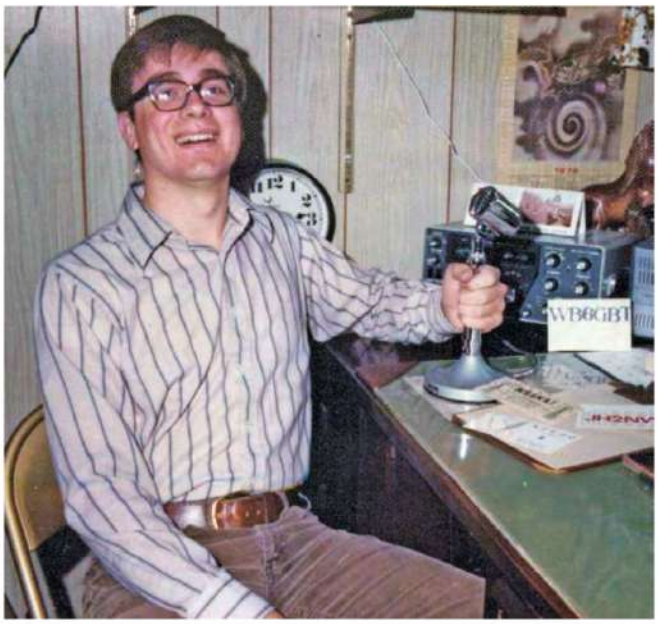
In 2003, my wife and I moved to the Colorado Western Slope and now live in Ridgway. I was again asked by local church leaders to start a class here, but the Western Slope is only lightly populated, and it proved ineffective to do in-person classes. Instead of the 20 attendees I'd seen in the Denver area, we had four.

At that same time, I was experimenting with a new technology called YouTube. I created something in between in-person classes and self-study. The idea was that I would create a series of videos that introduced the material in *The ARRL Ham Radio License Manual*.

Someone could watch the video, then study the section in the book, then study the questions, and repeat. The result was a series of 35 videos, tightly tied to ARRL's license manual.

Although only a few people on the Western Slope watched these videos, I started getting encouraging emails and comments from folks throughout the US. Many reported getting their Technician-class licenses as a result. Greatly encouraged, I developed a series of videos to accompany *The ARRL General Class License Manual*. The last step, which took nearly 2 years, was a complete set of videos for the Amateur Extra-class level. These videos were far more complex and harder to put together. It turns out that 25% of my viewers are from outside the US, and many hams from around the world reported that the videos are helpful with their national exams.

No sooner had I completed the Amateur Extra-class videos than I realized it was time to update the Technician-class videos for the new edition of the license manual. Since then, I've been through several cycles of updates.



Dave, back when he was WB6GBT.

A viewer suggested my next project, a series of videos in which I answered questions. Named "Ask Dave," the first video in this series was posted in 2015. I've increased the frequency of these videos and now post six new ones every week. I now have over 400 of these videos on my YouTube channel (**www.youtube.com/davecasler**). I also have a weekly livestream. Folks can send questions for my YouTube channel to **hamradioanswers@gmail.com** or put them into a form at **www.ke0og.net/ask-dave**.

New Beginnings

When the author of *QST*'s "The Doctor is In" column, Dr. Joel Hallas, W1ZR, retired, I was asked to step in. It is a daunting task, and Joel's shoes will be hard to fill. I will still be maintaining my YouTube channel, more formally known as "Ham Radio Answers," in addition to writing this *QST* column, which is named "Ask Dave," like my YouTube channel. I will continue to strive to put up my own new YouTube videos every day, and will address questions that are sent to me either here in this column or on my YouTube channel. And every month, I'll create a video for the ARRL YouTube channel (**youtube.com/arrlhq**) that's based on one of the questions from the *QST* column.

As for my licensing videos, they're moving to the ARRL website. I will still keep them current with the help of ARRL.

I'm excited by this new collaboration between ARRL and "Ask Dave." I look forward to your comments and questions. I can't promise to answer all of them, but between the YouTube channel and the column, we'll get you some answers!

Ask Dave Your Ham Radio Questions

Email **askdave@arrl.org** to submit a question that Dave Casler, KEØOG, may answer in an upcoming "Ask Dave" column.

Each month, Dave will expand one of his answers into a brief video that you can find in the "Ask Dave" playlist on ARRL's YouTube channel at **youtube.com/arrlhq**.

If you've got questions, don't be shy. Ask Dave!

Hints & Hacks

Testing Transformers, Securing Your Radio, and Slowing Down Your Dits

A Low-Voltage AC Dummy Load

An adjustable dc dummy load is a useful tool for testing power supplies. Such a circuit draws a specified current from a supply and measures the resulting output voltage, to describe how the latter varies with the former. Less frequently seen is an adjustable ac load, but such a unit can identify the relationship between current and output voltage for transformers. This is important information when choosing a transformer to, say, light up the filaments of a tube-based project, or when determining the properties of a hamfest find.

Power MOSFETs are often used in dc dummy loads. The voltage applied to a MOSFET's gate determines its resistance. Here is an ac load that contains two MOSFETs back-to-back. The same gate voltage is applied to both, so that an ac voltage across them sees a consistent resistance. The gate voltage may be varied continuously from a moderate negative voltage to an equal positive value to adjust that resistance. The circuit diagram is shown in Figure 1.

To measure the current drawn from a transformer and the resulting voltage, there are three possibilities, complicated by the fact that low-voltage ac meters are less common than dc devices. One option is analog meters, which are available from a variety of sources, but which may not offer as much precision as we want.

Another option is digital meters, which are more precise — or at least repeatable — but less common for low ac voltages. The third option measures the current drawn and the resulting voltage with external meters, such as digital multimeters with ac ranges.

The circuit in Figure 1 is built around a pair of inexpensive analog meters (0 – 30 V ac and 0 – 5 A) and parts that I had on hand. A simple power supply uses a small 20 V transformer (T1) and almost any rectifiers to provide the adjustable gate voltage to a pair of IRF542 MOSFETs. Most of the circuitry occupies a piece of a RadioShack protoboard.

The unit's enclosure is made from several pieces of sheet aluminum. Its size was dictated by the meters, which occupy most of the front panel, along with the power switch, indicator, load potentiometer, and two binding posts to connect to a transformer being tested. The load control is a multiturn potentiometer, to make precise setting of the load easier. A heat sink occupies much of the rear panel, to which the MOSFETs are attached with mica insulators and shoulder washers. The heat sink should be large. When the unit draws, say, 4 A from a transformer at 12 V, it must dissipate 48 W. Figure 2 shows the assembled unit from the back.

To use the dummy load, connect the secondary of the transformer being tested to the load and power up both the load and the transformer, being careful of the primary voltage. With the load's control, set the current to be drawn from the transformer, and read the resulting voltage. Figure 3 shows a transformer being tested. Figure 4 presents a graph of a transformer's output voltage as a function of the current drawn from it. As expected, that voltage diminishes as the current increases.

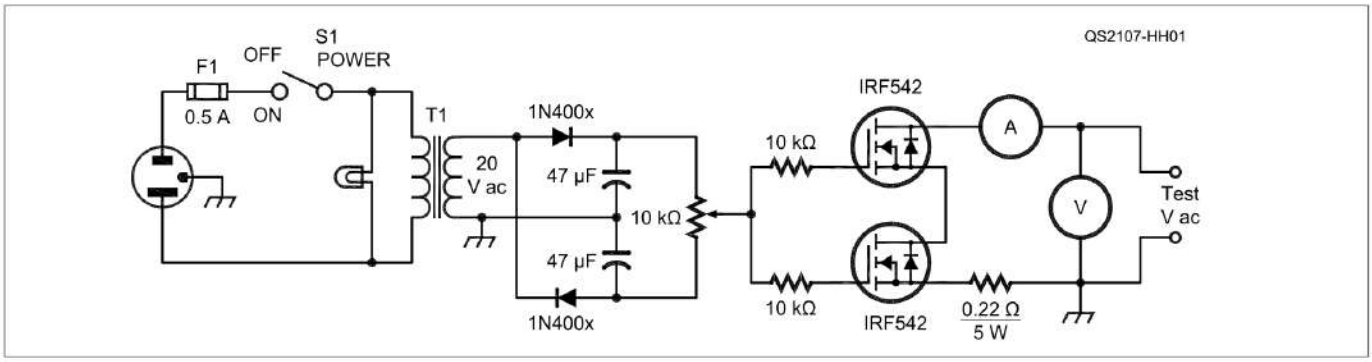


Figure 1 — A schematic diagram of the low-voltage ac load.

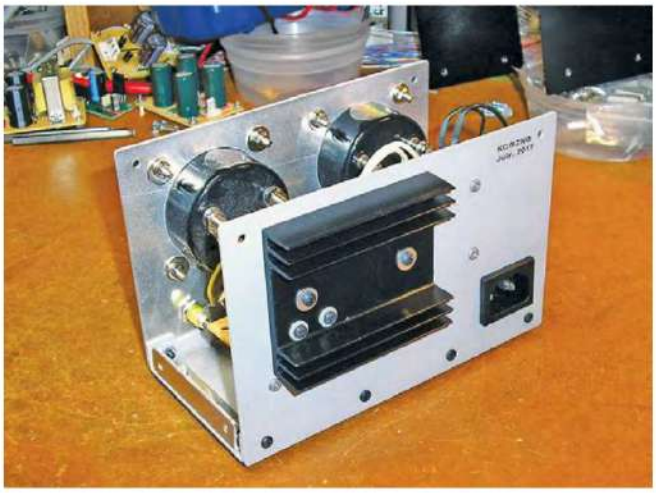


Figure 2 — The assembled unit. [Bryant Julstrom, KCØZNG, photo]

Figure 3 — Testing a transformer with the load. [Bryant Julstrom, KCØZNG, photo]

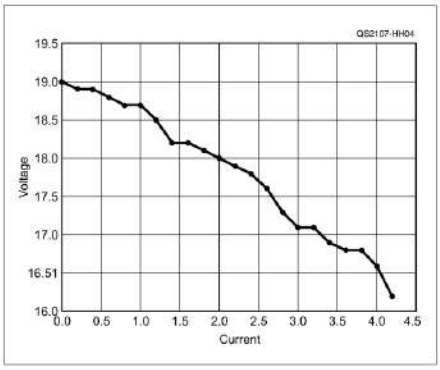


Figure 4 — The transformer's output voltage as a function of the current drawn from it.

Some MOSFETs can handle large voltages, so an ac dummy load using such transistors should be able, with appropriate changes in metering, to analyze high-voltage transformers as well. In that case, be careful of the high voltage being tested. — *73, Bryant Julstrom, KCØZNG,* **kc0zng@arrl.net**

Lock Your Rig

The Kensington Security Slot is an anti-theft lock commonly used to keep laptop computers from being stolen. It can also be used to secure your ham radio equipment.

The lock slot can be added to panels up to 3⁄16 inch thick. I added a slot to the heatsink on my Icom IC-7000 transceiver (see Figures 5 and 6).

Figure 5 — A small slot cut in the heatsink or metal frame of your radio is all that is needed to accommodate a Kensington lock. [Bob Klaus, NØYWB, photo]

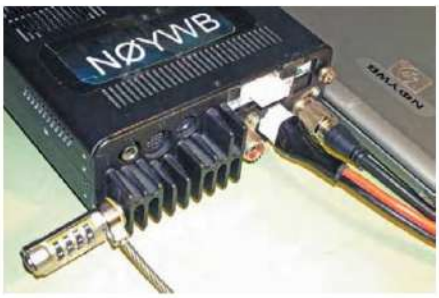


Figure 6 — A Kensington lock securing your rig will add an extra measure of security to any portable operation. [Bob Klaus, NØYWB, photo]

I drilled two 1⁄8-inch-diameter holes, with the centers 1⁄4 inch apart. Then I drilled additional holes between. I slowly worked the bit side to side to mill out the remaining material to create an appropriately sized slot. Finally, I inserted the lock and rotated 90°. All that's left to do after that is remember the combination. — *73, Bob Klaus, NØYWB,* **n0ywb@arrl.net**

Slow Your Dits

Many medium-speed CW operators like to use bugs but have a hard time getting the dits under control. I have found that rather than adding more weight to the pendulum arm, if I extend the arm so that the weight is outside of the damper arm, I can get the dits exactly right. Best of all, the feel of the bug is better than it is with a lot of weight on the pendulum.

If you'd like to try this method, cut 2 inches of 5⁄32-inch brass rod and 2 1⁄4 inches of 3⁄16 × 0.014 brass tubing. Slide the piece of brass tubing on the pendulum arm of the bug and then slide the brass rod into the tubing. — *73, Lynn Kuluva, KØIMI,* **k0imi@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.

Paul Wade, W1GHZ, w1ghz@arrl.org

Microwavelengths

Understanding Feed Horns for Parabolic Dishes

A dish antenna has two parts: the parabolic reflector and the feed antenna that transitions RF energy from the feed line to the dish. At microwave frequencies, the feed is commonly a feed horn. There seems to be a lack of understanding of feed horns, even among some experienced microwavers. It's time for a review of the basics.

Parabolic Dish Illumination

A parabolic dish is a quasi-optical reflecting lens. Energy arriving from a distant source is reflected by the dish to converge on the focal point. In the other direction, transmitted energy emitted at the focal point is reflected by the parabolic reflector into a narrow beam. Any energy emitted that does not illuminate the reflector is wasted, so we want a source that only illuminates the reflector.

A feed horn is chosen to illuminate the desired parabolic reflector. A typical feed horn radiation pattern is selected and positioned to be about 10 dB down at the edges of the reflector to provide the best aperture efficiency, yielding the best gain. Figure 1 shows how a feed horn for a prime-focus dish must cover a wide illumination angle (120 to 180 degrees depending on the focus-to-diameter ratio, or f/D), while a feed horn for an offset dish covers a narrower angle (about 80 degrees for common TV satellite dishes). The feed horn should be matched to the reflector, so the 10 dB down circle of the horn should meet the edge of the dish when the feed horn is at the focus.

An open waveguide radiates with a rather wide beamwidth, which might be usable as a feed horn for some prime-focus reflectors; coffee cans have been used at lower frequencies. Because beamwidth is inversely proportional to aperture size (a larger aperture produces a narrower beamwidth), the narrower beam needed for an offset dish can be realized by flaring the waveguide into a horn with a larger aperture.

One problem with simple waveguide feed horns is that currents in the waveguide wall at the aperture create large side lobes in the E-plane (azimuth for horizontal polarization). This makes the radiation pattern asymmetrical, illuminating the reflector unevenly, wasting power, and reducing efficiency and gain. A circular waveguide flaring out into a funnel-shaped horn has the same problem.

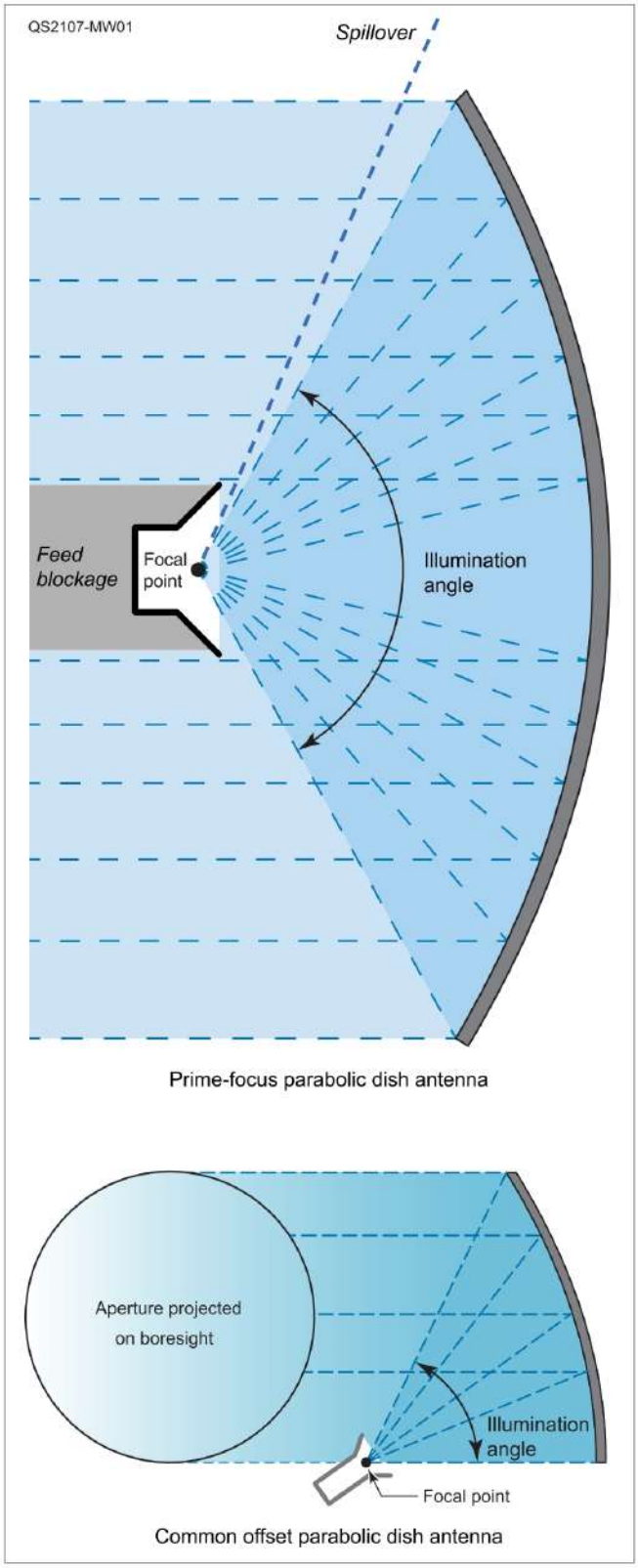


Figure 1 — Prime-focus and offset parabolic dish antennas showing illumination angles.

Figure 2 — Choke rings improve dish gain and efficiency to make better feed horns. On the left are single and multiple choke rings for prime-focus. At the right is a conical horn with rings for an offset feed horn.

However, the width and height of a rectangular horn can be varied independently to make the radiation pattern more symmetrical and to move the side lobes so that they miss the reflector. Thus, a carefully designed rectangular horn can be a good feed horn for an offset dish. A template for one may be found in *The ARRL Antenna Book*, 24th edition, page 15-74.

The effect of the currents in the waveguide can be reduced and performance can be improved by adding choke rings around the waveguide (see Figure 2). Adding multiple rings (often called a Chaparral feed) makes the feed more broadband, but a single ring is adequate for an amateur band. The classic choke ring, popularized by Barry Malowanchuk, VE4MA, is ½ λ deep and ½ λ wide around the circular waveguide. Performance can be further improved by optimizing the dimensions, which is explained in more detail at **www.w1ghz.org/antbook/conf/high_efficiency_prime_feeds.pdf**.

Standalone satellite TV horns are rare today, as most are integrated into a low-noise block (LNB) assembly, but some can be cut off and modified. For lower bands, similar horns can be homebrewed by scaling the dimensions. Some metal work may be required, either with sheet metal (see Figure 3) or by finding pipe, tin cans, and cake tins with approximately the desired dimension. Another possibility is 3D printing a feed horn, then coating the plastic with conductive metal, as described in the January 2019 "Microwavelengths" column.

The Phase Center

The parabolic reflector has a focal point where energy is focused, but feed horns are much larger than a point. The radiation from a good feed horn appears to emanate from a single point, which we call the *phase center*, at least over the illumination angle. Better feed horns have the same phase center in both the E-plane (azimuth) and H-plane (elevation). When the phase center of the feed horn is placed at the focal point of the dish and the feed horn is pointed at the center of the reflector, the dish antenna is complete.

Figure 3 — Larger feed horns for lower frequency bands can be fabricated from sheet metal, like the one Chip Taylor, W1AIM, is adjusting on his 16-foot dish for 1296 MHz.

For prime focus feed horns, the phase center is located near the center of the waveguide aperture. For the phase center of offset feed horns, it is typically inside the horn. Exact feed horn placement can be optimized by using sun noise or a sufficiently long antenna range.

On-Air Testing

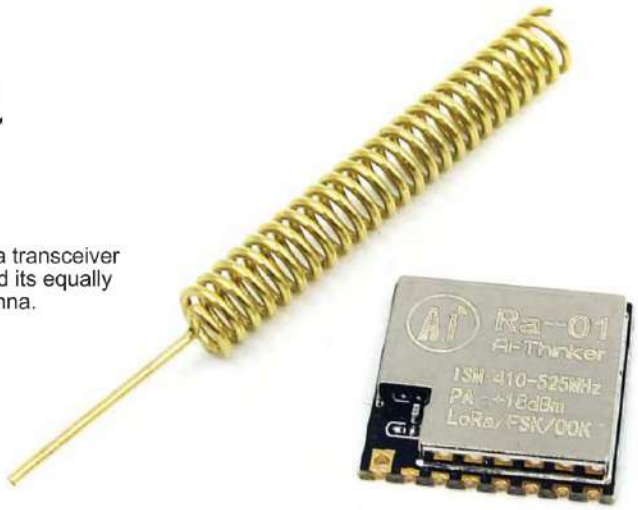
The best antenna is the one that is on the air and making contacts. Getting on the air usually involves some compromises, so don't obsess about making everything perfect. Just do your best, try it out, and you'll see where improvements are needed over time.

All photos provided by the author.

Steve Ford, WB8IMY, wb8imy@arrl.net

Eclectic Technology

The Rise of LoRa



A tiny LoRa transceiver module and its equally small antenna.

The April edition of this column discussed a novel radiosonde tracking system built around a miniature 70-centimeter data transceiver. You may have noticed in the transceiver ordering details that the acronym "LoRa" appeared as part of the model number.

I've been seeing increasing references to LoRa in wireless circles, including those frequented by hams. You can expect to hear more about this technology in the years to come, so it helps to get at least minimally acquainted.

The Internet of Things

LoRa is an acronym that simply means "long range," which doesn't tell you very much. Dig deeper and you discover that it is a data communications system based on UHF transceiver modules, some of which are the sizes of postage stamps. These modules communicate using a modulation technique derived from chirp spread spectrum (CSS) technology.

LoRa transceivers are capable of sharing data over distances of several miles and more — sometimes much more. There are even LoRa satellites presently in low Earth orbit and they pass data to ground stations that often sport little more than ground-plane antennas.

LoRa achieves its remarkable performance by striking a compromise between sensitivity and data rates. When signals are good, the data rate automatically increases, but as signals decline, the data rate decreases. This is all taking place within a fixed-bandwidth channel of either 125 or 500 kHz (for uplink channels), and 500 kHz (for downlink channels).

LoRa also uses orthogonal spreading factors that adapt to whatever the network conditions may be. Devices communicating with each other over relatively short distances would transmit data at a low spreading factor, because very little link budget would be needed. However, a device that needs to communicate over long distances would transmit with a much higher spreading factor. This higher spreading factor provides increased processing gain, and higher reception sensitivity, although the data rate is lower.

Manufacturers like Semtech and many others are creating low-power wireless platforms with LoRa transceiver modules and they are rapidly becoming the default technologies for Internet of Things (IoT) networks worldwide.

IoT is yet another acronym that will become familiar to more people in the near future. It promises a world in which many of the devices you take for granted will communicate with each other, and the internet, using LoRa. IoT devices will share information, automatically download data, and even install software updates. A refrigerator, for instance, could "know" when you're running out of eggs and automatically place a restocking order.

Industry is already embracing IoT in major ways, especially in automation and remote monitoring applications. In IoT networks that have been deployed to date, LoRa appears to be the technology of choice.

LoRa and Ham Radio

LoRa transceivers are inexpensive and widely available. You can pick up a 100 mW LoRa transceiver module on Amazon, for example, for less than $25. A few hams I've spoken with are wondering if LoRa radios might be put to use creating ad-hoc networks over large areas for applications such as public service. There are LoRa transceiver boards available for use within our 70- and 33-centimeter bands.

Although the price is attractive, keep in mind that the data rates are typically low. This means you're unlikely to be passing voice or video data through a LoRa network. That said, they may be excellent for low-data-rate telemetry, such as a network of weather sensors. For less than $25 a pop, I think it would be fun (and in keeping with the spirit of amateur radio) to buy a couple and see what can be done!

The West Gulf Division Communication Task Forces Program

These highly trained teams were formed to support requests from the Texas Division of Emergency Management.

Lee H. Cooper, W5LHC

During the 2007 Texas legislative session, the state responded to identified shortcomings in its response to both Hurricane Ike and Hurricane Rita. Communications — or, more accurately, the lack thereof — was one of the items at the top of the agenda. While Texas enjoys very robust public safety communications systems, the lack of interoperability was evident in the after-action reports.

As a result, several bills were introduced to help support future emergency and disaster response. In addition to bills that prevented homeowners associations (HOAs) from not allowing solar panels or generators, legislation was also passed to create the Communications Coordination Group (CCG). This department of the governor's office was chartered to review and address any communications-related shortcomings in the state's preparation for, and response to, disasters, with a focus on all organizations that could provide communication needs. Among the local, state, federal, military, and civilian organizations invited to be members, the amateur radio community became a prime member of the group.

As the CCG was formed and began to develop policies, procedures, and response protocols, the Chief of the Texas Division of Emergency Management created task forces to be staffed, trained, and prepared to meet the next major event. He created four teams comprised of emergency responders from multiple agencies across state and local regions to train and be prepared to respond when needed. The communications needs were to be coordinated by the CCG. Communications resources were drawn from state, local, and civilian organizations, and included amateur radio. These teams were organized around separate geographical areas and were known as Team Dallas, Team Waco, Team Austin, and Team San Antonio. Amateur radio task force operators were assigned to each team.

The West Gulf Division Communication Task Forces Program

As a result of the formation of the CCG, the ARRL West Gulf Division (WGD) recognized a need to be prepared at a higher level than was typical in an ARES organization. To that end, the WGD developed what are known today as Communication Task Forces (CTFs). Coordinating with the ARRL Ham Aid program, which has a number of pre-positioned go-kits

West Gulf Division Communication Task Force members Robert Geraldon, N5REG (seated at left), and Don Reznicek, N5DMR (seated at right), sharpen their skills as CTF member Dave Martin, K5YFO (standing at right), and Mike Barnett, KF5DEY, look on (standing at left).

A Communications Task Force go-kit.

stationed nationwide, several kits were pre-positioned with the task forces to allow operators to practice using them in advance of a potential need. The kits, which can be re-positioned if needed, consisted of an HF radio, a tuner, and wire antennas. The task forces supplemented these with VHF capabilities, laptops, and locally sourced SCS PACTOR III modems.

Along with the creation of these teams, a standard training matrix was developed, consisting of standardized training that ranged from entry level to the highly advanced training required to participate in one of the CTFs. Additionally, a very detailed Position Task Book was created to track the team members' level of training.

The CTFs were also required to conduct regular field operation training to ensure the equipment and the operators were ready to deploy at a moment's notice. Each team was required to be able to deploy to devastated areas and subsist on their own for up to 72 hours, until local infrastructure was operating again, or until they were relieved.

The field training requires each team to be able to set up Winlink hubs to receive local VHF-based messages. The teams also had to have the HF capabilities to reach out of the affected areas and pass the information forward.

The various state task force participants, whose communications needs during disaster events were coordinated by the CCG, used several high-end communications platforms provided by multiple county/city emergency response organizations. Most had amateur radio capabilities built into them.

Each participating agency had an individual approach, and within the platforms there was no standard or practical experience in communicating between team platforms as needed. This is the primary reason the CTFs were included in the platform makeup.

Most of the amateur capabilities on these platforms were focused on local response, mainly VHF in nature. Because the WGD CTFs were available to respond with these teams, the platforms gained the Winlink HF capability.

Amateur Radio at the Table

Once legislatively created, the CCG began developing protocols on how to ensure interoperability concerns were best managed. A provision of that legislation was to identify amateur radio as a prime member of the group. The West Gulf Division's response was to develop the Communication Task Forces to meet this commitment.

One of the first items the CCG addressed was that there were three prime response organizations assigned to the CCG (ARES, RACES, and MARS) and we needed to work together to be functional.

This led to the creation of an overarching grouping called the Volunteer Amateur Groups, a combination of each of the three prime response organizations, with specific areas of responsibility assigned to them. When handed an ICS-213 request for amateur radio assistance, the request would be evaluated against defined mission statements or a group's specific capabilities and be assigned to the group best equipped to respond to the request.

The primary missions of the Volunteer Amateur Groups are:

MARS serves Texas Military Forces and the Texas Division of Emergency Management (TDEM). Note: At the time the CCG was created, Army MARS had a standing request from the Texas National Guard to participate actively in the response efforts. Since then, their mission has evolved into a primarily DOD mission, so MARS is no longer an active participant in the Volunteer Amateur Groups.

RACES supports the TDEM State Operations Center and Disaster District Committees, and provides backup communications between each.

ARES supports county, city, and local Emergency Operations Centers, state and local shelters, hospitals, the National Weather Service, the American Red Cross, and other served agencies as requested, as well as other missions as requested by agencies or assigned by the CCG.

Prepared for a Major Response

Due to leadership changes at the state level, the CCG's task forces were disbanded, citing the prohibitive costs of the ongoing training and communications exercises. WGD ARES, however, saw the value and effectiveness of the concept and has kept the response team in place. Through today, during large-scale disaster events, these teams are available and put on standby to be deployed if state emergency management officials request it.

There is an old adage that says, "All disasters are local," and they are — except when they're not. While a tornado or flooding event may be primarily a local event, storms such as hurricanes tend to be very widespread and the need for disaster intelligence, situational awareness, and operational traffic can span many jurisdictions, causing communications issues to become critical even when they have not necessarily failed. The WGD currently has five task force teams in place with the equipment and training to respond to a major disaster. While the program was created to address these internal requests, the basic concept of deploying outside the local area can also address requests from served agencies at a state or national level, but there is often a lack of training focused on that level of preparation. Applying the concept for the CTF program nationally would likely help us be prepared when the next Hurricane Maria-level event occurs.

Lee Cooper, W5LHC, was first licensed in 1994 and has been active in emergency management since 1996. He has helped pass state legislation so hams can take time off work to assist in disaster response, established ARCHES (Amateur Radio Communication for Hospital Emergency Service), and developed the Texas Division of Emergency Management's Communications Coordination Group. Lee can be reached at **w5lhc@arrl.org**.

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

Inside Medical Tent Alpha, US Navy personnel input data into laptop computers linked to AREDN network equipment. [Roger Roehr, KK4YJJ, photo]

AREDN at the US Marine Corps Marathon

Improving communications equipment and network speeds for one of the largest marathons in the country.

Mark D. Braunstein, WA4KFZ

For over 20 years, hams in the National Capital Region have supported the US Marine Corps Marathon, held each year in late October. Often referred to as "The People's Marathon," the event is open to runners of all levels and is one of the largest marathons in the US. Each year, about 20,000 runners and 70,000 spectators come out to participate.

Joined Forces

This marathon is unique in that it's a joint effort between the US military and civilian volunteers. The Marine Corps sponsors and manages the race, and US Navy medical personnel provide triage and treatment for runners in need of assistance, ranging from simple cuts and scrapes to more life-threatening situations, such as heat stroke. The marathon office treats this as a "planned mass casualty" event and uses it as an opportunity to train medical students for working in chaotic, high-stress environments. Numerous civilian volunteers aid in the logistics of the event. As civilian volunteers, hams are considered an important part of the operation because we provide communications along the race course and at the medical tents. About 150 hams volunteer for the marathon each year.

Ham Volunteers

Along the race course, hams with mobile radios and handheld transceivers relay information back to a unified command center staffed by representatives of multiple security and first responder agencies in the area. On the medical front, hams provide communications at the aid stations along the course, as well as at the medical stations at the end of the course. Hams enter medical information into a central runner database, so that injuries and medical dispositions can be tracked.

Time for an Upgrade

Originally, medical communication via ham radio was performed using packet radio. Telnet connections were established to allow information (recorded on paper forms) to be transcribed into simple text fields that would then be uploaded to a database. Starting in 2007, D-STAR (Digital Smart Technologies for Amateur Radio) Icom ID-1 radios were used to provide faster communications, with data being entered into a web browser form.

Because the Icom ID-1 radios are no longer produced, AREDN® (Amateur Radio Emergency Data Network) was considered as an alternative way of providing digital communications for the database. Additionally, the marathon office changed their database vendor. The new database is a web-based application that requires internet-level speeds to operate, as well as a reliable connection back to a cloud server. Initial tests with the new database and ID-1 radios were conducted. Because the ID-1 can only support a link speed of 128 Kbps, a faster link was needed. It be-came clear that AREDN would be required to provide megabit-level service to support use of the new database.

Equipment Testing

In 2018, an initial test of AREDN was conducted between the medical stations. A chain was established

from the medical tent at the finish line to the last medical tent at the Rosslyn Metro Station in Rosslyn, Virginia. The Marine Corps provided the internet connection using their mobile command post. This test revealed the challenges in supporting communications environments ranging from an urban canyon in Rosslyn to the open areas at the National Iwo Jima Memorial, where the finish line is located. Only the medical stations were tested; the aid stations along the course were not involved. All told, a mesh network link could be established and data rates of nearly 3 Mbps could be realized using nodes located on relatively low masts.

Ed Colonna, K4ESC, set up an array of Raspberry Pi computers as servers linked to the US Marine Corps network. The servers provided the AREDN network with Network Time Protocol (NTP), chat capabilities, PBX (private branch exchange) capability for IP phones, and a reverse-proxy server to provide HTTPS/HTTP translation compliant with FCC Part 97 requirements. Joe Porcelli, KT3I, configured the reverse-proxy server. [Mark Braunstein, WA4KFZ, photo]

Leveraging the successful AREDN tests, a course-wide test was conducted in 2019. This test was designed to connect the aid stations along the course, as well as the medical tents. The Marine Corps again provided the internet connection to the cloud server hosting the runner database. To cover the entire course, sector nodes were established. The nodes were arranged at approximately 90° to each other, providing overlapping coverage. The goal of this arrangement was to offer coverage opportunities for aid stations that may not be able to access a single sector due to blockages from buildings or trees. The nodes were installed a few weeks before the race.

One sector, operating at 2.4 and 5.8 GHz, was located on the roof of the DoubleTree Hotel in Crystal City, Virginia. A cellular modem was used to support management of the network prior to the race because a local internet connection wasn't available on the roof of the building. The second sector, operating at 5.8 GHz, was located on the roof of the Arlington General District Court. With 120° beamwidths, both sectors were able to "see" each other and automatically connect via the AREDN mesh networking architecture. We were also allowed to install a third sector node on top of the Smithsonian National Museum of American History. This node operated at 2.4 and 5.8 GHz and provided additional coverage for the aid stations along the National Mall. Throughout the day of the race, the AREDN nodes were able to maintain a connection through the mesh network.

The 2019 deployment was considered a further test of AREDN capabilities for the race. This was the first opportunity for operators along the course to test out their gear in an actual deployment. It turned out that 78% of the stations could successfully connect to the AREDN network. Those that couldn't were limited by terrain or other obstacles, or experienced unforeseen equipment issues. This was a successful first step in proving the viability of AREDN for use at the Marine Corps Marathon.

Future Plans

The plan going forward is to further enhance AREDN performance and increase the number of stations able to successfully connect to the network. Also, more testing and joint operational exercises are planned in conjunction with the Marine Corps Marathon office to resolve network bandwidth and stability issues.

A special thanks goes out to several individuals involved in this effort. First and foremost, thank you to the ham radio volunteers who have worked to make this AREDN effort a success. I would also like to thank Arlington County Emergency Operations Manager David Morrison; John Weise, N4NPG (NN3SI call sign custodian); Michael Carrancho, KV4RC, and National Museum of American History Director of Facilities Operations Mark Edney for assistance in gaining access to the rooftop of the National Museum of American History.

Mark Braunstein, WA4KFZ, first earned his license in 1970, in Cincinnati, Ohio. After serving as an Electronics Technician (E6) in the US Coast Guard, he earned a BS in electrical engineering from The George Washington University in 1985. Mark works as a Senior Principal RF Engineer in the defense industry. He has been volunteering with the US Marine Corps Marathon ham operators since 2011, using both D-STAR and AREDN technology, and is a member of the Ole Virginia Hams Amateur Radio Club. He can be reached at **wa4kfz@arrl.net**.

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

Simulated Emergency Test 2020 Results

Amateur radio operators practice their emergency response skills in simulated disaster scenarios.

Steve Ewald, WV1X

As Ken Kobetitsch, KD2GXL, Assistant District Emergency Coordinator of Nassau County, New York, aptly stated in his SET summary report, "2020 was a challenging year in many ways." With the pandemic ever-present around the world, amateur radio operators adapted and continued to prepare for emergencies. The 2020 ARRL Simulated Emergency Test results help represent the efforts by leaders and participants in the ARRL Amateur Radio Emergency Service (ARES®), the Radio Amateur Civil Emergency Service (RACES), the National Traffic System (NTS), SKYWARN®, and many other allied groups and individuals.

ARES members of the Bedford County Amateur Radio Society (BCARS) in the Western Pennsylvania Section provided supplementary communications for a simulated search and rescue effort in Shawnee State Park to find two lost hikers with medical conditions. [Lloyd Bankson Roach, K3QNT, photo]

Maryland-DC Monitors Water Gauges in a Flood Scenario

Jim Montgomery, WB3KAS, Section Emergency Coordinator, Maryland-DC

This exercise demonstrated the versatility, readiness, and capabilities of this all-volunteer group of radio communicators. When emergencies strike, current ground truth information is of the utmost importance. In 2020, our simulated exercise focused on area flooding. There are approximately 1,100 stream gauges across the State of Maryland. They provide data for all sizes of flowing water, from creeks to rivers. Seventy-nine such gauges were selected for the exercise, resulting in data collected from 44 different sites. The ARRL Maryland-DC Section was tasked to survey those gauges and report their findings back to the state.

In this exercise scenario, following a near-miss of a hurricane and isolated tornados, statewide rivers and streams swelled to the point of concern to the Maryland Emergency Management Agency (MEMA). Roads became impassable, and families and communities were slowly being isolated. MEMA asked the amateur radio community to assess the status of gauges and report water levels approaching flood stage in various locations, send a photo, and to report gauge condition, location, and GPS coordinates.

On October 10, survey teams deployed a buddy system to previously researched designated flood-prone areas and began relaying MEMA requested information back to a centralized-county command post in Baltimore County. Some survey teams had an APRS/voice/data operator in the passenger seat. Multiple teams surveyed multiple sites during their deployment to canvass a segment of their county.

There were several communications options available to the radio operators to keep in touch and send their reports to their county collection point, including local (county) repeaters, simplex operations, or the Central Maryland Repeater Group (CMRG) 440 Linking System.

SET Scores

For an explanation of SET scores, visit **www.arrl.org/public-service-field-services-forms** and click on "SET Score Card."

Great ShakeOut for Tri-Valley Region

Ron Kane, AD6KV, Emergency Coordinator

The amateur radio operators within the Tri-Valley region in California (East Bay Section), including Livermore Amateur Radio Klub and the Tri-Valley ARES, participated in the Great ShakeOut earthquake drill by forming radio networks across the valley, as well as in the separate cities. The ini-

2020 SET Top Ten

Section	Points
ARES Activity	
Mississippi	10,918
Ohio	2,047
Southern New Jersey	1,314
Eastern Pennsylvania	1,198
Connecticut	1,129
Georgia	1,089
Western Washington	1,045
Western Pennsylvania	977
Eastern New York	761
Wisconsin	704
Section/Local Nets	
Mississippi	9,743
Wisconsin	7,655
Ohio	2,023
Connecticut	461
Western Pennsylvania	447
Wayne Co.	403
Kentucky	313
Alabama	306
Georgia	222
Western New York	175

tial radio check-in net had 21 participants and the city nets were composed of their respective members. Nearly everyone was able to check in locally using simplex as well.

The format for the exercise was to have operators check in with their call sign, sector location, and a statement of "damage" or "no damage." The AD6KV radio repeater system at ValleyCare Hospital in Pleasanton was used to attempt to cover the entire valley. There is emergency power for this system. As luck would have it, the Pacific Gas and Electric public safety power shutoff included the repeater, which disabled it. This added a bit more realism to the ShakeOut. Net operations were controlled, participants operated in a disciplined manner, and the event was viewed as a general success.

Red Cross Drill Incorporated in Dallas County, Iowa

Dan Case, K0WOI, Emergency Coordinator

The 2020 Dallas County, Iowa, Simulated Emergency Test was conducted on November 14, 2020. We took advantage of the American Red Cross drill occurring that same day to tie that event into our local exercise and found it to be quite effective.

Our local simulated scenario involved a winter storm, resulting in several feet of snow over an extended period that rendered travel between smaller communities in our area impossible. Shelters had been set up in these small towns to house stranded individuals or those who needed food or a place to stay warm. Additionally, several power outages had impacted local cell phone service.

The American Red Cross mobilized resources to help provide needed supplies to these shelters as soon as primary transportation could be reopened. Amateur radio operators from each community were asked to prepare them for that mission with specific information about the shelter's location, the number of people in each one, whether the shelter had power and heat, and discussing if any special supplies were needed. ARES members used VHF repeaters to collect the required information and transmitted via a Winlink HF gateway to the Red Cross North Central clearinghouse in Minnesota.

Boone County, Missouri, SET Coincides with Red Cross Exercise

Bill McFarland, N0AXZ, Emergency Coordinator

The 2020 SET was designed to coincide with the American Red Cross's nationwide emergency communications drill held the same day. The Red Cross objective was to see how many ARC-213 forms could get sent via Winlink to their designated divisional clearinghouses from interested radio operators around the country.

Our ARC-213s were to be addressed to Winlink tactical address ARC SOUTHWEST, and we copied WX0BC for delivery to our Emergency Communications Center (ECC) station. Boone County ARES deployed 17 amateur radio operators in pursuit of the information packets that had been created and distributed to 25 Red Cross designated shelters throughout the county by the Boone County Office of Emergency Management before the exercise. The information packets contained instructions and data for the creation of an ARC-213. By using the Winlink RMS nodes Boone County ARES established at the ECC, we demonstrated that we can communicate efficiently via Winlink email from the shelters to the Southwest Clearinghouse and the ECC in the same message. Voice communications were confirmed from all shelter sites by using available repeaters in the county, including digital mobile radio (DMR) and Digital Smart Technologies for Amateur Radio (D-STAR).

Luzerne County ARES Tests Communication Capabilities

David Kirby, N3SRO, Emergency Coordinator

Luzerne County ARES conducted a SET on October 19 to test the voice, digital, and image capabilities between the Luzerne County Emergency Operations Center in Wilkes-Barre, Pennsylvania, and various amateur radio operators located throughout the county by using several layers of available radio infrastructure. High-frequency voice and data communications were also successfully utilized between the EOC and field units. Telemetry (position and weather) and text messages were also sent using the packet system in the county.

Sixteen radio amateurs participated in the exercise, covering 13 field units, and the EOC, where three radio amateurs were stationed. Individual operators were socially distanced as they worked from their home stations, and the EOC-assigned operators wore all necessary personal protective equipment and followed social distancing protocols as dictated by the emergency management agency staff. Several ARES members ran their home stations on emergency power for testing purposes.

ARES Activity

Area	Reporter	Points	Section
Atlantic Division			
Eastern Pennsylvania			1,198
Wayne Co.	WA2CCN	902	
Montgomery Co.	W3AFV	179	
Luzerne Co.	N3SRO	117	
Maryland/DC			126
Anne Arundel Co.	KA2JAI	72	
Dorchester Co.	N3SCF	54	
Statewide exercise	WB3KAS	Written report	
Southern New Jersey			1,314
Section-wide	WB2ALJ	707	
Ocean Co.	WX2NJ	213	
Cumberland Co.	N2MHO	162	
Gloucester Co.	W2KBF	137	
Mercer Co.	WJ3P	122	
Western New York			377
Otsego Co.	KD2HXE	244	
Chenango Co.	KC2FSU	133	
Western Pennsylvania			977
Bedford Co.	KA3UDR	298	
Crawford Co.	WW3S	227	
Allegheny Co. (South 1)	NU3Q	148	
Beaver Co.	N3TN	122	
Mercer Co. #1	NR3C	110	
Mercer Co. #2	NR3C	72	
Central Division			
Illinois			174
Lake Co.	K9DRW	174	
Wisconsin			704
Eau Claire Co.	K9NY	335	
Dunn Co.	KB9MMT	283	
Ozaukee Co.	AA9WP	86	
Dakota Division			
Minnesota			316
Washington Co.	KAØHYR	197	
Carlton Co.	KCØAFE	119	
Delta Division			
Arkansas			357
Eastern Arkansas	W5WPN	357	
Mississippi			10,918
Scott Co.	K1REZ	10,127	
Statewide	KC5IMN	247	
District 8	KF7DLW	154	
Jackson Co.	K9EYZ	132	
Madison Co.	W5DIX	97	
Forrest Co.	N5AAS	94	
Harrison Co.	AG5RI	67	
Tennessee			311
Jefferson Co.	WD4CM	204	
Anderson Co.	WA4LNX	107	
Great Lakes Division			
Kentucky			533
District 9	KB9LXH	124	
Trigg Co.	KJ4TKL	102	
Madison Co.	KO4OL	90	
Butler Co.	KN4MAA	84	
Logan Co.	KF4UKC	71	
Caldwell Co.	KJ4HFS	62	
Michigan			352
Saginaw	KC8YVF	251	
Tuscola Co.	WJ8V	101	
Ohio			2,047
Licking Co.	KD8SCL	431	
Cuyahoga Co.	KC8NZJ	317	
Franklin Co.	N8PVC	230	
Miami Co.	KC9NVP	205	
Guernsey Co.	WD8SDH	132	
Delaware/ Franklin Co.	N8BHL	115	
Warren Co.	N8EPG	113	
Shelby Co.	N8KZL	94	
Greene Co.	KE8FMJ	91	
Lake Co.	WB8ZGH	72	
Jefferson Co.	N8CUX	66	
Stark Co.	N8ATZ	61	
Washington Co.	W8JTW	52	
Mahoning Co.	WB8YHD	51	
Wayne Co.	N8CEY	17	
Hudson Division			
Eastern New York			761
Schenectady Co.	N2UZQ	220	
Orange Co. #1	KD2HWO	211	
Rensselaer	WO2H	162	
Orange Co. #2	KD2HWO	124	
Rockland Co.	N2GOP	44	
New York City-Long Island			400
Nassau Co.	KD2GXL	206	
Township of Southold	N2QHV	194	
Northern New Jersey			150
Section-wide	W2VTV	150	
Midwest Division			
Iowa			94
Dallas Co.	KØWOI	94	
Missouri			355
Boone Co.	NØAXZ	214	
Marion Co.	KDØHHN	141	
New England Division			
Connecticut			1,129
Region 2	AF1HS	156	
Danbury	W1QH	132	
Roxbury	WR1Z	121	
Region 4	KC1TWR	120	
South Windsor	K1XFC	112	
Clinton	WZ1V	106	
Region 3, Capitol East	KC1MM	91	
Winchester	KA1WPM	74	
Newtown	KB1LYP	59	
Region 3, Northwest	AB1LZ	54	
New Hartford	NP2GG	52	
Windham Co.	KB1DGY	52	
Maine			293
Cumberland Co.	WS1EC	293	
Northwestern Division			
Western Washington			1,045
Clark Co.	AE7GQ	613	
Pacific Co.	N7CVW	294	
Grays Harbor	N7UJK	138	
Pacific Division			
East Bay			32
Tri-Valley	AD6KV	32	
Nevada			515
Douglas Co.	KA7AJQ	147	
Nye Co.	KC6ILH	140	
Washoe Co.	WA6MTY	113	
Lyon Co.	KE7JIV	105	
Lincoln Co.	AD7OY	10	
Sacramento Valley			147
Alpine Co.	KA7AJQ	147	
Santa Clara Valley			436
Santa Clara Co.	KE6TIM	266	
San Benito Co.	W6TST	170	
Roanoke Division			
North Carolina			238
Moore Co., Lee Co.	N4YYL	238	
South Carolina			80
Anderson Co.	WB4LZT	80	
Virginia			130
York Co.	WB4UHC	71	
Poquoson	KK4TPI	59	
Rocky Mountain Division			
Colorado			121
Arapaho Co.	KCØVAQ	121	
Southeastern Division			
Alabama			641
Tuscaloosa Co.	WS4I	641	
Georgia			1,089
Cherokee Co.	KK4YQV	773	
Gilmer Co.	KK4NTC	252	
Gwinnett Co.	W4IGE	64	
Southern Florida			472
Lee Co.	W9GPI	233	
Martin Co.	WW4RX	165	
Saint Lucie Co.	W4ISZ	74	
West Gulf Division			
North Texas			133
Irving	KA5OZC	133	
South Texas			143
Fort Bend Co.	KØLTB	143	

Section/Local Nets

Area/Net Name	Net Mgr	Points	Section Points
Atlantic Division			
Eastern Pennsylvania			403
Wayne Co.	WA2CCN	312	
Montgomery Co.	W3AFV	91	
Western New York			175
Western District Net	KB2YAA	175	
Western Pennsylvania			447
BCARS	KA3UDR	447	
Central Division			
Illinois			59
Lake Co.	K9DRW	59	
Wisconsin			7,655
Dunn Co.	KC9FXE	6,903	
Badger Emergency	NX9K	517	
Eau Claire Co.	K9NY	182	
Jefferson Co.	KD9BDL	53	
Delta Division			
Arkansas			119
Cross Co.	W5WPN	119	
Mississippi			9,713
Scott Co.	K1REZ	9,219	
Central Mississippi	K1REZ	336	
Statewide Winlink	W5DIX	65	
Mississippi Coast #1	K9EYZ	78	
Mississippi Coast #2	AG5RI	45	
Tennessee			95
Jefferson Co.	W4CDK	95	
Great Lakes Division			
Kentucky			313
Madison Co.	KO4OL	60	
Tri Counties #1	KW4KL	60	
Daviess Co.	WBØNEX	48	
Logan Co.	KF4UKC	35	
Tri Counties #2	KJ4HFS	32	
District 9	KB9LXH	29	
Butler Co.	KN4MAA	28	
KDN	AD4Y	21	
Michigan			170
Saginaw Co.	KC8YVF	92	
Tuscola Co.	WJ8V	78	
Ohio			2,023
OSSBN	KC8WH	454	
COTN	KD8TTE	287	
Buckeye Net	WB8YLO	269	
Cuyahoga Co.	KC8NZJ	286	
Licking Co.	KD8SCL	135	
District 10	AB8M	130	
Miami Co.	WB8PMG	127	
Shelby Co.	KD8RLF	93	
Greene Co.	KE8FMJ	76	
Mahoning Co.	WB8YHD	57	
Warren Co.	N8EPG	57	
Delaware Co.	K8MP	34	
Stark Co.	N8ATZ	18	
Hudson Division			
New York City-Long Island			143
Nassau Co.	KD2GXL	143	
Midwest Division			
Kansas			145
Kansas Sideband Net	KØRCJ	145	
Missouri			51
Hannibal ARES	KDØHHN	51	
New England Division			
Connecticut			461
Middlesex ARS	K1CMM	78	
ARES Region 4	KC1TWR	73	
Section Manager Net	K1DFS	67	
Connecticut Phone Net	K1XFC	59	
CARA SET Net	W1QH	47	
ARES District 5, North Zone	KB1TOR	41	
BARENS	AB1LZ	38	
New London Co. SKYWARN	W1JOP	35	
Winsted Local Net	KA1WPM	12	
Litchfield Co. Weather	KA1WPM	11	
Southeastern Division			
Alabama			306
ALENU (Tuscaloosa)	WS4I	306	
Georgia			222
Gilmer	KK4NTC	147	
Resource/Tactical	W4AJM	75	
Southern Florida			135
Brevard Co.	K7LCW	135	
West Gulf Division			
North Texas		58	
Irving RACES/ARES	KA5OZC	58	

Rick Lindquist, WW1ME, ww1me@arrl.org

Happenings

ARRL and American Red Cross Renew Memorandum of Understanding

ARRL and the American Red Cross (ARC) have renewed their long-standing *Memorandum of Understanding* (*MOU*) for another 5 years. The *MOU* spells out how ARRL and the American Red Cross will work cooperatively during a disaster response.

"We are pleased to extend our partnership with the American Red Cross," ARRL President Rick Roderick, K5UR, said. "This agreement details how ARRL Amateur Radio Emergency Service® (ARES) volunteers will interface with Red Cross personnel within the scope of their respective roles and duties whenever the Red Cross asks ARES volunteers to assist in a disaster or emergency response."

The *MOU* calls on both parties to maintain open lines of communication and to share information, situation, and operation reports, as allowed to maintain confidentiality. They will also share "changes in policy or personnel relating to this *MOU* and any additional information pertinent to disaster preparedness, response, and recovery." ARRL and the American Red Cross will also encourage their respective units to discuss local disaster response and relief plans. They may further cooperate in joint training exercises and instruction. The Red Cross will encourage regions or chapters to participate in ARRL Field Day, the Simulated Emergency Test (SET), and other emergency exercises.

"This agreement keeps in place the strong and mutually beneficial bond between ARRL and the ARC," said ARRL Director of Emergency Management Paul Gilbert, KE5ZW. "The Red Cross is a primary served agency for ARES teams, and it's important that we be able to work together toward common goals when responding to an emergency."

The agreement points out that any ARRL volunteers who are interested in also becoming Red Cross volunteers should understand that a background check is a requirement. Although ARES has no background check requirement, radio amateurs who register as Red Cross volunteers must abide by the Red Cross's background check requirement.

ARRL and the Red Cross may also cooperate in the sharing of equipment. A *Statement of Cooperation* between the two organizations at the local level may be developed separately from the *MOU* to spell out the role of each in providing services to communities during or after a disaster event.

FCC Issues Enforcement Advisory

On April 20, the FCC's Enforcement Bureau issued a new Enforcement Advisory, repeating admonishments contained in a January Advisory that no licensee or user of the Amateur or Personal Radio Services may use any radio equipment in connection with unlawful activities of any nature. The Commission specifically cautioned that individuals found to have used radios in connection with any illegal activity are "subject to severe penalties, including significant fines, seizure of the offending equipment, and in some cases, criminal prosecution."

In addition, licensees should be aware that illegal operation in any service or band, including completely outside the amateur allocations, could potentially disqualify a person from holding any FCC license in any service, not just the Amateur Radio Service.

Any amateur observing suspicious activity that might be of an illegal or criminal nature should report it to their local law enforcement office or the FBI.

EC Okays In-Person Board of Directors Meeting for July

At an April 5 virtual meeting, the ARRL Executive Committee (EC) agreed to hold an in-person Board of Directors meeting in July, in accordance with Connecticut COVID-19 regulations. At the April meeting, ARRL CEO David Minster, NA2AA, told the EC that a new procedure was being put into place to recognize centenarian members — those who are 100 years of age or older. The membership team will now identify members who qualify for ARRL's Centurion Award, and the corresponding Director will determine how to proceed with the award presentation. The EC agreed to include a $100 ARRL gift certificate to accompany the award. In addition, with the changes pending in the 9-centimeter band, the EC adopted a new calling frequency for that band of 3400.1 MHz. Minutes of the EC meeting have been posted at **www.arrl.org/board-meetings**.

Yasme Foundation Releases Chronicles of Amateur Radio DX History

The Yasme Foundation has released two chronicles of amateur radio DX history that make for compelling reading — a downloadable edition of *Yasme: The Danny Weil and Colvin Radio Expeditions,* by former ARRL Headquarters staffer Jim Cain, K1TN, and the extended article, "Danny Weil — a Dreamer of Distant Lands Who Took the Amateur Radio Trip of a Lifetime," by Martti Laine, OH2BH.

Cain's 324-page history, initially published by ARRL in 2003 and now out of print, is available for the first time in a downloadable format at no cost. It includes some as-originally-intended revisions to the text as well as a new introduction.

"Even after years of writing a DX newsletter and then publishing dozens of feature articles in *QST*, I guess I hadn't gotten it out of my system yet," Cain said, recounting the book offer that was too good to pass up.

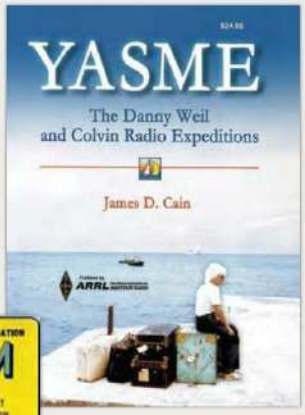
Cain's book documents the lives and DX adventures of Danny Weil, VP2VB — of Yasme fame — and of Iris, W6QL, and Lloyd Colvin, W6KG. It also offers a look into the DXCC program from the 1950s through 2000.

Between 1955 and 1963, Weil sailed to various exotic locations in his yawl *Yasme* (four different boats in all) to operate, escaping dangerous and life-threatening disasters. Another ham radio legend, Dick Spenceley, KV4AA, created the Yasme Foundation to provide funding for Weil's excursions. He also prompted Weil's fundraising tour in 1956 to more than 100 ham radio clubs and gatherings. Weil's wife, Naomi, accompanied him on some of his maritime journeys to rare DX venues. In 1964, the Colvins took up the Yasme banner, visiting 223 countries and operating from more than half of them before their final expedition in 1993.

Yasme Foundation President Ward Silver, NØAX, said Cain's book, "along with recounting some fascinating history, explains a lot about how the structures of modern DXing emerged, introducing many of us to the colorful characters who populated the DX scene at the time."

Laine's article provides even more details about the life of Danny Weil and his DXpeditions, drawing from Weil's personal recollections as well as Cain's book. The article's web page includes links to a collection of Weil's QSL cards and an audio interview of Weil at age 80.

In 2020, an international group of operators, including Laine, conducted a Yasme Memorial Expedition using Weil's reissued call sign.



▲The cover of James D. Cain's, W1TN, book, *Yasme: The Danny Weil and Colvin Radio Expeditions.*

◀A VP2VB QSL card.

National Science Foundation Funds Creation of Research Lab at Alaska's HAARP

A 5-year, $9.3 million National Science Foundation (NSF) grant will allow the University of Alaska Fairbanks (UAF) Geophysical Institute to establish a new research observatory at the High-frequency Active Auroral Research Program (HAARP). A former military facility, HAARP is now operated by UAF and is home to HAARP Amateur Radio Club's KL7ERP. The new Subauroral Geophysical Observatory for Space Physics and Radio Science will be dedicated to exploring Earth's upper atmosphere and geospace environment. The facility's 33-acre Ionospheric Research Instrument will be the centerpiece of the observatory.

"This NSF support will provide the scientific community increased access to the instruments at the observatory and, hopefully, grow the scientific community," said Geophysical Institute Director Robert McCoy, the project's principal investigator.

A second NSF-funded project will add a Light Detection and Ranging (LiDAR) instrument at the site, which will allow the study of other regions of the upper atmosphere. UAF hopes to add additional instruments over time at the Gakona, Alaska, research site.

The research grant will allow scientists to investigate how the sun affects Earth's ionosphere and magnetosphere to produce changes in space weather. Their work will help fill gaps in knowledge about the region, which is important because ionospheric disturbances, if severe enough, can disrupt communication systems and damage the power grid.

The HAARP antenna field at sunset.

Research at the observatory is initially expected to include the study of various types of aurora and other occurrences in the ionosphere.

The Gakona facility is a prime location for the study of the ionosphere and magnetosphere because of its location in relation to one of Earth's magnetic field lines that reaches deep into the magnetosphere.

"Amateur radio will clearly benefit with an improved understanding of ionospheric propagation and space weather physics, and providing improved HF propagation prediction modeling data," HAARP Research Station Chief Engineer and ARRL Life Member Steve Floyd, W4YHD, told ARRL. He said, "Radio science experiments will also provide a valuable data set to encourage development of new radio technologies and modulation methods."

Floyd is the trustee for KL7ERP, which, he says, is available "to demonstrate amateur radio to visiting scientists and students, to maintain contact with Alaska hams, and to provide visiting hams with an opportunity to operate from this unique Alaska location."

Woody Brem, K3YV, is the 2020 Bill Orr, W6SAI, Technical Writing Award Winner

The ARRL Foundation Board of Directors has selected Ellwood "Woody" Brem, K3YV, of Spring Mills, Pennsylvania, as the winner of the 2020 Bill Orr, W6SAI, Technical Writing Award for his article, "'Leaky' Antenna Switches," which appeared in the March 2020 issue of *QST*. The Foundation Board acted on a recommendation from the *QST* editorial staff in selecting the recipient at its January 27 annual meeting.

Ellwood "Woody" Brem, K3YV

"I am truly honored," Brem said. "Bill Orr was and is one of my inspirations. I have read his books for many years and have always tried to live up to his high standards. I'd like to think Bill Orr helped me along to a wonderful career in electrical engineering."

The Bill Orr, W6SAI, Technical Writing Award is bestowed each year upon the author of an outstanding *QST* article or series on new or existing technologies, or on methods or means of amateur communication. Articles must be written in an easily understood style, worthy of the Bill Orr stamp of approval, encourage interest, and expand knowledge and understanding of amateurs who may lack a strong technical background.

The *QST* editorial staff serves as the selection panel and recommends the winner from a review of the year's *QST* articles to the ARRL Foundation Board for final approval.

Section Manager Nomination Notice

To all ARRL members in Alabama, Alaska, Delaware, East Bay, Kansas, Michigan, New Mexico, Santa Barbara, Tennessee, and Western Massachusetts. 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 the League 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 September 10, 2021. If more than one member is nominated in a single Section, ballots will be mailed from Headquarters no later than October 1, 2021, to full members of record as of September 10, 2021, which is the closing date for nominations. Returns will be counted November 23, 2021. Section Managers elected as a result of the above procedure will take office January 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 on January 1, 2022. If no petitions are received from a Section by the specified closing date, such Section will be resolicited in the January *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. — *Bart Jahnke, W9JJ, Field Services & Radiosport Department Manager*

Call for Nominations for ARRL Director and Vice Director

Attention to full ARRL members in the Central, Hudson, New England, Northwestern, and Roanoke Divisions. You have the opportunity to choose a Director and Vice Director to represent you for 3-year terms beginning January 1, 2022.

ARRL is governed by its Board of Directors. A voting Director is chosen by ballot by the full (licensed) ARRL members in each of its 15 Divisions. Vice Directors, who serve in the absence of the Director at a Board meeting and succeed to the position of Director should a vacancy occur, are chosen at the same time. Elections are held in five Divisions per year. It only takes 10 full members in a Division to nominate a candidate for either office.

Qualifications

The eligibility of nominees for the positions of ARRL Director and Vice Director will be reviewed by the Ethics & Elections Committee, composed of three Directors not subject to election this year: Mickey Baker, N4MB; Tom Abernethy, W3TOM, and Jeff Ryan, KØRM. A nominee must be at least 21 years old and must have been licensed and a full member of ARRL for a continuous term of at least 4 years immediately preceding nomination. Each nominee must provide information concerning their employment, ownership, and investment interests, and other financial arrangements to ensure compliance with the Conflict of Interest Policy (see Article 12 of the ARRL *Articles of Association and Bylaw 45*, available at **www.arrl.org/general-information**). The qualifications for Director and Vice Director are identical. All the powers of the Director are transferred to the Vice Director in the event of the Director's death, resignation, recall, removal outside the Division, or inability to serve.

Nomination Procedure

Step 1: Obtain official nominating petition forms. Starting July 1, any full member residing in a Division where there is an election may request an official nominating petition package in writing, either by letter or via email, to **cpereira@arrl.org**. The request must reach the ARRL Secretary no later than noon EDT on Friday, August 13, 2021. If you are seriously considering running or nominating someone to run, please don't wait until the last minute to request the forms. The deadline for submitting a completed petition form is just 1 week later.

Step 2: Obtain signatures and complete questionnaire. Only the official form may be used. The petition form has two sides. To be valid, a nominating petition must name the candidate and must bear the signatures of 10 full members of the Division. The candidate must complete the other side, providing the information required to determine eligibility, certifying its accuracy, and agreeing to assume the office if elected.

Step 3: Submit petition form. The completed form must reach the Secretary no later than noon EDT on Friday, August 20, 2021. The submission may be made by electronic transmission of images (i.e., a PDF or JPEG attachment to an email) or facsimile provided that upon request, the original documents are received by the Secretary within 7 days of the request. A person who is nominated for both Director and Vice Director may choose to decline the nomination for Director; otherwise the nomination for Director will stand and that for Vice Director will be void.

On Monday, August 23, 2021, the Secretary will notify each candidate of the name and call sign of each other candidate for the same office. Candidates will then have until Friday, September 3, 2021 to submit a 300-word statement and a photograph if they desire these to accompany the ballot, in accordance with instructions that will be supplied.

Balloting

If there is only one eligible candidate for an office, they will be declared elected by the Ethics & Elections Committee. If there is more than one eligible candidate for an office, the full members in that Division who are in good standing as of September 10, 2021 will have the opportunity to cast ballots. Official paper ballots and candidates' statements will be mailed to members who are eligible to vote no later than October 1, 2021. Completed ballots must be received at the designated PO Box in the envelope provided by noon Eastern Time on Friday, November 19, 2021. The candidate receiving the most votes will be declared the winner that day.

Absentee Ballots

A full member who is residing temporarily outside their home Division, including overseas, may arrange to vote in the home Division by notifying the Secretary prior to September 10, 2021, giving their current mailing address as reflected in the ARRL membership records (i.e. *QST* mailing address) and the reason why another Division is considered home. Members with overseas military addresses should take special note of this provision; in the absence of information received to the contrary, ballots will be sent to them based on their postal addresses.

The Incumbents

The incumbent Directors and Vice Directors, respectively, in the five Divisions in which elections will be held this year are:

Central: Kermit Carlson, W9XA, Director, and Carl Luetzelschwab, K9LA, Vice Director

Hudson: Ria Jairam, N2RJ, Director, and Bill Hudzik, W2UDT, Vice Director

New England: Fred Hopengarten, K1VR, Director, and Phil Temples, K9HI, Vice Director

Northwestern: Mike Ritz, W7VO, Director, and Mark Tharp, KB7HDX, Vice Director

Roanoke: Bud Hippisley, W2RU, Director, and Bill Morine, N2COP, Vice Director

For the Board of Directors
May 18, 2021

David Minster, NA2AA,
Secretary/Chief Executive Officer

Rick Lindquist, WW1ME, ww1me@arrl.org

Amateur Radio World

IARU and CEPT Nudge WRC-23 Preparations Forward

The International Amateur Radio Union (IARU) continued preparing for World Radiocommunication Conference 2023 (WRC-23) by attending the second meeting of the European Conference of Postal and Telecommunications Administrations (CEPT) Conference Preparatory Group (CPG) Project Team A on March 23 – 25. IARU Region 1 Spectrum Affairs Chair Barry Lewis, G4SJH, explained that Project Team A develops the CEPT WRC briefs for several WRC scientific and regulatory agenda items of particular interest to the amateur community. Specific attention is being paid to WRC-23 agenda items 1.12, 1.14, and 9.1a.

IARU put forward its agreed preliminary positions for these agenda items at the meeting. Lewis said IARU's overall objective is to safeguard the allocations to the Amateur and Amateur Satellite Services in co-located and adjacent frequency bands within the scope of each agenda item. The CEPT briefs include a special section containing the views of recognized international and regional organizations, and IARU's views are now in this section of the draft briefs for each of these agenda items:

♦Agenda Item 1.12 — Earth exploration-satellite service (EESS) (active) for spaceborne radar sounders within the range of frequencies around 45 MHz. IARU's position is to ensure that adjacent-band 50 MHz Amateur Services are protected. CEPT has not voiced a position yet.

♦Agenda Item 1.14 — Possible new primary frequency allocations to EESS (passive) in the frequency range 231.5 – 252 GHz. IARU's position is no change to the 248 – 250 GHz primary allocations and the 241 – 248 GHz secondary allocations. CEPT supports the EESS proposal.

♦Agenda Item 9.1A — Radio service designations for space weather sensors. IARU's position is to avoid additional constraints on Amateur Services. CEPT's position is not yet defined.

The IARU Spectrum and Regulatory Liaison Committee (SRLC) continues to be active in all CEPT project teams dealing with WRC-23 preparations. CEPT Conference Preparatory Group Project Team A will also consider agenda item proposals to be put forward at WRC-27.

International Radiosport Competition Rescheduled for 2023

World Radiosport Team Championship 2022 (WRTC 2022), set to be held this summer in Italy, has been postponed for 1 year. At the WRTC 2022 Association Assembly on April 23, the event's Organizing Committee decided to postpone WRTC 2022 until 2023 after consulting with the WRTC Sanctioning Committee. "There have been no changes in the qualification process or to the overall structure of the event and its sponsoring committee," said the announcement from WRTC 2022 Organizing Committee President Carlo de Mari, IK1HJS. "A detailed report on the qualification standings will be prepared and released at a later date. In consideration of the worldwide public health challenges from the COVID-19 pandemic, we believe our decision is reasonable."

The committee said further announcements will be forthcoming as soon as new arrangements for the event have been made.

ARRL Executive Committee Nominates Joel Harrison, W5ZN, to be Next IARU Secretary

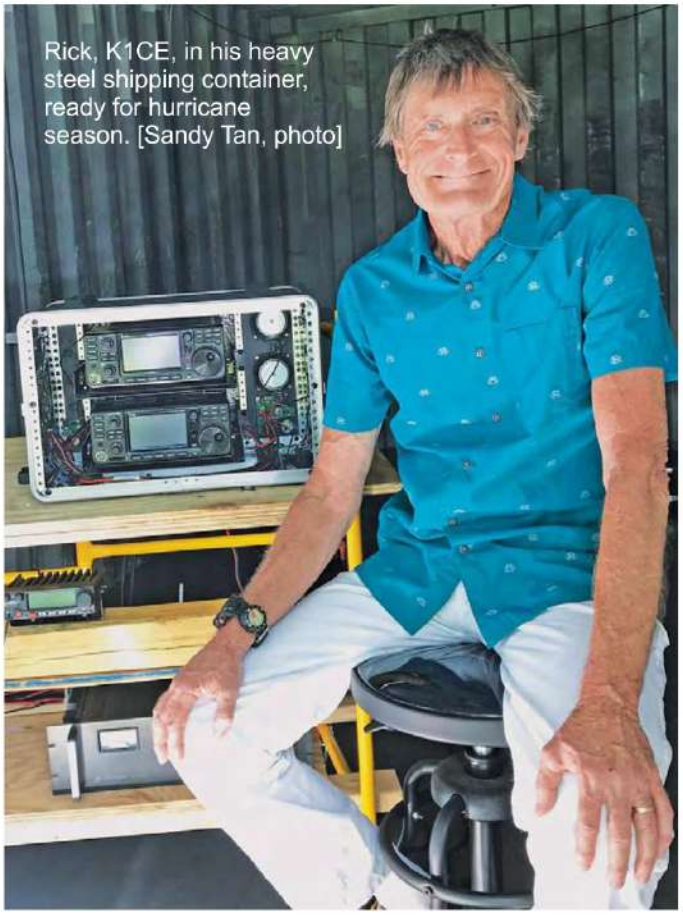
At its April 5 meeting via Zoom, the ARRL Executive Committee (EC) nominated past ARRL President Joel Harrison, W5ZN, to become the next Secretary of the IARU. The incumbent Secretary, David Sumner, K1ZZ, had announced his intention to step down on July 1. ARRL International Affairs Vice President Rod Stafford, W6ROD, explained that ARRL, as IARU Secretariat, has the right and obligation to appoint a successor. Harrison has been serving as IARU Assistant Secretary. The ARRL Board of Directors ratified the nomination on April 16.

Joel Harrison, W5ZN

Rick Palm, K1CE, k1ce@arrl.net

Public Service

Preparing for the 2021 Hurricane Season


Rick, K1CE, in his heavy steel shipping container, ready for hurricane season. [Sandy Tan, photo]

Professional-grade training for amateur radio emergency communicators has evolved quickly over the course of the pandemic. Examples of excellent training include the online weekly training sessions offered by the Radio Amateur Training Planning and Activities Committee; the American Red Cross Emergency Communications Training Group's Winlink Thursdays and nationwide drills; Comm Academy 2021; the New England ARES Academy, and countless YouTube videos from leading practitioners such as Matthew Curtin, KD8TTE, and Oliver Dully, K6OLI.

Sophisticated training exercises (both online and featuring full deployment) that are compliant with FEMA's Homeland Security Exercise and Evaluation Program have come into their own recently too, with participation from across the country. Examples include the exercises based in northern Florida, a region prone to major hurricane disasters. Amateurs participating in Military Auxiliary Radio System (MARS) exercises support the Department of Defense with the five 60-meter channels available for interoperability between amateur and government stations.

Using Winlink

Consider this hurricane disaster scenario: You are responding to a Red Cross shelter that has poor or no communications with a regional Red Cross center and no internet (meaning no email capability). You draft an ARC-213 message on behalf of the shelter manager to be sent to the center as an email, post it to your Winlink Express outbox, connect to an on-the-air Winlink HF Radio Mail Server (RMS) outside the disaster area that is connected to the internet, and your message is sent to the email inbox of the center's on-duty staff. Responses can easily be routed back to the shelter. For more local, intra-disaster area message handling, there are shorter-range Winlink VHF FM modes as well as direct peer-to-peer modes (where no intermediary RMS stations are involved).

The advantages are clear, and that's why the Red Cross and others embrace Winlink. There is a learning curve to gaining Winlink proficiency, however. It's not a system for spontaneous volunteers to use without training and experience, which comes from the frequent Winlink Thursday and nationwide drills conducted by Red Cross officials and other exercise conductors.

Training During Hurricane Season

The 2021 hurricane season started on June 1. Amateur Radio Workshop sessions are scheduled for Tuesday, June 15, in conjunction with the National Hurricane Conference from June 14 – 17 in New Orleans. Held virtually this year, the workshop will be moderated by Rob Macedo, KD1CY, Director of Operations for the VoIP Hurricane Net, along with Julio Ripoll, WD4R, Assistant Coordinator of the National Hurricane Center's (NHC) amateur station, WX4NHC.

At the time of this writing, the WX4NHC Annual Station On-the-Air Test is scheduled for May 29. This hurricane season, WX4NHC operators plan to be working remotely. The NHC is planning to maintain all CDC pandemic protocols until the end of 2021. Ripoll said, "Last year's season was an incredibly busy one, but the remote WX4NHC operations were successful, collecting many important reports via the Hurricane Watch Net, VoIP Hurricane Net, Winlink, the online hurricane report form, as well as many other means and modes." On behalf of WX4NHC, Ripoll offered thanks to all who collect, send, and relay hurricane surface reports.

Nets to Know

The venerable Hurricane Watch Net (**www.hwn.org**) on 14.325 MHz/7.268 MHz disseminates advisories issued by the NHC for marine interests, Caribbean Island and Central American nations, and other interests where public media is not readily available. The net receives real-time ground truths of conditions and damage assessments from amateur radio operators in affected areas for relay to the center via the center's WX4NHC station. The net also serves as a backup communication link for the center, National Weather Service (NWS) Forecast Offices, and others involved in the protection of life and property.

The VoIP Hurricane Net (**www.voipwx.net**) has merged the EchoLink Conference Server with an IRLP reflector to create this net, which provides a single point of contact for people in the field submitting reports, as well as for the NHC and NWS to be able to easily stay in contact with one another. Use the EchoLink WX-TALK Conference and IRLP reflector 9219.

Home and Station Preparation

Check out the NWS's page for personal and family hurricane season preparedness, at **www.weather.gov/wrn/hurricane-preparedness**. Next, prepare your station for possible service. Have multiple sources of backup power, including batteries and gas-powered generators. I recently ordered a Bioenno 12 V 20 Ah LFP battery (model BLF-1220A) to replace my aging pair of 12 V 31 Ah sealed lead-acid batteries. I reprogrammed my West Mountain Radio Epic PWRgate dc power management system for charging my new battery with a standard dc power supply and 50 W solar panel.

I poured fresh gasoline into my Honda EG2800i generator and ran it for 30 minutes to check its status, which was good. I mounted my generator on a small utility trailer for deployment, if necessary. The generator is rated for 120 V and 20.8 A.

Ensure your ability to take down and put up your antennas quickly and efficiently when storms threaten your area. My VHF antennas are mounted atop masts that are secured into the ground with stakes that swivel and attached to the side of my 8 × 20 foot heavy steel shipping container with zip ties. My HF dipole can be taken down and put up in a minute.

My radios and peripherals are housed in the container that is set off the ground by a concrete pad. It weighs 4,917 pounds and can withstand 150 MPH winds. I do need to anchor it to the ground at four corners.

Check into local or regional nets now to practice net procedure, meet and know emergency management, and connect with Red Cross, CERT, ARES, and RACES communicators you might work with in a disaster.

Field Organization Reports

April 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**.

804
WA7PTM

542
W7PAT

539
KK6GXG

475
WA3EZN

450
N9VC

403
W7EES

330
KE8BYC

285
W8MAL

281
WA2CCN

275
ND8W

250
KD2LPM
KW9EMG

240
KØFBS

225
WØPZD

220
KT2D

215
KD2NMG
KM8V
KB8RCR

211
AD8CM

205
N8MKY

204
W3GWM

200
N2WGF

185
WO2H

180
N2LC
ALØY

165
W2PH

164
KB5PGY

162
AI9F

160
AC8NP
KG5NNA
WB9QPM

156
KT5SR

155
AB8MW
WD8USA

154
W8IM

153
WA2BSS
WM2C

150
AD3J
K8AMH
N4CNX

145
KF5OMH
W4DNA

140
KØRCJ
K4IWW
KK3F

135
WB9WKO
W3YVQ

134
KC8T

132
N8SY

130
W4CMH
K9LGU
ACØKQ
N2JBA
W8DJG
N1LL
WK4WC
KA9MZJ
KW1U

128
KB3YRU

125
AG9G
K9ILJ
KC5FXE
KDØHHN

120
WC4FSU
K2TV
K3JL
KE5YTA
KA9QWC
WØLAW
KD8ZCM
KY2D
NA7G
N7IE
WA4VGZ
KD2IWN

116
K8MDA

115
KY2MMM
W3CJD
N1TF

114
W9EEU

113
AB3WG

111
N2DW

110
WA1URS
WAØQLW
KC8WH
KL7RF
KF5IOU
WB8TQZ
K8BKM
KB2QO
K3IN
N3SW
KO4OL
N1IQI
KD2JKV
W1RVY
WM5N
WF2Y
WS4P

105
AD4DO
W2PAX
KB8PGW
K8RDN

104
KB1TCE
KC8YVF
WV5Q

102
W4TTO
KE4DRF

100
WB4RJW
KZ8Q
W1KX
KN9P
NX9K
WX2DX
AC8RV
WB8SIQ
KJ7BHO
AA3N
K8ED
KB2YAA
W2ZXN
N1LAH
K2MZ

99
KB1NMO

97
AA3SB

96
NI2W

95
KD8KBX
KC1HHO
KA9IKK

92
WB8YYS
K1XFC

90
KM4WHO
KB9GO
K3MY
K8KRA
N8MRS
KD8UUB
KI5GRH
K2MJF
W2AH
K2EAG
WB4ZDU
WDØBFO
KC1KVY
KC1MSN

88
W7PHX
K6JT
W3ZR

87
K7OED
K1STM
WA1LPM
NV1N

86
N8CJS
AB9ZA
KA2HZP

85
KF5IVJ
N4ZM
K1HEJ

84
KU1U
N3KRX

83
NØUMP
KA2JFU

80
KR4ST
KØWAV
N2TSO
KB8HJJ
KA1G
KD8UOT
W8GSR
KF7GC
KI7TIG
W9BGJ
W4EDN
WB8R
KB3MXK

77
KFØBPN
W5XX

76
KC1FLU
KA2GQQ

75
K4FHR
W2ARP
K8ASA

74
KV8Z

73
K2IE
WB2VUF

72
KD2GXL
KB3IN
KBØDTI
N5PK
K3YAK
N2JET

70
K6RAU
WJ3P
KN4AAG

The following stations qualified for PSHR in previous months, but were not reported in this column. (Mar.) WB4ZDU 129, KO4OL 115, WF2Y, WS4P 110, WV5Q 107, WDØBFO 90, KAØDBK 86, W5XX 77.

Section Traffic Manager Reports

The following Section Traffic Managers reported:
AR, AZ, CO, CT, DE, EMA, ENY, EPA, IL, IN, KS, KY, LA, MDC, ME, MN, MO, MS, MT, NC, ND, NE, NFL, NLI, NM, NNJ, NTX, NV, OH, OR, SC, SD, SFL, SNJ, STX, TN, UT, WCF, WI, WMA, WNY, WPA, WV, WWA, WY.

Section Emergency Coordinator Reports

The following Section Emergency Coordinators reported:
ENY, EPA, IA, IL, IN, KY, MDC, ME, MO, MI, MS, ND, NLI, NM, NNJ, NV, OH, OK, OR, PAC, SCV, SFL, SJV, SNJ, SV, TN, WI, WPA, WV, WY.

Brass Pounders League

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

NX9K 1,527, KK3F 1,292, N9CK 1,194, WB9WKO 826, KW1U 536.

Maria Somma, AB1FM, ab1fm@arrl.org

Exam Info

Email Address Required on All Applications

After June 29, all amateur radio applications are required to contain an email address for FCC correspondence. The applicant will receive an email directly from the FCC with a link to the official electronic copy of their license when a license is issued or changed. The ARRL VEC suggests that those without access to email use the email address of a family member or friend. Licensees are able to log in to the FCC's License Manager System at **https://wireless2.fcc.gov/UlsEntry/licManager/login.jsp** using their FCC Registration Number (FRN) and password to download the latest version of their license at any time. For detailed download instructions, go to **www.fcc.gov/how-obtain-official-authorizations-uls**. For password issues, visit the FCC support page at **www.fcc.gov/available-support-services**. The FCC discontinued mailing paper licenses in December 2020.

CSCE Updated with FCC Application Fee Language

In preparation for the coming FCC application fee, the ARRL VEC Certificate of Successful Completion of Examination (CSCE) was updated to include language about the fee. The CSCE points applicants to a new web page (**www.arrl.org/FCC-Application-Fee**) containing instructions on paying the $35 fee and a link to the FCC's "PAY FEES" system. Additional information will follow when the FCC announces the effective date.

Social Security Numbers No Longer Allowed at Exam Sessions

Beginning on May 20, all amateur examination applicants are required to provide an FCC Registration Number (FRN) to the Volunteer Examiners (VEs) on the 605 form application before taking an examination.

American Radio Relay League VEC
Certificate of Successful Completion of Examination

ARRL the national association for amateur radio

Test Site (City/State): _____ Test Date: _____

NOTE TO VE TEAM: COMPLETELY CROSS OUT ALL BOXES BELOW THAT DO NOT APPLY TO THIS CANDIDATE.

The applicant named herein has presented valid proof for the exam element credits indicated below:
Element 3 credit
Element 4 credit

CREDIT FOR ELEMENTS PASSED VALID FOR 365 DAYS
You have passed the written element(s) indicated at right. You will be given credit for the appropriate examination element(s), for up to 365 days from the date shown at the top of this certificate.

EXAM ELEMENTS EARNED
Passed written Element 2
Passed written Element 3
Passed written Element 4

LICENSE UPGRADE NOTICE
If you hold a valid FCC-issued Amateur Radio license and call sign, this certificate validates temporary operation with the operating privileges of your new operator class (see Section 97.9[b] of the FCC Rules) until you are granted the license for your new operator class, or for a period of 365 days from the test date stated above on this certificate, whichever comes first. See the back of the certificate for temporary operating instructions.

NEW LICENSE CLASS EARNED
TECHNICIAN
GENERAL
EXTRA
NONE

APPLICATION STATUS AND FEES
Visit **www.arrl.org/FCC-Application-Fee** for the instructions on how to pay the FCC application fee. You can find out if a new license or upgrade has been issued by the FCC by visiting the FCC website at **http://www.fcc.gov/wireless/systems-utilities/universal-licensing-system** (Click on License Search); or by calling the FCC at 1-888-225-5322 or the ARRL at 1-860-594-0300 during business hours (8am-5pm).

THIS CERTIFICATE IS NOT A LICENSE, PERMIT, OR ANY OTHER KIND OF OPERATING AUTHORITY IN AND OF ITSELF. THE ELEMENT CREDITS AND/OR OPERATING PRIVILEGES THAT MAY BE INDICATED IN THE LICENSE UPGRADE NOTICE ARE VALID FOR 365 DAYS FROM THE TEST DATE. THE HOLDER NAMED HEREIN MUST ALSO HAVE BEEN GRANTED AN AMATEUR RADIO LICENSE ISSUED BY THE FCC TO OPERATE ON THE AIR.

Candidate's Signature _____ Call Sign _____ (If none, write none)
Candidate's Name _____
Address _____
City _____ State _____ ZIP _____

VE #1 _____ Signature _____ Call Sign
VE #2 _____ Signature _____ Call Sign
VE #3 _____ Signature _____ Call Sign

COPIES: WHITE–Candidate, YELLOW–VE Team, PINK–ARRL VEC
MVE 4/2021

The new ARRL VEC Certificate of Successful Completion of Examination.

First-time exam applicants must create an FCC user account and register their Social Security Number in the FCC COmmission REgistration System (CORES) before taking an amateur radio test. Registrants will be assigned an FRN, which will be used in all license transactions with the FCC. An FCC instructional video (available at **www.fcc.gov/rofrn**) provides step-by-step instructions on how to establish a CORES account (username and password) and register for an FRN.

Amateur candidates who already have an FCC license, whether for amateur radio or in another service, already have an FRN and can use that number. Prospective new FCC licensees, however, will be required to obtain an FRN before the examination and provide that number on the application.

The FRN is necessary for all new applicants to take an amateur exam, and is used by the applicant to download the "official authorization" (license document) from the FCC website, upgrade the license, request a vanity call sign, and submit administrative updates (such as address and email changes) and renewal applications.

Technician Review is Here

The Technician-, General-, and Amateur Extra-class amateur radio question pools review is part of a regular process. Each question pool is reviewed and updated on a 4-year rotation and designed around standard subjects such as FCC rules, operating procedures, radio wave propagation, electrical principles, circuits, signals and emissions, antennas and transmission lines, and safety. All amateur radio exams are created from these pools. No question pools are scheduled to be released in 2021. The Technician-class (Element 2) question pool is currently being reviewed.

Help Shape the Next Question Pool!

The National Conference of Volunteer Examiner Coordinators (NCVEC) Question Pool Committee (QPC) welcomes comments and suggestions for new questions or changes to the topic areas for any of the pools. Please send your input to the QPC by emailing **qpcinput@ncvec.org**. The updated Technician-class question pool will take effect July 1, 2022.

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

Contest Corral

July 2021

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

Start - Finish Date-Time		Date-Time		Bands	Contest Name	Mode	Exchange	Sponsor's Website
1	0000	1	2359	1.8-144	RAC Canada Day Contest	CW Ph	RS(T), VE province/territory or serial	www.rac.ca
1	1700	1	2100	28	NRAU 10-Meter Activity Contest	CW Ph Dig	RS(T), 6-char grid square	nrrlcontest.no
1	1900	1	2100	1.8-50	SKCC Sprint Europe	CW	RST, SPC, name, mbr or "none"	www.skccgroup.com
2	0145	2	0215	1.8-21	NCCC RTTY Sprint	Dig	serial, name, QTH	www.ncccsprint.com
2	0230	2	0300	1.8-21	NCCC Sprint	CW	serial, name, QTH	www.ncccsprint.com
3	1100	4	1059	3.5-28	DL-DX RTTY Contest	Dig	RST, serial	www.drcg.de/dldxrtty
3	1400	4	1400	1.8-28	Marconi Memorial HF Contest	CW	RST, serial	www.arifano.it
3	1500	4	1500	3.5-14	Original QRP Contest	CW	RST, serial, power category	www.qrpcc.de/contestrules
3	2000	4	2000	7	PODXS 070 Club 40-Meter Firecracker Sprint	Dig	RST, SPC	www.podxs070.com
5	0000	5	0100	1.8-14	K1USN Slow Speed Test	CW	Max 20 WPM. Name, SPC	www.k1usn.com/sst.html
5	1900	5	2030	3.5	RSGB 80-Meter Club Championship, CW	CW	RST, serial	www.rsgbcc.org/hf
6	0100	6	0159	1.8-50	Worldwide Sideband Activity Contest	Ph	RS, age group (OM, YL, or youth)	wwsac.com/rules.html
6	0100	6	0300	3.5-28	ARS Spartan Sprint	CW	RST, SPC, power	arsqrp.blogspot.com
6	1700	6	1900	3.5-14	RTTYops Weeksprint	Dig	Other's call, your call, serial, name	rttyops.wordpress.com
7	1300	7	1400	1.8-28	CWops Mini-CWT Test	CW	Name, mbr or SPC	cwops.org/cwops-tests
7	1700	7	2000	144	VHF-UHF FT8 Activity Contest	Dig	4-char grid square	t8activity.eu/index.php/en
7	1900	7	2000	1.8-28	CWops Mini-CWT Test	CW	Name, mbr or SPC	cwops.org/cwops-tests
8	0300	8	0400	1.8-28	CWops Mini-CWT Test	CW	Name, mbr or SPC	cwops.org/cwops-tests
8	1700	8	1900	3.5-14	RTTYops Weeksprint	Dig	Other's call, your call, serial, name	rttyops.wordpress.com
9	2000	9	2100	1.8-14	K1USN Slow Speed Test	CW	Max 20 WPM. Name, SPC	www.k1usn.com/sst.html
10	1200	11	1200	1.8-28	IARU HF World Championship	CW Ph	IARU HQ: RS(T) + IARU Society. Non-HQ: RS(T) + ITU Zone.	arrl.org/iaru-hf-world-championship
10	1200	11	2359	1.8-50	SKCC Weekend Sprintathon	CW	RST, SPC, name, mbr or "none"	www.skccgroup.com
11	2000	11	2300	1.8-28	QRP ARCI Summer Homebrew Sprint	CW	RST, SPC, mbr or power	qrparci.org
12	0000	12	0200	1.8-28	4 States QRP Group Second Sunday Sprint	CW Ph	RS(T), SPC, mbr or power	www.4sqrp.com
14	1700	14	2000	432	VHF-UHF FT8 Activity Contest	Dig	4-char grid square	ft8activity.eu/index.php/en
14	1900	14	2030	3.5	RSGB 80-Meter Club Championship, SSB	Ph	RS, serial	www.rsgbcc.org/hf
15	0030	15	0230	3.5-14	NAQCC CW Sprint	CW	RST, SPC, mbr or power	naqcc.info
17	0700	17	1459	7-28	Russian Radio Team Championship	CW Ph	RS(T), RRTC code or ITU zone	srr.ru/chempionat-rossii-po-radiosvyazi-na-kv-rrtc
17	0800	17	1400	1.8-7	Trans-Tasman Low-Bands Challenge	CW Ph Dig	RS(T), serial	wia.org.au/members/contests
17	1000	17	2159	3.5-28	YOTA Contest	CW Ph	Age	ham-yota.com/contest
17	1200	17	1359	1.8-50	Feld Hell Sprint	Dig	RST, mbr, SPC, grid	sites.google.com/site/feldhellclub
17	1800	18	0559	3.5-28	North American QSO Party, RTTY	Dig	Name, SPC	www.ncjweb.com
17	1800	18	2100	50, 144	CQ Worldwide VHF Contest	CW Ph Dig	4-char grid square	www.cqww-vhf.com
18	0900	18	1600	3.5-14	RSGB Low Power Contest	CW	RST, serial, power	www.rsgbcc.org/hf
18	2000	18	2159	14	CQC Great Colorado Gold Rush	CW	RST, SPC	www.coloradoqrpclub.org
18	2300	19	0100	1.8-28	Run for the Bacon QRP Contest	CW	RST, SPC, mbr or power	qrpcontest.com/pigrun
22	1900	22	2030	3.5	RSGB 80-Meter Club Championship, Data	Dig	RST, serial	www.rsgbcc.org/hf
24	1200	25	1200	3.5-28	RSGB IOTA Contest	CW Ph	RS(T), serial, IOTA # (if applicable)	www.rsgbcc.org/hf
25	1700	25	2100	7-28	ARS Flight of the Bumblebees	CW	RST, SPC, power or bumblebee number	www.arsqrp.blogspot.com
26	1900	26	2030	3.5-14	RSGB FT4 Contest Series	Dig	4-char grid square	www.rsgbcc.org/hf
28	0000	28	0200	1.8-50	SKCC Sprint	CW	RST, SPC, name, mbr or "none"	www.skccgroup.com
31	1200	1	1159	1.8-28	Russian WW MultiMode Contest	CW Ph Dig	RST(Q), oblast or serial	www.rdrclub.ru
31	1400	1	2000	1.8-UHF	Missouri QSO Party	CW Ph Dig	RS(T), MO county or SPC	www.w0ma.org

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.*

August 2021 ARRL Rookie Roundup — RTTY

1800 UTC – 2359 UTC, Sunday, August 22

Rookies make as many contacts as possible during this 6-hour event. Rookies work everyone and non-Rookies work only Rookies.

The exchange is your name, the last two numbers of the year you were licensed, and your state, province, or "DX" if you're outside of the US and Canada.

You can enter as a Rookie if:

- You were first licensed this year or during the previous 3 calendar years (send the last two digits of the year you were first licensed in the exchange);
- You were licensed before 2018 and made your first-ever contact this year or during the previous 3 calendar years (send the last two digits of the year of your first contact in the exchange); or
- You haven't made any contacts using the contest mode (RTTY) before (send the last two digits of the current year in your exchange).

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

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

Rosemarie Lones, K1AQT, operated as KC1RMS during the ARRL 2018 Rookie Roundup — RTTY as part of the Nashua Area Radio Society Multioperator team in Hollis, New Hampshire. The team took first place overall in the contest. [Nashua Area Radio Society photo]

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

The 2021 222 MHz and Up Distance Contest

1800 UTC Saturday, August 7 – 1800 UTC Sunday, August 8

The objective of this distance-scoring event is to make as many contacts as possible on 222 MHz up to 241 GHz using terrestrial means (no EME contacts) over as great a distance in kilometers as possible. Participants will exchange six-digit grid locators and distances will be based on the center-to-center distance between each two stations' six-digit locators. Visit **http://k7fry.com/grid** for a grid mapping/distance tool, courtesy of Steve Fry, K7FRY.

The three station categories are: Single Operator, Fixed; Multioperator, Fixed, and Rover. Rover stations may be worked from each four-character grid square in which they operate. If more than one contact on a given band is made between stations in specific grid squares, then the contact with the longest distance will be counted. All stations exchange six-digit grid locators on as many bands as possible, but Rover stations can re-contact stations when they move to a new four-digit grid square. Attempts to increase the contact distances are encouraged, and all contacts should be logged (even duplicates, to ensure that a valid contact isn't lost).

There are no power categories. Competition is by region. There is also a Club Competition and Team Competition. Be sure to register your team at **https://contests.arrl.org/teamreg.php?eid=1** before the start of the contest.

Each band has a unique band factor value. Total score is the sum of QSO points of all contacts.

Luther Schaefer, N2SLN, used his "MobileComm1" contesting van and Jonathan Englert, W2BDN, used his car while at their western FN22 hilltop location during the ARRL 2019 222 MHz and Up Distance Contest. [Luther Schaefer, N2SLN, photo]

Only electronic, Cabrillo-formatted logs will be accepted. Upload logs to **http://contest-log-submission.arrl.org**. The deadline for submission of entries is 1800 UTC August 22, 2021.

For more rules, see www.arrl.org/www-mhz-and-up-distance-contest

Scott Tuthill, K7ZO, k7zo@cableone.net

2020 ARRL 10-Meter Contest Results

The results of the December 12 – 13, 2020 event.

Full Results Online

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

The 2021 ARRL 10-Meter Contest will be held December 11 – 12, 2021.

It doesn't take a large antenna to operate the ARRL 10-Meter Contest. Tim Raymer, KAØOUV, operating as NØSS, used a dipole antenna mounted above his deck, with a high-tech weatherproof balun enclosure. [Tim Raymer, KAØOUV, photo]

Sebastian Galeazzi, LU8MHL, operated during the 2020 ARRL 10-Meter Contest in the Single Operator, Unlimited, CW Only, Low Power Category. He completed 688 contacts for a total score of 244,800 — bringing home a country record for Argentina. [Sebastian Galeazzi, LU8MHL, photo]

Affiliated Club Competition

Club	Score	Entries
Unlimited		
Potomac Valley Radio Club	7,954,388	120
Florida Contest Group	6,036,794	52
Yankee Clipper Contest Club	5,343,012	64
Frankford Radio Club	5,030,984	66
Minnesota Wireless Assn.	5,005,366	94
Society of Midwest Contesters	3,830,940	90
Medium		
Northern California Contest Club	2,940,048	41
Central Texas DX and Contest Club	2,708,174	30
Southern California Contest Club	2,160,774	40
Alabama Contest Group	2,102,768	9
Tennessee Contest Group	1,946,036	33
Arizona Outlaws Contest Club	1,732,104	35
Grand Mesa Contesters of Colorado	1,675,546	19
South East Contest Club	1,360,442	18
Contest Club Ontario	1,207,418	48
Mother Lode DX/Contest Club	1,135,240	20
Kentucky Contest Group	1,112,240	18
Willamette Valley DX Club	1,089,378	24
Kansas City Contest Club	1,027,096	10
DFW Contest Group	982,372	22
Carolina DX Assn.	924,348	13
Western Washington DX Club	765,676	17
Texas DX Society	531,376	10
599 DX Assn.	462,564	6
Georgia Contest Group	459,446	5
Hampden County Radio Assn.	457,342	16
Hudson Valley Contesters and DXers	425,238	15
Louisiana Contest Club	397,856	6
Great Places Contest Club	386,376	6
North Coast Contesters	371,980	7
Swamp Fox Contest Group	363,150	12
Saskatchewan Contest Club	356,380	3
Rochester (NY) DX Assn.	314,764	8
Mad River Radio Club	310,396	11
Northeast Maryland Amateur Radio Contest Society	309,072	11
Bay Area DXers	260,844	4
Order of Boiled Owls of New York	260,064	6
North Texas Contest Club	247,768	4
Driftless Zone Contesters	187,780	7
Big Sky Contesters	174,740	6
Pacific Northwest VHF Society	136,680	5
Orca DX and Contest Club	135,208	8
Maritime Contest Club	103,984	4
Candlewood ARA	80,808	4
Spokane DX Assn.	67,292	4
Valley Amateur Radio Assn.	64,032	5
Silver Comet Amateur Radio Society	58,176	5
Port Lavaca ARC	33,452	4
New Providence ARC	29,030	3
South Jersey Radio Assn.	27,712	3
Downey ARC	22,890	3
Providence Radio Assn.	21,178	3
Six Meter Club of Chicago	14,558	3
Great South Bay ARC	4,468	4
Sierra Nevada ARS	2,602	4
Rockwall ARC	684	3
Local		
Iowa DX and Contest Club	458,848	3
The Villages ARC	454,090	6
Central Virginia Contest Club	411,152	7
Niagara Frontier Radiosport	191,178	8
Hazel Park ARC	76,890	7
Bristol (TN) ARC	67,822	3
CTRI Contest Group	30,942	5
Meriden ARC	23,386	5
Athens County ARA	15,600	4
Preble ARA	14,070	4
North Fulton ARL	13,256	3
Hilltop Transmitting Assn.	11,816	3
OH-KY-IN ARS	4,218	3
TX Emergency Amateur Communicators	1,566	3
Central Michigan ARC	1,316	4

Top Ten

United States

Single Operator, Mixed Mode, High Power

KI6RRN (@WA6TQT)	794,240
W5ZN	778,070
N4OX	737,632
N4EEB	642,396
W6YX (N7MH, op)	501,984
KØTT	487,104
KØMD	419,120
K7RL	375,360
K7RAT (N6TR, op)	333,424
KU2M	308,374

Single Operator, Mixed Mode, Low Power

N8II	398,764
WQ5L	372,294
KTØK	365,014
K2PS	328,090
N5JJ	271,416
ACØW	247,164
WA7NB	229,500
NV4B	224,770
ND9G	178,724
WØPV	177,606

Single Operator, Mixed Mode, QRP

NDØC	51,968
N4ELM	30,622
K2GMY	26,696
K6EI	22,842
WB2AMU	22,724
WA6FGV	20,328
NA4CW	14,382
AA5KD	12,958
K4PZC	12,512
K4PQC	11,322

Single Operator, Phone Only, High Power

NR5M	351,828
K5TR	298,462
KD7RF	254,748
W4DD	195,016
KØJU	128,520
N8RA	126,060
K2XA	113,916
ND4Y	112,362
W5LO	111,612
KE2DX	75,582

Single Operator, Phone Only, Low Power

K5OF	62,370
KØDD	40,138
K4TMC	38,916
K4QQG	34,900
W4QNW	29,848
KB4OLM	28,520
KD5UVV	27,888
KØNEB	20,800
N4JKO	20,240
WA9BZW	17,252

Single Operator, Phone Only, QRP

KEØWPA	2,400
KD2UHF	1,296
WWØWB	1,152
W6QU (W8QZA, op)	840
WE6EZ	810
WBØTEV	768
KC9AMM	672
KS4GW	308
KC1MBQ	306
WX2N	228

Single Operator, CW Only, High Power

K5NA	509,440
K5PI	495,804
WW5M	393,736
KU8E	354,432
K1KI	303,392
K5LG	275,700
WØZA	262,372
K4BAI	238,392
K3UA	236,716
WØVTT	232,320

Single Operator, CW Only, Low Power

K7SV	166,320
K4FT	153,400
W4NZ	149,760
W3BGN	145,656
AE5GT	142,632
WB4TDH	139,712
K1XM	125,660
K5XU	120,596
N5EE	119,000
K1VUT	109,760

Single Operator, CW Only, QRP

WAØMHJ	70,200
K3TW	69,748
WØCW	36,432
NØJK	24,940
K2YG	22,632
N8AP	22,192
N5OE	20,020
N1IX	17,500
K2YAZ	15,836
AD7L	13,440

Single Operator Unlimited, Mixed Mode, High Power

N8OO	1,243,512
N4UU	704,728
K4AB	567,336
N4RV	519,232
K3MM	497,568
WO4O	483,120
W3EP	469,212
W3IP	462,352
N2TU	361,620
K3WW	360,864

Single Operator Unlimited, Mixed Mode, Low Power

K9OM	351,440
N2CEI	305,230
K1HTV	188,500
K6AM	169,476
NØHJZ	159,084
K1ZE	154,112
KØKX	142,024
W9AV	134,300
KT4Q	102,312
KØVBU	98,770

Single Operator Unlimited, Mixed Mode, QRP

N2XP	11,232
K2AL	6,380
KN2M	1,530
K8ZT	1,470
K3MAW	324
KJ5T	84

Single Operator Unlimited, Phone Only, High Power

K4WI	248,976
W5PR	194,076
NA4DA	96,868
NØIRM	77,220
KD5JRY	67,340
W3FOX	59,000
KAØRVL	38,514
WTØDX	27,132
W9KEY	27,048
W9NY	26,840

Single Operator Unlimited, Phone Only, Low Power

K2DRH	127,680
N3AAA	35,872
KA2K	31,944
W4VS	16,192
WA5WFE	8,484
N1FTP	6,758
W7BOB	6,440
KG5KRZ	5,460
KB1RVU	4,368
K7SYS	3,936

Single Operator Unlimited, Phone Only, QRP

KU4A	1,116

Single Operator Unlimited, CW Only, High Power

K1MM	530,800
NN7CW	492,800
KVØQ	446,720
W1KM	425,880
N4BP	420,792
K3EST	373,920
W2UP	362,792
N6SS	340,800
N2MM	333,984
N3RD	299,880

Single Operator Unlimited, CW Only, Low Power

K4OAQ	208,164
W9XT	175,104
WT9Q	156,000
K6WSC	116,424
K7XC	112,992
K2DFC	107,736
NM5M	105,624
K3AU (K2YWE, op)	98,208
N7YK	94,928
W3KB	78,848

Single Operator Unlimited, CW Only, QRP

NØUR	57,552
WC7S	13,572
K6MI	10,920
KR4AE	3,496

Multioperator, Single Transmitter, High Power

NX5M	906,752
NV9L	694,232
KA1ZD	542,794
KØRF	473,364
AA1JD	417,696
AD4ES	354,756
K3AJ	330,454
K9YY	250,880
K7ZS	242,556
NX6T	216,972

Multioperator, Single Transmitter, Low Power

NC1CC	340,120
K4MM	115,200
W1OMG	48,280
KA9VVQ	34,800
WB4WXE	21,150
W4TG	16,340
K5LRW	5,440
N1SOH	4,876
W4BSF	2,600
KB5ZSK	1,968

Canada

Single Operator, Mixed Mode, High Power

VE4VT	130,400
VE3PN	71,168
VE3UZ	41,890
VA3MW	5,040
VE5CPU	1,296
VE6TK	540

Single Operator, Mixed Mode, Low Power

VE2NCG	23,828
VE3LVW	22,680
VE3GFN	21,504
VA3YV	19,188
VE3OIL	16,644
VE7ZR	14,104
VA3RKM	14,060
VE3TG	11,780
VE6UM	6,608
VE3SST	6,156

Single Operator, Mixed Mode, QRP

VE3CBK	638

Single Operator, Phone Only, High Power

VA2BN	28,560
VO1KVT	1,080
VE3ETE	924
VE2JM	744

Single Operator, Phone Only, Low Power

VE3BFU	2,530
VE3CNA	1,440
VA2LGQ	1,332
VE3BK	1,120
VE3NQM	432
VE2HIT	418
VE9RLW	176
VE5DLC	160

Single Operator, CW Only, High Power

VA7MM	57,904
VE6BBP	56,368
VA7ST	23,940
VE3VN	15,836
VA1MM	7,200
VE7BV	3,444

Single Operator, CW Only, Low Power

VE3KP	31,096
VE1ZA	30,024
VY2OX	28,424
VE5GC	25,200
VE3ZY	17,544
VA3JK	14,880
VE3LC	12,460
VE3AQ	11,484
VE2OWL	7,900
VE9VIC	6,960

Single Operator, CW Only, QRP

VE3LBG	1,984
VE3KJQ	680
VE3LMS	448
VE3DQN	144

Single Operator Unlimited, Mixed Mode, High Power

VE5MX	350,760
VA3DF	180,708
VE3CX	124,488
VE3RZ	44,764
VE7KW	18,080
VE9CB	15,120
VE7CV	12,880
VE3MM	5,376
VA3ROC	4,930
VE3TW	4,002

Single Operator Unlimited, Mixed Mode, Low Power

VE3PJ	56,304
VE3VY	33,630
VE2HEW	12,760
VE3KTB	4,104
VE6SH	2,016
VE3RYI	1,440
VE7ZX	602

Single Operator Unlimited, Phone Only, High Power

VA3WW	15,540
VA3PC	462
VE2GT	72

Single Operator Unlimited, Phone Only, Low Power

VE3RKS	80
VA2FW	6

Single Operator Unlimited, CW Only, High Power

VE3UTT	170,000
VE3EJ	107,424
VE3NNT	92,136
VE9AA	74,360
VA7DX	52,416
VE3NE	50,160
VE2FK	26,448
VE7XF	15,696
VO1HP	14,400
VE3MIS (VA3CW, op)	7,120

Single Operator Unlimited, CW Only, Low Power

VA3WB	20,672
VA3EC	16,500
VE3VSM	15,264
VE3MV	14,980
VA3FF	10,752
VE3NZ	9,088
VE7XT	8,448
VA3TNM	7,316
VA7VJ	4,600
VE3MA	2,924

Single Operator Unlimited, CW Only, QRP

VE6EX	5,304
VA3AMX	2,622

Multioperator, Single Transmitter, High Power

VE3YAA	57,036

Multioperator, Single Transmitter, Low Power

VE9ML	7,304

Mexico

Single Operator, Mixed Mode, Low Power

XE2I	21,204
XE2NK	8,976
XE1SVT	460
XE2OK	100

Single Operator, Phone Only, High Power

XE1CKJ	11,692
XE1BRX	9,960

Single Operator, Phone Only, Low Power

XE1MYO	5,248
XE1ZTW	5,152
XE1SY	3,066
XE1SFE	480
XE2JTS	450
XE2ML	112
XE2PXN	32
XE1AHP	18
XE1RF	16
XE2SB	2

Single Operator, CW Only, High Power

XE2X	22,800

Single Operator, CW Only, Low Power

XE1CT	91,584
XE2S	75,260
XE2HQI	47,168
XE2AD	17,220
XE2YWH	6,156
XE3A	4,400
XE2RT	3,196
XE1RE	2,160
XE1AY	232
XE2MWY	100

Single Operator Unlimited, Mixed Mode, Low Power

XE2B	23,848

Single Operator Unlimited, Phone Only, High Power

XE1CWJ	45,076

Single Operator Unlimited, Phone Only, Low Power

XE2JS	33,156
XE2N	1,386

Single Operator Unlimited, CW Only, High Power

XE2CQ	62,916

Single Operator Unlimited, CW Only, Low Power

XE1EE	13,764

DX

Single Operator, Mixed Mode, High Power

LU8DPM (LU5WW, op)	1,034,796
LU5FC	970,522
LW1D	295,240
WP3R	246,024
OA4SS	217,512
LZ4TX	107,700
ZD7BG	105,930
HG8W (HA8ZO, op)	76,032
VR2XAN	65,076
PI4DX (PD1DX, op)	60,060

Single Operator, Mixed Mode, Low Power

PY3YD	361,440
LU4HK	130,494
4U1A (OE1ZZZ, op)	34,170
YV4ABR	33,280
PY2AXH	31,270
CO2RQ	24,776
UXØFF	22,878
UR5FIL	17,600
PV8DX	16,564
DK5DQ	15,360

Single Operator, Mixed Mode, QRP

PY2NY	43,792
PU2MST	10,716
HG6C (HA6IAM, op)	4,560
JJ1XAS	3,052
CT1FPQ	2,958
JH7UJU	2,516
SN5R (SP5XMU, op)	2,318
UT5EOX	1,904
UT2HM	1,428
EA8AA	780

Single Operator, Phone Only, High Power

CX7SS	242,248
PY5ZD	111,690
CE7VPQ	97,200
TI1T (TI2CC, op)	53,676
PP5RT	46,498
PY5DC	46,376
TI2CDA	45,668
LU8VLE	35,568
J79WTA	35,088
PY5WW	25,080

Single Operator, Phone Only, Low Power

PY2UD	59,520
PU5JDA	47,742
PY2CX	40,430
LW4EF	39,186
LU8ADX	36,120
YY5RAB	27,896
CX8DS	25,296
LU1HHT	19,482
TI2VVV	18,696
KH2RU/KP4	15,570

Single Operator, Phone Only, QRP

TG9ANF	41,148
PY2BN	8,436
PQ8RS	5,240
LU7VCH	1,530
HI8JSG	1,404
PF70DARC (PA2TMS, op)	600
LW2DHD	572
PU2OIE	324
NP3T	252
E20WXA	160

Single Operator, CW Only, High Power

ZF5T	540,484
PS2T (PY2ZEA, op)	325,220

KP2M (KT3Y, op)	288,864
CE2ML	242,172
LU6D (LU6DOT, op)	206,712
OM2VL	188,832
PY4DX	151,776
CX9AU	139,536
LU7HN	111,568
KP4/NM2O	87,324

Single Operator, CW Only, Low Power

LU8QT	123,872
PY2EX	113,032
LQ3D	60,264
HC2AO	50,752
4D3X (DU3LA, op)	48,816
KH6CJJ	34,572
RA3Y	29,680
LU6UO	28,420
J35X	26,268
VR2EH (VR2ZQZ, op)	25,704

Single Operator, CW Only, QRP

LW9EKA	20,340
RW3AI	5,712
RA1AL	4,020
CO2JD	2,592
LZ2RS	2,560
LY5G	2,240
JQ1NGT	2,240
HA3HX	1,960
JR1NKN	1,692
F5ROX	1,260

Single Operator Unlimited, Mixed Mode, High Power

ZF2WF (W9KKN, op)	526,120
LW5HR	379,572
LU3WC	367,080
DL2ARD	314,960
PY2KJ	236,062
YL7X (YL2LY, op)	119,200
LY7Z	114,552
VK4QH	108,072
LY4A	95,760
PY5AMF	88,182

Single Operator Unlimited, Mixed Mode, Low Power

9Z4Y	109,440
PY2QT	90,804
XQ3WD	83,752
PY1VOY	60,010
NP2KW	19,800
DL2LDE	13,860
PY2MIA	13,148
LY2DX	12,992
4F3BZ	12,600
RA3RA	12,464

Single Operator Unlimited, Mixed Mode, QRP

ZV2F (PY2SFA, op)	2,176
UT3EK	1,590
PY2XC	1,188
PE2K	1,064
JK1TCV	546
EA1AER	192
EF1M (EB1RL, op)	12
F8CPA	4

Single Operator Unlimited, Phone Only, High Power

ZW5B (PY5EG, op)	145,266
LT7F (LU6FOV, op)	132,720
PT4A (PY4AZ, op)	131,100
LU1DX	110,716
V51WH	76,272
PY5QW	64,372
PY2KNK	59,436
LW3EK	32,880
LW9DYP	21,300
PY4JW	14,946

Single Operator Unlimited, Phone Only, Low Power

PU5FJR	121,644
HI3CC	60,320
PP1WW	44,712
PY2CP	25,380
LU6DC	18,810
PY2HT	18,616
PY2ZR	15,200
PU4MMZ	14,362
PP5DZ	14,208
PY1NS	8,938

Single Operator Unlimited, Phone Only, QRP

HK4GOO	900
PU2VJI	648
NP4TX	552
EA3O	30

Single Operator Unlimited, CW Only, High Power

VK2IA	223,776
CX5UA	202,536
V51YJ	182,880
9A5Y (9A7DX, op)	148,960
L33M (LU3MAM, op)	81,872
ZL1IF	81,420
S57Q	78,416
OM8CW	73,200
F8DGY	57,820
DK2OY	45,344

Single Operator Unlimited, CW Only, Low Power

LU8MHL	244,800
LT7D	224,632
PP1CZ	152,768
PY4XX	134,680
KP2B (WP3A, op)	88,192
HK1N	58,860
R7AB (R7DA, op)	48,780
TM6M (F1AKK, op)	35,088
9A6A	33,440
ON6NL	27,692

Single Operator Unlimited, CW Only, QRP

YT2RX	3,612
DD0VS	2,160
LZ5QZ	1,560
SP5EWX	1,404
OK1FKD	432
SM3OMO	280
BG3UFC	180
DL8MF	120
9A5YY	16
YC2VOC	12

Multioperator, Single Transmitter, High Power

PY2YU	1,196,634
LU2DX	1,090,188
LR1E	883,976
PX2A	825,044
CX5A	601,174
PR4T	392,460
PT3T	330,960
LU2EE	302,804
LZ5R	213,358
YV5AM	172,992

Multioperator, Single Transmitter, Low Power

FY5KE	592,516
PR2E	312,634
WP3C	301,484
LS2D	256,128
PP5EI	28,680
ZP6RAI	26,432
PU2XMY	7,872
CE4WT	4,144
PY2ERA	2,162
OL725PLZ	2,080

Continental Winners

Africa

Single Operator, Mixed Mode, High Power	ZD7BG	105,930
Single Operator, Mixed Mode, Low Power	EA8AQV	7,722
Single Operator, Mixed Mode, QRP	EA8AA	780
Single Operator, Phone Only, High Power	FR4QT	11,780
Single Operator, Phone Only, Low Power	D44PM	14,670
Single Operator, CW Only, High Power	EA8DHV	4,332
Single Operator Unlimited, Mixed Mode, High Power	EA8RM	17,424
Single Operator Unlimited, Mixed Mode, Low Power	EA8OM (DJ1OJ, op)	11,900
Single Operator Unlimited, Phone Only, High Power	V51WH	76,272
Single Operator Unlimited, CW Only, High Power	V51YJ	182,880
Single Operator Unlimited, CW Only, Low Power	6W1TA	540
Multioperator, Single Transmitter, High Power	D4Z	50,808

Asia

Single Operator, Mixed Mode, High Power	VR2XAN	65,076
Single Operator, Mixed Mode, Low Power	JR1MEG/1	5,472
Single Operator, Mixed Mode, QRP	JJ1XAS	3,052
Single Operator, Phone Only, High Power	JA8IJI	96
Single Operator, Phone Only, High Power	JG2REJ	96
Single Operator, Phone Only, Low Power	JR1AKD	1,116
Single Operator, Phone Only, QRP	E20WXA	160
Single Operator, CW Only, High Power	4X1MM	6,424
Single Operator, CW Only, Low Power	VR2EH (VR2ZQZ, op)	25,704
Single Operator, CW Only, QRP	JQ1NGT	2,240
Single Operator Unlimited, Mixed Mode, High Power	JH4UTP	24,888
Single Operator Unlimited, Mixed Mode, Low Power	JH6WHN	10,556
Single Operator Unlimited, Mixed Mode, QRP	JK1TCV	546
Single Operator Unlimited, Phone Only, High Power	JH1CML	1,482
Single Operator Unlimited, Phone Only, Low Power	BU2EV	396
Single Operator Unlimited, CW Only, High Power	E25KAE	26,492
Single Operator Unlimited, CW Only, Low Power	E29TGW	8,064
Single Operator Unlimited, CW Only, QRP	BG3UFC	180
Multioperator, Single Transmitter, High Power	JF2QNM	20,526
Multioperator, Single Transmitter, Low Power	JK2VOC	1,800

Europe

Single Operator, Mixed Mode, High Power	LZ4TX	107,700
Single Operator, Mixed Mode, Low Power	4U1A (OE1ZZZ, op)	34,170
Single Operator, Mixed Mode, QRP	HG6C (HA6IAM, op)	4,560
Single Operator, Phone Only, High Power	IZ4DPV	10,530
Single Operator, Phone Only, Low Power	G0AEV	4,644
Single Operator, Phone Only, QRP	PF70DARC (PA2TMS, op)	600
Single Operator, CW Only, High Power	OM2VL	188,832
Single Operator, CW Only, Low Power	RA3Y	29,680
Single Operator, CW Only, QRP	RW3AI	5,712
Single Operator Unlimited, Mixed Mode, High Power	DL2ARD	314,960
Single Operator Unlimited, Mixed Mode, Low Power	DL2LDE	13,860
Single Operator Unlimited, Mixed Mode, QRP	UT3EK	1,590
Single Operator Unlimited, Phone Only, High Power	LY1R	12,580
Single Operator Unlimited, Phone Only, Low Power	EC7WR	2,756
Single Operator Unlimited, Phone Only, QRP	EA3O	30
Single Operator Unlimited, CW Only, High Power	9A5Y (9A7DX, op)	148,960
Single Operator Unlimited, CW Only, Low Power	R7AB (R7DA, op)	48,780
Single Operator Unlimited, CW Only, QRP	YT2RX	3,612
Multioperator, Single Transmitter, High Power	LZ5R	213,358
Multioperator, Single Transmitter, Low Power	OL725PLZ	2,080

North America

Single Operator, Mixed Mode, High Power	WP3R	246,024
Single Operator, Mixed Mode, Low Power	CO2RQ	24,776
Single Operator, Mixed Mode, QRP	NP3V	462
Single Operator, Phone Only, High Power	TI1T (TI2CC, op)	53,676
Single Operator, Phone Only, Low Power	TI2VVV	18,696
Single Operator, Phone Only, QRP	TG9ANF	41,148
Single Operator, CW Only, High Power	ZF5T	540,484
Single Operator, CW Only, Low Power	J35X	26,268
Single Operator, CW Only, QRP	CO2JD	2,592
Single Operator Unlimited, Mixed Mode, High Power	ZF2WF (W9KKN, op)	526,120
Single Operator Unlimited, Mixed Mode, Low Power	NP2KW	19,800
Single Operator Unlimited, Phone Only, High Power	KP4/K0BBC	12,528
Single Operator Unlimited, Phone Only, Low Power	HI3CC	60,320
Single Operator Unlimited, Phone Only, QRP	NP4TX	552
Single Operator Unlimited, CW Only, Low Power	KP2B (WP3A, op)	88,192
Multioperator, Single Transmitter, Low Power	WP3C	301,484

Oceania

Single Operator, Mixed Mode, High Power	FK8IK	47,216
Single Operator, Mixed Mode, Low Power	YB2MM	294
Single Operator, Phone Only, High Power	FK4QX	4,452
Single Operator, Phone Only, Low Power	VK4NH	2,210
Single Operator, Phone Only, QRP	4I1EBD	70
Single Operator, CW Only, High Power	KH6LC	65,688
Single Operator, CW Only, Low Power	4D3X (DU3LA, op)	48,816
Single Operator, CW Only, QRP	VK4BAP	192
Single Operator Unlimited, Mixed Mode, High Power	VK4QH	108,072
Single Operator Unlimited, Mixed Mode, Low Power	4F3BZ	12,600
Single Operator Unlimited, Phone Only, Low Power	VK2NSS	7,592
Single Operator Unlimited, CW Only, High Power	VK2IA	223,776
Single Operator Unlimited, CW Only, Low Power	YB8RW	1,280
Single Operator Unlimited, CW Only, QRP	YC2VOC	12

South America

Single Operator, Mixed Mode, High Power	LU8DPM (LU5WW, op)	1,034,796
Single Operator, Mixed Mode, Low Power	PY3YD	361,440
Single Operator, Mixed Mode, QRP	PY2NY	43,792
Single Operator, Phone Only, High Power	CX7SS	242,248
Single Operator, Phone Only, Low Power	PY2UD	59,520
Single Operator, Phone Only, QRP	PY2BN	8,436
Single Operator, CW Only, High Power	PS2T (PY2ZEA, op)	325,220
Single Operator, CW Only, Low Power	LU8QT	123,872
Single Operator, CW Only, QRP	LW9EKA	20,340
Single Operator Unlimited, Mixed Mode, High Power	LW5HR	379,572
Single Operator Unlimited, Mixed Mode, Low Power	9Z4Y	109,440
Single Operator Unlimited, Mixed Mode, QRP	ZV2F (PY2SFA, op)	2,176
Single Operator Unlimited, Phone Only, High Power	ZW5B (PY5EG, op)	145,266
Single Operator Unlimited, Phone Only, Low Power	PU5FJR	121,644
Single Operator Unlimited, Phone Only, QRP	HK4GOO	900
Single Operator Unlimited, CW Only, High Power	CX5UA	202,536
Single Operator Unlimited, CW Only, Low Power	LU8MHL	244,800
Multioperator, Single Transmitter, High Power	PY2YU	1,196,634
Multioperator, Single Transmitter, Low Power	FY5KE	592,516

Maritime Mobile

Multioperator, Single Transmitter, Low Power	PY2XM/MM	1,806

James Duffey, KK6MC, jamesduffey@comcast.net

2021 ARRL January VHF Contest Results

This year's ARRL January VHF Contest was held January 16 – 18, 2021.

Division Winners

Classic Rover

Atlantic	W2EV/R	36,200
Central	K9TMS/R	20,739
Dakota	KCØP/R	7,400
Delta	AG4V/R	35,000
Northwestern	KE7MSU/R	6,090
Pacific	N6NB/R	281,232
Roanoke	W5JMC/R	19,596
Southeastern	K1DS/R	196
Southwestern	N7GP/R	169,533
West Gulf	K2EZ/R	265,580
Canada	VE3OIL/R	3,146

Limited Rover

Atlantic	WS3O/R	550
Central	N9GH/R	1,045
Delta	NV4B/R	8,083
Hudson	N2DXT/R	3,408
Midwest	KEØMHJ/R	4,500
New England	AF1R/R	4,379
Northwestern	KC7OOY/R	7,353
Pacific	WB6HUM/R	1,392
Roanoke	KM4OZH/R	6,592
Rocky Mountain	AA5PR/R	3,542
Southeastern	WB8LYJ/R	9,028
Southwestern	N6GP/R	19,228
West Gulf	KA5D/R	42,883
Canada	VE6CCL/R	750

Unlimited Rover

Delta	AE5P/R	9,600
Midwest	AF4JF/R	8
New England	KG6CIH/R	9,744
Northwestern	K7ATN/R	15
Pacific	K6MI/R	105,300
West Gulf	K5SRT/R	194,590
Canada	VE7AFZ/R	1,216

Single Operator, High Power

Atlantic	K1RZ	182,004
Central	WD9EXD	42,763
Dakota	WØZQ	17,628
Delta	W5ZN	110,745
Great Lakes	WZ8D	39,480
Hudson	W2BVH	19,778
Midwest	KØTPP	16,377
New England	K1TEO	347,156
Northwestern	KE7SW	14,750
Pacific	K6KLY	13,288
Roanoke	W3IP	55,428
Rocky Mountain	WE7L	752
Southeastern	WA4GPM	12,160
Southwestern	N1AV	126,232
West Gulf	W5LUA	17,661
Canada	VE3ZV	22,074

Single Operator, Low Power

Atlantic	WA3NUF	42,940
Central	K2DRH	70,470
Dakota	KAØPQW	2,500
Delta	AA4DD	4,005
Great Lakes	W8DPK	6,844
Hudson	WA2VNV	16,320
Midwest	WDØBGZ	810
New England	AF1T	88,580
Northwestern	N7EPD	10,868
Pacific	K2GMY	8,370
Roanoke	N3GLZ	4,223
Rocky Mountain	NR7T	1,241
Southeastern	W4MAA	12,483
Southwestern	N7VD	16,646
West Gulf	K5TRA	18,081
Canada	VE3DS	21,576

Single Operator, Portable

Atlantic	N3YMS	2,420
Central	WK9U	3,105
Dakota	NØSUW	320
Delta	W4RXR	3,596
Great Lakes	N8XA	260
Hudson	WB2AMU	440
Midwest	NØJK	72
Northwestern	K7IW	155
Pacific	AA6XA	3,703
Roanoke	KK4BZ	5,544
Rocky Mountain	WØKI	138
Southeastern	AB4DX	608
Southwestern	WA7JTM	8,646
West Gulf	WD5AGO	7,424
Canada	VE3IPS	120

Single Operator, Three-Band

Atlantic	W3ATV	16,368
Central	KO9A	45,480
Dakota	NØAT	2,263
Delta	WT4R	1,274
Great Lakes	AB8M	6,162
Hudson	KG2H	2,821
Midwest	KØPHP	1,938
New England	K1HC	9,625
Northwestern	N7QOZ	2,373
Pacific	NU6S	12,704
Roanoke	K5VIP	6,254
Rocky Mountain	KC7QY	323
Southeastern	W4TM	5,499
Southwestern	N7IR	7,263
West Gulf	W5TRL	11,570
Canada	VA3ASE	10,488

Single Operator, FM Only

Atlantic	W3HDB	826
Central	W9WB	100
Dakota	NØHDR	276
Delta	W5WGF	360
Great Lakes	KE8PX	6
Northwestern	KJ7AXA	582
Pacific	N6NFB	407
Roanoke	KM4KMU	17,404
Rocky Mountain	KG7AZY	540
Southeastern	WG4I	948
Southwestern	KK6OTK	810
West Gulf	KG5UNK	315
Canada	VE3RWJ	776

Limited Multioperator

Atlantic	W2MMD	26,928
Hudson	N2NT	119,647
New England	W1FM	855
Roanoke	K8GP	96,390
Southeastern	WB4WXE	5,535
Southwestern	WO1S	3,024
West Gulf	K5QE	70,350
Canada	VE3MIS	26,166

Unlimited Multioperator

Atlantic	N2JMH	102,492
Dakota	KEØVKO	98
Delta	N4QWZ	51,993
Great Lakes	N8GA	70,755
New England	KA1SU	7,014
Southeastern	W4ZST	46,417
West Gulf	KC5MVZ	1,656

Affiliated Club Competition

Club	Score	Entries
Unlimited		
Mt. Airy VHF Radio Club	1,391,631	61
Medium		
Arizona VHF Society	529,797	14
Rochester VHF Group	407,388	22
Southern California Contest Club	347,510	19
Potomac Valley Radio Club	297,386	50
North East Weak Signal Group	253,995	20
Society of Midwest Contesters	197,589	26
Roadrunners Microwave Group	115,498	4
Pacific Northwest VHF Society	108,173	30
Fourlanders Contest Team	101,020	15
DFW Contest Group	87,338	7
The Ontario VHF Assn.	72,094	8
Northern Lights Radio Society	59,684	17
Yankee Clipper Contest Club	48,984	17
Contest Club Ontario	44,790	16
Northern California Contest Club	43,768	17
Frankford Radio Club	40,561	13
Michigan VHF-UHF Society	40,332	4
Gloucester Co. ARC	31,600	6
North Texas Microwave Society	29,022	4
Northeast Maryland AR Contest Society	20,943	6
Arizona Outlaws Contest Club	17,668	9
Carolina DX Assn.	15,056	8
Badger Contesters	13,429	3
Florida Weak Signal Society	13,367	3
Florida Contest Group	10,650	11
Texas DX Society	10,596	6
Mad River Radio Club	9,725	5
Minnesota Wireless Assn.	7,974	9
Hudson Valley Contesters and DXers	5,077	5
Downey ARC	4,614	3
Alabama Contest Group	4,228	3
New Mexico VHF Society	3,937	4
South Jersey Radio Assn.	3,438	8
Tennessee Contest Group	3,253	4
Wayne County ARC	3,234	3
Six Meter Club of Chicago	2,625	4
Contoocook Valley Radio Club	2,270	3
Willamette Valley DX Club	1,784	3
Swamp Fox Contest Group	1,343	3
South East Contest Club	918	3
Grand Mesa Contesters of CO	687	3
Local		
Stoned Monkey VHF ARC	50,840	5
Chippewa Valley VHF Contesters	27,460	5
Bergen ARA	8,310	6
Bristol (TN) ARC	5,919	3
Meriden ARC	2,428	3

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.

Regional Leaders

LM = Limited Multioperator; R = Classic Rover; RL = Limited Rover; RU = Unlimited Rover; SO3B = Single Operator, Three-Band; SOFM = Single Operator, FM Only; SOHP = Single Operator, High Power; SOLP = Single Operator, Low Power; SOP = Single Operator, Portable, and UM = Unlimited Multioperator.

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

N6NB/R	281,232	R
N7GP/R	169,533	R
K6VHF/R	55,743	R
KJ7JC/R	52,700	R
N7OW/R	39,468	R
N6GP/R	19,228	RL
KC7OOY/R	7,353	RL
KX6A/R	2,394	RL
K7AMB/R	2,074	RL
AL1VE/R	1,869	RL
K6MI/R	105,300	RU
KE6QR/R	7,967	RU
KI6ARW/R	4,602	RU
VE7AFZ/R	1,216	RU
K7ATN/R	15	RU
N1AV	126,232	SOHP
K7EME	41,230	SOHP
KE7SW	14,750	SOHP
K6KLY	13,288	SOHP
K7ND	8,096	SOHP
N7VD	16,646	SOLP
N7EPD	10,868	SOLP
K2GMY	8,370	SOLP
N7RK	7,371	SOLP
K7YO	5,668	SOLP
WA7JTM	8,646	SOP
KF7NP	5,211	SOP
W7JET	4,375	SOP
AA6XA	3,703	SOP
K7TEJ	992	SOP
NU6S	12,704	SO3B
N7IR	7,263	SO3B
K6RO	4,122	SO3B
N7QOZ	2,373	SO3B
KC7V	2,156	SO3B
KK6OTK	810	SOFM
KJ7AXA	582	SOFM
N6NFB	407	SOFM
N1TEN	392	SOFM
VE6TC	150	SOFM
WO1S	3,024	LM

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

K2EZ/R	265,580	R
KCØP/R	7,400	R
NØHZO/R	6,919	R
KA5D/R	42,883	RL
W5TN/R	39,216	RL
K5ND/R	14,036	RL
KEØMHJ/R	4,500	RL
AA5PR/R	3,542	RL
K5SRT/R	194,590	RU
NØLD/R	189,472	RU
KD5IKG/R	74,475	RU
N6RH/R	9,420	RU
KT5TE/R	8,700	RU
W5LUA	17,661	SOHP
WØZQ	17,628	SOHP
KØTPP	16,377	SOHP
K5LLL	15,318	SOHP
WØGHZ	10,404	SOHP
K5TRA	18,081	SOLP
WR5AY	3,120	SOLP
KAØPQW	2,500	SOLP
WB5TUF	1,815	SOLP
KM5RG	1,750	SOLP
WD5AGO	7,424	SOP
NØSUW	320	SOP
WØKI	138	SOP
KF5RRW	80	SOP
NØJK	72	SOP
W5TRL	11,570	SO3B
WA5DM	2,952	SO3B
NØAT	2,263	SO3B
NØUR	2,170	SO3B
KØPHP	1,938	SO3B
KG7AZY	540	SOFM
KG5UNK	315	SOFM
NØHDR	276	SOFM
KØJJW	90	SOFM
KM5YX	40	SOFM
K5QE	70,350	LM
KC5MVZ	1,656	UM
KEØVKO	98	UM

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

K9TMS/R	20,739	R
AA9IL/R	14,784	R
N9REP/R	14,420	R
K9JK/R	12,984	R
VE3OIL/R	3,146	R
N9GH/R	1,045	RL
WA9FIH/R	368	RL
WD9EXD	42,763	SOHP
WZ8D	39,480	SOHP
KB8U	33,558	SOHP
KE8FD	28,321	SOHP
VE3ZV	22,074	SOHP
K2DRH	70,470	SOLP
VE3DS	21,576	SOLP
K9KLD	9,727	SOLP
K9MU	8,816	SOLP
KC4KK	7,670	SOLP
WK9U	3,105	SOP
W9SZ	559	SOP
N8XA	260	SOP
VE3IPS	120	SOP
VA3RKM	56	SOP
KO9A	45,480	SO3B
VA3ASE	10,488	SO3B
VE3SST	9,288	SO3B
AB8M	6,162	SO3B
N8XQM	5,661	SO3B
VE3RWJ	776	SOFM
VA3CBU	276	SOFM
W9WB	100	SOFM
VE3ISO	24	SOFM
KE8PX	6	SOFM
VE3MIS	26,166	LM
N8GA	70,755	UM

Southeast Region
(Delta, Roanoke, and Southeastern Divisions)

AG4V/R	35,000	R
W5JMC/R	19,596	R
W5VY/R	11,814	R
K1DS/R	196	R
WB8LYJ/R	9,028	RL
NV4B/R	8,083	RL
KM4OZH/R	6,592	RL
K2JB/R	936	RL
WD5HJF/R	902	RL
AE5P/R	9,600	RU
W5ZN	110,745	SOHP
W3IP	55,428	SOHP
W4VHF	32,076	SOHP
N3MK	20,898	SOHP
AB4SF	14,948	SOHP
W4MAA	12,483	SOLP
WG8S	11,690	SOLP
N3CMH	7,182	SOLP
K4MY	4,850	SOLP
W4RAA	4,470	SOLP
KK4BZ	5,544	SOP
W4RXR	3,596	SOP
AB4DX	608	SOP
WB1AJJ	8	SOP
K5VIP	6,254	SO3B
W4TM	5,499	SO3B
WB2FKO	4,860	SO3B
KO4ECD	4,116	SO3B
WA4LDU	3,476	SO3B
KM4KMU	17,404	SOFM
WG4I	948	SOFM
W5WGF	360	SOFM
KO4IUM	100	SOFM
K4NRT	24	SOFM
K8GP	96,390	LM
WB4WXE	5,535	LM
K4MM	2,516	LM
N4QWZ	51,993	UM
W4ZST	46,417	UM

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

W2EV/R	36,200	R
NN3Q/R	27,216	R
W3ICC/R	23,560	R
K2ET/R	21,522	R
KV2X/R	12,306	R
AF1R/R	4,379	RL
N2DXT/R	3,408	RL
KA2YRA/R	1,312	RL
WS3O/R	550	RL
N6MEJ/R	208	RL
KG6CIH/R	9,744	RU
KJ1K/R	1,062	RU
K1TEO	347,156	SOHP
K1RZ	182,004	SOHP
W3SZ	77,972	SOHP
N3RG	75,591	SOHP
WZ1V	61,256	SOHP
AF1T	88,580	SOLP
WA3NUF	42,940	SOLP
NR2C	37,733	SOLP
NF3R	26,964	SOLP
W3KM	16,590	SOLP
N3YMS	2,420	SOP
WB2AMU	440	SOP
KQ2RP	84	SOP
WX3P	72	SOP
WA3UOE	63	SOP
W3ATV	16,368	SO3B
N3AAA	10,850	SO3B
K1HC	9,625	SO3B
W3FAY	5,694	SO3B
N3ALN	5,460	SO3B
W3HDB	826	SOFM
VA2DG	81	SOFM
W3SEN	2	SOFM
KE3AO	1	SOFM
N2NT	119,647	LM
W2MMD	26,928	LM
WA3EKL	13,860	LM
N3EXA	11,092	LM
W1FM	855	LM
N2JMH	102,492	UM
N2WK	66,963	UM
WA3EHD	44,304	UM
KD2LGX	40,710	UM
KA1SU	7,014	UM

Top Ten

Single Operator, FM Only

KM4KMU	17,404
WG4I	948
W3HDB	826
KK6OTK	810
VE3RWJ	776
KJ7AXA	582
KG7AZY	540
N6NFB	407
N1TEN	392
W5WGF	360

Single Operator, Three-Band

KO9A	45,480
W3ATV	16,368
NU6S	12,704
W5TRL	11,570
N3AAA	10,850
VA3ASE	10,488
K1HC	9,625
VE3SST	9,288
N7IR	7,263
K5VIP	6,254

Single Operator, High Power

K1TEO	254,196
K1RZ	81,962
N1AV	81,400
W5ZN	67,373
W3SZ	49,220
N3RG	47,058
WZ1V	45,066
W3IP	41,985
WD9EXD	40,383
W3SO (W3XOX, op)	37,497

Unlimited Multioperator

N2JMH	102,492
N8GA	70,755
N2WK	66,963
N4QWZ	51,993
W4ZST	46,417
WA3EHD	44,304
KD2LGX	40,710
KA1SU	7,014
KC5MVZ	1,656
W2RME	1,334

Limited Rover

KA5D/R	42,883
W5TN/R	39,216
N6GP/R	19,228
K5ND/R	14,036
WB8LYJ/R	9,028
NV4B/R	8,083
KC7OOY/R	7,353
KM4OZH/R	6,592
KEØMHJ/R	4,500
AF1R/R	4,379

Single Operator, Portable

WA7JTM	8,646
WD5AGO	7,424
KK4BZ	5,544
KF7NP	5,211
W7JET	4,375
AA6XA	3,703
W4RXR	3,596
WK9U	3,105
N3YMS	2,420
K7TEJ	992

Single Operator, Low Power

AF1T	88,580
K2DRH	70,470
WA3NUF	42,940
NR2C	37,733
NF3R	26,964
VE3DS	21,576
K5TRA	18,081
N7VD	16,646
W3KM	16,590
WA2VNV	16,320

Limited Multioperator

N2NT	119,647
K8GP	96,390
K5QE	70,350
W2MMD	26,928
VE3MIS	26,166
WA3EKL	13,860
N3EXA	11,092
WB4WXE	5,535
WO1S	3,024
K4MM	2,516

Classic Rover

N6NB/R	281,232
K2EZ/R	265,580
N7GP/R	169,533
K6VHF/R	55,743
KJ7JC/R	52,700
N7OW/R	39,468
W2EV/R	36,200
AG4V/R	35,000
WA6IPZ/R	28,512
NN3Q/R	27,216

Unlimited Rover

K5SRT/R	194,590
NØLD/R	189,472
K6MI/R	105,300
KD5IKG/R	74,475
KG6CIH/R	9,744
AE5P/R	9,600
N6RH/R	9,420
KT5TE/R	8,700
KE6QR/R	7,967
KI6ARW/R	4,602

The 2022 ARRL January VHF Contest will be held January 15 – 17, 2022.

Bernie McClenny, W3UR, w3ur@arrl.org

How's DX?

July's Islands On The Air (IOTA) DXpeditions

During July, the northern hemisphere's 6-meter sporadic-E (E_s) season is in full force, and will continue into the first week of August. In between E_s openings on 50 MHz, don't forget the HF bands, because July is a great month for Islands On The Air (IOTA) activities, including IOTA DXpeditions and the Radio Society of Great Britain's (RSGB) IOTA Contest, which takes place over the last full weekend of July (July 24 – 25). Complete rules for the contest can be found at **www.rsgbcc.org/hf/rules/2021/riota.shtml**.

Established in 1964, the IOTA activity program encourages radio contacts with stations from different islands around the world. Currently, there are just slightly over 1,200 island groups, of which 1,136 have been activated at least once.

The highest-ranking competitor is Tom, 9A2AA, with 1,132 island groups confirmed (see Table 1). In partnership with the RSGB, Islands On The Air (IOTA) Ltd. administers the program. Rules and complete details about the program can be found on the IOTA website at **www.iota-world.org**. Also check out Bill's, NG3K, web page at **www.ng3k.com/Misc/iota2021.html** for the 2021 RSGB IOTA Contest announcement.

Table 1
Highest-Ranking IOTA Competitors

Rank	Call Sign	Total
1	9A2AA	1,132
2	I2YDX	1,131
3	I1JQJ	1,130
4	G3KMA	1,129
5	K9PPY	1,128
5	W1NG	1,128
7	I4LCK	1,127
7	W5BOS	1,127
9	HB9AFI	1,126
9	I1SNW	1,126
9	ON6HE	1,126

One of the things I really like about the IOTA program is the nostalgia. It brings back memories of the old days of DXpeditions, before the internet and online log-checking. DXpeditioners would announce their plans for an activation and take a radio, an amplifier, and an antenna setup. With a small group of operators, the DXers would be on the air for just a few days, usually sticking to one or two bands, and if you weren't sure you had a solid contact, you would work them again to make sure you were in the log.

Russian Robinson Club

For several years, the Russian Robinson Club (RRC) has been planning an IOTA DXpedition to the Rat Islands (NA-070), specifically Kiska Island. They were unable to make it in 2020 because of the COVID-19 pandemic. The RRC is optimistic they will be able to make the trip in 2021, with an all-American group led by experienced IOTA DXpeditioner Yuri Sushkin, N3QQ (ex-UA9OPA), and including Hal, W8HC; Rob, N7QT; Tim, NL8F, and Walt, N6XG. They announced their trip in mid-April with plans to visit Adak Island (NA-039) both before and after their operation from Kiska.

Kiska Island is part of the Rat Islands group, which are part of the Aleutian Islands situated in the treacherous Bering Sea (see Figure 1). In their

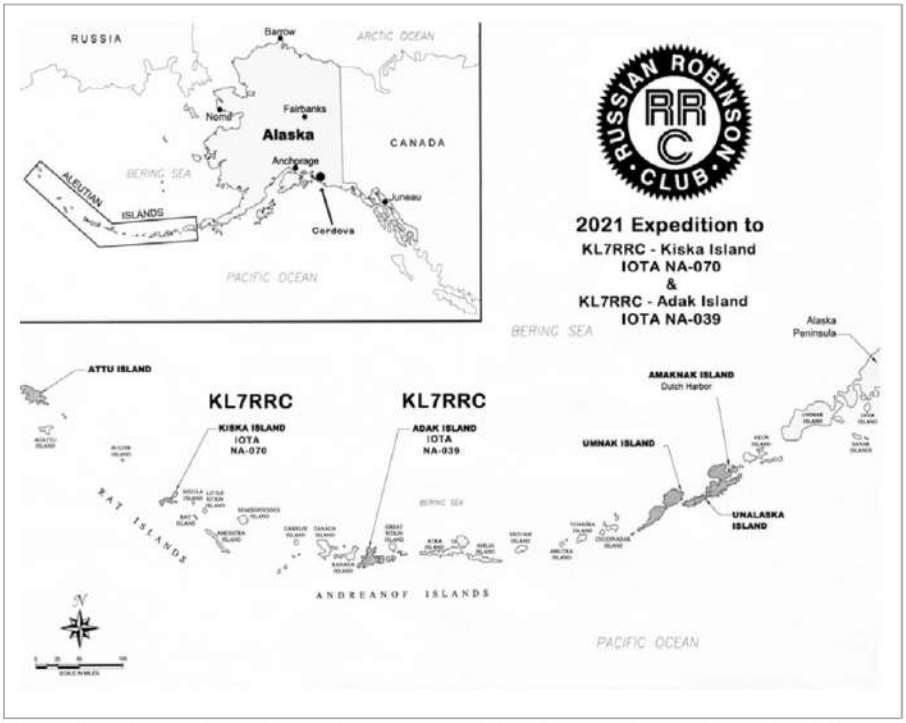


Figure 1 — A map of the Russian Robinson Club's 2021 DXpedition to the Aleutian Islands.

press release, the team mentioned this is "one of the most intense patches of ocean on Earth, where strong winds, freezing temperatures, and icy water are the norm."

The island is approximately 35 kilometers (22 miles) long and ranges between 2.4 and 9.7 kilometers (1.5 to 6 miles) wide. There is no human population on the island. The highest point on the island is the "prominent conical, Kiska volcano, the westernmost historically active volcano in Alaska's Aleutian Island chain." The United States National Park Service designated Kiska Island an Aleutian Island World War II National Historic Area. The team said, "Permission to visit Kiska is required from both Alaska's Maritime National Wildlife Refuge and the US Fish and Wildlife Service."

The last operation on the NA-070 island group was by Jeff, KL2HD, who was using the call sign KL7NWR in June 2015. Only 15% of the IOTA Chasers have worked this rare one.

The RCC crew have hired the 56-foot aluminum sailboat *Seal* to charter the team and their equipment from Cordova, Alaska. Along the 1,600-kilometer (1,000-mile) journey, the *Seal* will stop in Dutch Harbor to pick up Tim, NL8F, and the KL7RCC team's gear. Next, the *Seal* will continue west to Adak Island (NA-039) to pick up the rest of the team. There could be some activity on the air from Adak between June 30 and July 3. Then, the entire team will board and set sail for Kiska Island, where they plan to be on the air from July 7 to 12. They head back to Adak and fly home on July 17. There could also be some Adak Island activity from July 14 to 16.

The KL7RRC team plan to have at least two stations operating on 7 through 50 MHz on SSB, CW, and FT8 running with amplifiers. The team said, "Special emphasis will be on the difficult trans-polar path to EU."

It is an expensive trip, with a $30,000 sail and a total budget of about $40,000, not including the team members' airfares, lodgings, and meals. The team is seeking support, which can be made via PayPal, as linked on their website (**www.na-234.com**), or mailed to Yuri's callbook address and made payable to Russian Robinson Club, noting "Donation for KL7RRC 2021 Expedition." QSL cards for both KL7RRC operations from Kiska Island (NA-070) and Adak Island (NA-039) are available via QSL manager N7RO. Those contributing in advance will receive directs QSLs.

Moneron Island (AS-149)

In mid-March 2021, Andy, R9YU, released details of a Russian team heading to Moneron Island (AS-149), Asiatic Russia during the second half of July, including participation in the 2021 RSGB IOTA Contest. As this column was being written, the core team that will be going includes Andy, R9YU; Vladimir, UA3A; Bob, RN5A; Eugene, RX3AMI; Alexander, RA3DS, and Mikhail, RA9Y. They will be operating RIØFM on CW, SSB, and FT8 (fox and hound) on 160 through 2 meters, as well 70 centimeters. Equipment will include two Elecraft K3s, one homebrew amp, and a TEN-TEC Titan amp. On the low bands, they will use ground planes, but there is no word on what will be used for the higher bands. Check out the RIØFM website for more details and to help with support. QSL via RW6HS.

Spitsbergen Coastal Islands (EU-063)

The Norwegian archipelago is made up of three separate IOTA groups. The main island is Spitsbergen (EU-026), the rarer Bear Island (EU-027), and the Spitsbergen Coastal Islands (EU-073), which include about 20 different islands. One of those islands is Prins Karls Forland, where a Norwegian team of five or six operators plan to go at the end of July. It has been more than 20 years since the last amateur radio operation took place from Prins Karls Forland island. In 2021, LB1QI, LB2HG, LA7GIA, LA7QIA, and

LA8OM will be operating JWØW from July 21 to 26, including a stint in the RSGB IOTA Contest. The "tent-and-generator" IOTA DXpedition will take place from the southeast end of the island (grid locator JQ58wk).

They will be using an Elecraft K3, an Elecraft KX3, and a Kenwood TS-590, with two amplifiers, along with VDA antennas and verticals on the shore. An emphasis will be made on 40, 30, and 20 meters; however, they will be on other bands "if propagation allows." As of press time, they did not know about 50 MHz activity. Ken, LA7GIA, said, "Outside contest focus will be NA/Asia."

The JWØW IOTA Team is seeking financial donations, which can be sent via **jw0wpk@gmail.com**. Contacts will be uploaded to Logbook of The World (LoTW) and a log search. Charles, MØOXO, will be taking care of all the QSLing duties, which can be made using OQRS, either direct or via the bureau. Check out **www.m0oxo.com/2021/04/22/jw0w-prins-karls-forland-island** for operation updates.

Wrap-Up

That's it for this month, with thanks to LA7GIA, MØOXO, R9YU, W8HC, and the Russian Robinson Club 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

Solar Cycle 25 Activity Dampens HF Public Service Nets

Consider the following scenario: A major spring storm system with multiple supercell thunderstorms causes damage across the Midwest and southeast states. Multiple F4 and F5 tornados take out public service and cell towers. Amateur radio would be vital to disaster response, but with high solar activity, D-layer absorption, and active geomagnetic conditions, the HF nets would have difficulty operating. Public officials would find it difficult to get up-to-date disaster updates and information. Here are a few options that are useful in an emergency or disaster scenario.

Reliable VHF/UHF and *WSJT-X*

Rick Palm, K1CE, mentioned *WSJT-X* in his "Public Service" column in the April 2021 issue of *QST*. He discussed "poor conditions on the low bands" due to increased solar activity. People typically think of local 2-meter FM nets for VHF disaster operations, but longer distances are possible on the VHF/UHF bands, even in a disaster zone, and *WSJT-X* communications are durable and reliable.

For *WSJT-X*, the usual information communicated are call signs, reports, and confirmations of reports, but you can send other short messages. The information payload is very small with FT8. A way to increase it is to use "JS8." JS8 (Jordan Sherer-designed MSK-8) is derived from FT8. It applies FT8-style message encoding and modulation to longer messages, allowing senders to transmit across adjacent time slots instead of the usual 15-second alternating transmit-receive sequence. The 75-bit JS8 messages cannot be decoded by 77-bit FT8 software. It layers on a messaging and network protocol for weak-signal communication with a keyboard-to-keyboard interface. It can communicate at a rate of about 5 words per minute.

Meteor Scatter MSK144

Meteors enter the Earth's atmosphere daily throughout the year. Meteor scatter mode allows communication over paths from 400 – 900 miles. Meteor scatter is not disrupted by solar flares and geomagnetic activity. Two 50 MHz stations, each with 100 W and a three-element Yagi, can complete MSK144 contacts routinely. Information could be passed using MSK144. The information throughput would be slow, but critical information could be sent out of a disaster area to officials and back to onsite personnel.

Tropo-Scatter FT8, JS8, Q65A

Tropospheric refraction is not directly affected by a solar storm. Tropo-scatter contacts on 144 and 432 MHz are made on a regular basis over several-hundred-mile paths. Using FT8, JS8, or Q65A, a station running 100 W and a small Yagi could communicate critical information out of a disaster zone over several hundred miles. JS8 may potentially be able to communicate more information than FT8 via weak-signal text chat mode with keyboard-to-keyboard messaging on tropo-scatter paths. Perhaps multiple stations in the disaster zone could use *WSJT-X* modes to facilitate communication. As geomagnetic activity subsides, HF nets may be able to operate on a limited basis. *WSJT-X* and the VHF and UHF bands provided a critical communications channel at the early stages of disaster recovery. Establishing *WSJT-X* VHF/UHF nets with communication protocols should be considered prior to a disaster.

Solar Cycle 25 Sparks 6-Meter Opening

On the afternoon of April 20, 2021, a strong, long-lasting 6-meter opening took place from many parts of North America to South America (see Figure 1). Sporadic E was present across the southeast states. This set up links for suitably located stations to be able to work South America. The DX came in around 1700Z and went on to almost 2200Z.

KE8FD (EN80) worked HK4GSO at 1713Z, followed by CX and LU stations to 2000Z. Gary, KMØT (EM13), worked eight stations in Argentina and

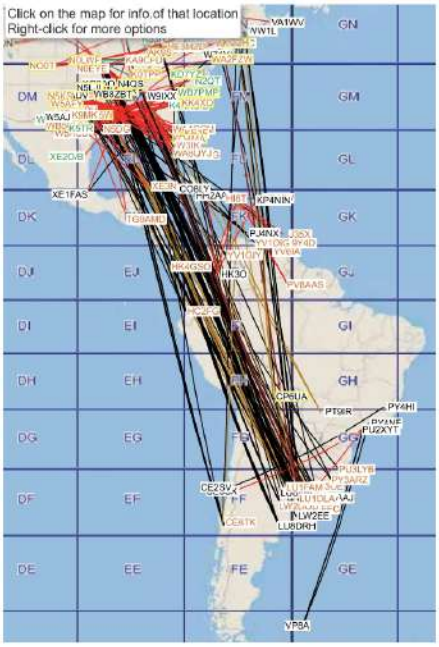


Figure 1 — A map of the 6-meter opening from North America to South America, which took place on April 20, 2021. [Graphic courtesy of **www.dxmaps.com**]

Uruguay on FT8. He picked up to two LU stations on SSB with 55 signals. Larry, NØLL, heard eight South American stations while portable in Nebraska. I (NØJK) operated during the opening from 2010 – 2030Z, with a ¼-wave whip on the car and an old MFJ-9406 radio. I decoded six different stations in Uruguay and several in Chile.

From 8,846 kilometers away, CE6CGX (FF31) peaked to +6 dB, and at 2025Z, he gave my 10 W a –6 dB report. WAØFMY (EN11) worked South America and Walt, AJ6T (EM66), found LU9DO (GF05) at 2011Z. From Minnesota, WØVTT (EN33) said he "had a pipeline to Chile," with CE6TK up to +15 dB. He runs 1 kW to a seven-element Yagi at 132 feet. The solar flux was up at 86. Sporadic E played a major role linking to the afternoon trans-equatorial propagation. In addition to CE, CX, and LU, VP8 stations were spotted into the Midwest.

On the Bands

50 MHz. K3FR (FM18) worked rare grid KV4HV (EL94) on April 13 on E_s. On April 19, Jim, K5VVV (EM10), worked XE2TT (DL44). Jay, N1AV (DM43), worked double-hop sporadic E to W1 and W2. These E_s openings set up a remarkable opening to the South Pacific. NZ3M (FM18) worked Tony, 3D2AG (RH91). 3D2AG was heard by K1TEO, K3EEI, W3LL, and K3SWZ. 3D2AG copied W8GNM, W3LL, AB3AH, and NF3R.

Figure 2 — Larry Lambert's, NØLL, portable 6-meter MSK144 operation. Setups like Larry's can provide amateur radio communications in a natural disaster. [Larry Lambert, NØLL, photo]

Figure 3 — A map of the April 27, 2021 tropospheric opening, showing the 2-meter paths that were present. [Graphic courtesy of **www.dxmaps.com**]

Larry, NØLL, was in EN02 for the Lyrid meteor shower. He made 21 contacts in 5 hours on MSK144 (see Figure 2). WØVTT picked up AG6EE/p (DN42/52) and AA5PR (DM55). K3FR worked ZF1EJ (EK99) on April 20. On April 21, Chip, K7JA (DM03), logged 3D2AG at 2349Z and 3D2TS, who uses "just a wire antenna" at 0033Z on April 22. Bob, N6RW, said he decoded 3D2AG working WD5COV "out of nowhere." His signal "jumped up to +4 dB," and he worked 3D2AG at 0210Z. He also decoded 3D2TS. N1AV also worked 3D2AG on April 22, and he said he had a "monster signal."

On May 2, Gary, K9RX (EM84), worked Bert, KH6HI (BL01), for his 50th state on 6 meters. Gary used his EME array of four seven-element Yagis for the contact.

144 MHz. Tropo occurred on April 13 between Texas and Florida. KO4MA (EL88) worked N5TJD (EM10) on FT8 at 0034Z. AC4TO (EM70) chatted with KE5JXC (EL39) on 144.200 MHz SSB at 0118Z. During the Lyrid meteor shower, Mike, KMØT (EM13), worked W6TCP (CM97) with MSK144 at 1148Z. The contact took an hour. A widespread tropo opening took place on April 27 across the lower Midwest and southeast states (see Figure 3). KØTPP (EM48) worked down to KO4MA (EL88) in Florida on FT8. KFØM (EM17) worked south Texas and was heard by XE2OR (DL98).

222 MHz. Sam, K5SW (EM25), made five contacts on SSB in the 222 MHz Sprint on April 13, and his best DX contact was with K5IM (EM20) at 592 kilometers.

2304 MHz. Buddy, WB4OMG (EL98), worked Al, W5LUA (EM13), on 2304.174 MHz FT8 during the April 27 tropo at 1151Z. Buddy runs 30 W to a 76-element loop Yagi up 100 feet.

Here and There

Gordon Pettengill, W1OUN, became a Silent Key on May 9, 2021, at the age of 95. Dr. Pettengill was Director of the Arecibo Observatory and was instrumental in arranging for amateur radio operators to use the big dish for EME, which he used to radar map the surface of Venus and Mercury.

Special Event Stations

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

June 12 – June 20, 1300Z – 1300Z, WØDBQ, Dubuque, IA. Great River Amateur Radio Club. **Iowa's Islands on the Air (US Islands on the Air)**. 14.260 28.560 18.128 3.755. Certificate & QSL. Great River Amateur Radio Club, P.O. Box 1384, Dubuque, IA 52004. *Certificate for working five Iowa Islands.* See **https://usislands.org** *or* **www.w0dbq.org**

June 19 – June 27, 0000Z – 2359Z, W8M, Cincinnati, OH. OH-KY-IN ARS. **International Museums Weekends 2021 — Cincinnati Art Museum**. 14.250 7.250. QSL. Robert Frey, WA6EZV, 7895 Jessies Wy., Apt. 301, Hamilton, OH 45011. *Operating Saturday and Sunday per International Museums Weekends recommendations.* **www.ohkyin.org**

June 29 – July 2, 1200Z – 1000Z, K2BSA/8, Metamora, MI. Garden City Amateur Radio Club. **Boy Scouts of America/ Michigan Crossroads Council — Trail To Eagle XXVII**. 14.330 7.270 3.840. QSL. Richard Zarczynski, AC8FJ, 7371 N. Farmington Rd., Westland, MI 48185-6900. *K2BSA/8 will be operating at the D-Bar-A Scout Ranch as time permits. Grid: EN82ix.* **https://scoutingevent.com/272-ttexxvii**

June 27 – July 11, 1200Z – 2359, K9U, Liberty, IN. Union County Indiana Bicentennial Board. **Union County Indiana Bicentennial**. 14.040 3.540 7.185 7.035. QSL. Howie Huntington, K9KM, 25350 N. Marilyn Ln., Hawthorn Woods, IL 60047. **k9km@arrl.net**

June 28 – July 9, 0000Z – 2359Z, K1P, Hinsdale, MA. K1TTT. **250th Anniversary of Peru, Massachusetts**. 14025 14074 14085 14250. QSL. Via LoTW or direct to David Robbins, 15 Baumann Rd., Hinsdale, MA 01235. *Medallions for most band/mode combinations.* **wiki.k1ttt.net/Peru250thAnniversary.ashx**

July 3, 1400Z – 2000Z, K4RC, Williamsburg, VA. Williamsburg Area Amateur Radio Club. **Colonial Williamsburg Special Event — 245th Anniversary of the Signing of the Declaration of Independence**. 7.265 14.265. Certificate & QSL. QSL Manager, P.O. Box 1470, Williamsburg, VA 23187. **www.k4rc.net**

July 4, 1400Z – 2200Z, W7PX, Missoula, MT. Hellgate Amateur Radio Club. **Independence Day Celebration at Fort Missoula**. 14.260 7.195. QSL. Hellgate Amateur Radio Club, P.O. Box 3811, Missoula, MT 59806-3811. **www.w7px.org**

July 10, 1000Z – 1600Z, WA4USN, Hanahan, SC. Charleston Amateur Radio Society. **50th Anniversary**. 7.190 14.265; General-class frequencies, 20 and 40 meters. QSL. Bill Dean, 30 Lombardi Ln., Hanahan, SC 29410. **www.wa4usn.org**

July 10, 1600Z – 2300Z, NI6IW, San Diego, CA. USS *Midway* (CV-41) Museum Ship. **Independence Day**. 14.320 7.250 PSK31 and CW (various) D-STAR. QSL. USS *Midway* (CV-41) COMEDTRA, 910 N. Harbor Dr., San Diego, CA 92101. *Check spotting networks to find us on HF. See* **www.dstarusers.org** *to find our call sign, NI6IW, and Reporting Note to see what reflector we're using.* **www.qrz.com/db/ni6iw**

July 11 – July 18, 0000Z – 2300Z, K9R, Vincennes, IN. Red Skelton Museum of American Comedy. **Red Skelton Museum of Comedy Festival 2021**. Frequencies TBD. Certificate & QSL. Mark Steven Williams, K9GX, P.O. Box 5973, Elizabeth, IN 47117-5973. **www.facebook.com/groups/368704358206875**

July 17 – July 19, 0600Z – 0600Z, KCØLFF, Silverton, CO. **Hardrock Endurance Run**. Kendal Mountain 147.375 + PL 156.7, Engineer Mountain 147.270 + PL 12. QSL. Shauna and Steve Blaylock, 327 Hillcrest Dr., Durango, CO 81301. **www.hardrock100.com**

July 18, 1300Z – 2100Z, KY8C, New Concord, OH. Cambridge Area Maker Group. **John Glenn's 100th Birthday Celebration — John Glenn Museum**. 14.290 14.275 7.275 7.240. QSL. Cambridge Area Maker Group, Robert M. Howell, N8WJ, 69081 Mount Hermon Rd., Cambridge, OH 43725-9469. **www.cambridgeareamakers.org**

July 19 – July 22, 1220Z – 1220Z, WX4SOC, Gatlinburg, TN. Special Operations Radio Team. **Public Safety Cadet National Conference**. 3.975 LSB 7.725 LSB. Certificate. Darrell Collier, 234 Historic Nature Tr., Gatlinburg, TN 37738. **www.sort-team.org**

July 19 – July 24, 2330Z – 0130Z, W4H, Boonville, IN. Warrick ARES/RACES. **Warrick County 4-H Fair**. 14.320 SSB. QSL. Steve Connaughton, 7677 Jenner Rd., Chandler, IN 47610. **Celebrating the Warrick County Indiana 4-H Fair.** *Additional frequencies and modes may be used depending on band and weather conditions. Operating mostly late afternoons and evenings.* **www.warrickaresraces.org**

July 24, 1200Z – 2100Z, W4R, Hampton, VA. Blackbeard's Crew. **Pirates Parlay**. 14.260 14.255 7.198 7.177. Certificate. Jason Gnatowsky, 25 Melita Rd., Arvonia, VA 23004.

July 24, 1700Z – 2100Z, W8VP, Cambridge, OH. Cambridge Amateur Radio Association. **Ohio Salt Fork State Park 61st Anniversary**. 7.235 14.245. Certificate.* Cambridge Amateur Radio Association, P.O. Box 1804, Cambridge, OH 43725. **www.w8vp.org**

July 31 – Aug. 1, 1400Z – 1900Z, N3P, Susquehanna, PA. Binghamton Amateur Radio Association. **66th Season at Penn Can Speedway**. 28.350 14.260 7.260 146.865 repeater (146.2 tone). Certificate. Robert Mess, 2505 Oak Hill Rd., Susquehanna, PA 18847. **ws2u.bob@gmail.com** *or* **www.w2ow.org**

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

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

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

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

Idaho (Post Falls) — Aug. 7 D H R S T
9 AM – 2 PM. *Spr:* Kootenai Amateur Radio Society. Farm Field, 2130 N. Meyer Rd. *TI:* 146.98 (127.3 Hz). *Adm:* $5. **www.k7id.org**

Illinois (Carlinville) — Aug. 7 D F H Q R S T V
7 AM – 1 PM. *Spr:* Macoupin County ARC, Montgomery County ARC, Okaw Valley ARC, and Sangamon Valley Radio Club. Macoupin County Fairgrounds, 21149 State Rte. 4. *TI:* 444.250 (103.5 Hz). *Adm:* $5. **www.k9mce.com**

Illinois (Peotone) — July 18 D F H T V
6 AM – 2 PM. *Spr:* Kankakee Area Radio Society. Will County Fairgrounds, 710 S. West St. *TI:* 146.94 (107.2 Hz). *Adm:* $8 advance, double stub; $10 door, single stub. **www.w9az.com**

Illinois (Peotone) — Aug. 1 D F H R T
6 AM gate, 8 AM exhibition hall. *Spr:* Hamfesters Ham Radio Club. Will County Fairgrounds, 710 S. West St. *TI:* 442.450 (131.8 Hz). *Adm:* $8. **www.hamfesters.org/hamfest**

Indiana (Elkhart) — Aug. 7 D H
9 AM – 3 PM. *Spr:* Northern Indiana K9DEW Repeaters. Northern Indiana Event Center, 21565 Executive Pkwy. *TI:* 145.430 (141.3 Hz). *Adm:* $8. **www.elkhartеasthamfest.com**

Indiana (Winchester) — July 31 D F H R S T V
8 AM – 5 PM. *Spr:* Randolph County ARC. Randolph County Fairgrounds,1885 S. US Hwy. 27. *TI:* 147.300 (110.9 Hz). *Adm:* Free. **www.sites.google.com/view/ecindianahamfest**

ARRL IOWA STATE CONVENTION

August 7 – 8, Central City, Iowa
D F H Q R S T V
8 AM – 3 PM. *Spr:* Cedar Valley ARC and Collins ARC. Linn County Fairgrounds, 201 Central City Rd. *TI:* 146.745 (192.8). *Adm:* $10. **www.w0gq.org/hamfest**

Michigan (Shelby Township) — July 17 D F
8 AM – noon. *Spr:* GM Amateur Radio Club. Packard Proving Grounds, 49965 Van Dyke Ave. *TI:* 443.075 (123 Hz). *Adm:* $8. **www.gmarc.org**

Missouri (O'Fallon) — Aug. 8 D F H R V
Flea market 7 AM – noon, Hall 8 AM – noon. *Spr:* St. Charles ARC. O'Fallon Elks Lodge, 1163 Tom Ginnever Ave. *TI:* 146.670, alternate 145.330. *Adm:* one ticket for $5, five tickets for $20. **www.wb0hsi.org/hamfest**

Missouri (Warrensburg) — July 17 D H R S T
7 AM – 1 PM. *Spr:* Warrensburg Area ARC, Inc. Johnson County Fair Association, 144 NW 361st Rd. *TI:* 146.88 (107.2 Hz). *Adm:* Free. **www.waarci.org**

ARRL MONTANA STATE CONVENTION

July 16 – 18, Essex, Montana
D F R S T V
9 AM – 7 PM. *Spr:* Great Falls Area ARC. Glacier Meadow RV Park, 15735 US-2. *TI:* 146.52. *Adm:* $5. **www.gwhamfest.org**

New Jersey (Augusta) — July 18 D F H Q R T V
8 AM – 3 PM. *Spr:* Sussex County ARC. Sussex County Fairgrounds, 37 Plains Rd. *TI:* 147.30 (151.4 Hz). *Adm:* $8. **www.scarcnj.org**

New Jersey (Wall Township) — July 24 D F H R T
8 AM – noon. *Spr:* New Jersey Antique Radio Club. Info Age Science and History Museums, 2201 Marconi Rd. *TI:* none. *Adm:* $5. **www.njarc.org**

New York (Camillus) — July 10 D F H R T V
7:30 AM – 12:30 PM. *Spr:* Radio Amateurs of Greater Syracuse. Camillus Elks Lodge #2367, 6117 Newport Rd. *TI:* 146.91 (103.5 Hz). *Adm:* $5. **www.ragsclub.org**

North Carolina (Waynesville) — July 24 F R T V
8 AM – 2 PM. *Spr:* Western Carolina ARS. Smoky Mountain Event Center (Haywood County Fairgrounds), 758 Crabtree Rd. *TI:* none. *Adm:* $8 door; $6 advance. Email: **wcars.nc.hamfest@gmail.com**.

North Dakota (Dunseith) — July 10 F H R S T V
9 AM – 7 PM. *Spr:* Souris Valley ARC. Peace Garden Lodge, 10939 US-281. *TI:* 146.52 simplex, 444.500 repeater. *Adm:* $10. Phone: **701-833-1000**

Ohio (Elyria) — July 17 D F H R T
8 AM – noon. *Spr:* Northern Ohio ARS. Lorain County Community College, 1005 N. Abbe Rd. *TI:* 146.70 (110.9 Hz). *Adm:* $7. **www.noars.net**

Ohio (Grove City) — Aug. 7 F H R T
8 AM – 1 PM. *Spr:* Aladdin Shrine Audio Unit. Aladdin Shrine Center, 1801 Gateway Cir. *TI:* 146.76 (123.0 Hz). *Adm:* $5. **www.columbushamfest.com**

Ohio (Van Wert) — July 18 F H R T
8 AM – 1 PM. *Spr:* Van Wert ARC. Van Wert County Fairgrounds, 1055 S. Washington St. *TI:* 146.85. *Adm:* Free. **www.w8fy.org**

VIRTUAL PACIFIC NORTHWEST DX CONVENTION

August 7, Online
8:30 AM – 6 PM Pacific Time. *Spr:* Willamette Valley DX Club. *Adm:* Free. **www.pacificnwdxconvention.com**

Pennsylvania (Chambersburg) — July 31 D F H Q R T V
8 AM – noon. *Spr:* Cumberland Valley ARC. CVAEMA Showgrounds, 1501 Criders Church Rd. *TI:* 147.120 (100 Hz). *Adm:* $5. **www.w3ach.org**

Pennsylvania (Erie) — July 10 F R T V
7 AM – noon. *Spr:* Wattsburg Wireless Association. Greene Township Municipal Building, 9333 Tate Rd. *TI:* 147.315 (186. 2). *Adm:* Free. **www.wattsburg-wireless.us**

Pennsylvania (Phoenixville) — July 17 D F H Q R T V
8 AM. *Spr:* Mid-Atlantic ARC. Kimberton Fire Company Fairgrounds, 762 Pike Springs Rd. *TI:* 147.060 (131.8 Hz) and 145.130 (131.8 Hz). *Adm:* $10. **www.marc-radio.org/hamfest2.htm**

Pennsylvania (Sinking Spring) — Aug. 7 D F H R T V
8 AM – noon. *Spr:* Reading Radio Club, Inc. Heritage Park, 992 Clematis St. *Tl:* 146.91(131.8 Hz). *Adm:* $5; test takers and unlicensed family, free. **www.qsl.net/w3bn**

Tennessee (Athens) — July 17 D F H R T V
7 AM. *Spr:* McMinn County ARC. Athens Regional Park, 101 Regional Park Dr. *Tl:* 147.060 (141.3 Hz) and 146.490 simplex. *Adm:* $5. **www.mcminnarc.com**

Tennessee (Lebanon) — July 31 D H Q R S T V
8 AM – 3 PM. *Spr:* Wilson County ARC. James E. Ward Agricultural Center "Wilson County Fairgrounds" 935 E. Baddour Pkwy. *Tl:* 147.105 (156.7 Hz). *Adm:* $5. **www.midtnhamquest.com**

Virginia (Roanoke) — Aug. 7 D F H R S T V
8 AM – 1 PM. *Spr:* Roanoke Valley ARC. Gospel Light Baptist Church, 6307 Cloverdale Rd. *Tl:* 146.985 (107.2 Hz). *Adm:* Free. **www.w4ca.com**

Wisconsin (Chippewa Falls) — July 17 F H T
9 AM – 2:30 PM. *Spr:* Chippewa Valley ARC. Eagle's Banquet Center and Conference Hall, 2588 Hallie Rd. *Tl:* 147.375 (110.9 Hz). *Adm:* $5. **www.w9cva.org/hamfest**

Wisconsin (Onalaska) — Aug. 7 D F H Q R T V
8 AM – 1 PM. *Spr:* Riverland ARC. Onalaska American Legion Post 336, 731 Sand Lake Rd. *Tl:* 146.970 (131.8 Hz). *Adm:* $5. **www.rarc.qth.com**

Wisconsin (Jefferson) — Aug. 7 D F H V
8 AM – 1 PM. *Spr:* Tulare County ARC and JefCares. Spangler Campground, 892 N. Jackson Ave. *Tl:* 145.49 (123 Hz). *Adm:* $5. **www.w9mqb.com**

To All Event Sponsors

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

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

The deadline for receipt of items for this column is the **1st of the second month preceding publication date**. For example, your information must arrive at HQ by **August 1** to be listed in the **October** 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**.

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.

♦A General-class renewal applicant withdrew his application after an FCC notice that the renewal application would be held up pending review of Volunteer Monitor complaints. As a consequence, the Quakertown, Pennsylvania, applicant has no operating privileges.

♦Twenty-one operators in 14 states received advisories because of their operation in the March CQ World Wide DX Contest. While making contacts with VC3T and VC2W, their LSB signals extended below 7.125 MHz, which is the lower limit of the 40-meter amateur phone band.

♦Volunteer Monitors participated in a nationwide training program on April 7 that was conducted by ARRL and the FCC.

♦The Volunteer Monitor Administrator had two meetings in April with FCC Enforcement Bureau personnel.

The totals for VM monitoring in March were 1,394 hours on HF frequencies and 2,515 hours on VHF and above frequencies. — *Thanks to Riley Hollingsworth, K4ZDH, Volunteer Monitor Program Administrator*

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.

February 2021

Kevin M. Brouelette, AJ6EE	10
Alton R. DeWeese, Jr., N4IDH	10
Michael L. Jones, KG6UBG	10
Daniel Lasorso, KD8OFT	10
Lawrence A. Lisle, K9KZT	10
James P. Long, N9EET	10
Kenneth L. Powell, KG4LLQ	10
Thomas S. Watson, W5ZBT	10
William N. Massie, AA8KY	15
Matthew J. Mikolay	15
Christopher G. Pearson, G5VZ	25

March 2021

David A. Hewitt, WA9AVZ	10
Richard J. Berezanich, WB3HUS	10
Ben Bowers, KE3KQ	10
Thomas L. Hardy, K6TLH	10
David O. Krovetz, K4KXA	10
Thomas W. Porter, W8KYZ	10
Brett H. Sharpton, KD2SZW	10
Remell A. Spencer, Jr., KA6DOY	10
Thomas P. Stelmach, NØQBX	10
Rene M. Beland, KE8NPD	15
Mark Anthony Isom, KI5JH	15
Michael S. Lundy, W4MSL	15
Thomas W. Porter, W8KYZ	15
Paul A. Miller, W5RES	20
Thomas W. Porter, W8KYZ	20
Brian K. Moore, KM6ZX	25

April 2021

William T. Cronenwett, W5TPJ	10
Dane E. Groszek, KD2SSS	10
Christopher J. Porter, AA7KL	10
Donald L. Steinbach, AE6PM	10
Bill H. Stephens, NUØY	10
Joel F. Wagner, III, ND5V	10
Richard J. Berezanich, WB3HUS	15
Victor Denisov, N6DVS	15
Edward H. Linch, III, N4LS	15
Richard B. Peglowski, KE4SAV	15
Warren T. Seeley, W4FLL	15
John H. Summers, Jr., WØDY	15
Robert T. Marston, AA6XE	20
Arvid W. Weflen, KL7YC	25
James Carson, WT8P	30
Christopher G. Pearson, G5VZ	30
Edward J. Picha, N9EP	35

Congratulations to all the recipients.

July 2021 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.

July 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 are scheduled to be transmitted by KH6TU on Wednesday, July 28 at 6 PM HST (0400 UTC on Thursday, July 29) on 7047.5 and 14047.5 kHz. Unless indicated otherwise, sending speeds are from 40 to 10 WPM.

Amateur radio operators who participate in Qualifying Runs may submit proof of 1 minute of the highest speed they have copied in the hope of qualifying for the Certificate of Code Proficiency, or an endorsement to their existing certificate.

Legibly copy at least 1 minute of text by hand, and mail the sheet to: W1AW Qualifying Runs, 225 Main St., Newington, CT USA 06111.

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

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

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

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

W1AW Code Proficiency Schedule — July 2021
(All times are in Eastern Daylight Time)

Monday	Tuesday	Wednesday	Thursday	Friday
	7/6 4 PM – 2000Z 10 – 35 WPM	**7/7** 7 PM – 2300Z 35 – 10 WPM	**7/8** 10 PM – 0200Z **(7/9 – UTC)** 10 – 40 WPM	**7/9** 9 AM – 1300Z 10 – 35 WPM
	7/13 4 PM – 2000Z 10 – 35 WPM	**7/14** 7 PM – 2300Z 10 – 40 WPM	**7/15** 9 AM – 1300Z 35 – 10 WPM	**7/16** 10 PM – 0200Z **(7/17 – UTC)** 10 – 35 WPM
	7/20 9 AM – 1300Z 10 – 35 WPM	**7/21** 10 PM – 0200Z **(7/22 – UTC)** 35 – 10 WPM	**7/22** 7 PM – 2300Z 10 – 35 WPM	**7/23** 4 PM – 2000Z 10 – 40 WPM
7/26 10 PM – 0200Z **(7/27 – UTC)** 10 – 40 WPM		**7/28** 9 AM – 1300Z 35 – 10 WPM	**7/29** 4 PM – 2000Z 35 – 10 WPM	**7/30** 7 PM – 2300Z 10 – 35 WPM

W1AW Schedule

PAC	MTN	CENT	EAST	UTC	MON	TUE	WED	THU	FRI
6 AM	7 AM	8 AM	9 AM	1300		FAST CODE	SLOW CODE	FAST CODE	SLOW CODE
7 AM-1 PM	8 AM-2 PM	9 AM-3 PM	10 AM-4 PM	1400-1600 1700-1945	VISITING OPERATOR TIME (12 PM-1 PM CLOSED FOR LUNCH)				
1 PM	2 PM	3 PM	4 PM	2000	FAST CODE	SLOW CODE	FAST CODE	SLOW CODE	FAST CODE
2 PM	3 PM	4 PM	5 PM	2100	CODE BULLETIN				
3 PM	4 PM	5 PM	6 PM	2200	DIGITAL BULLETIN				
4 PM	5 PM	6 PM	7 PM	2300	SLOW CODE	FAST CODE	SLOW CODE	FAST CODE	SLOW CODE
5 PM	6 PM	7 PM	8 PM	0000	CODE BULLETIN				
6 PM	7 PM	8 PM	9 PM	0100	DIGITAL BULLETIN				
6:45 PM	7:45 PM	8:45 PM	9:45 PM	0145	VOICE BULLETIN				
7 PM	8 PM	9 PM	10 PM	0200	FAST CODE	SLOW CODE	FAST CODE	SLOW CODE	FAST CODE
8 PM	9 PM	10 PM	11 PM	0300	CODE BULLETIN				

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

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

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

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

Code bulletins are sent at 18 WPM.

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

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

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

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

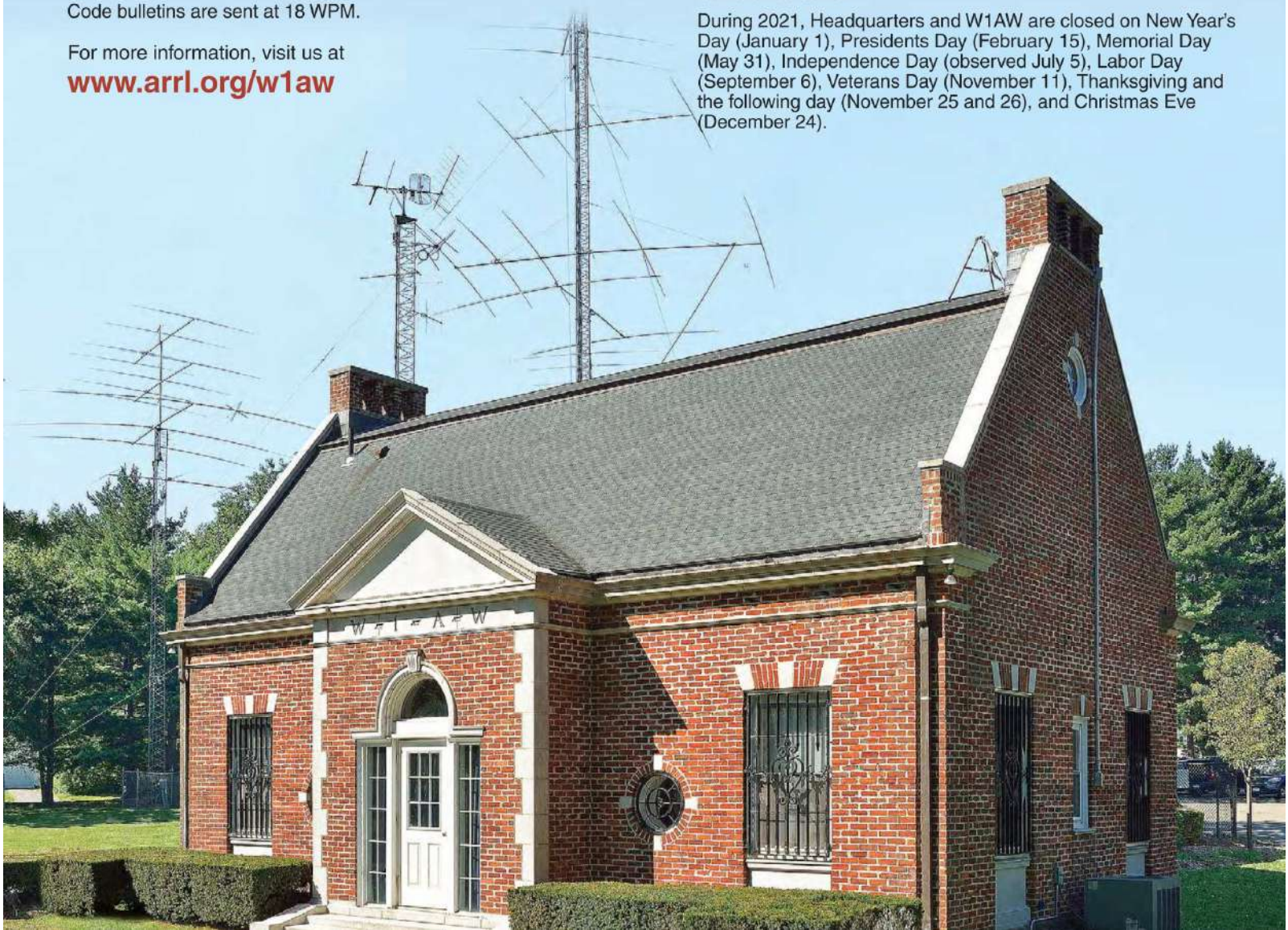
Keplerian elements for many amateur satellites will be sent on the regular digital frequencies on Tuesdays and Fridays at 6:30 PM Eastern time using Baudot and PSK31.

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

♦ Notes: On Fridays, UTC, a DX bulletin replaces the regular bulletins. W1AW is open to visitors 10 AM to 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 2021, Headquarters and W1AW are closed on New Year's Day (January 1), Presidents Day (February 15), Memorial Day (May 31), Independence Day (observed July 5), Labor Day (September 6), Veterans Day (November 11), Thanksgiving and the following day (November 25 and 26), and Christmas Eve (December 24).



A Look Back


QST
devoted entirely to
amateur radio
1914
50th Anniversary
1964
July 1964
50 cents
55c in Canada
Radio And Messages
Flash Quake
Contact with Earthquake Areas Kept by Hams
Radio Hams Help in Emergency
Radio Hams Send Word To Alaskans
Reassurances Come From Alaska; Radio Ham Stands By For Reports
Westchester Residents Get Word Of Relatives
Radio 'Blackout' Didn't Last Long After Quake
Ketchikan Ham Is Busy Man
Bureau Applauds Ham Performan
Radio Amateu
Ham' Relays Messages From Alaska
PUBLIC SERVICE!
Gives Alaska Short Wa
hers Send Messages to Alaska
Local Ham Operators Await Replies
Local Hams Keep Alaska Line Hot
Hams Helped Alaska During Quake Disaste
Hams Getting Alaska Calls
ms Set Up ake Network
Hams Provide Sta
Ham Operators Continue to Give Alaska Communications Service
Unpaid Public Servants
PUBLISHED BY THE AMERICAN RADIO RELAY LEAGUE

Here is what a corner of KL7DQL's shack looked like after the earthquake.

And yet, in this emergency which affected communications in the entire United States and Canada, the KL7s showed up in droves. True, some of them were ill-prepared, both in equipment and skill, to handle the tremendous volume of traffic which descended on them. Despite this and other drawbacks, the nation's presses and other news media, as well as officialdom, have been ringing with praises of the amateurs' performance during the aftermath of the earthquake.

This writeup is more concerned with what *was* done than with what *should* have been done. One could write a book on the latter, because hindsight is always better than foresight. Our analysis of reports received (48 from KL7s, hundreds from others) shows a grand total of 314 Alaskan amateurs participating in the emergency operation in one way or another. Considering the potential total, this is a whale of a lot of hams. (There are about 1200 licensed amateurs in Alaska.) Reports from the other 49 states show a total of over 1600 amateurs taking

The Alaska Story

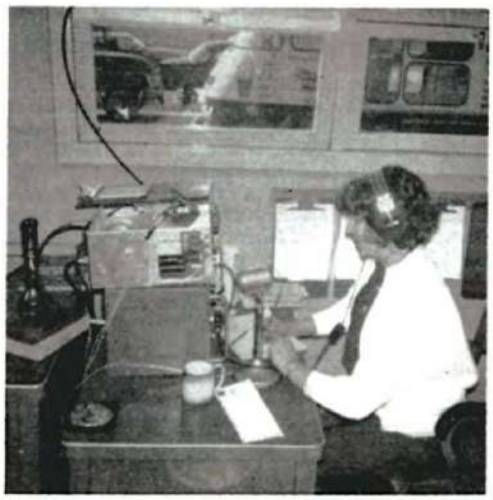
A Summary of Reports of Outstanding Amateur Performance in the Earthquake Emergency

BY GEORGE HART,* W1NJM

Alaska is a big place. It sprawls over four time zones — as many as the entire remaining continental U.S. — and in most of its area there are few if any roads, population is sparse or nonexistent and communication is limited. An earthquake of whatever severity in some parts of the state could have gone almost without notice. But the one that occurred on Good Friday, 1964, took place in one of Alaska's few population centers and struck its largest city, Anchorage. Had the same thing happened in the San Francisco or Los Angeles area (which it *could* have!), deaths would have mounted into the thousands; for this was the strongest earthquake ever recorded in the northern hemisphere.

Earthquakes are almost entirely unpredictable. That is, we know they are more apt to occur at one place than another, in a general way, but usually they come on completely without warning. When it happens, everybody is caught by surprise. In an organizational sense, Alaska was not "ready" for a communications emergency. Some good c.d. organization exists in Anchorage, but otherwise it couldn't have happened in a worse place.

* National Emergency Coordinator, ARRL.



This emergency station at the Anchorage International Airport was operated continuously for 144 hours following the 'quake. That's KL7BLL at the controls. Other operators were KL7s AUV CLY (who owns the 2-meter rig) and DQL.

part in the Alaskan traffic-handling in one way or another. Any way you look at it, it was a *big* operation. Personal inquiry traffic got so thick on the networks that it had to be piled up on the west coast, awaiting outlets, as the traffic flowed *from* Alaska in a steady stream. National Traffic System nets were unable even to begin to handle the load. No communications system could have done it. Western Union, the Bell System, the military and all others were hopelessly bogged down. Only when the outgoing traffic slowed down was it possible to take care of the personal inquiries, most of them by that time obviated. Red Cross estimates that something like 70,000 such messages were stacked up at one time, awaiting an outlet into Alaska.

Disaster Area Reports

Of the 48 reports received from Alaska, 28 came from stations in what can be considered the disaster area — from Anchorage southward over the Kenai Peninsula. Kodiak Island was also affected, but we have no direct reports from there. It is impossible, from the mass of reports received, to get up a concise, chronological story of the development of amateur emergency communication. We'll just have to take the reports as they come, Anchorage area first, then other Alaska reports, then reports of other U. S. stations who contacted Alaska, then all remaining reports. Some will have to be omitted entirely; some will be cut to the bone. Most critical comments will have to be omitted, so we can concentrate on the facts.

KL7ERL set up gear at St. Mary's Rest Home in Anchorage, where emergency power was available. First call on 14,100 kc. was answered by W7CSW. Traffic was handled with W7CSW, K7JHA and W6MVL, mostly with K7JHA, who "is a real traffic man" (he is manager of RN7, NTS). While handling this traffic into and out of Anchorage, about 2100 GMT Mar. 28, the traffic was interrupted by a second earth shock, but no damage.

KL7ESR operated for 72 hours after the 'quake, on 80- and 20-meter sideband. Traffic was handled with KH6USA and then with KL7FBA at Elmendorf Air Force Base, who relayed all traffic into a net which he had set up. KL7FBA was operated by W7BDJ. All traffic was press releases and priority messages to Governor Eagan in Juneau.

KL7EJM at Soldatna put in 27 hours on 75 and 2 meters, part of which was spent in preparing messages for transmission and copying incoming messages. Contact was made with *KL7s* EAN EOU WAF EKO APH EKS EPL EOA and CHL.

KL7AUV and *KL7BLL*, a husband-and-wife team in Anchorage, spent from 20 to 28 hours on 75 and 2 meters on emergency power on the state c.d. net handling traffic for c.d., State Dept. of Aviation, FAA, various air lines, police and fire departments, Salvation Army and the armed services.

"To our knowledge," says Jack (or maybe it was Margie), "the amateur . . . carried at least 80% of *all* communications the first two days."

KL7DVY reports he operated 20 hours on two meters, relaying messages from the Alaska Native Hospital to c.d. headquarters in Anchorage.

KL7EAN operated 75 hours on 75 and 2 meters in the Sourdough Net, handled about 300 messages, mostly originals to the "outside."

KL7CPO in Spenard used his 3-kw. emergency generator to good effect on 20 meter sideband, also spent some time at KL7USA, Fort Richardson, repairing their gear. KL7USA was operated 24 hours a day for a full week. Much traffic was handled with W5PAA in Oklahoma.

One of the best NTS liaison stations was *KL7PI*, whose report mentions only that he spent 36 hours on 40 and 20 meter c.w., handling traffic for civil defense. With whom? With *KL7s* ENC BR ESA, W5IGW, *W6s* ASH CIS, K7JHA, *W7s* DZX JHR DIS and VE7BDJ.

KL7COI runs an FAA radio station at Eklutna, not far from Anchorage, and was all set up with emergency power. He operated about 29 hours on 20-meter c.w., handling traffic with W7AMZ and K6RAU. VK3DQ and ZL3GA assisted in "establishing and clarifying" traffic when frequency got congested.

KL7ENC and *KL7BAP* in Homer, another married team, spent some 38 hours on 75-meter phone and 20-meter phone and c.w. Local telephone service was almost completely disrupted and there was no long distance service because of destruction of the toll center in Anchorage. According to Ed, KL7ENC, c.w. and s.s.b. did the biggest job in bridging the gap. He appends a long list of stations with whom traffic was handled — *too* long to include here.

KL7ARY, Spenard, says that the power failed with the first shock and he was off the air until a neighbor set up a generator for him. Meanwhile, he assisted at KL7CKQ and KL7ENT. All traffic from KL7ARY was outgoing to the "lower 48." All messages carried instructions to be delivered by collect telephone. Senders were asked to request recipients in the "lower 48" to notify others so that only one message per person was filed. Some 300 messages were handled in this manner.

KL7EOU, KL7EJM and KL7EAN set up equipment at a bowling alley in Soldatna, on the Kenai Peninsula south of Anchorage, because emergency power was available there. At first KL7EAN's rig was used, then KL7EJM's rig was installed using the call KL7EOU and KL7EAN got on from his home. VE6NH/KL7 was the principal operator from KL7EOU. Contact was maintained with KL7WAF on two meters. Fifty hours of concentrated operation in the Sourdough and other nets resulted in a good job being done from KL7EOU.

Operation continued around the clock at W6CXO, American Red Cross Western Area headquarters in San Francisco. Shown above during a tense moment are (at left, front to back) W6GHI, W6GGC, K6QKY; at right, WA6TXY (on telephone) and W6JWF.

July 1964

KL7EIP operated from Juneau, handling health and welfare traffic both into and out of the disaster zone.

A very interesting report from KL7BZO and XYL KL7CZU tells of some of the important kinds of traffic handled. One concerned a patient at Providence Hospital with gas gangrene, for whom a special piece of equipment was needed. W7AY, with whom contact was made, did the "leg" work and finally located the necessary gear at a hospital in Seattle, and arrangements (all by amateur radio) were made to fly the patient from Anchorage to Seattle.

Civil defense originated some messages going to the "lower 48" detailing some of the damage done and requesting supplies. Owners and operators of large industries originated messages with similar information and requests. Messages were received from officials of undamaged cities offering assistance, and Fairbanks sent 700 loaves of bread. The Salvation Army helped set up an amateur message center, where messages to the other states were filed, messages from the other states received and delivered by teen-age messengers. A good job by Ken and Edith Koestler, KL7BZO/CZU.

KL7FBA, at Elmendorf AFB, handled some 1500 messages of a military, civilian and personal nature, during the emergency. The commander of the unit responsible for the operation sent a letter of congratulations for the job done by the amateur service, to ARRL President Hoover.

KL7ALA in Spenard operated 48 hours from his home and 98 hours at c.d. headquarters, handling traffic for c.d. and the Salvation Army.

KL7EMP reports he wasn't able to do much, but that KL7EKB working as civil defense net control, did a great deal from his home in Spenard and also from c.d. headquarters in Anchorage, handling hundreds of health and welfare messages to the lower 48.

KL7MF, FCC Engineer in Charge for District #23, spent some time on 40 and 20 meters, phone and c.w., and says the cooperation from the rest of the states was wonderful.

KL7BR operated eight to ten hours on 40- and 20-meter c.w. and handled over 200 messages, most of them *incoming* health and welfare inquiries. Propagation conditions prohibited more extensive operations.

KL7ESW in Cape Yakataga tells us about KL7EPL in Valdez, who lost his home and a son in the disaster but was on the air less than five minutes afterward trying to contact Anchorage civil defense. "All our communications are out here," he told KL7ESW. "Buildings are falling in, water and sewer lines are broken and everything is coming apart." KL7EPL remained in town after it was evacuated, including his family, for over 70 hours, handling crucial communications without regard to his personal welfare or suffering.

KL7DRW, RACES officer for Anchorage, forwards a fine, detailed report of what went on from his vantage point, indicating that in Anchorage itself amateur (RACES) communication was far from disorganized. As soon as the ground had stopped heaving, he tells us, amateurs started gathering their equipment together and putting it into operating condition. Mobiles proceeded to points within and outside the city as directed by a mobile at c.d. headquarters on two meters, to such places as hospitals, Public Works, Defense Communications Agency, military installations, radio stations and other strategic points. Within ten minutes after the initial shock, some of these stations were activated.

But night was approaching, it started to snow, travel was already hazardous because of broken pavement, gas and water lines and fallen buildings. The entire city was without electricity and only one telephone in four was operative. A high-frequency station was activated at c.d. headquarters, operating on emergency power, and contact made with OCD in Everett, Wash., the nearest federal office. Meanwhile, other Anchorage stations started to get on the air and call in to ask for information and instructions. The commander at Elmendorf AFB maintained contact with c.d. by an amateur two-meter circuit.

The remainder of the night was pretty much a nightmare, the report goes on, as tidal wave warnings were being given to other cities, often in the blind. By daylight, amateur radio communication was becoming more and more dependable and was being more and more depended upon, and new operators started to come on to relieve those who had stayed at their jobs all night. The operation settled down, and the days that followed saw many vital messages passed, such as requests and orders for medical supplies, flight information for the Civil Air Patrol, and thousands of messages for individuals notifying loved ones elsewhere in Alaska and the other states of their situation. Amateurs served continuously for a week, then gradually as normal services were restored the nets began to secure and operators returned to their normal duties, subject to immediate recall should more severe tremors occur.

KL7DRW's report lists many amateurs in Anchorage and vicinity who assisted in the over-all operation.[1] He fears that many were inadvertently omitted, but perhaps other reports will pick them up.

KL7EKO in Kenai put in about 35 hours of actual operation on 20- and 80-meter phone, passing 65 messages out of the area to the other states. He was on the air an hour after the earthquake, meanwhile driving through town to assess the damage.

[1] Omitting all stations already mentioned above: *KL7s* ZF HMD/mm ELG EKS APH/mobile EKO EDK ETZ BZB ENV EKU ETD AN IS PJ ZR AIR AHH AKC AKW APV AQU BCH BDG BIM BJD BJW BTP BXK CAH CCL CDG CUK CHO CHV CMQ DDM DDQ DFE DGA CLY DLA DQL DQD DVE DVH DGO EOJ ECW EMG EMY ENQ ERY EVD EQO EQQ ERH ERU EDU TDZ CII, W6VKB/KL7, K7KIU/KL7, WA6MSO/KL7, K5GUG/KL7.

His telephone, one of the few working, averaged a call every six minutes the first three days.

KL7ZF was at his job in the railroad depot in Seward when the 'quake struck. He set up his amateur gear at the General Hospital, where emergency power was available. First contact was KL7PI in Fairbanks, who relayed a message to civil defense via KL7CAH in Anchorage. From that time on for three days, he and KL7CJD were on a 24-hour basis, operating in the Alaska Sourdough Net. When electric power was restored, they returned to the regular KL7ZF location and were soon back on again, although there was no water or heat. There was also no means of communication with the outside world except their amateur station, and they were kept mighty busy for six days. On the sixth day they got some relief assistance from KL7EBK/KL7 in Douglas, and finally succeeded in clearing the hook just a few hours short of a week from the disaster. KL7ZF has special words of commendation for KL7CAH in Anchorage and the following stations outside Alaska: K6HLO, W7CSW, W9JNX, W6GHG, W7DIS, "and many others."

KL7DQL in Spenard operated mostly in the 2-meter RACES net, but did spend some time from his mobile on 75 meters. Travel was very difficult, with wide cracks in the streets making them impassable in some places.

KL7DZE operated for seven days after the disaster on 20 and 75 meters, mostly the former, on a.m. phone, putting in about 30 hours all told. His principal activity was sending out messages for the Red Cross and Salvation Army. Messages were sent to him by auto, because no communications were available in Anchorage. His report, like so many others, says little about what he did, much about the other amateurs who were active.

An interesting report and batch of clippings from *KL7EKZ* tell us that power in Anchorage was restored within 24 hours, water and sewage within a week except for the heavily-damaged Turnagain and downtown area. A city policeman with a multitude of duties, he was not able to participate much as an amateur.

Other Alaska Reports

Although the earthquake was felt within about a 300-mile radius of the assumed epicenter in Prince William Sound south of Anchorage, in many places the tremors caused little or no damage. Many amateurs in Alaska not affected by the earthquake responded to our request for reports and information.

KL7DG, who lives in Anchorage, was on business in Juneau when the earthquake occurred. Naturally, he was concerned with what was going on, and listened at a receiver in his hotel, without being able to transmit. He tells an interesting story:

"It was less than an hour after quake time in Anchorage. KL7ENV of Juneau was directing emergency traffic on the Sourdough Net (3892 kc.), under control of KL7CAH. KL7EBK of Juneau was also handling emergency matters. KL7DRZ had established contact with W7UMU in Seattle and was also working W7UEM. The only station in Anchorage immediately at quake time was KL7ESR, who was caught in his automobile north of Anchorage. Heard from W7UIA that Public Health Services not needed in Anchorage at present time. A relayed message from W7UMX to KL7ENV in Juneau. A message from KL7APH of Kodiak relaying a message from town of Kodiak to the Navy Station 7 miles away via KL7ENV in Juneau, who sent it back to the Navy Station by teletype. KL7DB of Juneau offered assistance, as did KL7RU in Ketchikan and KL7CQF of Haines."

A report from the Communications Officer at Galena Air Force Station mentions that many of the "remote site" stations fanned out on each side of a net on 14,285 kc. handling outbound traffic and accepting incoming traffic. About 168 of these were airlifted to Elmendorf by jet fighters to be delivered in Anchorage.

KL7CVB was at an FAA installation in Northway, near the Canadian Border, when the quake occurred. Little damage was sustained there, but communication was disrupted. Unable to get information regarding the airstrip at Valdez over normal circuits, the ham rig was fired up and the required info was obtained from an emergency net NCSd by KL7ENV in Juneau.

KL7EQH at Yakutat handled a few messages for that town and gave some outgoing ones to the Southeast Alaska Net.

One of the more active stations in Juneau was *KL7ELM*. On the air at 2010 PST March 27, this station remained active almost continuously until April 1, acting as a relay station for traffic in and out of several points in Alaska, including Anchorage and other points in the disaster area. A total of 537 messages were handled while all other means of communication, except official military, were cut off.

KL7TEK reports from Fairbanks, which was not damaged by the earthquake, that he handled considerable personal welfare traffic into Anchorage from Fairbanks and other states. Much of this traffic was undeliverable; KL7CNX tried to deliver some of it in person in the stricken Turnagain area of Anchorage, but was prevented by police from going in.

KL7EFN is the station of a military radio club at Shemya Island, far out on the Aleutian chain, farther from Anchorage than many points in the other states. First alerted on Friday, Mar. 27, minutes after the earthquake, initial contact was established with K7DKD. The station originated more than a hundred messages from personnel at the 79th A.S.A. assuring relatives on the mainland that they were safe, and accepting messages from the "lower 49." These messages were put on the mail plane for Anchorage the next day. WA6BTK was the operator at KL7EFN.

KL7EEJ put in 53 hours handling health & welfare traffic with the assistance of his XYL (at left). This station is located at Galena, 400 miles north of Anchorage on the Yukon River.

Operating at *KL7DNE* on St. Paul Island, one of the Pribiloff group west of the Alaskan mainland, K9ASL spent eleven hours handling direct and written traffic for personnel at the Loran station there, although the Pribiloffs suffered no damage from the earthquake. Incoming messages for the mainland were accepted only when no delivery date was specified.

KL7DTR at Ketchikan operated long hours relaying messages to the disaster area but has no idea how many of them were delivered.

The report from *KLAZJ*, Fairbanks area, on behalf of her OM, KL7AEQ (he would never get around to it, she says) is almost worthy of a feature article alone. This is true of so many of the reports received! Although Fairbanks was not damaged and did not lose power, Flo tells us that the power in Anchorage went off after the first tremor because of an automatic device in the electric generators which cuts off all power in such a contingency. It's

hard to say who was first on the air thereafter, as stations started getting back on with emergency power. KL7ENV in Juneau assumed control and did an extremely capable job of handling early disaster reports, particularly tidal wave reports which were promptly handed over to the Coast Guard. In Fairbanks, C.D. Communications Officer KL7BET and KL7DIY assigned monitoring frequencies, particularly 3850, 3892 and 3866 kc., known Alaska net frequencies. KL7ENV was assisted by KL7DTH during the first 12 hours as disaster reports poured in. The first call for help from Anchorage came from KL7CQS/mobile, for medical aid and supplies. KL7CQO and K5GEG, both mobile in Anchorage, were on describing damage and destruction until their gasoline supplies ran low. KL7BFB on Fire Island relayed a few important messages into Anchorage on a landline still available. KL7EPL in Valdez was back on the air 30 minutes after the disaster, although he had just lost his 15-year-old son when the entire city waterfront disappeared in a huge submarine landslide. KL7ELS at Hinchenbrook Island served as liaison to Valdez that first night. KL7EKU in Cordova told of a collapsed radio tower, damage to the waterfront and roads; KL7EAN reported from the Kenai-Soldatna area. KL7APH/mobile gave an eye-witness account of the arrival of the huge seismic tidal wave that all but destroyed Kodiak. KL7AEQ (including KL7DCF and KL7AZJ as operators) was assigned as Fairbanks representative in the 75-meter c.d. net. This group stood by all night, passing any information received directly to c.d. headquarters on two meters, whence it was relayed to news media in Fairbanks, thence to the wire services for dissemination worldwide.

By morning, disaster reports from the major towns were in. KL7CAH, NCS of the Sourdough Net, was back on the air and, assisted by XYL KL7BJD worked superhuman hours for a solid week, relieved from time to time by *KL7s* BJW AN and ZR. Reports on the condition of roads, railroads, warehouses and dock facilities were gathered, data on the status of state and federal property were collected, backup communications for military operators were provided and messages from mayors, other city officials, the governor and even the Secretary of the Interior were relayed.

By Saturday night it became necessary to relieve KL7EPL in Valdez, the only active ham in the town. KL7EMH offered her mobile and, loaded with equipment and supplies, an expedition consisting of *KL7s*, EMH, DEJ and DIA made the 12-hour drive over damaged roads and bridges to Valdez. They remained for three days. KL7DIA not only stood regular watches but also repaired most of the radio equipment in town.

KL7ZF at Seward was on the air from time to time, as power obtained from city hospital would permit. This town had just about been wiped out.

The c.d. net carried no "health and welfare" messages in the early stages. Amateurs not otherwise occupied buckled down to taking care of thousands of outgoing messages, and as local telephone systems were restored incoming messages were accepted. Military stations KL7WAH and KL7FAF were active in this phase. *KL7s* AC DJI PE and DUW were participants in Fairbanks, but this is only a partial list. The 75-meter band remained open for the first 24-hours after the earthquake, which was a great and unexpected blessing. When the band deteriorated later, traffic between Fairbanks and Anchorage was relayed by KL7IS-DDB at Lake Minchumina and KL7ECO-ENO in Fairbanks. KL7DIS at Galena also assisted, being able to bounce two-meter signals off Mt. McKinley and contact both Fairbanks and Anchorage on two meters.

Two complete teletype stations were set up in Fairbanks, one at c.d. headquarters and another at the home of KL7ENZ. A crew of electronics technicians, consisting of *KL7s* EUN EVV ETR EVX and DNW, drove to Anchorage to set up a similar station there. One of the stations in Fairbanks used equipment borrowed from KL7CNC and the Engineering Dept. of the University of Alaska, operating 24 hours a day with the call KL7KC, taking some of the burden off KL7AEQ. This was set up and operated by *KL7s* CUS BIL AND and EUY. Many other amateurs served through the small hours on the demanding shifts at c.d. headquarters.

Reports from the "Lower 48"

Where to begin? Response to the ARRL Bulletin over the OBS system has been so overwhelming that it just isn't possible to summarize all reports received. We have gone through the stack and taken out certain reports which seem inconsequential, then gone through them again, and again. This section of the Alaska story is devoted to what was left after the third or fourth culling. We regret having had to leave *anybody* out. It was absolutely necessary.

Celebrating Our Legacy

Enjoying CW

I earned my license in 1965 at 13 years old, and was one of the youngest hams in my town. My first radio was a Heathkit DX-60 and Hallicrafters SX-110 receiver. Being so young, I didn't know antenna wire could have insulation on it, so my 40-meter dipole antenna was made out of the wire I painstakingly stripped from 500 Ω TV twinlead. The antenna was 8 feet above ground, and it worked! A few months later, I replaced it with solid wire, which was a thrill for us young neighborhood hams to use.

Howard Bernstein's, WB2UZE, 1967 radio shack.

I didn't know how to load the Pi network of the DX-60, so I quickly burned out the grid bias resistor of the 6146 tube. Being unable to solder, I was saved by my cousin, who owned a TV repair shop. He identified the resistor with its colored bands and replaced it. The SX-110 was a drifting receiver with no filters or selectivity, which made copying CW difficult. But equipment like that caused us Novices to copy CW by mentally tuning out the other stations, which helped us learn to head copy for our General-class licenses. I still prefer listening to a receiver wide open rather than hearing the "tunnel sound" of a 500 Hz filter.

I eventually earned my General-class license and gained variable frequency oscillator (VFO) privileges, so I bought a Globe VFO. I received a warning from the FCC for being outside of the 20-meter band copying CW with my poorly calibrated SX-110. After that, my father, who was a World War II B-17 radio operator, bought me the Drake 4-Line twins. Having that equipment revolutionized my ham radio experience. I still have my DX-60, Globe VFO, and Drake 4-Line twins, all restored by Joseph Yamond, N2OUV.

I stayed active in radio through college, where I started a radio club and station at the State University of New York in Albany. After college, I continued to stay active as I navigated married life and five kids. My career dealt with the import and export of industrial chemicals for communication using Telex, fax, and eventually email.

In 2018, I co-founded the Long Island CW Club, where we now teach 47 Zoom CW classes per week to adults and kids, with the goal to help keep CW an active part of amateur radio. It's been a great ride, with more to come!

Howard Bernstein, WB2UZE
Manhasset, New York

ARC Radio Jackpot

I earned my ham radio license in 1957, at 12 years old. My first receiver was a military surplus 6-9.1 megacycle receiver from the ARC-5 Command Radio Set. I also purchased a new receiver from "Radio Row" in Philadelphia, for $13.

In 1976, I began working at ARC (Aircraft Radio Corporation), located in Boonton, New Jersey, at the time. While working late one night, another engineer (and fellow ham) showed me numerous shelves in the attic that were filled with World War II avionics, including most, if not all, of the ARC-5 system units. He explained that during the war, ARC kept the first item from every production run as a reference and that every unit in the attic was serial number one.

Then we went to the basement, which was full of shelves with the tools to make ARC-5 radios. I'd already seen the original linen drawings from World War II in our drafting department, but now I realized we could start making World War II ARC-5 radios nearly 40 years after the war ended.

In 2012, Albert D. Helfrick, K2BLA, visited the original ARC 1929 laboratory in Boonton, New Jersey, where he worked in 1976.

The attic and basement were cleaned out when ARC was sold in 1984. The tools were sold for scrap, but thankfully the new radios went to the Smithsonian National Air and Space Museum.

Albert D. Helfrick, K2BLA
Deland, Florida
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.

George J. Misic, KE8RN, ke8rn@comcast.net

Classic Radio

From Vacuum Tubes to Solid State

Between 1950 and the late 1980s, amateur radio equipment went through a major transition from vacuum tubes to solid state in receivers, transmitters, transceivers, and some linear amplifiers.

Transistor Radio

Building solid-state devices started in 1947 to replace mechanical methods, which took thousands of relays, and electrical methods, which used vacuum tubes. In 1948, Bell received a patent after three Bell Telephone Laboratories engineers invented the first transistor while trying to discover new devices to route telephone calls more efficiently, using less space and consuming less power.

It took nearly 7 years after the invention of the transistor to begin manufacturing component parts under the Bell patent. In 1954, the Industrial Development Engineering Associates (IDEA) company released the first commercial transistor radio, the Regency TR-1. It sold for $49.95 and used a 22.5 V battery. Regency sold about 150,000 of these radios.

In 1955, Sony bought a license to manufacturer transistors from Bell Laboratories. Sony released the model TR-55, which used a 22.5 V battery. In 1957, Sony made the TR-63, which used a 9 V battery. Neither of the Sony transistor radios were sold in the US.

Start of Solid State

In 1956, IDEA's Regency division developed a converter for use with an AM broadcast radio — usually an automobile radio — known as the model ATC-1. Most hams operating on voice communication on AM could be heard on a normal car radio. In the late 1960s, Regency moved to 2-meter FM with the HR-2 mobile transmitter-receiver. Regency went on to develop Citizens Band (CB) radios, building mostly vacuum-tube sets.

The SBE SB-33

In 1962, SideBand Engineers (SBE) manufactured the largely solid-state SSB transceiver, the model SB-33. It had a built-in ac power supply and speaker. The SB-33 used three vacuum tubes in the transmitter; many of the early solid-state radios used vacuum tubes in the high-power transmitter stages, because transistors that could produce a hundred or more watts of RF were not available in 1962. The SB-33 was sold for $389.50, compared to the $1,150 five-band Collins KWM-2 and the $275 single-band Swan transceiver, both of which sold without a power supply or speaker.

Davco Solid-State Receiver

In 1964, Davco released the DR-30, a small, high-performance transistorized receiver (see Figure 1). The receiver used mostly germanium transistors and two field-effect transistors (FETs), which were new at the time. The receiver used a Collins mechanical filter for SSB selectivity and a single crystal for CW selectivity. The first conversion was crystal controlled, and the VFO tuned a fixed range on all bands. The receiver was double conversion with a tunable first intermediate frequency (IF) on all bands and a second IF of 455 KHz. The receiver's dimensions were 7.125 × 4 × 6 inches, and it weighed 7 pounds, and it would operate from flashlight batteries. Sadly, the matching transmitter never made it to production, and the company that made the Davco DR-30 is now totally gone.

Transcom SBT-3 Transceiver

Transcom Electronics produced one new product before disappearing from

Figure 1 — The Davco DR-30 Receiver. [George Misic, KE8RN, photo]

Figure 2 — The Transcom SBT-3. [Rodger Singley, WQ9E, photo]

the market. It was the SBT-3, a three-band SSB-CW transceiver, and was all solid state, except for a pair of instant heat 6146 tubes, the unusual 8042 (see Figure 2). The Transcom was significantly smaller than the SBE SB-33, but the power supply was a separate unit.

SBE SB-34, SB-35, and SB-36

SBE developed the next generation of the SBE radio with new features. The SB-34 added a built-in 12 V dc power supply and a clever two-speed dial drive on the VFO. Between 1964 and 1966, the SB-34 was released with three vacuum tubes, a pair of 6GB5s in the final amplifier, and a 12DQ7 in the driver function. The SB-35 and SB-36 (see Figure 3) were mostly solid state, but had vacuum-tube final amplifiers. Both were five-band transceivers covering 80/75, 40, 20, 15, and 10 meters, but they didn't sell well.

The Signal One CX-7

In 1969, Richard Ehrhorn and Don Fowler of Signal One Corporation released a solid-state deluxe transceiver that included a built-in ac power supply, speaker, two VFOs for split-frequency operation, a built-in keyer, a speech compressor, and passband tuning. It used a conduction-cooled 8072 tube from the RCA Transmitting Tube division. The rig had all solid-state circuitry, using conventional transistors, dual-gate MOSFETs, and analog and digital integrated circuits.

Heathkit

Heathkit became a big player in 1963, when they released the first fully solid-state receiver with the GC-1 Mohican, using 10 germanium transistors with a single-conversion design covering 550 KHz to 32.0 MHz. The unit would operate from eight C-size flashlight cells. The Mohican was popular until 1968 and was a good-performing shortwave receiver.

Figure 3 — The SBE SB-36. [Rodger Singley, WQ9E, photo]

In 1970, Heathkit produced a solid-state linear master oscillator — the Heathkit VFO unit — with the SB-102 transceiver and the solid-state SB-303 receiver. Heathkit then developed the SB-104, which featured a digital frequency readout, broadband circuitry, and solid-state final amplifiers. The SB-104 had a lot of problems due to the cutting-edge quality of its features, but it was released for sale in December 1974. In 1977, they tried to correct all of the problems with the release of the SB-104A.

Japanese Radios

The first Japanese radios appeared in the late 1960s. Yaesu started with all vacuum-tube transceivers, and other gear emerged in 1967, like the Yaesu FTDX-400, which was all vacuum tubes, except for a smattering of solid state. In 1970, Yaesu made a big move toward solid-state radios with the FT-101, which was all solid state, except for the transmitter driver and final amplifier stages, which were made with a 12BY7 and two 6JS6A tubes.

Kenwood equipment (except for linear amplifiers) all had considerable solid-state content. The R-599 receiver from 1970 was all solid state; the T-599 transmitter had a 12BY7 driver tube and a pair of 6146 (or Japanese S2001A) tubes in the final amplifier. The TS-511 and TS-520 had some tubes (10 in the TS-511 and three in the TS-520) with all the rest solid state. By the end of the 1970s, Kenwood, Yaesu, and Icom were marketing totally solid-state transceivers.

Collins and National

National released the historic and technologically exciting HRO-500 in 1964; it was all solid state. The later NCX-1000 80/75 – 10 meter SSB/CW transceiver from 1969 had a built-in power supply and speaker and was all solid state, except for the driver and high-power final, which used an RCA 8122 vacuum tube.

Collins made their last amateur radio transceiver, the model KWM-380, which was totally solid state with an internal ac power supply and speaker. It delivered 100 W output and covered all ham bands from 160 to 10 meters and the receiver was general coverage from 5 KHz to 30 MHz.

Both the National and Collins radios were great products. Most amateur radio hobbyists are sorry to see them gone from the ham radio market.

Feedback

The article, "High-Efficiency 2 kW Water-Cooled Dummy Load," by Guenther Knebel, DK6ET, published in the May 2021 issue of *QST*, contained an error in the Figure 6 drawing, which showed water flow during the cooling process. As drawn, Radiator #2 had two inputs and no outputs. The arrow's head needed to be moved from the output of Radiator #2 to the input of the dummy load. *QST* regrets the error.

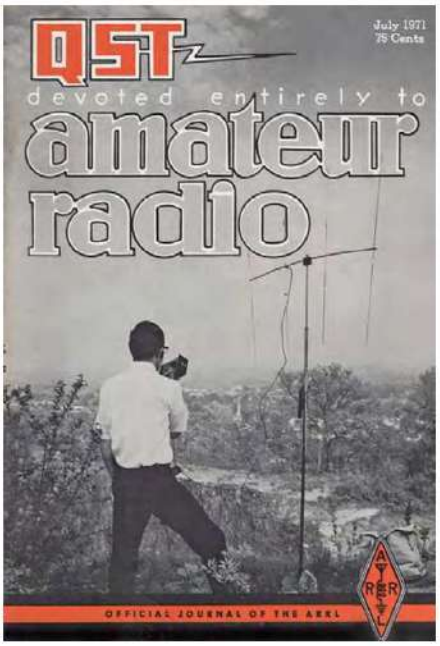
100, 50, and 25 Years Ago

July 1921

- The cover art shows two young men rowing down a river in a rowboat filled with ham gear.
- The editorial discusses "What We Want in Radio Law."
- R. A. Heising provides Part I of "Modulation in Radio Telephony."
- R. C. Denny, 6CS, discusses "The Ideal Relay Spark Station."
- The "First National A.R.R.L. Convention" was held in Chicago from August 30 to September 3, and was expected to be "the biggest combined radio show and general good time ever staged."
- E. W. Whittier, 1DH, presents "A Sure-Fire C.W. Circuit."
- The "Amateur Radio Stations" column offers a description and photos of 1XM, the ham station of the Massachusetts Institute of Technology Radio Society.

July 1971

- The cover photo shows W1FXJ making contacts with a portable 2-meter beam and a handheld transceiver.
- The editorial discusses the most recent meeting of the ARRL Board of Directors.
- Doug DeMaw, W1CER, explains "The 2-Meter FM 'Pip-Squawk,'" a small handheld transceiver.
- Jerry Sevick, W2FMI, discusses "The Ground-Image Vertical Antenna."
- Frank N. Van Zant, W2EGH, describes his useful receiving accessory, "A Solid-State Noise Blanker."
- Laird E. Campbell, W1CUT, shares how to build the "Two-Toter," a collapsible, lightweight portable beam for 2 meters.
- "A Tunable 440-MHz FM Receiver," by John Bertini, K1ZJH, explains effective UHF monitoring at low cost.
- Douglas A. Blakeslee, W1KLK, provides "A Second Look at Linear Integrated Circuits" that's very informative.



July 1996

- The cover photo shows SK3HQ getting ready for the ARRL IARU HF World Championship.
- The editorial, "Write Now!," urges readers to write to the FCC regarding the 2-meter and 70-centimeter bands, and the 1997 ITU World Radiocommunication Conference (WRC-97).
- "Up Front in *QST*" offers a description and photos of the 2-meter legal-limit amplifier designed and built by KN5S.
- Darrel Emerson, AA7FV/G3SYS, presents Part 2 of "The Radio Sky."
- In "An Improved Multiband Trap Dipole Antenna," Al Buxton, W8NX, discusses traps with lower loss, higher Q factor, increased power-handling capability, and four-band coverage.
- Tim Riley; Dennis Bodson, W4PWF; Stephen Rieman, and Teresa G. Sparkman offer comprehensive information in "A Comparison of HF Digital Protocols."
- "CQ from WW2END," by Robert J. Tomas, N7KTP, reports on the joint effort of a group of ham clubs in the Puget Sound area in Washington. They operated a special event station to commemorate the 50th anniversary of the end of World War II.
- Peter Casier, ON6TT, shares what it's like "Living, Working and Hamming in Africa."
- Tom Thomas, WA6WPG, was "A MARS Operator at Fort MacArthur" in San Pedro, California, whose duties included making phone patches for US troops in Vietnam.

Silent Keys

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

W1BGL **Gatzios**, Nicholas E., Shrewsbury, MA
W1CD **Browne**, Robert E., Bedford, MA
•N1FHR **Pineault**, William, Norwich, CT
W1KKF **Wawrzeniak**, William W., Wallingford, CT
KC1LKM **Dropps**, Kevin Jon, Appleton, ME
♦K1MET **Johnson**, Lance Q., East Hampton, CT
AJ1N **Accardi**, Philip, Simsbury, CT
WA1NBL **Bento**, John B., New Bedford, MA
N1RED **MacWilliam**, Scott A., Bloomfield, CT
W1RZO **Flood**, Robert E., Pittsfield, MA
W1TEQ **Finley**, Irving G. "Fin," Rye, CO
W1TNT **Anderson**, Ross, Buxton, ME
W1UL **LeJeune**, Urb A., Little Egg Harbor Township, NJ
W1VIK **Blumsack**, Harvey L., Peabody, MA
W1YMH **Richardson**, Victor C., Jamestown, RI
N2AAK **Ortloff**, Gary L., Kingston, NY
WA2BBW **Howland**, Eugene J., Livingston, NJ
KA2DVM **Wemple**, Raymond W., Schenectady, NY
KA2EDX **Poulsen**, Gloria B., Basking Ridge, NJ
KD2GGV **Nicolette**, Enos, Mohawk, NY
W2GYH **Galinus**, Anthony J., Haddonfield, NJ
K2JVL **Testa**, Joseph, Venice, FL
K2KRF **Chooljian**, John, Hackensack, NJ
KC2OUU **Fraser**, Tom K., Tuckerton, NJ
KC2OWO **Taylor**, Charles E. "Chuck," Brigantine, NJ
WA2OZO **Leifer**, Gloria, Ontario, CA
•WA2PXT **Gruenfelder**, Norman, Westbury, NY
♦N2RA **Yadzinski**, Edward, Snyder, NY
W2VMX **Wood**, Charles L., Southern Pines, NC
N2WUD **Klapp**, Rosemary "Joy," Schenectady, NY
♦WA2WVL **Koontz**, Floyd A., Rochester, NY
N3AQB **Fager**, Charles B., Camp Hill, PA
♦♦•W3BAG **Murray**, John A., West Union, SC
•WB3ESA **Buchanan**, Harry M., Jr., East Petersburg, PA
AA3FO **Aronson**, Arthur H., Renfrew, PA
W3HO **Hughes**, Douglas J., Knoxville, TN
KB3JRW **Robison**, James R., Cumberland, MD
•W3MKV **Miller**, Wilbur J., Lancaster, PA
AK3O **Brassell**, John A. "Jay," Wexford, PA
W3QBZ **Gontarz**, Adda M., Mansfield, PA
•AA3R **Ruth**, Richard L., State College, PA
W3SSF **Zarriello**, Paul R., Catonsville, MD
KB3XY **Benson**, R. Jon, Panama City, FL
WA3ZZK **Mikloski**, Colleen C., Nanticoke, PA
N4AXC **Paris**, Jean P., Bristol, TN
K4AYZ **Robinson**, James H., Shallotte, NC
♦KI4B **Feldkamp**, William, Bowling Green, KY
NY4C **Weir**, Arthur J., The Villages, FL
♦•WB4DDU **Clark**, Joseph L., Sr., Jonesboro, GA
K4EAA **Kemski**, Kenneth C., Sarasota, FL
N4EAI **Eaves**, William A., Rossville, GA
KO4ES **Scott**, Bobby, Alexander City, AL
WA4ETE **Wofford**, Johnny E., Sr., Olive Branch, MS
KF4FMX **Langley**, H. Allen, Pittsboro, NC
•KE4GWH **Chapman**, Richard O., Summerland Key, FL
WA4HIA **Magee**, Larry, Eutaw, AL
KE4HIH **George**, Rhett, Wilmington, NC
KO4HNK **Senn**, Carroll W., West Columbia, SC
K4JJS **Safranek**, Joseph J., Gloucester, VA
KD4KUD **McNear**, James D., Campbellsville, KY
K4KWX **Worsham**, Landon R., Chatham, VA
W4LGF **Fehrenbaker**, Lawrence G., Naples, FL
K4ND **Walker**, Joel A., Bunn, NC
K4NOQ **Robinson**, Alvin K., Gastonia, NC
KK4OA **Phelps**, Gregory K., North Chesterfield, VA
WD4OGU **Koonts**, Randy T., Lexington, NC
K4OVG **Morgan**, Jay H., Greeneville, TN
AA4PL **Sallee**, Buell L., Greenville, KY
•KC4PWT **Bradeen**, Kenneth J., Melbourne Beach, FL
•KJ4QJE **Cherry**, Alvin W., Decatur, GA
WB4QXG **Overstreet**, Frederick G., Pfafftown, NC
KW4RJB **Brown**, Ricky J., Deatsville, AL
K4SRX **Rinker**, Gary E., Sterling, VA
K4STC **Berry**, Carl, Gainesville, GA
•WA4STK **Brown**, Loren W., Martinsville, VA
WB4SUD **Minor**, Clyde S., Wilmington, NC
W4TIF **Makrauer**, George A., The Villages, FL
K4UPX **Gentry**, A. J., Jr., Lenoir City, TN
•KE4VDV **Ragland**, Timothy P., Dahlonega, GA
N4VPM **Atchley**, Howard E., Grand Junction, CO
KO4VQ **Turley**, Hubert, Culpepper, VA
K4WHT **Nelson**, Justin D., Gadsden, AL
AB4XK **Carruth**, Chet, Eagle Lake, FL
W4YH **Plexico**, Joseph Lee, Jr., Sylacauga, AL
♦W4ZE **Huf**, Theodore A., Port Saint Lucie, FL
KD5AIX **Esau**, Beverly J., Cabot, AR
WA5CAM **Owens**, Stan E., Natchez, MS
AF5DK **Swearingin**, Phillip E., Fort Smith, AR
KE5DQM **Warren**, Robin R., Ivanhoe, TX
•WD5EXT **McFarland**, Billie F., Waco, TX
K5FRG **Mason**, Tommie L., San Augustine, TX
♦W5HNK **Muscanere**, Joe S., Pearland, TX
•KD5MCE **Harris**, Richard W., Guthrie, OK
♦WA5NTI **McCarty**, Terry G., Jr., Manassas, NY
N5NY **Adler**, Robert D., Euless, TX
KC5PEQ **Jackson**, Michael D., Granbury, TX
KE5RSY **Jones**, Maryann, Independence, LA
N5SGO **Pascoe**, Lee A., Catoosa, OK
W5WEE **Fancher**, J. K., Jr., Harrison, AR
♦AA5YV **Hunt**, Lawrence H., Woodward, OK
KC5ZT **Neely**, C. L., Kerrville, TX
K6AID **Lindgren**, Theodore P., Ventura, CA
WA6AMI **Mathison**, Donald C., Chico, CA
♦W6ASO **Smith**, Charles L. "Chuck," Grants Pass, OR
WA6AVR **Tannhauser**, Jerry H., Columbia, CA
KD6CCM **Tompkins**, Richard D., Tucson, AZ
•KJ6CNX **Maddox**, Hannelore, Paradise, CA
•WD6FXV **Collins**, Oliver D., Portland, OR
WA6HLE **Schumacher**, Leonard J., Belmont, CA
N6HZH **Huff**, Raymond J., Los Angeles, CA
WA6ILA **Wallin**, Walter C., Stockton, CA
WA6IWU **Dunsford**, Owen L., Pacific Grove, CA
K6JAD **Henderson**, Wilbur "Jim," Jr., Riverside, CA
W6LUY **Raynor**, Robert F., Harlingen, TX
AC6M **Russell**, Richard D., Port Orange, FL
KE6NWZ **Sahutske**, Maria T., Sun Valley, CA
N6OCX **Stockton**, Peter D., Merlin, OR
♦•W6RLE **Covey**, Paul A., Stockton, CA
WB6ZEQ **Smith**, Herman C., Lakeland, FL
W6ZJ **Rink**, Paul A., Cloverdale, CA
WB7EER **Kinzer**, Douglas B., Richland, WA
K7EOG **Skinnell**, James F., Phoenix, AZ
WA7IRW **Roush**, Gregory C., Reno, NV
W7LBN **Morton**, Donald E., Tempe, AZ
♦W7MEU **Swafford**, John L., II, Snohomish, WA
KC7OMZ **Davidson**, Walter L., Scottsdale, AZ
N7OWN **Putala**, Donald M., Las Vegas, NV
KK7UFO **Purrington**, David L., West Jordan, UT
W7WDD **Mangum**, Bob, Jr., Nampa, ID
KE7YIB **Vess**, Gary L., Spokane Valley, WA
N8BBI **Grosser**, Joseph E., Lake Havasu City, AZ
W8BUD **Coulter**, Bud L., South Haven, MI
♦W8CRK **Higley**, Roger M., Cincinnati, OH
KC8CZY **Brogan**, James W., Wadsworth, OH
KD8GI **Beaver**, Thomas R., Gallipolis, OH
N8GM **Miller**, Godfrey, Reston, VA
KD8GRO **Burgess**, Daniel R., Jr., Mansfield, OH
AB8K **Hardin**, Keith D., Kettering, OH
WB8LDW **Stahl**, Thomas E., Piqua, OH
W8MLL **Lovell**, Marvin L., Marion, OH
♦WD8OIZ **Cordray**, Edward J., Jr., Reno, NV
W8RGA **Breece**, Burton W., Davison, MI
KB8SCO **Rejniak**, Lawrence T., Grand Blanc, MI
♦W8TVT **Novak**, Joseph W., Traverse City, MI
•N8UGE **Patrick**, William R., Fairborn, OH
K8VIR **Hartz**, Edwin H., Holly, MI
KC8VTI **Jenkins**, Bob G., Ashland, OH
KB8WEE **Engel**, Judy A., Alger, MI
KD8ZUZ **Robinson**, Dave B., Brookings, SD
W8ZXP **Oros**, John, Port Charlotte, FL
KA9AQZ **Toby**, Robert A., Merrillville, IN
•WA9ARY **Brown**, Charles R., Springfield, IL
WD9ATI **Habdas**, James W., Westmont, IL
WA9BQX **Casey**, Rodger L., Ashburn, VA
W9GRE **Lee**, John J., Indianapolis, IN
KE9HZ **Seward**, Bryan C., Terre Haute, IN
♦KC9KAE **Mapes**, Rex L., Wingate, IN
♦WB9LQX **Isom**, James H., Bloomington, IL
KB9LRX **Schriefer**, Victor V. "Skip," Jr., Newburgh, IN
KB9OGK **Allen**, Donald W., Venedy, IL
KD9QAA **Moss**, Harvey A., Oshkosh, WI
N9QLP **Sens**, Allen F., Oshkosh, WI
♦NF9T **Miller**, Tuck, Danville, IL
N9TH **Wood**, Richard T., Terre Haute, IN
K9UZZ **James**, Herbert L., Ridgeville, IN
K9XA **Gray**, Larry, Wagram, NC
WØAJL **Lyman**, James O., Brighton, CO
WØBBM **Pick**, Edwin A., Concordia, KS
WVØBEN **Janssen**, Ben J., Lucerne, CO
KBØBTB **Kemp**, Timothy L., Vinton, IA
WAØBTM **Adams**, Gary E., Kansas City, KS
NØCYH **Foster**, David L., Marion, IA
WØDOX **Drake**, Donald E., Tipp City, OH
•WUØE **Chastain**, Joe E., Afton, IA
WAØEHJ **Miller**, Bobby L., Wichita, KS
•WØENB **Santoski**, Norbert F., Eagan, MN
ABØEX **Ferguson**, Doug H., Pennock, MN
WSØG **Valus**, John P., Bettendorf, IA
WDØGVW **Dall**, James R., Iron, MN
KAØGZW **Little**, La Verne E., Corinth, MS
WØLDO **Kordik**, William J., Saint Louis, MO
WØLY **Martin**, James R., Crestview, FL
KEØMM **McCall**, Monte L., Grand Junction, CO
•WAØRGA **Lloyd**, William E., Colorado Springs, CO
KBØU **Meert**, James H., Jr., Sioux Falls, SD
•KCØWNB **Burnett**, Louise M., Nora Springs, IA
VE2FPD **Regimbald**, Robert E., Gatineau, QC, Canada
VA3AL **Leslie**, John, Welland, ON, Canada
VE3DGX **Hrischenko**, George, Zephyr, ON, Canada
VA3DXN **Robson**, Ronald, St. Catharines, ON, Canada
VE3GDZ **McCoy**, Bruce K., London, ON, Canada
VE3JAN **Chinnery**, Kyle W., Windsor, ON, Canada
VE3MHP **Purcell**, Alice G., Smith Falls, ON, Canada
VA3OL **Rumball**, William G., Coldwater, ON, Canada
VE3SEP **Globe**, Ronald W., Burlington, ON, Canada
VE3YYP **Niles**, Harold R., Hamilton, ON, Canada
VE7XON **Hurley**, John L., Victoria, BC, Canada
VK2JJ **Thurstun**, John R., Valley Heights, NSW, Australia

The December 2019 *QST* "Silent Keys" column lists Rainer Langstedt, W2EL. Rainer is not a Silent Key. *QST* regrets the error.

♦ 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**.

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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-3DR *C4FM/FM 144/430 MHz Xcvr*

• 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 • Simultaneous C4FM/C4FM Standby • 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

FT-60R | *2M/440 5W HT*

• Wide receiver coverage • AM air band receive • 1000 memory channels w/alpha labels • Huge LCD display • Rugged die-cast, water resistant case • NOAA severe weather alert with alert scan

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IC-9700 | *All Mode Tri-Band Transceiver*

• VHF/UHF/1.2GHz • Direct Sampling Now Enters the VHF/UHF Arena • 4.3" Touch Screen Color TFT LCD • Real-Time, High-Speed Spectrum Scope & Waterfall Display • Smooth Satellite Operation

IC-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

Prerelease. This device has not been approved by the F.C.C.

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**Except 60M Band. ***Frequency coverage may vary. Refer to owner's manual for exact specs. *1 Optional UX-9100 required. 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.

LDG

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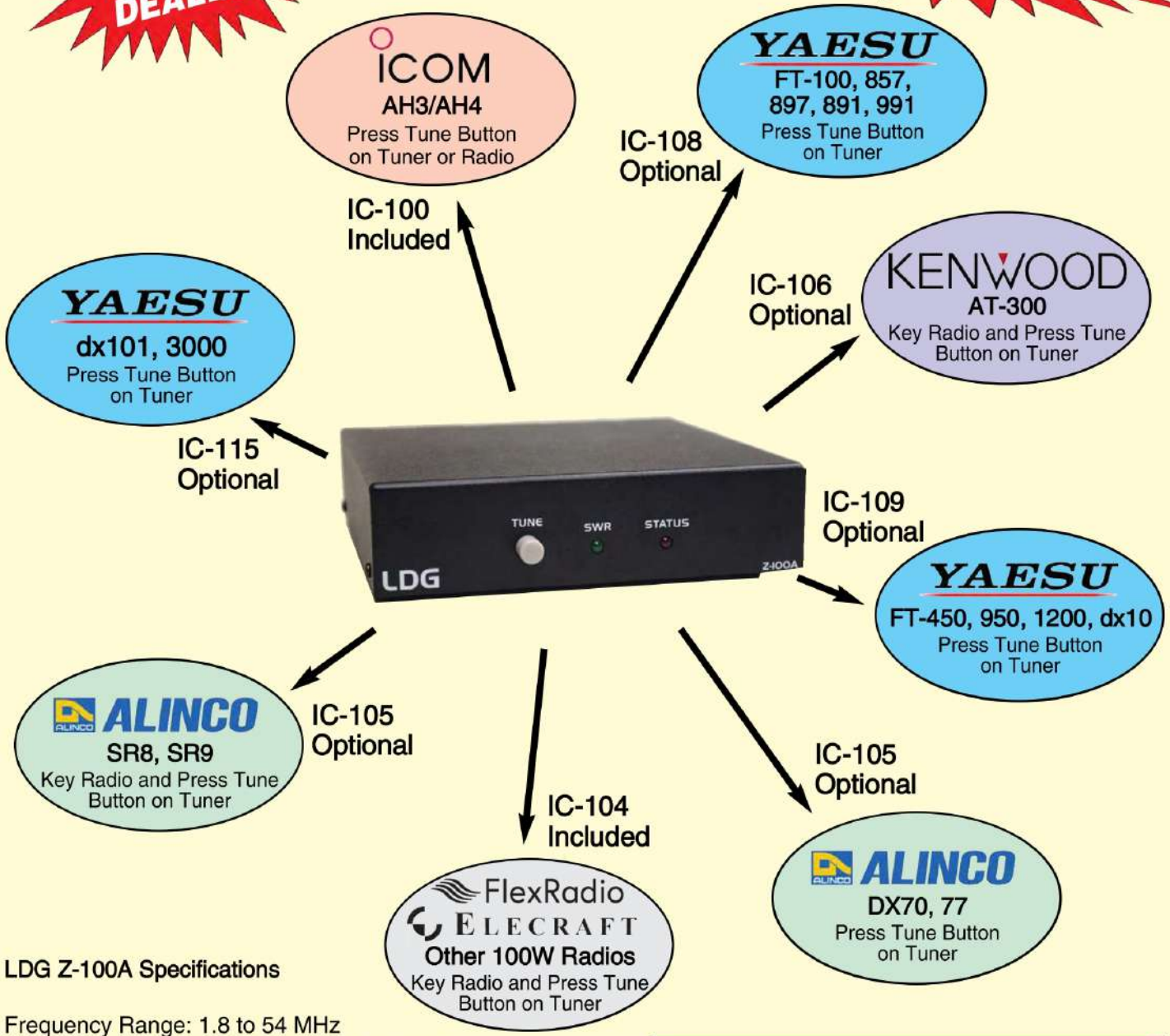

LDG Z-100A Specifications

Frequency Range: 1.8 to 54 MHz
Power: 125W SSB, 50W FT-8, 30W AM/FM
Input Impedance: 50 ohms
Tuning Range: 10:1 SWR, 3:1 on 6M
Memories: 2000
Retune Time: Less than 1.0 second
Voltage: 13.8 VDC +/-15%
Current Draw: 500 mA tuning, 20 mA idle
Size: 6.3"x6.3"x1.5", 160x160x40mm
Weight: 1.5 pounds, 680 grams

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HAM-IV – $709.95

The Most Popular Rotator in the World!

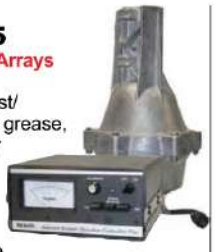
For medium communications arrays up to 15 square feet wind load area. Has 5-second brake delay, Test/Calibrate function. Low temperature grease permits normal operation down to -30 degrees F. Alloy ring gear gives extra strength up to 100,000 PSI for maximum reliability. *Precision* indicator potentiometer. Ferrite beads reduce RF susceptibility. Cinch plug plus 8-pin plug at control box. Dual 98 ball bearing race for load bearing strength and electric locking steel wedge brake prevents wind induced movement. North/South center of rotation scale on meter, low voltage control, max mast $2^{1}/_{16}$".

HAM-VI – $809.95 with DCU-2
HAM-VII – $959.95 with DCU-3

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 SERIES II – $869.95

For Large Medium Antenna Arrays up to 20 sq. ft. wind load.



Has 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 box, triple bearing race with 138 ball bearings for large load bearing, electric locking steel wedge brake, North/South center of rotation scale meter, low voltage control, $2^{1}/_{16}$" max mast. **MSHD, $139.95**. Above tower heavy duty mast support. T2X, HAM-IV, HAM-V, HAM-VI. Accepts $1^{7}/_{8}$-$2^{5}/_{8}$" OD.

T-2XD2 – $979.95 with DCU-2
T-2XD3 – $1039.95 with DCU-3

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 bearings**
Mounting Hardware	Clamp plate/steel U-bolts
Control Cable Conductors	**8**
Shipping Weight	31 lbs.
Effective Moment (in tower)	**3400 ft.-lbs**

CD-45II – $499.95

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-45D2 – $599.95 with DCU-2
CD-45D3 – $659.95 with DCU-3

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 bearings**
Mounting Hardware	Clamp plate/steel U-bolts
Control Cable Conductors	**8**
Shipping Weight	22 lbs.
Effective Moment (in tower)	**1200 ft.-lbs**

New!

Hy-Gain Programmable DCU-3 Digital Rotator Controller

DCU-3 – $499.95

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 – $459.95
Like DCU-3, but less programmable memories. 110 VAC. Order **DCU-2X**, for 220 VAC.

AR-40 – $399.95

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 any desired location. Solid state, low voltage control, safe and silent operation. $2^{1}/_{16}$ inch maximum mast size. MSLD light duty lower mast support 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 U-bolts
Control Cable Conductors	**5**
Shipping Weight	14 lbs.
Effective Moment (in tower)	**300 ft.-lbs**

Replace your Yaesu Rotator Controller

YRC-1 – $369.95

Hy-gain 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 minimizes overshoot. Intuitive menu. Field upgradeable. For Yaesu G-800/1000/2800/G450/650. AC or DC motors.

YRC-3, $449.95. Like YRC-1 and adds 6 memories.

AR-500 Rotator/Controller – $169.95

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 light-weight ham antennas. Rotator is built in a weather-proof one piece cast aluminum housing with precision all 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.

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3 Tripod Frame Sizes
- TB-1500, TB-2000, TB-2500
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  - TB-2000 load rated to 250#
  - TB-2500 load rated to 300#

Can be fitted and ordered for
- 1½" od, 1¾" od, or 2" od mast

Only tripod with flat feet, great for staking down
Heavy duty construction with 6061-T6 aircraft aluminum and stainless steel nuts and bolts

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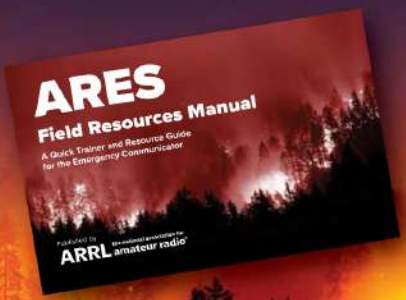
Field Resources Manual



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MFJ Power Supplies

Wold's Best and Largest Selection of Clean, NO RF Hash, no RFI power supplies are designed for ultra-reliable ham radio! High duty cycles on switchers for long Digital mode transmissions!

75-Amps, $274.95

MFJ-4275MV high-current switching power supply gives 75A max/70A continuous. Great for ALS-500M amplifier. Adjustable output 4-16 VDC/ 110/220 VAC. Binding posts, quick connects, *PowerPoles*(R), cigarette lighter socket on front. Battery charger gives charging current of 20A max, 5A continuous. 9¾Wx5½H x9½D". Only 10.5 lbs.

45-Amps, $159.95

MFJ-4245MV Switching power supply gives 45A surge/40A continuous. 9-15 VDC out. 85-260 VAC in. Low ripple, highly regulated. 5-way posts, cigarette lighter, quick connects. 5 lbs., 7½Wx4¾Hx9D".

25-Amps, $104.95

MFJ-4225MV Switching power supply gives 25A surge, 22A continuous. Adjustable 9-15 VDC output, 85-260 AC input. Large 3" dual Amp/Volt meters, binding posts, cigarette lighter socket. 3.7 lbs., 5¼Wx4½Hx6D".

$94.95

30 Amp, 4-16 Volts Adjustable, Volt/Amp Meter, 5Wx21/2Hx6D"

Ham Radio's Best Seller!

MFJ-4230MV is ham radio's best compact switching power supply -- just 5Wx2½Hx6D" and 3 lbs. Takes up little room on your operating position and perfect for home station, field day, DXpeditions, camping, hiking or for your next business trip or vacation. Gives 25A continuously or 30Amps surge at 13.8 VDC. Voltage is front panel adjustable 4-16 VDC. Selectable input voltage of 120 or 240 VAC at 47-63 Hz lets you carry it with you and use it worldwide. Front panel rocker switch lets you choose Amp/Volt meter for continuous monitoring. Cool operation with excellent 75% efficiency. Extra low ripple and noise is less than 100 mV. It's quiet! Continuous air flow gently cools the power supply and a heat sensor increases fan speed if the temperature rises above 70 degrees celsius. Over-voltage and over-current protection fully protects your transceiver and has ALARM LED. DC output is 5-way binding posts on the back so yourcan power your HF, VHF, UHF transceiver and accessories with ease.

Add a pair of *PowerPoles*(R)

MFJ-4230MVP, $104.95 *PowerPoles*(R) on back.

MFJ-4230MPF, $104.95 *PowerPoles*(R) on front of unit.

MFJ-4230DMP, $149.95 Like MFJ-4230MVP but has bright orange digital Volt/Amp display.

35-Amps, $139.95

MFJ-4235MV switching power supply. 35A surge, 30A continuous. 4-16 VDC, 1% voltage regulation. <9 mV peak-to-peak ripple. AC in: 90-125 or 200-240V. 7Wx4¼Hx8¾D", 4 lbs.

25-Amps, $89.95

MFJ-4125 gives 25A surge, 22A continuous. 13.8 VDC switcher has 5-way binding posts on front and quick connects on back. 3.5 lbs.

35-Amps, $159.95

MFJ-4035MV 19.2 lb. transformer, 35A max, 30A continuous. 1-14 VDC out, 110 VAC in. Highly regulated, 1% load, 1 mV ripple. 5-way posts, cig lighter. 9½Wx6Hx9¾D".

25-Amps, $99.95

MFJ-4125P. 25A surge, 22A continuous. 13.8 VDC switcher has 2-pair *PowerPoles*(R), 5-way posts, quick connects. 3.5 lbs.

15-Amps, $74.95

MFJ-4115. 17A surge, 15A cont. 13.8 VDC. 110/220 VAC. 3¾Wx2¼Hx7¾D", 1.5 lb. 5-way posts.

MFJ-4215MV, $74.95. Like MFJ-4115 but has backlit volt/amp meters.

28-Amps, $89.95

MFJ-4128. 28A surge, 25A cont. 13.8 VDC. AC: 85-135/170-260 VAC. 5-ways, cig sock.

MFJ-4218MV, $104.95. 0-24 VDC,18A@13.8/9A@24VDC.

MFJ *PowerPole*(R) Splitters

MFJ-1104, $49.95 *PowerPole*(R) Splitter, 30 Amp fused input, outputs fused at 25, 10, 5A. Open fuse indicator. 2¾Wx3¼Hx1½D".

MFJ-1107, $54.95 40A fused binding posts input, 4 fused *Power Pole*(R) outputs, two 2.1 mm center positive power jacks.

MFJ-1106, $44.95

One in, six out *Power Poles*(R). 30A total. 7 sets mating conectors included.

MFJ High Current DC Multi-Outlet Strips

Power multiple transceivers/accessories from a single DC power supply

MFJ-1118, $89.95 **Power** two HF and/or VHF rigs and six accessories from rig's 12 VDC supply. 35A high-current and 15A accessory binding posts, Voltmeter, on/off switch. Master fuse, RF bypass. 12½Wx2¾Hx2½D".

MFJ-1129, $125.95 **10 outlets.** Installed fuses: two 1A, three 5A, three 10A, two 25A, one 40A. Outlets 1, 2, 4-8 are *PowerPoles*(R). Outlet 3 is a 35A high current post, outlet 9, 10 are 15A posts. Switch, voltmeter. 12½Wx1¼Hx2½D".

MFJ-1116, $64.95 **Like** MFJ-1118 but 15A total, 8 pairs 5-ways."On" LED, 0-25 VDC voltmeter.

MFJ-1128, $115.95 12 fused *Power Poles*(R), three 1A, four 5A, four 10A, one 25A, one 40A. Switch, Meter.

MFJ-1112, $49.95 **Like** MFJ-1116 but 6 pairs 5-way posts, no meter/switch. 12½Wx2¾Hx2½D".

MFJ-1126, $89.95 8 fused *PowerPoles*(R): a 1A, three 5A, two 10A, one 25A, one 40A. Switch, Voltmeter. 9Wx1½Hx2¾D".

MFJ-1117, $69.95 **High-current.** Powers four HF/VHF radios simultaneously -- 2 at 35A each, 2 at 35A combined. 8Wx2Hx3D".

MFJ-1124, $69.95 4 pairs 35A PowerPoles(R), 2 pairs 35A high current posts.

MFJ Enterprises, Inc. 300 Industrial Pk Rd, Starkville, MS 39759

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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, $459.95. Like MFJ-1786 but has fast/slow tune manual control.

MFJ-1780, $369.95. 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, $699.95. 40-15 Meters.

MFJ-1783, $649.95. 30-10 Meters.

Build your own Mag loop!

Motorized Butterfly Capacitors


1


2


3


4


5


6


7


8

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


C

Turns wire or coax into a small, high efficiency multi-band transmitting magnetic loop antenna!


B

Work the world 3.5 to 30 MHz with a *full 150 Watts* SSB/CW/Digital. No ground, radials or counterpoises needed.


A

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.

A. MFJ-936C, $349.95. Antenna current meter, Cross-Needle SWR/Wattmeter. 9¼Wx5½Hx9½D".

B. MFJ-935C, $299.95. Antenna current meter. 6¼Wx5½Hx9½D".

C. MFJ-933C, $249.95. 6¼Wx5½Hx9½D".

MFJ-58B, $59.95

PVC Cross Loop support. 60-40M 20-15M 17-10M loop wires, wire clips.

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
$69.95

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

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.

AR-500
$169.95

MFJ Tripods/Masts

Strong, black *steel* triangular braced base. Non-skid feet, strong mast locks.

MFJ-1919, $109.95, 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, $179.95. Tripod *plus* mast. 18' extended. 5' collapsed. 1/8" wall, 3/4" dia. top, 1½" dia. bottom.15 lbs.

MFJ-1918, $69.95, 6'extended. 38" collapsed, 6¾ lbs.

MFJ-1918EX, $109.95. Small tripod with extension mast. 9½', 3.8 ft. collapsed. ¾"top, 1" bottom. 6.5 lbs.

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MFJ G5RV Antennas

Operate all bands 10 through 160 Meters with a single wire antenna!

***The famous** G5RV antenna is the most popular ham radio antenna in the world!*

It's an efficient, *all* band 102 foot long antenna – shorter than an 80 Meter dipole. Has 32.5 foot ladder line matching section ending in SO-239 connector for your coax feedline.

MFJ-1778
$69.95

Use horizontally or as Inverted Vee or Sloper with just one support. 1500 Watts.

Operate all bands 80-10 Meters with an antenna tuner and even 160M with ground.

Fully assembled with *ceramic* end and fiberglass center insulators. *Hang and Play*™ – add coax, rope to hang and you're on air!

MFJ-1778M, $59.95. *Half-size*, 52 foot *G5RV JUNIOR for limited space*. 40-10 Meters with tuner. Full 1500 Watts.

MFJ All Band Classic Doublet

MFJ 102 foot *all band* doublet covers 160-6 Meters with balanced line tuner. Super strong custom fiberglass center insulator relieves stress on 100 foot ladder line. *Glazed ceramic* end insulators. 1500 Watts.

MFJ-1777
$79.95

RF Isolator

MFJ-915 *RF Isolator* prevents unwanted RF from traveling on the outside of your coax shield into your transceiver. This unwanted RF can cause painful RF "bites" when you touch your microphone or volume control, cause your display or settings to go crazy, lock up your transceiver or turn off your power supply. In mobile installations, stray RF could cause your car to do funny things even blow your car computer. Clear up these problems, plug an MFJ-915 between your antenna and transceiver. 1.8-30 MHz, 1500 Watts. 5 x 2 inches.

MFJ-915
$39.95

MFJ-919, $69.95. 4:1 current balun,1.5 kW.
MFJ-913, $39.95. 4:1 balun, 300 Watts.

True 1:1 Current

Balun & Center Insulator

True 1:1 *Current Balun/Center Insulator* forces equal radiator currents in dipoles for true dipole radiation pattern. Reduces coax radiation and field pattern distortion – your signal goes where *you* want it. Reduces TVI, RFI and RF hot spots. *Don't build a dipole without one!* 50 hi-permeability ferrite beads on high quality RG-303 *Teflon®* coax and *Teflon®* SO-239. 1.5kW 1.8-30 MHz. Stainless steel hardware. 14 gauge stranded copper wire is *directly* connected to your antenna. 5 x 2 inches. Heavy duty weather housing.

MFJ-918
$39.95

2-Position Antenna Switch

MFJ-1702C, $49.95. 2-position antenna switch, lightning surge protection, center ground. SO-239s.

Lightning surge protectors

MFJ-270, $24.95. 400W. **MFJ-272, $34.95.** 1500 W. Gas discharge tube shunts 5000 amps peak.< 0.1 dB loss. 1 GHz. SO-239s.

MFJ-16C06, $9.45. 6-pack *glazed ceramic* end/center ant. insulators.

MFJ-16B01, $24.95. Molded high strength center insulator. SO-239.

MFJ-16D01, $9.95. 450 Ohm fiberglass end/center insulator with ladder line stress relief and SO-239 mount.

MFJ-18H100, $44.95. 100 feet, 450 Ohm ladder line, 18 gauge copper clad.

80-10 Meter End-Fed Half Wave antenna

Cover all bands with one single wire and no tuner!

MFJ-1982HP
$109.95

No tuner needed!
All band 80-10M EFHW antenna

Get-on-the air on all bands 80-10 Meters with just one wire and one support (pole or tree) and no tuner or long counterpoise.

Installs anywhere in minutes! Rugged *insulated*-wire radiator prevents detuning when contacting limbs/branches. "*No-snag*" end insulator slides over branches, leaves.

Toss over a high limb for inverted-V or sloper or go vertical with an inverted-L.

Dark jacketed wire is virtually invisible – *don't let antenna restrictions keep you off the air!* Great for emergencies.

EFHWs naturally resonate on the 1/2-wave fundamental frequency and odd/even harmonics. Covers 80/40/30/20/17/15/12/10 Meters without traps, stubs or resonators.

Broad-band matching transformer at feed point gives SWR so low you may never need a tuner. Compensating inductor optimizes SWR. 800 Watts SSB/CW. 132 feet jacketed antenna wire.

MFJ-1984HP, $89.95. Like MFJ-1982HP but 40-10M. 66 feet jacketed wire.

See *www.mfjenterprises.com*
for 30 Watt QRP and 300 Watt models.

Dual Band Dipoles

MFJ-17758, $99.95. Operate 80/40 Meters with a short 85 foot dipole. Full-size on 40 Meters with ultra-efficient end-loading on 80 Meters. 1500 Watts. Super-strong custom molded center insulator with SO-239 connector and hang hole. Ceramic end insulators. 7-strand, 14 gauge hard copper wire. No tuner needed!

MFJ-17758
$109.95
80/40 Meters

MFJ-17754, $69.95. Like MFJ-17758 but is only 42 feet. Operate 40/20 Meters. Full-size on 20 Meters, ultra-efficient endloading on 40 Meters. 1500 Watts.

Single Band Dipoles

Ultra high quality center fed dipoles give years of troublefree service. Custom injection-molded UV resistant center insulator has built-in SO-239 and hanging hole. Glazed ceramic end insulators. 7-strand, 14-gauge hard copper antenna wire. 1500 Watts. Use horizontally or as sloper or inverted vee. Simply cut to length with provided cutting chart.

MFJ-1779A
$79.95
160M, 265 ft.

MFJ-1779B
$59.95
80-40M, 135 ft

MFJ-1779C
$39.95
20-6M, 35 ft.

OCFD Dipoles

MFJ-2012
$89.95
1500 Watts

MFJ-2010
$69.95
300 Watts

No tuner needed!
MFJ *Off-Center Fed Dipoles* use MFJ's exclusive *ExactRatio*™ RF broadband transformer to give low SWR and maximum bandwidth on 40/20/10/6 Meters. A Guanella current balun kills feedline radiation, pattern distortion, SWR shifts, RFI and noise pickup. Install anywhere and get the same predictable performance regardless of feedline length. You get ground reinforced gain over verticals. Use horizontally, inverted vee, sloper. 98% efficient, 14 gauge, 7-strand copper wire, ceramic end insulators.

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

MFJ Weather-Proof Window Feedthrough Panels

Weather-proof window feedthrough panels bring coax, balanced lines, HF/VHF/UHF antennas, random wire antennas, ground, rotator/antenna switch cables and DC/AC power into your hamshack without drilling through walls!

MFJ Weather-Proof Window Feedthrough Panels mount in your window sill. Lets you bring all your antenna connections into your hamshack without drilling holes through walls.

Simply place in window sill and close window. One cut customizes it for any window up to 48 inches. Use horizontally or vertically. Connectors are mounted on inside/outside stainless steel plates and attached to a 4 foot long, $3^1/_2$ inch high, $^3/_4$ inch thick pressure-treated wood panel.

Real Western Red Cedar wood is naturally resistant to rot, decay and insects -- lasts longer, maintenance-free. Pitch and resin free for a wide range of beautiful finishes or leave it in its naturally beautiful raw finish. Edges sealed by weather-stripping. Seals and insulates against all weather conditions. Includes window locking rod.

Inside/outside stainless steel plates ground all coax shields. Stainless steel ground post brings ground in.

MFJ-4603 Universal Window Feedthrough Panel

MFJ-4603
$109.95

Four 50 Ohm Teflon® SO-239 coax connectors lets you feed HF/VHF/UHF antennas at full legal power limit.

A 50 Ohm Teflon® coax N-connector lets you use any antenna up to 11 GHz, including 450 MHz, UHF, satellite, moon bounce and 2.4/5.8 GHz Wi-Fi antennas.

A 75 Ohm, 1 GHz F-connector makes it easy to bring in television, Satellite, HD, cable TV and FM radio signals.

A pair of high-voltage ceramic feedthru insulators lets you bring in 450/300 Ohm balanced lines directly to your antenna tuner.

Has random/longwire antenna ceramic feedthru insulator.

5-way binding posts lets you supply 50 Volts/15 Amps DC/AC power to your outside antenna tuners/relays/switches.

Stainless ground post brings in ground connection, bonds inside/outside stainless steel panels together and drains away static charges.

MFJ's exclusive Adaptive Cable Feedthru™ lets you bring in rotator/antenna switch cable, etc. without removing connectors (up to $1^1/_4$ X $1^5/_8$ in). Adapts to virtually any cable size. Seals out rain, snow, adverse weather.

3 Coax, Balanced Line, Random Wire

Best Seller! 3 Teflon® coax connectors for HF/VHF UHF antennas. Separate high voltage ceramic feed-thru insulators for balanced lines and longwire/random wire, Stainless steel ground post.

MFJ-4602
$79.95

6 Coax

6 high quality Teflon® coax connectors for HF/VHF/UHF antennas. Stainless steel ground post. Full 1500 Watt legal limit.

MFJ-4601
$69.95

4 Balanced Line, 2 Coax

4 pairs of high-voltage ceramic feed-thru insulators for balanced lines and 2 coax connectors.

MFJ-4600
$89.95

5 Cables, any-size

5 Adaptive Cable Feedthrus™. Pass any cable with connector: 2 cables with large connectors up to $1^1/_4$ x $1^5/_8$ inches and 3 cables with UHF/N size coax connectors. Seals out weather.

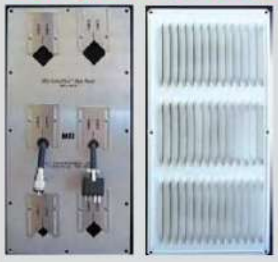
MFJ-4604
$114.95

All-Purpose FeedThru/CableThru™

Stacks MFJ-4603 and MFJ-4604! Gives you every possible cable connection you'll ever need through your window without drilling holes in wall – including UHF, N and F coax connectors, balanced lines, random wire, ground, DC/AC power and cables of any size for rotators, antenna switches, etc.

MFJ-4605
$179.95

Bring cables through the eave of your house



MFJ-4616
shown with standard full size vent (not included) it replaces. For 6 Cables
$34.95

MFJ-4613
shown with standard half size vent (not included) it replaces. For 3 Cables
$19.95

Replace your standard air vents on the eave/sofitt of your house with these MFJ AdaptiveCable™ Air Vent Plates and...

Bring in coax, rotator, antenna switch, power cables, etc. with connectors up to $1^1/_4$ x $1^5/_8$ inches!

Sliding plates and rubber grommets adjust for virtually any cable size to seal out adverse weather, insects and varmints. Use existing vent hole, mounting screws and screw holes.

AdaptiveCable™ Wall Plates

MFJ-4614
For 4 Cables
$44.95

Bring nearly any cable -- rotator, antenna switch, coax, DC/ AC power, etc. -- through walls without removing connectors (up to $1^1/_4$x$1^5/_8$ inches). Sliding plates and rubber grommets adjust hole size to weather-seal virtually any size cable.

Includes stainless steel plates for each side of wall, sliding plates, rubber grommets, weather stripping and screws.

MFJ-4612
For 2 Cables
$34.95

MFJ-4611
For 1 Cable
$19.95

Free Dealer/Catalog/ Manuals/Instructions – Visit: www.mfjenterprises.com or call toll-free 800-647-1800

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

MFJ Mobile Antennas!

Dual Band Mag Mount Antennas

MFJ-1724B

2-Meter/440 MHz

MFJ-1724B **$34.95**

This antenna is perfect for your dual band mobile or HT. Powerful 3 1/2 inch magnet holds firm at highway speeds, rubber guard, 19" black stainless steel whip, low SWR, excellent gain, 300 Watts PEP, 12 feet coax with PL-259. Free BNC adapter.

MFJ-281 **$15.95**

MFJ-281

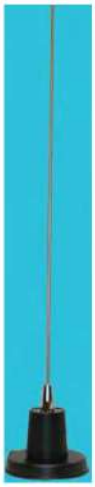
Clearest speech you ever heard!
3" speaker, 8W, 8 Ohms, 6' cord, 3.5 mm plug.

MFJ-1729

Power*Gain™

MFJ-1729 **$49.95**

Ham Radio's most powerful dual band antenna gives whopping gain on 440 MHz and 2-Meters! Low SWR. 27 1/2" stainless steel Slimline™ radiator minimizes wind vibration for less SWR flutter for longer range, better readability. 12' coax, PL-259, Heavy duty magnet mount.



MFJ-1728B

5/8 Wave 2/6 Meter Mobile

MFJ-1728B **$34.95**

Full 50-inch 5/8 Wave gives you maximum possible gain of any single element antenna on 2-Meters. On 6-Meter "magic band" you get a powerful signal with its high-performance low SWR full 1/4 Wave. 300 Watts PEP, heavy duty magnet, 12 feet coax, stainless steel radiator.

MFJ Super-Strong Magnet Mounts with Coax/PL-259

MFJ 5-inch Magnet

Best Seller!

These jetblack 5-inch super strong magnet mounts have 17' coaxial line terminated with PL-259 connectors. SO-239 (BS) or NMO (BM) for your VHF/UHF antennas or 3/8-24 threaded (BT) for your HF hamstick antennas with a 3/8-24 threaded connector.

$19.95 Each

MFJ-335BS – SO-239
MFJ-335BM – NMO
MFJ-335BT – 3/8 - 24 For HF sticks

MFJ 3-inch Magnet

3-inch Black Magnet Antenna Mounts

17-foot coax is terminated with PL-259 connector. Choose SO-239 (BS) or NMO (BM). For VHF/UHF lightweight antennas.
MFJ-333BS Pictured

$15.95 Each

MFJ SMA/BNC Cables

Release strain on your HT's antenna connector! 3 ft. flexible, mini coax with SO-239 connector.

$19.95 Each

A. **MFJ-5612S** SMA Male.
B. **MFJ-5612SF** SMA Female Wouxun/Baofeng.
C. **MFJ-5612B** BNC Male.

MFJ Triple 5-inch Magnets

Goliath™ – Ultimate Strength Magnet

Three super-strong 5-Inch Magnets make up this MFJ Goliath™ Tri-Magnet Mount. 1/4" thick steel triangle base. 17' coax. Select SO-239, NMO, 3/8-24 antennas.

Caution: once on, it's difficult to get off!

$44.95 Each

MFJ-336S – SO-239
MFJ-336M – NMO
MFJ-336T – 3/8 x 24

HF/VHF/UHF 200 Watt Duplexers

MFJ-916B **$34.95**

Use separate HF/VHF and 440 MHz UHF antennas with single transceiver OR use two separate HF/VHF and 440 MHz UHF transceivers with a single HF/VHF/UHF antenna. Heavy-duty diecast enclosure houses low/high pass networks that separate/combine HF/VHF/UHF signals. Low loss SO-239s. 50 Ohm ports. **MFJ-916BC, $59.95** 3 ft. coax pigtails on 2-port side.

1.8-200 MHz SWR/Wattmeter

Compact 1.8-200 MHz SWR/Wattmeter has HUGE 3" Cross-Needle meter. Read forward/reflected power and SWR simultaneously. Perfect for mobile/portable. 30/300 Watt ranges. Built-in meter light. SO-239s. 3 1/4W x 3 1/4H x 3 1/4D". **MFJ-842, $69.95** covers 140-525 MHz, 15/150 Watts.

MFJ-822 **1.8-200 MHz** **$69.95** **MFJ-842 140-525**

VHF/UHF Hi-Gain Antennas

A. MFJ-1402, $39.95.
VHF/UHF RuffRiderJunior™. Premium, short 16 1/2" antenna fits in any garage on any auto. 1/4 Wave on 2 Meters, 1/2 Wave, gain on 440 MHz. 100W. No foldover. B or C.

B. MFJ-1412, $39.95.
VHF/UHF RuffRider High Power™. Just 40" long handles full 200 Watts. Great for high power mobile amp. 1/2 Wave, gain on 2 Meters, 5/8 Wave, great gain on 440 MHz. Black or chrome.

C. MFJ-1422, $44.95.
VHF/UHF RuffRider High Gain™. 41 1/2 inch long antenna gives extra gain with little height increase. Handles 150 Watts. 1/2 wave with good gain on 2 Meters, 5/8 wave, excellent gain on 440 MHz. Black or chrome.

D. MFJ-1432, $64.95.
VHF/UHF RuffRider Hyper Gain™. 62 1/2" brute gives whopping gain on 7/8 Wave 2-Meters, 5/8 Wave and a MONSTER gain on 440 MHz. MFJ will rock your ham radio world! 150 Watts. Use tri-magnet. Black or Chrome.

MFJ Mobile HF Ham Sticks

Each is ruggedly constructed. A heavy duty 4 foot, 3/8 inch diameter fiberglass rod; a nearly indestructible .125 inch diameter PH-17-7 stainless steel whip and chrome plated brass fittings will give you years of service. It's sleek, low profile construction has low wind loading and its semi-rigid fiberglass eliminates the need for springs or guys.

Black anti-static jacket protects loading coil, blends with any vehicle. Stainless steel whip is adjustable for lowest SWR. Push it down to park in the garage or fully extend it for maximum efficiency during mobile operation.

Includes allen wrench and complete tuning and matching instructions. Handle 250 Watts PEP. Whips are 7 feet fully extended, and collapse to about 4 feet for easy storage.

Simply screws into any 3/8 x 24 female mount for quick bandchanging. Get them all for great band coverage!

MFJ-1675T - 75 Meters
MFJ-1660T - 60 Meters
MFJ-1640T - 40 Meters
MFJ-1630T - 30 Meters
MFJ-1620T - 20 Meters
MFJ-1617T - 17 Meters
MFJ-1615T - 15 Meters
MFJ-1612T - 12 Meters
MFJ-1610T - 10 Meters
MFJ-1606T - 6 Meters

$19.95 -$21.95 Each

60-75 Meters $29.95 each

— 3/8-24 Ham Stick Mounts —

MFJ-343, $15.95. Tough 3/8-24 hard mount for permanent installation.

MFJ-342T, $15.95. 3/8-24 HF horizontal or vertical 1/4 or 1/2 inch pipe or mirror mount.

MFJ-344, $15.95. Like MFJ-342T, but horizontal pipe mount.

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MFJ_1724B_101008_QST_040819DS

"Best thing since sliced bread!"

More hams use MFJ analyzers than all others in the world!

MFJ-269D . . . 280 KHz - 230 MHz plus 415-470 MHz, 12-bit A/D

New and improved. Now covers 280 KHz to 230 MHz and 415 to 470 MHz and 2200 Meter band!

Instantly gives you a complete picture of your antenna.

Read SWR, return loss, reflect-ion coefficient, match efficiency at any frequency simultaneously.

Read Complex Impedance (100 KHz to 230 MHz) as series equivalent resistance and reactance (Rs+jXs) or as magnitude (Z) and phase (degrees). Also reads parallel equivalent resistance and reactance (Rp+jXp).

Determine velocity factor, coax loss in dB, length of coax and *distance to short or open in feet (it's like a built-in TDR).*

Coax Calculator™ calculates coax line length in feet given degrees and vice versa for any frequency, velocity factor.

New! MFJ-269D **$419.95**

Measure SWR and loss of coax with *any* characteristic impedance (280 KHz to 230 MHz) from 10 to over 600 Ohms.

Measures inductance in uH and capacitance in pF at RF frequencies, 100 KHz to 230 MHz.

High contrast LCD gives precision readings and two side-by-side analog meters make antenna adjustments smooth and easy.

12-bit A/D converter gives much better accuracy and resolution than common 8-bits -- *MFJ-269D exclusive!*

Built-in frequency counter, battery saver, low battery warning, Ni-Mh/NiCd charge circuit. 4Wx2Dx6¾", 2 lbs. Use ten aA batteries or 110 VAC with MFJ-1312D, $19.95.

MFJ-269DPRO™ SWR Analyzer

MFJ-269DPro, $459.95. Like MFJ-269D, but UHF range covers ***430 to 520 MHz***. For commercial work.

MFJ-259D . . . World's Most Popular Antenna Analyzer!

New!

MFJ-259D **$319.95** ***New and improved, now covers 280 KHz-230 MHz!***

***World** famous* MFJ-259D gives you a complete picture of your antenna's SWR and Complex Impedance.

MFJ-259D is a complete ham radio test station including frequency counter, RF signal generator, *SWR Analyzer™*, RF Resistance/ Reactance Analyzer, Coax Analyzer, Capacitance/ Inductance Meter and more!

Read Complex Impedance as series resistance and reactance (R+jX) or as magnitude (Z) and phase (degrees).

Determine velocity factor, coax cable loss in dB, length of coax and distance to short/open.

Read SWR, return loss and reflection coefficient at any frequency simultaneously.

Read inductance (uH) and capacitance (pF) at RF frequencies.

Large easy-to-read two line LCD screen and side-by-side meters clearly display your information.

Built-in frequency counter, Ni-MH/Ni-CD charger circuit, battery saver, low battery warning, smooth reduction drive tuning.

Super easy-to-use! Just set the bandswitch and tune the dial -- just like your transceiver. SWR, Complex impedance displayed instantly!

Fully portable, take it anywhere -- remote sites, up towers, on DX-peditions. Use 10 AA or Ni-Cad or Ni-MH batteries (not included) or 110 VAC with MFJ-1312D, $19.95. Rugged metal cabinet, 4x2x6¾". **MFJ-249D, $299.95.**

MFJ-249D does everything MFJ-259D does with digital display only.

MFJ-223 1-60 MHz Color Graphic VNA Analyzer

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!

MFJ-223 **$319.95**

- **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

Out in the field, the MFJ-225 is a compact completely *self-contained handheld graphing analyzer*. On the bench it becomes a full-fledged two-port (S21) desktop machine when teamed up with your PC. Using powerful IG-miniVNA freeware, you'll run de-tailed data analysis and print out stunning color-graphic plots to document your work! Built-in back-lighted *3-inch LCD graphic* display. Make fine adjustments using full-screen easy-to-view SWR bargraph, capture vivid swept displays for SWR, impedance, re-turn loss, phase angle, more. DDS generator.

MFJ-225 **$339.95**

SWR Analyzer Accessories

A. **MFJ-29D/MFJ-39D, $24.95.** Carrying Pouch for MFJ-259D/269D.

B. **MFJ-92AA10, $29.95.** 10-Pack 2500 mAh Ni-MH Supercells.

C. **MFJ-66, $24.95.** Dip coils, set of two covers 1.8-230 MHz.

D. **MFJ-731, $99.95.** Tunable Analyzer Filter, 1.8-30 MHz, for strong RF fields.

E. **MFJ-917, $29.95.** 1:1 Current balun for SWR Analyzers to test balanced line antennas, other loads.

F. **MFJ-7737, $5.95.** PL-259 to BNC Female.

G. **MFJ-7727, $5.95.** PL-259 to SMA Female.

H. **MFJ-5510, $9.95.** 12VDC cigarette lighter adapter.

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Born in the U.S.A.!

Buy American! MFJ automatic tuners are built on American soil by American workers right here in Starkville, Mississippi USA.

MFJ *IntelliTuner*™ Automatic Tuners

The MFJ-993B *IntelliTuner*™ lets you tune any antenna *automatically -- ultra fast.*

MFJ-993B **$299.95** *Full Digital Power!*

It's a comprehensive automatic *antenna tuning center* complete with SWR/Wattmeter, antenna switch for two antennas, wire connection and 4:1 current balun for balanced lines.

MFJ's exclusive *IntelliTuner*™, *Adaptive Search*™ and *Instant Recall*™ algorithms give you *ultra fast* automatic tuning with over 20,000 *VirtualAntenna*™ Memories.

You get a highly efficient L-network, 6-1600 ohm matching at 300 Watts SSB/CW and digital or *extra-wide* 6-3200 Ohm matching at 150 Watts SSB/CW and digital, 1.8-30 MHz coverage, Cross-Needle *and* digital meters, audio SWR meter, *backlit* LCD, remote control port, radio interface, heavy-duty 16 amp/1000V relays. MFJ-993B automatically tunes for minimum SWR and remembers your frequency and tuner settings. The next time you operate on that frequency and antenna, these tuner settings are instantly restored and *you're ready to operate in milliseconds!* 10Wx2¾Hx9D inches. Use 12-15 VDC/1 amp or 110 VAC with **MFJ-1316, $29.95**. Radio interface cables, remote control available. See ***www.mfjenterprises.com***

made in USA

600 Watt MFJ Automatic Antenna Tuner

MFJ-994B, $379.95. Like MFJ-993B but handles 600 Watts SSB/CW/Digital, matches 12-800 Ohms. 10,000 memories. Doesn't have LCD, antenna switch, balun, audio SWR meter. 10Wx2¾Hx9D inches.

More hams use MFJ tuners than all other tuners in the world!

World's most advanced Automatic Antenna Tuners feature world renowned MFJ AdaptiveSearch™ and AutomaticRecall™ algorithms -- world's fastest ultra-wide range tuning. Nine World Class models! Choose your features: Digital/Analog/Audio SWR-Wattmeter, Antenna Switch, Balun, Radio Interface, Digital frequency readout, Remoteable, Coax/Balanced Lines/Wire Tuning, Field Upgradeable . . .

1500 Watt *Legal Limit*

for Ameritron AL-1500/1200/82 amps

Roam the entire HF spectrum 1.8- 30 MHz *hands-free* with full *1500 Watt* legal limit on SSB/CW/Digital and near-perfect SWR! Lighted LCD/Cross-Needle Meter.

MFJ-998 **$739.95** *Full Digital Power!*

300 Watt ...Extra Wide Range

SWR/Wattmeter, 10000 VA Memories

Extra *wide matching range at less cost.* MFJ's *exclusive* dual power level: 300 Watts for 6-1600 Ohms; 150Watts for 6-3200 Ohms. Cross-Needle SWR/Wattmeter.

MFJ-991B **$259.95** *Full Digital Power!*

200 Watt ... Compact

Digital Meter, Ant Switch, Wide Range

MFJ-929 **$269.95** *Full Digital Power!*

World's fastest compact auto tuner uses MFJ *Adaptive Search*™ and *InstantRecall*™ algorithms. 132,072 tuning solutions instantly match virtually any antenna with near perfect SWR. Bright LCD Display.

200 Watt *MightyMite*™

Matches IC-706, FT-857D, TS-50S

Full Digital Power!

MFJ-939KIY **$169.95**

200W SSB/CW and Digital. Low-profile automatic tuner is great for those tiny new rigs. Just tune and talk! Includes interface cable, 2-year warranty. 6½Wx2⅞Hx8⅜D".

MFJ *Remote AutoTuners*

Get greatly reduced losses and high efficiencies with long coax runs and high SWR antennas. *Full Digital Power!*

MFJ-926B, $329.95. 200W.
MFJ-993BRT, $339.95. 300W.
MFJ-994BRT, $459.95. 600W.
MFJ-998BRT, $869.95. 1.5 kW.

G5RV Antennas

Cover 160-10 Meters with antenna tuner. 102 ft. long. Use as inverted vee or sloper, 160 Meters as Marconi. 1500 Watts. Super-strong fiberglass center/feedpoint insulators. *Glazed ceramic* end insulators.

MFJ-1778 **$69.95**

MFJ-1778M, $59.95. 52'. 40-10M.

No Matter What™ Warranty

Protected by MFJ's famous one year *No Matter What*™ limited warranty. We will repair or replace (at our option) for a full year.

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TIMEWAVE TECHNOLOGY INC.

New!!
ANC-4+

Timewave Products available at:
- HRO
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*NEW! ANC-4+

ANC-4+ Antenna Noise Canceller

The familiar, rugged ANC-4 now with:
- *External TX/RX control*
- *Adjustable TX hang time*
- *Noise amp front end protection*
- *TX LED indicator*
- *SMT construction*

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

Estmated availability June 2021. Check Timewave & our Dealers Websites. Get on the list for this popular item!

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**
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- **Convenient - No annoying jumpers!**

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

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

PK-232SC+

Multimode Data Controller*

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

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

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

■ PK-96/100 USB Packet TNC

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

■ HamLinkUSB™ USB-to-RS-232 Adapter

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

■ HamLinkUSB™ Rig Control+

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

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St. Paul, MN 55113 USA

www.timewave.com
sales@timewave.com

651-489-5080

MFJ Tuners

New, Improved MFJ-989D 1500 Watt legal limit Antenna Tuner

World's most popular 1500 Watt Legal Limit Tuner just got better -- much better -- gives you more for your money!

New, improved MFJ-989D legal limit antenna tuner gives you better efficiency, lower losses and a new true peak reading meter. It easily handles full 1500 Watts SSB/CW, 1.8 to 30 MHz, including MARS/WARC bands.

New, dual 500 pF air variable capacitors give you twice the capacitance for more efficient operation on 160 and 80 Meters.

New, improved AirCore™ Roller Inductor gives you lower losses, higher Q and handles more power more efficiently.

New, TrueActive™ peak reading Cross-Needle SWR/Wattmeter lets you read true peak power on all modes.

MFJ-989D $469.95

Includes six position ceramic antenna switch, 50 Ohm dummy load, indestructible multi-color Lexan front panel with detailed logging scales and legends.

The MFJ-989D uses the superb time-tested T-Network. It has the widest matching range and is the easiest to use of all matching networks. Now with MFJ's new 500 pF air variable capacitors and new low loss roller inductor, it easily handles higher power much more efficiently.

New, high voltage current balun lets you tune balanced lines at high power with no worries.

New, crank knob lets you reset your roller inductor quickly, smoothly and accurately.

New, larger 2-inch diameter capacitor knobs with easy-to-see dials make tuning much easier.

New, cabinet maintains components' high-Q. Generous air vents keep components cool. $12^{7}/_{8}$W x 6H x $11^{5}/_{8}$D inches.

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-986 Two knob Differential-T™

MFJ-986 $419.95

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. 15W x $4^{1}/_{2}$H x $10^{3}/_{4}$D in.

MFJ-962D compact kW Tuner

MFJ-962D $359.95

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. $10^{7}/_{8}$W x $10^{3}/_{4}$H x $4^{1}/_{2}$D in.

MFJ-969 300W Roller Inductor Tuner

MFJ-969 $259.95

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-949E deluxe 300 Watt Tuner

MFJ-949E $219.95

More hams use MFJ-949s than any other antenna tuner in the world! Handles 300 Watts Full 1.8 to 30 MHz coverage, custom inductor switch, 1000 Volt tuning capacitors, full size peak/average lighted Cross-Needle SWR/Wattmeter, 8 position antenna switch, dummy load, QRM-Free PreTune™, scratch proof Lexan front panel. $10^{5}/_{8}$W x $3^{1}/_{2}$H x 7D inches. **MFJ-948, $179.95.** Economy version of MFJ-949E, less dummy load, Lexan front panel.

MFJ-941E Super Value Tuner

MFJ-941E $169.95

Most for your money! 300 Watts PEP, 1.8-30 MHZ, lighted Cross-Needle SWR/Wattmeter, 8 position antenna switch, 4:1 balun, 1000 volt capacitors, Lexan front panel. $10^{1}/_{2}$W x $2^{1}/_{2}$H x 7D in. **MFJ-941EK, $139.95.** Tuner Kit -- Build your own!

MFJ-945E HF/6M mobile Tuner

MFJ-945E $159.95

Extends your mobile antenna bandwidth so you don't have to stop, go outside and adjust your antenna. Tiny 8W x 2H x 6D in. Lighted Cross-Needle SWR/Wattmeter. Lamp and bypass switches. Covers 1.8-30 MHz and 6 Meters. 300 Watts PEP. **MFJ-20, $9.95**, mobile mount.

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MFJ-971 $149.95

Tunes coax, balanced lines, random wire 1.8-30 MHz. Cross-Needle Meter. SWR, 30/300 or 6 Watt QRP ranges. Matches popular MFJ transceivers. Tiny $6^{1}/_{2}$W x $2^{1}/_{2}$H x 6D in.

MFJ-901B smallest Versa Tuner

MFJ-901B $119.95

MFJ's smallest (5W x 2H x 6D 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-902B Tiny Travel Tuner

MFJ-902B $129.95

Tiny $4^{1}/_{2}$W x $2^{1}/_{4}$H x 3D inches, full 150 Watts, 80-6 Meters, has tuner bypass switch, for coax/random wire. **MFJ-904H, $169.95**. Same but adds Cross-needle SWR/Wattmeter and 4:1 balun for balanced lines. $7^{1}/_{4}$W x $2^{3}/_{4}$H x $2^{3}/_{4}$D inches.

MFJ-16010 random wire Tuner

MFJ-16010 $79.95

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 4W x 2H x 3D in.

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MFJ-9201 $54.95

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MFJ-921/924 VHF/UHF Tuners

MFJ-921/924 $109.95

MFJ-921 covers 2 Meters/220 MHz. **MFJ-924** covers 440 MHz. SWR/Wattmeter. 8W x $2^{1}/_{2}$H x 3D in.

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MFJ-931 $129.95

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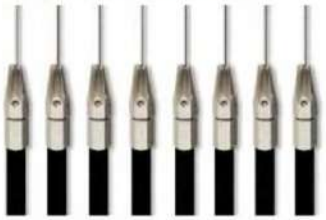

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VIDEOS: https://m.youtube.com/results?search_query=MFJ-9232

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OPTIONS

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MFJ-1234BSD,$59.95. RigPi 2.0 software on SD Card only.
MFJ-1234BOS, $29.95. Rig Pi Version 2.0 software download.
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TECH HELP

- RigPi forum is *https://rigpi.groups.io*
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MFJ Curtis-Keyer has all modes, dot-dash memories, jam-proof spacing, weight, sidetone, built-in speaker. Speed, weight and tone controls and tune, semi-auto and on/off are on front panel.

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