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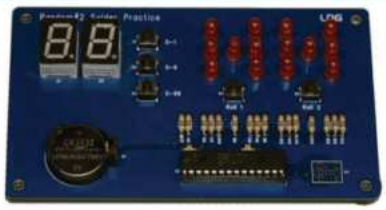

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QST

Contents

November 2024 ♦ Volume 108 ♦ Number 11

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

Columns

Departments

Our Cover
Robert J. Zavrel, W7SX, needed multiple relays for a complex antenna system for HF. He came up with "A Full-Power, Inexpensive Antenna Relay" that gets the job done — read all the details in this issue. [Sierra Harrop, W5DX, photo]

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X200A (2 Section)	2m/70cm	8.3	200	UHF
X50A (1 Section)	2m/70cm	5.6	200	UHF or N
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CP22E (Aluminum)	2m	8.9	200	UHF
F718A (Coax Element)	70cm	15	250	N
Dualband Mobile Antennas				
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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
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NR7900A	2m/70cm	57 in.	300/250	UHF
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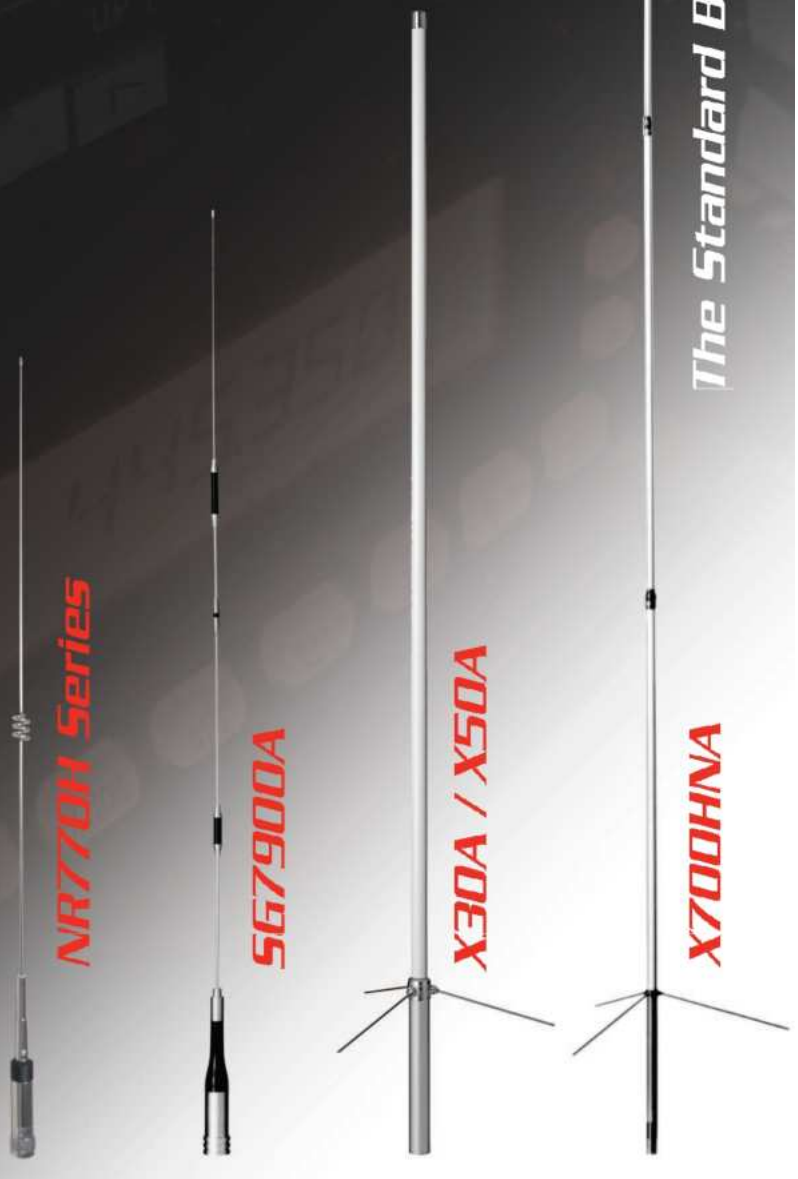

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David A. Minster, NA2AA, ARRL Chief Executive Officer, na2aa@arrl.org

Second Century

The Future of DXCC

DXCC® is one of ARRL's many ETLAs (extended three-letter acronyms), this one describing our primary recognition program for working countries on the HF bands, the higher bands where EME is necessary, and even satellite. The DX Century Club® was born of a time when radios were meager by today's standards, making contact with 100 countries quite an accomplishment!

As the years moved on, equipment improved, and solar conditions improved to where many who experienced it believe that Solar Cycle 19 was the best one ever. Thrill-seeking hams like Lloyd and Iris Colvin were traveling to rare countries handing out contacts toward progressively higher DXCC totals for their followers! In a letter to the *QST* Editor in 1966, member Ralph McClintock, K1SCQ, wrote "…this mess is getting to the point where DXCC should be rephrased DX-pedition Continuing Countlessness." Gone were the days of having an actual QSO with a new DX country and learning something about the operator, replaced with a quick 59 QRZ. The change was not a happy one. It is similar to the cries that FT8 contacts should not be counted for DXCC.

Today DXCC is nowhere near a lifetime endeavor. Receiver stats from Rob Sherwood, NCØB, show many outstanding radios with little to no discernable difference among the top radios. DXpeditions are more routine, and pileups, once a badge of honor to bust, are now decoded by modes like FT8 and Super Fox. Even tuning across the bands has become a lost art, replaced by spotting networks and programs tracking when a needed country is on the air, and where. Big stations can achieve DXCC on four or even five bands in one contest weekend!

DXCC has always been a bit of an opportunity to brag about ranking. Attend nearly any DX banquet to observe the tradition of watching people sit down as the emcee counts up the total countries worked, leaving only the top earners left standing for a round of deserved applause. Today's top tier of DXCC is celebrated with two honors: you need 331 countries for Honor Roll and all 340 for Honor Roll #1. Conventional wisdom once showed that it took around 15 years to get on Honor Roll. Not anymore.

The world is dynamic. In the history of the program, governmental changes have caused countries to be added and deleted. Look at Bonaire, PJ4. If you worked the same station with the same call on the same band on 10/9/2010 and again on 10/10/2010, you have two countries in your DXCC count, with the earlier one having been deleted due to a change in government. Same thing for Canal Zone, now a part of Panama. So a DXCC count including deleted countries is deceiving in terms of an attainable goal.

If a government turns a former DXpedition hot spot into an environmentally protected zone, is it fair to keep the entity on the list or should it be deleted? Will the change last forever?

DXpedition visionary George Wallner, AA7JV, and his team have developed Radio In a Box (RIB) stations, essentially radios with networking infrastructure, in a box, that can be dropped on an island and operated remotely from a boat. He's hoping that teams can make an argument to regulators about operating from a protected area with near zero human footprint. George has also leveraged Starlink internet access to permit remote operators from around the world to keep the stations hopping! No operator fatigue here! But these operations open up new questions about the radio regulations governing these operations and care must be taken to follow them.

The last major change to DXCC was in 2000. Changes have been at a glacial pace, some citing an old guard unwilling to "move the bar" of achievement. Next year, the ARRL Programs and Services Committee will be undertaking "DXCC 2025" to examine the program with the DX Advisory Committee, potentially to make changes to keep up with the changing technologies and environments.

What changes do you want to see to DXCC? Think about the next 15 years. Will you make Honor Roll? Will some heavily regulated entities keep you from your goal? One thing is for sure: you'll need to be radio active to catch the rare ones as they pop up. Be a connector and include friends from your club to tackle the DX challenge together. And see you in the pileups!

David A. Minster, NA2AA
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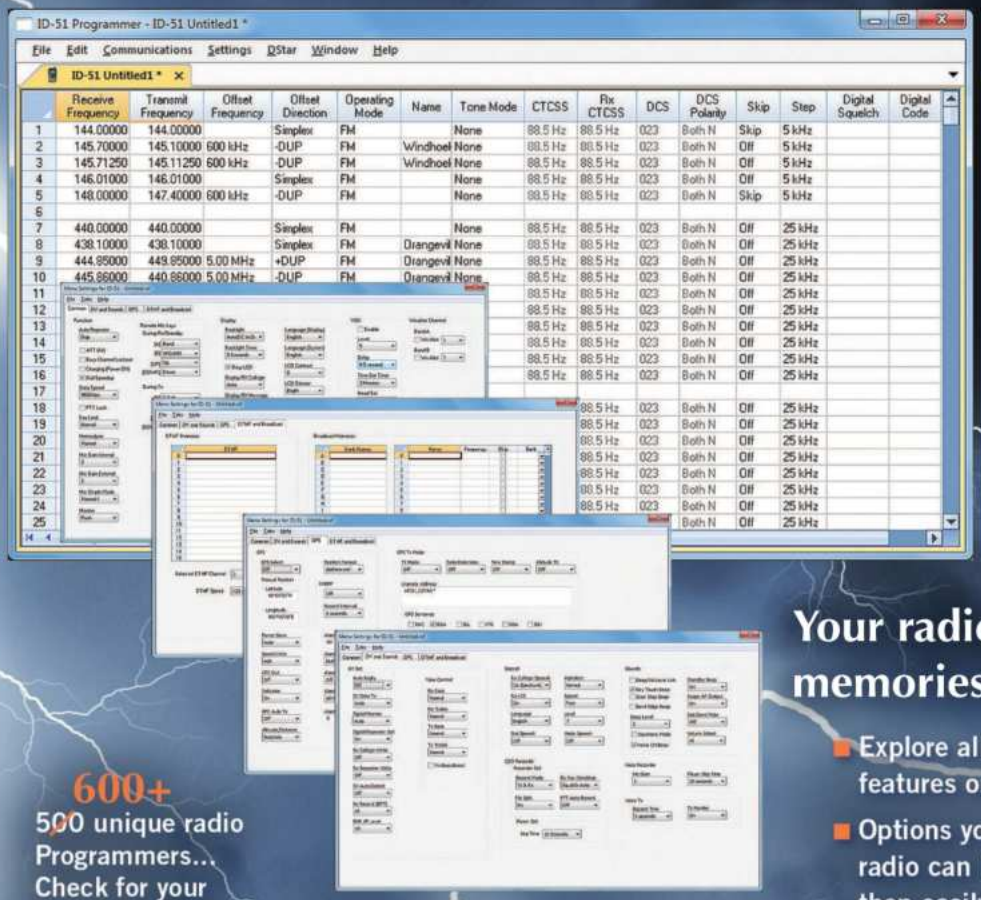

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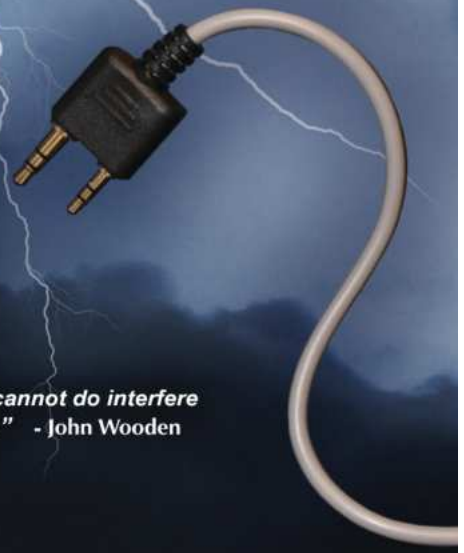

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Member Spotlight

Rachel Jones, KO4HLC

Rachel Jones', KO4HLC, ham radio journey started in her online pre-calculus class, at the start of the COVID-19 pandemic. A classmate announced that they were studying to get their amateur radio license, and she thought about doing the same. "The idea of using radios to communicate around the world sounded really cool. I was especially interested in radios related to space science research, such as satellite communication and radio astronomy," she said. As a PhD student studying aerospace sciences at the University of North Dakota, amateur radio was right up her alley.

While juggling classes during the total pandemic lockdown, Rachel prepared for her Technician exam by contacting local ham clubs for study tips, purchasing an ARRL license manual, and watching Dave Casler's, KE0OG, helpful YouTube videos. Just 3 months later, Rachel took her test alongside her husband, who agreed to give it a try as a show of support; he didn't score high enough in the end, but she passed with flying colors.

A Teaching Tool

Rachel was quick to accomplish amazing things with amateur radio. Teaching is a passion of hers, and she has worked with students of all ages to teach amateur and space radio concepts. "I can list hundreds of activities I've enjoyed doing with students," she said. She has taught them to launch high-altitude weather balloons, practice Morse code, participate in foxhunts, and even visualize Earth's atmosphere by sticking a slice of cheese to a globe. "Students can recognize when you're passionate about something. Your energy is contagious," she said with pride. Rachel once organized a Technician test prep class for 11 Civil Air Patrol cadets and two Augusta Preparatory Day School students. One student failed, but that result only fired up her resolve, thanks to Rachel's encouragement. She passed the retake in 2 weeks and "a month later, she passed her General," Rachel added.

Rachel is also part of Amateur Radio on the International Space Station's (ARISS') Teach the Teachers team, which is a feature of the Space Pioneers Amateur Radio Kit Initiative (SPARKI). She has helped design teaching materials while instructing other educators on the basics of radio waves and frequencies, electronics, codes and ciphers, and software-defined radios. She presented amateur radio at three teacher workshops this year and at BSidesAugusta.

Research and Community Building

Rachel continues to use amateur radio for scientific inquiry. In May 2023, she was the communications and safety officer for Crew 281's analog astronaut mission at the Mars Desert Research Station. Together they experimented with a Shack-in-a-Box station built by young ham Hope Lea, ND2L, in a simulated Martian environment. In January 2024, Rachel's university sent her to the Jules Undersea Lodge to design and test a radio setup that could function under water. She is presently working RF topics into her dissertation on the cybersecurity of space assets.

As a military spouse, Rachel moves frequently. But "being a ham provides me with instant friends no matter where I travel," she said. "I feel privileged to be part of an open, accepting community." Local nets, clubs, and events help her fit in just about anywhere. To Rachel's amusement, her husband must wear a shirt that reads "I'm NOT a HAM — talk to my wife!" when accompanying her to conventions and club meetups, as many event-goers try to talk radio with him instead of her.

More Goals to Meet

She dreams of one day having a home station geared toward 20- and 40-meter HF voice operation. In the meantime, she is working on "becoming a better Volunteer Examiner, starting Parks on the Air, and helping to run the first ARISS SPARKI workshop on the west coast."

In her short time as a ham thus far, Rachel's impact on the hobby is vast and ongoing. Whether on the air in a professional, academic, or casual context, she can't wait to see where amateur radio takes her next.

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Up Front

QSL Stamp Collection

Bob Vernall's, ZL2CA, wife, Sue Vernall, is compiling a collection of QSL Bureau stamps. Some QSL bureaus sell stamps for affixing to QSL cards to prove that the sender has paid for the QSL service. There is little documentation on QSL Bureau stamps, so collecting is somewhat of a discovery venture, particularly as to how many variants were issued by a given bureau. Some bureaus used rubber stamp imprints that have no philatelic value. QSL stamps are usually on the reverse side of a QSL card, so searching for them entails flipping cards.

A presentation in philatelic exhibit format is available for browsing on the Otago Radio Club website at **www.zl4aa.org.nz/zl4aa/qsl-exhibition**.

QSL stamps from Congo, Lebanon, Lithuania, and Trieste have yet to be collected, along with QSL stamp variants additional to those shown in the website exhibit. Website pages will be updated as stamps are added. Bob and Sue would be happy to know if you see any (contact them at **vernall@xtra.co.nz**). The hope is that this eventually becomes a reference collection.

Andora

Transkei

Switzerland

Norway

Chile

Images of scarce QSL stamps. [Bob Vernall, ZL2CA, images]

Visiting Switzerland

Dennis Ashworth, K7FL, attended the 2023 HAM Radio Friedrichshafen event in Germany, followed by a tour of Switzerland. No radio amateur's visit to Switzerland would be complete without a stop in Geneva at the International Telecommunication Union (ITU) building for a tour of station 4U1ITU. [Ati Matas, HB9IAJ, photo]

Hope of Better DX in Cycle 25

A good omen. Joe Molon, KA1PPV, walked out his door at just the right moment to see this beautiful rainbow over his tower. The photo shows only part of what was there — a complete arch with a faint double arch. [Joe Molon, KA1PPV, photo]

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Event to Inspire Technicians

I always enjoy working the Annual 13 Colonies Special Event every July. I try to work the 13 states on 40-meter CW. I didn't get it done this year because I got New Hampshire on 30-meter CW. I was able to work the other 12 states on 40-meter CW.

I do this every year to show Technician-class licensees that getting a certificate and even possibly a clean sweep with their license class, a 100 W radio, and a simple dipole (I used 85 W on a Cobra UltraLite Senior all-band dipole) is possible. I hope it will spur Technicians to get on HF, and maybe even upgrade.

I must thank all of the organizers and operators who participated in the event, as it is one way to integrate ham radio into the celebration of the founding of this country.

Jerry Palmer, N3KRX
Houston, Delaware
Life Member

Retiring "Elmer"

Isn't it time that amateur radio gave the term *Elmer* a makeover? "Elmer" is a title given to a radio amateur who mentors others in electronics and amateur radio. In the days of spark-gap radio (1887 to World War I), Elmer was a popular boy's name. Today, if you ask non-hams what comes to mind when they hear "Elmer," they most likely will think of Elmer Fudd or Elmer's Glue.

I believe that the amateur radio community can do better! Even the generic title of *mentor* would be preferable, but I'm sure that an appropriate replacement title could be found given the right incentive. Isn't it time that amateur radio thanks Elmer for a century and a half of loyal service and moves on to a term that is more current and more inspiring?

Clinton Andrews, WB8ORM
Grosse Pointe Park, Michigan

Give a Helping Hand

As you look around the amateur radio community, you notice many of us are getting older, and our ranks are getting thinner with few newcomers entering our hobby. Also, notice how diverse our hobby has become. It has entered the digital age and continues to advance.

With all this new technology, we seem to sometimes forget the human element. Whether you are chasing awards or chasing an aggregate number of contacts via phone or a digital mode, remember there is a human attached to the other end of that communication.

When we provide an on-the-spot correction for a harmless mistake, a 2-minute rant on the repeater isn't the way to do it. Sometimes, looking up the person's email and sending a guiding note directly to them is more appropriate. Offering mentorship is a good avenue to take, whether they are a new operator or not.

As a community, we are attempting to increase our ranks — no-code advancement, vanity call signs, Parks on the Air, and other methods have certainly helped to grow our numbers — but we also need to provide guidance and mentorship to each other and the new folks entering our diverse hobby. We should be welcoming all into the amateur radio community because we were once welcomed in, too.

James Stephen Grant, KB4YKC
Jacksonville, Florida

Test Equipment Proposal

At my company, there was always a bit of friendly competition between design engineers and test technicians. The engineers would analyze and offer expert opinions on predicted equipment performance. The technicians were tasked with conducting tests and measurements to officially verify performance.

Today, we have antenna modeling software that offers expert opinions on antenna performance. However, I propose a piece of test equipment that can measure and confirm performance.

Imagine a drone equipped with an HF field strength meter and a VHF transmitter for reporting measurements. Such a device could measure the actual radiated patterns in horizontal and vertical planes. If calibrated, it could also confirm the calculations for effective radiated power.

Precautions would have to be taken to prevent the on-board transmitter from interfering with the field strength measurements or the RF signals that control the drone. Perhaps an alternating sample-and-report operation could be devised. Alternatively, the drone could measure and record memory field strength measurements and GPS positions and altitudes, thus eliminating the need for a transmitter.

This would be a worthwhile club project. All the components involved in this device are off-the-shelf, minimizing innovation. How many hams would pay to have their station performance measured?

Tom Kilian, KDØMOM
Burtrum, Minnesota

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To keep 60-meters usable for radio amateurs, ARRL is working with the FCC to keep the 100 W power limit and the existing five channel allocation. ARRL is protecting the rights of all Amateur Radio Operators and the advancement of American expertise in wireless technology.

A delegation from ARRL and the International Amateur Radio Union represented our interests at the ITU World Radio-communication Conference 2023 (WRC-23) in Dubai, United Arab Emirates, in November and December. This huge effort at a significance expense needs your support.

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W1AW Schedule

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

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

♦ Morse code transmissions: Frequencies are 1.8025, 3.5815, 7.0475, 14.0475, 18.0775, 21.0675, 28.0675, 50.350, and 147.555 MHz.

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

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

Code bulletins are sent at 18 WPM.

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

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

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

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

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

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

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

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

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

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A Full-Power, Inexpensive Antenna Relay

Power relays work well for antenna switching of up to 30 MHz.

An inexpensive relay for 50 Ω systems. [Sierra Harrop, W5DX, photo]

Robert J. Zavrel, W7SX

Here's a simple, inexpensive relay for 50 Ω systems (see the lead photo). I'm building a complex antenna system and need multiple relays; I also wanted acceptable performance throughout the HF bands.

Many hams now use automatic antenna tuners, which can handle modest untuned conditions, making this design usable for up to 30 MHz (and even 50 and 144 MHz, because the SWR is well within range of auto tuners for VHF). Clearly, this won't be applicable to UHF and above operations and is questionable for most systems at 2, or even 6, meters. However, it's quite satisfactory across the entire HF band.

Construction

These homebrew relay boxes were compared with the popular Dow-Key coaxial relays for "off" isolation. They had an "off" isolation of about 51 dB to 10 MHz, while my homebrew switches exhibited about 32 dB. So, for a 1 kW switching function, the Dow-Key relay will present about 10 mW to the "off" outlet, while this homebrew unit would present about 790 mW. Performing a selection from multiple antennas running high power shouldn't be a problem. However, care should be taken where the "off" switch path goes to receiver inputs or other delicate circuits, such as when the switch to select one of two transceivers to work with a single antenna is used.

I used two 1½ × 4 × 4-inch steel electrical boxes to create a 3 × 4 × 4-inch enclosure — one box is for the relay and connector mountings, and the other is used as a top (see Figure 1). These boxes are readily available in the electrical department of big-box stores. Flip the second box on top of the bottom one, widen the holes in its tabs, and drill two new holes in the top to run two 1¾- or 2-inch screws through the top box and into the threaded tabs that are already part of the bottom box.

I covered the entire assembly with sticky copper tape for additional RF shielding. The challenge was drilling holes for the female coaxial connections because punch-out holes are already present. These can become detached when attempting to drill holes for the coax connectors. You can create the holes where you want them at the size for mounting screws by drilling a small hole before carefully using a reaming bit.

I used heavy 24 V power relays that can be purchased brand new but are also available unused from surplus outlets for less than $10. I've used these relays for antenna switching for decades. They're almost indestructible — even at full power — with one exception. I burned one once when I was trying to switch an open

Figure 1 — The two steel electrical boxes mounted one on top of the other. [Robert J. Zavrel, W7SX, photo]

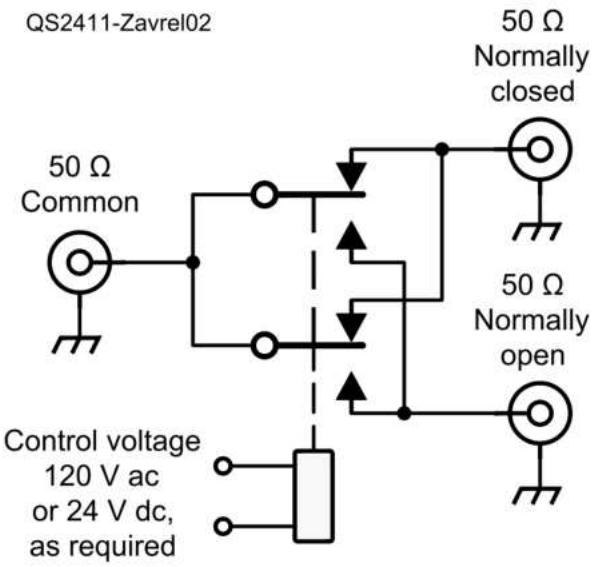

Figure 2 — Schematic of the parallel connection making an SPDT from a DPDT relay.

Figure 3 — Mounting of the relay and the SPDT wiring. [Robert J. Zavrel, W7SX, photo]

wire line at full power at a high-voltage point along the line. Using these relays at 50 Ω has never been a problem. Of course, clean the contacts and the plastic adjacent to the contacts to prevent arcing.

I did some rough calculations, and when I wired the two switched contacts and input contacts in parallel (see Figures 2 and 3), I got close to an impedance of 50 Ω for the completed assembly. During and after testing with a 50 Ω coaxial termination on both output connectors, I was delighted to see these input SWR results as a function of frequency:

- 1:1 SWR, 0 – 29 MHz
- 1.1:1 SWR, 29 – 37 MHz
- 1.2:1 SWR, 37 – 68 MHz
- 1.4:1 SWR, 144 MHz

Figure 3 shows how the components are mounted. The parallel connections of the common and switched terminals make one single-pole double-throw (SPDT) switch. It would also be possible to confiigure it as a double-pole double-throw (DPDT) coaxial switch, with possible small degradation of SWR. I found that #14 AWG solid bare-copper wire will handle full power.

Purchasing Supplies

Surplus relays are available at **www.surpluscenter.com**. I found imported relays for around $20, which appear to be similar to the Tyco standard relays on Amazon with several ac and dc operating voltages (**www.amazon.com/TWTADE-JQX-62F-2Z-Electronmagnetic-Voltage-110V%EF%BC%88You/dp/B07FCJFGL9?th=1**).

Watch the ARRL Lab show you how to build one of these remote antenna switches in the digital edition of *QST* (**www.arrl.org/qst**).

Robert J. Zavrel, W7SX, was first licensed in 1965 at age 14. He achieved DXCC in 1968 and has achieved DXCC Honor Roll (using only tree-supported wire antennas), CW DXCC Honor Roll, five-band DXCC, and five-band Worked All Zones (all 200). He's a Life Senior Member of IEEE and a member of the IEEE Antennas and Propagation Society, was a member of RF Design's Editorial Review Board (1985 – 1998), is an ARRL Life Member, and has been an ARRL volunteer technical advisor since 1984. Throughout the last 45 years, Robert has authored nearly 100 technical papers (professional and amateur radio-related) and authored ARRL's *Antenna Physics: An Introduction, 2nd Edition*.

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

An Antenna Remote-Control Tuning System

The authors describe an automatic antenna tuning system using a bias tee that includes a bi-directional 2.4 GHz port.

Nelson Sollenberger, KA2C, and Jeff Addleman, W3ADD

Bias tees power remote devices via coax shared with RF signals. For ham radio use, one bias tee is normally located in the shack to connect an RF signal and dc power to a common coaxial cable. A second bias tee is located with the remote equipment to separate the RF signal and dc power from the shared coax. A bias tee normally has two RF ports and one dc port. In this article, we describe a bias tee with four ports. It includes a 2.4 GHz Internet of Things (IoT) control port and a dc power port capable of 2.5 A, and it can handle HF RF power up to 1.5 kW.

All of the necessary documents for this project (schematics, Gerber files, software, etc.) can be found at **www.arrl.org/qst-in-depth**. These files can be used with the free *DipTrace* schematic and printed circuit board (PCB) tools at **www.diptrace.com**.

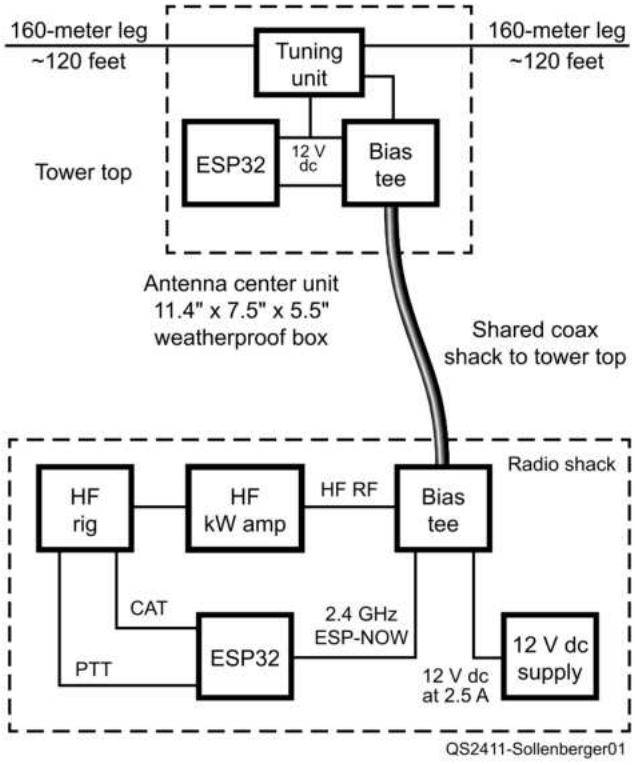

Figure 1 — Remote-control tuning system using a bias tee with a 2.4 GHz port.

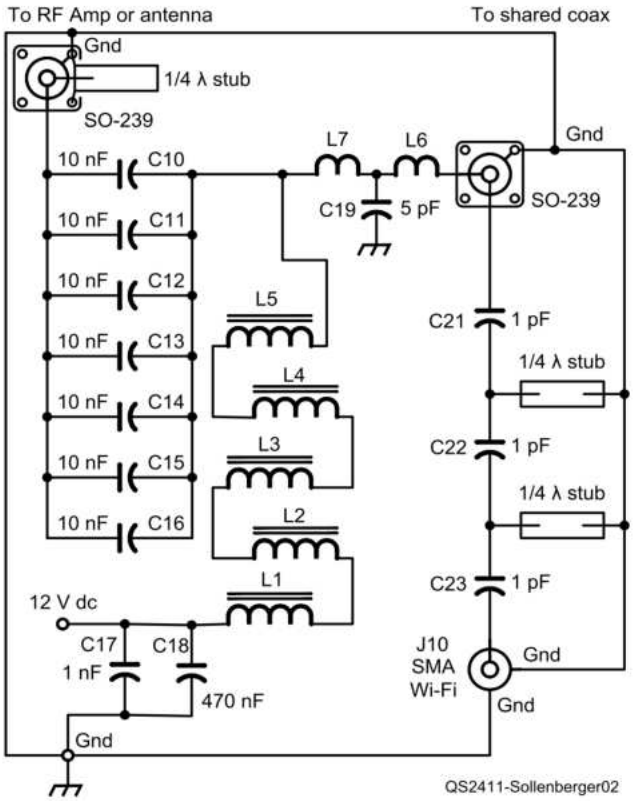

Figure 2 — Four-port bias tee schematic.

The block diagram in Figure 1 shows the four-port bias tee that connects the control signal to a 160-meter inverted V with integrated tuning at the antenna center unit. The bias tee's fourth port allows high-speed control and monitoring using a two-way 2.4 GHz IoT signal multiplexed on the shared coax. This provides a fixed, low-attenuation path without fading and interference. Low-latency and high-reliability two-way data transfer is supported using an ESP-NOW IoT protocol on ESP32 devices. ESP32 modules with a Wi-Fi or ESP-NOW 2.4 GHz I-PEX connector are available for about $11 as of press time (product number ESP32-DEVKITC-VIE). These modules support many general-purpose input/output (GPIO) pins that can be configured for a variety

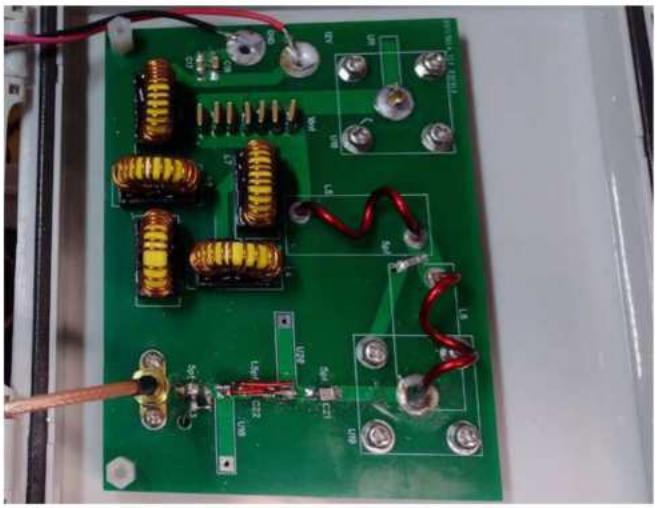

Figure 3 — The completed bias tee.

of uses, including general-purpose digital input/output, serial ports for I2C, universal asynchronous receiver/transmitter and other protocols, and analog-to-digital converter/digital-to-analog converter functions.

A Bias Tee Design with a 2.4 GHz Port

Figure 2 is the schematic of the four-port bias tee, and Figure 3 is a picture of the completed PCB. The bias tee fits on a 4.25-inch × 3.25-inch × 1.6-millimeter-thick two-sided FR4 PCB.

Seven parallel 0.01 µF 2 kV surface-mount device (SMD) capacitors isolate the dc from the RF signal. Each capacitor carries about 0.8 A RF at 1500 W. The measured loss of the bias tee below 60 MHz is typically less than 0.1 dB.

The dc power is coupled into the combined signal path through five Murata 32330C 33 µH 2.5 A toroid inductors in series. These inductors provide adequate blocking of a 1.5 kW RF signal. While the self-resonant frequency is about 28 MHz for each inductor, the reactance is still high at 60 MHz. There are dc bypass capacitors of 0.01 µF and 0.47 µF placed at the dc power connection to provide additional RF isolation. From 3 to 60 MHz, the high-power RF signal suppression on the dc path is 70 – 80 dB. On 160 meters, there is 60 – 65 dB of suppression.

Figure 4 — The control unit front panel.

The combined high-power RF signal and dc power are coupled to the shared SO-239 output through a two-stage filter, which blocks the 2.4 GHz control signal. This filter consists of two inductors in series, each two turns of ½-inch diameter × 1-inch-long #12 AWG solid copper wire. There is also a 5 pF shunt capacitor between the inductors. A ¼ λ 2.4 GHz open stub is placed on the high-power HF SO-239 connector; this stub shorts any leakage of the 2.4 GHz control signal, and it helps isolate the 2.4 GHz signal in the coax to the remote equipment. The 2.4 GHz open stub and 2.4 GHz blocking filter also block any 2.4 GHz noise from the rig or from the antenna to the shared coax, eliminating any possible interference with the control signals.

The 2.4 GHz control signal passes through three 1 pF 2 kV SMD capacitors in series, which blocks HF signals and dc power higher than 80 dB while passing 2.4 GHz signals with some modest attenuation. Two shorted ¼ λ 2.4 GHz stubs further block any HF at the 2.4 GHz port. Attenuation is more than 90 dB for signals less than 60 MHz, and it varies from 10 to 20 dB for signals that are more than 1 GHz. The 2.4 GHz attenuation is modest relative to the high path loss allowable for the control signal with ESP-NOW. An additional 20 dB of attenuation was added on this path using three SMD resistors at the SMA connector to give an overall 2.4 GHz path loss of about 80 dB; this results in about a –60 dBm signal level at the receiver. As the ESP32 device outputs +20 dBm at 2.4 GHz, and the ESP-NOW receiver sensitivity is about –97 dBm, the –60 dBm signal will support relatively long shared coaxial paths depending on the type of coax used. The dc voltage drop in the coax may be more limiting than the 2.4 GHz signal loss, though modern small form factor relays used for antenna switching and tuning typically require less than 50 mA.

ESP-NOW Control Signaling Using ESP32 Processor Modules

ESP32 modules can be programmed with the *Arduino IDE* software. The *Arduino IDE* version 1.8.19 was used with an Espressif Systems ESP32 version 1.0.4 board software package for the ESP32 hardware. Typically, one ESP32 module is placed in a control box in the radio shack with the 2.4 GHz control signal interfaced to the four-port bias tee. A second ESP32

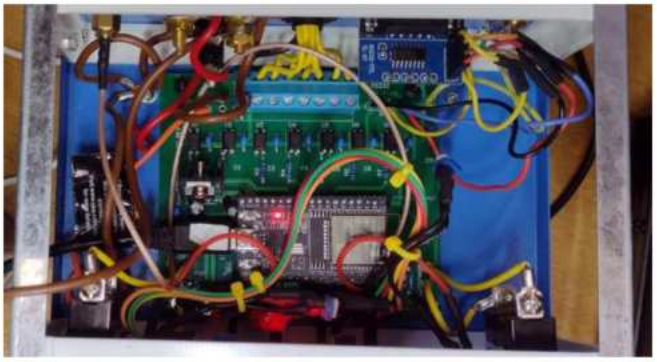

Figure 5 — The control unit interior.

Figure 6 — Part of the 160-meter center unit.

module is located in a remote unit also connected to a four-port bias tee. The control unit includes a user interface with pushbuttons, switches, LCD and LED indicators, a push-to-talk (PTT) connection, and an RS-232 interface for a CAT connection to the rig. The remote unit includes GPIO connections to opto-isolator drivers and relays.

This architecture can be easily expanded. The ESP32 remote processor can output up to 64 control signals by adding I2C serial-to-parallel ICs and relay drivers. Multi-band and multiple antenna operation can be supported by placing antenna switching and antenna tuning relays with the remote equipment. It is also possible for a single ESP32 controller in the radio shack to be interfaced to multiple bias tees and coaxial cables with a 2.4 GHz RF splitter, which allows control of multiple ESP32 remote processors and antenna systems using ESP-NOW in a star network arrangement.

A Remote-Tuned 160-Meter Inverted V

A 160-meter inverted **V** with integrated step tuning was built with relay switchable loading inductors placed in the antenna center unit. The system uses the rig's frequency CAT interface to control the antenna tuning based on pre-configured software tables in the control unit. The tuning tables were programmed during antenna construction and testing. PTT information prevents hot-switching of the tuner. Figures 4 and 5 show the front panel and interior of the control unit, respectively. Figure 6 is the partially assembled antenna center unit showing the tuning PCB and the bias tee PCB. Figure 7 shows the fully assembled antenna center unit.

Three different PCB designs are used: the four-port bias tee used at both ends of the shared coax, a single PCB design used for both the ESP32 control unit and the ESP32 remote unit, and a tuning PCB used in the antenna center unit.

The remote ESP32 outputs five GPIO control signals to opto-isolator relay drivers that control the relays for the 160-meter antenna step tuning system. The 7 µH, 3.5 µH, 1.75 µH, 0.88 µH, and 0.44 µH toroidal inductors in the center unit tuning PCB provide step tuning in a binary coded arrangement, with 32 steps to achieve finely spaced antenna resonant frequencies. The antenna resonates just below 2.0 MHz without any inductive loading. With all inductors inserted, the frequency is lowered to about 1.8 MHz. Two inductors are placed on one leg of the antenna, and three inductors are placed on the other antenna leg. It is not necessary to balance the loading exactly, as the antenna impedance changes slowly for small changes in the feed position with a center-fed antenna.

For the 160-meter inverted **V**, 11 frequency segments were selected to tune the antenna across the 160-meter band in test mode. That information was input to the tuning table in the control unit software. With the center of the inverted **V** at about 40 feet in height, the antenna's resistive impedance was about 20 Ω. An RF transformer on the tuning PCB, consisting of an FT240-43 toroid with an interleaved 8T primary and 5T secondary, provides impedance matching. This resulted in a standing wave ratio (SWR) of less than 1.5:1 across the band. However, depending on your antenna's particular characteristics, you may need to change the RF transformer.

ESP32 Software

The ESP32 control unit runs in three modes: **AUTOMATIC**, **MANUAL**, and **TEST**. The remote unit runs in just one mode. The **TEST** mode for the control unit is selected by holding in the **SELECT** button during power **ON**. A toggle switch can select **AUTOMATIC** or **MANUAL** mode.

In **MANUAL** mode, the user can select the antenna tuning settings from the pre-programmed table called **THREE_BAND_LOOKUP_TABLE_H**. This table is intended to support antenna tuning for up to three

Figure 7 — The complete center unit.

frequency bands. The user can step through the pre-programmed table with pushbuttons on the front panel of the control unit. The pre-programmed table contains a set of frequencies and corresponding relay settings for the remote unit. When a relay change is needed, the control unit sends a command to the remote unit using ESP-NOW over the shared coax.

In **AUTOMATIC** mode, the control unit monitors the rig's frequency using a CAT RS-232 interface, and it uses the pre-programmed table to determine when antenna tuning relay changes are needed. In both **AUTOMATIC** and **MANUAL** modes, the PTT signal is monitored by the control unit, and relay changes are blocked when PTT is active.

In **TEST** mode, the user can step through all possible antenna tuning relay settings using the pushbuttons on the front panel of the control unit. This mode is used during initial system setup to determine a table of frequencies and tuning relay settings for the **MANUAL** and **AUTOMATIC** modes. A good target is to add a new entry to the tuning table when the SWR reaches about 1.5. Once frequency and relay settings are determined in **TEST** mode, that table is transferred manually to the software table. The control unit code is then rebuilt with that table and downloaded into the control unit hardware.

The remote unit has only one mode in this example, and it is fairly simple. ESP-NOW continuously monitors for any incoming messages. When a change in relay information arrives, it is sent to the appropriate GPIOs with low delay. The remote unit also replies to incoming messages with an acknowledgment, so the control unit can detect any loss in the connection. If a loss of ESP-NOW communication occurs, the auto/manual LED will blink and the condition will be sent to the LCD. The remote ESP32 is lightly loaded in this example, and adding functions such as SWR monitoring and/or automatic tuning is possible.

Conclusion

A shared coax from the radio shack to an antenna system that supports up to 1.5 kW transmit power for the HF bands, 12 V dc (or higher) up to 2.5 A, and control signaling at 2.4 GHz using IoT devices is attractive. A high-performance, low-cost four-port bias tee can be built and used at both ends of the shared coax to multiplex and de-multiplex the signals. ESP32 devices were used to build control and remote units for a 160-meter inverted **V** with antenna-integrated tuning. ESP-NOW IoT protocol at 1 Mbps provides two-way data and supports low delay. The control unit monitors the rig's frequency and PTT to control the antenna tuning relays and prevent relay changes during transmit periods.

The authors would like to thank Phil Salas, AD5X, for his work on reviewing and editing this article.

See *QST* in Depth for More!

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

- ✓ Schematics, Gerber files, software, and other documents necessary for this project

All photos provided by the authors.

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

Product Review

QRP Labs QMX 5W QRP Transceiver

Reviewed by Andy Milluzzi, KK4LWR
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At the 2023 Four Days in May event before Dayton Hamvention, QRP Labs launched their new multi-mode transceiver kit: the QMX. The QMX is a QRP transceiver that can receive and transmit in CW and digital (FT8, etc.), and SSB in reception only. SSB transmit will be added in a future software release (maybe it will be available by the time this review is published). This kit is similar to their previous kits, providing all the parts, instructions, and software needed to construct. If you run into issues, the incredible community (and often the owner, Hans Summers, GØUPL, himself) is available on the QRP Labs Groups.io (**www.groups.io/g/QRPLabs**). Since its initial release, the kit has seen a new printed circuit board (PCB) revision, multiple software updates, and the availability of different band coverage (more on this later). Keep in mind that QRP Labs sells the QMX as a kit or a factory-assembled unit. I got the kit. QRP Labs released a new model at the 2024 Hamvention, the QMX+, which is a bigger unit covering more bands. While this unit is not covered in this review, it shares many similarities with the smaller QMX.

Bottom Line

The QRP Labs QMX is an affordable compact CW/digital 5 W QRP transceiver. It can receive SSB, and transmit will be added in a future update. The kit is fun to build, well documented, and not too difficult. Also available is a factory-assembled version.

Description

The QRP Labs QMX QRP transceiver is very small but rich in features. On the QRP Labs website (**www.qrp-labs.com**), there are three versions available with different band coverage. The first version covers 20, 30, 40, 60, and 80 meters. The second version covers 15, 17, 20, 30, 40, and 60 meters. The third version covers 10, 12, 15, 17, and 20 meters.

The unit measures 3.75 × 2.5 × 1 inches. The volume and tuning knobs are on top of the unit, and two push-buttons navigate the menu and settings.

On the left side of the unit you have two 3.5-millimeter ports — one to connect a key or paddle, and the other for external audio/headphones. On the same side, you will also find a 2.1-millimeter barrel connector for power.

On the right side, there is a USB-C connector for firmware updates, but it also serves as an audio sound card and CAT control when connected to a PC. The USB port makes this unit easy to use with a PC for digital modes. Beside the USB there is a 3.5-millimeter port for a push-to-talk (PTT) and BNC antenna connector.

The Kit

Out of the box, the kit contains every part you need, organized in a few bags. The first thing you'll notice is that the PCBs come in a single index card-sized panel that you need to separate. In addition, there are two bags, one that has connectors and electrical components, and another with hardware. There is also some magnet wire for winding toroids.

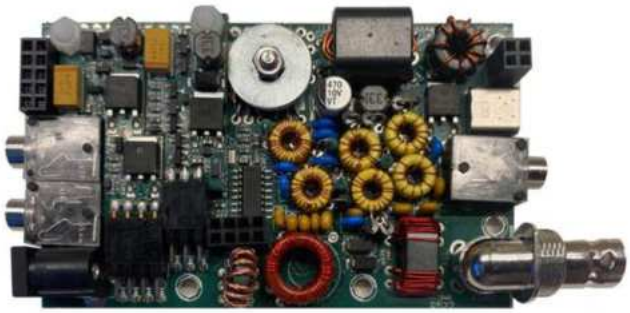


Figure 1 — The QMX main board assembly completed.

Figure 2 — The QMX with the display board installed.

As with any kit, before starting assembly you should read the instructions a couple of times. This is a large, complex kit, so you might miss something, even with a few reads. It is critical to take your time, enjoy the build, and pay attention to the details.

Assembly begins with breaking apart the PCBs and filing down any tabs that remain. After that, it's time to break out the soldering iron. It is worth mentioning that all surface-mount components are pre-populated, making this kit accessible. When you construct the kit, you will be soldering only through-hole components and interconnects.

The instructions are complete with photos and excellent descriptions. You'll solder the supplied diodes, capacitors, transistors, and inductors, before moving into toroid winding. Each step in the instructions contains a picture highlighting where a component goes as well as a table of the parts.

Winding toroids is probably the most time-consuming step. The keys to any good filter are tight windings and a little bit of tuning. This radio is no different; however, the toroids are tightly packed on the PCB. This means it can be difficult to space windings. There is one major decision to make when building one of the transformers: 9 V dc or 12 V dc input power. I chose the 12 V dc option, and it allows me to run at 9 V dc with reduced RF output.

The main board is finished off with the external connectors and board-to-board connections (see Figure 1). The QMX has several smaller PCBs that mount to the main board (see Figure 2). You'll first have to solder on the connections for the power supply boards. These connections involve mounting headers on the sides of the PCBs. The user interface and alphanumeric display PCBs are clever, requiring you to reuse cut-off leads from the capacitors and modify the encoders to be mounted from the bottom of the PCB. The boards display creativity while also showcasing thoughtful mechanical solutions.

The whole stack of PCBs mounts perfectly in the case. I did a test fit before powering on the radio, just to check clearances. Once I confirmed it fit in the case and I didn't need to adjust anything, I took it out and attempted to power it up. I wanted easy access in case of an issue. To my surprise, it powered up and was ready to be flashed.

Testing, Modifications, and Updates

The QMX is normally supplied without any preinstall firmware, so you must install the firmware after building the kit. Updating the firmware is easy — just put the QMX into **UPDATE** mode, connect the USB port to a PC (it will detect it as USB storage in File Explorer), and copy the new binary file onto the PCB. The QRP Labs team is continually updating the firmware. As I write this article, version 15 is just coming out. I've completed a number of updates at this point, and each one brings bug fixes and new features.

However, as an early adopter, there were a few issues that required some tinkering. I originally completed assembly of the board last summer, just after the instructions were initially posted. The community quickly discovered a hardware issue in the 20-meter filter, having very poor reception and power output. This required me to reconstruct one of the toroids. In addition, I needed to swap a couple of capacitors.

The change was not for the faint of heart. Getting the components to de-solder and fit back into the same hole was nearly impossible. I ended up having to be creative in my soldering to get a good connection. The toroid was fairly easy to do, but the capacitors required me to surface-mount them on the bottom of the board. As a seasoned engineer, I enjoyed the tweaking and appreciated the challenge. Hans had a great description of the change and also updated the instructions so that others do not encounter the issue. By the time this review is published, if you decide to buy a kit you will get the new version that is now a more mature product.

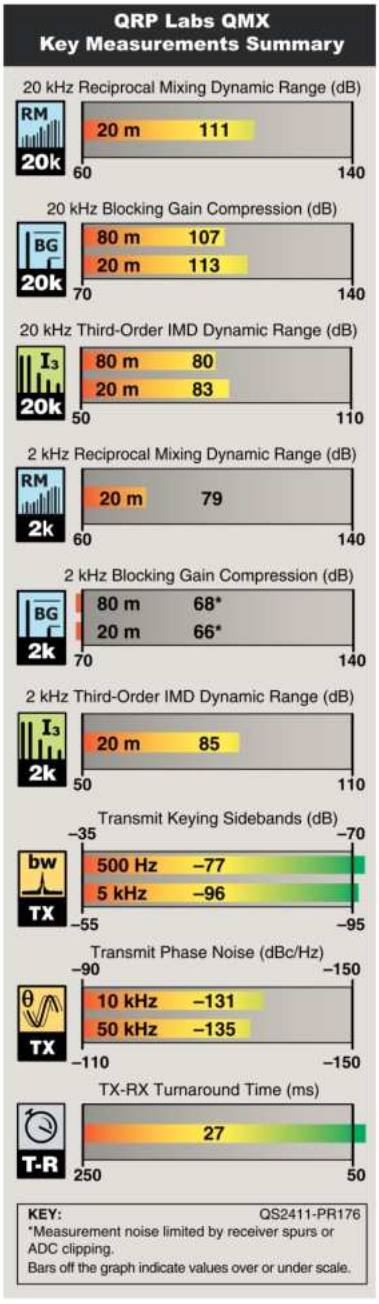


Table 1 — QRP Labs QMX 5W QRP Transceiver (Firmware Version 1_00_21)

Manufacturer's Specifications	Measured in the ARRL Lab
Frequency coverage: Receive: Not specified; Transmit: 3.5 – 4.0 MHz; 7 – 7.3 MHz; 5.332 – 5.405 MHz; 10.1 – 10.15 MHz; 14 – 14.35 MHz.	Receive: 2.989 – 17.95 MHz continuous; Transmit: As specified.
Power requirement: 6 – 12 V dc; Transmit: 700 mA; Receive: 80 mA.	At 12 V dc: Transmit: 0.716 A; Receive: 100 mA (no signal, max. volume, LCD backlight on); 93 mA (backlight off).
Modes of operation: CW, FSK digital.	As specified.

Receiver

Receiver Dynamic Testing[1]

CW sensitivity: Noise floor (MDS): Not specified.	Noise floor (MDS): 3.52 MHz –121 dBm (0.19 µV) 5.358.5 MHz –127 dBm (0.10 µV) 7.02 MHz –131 dBm (0.06 µV) 10.12 MHz –128 dBm (0.09 µV) 14.02 MHz –124 dBm (0.14 µV)
Blocking gain compression dynamic range: Not specified.	Blocking gain compression dynamic range: *Band* / *20 kHz Offset* / *5/2 kHz Offset* 3.5 MHz / 107 dB / 101/68 dB[2] 14 MHz / 113 dB / 113/66 dB[2]
Reciprocal mixing dynamic range: Not specified.	3.5 MHz, 20/5/2 kHz offset: 111/111/85 dB; 14 MHz, 20/5/2 kHz offset: 113/101/79 dB.

ARRL Lab Two-Tone IMD Testing

Band	*Spacing*	*Measured IMD Level*	*Measured Input Level*	*IMD DR*
3.5 MHz	20 kHz	–121 dBm	–41 dBm	80 dB
14 MHz	20 kHz	–124 dBm	–41 dBm	83 dB
14 MHz	5 kHz	–124 dBm	–40 dBm	84 dB
14 MHz	2 kHz	–124 dBm	–39 dBm	85 dB

Second-order intercept point: Not specified.	14 MHz, +96 dBm.
S-meter sensitivity: Not specified.	For S-9 signal: –73 dBm (50 µV).
Receiver processing delay time: Not specified.	16 ms.
Spurious and image rejection: IF rejection: Not specified.	14 MHz, 118 dB.
Image rejection: Not specified.	102 dB.
Image rejection: Not specified.	71 dB.
Audio output: 32 Ω earphones only, not suitable for external speaker.	Not tested.
IF/audio response: 300 Hz.	309 Hz.

Transmitter

Transmitter Dynamic Testing

Power output: 5 W @ 12 V dc.	3.5 MHz; 6.15 W, 5.358 MHz; 6.97 W, 7.15 MHz; 5.53 W, 10.12 MHz; 5.80 W, 14.20 MHz; 4.85 W.
Spurious and harmonic suppression: Not specified.	5.358 MHz (worst case), –45 dBc; 14 MHz; –63 dBc. Meets the FCC limits for spurious emissions.
CW keyer range: Not specified.	Tested at 5 – 86 WPM, default = 12 WPM; iambic modes A and B.
CW keying characteristics: Not specified.	See Figures A and B.
Transmit-receive turnaround time (key release to 50% audio output): Not specified.	27 ms.
Transmit phase noise: Not specified.	See Figure C.
Size (height, width, depth):	1.0 × 3.8 × 2.5 inches, not including protrusions.
Weight:	0.5 pound.

[1] Measurement results were the same between VFO A and B unless otherwise noted.
[2] Measurements were noise limited due to receiver spurs or ADC clipping.

To aid in testing, the QMX offers a CAT interface with hardware tests. This is typically the first thing you do after assembly. Using a dummy load, you can test transmitted power and filter performance. The graphs are not super clear but work well enough to get things into a good state.

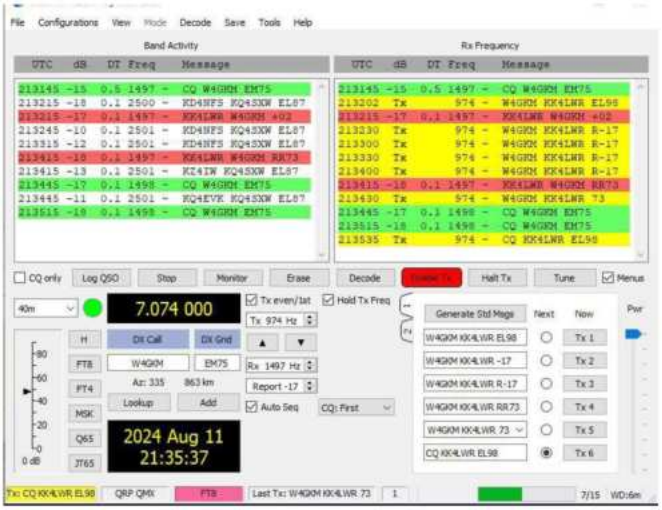


Figure 3 — The QMX in digital FT8 using *WSJT-X* software.

Updates to the QMX are frequent, usually one or two per month. The most recent updates have focused on lowering latency in the keyer and fixing some bugs. QRP Labs is doing it right with the support, and the community on Groups.io is constructive. The big update still to come is enabling SSB in transmit. One of the construction steps is to solder on a microphone, so the hardware is ready. Hans is actively working on the feature; however, there are already plenty of other features to keep you busy on the air until SSB is complete.

My plans for the QMX include operating Parks on the Air (POTA), and I needed it to work with my LiFePO4 battery. Because the battery is typically 14 V, it needs to be lowered to 12 V. The extra voltage would result in additional RF output and could overheat the final transistors. The good news is the QMX requires less than an amp at 12 V, and I was able to make a cable with a couple of power diodes to reduce the voltage. For the manufacturer's specifications and ARRL Lab measurements, see Table 1.

On the Air

Getting on the air is easy with the QMX. After doing the basic tests into the dummy load, I connected the QMX to my fan dipole and booted up *WSJT-X*. As soon as the software was open, I was able to quickly connect using the QDX profile that existed. A minute later, I had a new QSO in the log on 40 meters (see Figure 3). The process was quick and painless. I spent more time digging through my adapters bin to find the ¼- to ⅛-inch adapter for my key than I did making a CW contact — with a 599 signal, of course.

Due to the early success I had with the radio on my bench, I was confident to take it portable. I recently traveled to Italy for a few weeks for work and activated POTA at I-0873, Ex Cave di Casale in Vicenza. I easily made enough contacts and had a blast showing off the small radio. The QMX packs a lot into a small package. It looks professional, and I had no issues traveling with it. I found 30-meter FT8 really successful during the activation.

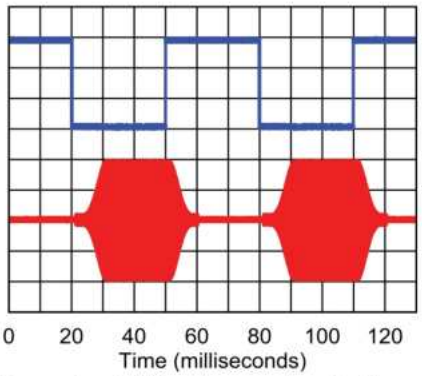


Figure A — CW keying waveform for the QRP Labs QMX showing the first two dits using external keying. Equivalent keying speed is 40 WPM. The upper trace is the key closure; the lower trace is the RF envelope. Horizontal divisions are 10 ms. The transceiver was being operated at 5 W output on the 14 MHz band, using semi QSK set to OFF. The first-dit rise time is 4.4 ms; the fall time is 4 ms. The second-dit rise time is 4.4 ms; the fall time is 4 ms. The first-dit on delay is 5 ms; the off delay is 5.7 ms. The second-dit on delay is 5.3 ms; the off delay is 5.6 ms.

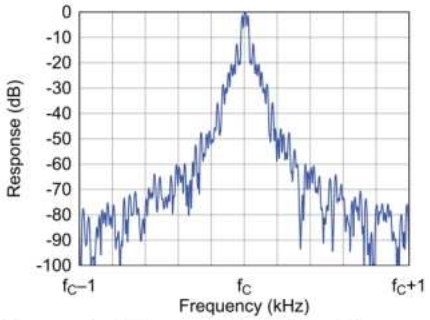


Figure B — The spectral display of the QRP Labs QMX transmitter during keying sideband testing. Equivalent keying speed is 40 WPM using external keying. Spectrum analyzer resolution bandwidth is 10 Hz, and the sweep time is 30 seconds. The transmitter was being operated at 5 W PEP output on the 14 MHz band, and this plot shows the transmitter output ±1 kHz from the carrier. The reference level is 0 dBc, and the vertical scale is in dB.

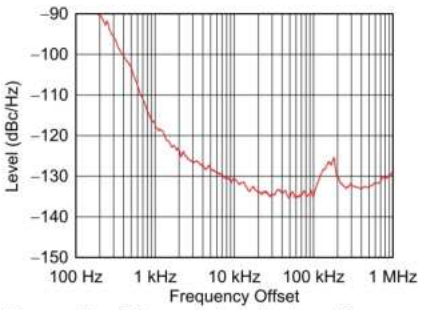


Figure C — The spectral display of the QRP Labs QMX transmitter output during composite-noise testing. Power output is 5 W on the 14 MHz band. The carrier, off the left edge of the plot, is not shown. This plot shows phase noise 100 Hz to 1 MHz from the carrier. The reference level is –90 dBc/Hz, and the vertical scale is 10 dB per division.

Having used the QMX on several activations, it has become my go-to POTA kit. I've paired the radio with a simple wire antenna, small key, and 6 Ah battery. The whole package is smaller than my lunch box and lives in my car. It's small, compact, and lightweight, allowing me to hike a bit before setting up a station.

When running on a battery, I've successfully used the radio for more than 8 hours. The radio maintains its output for almost the entire operation. The filter performance on each band varies a little, but in practice it was not a problem. I was able to work almost everyone I heard, and I'm sure with a better antenna, I could work even more.

Final Thoughts

The QMX is an impressive and fun little radio. The compact size makes it an effective tool for getting on the air when you need a compact and portable solution. The kit is a fun and challenging build that can be managed by spreading it over a few days or a week. The frequent updates and enthusiastic community make it even more fun.

Like most hams, I have several HF radios. The QMX sees the most activity due to its size and frequent updates. It is always accessible and great for a quick POTA activation or even just some CW or FT8 QSOs over lunch. I keep a BNC-to-SO-239 connector handy in case I want to use a different antenna.

Manufacturer: QRP Labs, England, **www.qrp-labs.com**. Price: kit, $102.47; enclosure (3D printer file also available for download), add $20; factory-assembled unit, add $50; a GPS receiver module is also available for an extra $23.

Lab Notes

The astute *QST* Product Review reader may have noticed that there are some things different in the way the ARRL Lab measured the CW keying waveform and sidebands of the QMX. Historically, these tests have been performed with a keying speed of 60 WPM. Per the PARIS standard, this equates to 20 ms key-on and 20 ms key-off durations. During exploration and discussions by the ARRL Clean Signal Initiative (CSI) Working Group of the CW bandwidth mask to be implemented, it was decided that a keying speed for the above tests would be better performed at 40 WPM or 30 ms key durations. The change was voted into the CSI standard because it better represented the highest practical speed at which most CW operators would operate using full break-in (QSK). The 40 WPM keying speed also proved through experimentation to demonstrate the limits of the transmitted bandwidth CSI would like to see manufacturers strive for. Also, in the past, the keying sideband test was presented in a graph displaying the center frequency ± 5 kHz. CSI has decided it would be better to display these results (for most rigs) at a ± 1 kHz resolution. This will allow one to better see if a transmitter meets or exceeds the CSI mask. Although the CSI program has not officially rolled out yet (it's coming soon, I promise!), I felt it was appropriate to make these changes for this and all CW-capable rigs going forward. — *George Spatta, W1GKS, ARRL Lab Manager*

Chameleon PRV POTA Antenna (Heavy Kit)

Reviewed by John Leonardelli, VE3IPS
ve3ips@gmail.com

As a dedicated portable radio operator, I recently had the opportunity to field-test the Chameleon PRV POTA Antenna (Heavy Kit). This antenna kit promises to be a versatile and robust option for Parks on the Air (POTA) activations, and I was eager to see how it performed in real-world conditions. After several outings, I can confidently say that this kit is an ideal addition to any portable operator's tool kit.

Table 2
Chameleon CHA PRV Antenna

Manufacturer's advertised specifications (not tested in the ARRL Lab)

Frequency coverage:	2 – 40 meters, with the SS58
(V)SWR:	Not specified
Maximum power rating:	500 W SSB, 300 W CW, 200 W data
Connector:	UHF female, SO-239
Antenna dimensions:	Coil diameter = 1¼ inches MCC length collapsed = 12½ inches MCC length extended = 19½ inches
Materials:	Anodized aluminum OD green, white Delrin, stainless-steel and silver-plated copper wire
Coil base:	⅜ × 24 male threaded stud
Whip receptacle:	⅜ × 24 female
Antenna package weight:	0.94 pound

Lately, there have been various "slider coil" antennas on the market that use a tuning sleeve or PVC ring for impedance matching. They provide a base-loaded or center-loaded vertical design at various price points depending on the build and quality of materials. Deployment is easier and faster as the antenna resonance is done by the slider using fixed counterpoise lengths.

These short antennas are typically referred to as "compromise" antennas, as their physical length is shorter than the standard ¼-wave reference length but can be deployed in areas where wires are not allowed in trees (e.g., state parks and other temporary locations). With its multiple mounting options, deployment can be done anywhere and by different mounting schemes, and the only compromise is that its signal efficiency will be an S-unit or two lower. Operating at 5 or 20 W with these antennas has always provided me with plenty of contacts, park activations in tight spots, and overseas DX.

I already have an older slider-style antenna that was built poorly and was wobbly, and I also have a "built like a tank" antenna, so why did I need another? My philosophy is that antennas are like tools, and you need various tools in your toolbox to get the job done. The PRV covers 40 to 6 meters with the supplied whip, and is lighter and has a smaller form factor (12½ inches when collapsed) than other antennas I have, making it useful in many ways. Packability is one feature I like over the longer length of bulkier and heavier antennas (see Table 2 for further specifications).

Bottom Line

The Chameleon PRV POTA Antenna (Heavy Kit) is a great choice for portable radio operators looking for a reliable and high-performance antenna that will enhance your portable operations.

The Chameleon PRV antenna also is a perfect complement to multi-band/multi-mode QRP and mobile transceivers that do not have a built-in antenna tuner. I can choose to leave the external antenna tuner at home as it's not needed, saving some weight.

Description

The antenna is packaged with the multi-configuration coil (CHA MCC) as the core component, with additional items in the Light or Heavy Kit, providing a solution right out of the box. In fact, you can receive your new antenna, open the box at the park, and operate with the PRV by just adding a radio and a battery. All cables and fittings are included.

The package provides a complete solution that is offered three ways: 1. the CHA MCC standalone accessory, 2. the CHA PRV SOTA (Light Kit), and 3. the CHA PRV POTA (Heavy Kit). More details about the different packages can be found on the manufacturer's website (**www.chameleonantenna.com**).

I will review my operations with the POTA Antenna (Heavy Kit), which offers two additional components compared to the Light version.

Design and Build Quality

First off, construction is top notch. Chameleon has a long-standing reputation for making high-quality products that are used by military and public safety agencies. This antenna is made in the US, of quality components with a mix of lightweight aluminum and sturdy composite materials (see the lead photo). The multi-configuration coil is well built and designed to handle higher power than balun-based antennas. I find that the construction of the coil and whip would support those claims. Set up in various types of terrain, including rocky outcrops (see Figure 4) and dense forested areas, the antenna maintained its integrity and performance.

The documentation guide is excellent. It goes into great detail on how to tune and adjust the antenna for several configurations.

The CHA PRV antenna, using the CHA MCC, serves as the kit's foundation. This base-loaded inductance coil features a sliding tuning tube that is well engineered. The coil is constructed out of an anodized aluminum outer body with a Delrin center and stainless-steel and silver-clad copper wire. The coil itself is fairly lightweight, weighing just under 16 ounces, and fully collapsed, it is 12½ inches long. The coil diameter is 1¼ inches. At the base of the coil is a ⅜ × 24 male threaded stud, which is grounded to the coax

connector. There is an SO-239 (UHF female) connection for the coax. A plastic locking knob is used to hand-tighten the tuning tube in place. This will keep it from slipping after you have a match. And finally, a ⅜ × 24 female receptacle is used for a whip. The choice of whip you use will determine the frequency range of the coil. Antenna inductance increases or decreases along its length. This antenna is fine for mobile stationary use, and I do not recommend using it while driving. I noticed that the tuning tube can slide right off the top of the coil, so caution is needed, as I almost lost the top components while deploying on a rocky outcrop at a river's edge.

The counterpoise puck screws onto the MCC base unit and offers six counterpoise connections with male banana plugs. This is an effective connectivity method, making for quick deployments. I won't lose a butterfly nut ever again using this puck. This allows more copper on the ground, improving performance over single-wire systems.

The counterpoise is four 12½-foot wires, each on its own line winder with a male banana plug.

The variable length counterpoise (VLC) is a nice addition that offers 34 feet of wire on a scuba line winder with a banana plug. This is used in elevated counterpoise scenarios on the lower bands.

Figure 4 — The Chameleon PRV installed on a rock.

The telescopic whip is 17½ inches collapsed and 58 inches extended. Its compact form factor fits into any backpack or side pocket. You can also add a longer whip antenna from the Chameleon MPAS kit.

Several mounting options are available. The included spike mount for ground mounting is heavy and solid. The new included universal clamp mount is perfect for picnic tables and flat surfaces. This is a strong and heavy clamp with a big tightening knob. It offers a ground lug as well as the ⅜"-24 stud. It provided a strong grip, but if being used on a balcony or railing you need to use a safety strap on the whip, coil body, and clamp, especially in high-rise locations. The jaw clamp accessory is useful for installing on round surfaces such as balcony rails, pipes, and poles.

I was anxious to try out the new expertly machined camera tripod adapter that offers the stud mount with a ¼"-20 thread. I can now use any camera tripod to deploy the antenna on a sidewalk or in a parking lot.

There are also two 12-inch extender rods that can be combined to lengthen the antenna or raise the MCC component.

The system is extensible, and you can use it with the 58-inch whip, but I believe it shines when you combine it with either the 9-foot CHA MIL WHIP 2.0 or the longer 17-foot SS17 stainless-steel collapsible whip.

Here's how I used the PRV on various outdoor radio adventures.

Ground-Mounted Scenario

I used a rubber mallet to drive the spike mount into the ground, and screwed on the MCC with the puck to the spike. I spread out the four radials, and installed and extended the whip.

I slid the tuning tube up or down for maximum noise, and then checked the SWR using low power. I adjusted the slider as needed for the best SWR. I found this to be very fast and easy, and often I had a 2:1 SWR on the first try.

Like all short ground-mounted verticals, the ground conditions will affect the SWR and thus the required inductance for an acceptable match. I did notice detuning when I tried to make adjustments on 20 meters.

The included 12-foot coaxial cable has a built-in RF choke to fend off common-mode current issues.

This low-profile setup worked great on the bands above 14 MHz. I found the bandwidth pretty much covered the 20-meter band without retuning. I also

Figure 5 — The Chameleon PRV installed on a balcony railing.

tried it on 40 meters using the longer counterpoise laid on the ground. I checked into the local nets and was satisfied with the signal report considering it's a short antenna on these bands. The usable bandwidth on 40 meters was just over 150 kHz. No need to retune if you're chasing contacts in the general bands.

The antenna was typically 1 to 2 S-units lower in signal strength reports and at times comparable to a full-size quarter-wave antenna. I had no problems making contacts and getting the 10 contacts logged for a park activation.

Tripod-Mounted Scenario

I have heard of POTA activators being warned by park staff that hanging wires in trees or even hammering a spike into the ground is illegal. This happened to me at Rocky Mountain Park in Colorado. A tripod-mounted deployment is ideal in this regard.

Elevated counterpoise wires improve antenna performance by eliminating some of the ground losses when ground mounted. I used the four counterpoise wires with the supplied stakes. I also deployed it with just the longer wire using the VLC winder. I pointed the longer wire toward Europe, as research indicates some slight directionality that might be helpful.

I used a Manfrotto lightweight portable tripod with extendable and adjustable legs. You can splay the legs out, and it will easily support the coil and the PRV standard whip in most weather conditions. It will also support the 17-foot whip as long as it is not windy. If there is anything more than a gentle breeze, you run the risk of the tripod tipping over. Sandbags or weights on the legs will help prevent that.

The tripod camera mounting plate has a ¼-inch male thread. These are standard tripod threads, and the PRV kit comes with a ¼- to ⅜-inch fine thread adapter. You will use this adapter with the Chameleon tripod or any other tripod you wish to use.

Feel free to try other scenarios. I have an 8-foot-long carbon fiber selfie stick with a ¼-inch male thread on the top. I could use this instead of the tripod with the adapter.

Tabletop Scenario

This scenario using the universal mounting adapter (UMA) allows easy table mounting or other flat surfaces. You can continue to use the four counterpoise wires or just the long one, depending on the clamp location. For a deployment on a wooden railing using the UMA, see Figure 5.

The clamp is very strong and will support longer and heavier whips. An easy option is to use the longer telescopic whips to increase the radiating length.

Extender Rod Scenario

Chameleon always publishes excellent user guides, but there wasn't a lot of information available on this accessory. They are 12 inches long and can be combined for a 2-foot length.

I tried the ground mounting and tripod mounting with adding the extender rods to extend the height of the coil from ground. This doesn't make it a center-loaded design, as the rods are on the ground side of the antenna, but getting the coil above an obstacle would be useful.

You could add the extender rods to the antenna side and increase the antenna radiating length from 58 to 82 inches. This configuration moves the slider coil toward the center of the antenna.

MPAS Add-On Scenario

As a long-time owner of various Chameleon antenna models, including the MPAS antenna, the package I chose also would allow me to use this antenna as

an add-on to my existing system. Chameleon has expanded its antenna product line with various items that can be mixed and matched. This would allow me increased flexibility and versatility to deploy any type or style of antenna based on any operating restrictions I may have. I figured it would be cheaper to buy a package as opposed to the individual components. The Chameleon balun is not used with the MCC. However, a choke is included in the supplied coaxial cable. The PRV kit on its own is competent and a reliable vertical antenna.

Adding the new components to the MPAS 2.0 (or earlier version) increases the deployment flexibility and possible antenna configurations. There is room inside the MPAS backpack for the PRV, but I also found a Donner drumstick carry bag to be ideal for standalone use. The two kits combined allow for cross-functionality in antenna experimentation.

Backpack Scenario

The shorter telescopic whip lends itself to backpack and field pack operations. Its whip is sturdy but can be damaged by low-hanging branches and obstacles while hiking. I hiked open-space trails with an FT-891 mounted on an Alice Pack and dragged two trailing counterpoises of a flexible #18 wire behind me. I found the extender rods useful in raising the MCC above my pack frame. I also used the antenna with a backpack using a PVC tube with a stud mount and using the Molle straps to hold it all together (see Figure 6).

Figure 6 — The Chameleon PRV mount on a backpack.

Longer Radiating Whips Scenario

The antenna allows modularity and cross-functionality with other antenna components using the ⅜"-24 stud mount. The provided SS58 whip offers a lower operating profile and works well on the 20-meter band and above. Low-band operators will find better performance using the 9- or 17-foot Chameleon whips. You can also use the VLC counterpoise as a radiator in a pinch. I coiled the wire to offer a 32-foot length for 40 meters, and with the slider at minimum inductance I was able to get a good match.

Performance

Performance-wise, the PRV Antenna Kit exceeded my expectations. During my field tests, the antenna consistently provided expected signal reception and transmission across various HF bands. The versatility of the sliding tuning tube system allows for fine-tuning and optimizing the antenna for different frequencies, which is a boon for operators who need to work across multiple bands. Whether operating on the 20- or 40-meter POTA money bands, the PRV demonstrated excellent SWR readings, ensuring efficient power transfer and minimal loss.

Portability

Portability is where this kit truly shines. The entire kit packs into a compact, lightweight package that is easy to transport and fits easily into a backpack alongside my radio and other gear. This makes it ideal for portable operations such as SOTA or POTA. The weight is balanced well enough that it doesn't become a burden during longer hikes to remote activation sites. This would be a great antenna for international travel, as it fits in a standard carry-on bag.

Ease of Use

Setting up the antenna kit is straightforward, thanks to the clear instructions and intuitive design. The quick-connect system for the various components simplifies the assembly process, even for those new to HF portable operations. The versatility of the mounting options, including ground spikes and flat surface and tripod mounts, adds to the ease of deployment in diverse environments.

Value

The Chameleon PRV POTA Antenna (Heavy Kit) represents excellent value for the money. While it may

be priced higher than some entry-level options, the performance, build quality, and ease of use justify the investment. For serious portable operators, this kit offers reliability and versatility that are hard to match.

Improvements

The line winders are fantastic, but for the short wire length a smaller line winder would be ideal if it was lighter and easier to pack.

A BNC connector on the MCC as an option would also be useful for those standardizing on BNC connectors.

Chameleon appears to be using a new narrower-gauge wire for the B radial, and I prefer the older #16-gauge Kevlar PFTE wire they use, as it is more rugged (though heavier) and is less prone to damage out in the field. For this price point, a better wire should be supplied. The thinner wire works very well on the scuba line winder due to its smaller gauge. I like to use larger-gauge wires for most of my deployments that need counterpoise wires laid on the ground.

The supplied 12-foot coax is too short. A 25-foot cable should be included, as you are basically operating within the antenna counterpoise radius.

I would like to see the kit include a carry case. There are multiple bits that will get lost. Chameleon offers a zippered pouch that I use to keep everything organized.

Conclusion

The Chameleon PRV POTA Antenna (Heavy Kit) is a top-tier choice for portable radio operators seeking a reliable, versatile, and easy-to-use antenna. Its robust construction, excellent performance across multiple HF bands, and exceptional portability make it a standout option in the market. Whether you're an experienced operator or new to portable HF, the Chameleon PRV will enhance your radio adventures. I think the PRV is at its best when you use it with the optional longer telescopic whips from Chameleon. I had no problems putting out great signals with QRP power using the short and long whips in various configurations.

Manufacturer: Chameleon Antenna, 155 Glendale Ave. S-17B, Sparks, Nevada 89431, **www.chameleonantenna.com**. Price: CHA MCC, $350; CHA PRV SOTA (Light Kit), $569; CHA PRV POTA (Heavy Kit), $674.

LDG AAF5 Analog Audio Filter

Reviewed by Paul Danzer, N1II
n1ii@arrl.net

Hams and other users of the radio spectrum have always tried to get better performance by filtering out noise and unwanted signals while passing through the wanted signal. In addition to performance, ease of installation has been very important. For that reason, a strictly analog filter, inserted between the receiver and the speaker or headphones, has been popular. As an example, the 1975 ARRL *Radio Amateur's Handbook* had such a filter. The unit reviewed here is a more recent design, taking advantage of effective filtering with a pleasant-sounding output. It lacks the harshness that digital sampling units often produce.

Bottom Line

The LDG AAF5 analog audio filter works well and provides high- and low-frequency controls that can be set to match the situation.

Packaged in an attractive 6 × 3.5 × 1.5-inch enclosure (see the lead photo), it matches many commercial receivers and transceivers. The delivered package includes the 1.5-pound filter unit, a 12 V dc 1.5 A (18 W rated total) wall-wart power supply, and a 3-foot audio patch cable with male 3.5-millimeter (⅛-inch) stereo male plugs on each end. Included is a three-page (8.5 × 11-inch) set of instructions. These sheets will tell you everything you might want to know about the unit, except perhaps some numerical performance numbers, which are also not included in any of the sales listings or literature.

Table 3 — LDG AAF5 Analog Audio Filter

Manufacturer's Audio Specifications (not tested in the ARRL Lab)	
Headphone output power:	150 mW maximum into 8 – 200 Ω
Headphone output impedance:	8 – 200 Ω
Speaker output power:	Greater than 5 W into 8 Ω
Speaker output impedance:	4 – 8 Ω
Filter input impedance:	10 kΩ

Installation

Installation should not take more than a few minutes, as shown by the photo of the rear panel in Figure 7. Assuming the receiver or transceiver uses the standard 3.5-millimeter audio output jack, one end of the supplied audio patch cable plugs into the speaker output of the receiver and the other end into the **INPUT** jack (shown in Figure 7). The loudspeaker connecting line that was removed from the receiver plugs into the jack labeled **5W SPEAKER**. Finally, the wall-wart power supply cable plugs into the socket labeled **7-18VDC 1A POWER**. This completes the installation.

As a convenience, if you want to supply audio to a recorder or other audio unit, a standard RCA jack labeled **LINE OUT** provides a line-level output. The front panel has a jack for headphones; inserting a plug here cuts off the speaker and routes all output to this jack. The installation sheets supply the numbers (shown in Table 3).

Figure 7 — The LDG AAF5 rear panel.

What Makes Up the Filter

The filter can be looked at as a variable band-pass filter. At one end (the low end of the audio frequencies of interest) is a high-pass filter. The manufacturer calls it a **LO CUT** unit, which can be adjusted to a selected frequency of 50 to 500 Hz. At the other end, the low-pass filter is called a **HI CUT** filter, and is adjustable from 500 to 10,000 Hz. Thus, if you set the low end of a band pass to a value in the 50 to 500 Hz range and set the other end to a value in the 50 to 10,000 Hz range, the band pass is therefore between the two values you have set.

Figure 8 — The LDG AAF5 internal printed circuit board.

Figure 8 shows the internal printed board. Surface-mount technology components are used with one microcontroller — the 14-pin dip at the lower right side of the board. The part number (PIC 16F 25324) marked on the microcontroller is listed as having 0.5 KB of ram and 7 KB of flash memory.

How to Set the Controls

The front panel in the lead photo shows a headphone jack on the far left, followed by a gain control (marked **LEVEL**) for headphones or a speaker. The two filter settings are shown in the instruction sheets. Table 4 shows the instruction sheets' suggested values for a different mode.

Notice that both knobs are roughly calibrated, and the **HI CUT** is also marked with corresponding mode recommendations. As a further guide, the table drawn in the instructions includes another column with the knob arrow positions drawn to the recommended initial settings.

Listening on the Air

The catalog listing said that received audio would sound better with an analog filter than with a digital filter. I can imagine this, but I wanted to test it. A good place to test this seemed to be the upper end of 75 meters, where AM ragchewing can be found. My IC-7300 RX bandwidth was set to AM and as wide as possible, and the filter upper cutoff frequency was set to about 7,500 Hz — it is hard to define "better," but often I could guess if a station was using a rig such as my Icom IC-7300 or an old strictly AM rig to transmit AM.

Table 4 — LDG AAF5 Filter Settings

Manufacturer's Suggested Filter Settings		
Mode	*LO (Hz)*	*HI (Hz)*
CW:	50	700
SSB:	350	3,000
Amateur AM:	50	5,000
Broadcast AM:	50	10,000

I tried the filter during ARRL Field Day. Did it work? Yes. Did it help? No. There were just too many activities on the air. I have to imagine how much incidental mixing, as well as splatter, occurred due to incorrect transmitter settings by ops using unfamiliar rigs. That is totally normal with audio filters.

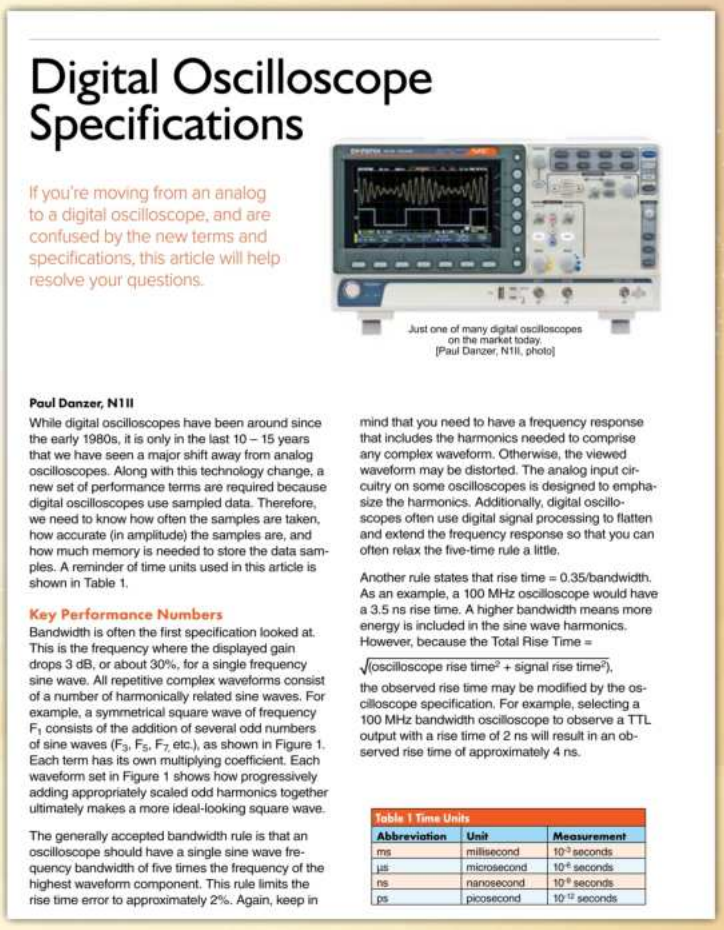
Before and after Field Day, under normal conditions, the filter was effective. One interesting effect was that you could cut the high end — not to get rid of QRM but just to reduce the noise bandwidth.

As with any filter system, there is a learning curve. After some practice, if the signal you want to listen to and the QRM remain fairly constant, the filter is very effective.

In Summary

Installation of an external connected filter is very simple. The manufacturer suggests the filter can "effectively reduce background noise by more than 10 dB, improve the signal-to-noise ratio by 20 dB, and increase the overall signal readability on the RS and RST scales." Verifying these numbers when connected to an antenna, rather than lab test instruments, is difficult. But when the high- and low-frequency controls are set to match the situation, the filter works well. As an analog-only design, when tuned to a single station, the resultant audio out is certainly cleaner than it is with simple digital filters.

Manufacturer: LDG Electronics, 1445 Parran Rd., St. Leonard, MD 20685, **www.ldgelectronics.com**. Price: $129.



Digital Oscilloscope Specifications

If you're moving from an analog to a digital oscilloscope, and are confused by the new terms and specifications, this article will help resolve your questions.

Just one of many digital oscilloscopes on the market today. [Paul Danzer, N1II, photo]

Paul Danzer, N1II

While digital oscilloscopes have been around since the early 1980s, it is only in the last 10 – 15 years that we have seen a major shift away from analog oscilloscopes. Along with this technology change, a new set of performance terms are required because digital oscilloscopes use sampled data. Therefore, we need to know how often the samples are taken, how accurate (in amplitude) the samples are, and how much memory is needed to store the data samples. A reminder of time units used in this article is shown in Table 1.

Key Performance Numbers

Bandwidth is often the first specification looked at. This is the frequency where the displayed gain drops 3 dB, or about 30%, for a single frequency sine wave. All repetitive complex waveforms consist of a number of harmonically related sine waves. For example, a symmetrical square wave of frequency F_1 consists of the addition of several odd numbers of sine waves (F_3, F_5, F_7 etc.), as shown in Figure 1. Each term has its own multiplying coefficient. Each waveform set in Figure 1 shows how progressively adding appropriately scaled odd harmonics together ultimately makes a more ideal-looking square wave.

The generally accepted bandwidth rule is that an oscilloscope should have a single sine wave frequency bandwidth of five times the frequency of the highest waveform component. This rule limits the rise time error to approximately 2%. Again, keep in mind that you need to have a frequency response that includes the harmonics needed to comprise any complex waveform. Otherwise, the viewed waveform may be distorted. The analog input circuitry on some oscilloscopes is designed to emphasize the harmonics. Additionally, digital oscilloscopes often use digital signal processing to flatten and extend the frequency response so that you can often relax the five-time rule a little.

Another rule states that rise time = 0.35/bandwidth. As an example, a 100 MHz oscilloscope would have a 3.5 ns rise time. A higher bandwidth means more energy is included in the sine wave harmonics. However, because the Total Rise Time = $\sqrt{(\text{oscilloscope rise time}^2 + \text{signal rise time}^2)}$, the observed rise time may be modified by the oscilloscope specification. For example, selecting a 100 MHz bandwidth oscilloscope to observe a TTL output with a rise time of 2 ns will result in an observed rise time of approximately 4 ns.

Table 1 Time Units

Abbreviation	Unit	Measurement
ms	millisecond	10^{-3} seconds
µs	microsecond	10^{-6} seconds
ns	nanosecond	10^{-9} seconds
ps	picosecond	10^{-12} seconds

Dave Casler, KE0OG, askdave@arrl.org

Ask Dave

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

Well-Grounded Hams

Interfacing a Newer Rig with an Older Amplifier

Q Spence Harrison, KK4TO, asks: In what order should I connect the following equipment? A Yaesu FT-950 HF rig, a Heathkit SB-200 HF amplifier, an external power meter, and a remote Heathkit antenna switch for four antennas.

A The order in which you list the equipment is correct. If you were to add a high-power tuner to the mix, it would go between your external power meter, which I assume is also a standing wave ratio (SWR) meter, and the feed line.

I'm concerned about a potentially destructive mismatch between your FT-950 and the SB-200. Your FT-950 is a modern rig, and the SB-200 is from a bygone era. The problem is not connecting the coax between the output of the FT-950 and the SB-200, but with the other two lines between the units. These are often simple mono phono cables with RCA plugs that deceptively look like they should work together.

A relay in the SB-200 changes the amplifier mode from standby to transmit. When you want to transmit, the FT-950 must provide a ground to the send line (see Figure 1) to complete the circuit. This allows the amplifier to begin amplifying. If you had a modern amplifier, it would use solid-state control circuitry that would require the FT-950 to absorb very little current. However, with older amplifiers, the FT-950 has limits. An external amplifier can require grounding of up to +60 V dc at no more than 200 mA or +30 V at 1 A (this varies from radio to radio. Check your rig's and amplifier's manuals before connecting a newer radio to an older amplifier). In your case, you may need to set up a relay to key the amplifier.

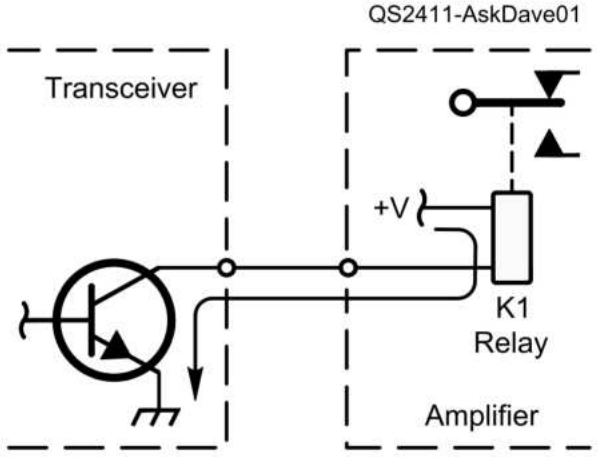


Figure 1 — Our radios tell amplifiers to kick in by causing a transistor to conduct. When the transistor conducts, it closes the circuit to activate the relay, causing the amplifier to switch from standby to transmit.

The SB-200 has built-in protection so that in case the FT-950 is overdriving it with too much power, it changes the voltage level, called automatic level control (ALC), to cause the FT-950 to reduce the power it sends to the amp input. This voltage varies from –16 to 0 V dc. The more negative the voltage is, the less power is provided from the FT-950 to the SB-200. At 0 V dc, the FT-950 puts out full power. At –16 V dc, the amp wants the FT-950 to cut off completely. The issue, which will be hard to work around, is that the FT-950 can accept only a negative voltage between –4 and 0 V dc. An ALC voltage exceeding this limit can damage the FT-950.

The only way around this is not to connect the ALC. Connect the FT-950 coax, send lines to the SB-200, and put a dummy load on the amplifier. Then listen on another radio with an S-meter while gradually turning up the power. You will likely get to the point where the S-meter no longer goes up as you increase the FT-950's output power. This is the maximum output power your FT-950 can transmit into the SB-200. If you go beyond this level, the SB-200 will create spurious emissions.

A Compromise Shortened Attic Antenna

Q Phillip Botero, KQ4AJI, asks: I have an Alpha Delta DX-EE antenna. It has a trapped 20/40-meter element and fan elements for 10 and 15 meters. I've made many contacts using this antenna with my Icom IC-7300 HF radio, but my only issue is the 40-meter bandwidth. I trimmed the antenna for the SSB section of 40 meters, giving me a 3:1 bandwidth of 7.170 to 7.290 MHz. The Icom's internal tuner can handle an SWR of up to 3:1. Will a wide-range antenna tuner allow me to enjoy the entirety of 40 meters?

AI reviewed the Alpha Delta DX-EE antenna in the 248th and 264th videos on my YouTube channel (**www.youtube.com/davecasler**). The antenna is remarkably sturdy and can be mounted horizontally or as an inverted **V**. One key feature is that the antenna is only 40 feet long, making it attractive for those with smaller backyards or for use as an attic antenna (see Figure 2).

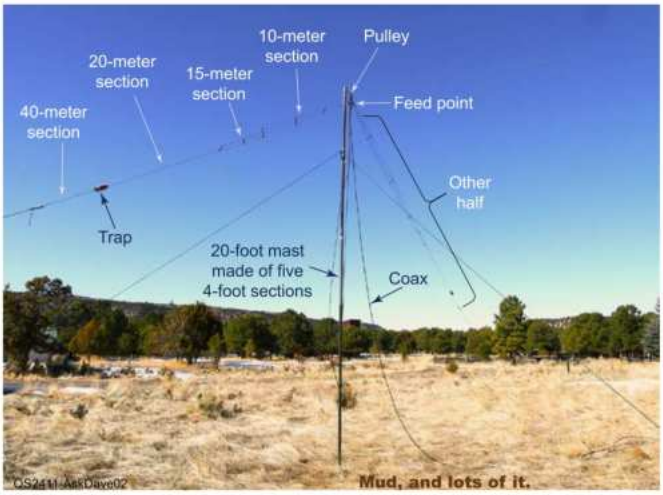


Figure 2 — The Alpha Delta DX-EE antenna is ready-made out of the box to provide 20 and 40 meters on one wire with appropriate traps. Two other wires in a fan dipole arrangement add 15 and 10 meters. The antenna is tough and sturdy.

A normal 40-meter dipole is 66 feet long. The DX-EE traps between the 20- and 40-meter sections also function as loading coils for 40 meters, allowing the shorter length. This makes the antenna a compromise antenna on 40 meters. The compromise here is not performance but rather bandwidth. As you noted in your question, the bandwidth is only about 150 kHz. Fortunately, the antenna is tunable, so you can pick the 150 kHz section you want, but if you choose the SSB section, this puts FT8 outside the antenna's reach.

Yes, you can use a wide-range tuner to attack this, although that would likely mean you'd pay nearly as much for the tuner as you did for the DX-EE. The SWR on the DX-EE rapidly climbs as you get away from the tuned section. You will also see higher line losses as you tune farther away from resonance. Note that with the wide-range tuner, you may also be able to include the 30-, 17-, and 12-meter WARC bands.

I recommend operating the DX-EE within its inherent limitations. It is not designed to operate across the entire 40-meter band. It's unfortunate that this limitation is not referenced in their promotional material.

Turning a Single-Band Antenna into a Multiband Antenna

QPeter Hill, NØRCE, asks: I have a 40-meter dipole (66 feet long) and an Icom IC-706MKII. I can operate the antenna on 6, 10, 12, 20, 30, 40, and 60 meters with my MFJ-939 automatic HF antenna tuner, but I can't tune it on 15 or 17 meters. I've tried different feed-line lengths and antennas, but I've had no luck and am out of ideas. How can I tune on 15 and 17 meters?

AI think you're using coaxial cable between your antenna tuner and antenna. You may find that your results will differ if you use a ladder or window line. Another option is to lengthen the antenna to about 100 feet. Note that changing the length of the coax does not usually have much effect on SWR.

I'm surprised that you can't use the antenna on 15 meters. Usually, something tuned for 40 meters will also work on 15 meters. Several months ago, I put together a fan dipole for 40, 20, and 10 meters and raised it as an inverted **V**. I had excellent results on 15 meters without a tuner. I'm also surprised you were able to tune it on 60 meters, which has no strong harmonic relationship with 40 meters. However, I'm not surprised about the difficulty tuning on 17 meters. It's a hard band to tune for many multiband antennas.

A 40-meter center-fed dipole is not a multiband dipole, though it can be forced to radiate on any frequency with a wide-range tuner, such as the MFJ-939. I have an idea: Get a 49:1 balun (widely available on Amazon) and re-string your antenna as an end-fed dipole. It instantly becomes an inherently multiband antenna. Better yet, use that same 49:1 balun and extend your wire to 132 feet (it will be less than that when tuned to 80-meter FT8). This will give you 40, 30, 20, 17, 15, 12, and 10 meters without making the antenna tuner work too hard. If 132 feet can't go in a straight line, zigzag it where it will fit.

Of course, there are other multiband wire antennas, such as loops, curtains, etc. *The ARRL Antenna Book* has many examples to try, and an internet search will surface other ideas.

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

Hints & Hacks

Pulley Alternatives; Straw Solutions; A Custom Cup Holder Mount; Adding Length with Clamps

Rope Pulleys That Won't Jam

Like many hams, I hang my antennas in trees using UV-protected polyester rope, pulleys, and weights. For years, I used steel pulleys, like the one shown on the left in Figure 1. But over time, the outer jacket of the rope would fray, exposing the underlying stranded core. The core would then jam in the pulley, which would defeat the purpose of the rig and make it extremely difficult to lower the antenna.

I eventually found the plastic clothesline pulley shown on the right-hand side of Figure 1. With its large diameter and smooth shoulders, this pulley does not fray the outer cover of the rope, and it has never jammed. These plastic pulleys are not UV-protected, but after several years of use, none have disintegrated from sun exposure. As a bonus, they are much less expensive than metal pulleys and are readily available at most big-box home improvement stores. — *73, Bruce Blackley, WD4LBR,* **wd4lbr@embarqmail.com**

Figure 1 — On the left is a steel rope pulley; on the right is a plastic clothesline pulley. [Bruce Blackley, WD4LBR, photo]

Figure 2 — Here are the tools you'll need: a drinking straw, a hot glue gun, and, of course, an aerosol can. [Dino Papas, KL0S, photo]

Wondering Where That Straw Went

If you're like me, your workbench is home to a lot of aerosol cans containing PCB cleaners, lubricants, compressed air, and more. Most of those cans have an attached nozzle at the top for spraying the can's liquid contents over a wide area, and many come with thin straws that you can insert into the nozzle tip for a much finer application.

Some cans have two molded slots in the top of the cap that you can snap the straw into for storage, but that takes up space on each side of the can. So, how can we store that straw so that we'll always have it available when we need it?

The solution requires only a plastic drinking straw and a hot glue gun (see Figure 2). Mark and cut the drinking straw to a length that allows the end of your

Figure 3 — Mark and cut the drinking straw to a length that allows the end of your nozzle straw to protrude above it, and then close the opposite end with a dab of hot glue. [Dino Papas, KL0S, photo]

Figure 4 — Attach the drinking straw to the side of the can, with the closed end pointing down. [Dino Papas, KL0S, photo]

nozzle straw to protrude above it, and then close the opposite end with a dab of hot glue (see Figure 3); you can squeeze the end together as the glue hardens, or simply dab a drop in the end of the straw. Next, glue the straw to the side of the can with the closed end pointing down (see Figure 4). Once you're done, you can slip the nozzle straw into the new holder, and you'll always know where it is when you need it. — *73, Dino Papas, KL0S*, **kl0s@arrl.net**

A No-Holes Mobile Mount

I use a VHF transceiver in my car for public service events. In the past, I have simply put the radio on the passenger seat or fastened it to the dashboard with a bungee cord. Each of these solutions was less than ideal. So, I developed a cup holder mount that works in both of my cars and keeps the radio secure under normal driving conditions.

The challenge was to find a way to secure the mount without damaging the cup holder. I went to a home improvement store and tried various plastic pipe fittings, but none were the right size. I later spotted a test plug (see Figure 5). This is a temporary plug that allows pipes to be tested under pressure. The plug works like some vacuum flask caps by expanding to make a tight fit when you tighten the wing nut. It is available in several sizes, and the 3-inch variety worked for my cup holder.

Figure 5 — A test plug is used to temporarily seal a pipe for testing under pressure. [John Dewey, KA9CAR, photo]

Figure 6 — The custom mount fits perfectly into the cup holder without causing damage. A piece of scrap aluminum was used to create a small platform for the radio. [John Dewey, KA9CAR, photo]

A piece of scrap aluminum and a little cutting and drilling were all that was needed to create the mount (see Figure 6) to attach to the test plug. I found that some lubrication on the test plug's wing nut threads and the wedge washers make it easier to tighten the mount in the cup holder. — *73, John Dewey, KA9CAR,* **ka9car@arrl.net**

Adding Length, the Easy Way

I acquired a VHF low-band mobile whip antenna that was taken out of service from the highway patrol. Its length of 80 inches meant it had a resonant frequency of about 35 MHz. My original plan was to cut it for 6 meters, but because of its historic value (at least to me), I decided to look for a way to lengthen it for 10 meters. I had a spare rod of sufficient length; I just needed a way to attach it to the whip without soldering or welding.

While browsing online hardware catalogs, I came across the perfect item to attach the rod to the whip: cable clamps for 3⁄16-inch wire rope (see Figure 7). Using both clamps (there are two to a package) provided a very secure attachment method. Plus, loosening the clamp screws allows me to adjust the overall length for the lowest standing wave ratio for the CW or SSB portions of 10 meters. — *73, Jeff Herman, KH6O,* **kh6o@arrl.net**

Figure 7 — A package of two cable clamps makes lengthening a whip antenna quick and easy. [Jeff Herman, KH6O, photo]

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

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

Healthy Contesting Habits

Minimize the physical demands of contesting with these tips.

Scott Wright, KØMD

Amateur radio contesting is a fun and competitive activity that's growing in popularity among ham radio operators of all ages.

Contesting is physically demanding, and big contests, such as the ARRL International DX CW and phone contests, require a commitment of up to 48 hours. This is equivalent to working a full-time job, all within the confines of a weekend (typically a Friday night through a Sunday night). It's no wonder so many contesters are exhausted by the time they return to work on Monday.

Let's review some healthy practices to consider while contesting (see the sidebar "Healthy and Unhealthy Approaches to Contesting" for more information).

Get Sufficient Sleep

Try to get enough sleep during the week leading up to the event. If you have difficulty sleeping, talk with your healthcare provider to see if you might have a sleep disorder. Much of the insomnia we see today is due to too much screen time after 6:00 PM and/or the consumption of too much caffeine after dinner.

Being well rested allows for alertness and freshness of mind, preventing common mistakes that can lead to missed information and score reductions. You may want to take a half day off work on the Friday before a major contest weekend to spend the afternoon getting some sleep. Having a 1- to 2-hour nap ahead of time will often prevent early fatigue during the first night.

I believe it's important to go to bed when you're tired during a contest weekend. Sleep deprivation and the use of stimulants to stay awake do not improve your accuracy and may lead to health consequences such as cardiovascular disease and early-onset type 2 diabetes mellitus. The use of stimulants such as highly caffeinated beverages can cause a heart attack and sudden cardiac death, especially among individuals younger than 50 years old. Use of these aids to stay awake while contesting may lead to premature health problems, or worse. No top contest score is worth this cost.

Eat a Nutritious Diet

Stick to eating healthful foods before, during, and after a contest. There are no data to suggest that carbohydrate loading, something frequently done by marathon runners, has any benefit with ham radio contesting. In fact, you may want to consume fewer calories during a contest weekend because you'll be more sedentary than usual. Keep some fresh vegetables available to snack on — carrots, radishes, broccoli, cauliflower, and small quantities of nuts are likely your best options. Of course, you should stay hydrated as well. Drink plenty of water and/or non-caffeinated, sugarless beverages to counter any dehydration induced by the heat from your shack lighting and the warmth of your tube amplifier. Allow yourself to take bathroom breaks to avoid any risks to your kidneys.

Set Up an Ergonomic Station

Design your station to minimize the damage from injuries associated with repetitive motion. Adjust the table so that the keyboard and computer monitor(s) are at appropriate heights for your arms and head to avoid straining your neck, back, or wrists and arms. I experienced significant neck strain one contest season until I realized my wall-mounted monitors were several inches too high for my height. Now I use a desk-mounted monitor that prevents such strain. Find a comfortable chair that supports your lower back; I typically recommend gaming chairs. I also operate standing for periods of time while contesting, because it allows me to stretch my back and legs, restores circulation to my lower extremities, and combats fatigue. Because of this, I use wireless keyboards that I can move to a shelf on my operating desk when I want to stand. Someday, I hope to try a walking treadmill desk or stationary bicycle while contesting.

Take Regular Breaks

Most contest advice focuses on keeping your body in the chair to maximize your score. This advice is good, but like all things, it becomes a

hindrance when taken to an extreme. I recommend you take regular breaks to clear your mind, restore your focus, and stretch your muscles. The breaks can be as short as 5 minutes or as long as 30 minutes; you'll figure out what works for you.

Attend to Your Mental Health

Contesting can become an obsession, especially if you're an extremely competitive person. Talk with loved ones to determine if frequent contesting is altering your mood or keeping you from being engaged and involved with your family and friends. There are no awards given at the end of a year, decade, or lifetime for completing a given number of contests. It's not uncommon to become irritated during a contest at typing mistakes you make or with the poor operating practices of those you meet on the air, but there's no reason to let your frustration boil into anger, which can raise your blood pressure, trigger a heart attack or stroke, or simply rob you of the fun and joy of the contest activity. If you're finding yourself getting frustrated, take a short break, have a bite of food, take a walk, or change bands.

Maintain Life Balance

You're ultimately responsible for the choices you make with contesting. If you feel that going all out for 48 hours is impacting your ability to work the Monday following a contest weekend, then finish operating early enough on Sunday to recover and prepare for the work week. Contesting is part of our hobby; it's not a way of life or a source of income.

Stay in Shape During the Off Season

Professional athletes stay in shape year-round. We should approach contesting health in the same way. The most successful contesters I know practice outside of the contest season to improve skills, such as copying CW despite noise, expanding their understanding of station and/or logger operations, and regularly participating in events that keep their SO2R skills fresh.

Additionally, the healthiest contesters I know, mentally and physically, exercise regularly during and outside of the contest season. Some are runners and credit running for their stamina while participating in longer contests. Consider starting an exercise routine to improve your overall health. Lose any excess weight, and work with your healthcare provider to manage any medical conditions you may have, such as hypertension, type 2 diabetes, heart disease, COPD, and arthritis. Work with a mental health coach on any psychological issues that may be impacting your ability to enjoy contesting.

Above all, stay connected with your community of contest friends, because they make the contest contacts worthwhile during the season.

Healthy and Unhealthy Approaches to Contesting

Healthy Habits

- Focusing on the fun of operating and worrying less about the score
- Striving to improve skills with communication and radio operation, not just earning a high score
- Savoring personal achievements with improving metrics and meeting goals
- Reconnecting with friends on the air
- Discovering more about propagation and band performance
- Learning to set and achieve goals
- Tempering personal expectations about what can be achieved
- Practicing gratefulness for the opportunity to be on the air and making contacts

Unhealthy Habits

- Depriving self of sleep for more contesting
- Excessive use of stimulants
- Dehydration
- Repetitive use of strained body parts from a non-ergonomic station
- Anger, with associated changes in blood pressure
- Poor posture, with associated joint and back pain
- Obsession with winning, especially to the point of detrimental effects on family and friendships

Scott Wright, K0MD, has been a ham for 47 years and enjoys DXing and contesting most of all. He is a past editor of *NCJ* and a past member of the ARRL Contest Advisory Committee. Scott has an SO2R contest station at his home in Minnesota, where he enjoys a range of contest events. He also operates overseas in contests as travel allows. Scott can be reached at **drscott.wright@gmail.com**.

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

Isle Royale National Park: A POTA Mini-DXpedition

Three hams crossed Lake Superior by seaplane to activate this isolated island.

Jon Oldenburg, AB9AH

In February 2023, Wolf River Coils co-owner Gary Hoehne, KB9AIT, brought up the idea of going on a mini-DXpedition to activate Isle Royale National Park in Lake Superior for Parks on the Air® (POTA) with his co-owner Terry Schilling, N9AOT, and me. We quickly agreed that this sounded like a fun adventure.

Gary Hoehne, KB9AIT; Larry Peterson, WA9TT, and Jon Oldenburg, AB9AH, boarded a seaplane to Isle Royale from a dock in Houghton, Michigan. [Jon Oldenburg, AB9AH, photo]

Founded in 1931, Isle Royale National Park is accessible only by boat or seaplane. It's the least visited US national park, with the highest yearly attendance recorded in 2019 — 18,977 visitors. The island is 45 miles long and 9 miles wide, making it the fourth largest lake island in the world. Due to severe winter conditions, it's open only from April through October.

The POTA movement began in 2016, following ARRL's year-long National Parks on the Air (NPOTA) event, which was created to celebrate the 100th anniversary of the National Park System and designed to encourage amateur radio operators to transmit from within national parks. This event inspired the creation of POTA in 2017, which encourages amateur radio operators to operate portable in a variety of parks and public lands (as *activators*) so that *hunters* (operators not in a park) can contact them.

In Gary's research of Isle Royale, he found that it had been activated for POTA on only two occasions, both of which were by the same operator.

Planning for the Trip

After the three of us agreed to take a mini-DXpedition to Isle Royale National Park, Gary contacted the park superintendent and reviewed our plans with them. They approved our plans and sent forms for each of us to complete. After subsequent reviews of what our equipment would consist of and what our space needs would be, the park approved our permit, and the trip was a go!

We would be traveling from Wisconsin to our departure point in Michigan, where our transit options were the ferry (with a travel time of 6 hours) or a seaplane (with a travel time of 1 hour). Gary booked the seaplane for July 13, and the park superintendent was advised of

Jon Oldenburg, AB9AH, operated on the 20-meter band using a Xiegu G90 QRP station. [Gary Hoehne, KB9AIT, photo]

Gary Hoehne, KB9AIT, enjoyed operating while fellow Isle Royale National Park visitors looked on. [Larry Peterson, WA9TT, photo]

our date for the activation. Terry had a conflict on that date and was unable to come along. We needed to find another operator, as Terry had been tasked with driving the Wolf River Coils motor home. After making a few phone calls, we added Larry Peterson, WA9TT, our club's POTA guru, to the trip.

Activating Isle Royale

The first leg of our trip began with a 4 ½-hour (238-mile) drive from Appleton, Wisconsin, to Houghton, Michigan, where we were met with a thriving riverfront downtown area. We explored the city for a little bit before finding our hotel. We then proceeded farther north to the tip of the Keweenaw Peninsula, where we tested our go-kit setups and activated a few POTA parks before returning to our hotel for the night.

We awoke the next morning to beautiful weather for the second leg of our trip. We checked in at the seaplane at 7:00 AM and enjoyed the 1-hour flight through cloudless skies over a calm Lake Superior, eventually landing at Tobin Harbor of Isle Royale. The seaplane dock is located opposite the isthmus that forms Rock Harbor (where we were planning to operate), so we had to hike ¾ of a mile using forest trails of about a 15 percent grade — a 22-pound go-kit never felt so heavy!

After checking in at the visitor center, we quickly set up our go-kits and Wolf River Coils antennas at some picnic tables on the shore of Rock Harbor and activated Isle Royale (POTA, US-0039). Gary started operating on 20-meter SSB, and once we were spotted, the action on the air was nearly a continuous pileup. Larry set up a few yards away, where he operated 15-meter FT8. Gary and I took turns operating on the 20-meter band using a Xiegu G90 QRP station and were very successful. We operated from 9:30 AM

A Wolf River Coils Take It Along (TIA) antenna was used for operating. [Jon Oldenburg, AB9AH, photo]

to 3:30 PM EST, which was when we had to tear down our stations and make the hike back to the seaplane dock for our flight out.

Results

All in all, it was a successful and enjoyable trip. We activated Isle Royale making 431 contacts. Larry planned a different route home to Appleton, which enabled us to activate seven additional parks. In total, we activated 14 parks on a 3-day road trip!

Jon Oldenburg, AB9AH, is the retired President of North East WI Inspection Services LLC, which provides commercial and residential building inspection services to governmental agencies. He has held an amateur radio license since 1999, and enjoys POTA, ragchew nets, and restoring and operating Kenwood hybrid transceivers. Jon can be reached at **ab9ah@arrl.net**.

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Summits on the Air in the Navajo Nation

A ham's journey to operate from never-before-activated summits.

Charlie Brown, NJ7V

Arizona has more tribal land than any other US state, comprising 27% of the state's total land base. Accessing summits within tribal lands for Summits on the Air (SOTA) requires special permission from the appropriate sovereign governments. Additionally, much of the land within tribal nations is sacred, and people who are not tribal members should not visit it except under special circumstances. Because of this, many SOTA peaks within tribal boundaries have never been activated.

A few years ago, my friend mentioned he was friends with Herb Goodluck, N7HG, the son of Navajo Code Talker Private First Class John V. Goodluck of the US Marine Corps. Eventually, I was introduced to Herb at the Flagstaff Hamfest and learned he was interested in starting SOTA. He invited me to his home in Lukachukai, Arizona, within the Navajo Nation, to join him on a few SOTA expeditions. Understanding how rare this opportunity was, I gladly accepted the invitation.

Beginning with POTA

After coordinating the visit, I packed my gear and started the 6-hour drive north from Mesa, Arizona, to Lukachukai. I didn't know when I would be up that way again, so I planned extra time to visit a couple of Parks on the Air (POTA) locations on the way.

I arrived at the Hubbell Trading Post National Historic Site at about 3:00 PM. I set up my normal low-power SOTA gear, a Yaesu FT-817ND transceiver, a home-brew linked dipole, a Bioenno 4.5 Ah battery, a fishing pole for the mast, a Palm Pico Paddle, and the *HAMRS* app on my phone for logging. I made 10 SSB contacts and 13 CW contacts coast to coast.

The Chuska Mountains looking south from Roof Butte.

After this activation, I made my way to the Canyon de Chelly National Monument park. I worked only CW, made contacts coast to coast again, and even managed to get a few Canadian stations.

Honoring the Navajo Code Talkers

Later, I arrived at Herb's house. He invited me in and gave me a tour of his shack. Herb primarily uses a Yaesu Mark-V FT-1000 and a Yaesu FTDX10, with a 70-foot tower mounted with several antennas. After the tour, he talked about his father's experiences as a code talker during World War II. After his father's death in 2000, Herb felt he needed to keep his father's legacy alive, and the best way to do that was through ham radio. So every year, Herb sets up a special event station at the Navajo Nation capital in Window Rock, Arizona. The Navajo Nation hosts a commemoration event every year on National Code Talkers Day. Herb operates there under the N7C special event call sign and operates with that call sign from home for several days after that. Herb also attends many hamfests in Arizona, where he sets up a Navajo Code Talkers educational display, and gives presentations at many ham radio clubs throughout the state.

Roof Butte

The next day, Herb and I decided to activate several SOTA peaks in the Chuska Mountains, starting with Roof Butte, which is the highest point in the range, and Matthews Peak. We arrived on top of Roof Butte and set up the station I used at the two POTA sites. Herb started on 20-meter sideband, and I followed on 20-meter CW. We repeated that order on 40 meters.

While Herb started calling "CQ SOTA," I assembled a 2-meter Yagi and attached it to my Yaesu FT-60R. My friend Pete, WA7JTM, told me he was on a SOTA summit about 175 miles southeast of us at approximately the same time we were on Roof Butte. I pointed the Yagi in his direction and started calling CQ. Sure

Herb, N7HG, getting low-power contacts on Matthews Peak (W7A/AP-009).

enough, Pete replied. He was also using a 5 W handheld and a $^5/_8$-wave vertical. Herb was finishing up, so I waved him over so he could get this amazing summit-to-summit contact. Afterward, Herb took the Yagi and handheld while I got on the HF radio.

While I was working a pileup, a Navajo gentleman who stays on Roof Butte full time greeted us. Herb found out that the gentleman was interested in learning ham radio to give him something to do on the mountain. Herb never misses an opportunity to be a ham radio ambassador!

Matthews Peak

We packed up and started the long drive south to Matthews Peak. One very important thing I failed to mention to Herb was that we needed to activate at the SOTA-designated coordinates, which often do not coincide with the locations of towers or overlooks. The site that was called Matthews Peak by the locals was still 1.5 miles away from the activation zone. So, we retraced our route, found a road that brought us within a mile of the activation zone, and hiked to the top from there. At the top, we found a road we could have driven up instead. Oh well, that's all part of the adventure.

Herb and I followed the same routine we used on Roof Butte and had a great time filling our log on this never-before-activated SOTA peak.

Yale Point

On the third day, we planned to activate two more peaks — Yale Point and Balakai Mesa — along the eastern rim of Black Mesa. We drove to the Yale Point summit, which had a number of communication towers, but again, this was not near the activation zone. We backtracked and found a road that was almost imperceptible in places and took it toward the activation zone for as far as I was comfortable driving, and then we hiked a mile to the top. We took turns on the radio again and easily made the requisite number of contacts, although band conditions had worsened from the previous day. By the time we finally finished this never-before-activated summit, it was noon, and we were 3 hours behind schedule. It was a long drive to Balakai Mesa, and I feared that by the time we reached it, it would be too late in the day to activate it. By the time we reached the pavement again, it was already 3:30 PM, so there was no time for a second summit.

It was truly an honor to spend a few days with Herb. I enjoyed learning about his Navajo heritage, and my respect for the Navajo way of life has grown. His father's experiences serving as a code talker were fascinating. Herb is excited to continue to participate in SOTA, saying, "I want to capture a lot more of the SOTA peaks nobody else has activated." It is only fitting for a Navajo ham radio operator to be the first to activate SOTA in the Navajo Nation. So, keep an eye out for Herb, N7HG, on the SOTAwatch3 spotter page. After he assembles his low-power portable station, we'll be hearing from him a lot more.

Watch Charlie, NJ7V, and Herb, N7HG, activate SOTA in the Navajo Nation in the digital edition of *QST* (**www.arrl.org/qst**).

All photos by the author.

Charlie Brown, NJ7V, was first licensed in 2005, shortly after Gary Hinton, AC7R, invited him to participate in ARRL Field Day. In 2014, Charlie was introduced to SOTA by Brian Betz, W7JET. Charlie and his wife Sandy, W7NRS, are avid hikers, so SOTA was a perfect fit for their outdoor adventures. Charlie was inspired by Jerry Hildman, Jr., KG6HQD (SK), to start his YouTube channel, Red Summit RF, to promote portable radio and share his experiences. He has been employed by the city of Scottsdale, Arizona, for 27 years and is currently working as a data engineer. Charlie can be reached at **nj7v@arrl.net**.

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

What Solar Eclipses Have to Tell Us

HamSCI reports on what citizen scientists observed on the HF, MW, and LF bands during an eclipse and explains how amateur observations become scientific findings.

Gary Mikitin, AF8A, and
Dr. Nathaniel A. Frissell, W2NAF

Project Origins: The Great American Eclipse of 2017

The Ham Radio Science Citizen Investigation (HamSCI) successfully encouraged hams to operate during the North American total solar eclipse of August 2017. Thousands of Solar Eclipse QSO Party (SEQP) contacts made on the 6 – 160-meter bands were monitored and later used to prove that amateur radio volunteers — citizen scientists — could play a valuable role in space physics research. Hams helped prove that solar eclipses affect the ionosphere by temporarily modifying its ability to refract radio waves from one point to another on Earth's surface. The complete study, authored by Dr. Frissell et al., in 2018, is available at **www.doi.org/10.1029/2018GL077324**.

Fast-Forward to 2023

A near-total solar eclipse, categorized as an annular eclipse, transited North and South America on October 14, 2023. This not only presented an opportunity for a second running of the SEQP, but it was also the ideal time for hams to put new hardware, software, and monitoring techniques into place. New equipment and methods conceived by HamSCI community members were designed to record expected changes in the ionosphere during this major solar event. Additionally, this eclipse provided practice for the next big event: the North American total solar eclipse of April 8, 2024.

Grape Personal Space Weather Station

The new equipment became known as a Grape Personal Space Weather Station (PSWS). Its components include a compact, single-frequency shortwave receiver, a GPS-disciplined oscillator, and a Raspberry Pi single-board computer. Most participants in the Grape network built their own receivers, assembled the components, configured software, and erected an antenna. Once their Grape was powered up and tested, they connected their systems to the internet so data from their receivers could be uploaded daily to a central server for later examination by scientists and amateurs. Eventually, all Grape data will be available for download on a public site.

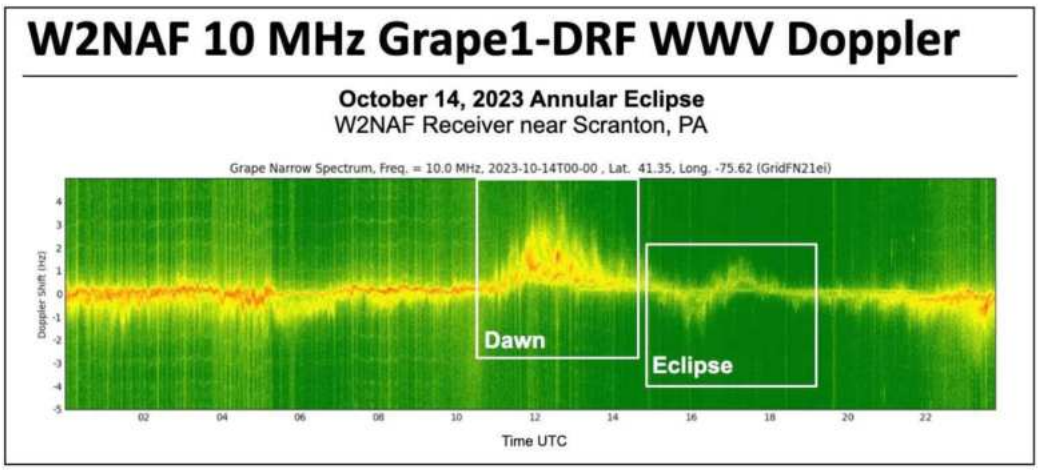

Figure 1 — Dr. Nathaniel Frissell's, W2NAF, Grape data plot for the October 2023 eclipse. The reddish line moving away from 0 indicates frequency shift. A positive shift indicates the bottom side of the ionosphere is moving down toward Earth's surface, while a negative shift indicates it is moving upward. Note the similarities between dawn (beginning at hour 12) and the period just after the eclipse (between hours 16 and 18). In both cases, the ionosphere is transitioning from being "in the dark" to being fully illuminated by the sun.

Grape PSWSs are used to monitor standard time and frequency stations such as WWV, WWVH, or CHU on a 24/7/365 basis. Those stations' transmitters are extremely precise — accurate to the microhertz (millionths of a Hertz). Despite the many factors that impact a radio signal as it travels hundreds or even thousands of

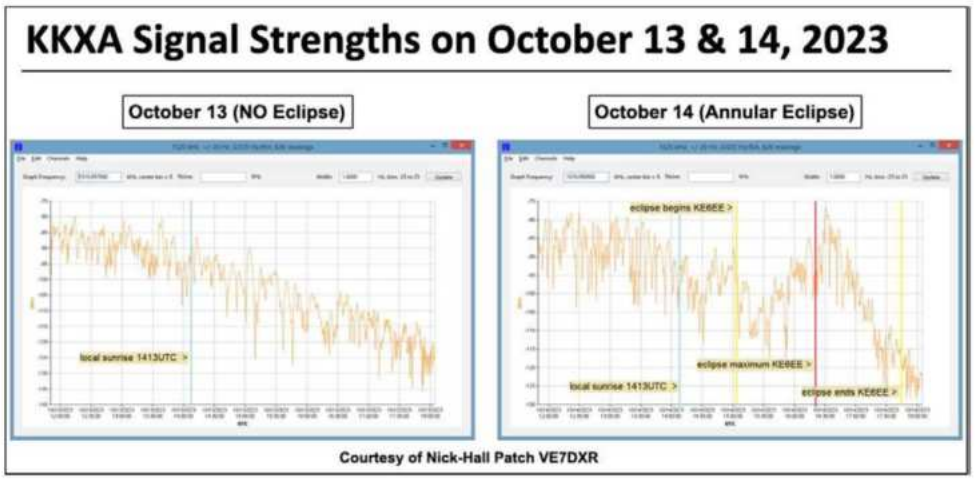

Figure 2 — Nick Hall-Patch, VE7DXR, compiled this illustration showing that a signal from station KKXA (Snohomish, Washington), received by Richard Cook, KE6EE (Fair Oaks, California), varied relatively little on the day prior to the eclipse. On eclipse day, Cook's station recorded a significant jump in signal strength.

miles, it is possible for a Grape PSWS to receive and accurately measure those signals with millihertz (thousandths of a Hertz) precision. In fact, Grape systems make receive frequency measurements so well that their output data can be used to sense changes in the height of the bottom of the ionosphere. The bottom side not only rises and falls, but it experiences ripple-like effects known as *traveling ionospheric disturbances*. Scientists hope to use Grape data to develop theories about bottom-side motion and how it is linked to solar, magnetospheric, and atmospheric events. Figure 1 shows a Grape PSWS data plot for the October 2023 eclipse. Learn how the Grape PSWS makes its measurements at **www.hamsci.org/grape**.

Monitoring the Medium-Wave Band

The medium-wave (MW) band, from roughly 500 to 1700 kHz, is used for professional AM radio broadcasts around most of the world. When it is nighttime at an operator's location, distant stations (DX) can be received from across the continent. When the sun is up at that same location, almost all signals are from local stations. The lack of daytime DX can be explained by a well-known phenomenon known as *D-layer signal absorption*. The D layer forms in the ionosphere at sunrise and dissipates at sunset.

We know that nighttime brings better DX conditions when there is no D layer to absorb MW signals. Of course, night occurs every 24 hours, though its length varies based on location and time of year. Of current interest to HamSCI are the brief conditions resembling night that occur thanks to a solar eclipse.

During a solar eclipse, the moon passes between the sun and Earth. For those in or near the eclipse's path, a brief period of near-darkness occurs because much of the sun's radiation is blocked from reaching Earth. The period of near-darkness resembles a very brief "night" perhaps 3 – 5 minutes in length. HamSCI members, knowledgeable about MW propagation and curious about how the short period of eclipse-generated night might affect radio signals, monitored AM broadcast stations before, during, and after the October eclipse. Figure 2 shows how the eclipse impacted signals from station KKXA. Researchers are eager to review their data, and they looked forward to having more receiving stations participate around the April 2024 eclipse. Further details are at **www.hamsci.org/MW-recordings**.

Moving to the Low-Frequency Band

HamSCI member Steve Cerwin, WA5FRF, monitored the signal from WWVB in Fort Collins, Colorado, during the 2017 and 2023 eclipses. WWVB's frequency (60 kHz) is in the low-frequency (LF) band (30 – 300 kHz). WWVB transmits the signal received by atomic clocks, which are consumer devices that self-correct when able to receive WWVB for short periods each day. In true ham spirit, Steve used a homebrew peak-detecting superheterodyne receiver designed for receiving WWVB. His antenna was a square loop with 2 meters on each side. Steve's setup allows us to compare results from similar eclipse events, 6 years apart. When looking at Figure 3, one can plainly see that there was enhanced reception of WWVB at Steve's Texas location when solar eclipses passed over his station — first in 2017, and again in 2023.

Observations and Findings

We can see *what* happened, but when will we know *why* it happened? Before we answer that question, it would be helpful to explain the difference between observations and findings. Described above are observations: data presented in formats that clearly depict what was observed (for example, changes in the height of the ionosphere and the enhancement of MW and LF signals during an eclipse). Scientific findings — explanations for the observations — will develop over time. In short, observations are what we saw, and findings are why we saw them.

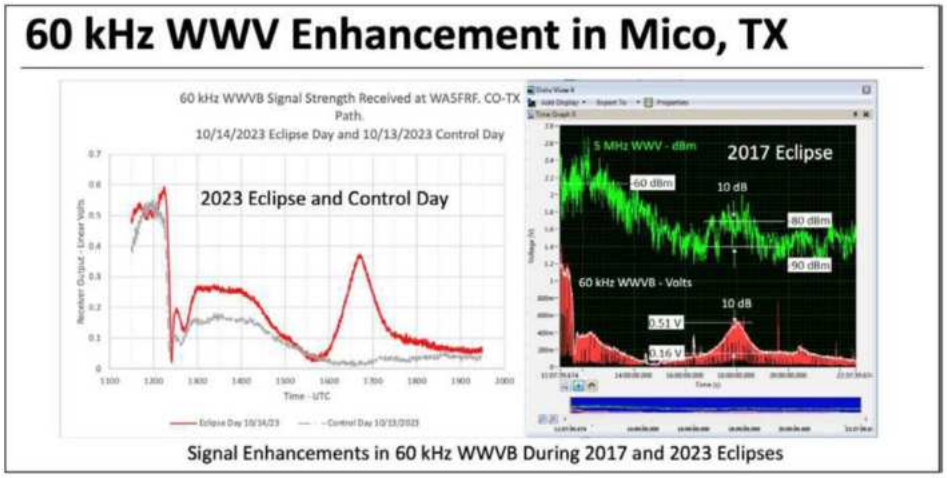

Figure 3 — These plots indicate receiver output, with voltage following signal strength. On the left, Steve Cerwin, WA5FRF, obtained control data (in gray) 1 day prior to the 2023 eclipse, and then he repeated his measurements (in red) on eclipse day. Note the signal enhancement beginning at 1600 UTC and continuing through 1730 UTC. On the right, plots have a similar shape in data recorded during the August 21, 2017, North American total solar eclipse.

More Citizen Scientist Eclipse Data

HamSCI sponsored two radiosport events as part of the 2023 Festivals of Eclipse Ionospheric Science. Results are available for both events:

- Solar Eclipse QSO Party: A 10-hour on-air contest using CW, SSB, and digital modes. **www.hamsci.org/2023-SEQP-results**
- Gladstone Signal Spotting Challenge: A competition for digital modes, such as WSPR, FST4W, and PSK31. **www.hamsci.org/foeis-results**

Findings will first appear in scholarly articles, which may be published in scientific journals or presented at scientific conferences. A scholarly author and co-author(s) spend a great deal of time studying data, formulating hypotheses, discussing and debating, and finally writing their conclusions into articles. Articles are submitted to journals, which use the peer-review process. Reviewers look for gaps in the data and errors in logic or calculations. They consider originality, methodology, and significance of the work while providing constructive criticism to the authors, who then revise their article to answer reviewers' criticisms. The process can take anywhere from months to years.

Recognizing Participants, Partners, and Sponsors

HamSCI's solar eclipse studies began in 2017, continued in 2023, and will carry on into 2024 and beyond. Each eclipse passes over North America for only a few hours. During those brief events, hams contribute to scientific knowledge as part of a tradition that dates back to the Transatlantic Tests. HamSCI and the space physics community are grateful to the hams and shortwave listeners who participate. All contributions are important; for example, see the sidebar, "More Citizen Scientist Eclipse Data," for links to the scores of two HamSCI-sponsored radiosport events.

The HamSCI community is led by The University of Scranton Department of Physics and Engineering Amateur Radio Club, W3USR, in collaboration with Case Western Reserve University Amateur Radio Club, W8EDU; the University of Alabama; the New Jersey Institute of Technology Center for Solar-Terrestrial Physics Amateur Radio Club, K2MFF; the Massachusetts Institute of Technology Haystack Observatory; TAPR in Arizona; additional collaborating universities and institutions, and volunteer members of the amateur radio and citizen science communities. We are grateful for the financial support of the US National Science Foundation, NASA, and Amateur Radio Digital Communications.

Gary Mikitin, AF8A, has been licensed since 1977. He is a retired electrical engineer, and he enjoys ragchewing, DXing, and contesting on HF CW. He currently volunteers as the Amateur Radio Community Coordinator for HamSCI.

Dr. Nathaniel A. Frissell, W2NAF, is an Associate Professor of Physics and Engineering at The University of Scranton. He was introduced to space physics in middle and high school through amateur radio, where he was fascinated by long-distance radio propagation and the variability imposed on it by the geospace system. His interests led to the founding of the Ham Radio Science Citizen Investigation (**www.hamsci.org**), a citizen science collective that aims to bring together the professional research and the amateur radio communities.

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

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Public Service

75 Years of the National Traffic System

In this month's column, Marcia Forde, KW1U, and Bud Hippisley, W2RU, discuss the past, present, and future of the National Traffic System (NTS), which was developed in 1949.

In March 1914, abnormally poor propagation forced Hiram Percy Maxim to utilize a "relay" station when sending a message from Hartford, Connecticut, to an amateur in Springfield, Massachusetts. ARRL was born from this experience. Despite forced shutdowns during two World Wars, US and Canadian radio amateur message handling grew in popularity; by 1941 there were active traffic nets in most ARRL Sections and perhaps a dozen trunk lines providing long-haul routes.

Almost immediately after resumption of on-air activities in 1945, limitations of the trunk-line concept generated complaints. Large expanses of the US were neither covered by, nor reliably linked to, the trunk lines; trunk-line operation relied on a few iron-man operators with superior stations, leaving few opportunities for those with limited availability and more modest stations.

In early 1948, ARRL Communications Manager Ed Handy, W1BDI, formally tasked his assistant, George Hart, W1NJM, with developing a solution. Hart drew on his War Emergency Radio Service experience while analyzing complaints and proffered remedies from traffic handlers and ARRL Field Organization leaders from coast to coast. The September 1949 issue of *QST* introduced a new National Traffic Plan, which became the NTS before the end of 1949.

The NTS concept was quite simple, and analogous to today's hub-and-spoke system of commercial airline flights, wherein a traveler uses a sequence of car, bus or train, and regional airline — the spoke — to get to or from a major airport — the hub — for a long-distance flight. Every weekday evening, phone and CW nets — each typically encompassing an ARRL Section, US state, or Canadian province — passed out-of-Section traffic to an assigned volunteer (representative) who carried that outbound traffic to a Region net spanning as many as seven Section nets. Messages headed to destinations in other Sections within that same Region were passed within that net session to representatives present from the other Section nets. Similarly, representatives from all the Region nets in a given time zone met to exchange inter-Region traffic during an associated Area net.

Nearly all existing Section nets instantly became part of the new system simply by sending a representative to their Region net each evening. In return, NTS brought a systematic umbrella for freeing Section net participants from having to worry about getting out-of-Section messages to their specific destinations, along with far more opportunity for individual growth and participation in long-haul traffic handling than the trunk lines had ever provided.

The NTS began operating 75 years ago, on October 3, 1949, when each Area net held its first session.

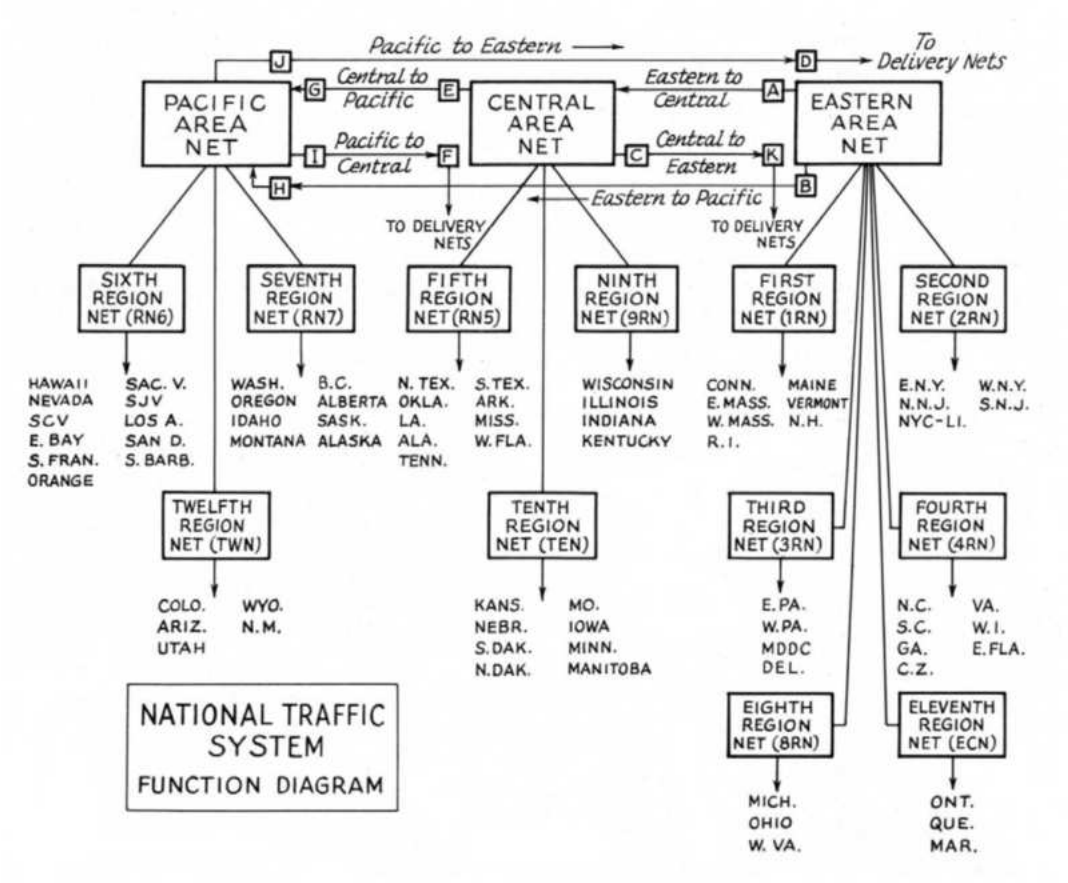
Enhanced Delivery Capabilities

The original plan for routing inter-Area traffic was soon supplanted by the Transcontinental Corps (TCC) — volunteers who passed traffic reliably across multiple time zones. Then as now, TCC assignments included a mix of out-of-net schedules and direct check-ins to destination Area, Region, and Section nets to expedite the movement of traffic between Areas, especially for eastbound traffic moving "against the sun."

Interest in the NTS grew throughout the 1950s, '60s, and '70s. The number of amateurs at home during the day was growing, so the NTS added a parallel daytime sequence of Section, Region, Area, and TCC functions using predominantly SSB, and adopted a four-cycle framework for net meetings that provided for constant System operation over a 16-hour "day" in each time zone if required by the high-traffic volumes of wide-area disasters, SETs, and holidays. TCC operators could then bring eastbound traffic originating in western nets to nets in the Central and Eastern time zones sooner, thus increasing the likelihood of "same-day delivery" for daytime (Cycle 2) originations and "next-day delivery" for evening (Cycle 4) originations.

Going Digital and Local

In the 1980s, the availability of personal computers unleashed interest in digital message handling. A network of dedicated NTS hub stations, referred to as NTSD and structured similarly to the Region and Area



This diagram of NTS functions appeared in ARRL's 1969 *The Radio Amateur's Operating Manual*.

nets but operating 24/7, was instituted in the 1990s using AMTOR and, later, PACTOR. Recent software modems have allowed more operators to participate using HF VARA.

This period also formally brought Local nets, with liaison to their Section net, into the NTS family. Most are VHF/UHF FM nets available to Technician-class licensees who recognize that structured third-party message-handling procedures and net operating skills are essential for emergency communications.

Present Improvements and a Look Ahead

In recent years, amateur radio traffic handling has seen a decline in total traffic — partly due to the emergence of the internet and ubiquitous personal communications devices, and partly because many served agencies and aid organizations now have their own internal communications systems. But all systems can fail — whether from a cyberattack, a natural disaster, or human error. Thus, hundreds of amateur traffic handlers continue to hone their message-handling skills as a critical component of their emergency communications preparedness. Extreme weather and security concerns have sparked a renewed interest in emergency communications, and a team of amateurs from across the country was authorized by ARRL's Emergency Communications and Field Services Committee to study and make recommendations for improvement and enhancement of the NTS. To disseminate information about this effort, a website has been established at **https://nts2.arrl.org**, augmented by a monthly electronic newsletter, *The NTS Letter*.

A web-based Radiogram Portal provides a platform to explain amateur radio messaging, introducing this public service capability and providing an easy way to submit messages into the network. This portal also provides for more true third-party traffic into our system, as these messages are retrieved by authorized amateurs for relay through voice or CW nets and/or the Digital Traffic System.

Due to the importance of emergency preparedness, it's important that we're prepared to relay messages accurately and efficiently using agency-required formats. While digital means may be preferable, access may not always be available. Messages entered into the digital network may require relay via voice or CW at some point. It's of utmost importance, therefore, to have a means of transmitting these forms, properly formatted word for word, via voice and CW. An encapsulated radiogram format has been developed and tested on voice and CW traffic nets. Training materials are available on the NTS2 website.

If you're interested in helping to continue to build the future of the NTS, email **ntsletter@arrl.org**, and let us know what you do as part of the NTS, as well as what you're interested in working on.

QST

Contest Season 2024 – 2025

QST Supplement, November 2024
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[David Chenault, W5CWT, photo]

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Contest Calendar

November 2024 – December 2025

This calendar covers the major HF contests (see "Descriptions of Major HF Contests" on the next page for more details), but there are plenty of others throughout the year. Visit **www.arrl.org/contest-calendar** and **www.contestcalendar.com** for more contest dates and details.

Nov 2024

2-4	ARRL NOVEMBER SWEEPSTAKES — CW
10	NORTH AMERICAN SPRINT — SSB
16-18	ARRL NOVEMBER SWEEPSTAKES — PHONE
23-24	CQ WORLD WIDE DX CONTEST — CW

Dec 2024

6-8	ARRL 160-METER CONTEST
14-15	ARRL 10-METER CONTEST
22	ARRL ROOKIE ROUNDUP — CW

Jan 2025

4-5	ARRL RTTY ROUNDUP
11-12	NORTH AMERICAN QSO PARTY — CW
18-19	NORTH AMERICAN QSO PARTY — SSB
24-26	CQ WORLD WIDE 160-METER CONTEST — CW

Feb 2025

2	NORTH AMERICAN SPRINT — CW
8-9	CQ WORLD WIDE WPX — RTTY
10-14	SCHOOL CLUB ROUNDUP
15-16	ARRL INTERNATIONAL DX CONTEST — CW
21-23	CQ WORLD WIDE 160-METER CONTEST — SSB
22-23	NORTH AMERICAN QSO PARTY — RTTY

Mar 2025

1-2	ARRL INTERNATIONAL DX CONTEST — SSB
9	NORTH AMERICAN SPRINT — RTTY
23	NORTH AMERICAN SPRINT — SSB
29-30	CQ WORLD WIDE WPX — SSB

Apr 2025

13	ARRL ROOKIE ROUNDUP — PHONE

May 2025

24-25	CQ WORLD WIDE WPX — CW

Jun 2025

7-8	ARRL INTERNATIONAL DIGITAL CONTEST
28-29	ARRL FIELD DAY

Jul 2025

12-13	IARU HF WORLD CHAMPIONSHIP
19-20	NORTH AMERICAN QSO PARTY — RTTY

Aug 2025

2-3	NORTH AMERICAN QSO PARTY — CW
16-17	NORTH AMERICAN QSO PARTY — SSB

Aug 2025 (cont'd)

17	ARRL ROOKIE ROUNDUP — RTTY
30-31	WORLD WIDE DIGI DX CONTEST

Sep 2025

7	NORTH AMERICAN SPRINT — CW
21	NORTH AMERICAN SPRINT — RTTY
27-28	CQ WORLD WIDE DX CONTEST — RTTY

Oct 2025

20-24	SCHOOL CLUB ROUNDUP
25-26	CQ WORLD WIDE DX CONTEST — SSB

Nov 2025

1-3	ARRL NOVEMBER SWEEPSTAKES — CW
9	NORTH AMERICAN SPRINT — SSB
15-17	ARRL NOVEMBER SWEEPSTAKES — PHONE
29-30	CQ WORLD WIDE DX CONTEST — CW

Dec 2025

5-7	ARRL 160-METER CONTEST
13-14	ARRL 10-METER CONTEST
21	ARRL ROOKIE ROUNDUP — CW

Descriptions of Major HF Contests

ARRL November Sweepstakes — CW, Phone
Stations in the US and Canada (including territories and possessions) exchange information with as many other US and Canadian stations as possible. Participants may operate for a maximum of 24 hours out of the 30-hour period. Sweepstakes is a great event for US and Canadian hams to work toward their Worked All States Award.

North American Sprint — SSB, CW, RTTY
The North American Sprint is a 4-hour contest that challenges operators while also allowing them to sharpen their operating skills. North American amateurs contact as many stations as possible, while non-North American stations contact as many North American stations as possible. Sprints are unique contests because once a contact is completed, the calling station must relinquish the frequency to the station that answered them.

CQ World Wide DX Contest — CW, RTTY, SSB
Stations worldwide contact as many other amateurs in as many CQ Zones and countries as possible. There are no operating time restrictions. Single Operator participants can choose to also enter the Classic Overlay category, which limits their operation to 24 of the 48 hours. Stations located anywhere can contact all other stations for points, so this is a great contest to increase your DXCC and Worked All States Award totals.

In the RTTY contest, US states and Canadian provinces also count as multipliers, and there is no operation allowed on 160 meters; operation is limited to only RTTY.

ARRL 160-Meter Contest
Stations worldwide exchange information with US and Canadian amateurs on 160-meter CW. There's no operating time limitation in any category.

ARRL 10-Meter Contest
Amateurs worldwide exchange information with as many stations as possible on the 10-meter band. Phone and CW may be used. Stations can be contacted once per mode. This is a great contest for newly licensed Technicians who have operating privileges on the 10-meter band.

ARRL Rookie Roundup — CW, Phone, RTTY
This 6-hour contest encourages operation by amateurs licensed for 3 years or less. Experienced operators (non-Rookies) are strongly encouraged to participate and help new operators, either on the air or in person. Rookie Roundup is a great contest for newly licensed or less-experienced operators to participate in competitive amateur radio operating.

ARRL RTTY Roundup
Amateurs worldwide contact and exchange information with other amateurs using the RTTY mode on the HF bands. Single Operator stations may operate for 24 hours out of the 30-hour contest period. Multioperator stations may operate the entire 30 hours.

North American QSO Party — CW, SSB, RTTY
The North American QSO Party (NAQP) is a low-power contest in which smaller stations from all parts of North America can effectively be top scorers. The 12-hour format allows participants to do some great contesting, yet still have time for other activities during the weekend. NAQPs are a favorite of beginners and seasoned operators alike.

CQ World Wide 160-Meter Contest — CW, SSB
Amateurs around the world utilize the 160-meter band to contact other amateurs in as many US states, Canadian provinces, and countries as possible. This is a 48-hour contest.

CQ World Wide WPX — RTTY, SSB, CW
Amateurs worldwide contact as many stations and call sign prefixes as possible. The score multiplier is the number of valid call sign prefixes contacted. Each unique prefix is counted once, regardless of the band or number of times the same prefix is contacted. A prefix is the letter and numeral combination that forms the first part of an amateur call sign (e.g., N8, W8, WD8, HG1, KC2). Single Operator entrants may operate up to 30 hours in the 48-hour contest period. WPX contests are unique in that many multipliers are available, even for contacts made within the same country.

School Club Roundup
There are two School Club Roundups during each school year, in October and February. Each 5-day event runs from 1300 UTC Monday through 2359 UTC Friday. A station may operate no more than 6 hours in a 24-hour period, and a maximum of 24 hours of the 107-hour event. Stations may be contacted once per band and mode on phone, CW, and digital.

ARRL International DX Contest — CW, SSB
US and Canadian (W/VE) stations are encouraged to expand their knowledge of DX propagation on the HF bands and improve their operating skills and station capabilities by creating a competition in which DX stations may only contact W/VE stations. This is a great contest to participate in if you're seeking to increase your DXCC country counts. There is no operating time limitation in any category.

ARRL International Digital Contest
Amateurs worldwide contact as many other amateurs in as many four-digit Maidenhead grid squares as possible. All digital modes (excluding RTTY) that can support the contest exchange are permitted. Single Operator stations may operate for 24 hours out of the 30-hour contest period. Multioperator stations may operate the entire 30 hours.

ARRL Field Day
Always held on the fourth full weekend in June, Field Day is the largest on-air amateur radio operating event in the world. Amateur operators set up temporary stations in public places to demonstrate ham radio's science, skill, and service to our communities and our nation. It combines public service, emergency preparedness, community outreach, and technical skills all in a single event.

IARU HF World Championship
Amateurs worldwide contact and exchange information with other amateurs, promoting self-training in radio communications, including improving amateur operating skills, conducting technical investigations, and communicating with other amateurs around the world. There's no operating time limitation in any category during this 12-hour contest.

World Wide Digi DX Contest
During this 12-hour contest, amateurs around the world contact as many other amateurs in as many Maidenhead grid fields as possible using the FT4 and FT8 modes. Contacts with a station count once per band, regardless of the mode used. This is a distance-scored event, and each contact is worth one point, plus an additional point for every 3,000 kilometers between the grid square centers of the stations. A grid field is the first two characters of a Maidenhead grid square (e.g., FN, DN, FL). There are no operating time restrictions in this event.

HF CONTESTING FOR TECHNICIANS:

Unlocking the World of Competitive Ham Radio

By Kevin Thomas, W1DED

Operating POTA is a good skill builder for contesting newcomers and Technician-class operators alike.

As a Technician-class license holder, you might feel limited in the vast world of ham radio contesting. However, there are plenty of opportunities to dive in to the excitement of contesting, hone your skills, and get hooked on this thrilling aspect of amateur radio. Drawing on insights from experienced contesters Randy Thompson, K5ZD; Chris Hurlbut, KL9A; Bill Fehring, W9KKN, and Tim Shoppa, N3QE, this guide will help you maximize your Technician privileges and participate in contests, and potentially inspire you to upgrade your license for even greater involvement.

Understand Band Privileges

Technician-class operators have limited HF frequencies to work within (see the sidebar "HF Bands for Technicians"). K5ZD acknowledges this initial hurdle: "In HF contesting, the frequency and mode options are very limited. Technicians have privileges on 80-, 40-, and 15-meter CW. On 15 meters, they have from 21.025 MHz on up, so lots of room. It's just unfortunate that the Technician license doesn't require people to know CW." If you learn CW, you can participate in many contests. Additionally, 10 meters offers a unique opportunity with privileges for CW, RTTY, and SSB, especially during the peak of the sunspot cycle.

Explore 10 Meters

Because many Technician operators may not have honed their CW skills yet, K5ZD emphasizes the potential of the 10-meter band, saying that if he were a Technician looking to get into contesting, that's where he would start, because you can operate during CW, RTTY, and SSB contests. Our current

sunspot cycle greatly enhances activity on the 10-meter band, making it a prime choice for Technicians.

KL9A said, "With 10 meters open, you can work the world with whatever you have for antennas and equipment." This band is literally your gateway to global contacts and exciting HF contesting. Participating in 10-meter contests can be competitive and educational, providing a strong foundation for future skill evolution.

K5ZD suggests looking at contests with single-band categories, so you can "operate 10 meters and enter as Single Band 10." This approach allows you to compete effectively within your current privileges. Even in all-band contests, focusing solely on 10 meters can still yield impressive results.

Find Contests for Newcomers

Not all contests are complex. In fact, some can be a fantastic introduction to contesting for many hams. The following ARRL contests provide excellent entry points for Technicians.

- **Rookie Roundup** — Designed for newly licensed amateurs (licensed for 3 years or less), this contest covers SSB, RTTY, and CW, with each mode having its own event.

- **November Sweepstakes** — While this contest is somewhat complex due to its exchange format, it's popular among newcomers because of its emphasis on making contacts with stations in all ARRL/RAC Sections, providing a great learning experience.

- **Field Day** — Although ARRL Field Day is not a contest, it's excellent for newcomers. Operators set up portable stations and make as many contacts as possible in 24 hours. Participants learn invaluable operating skills.

- **School Club Roundup** — Geared toward school clubs, this event is ideal for younger operators and newcomers alike who are part of a school or university radio club, and it offers a friendly and educational focus.

Don't forget, Technicians have access to digital modes. There are several digital contests, such as the World Wide Digi DX Contest and CQ World Wide RTTY DX Contest, that are perfect opportunities to get on the air and make contacts using RTTY and FT8.

All of these events provide a great way for newcomers to get involved in the ham radio community, learn the ropes of contesting, and have fun while doing it.

The 10-meter band is very active right now, thanks to Solar Cycle 25.

Build Skills and Equipment

W9KKN encourages Technicians to consider upgrading their license and suggests leveraging local resources; visit a local station that plans on operating in a contest and watch them operate. Additionally, consider participating as a member of a multioperator contesting team. Firsthand experience is invaluable, and Technician-class license privileges won't be a hindrance.

K5ZD and W9KKN also stress the importance of a good station setup: "Ten meters is a fairly easy band to get a beam up of some kind, even if you're just turning it by hand. A 10-meter Yagi is not a giant antenna," K5ZD said. Investing in a small Yagi can significantly improve your contesting experience.

Operate Effectively

It's important to have patience and a strategy when operating. Persistence and smart operating techniques will help you make more contacts.

KL9A adds, "Remember, if you're on 28450.4, you're not off [frequency]. You can be on any frequency there, so tune in stations correctly." Basic operating skills are crucial for success.

Although Parks on the Air® (POTA) is not a contest, it offers an accessible way to learn important contesting skills. POTA activators must adapt to changing conditions, make the best of minimal gear and low power, and still effectively manage large pileups. The ability to self-spot on the POTA website can attract many callers in a short time, providing a dynamic and challenging operating experience.

Your Contesting Journey Begins Now

Awareness and education are important. N3QE believes that the biggest gap to fill is accessibility for a Technician-class contester. Encouraging Technicians to explore this aspect of ham radio and providing accessible resources can help.

Contesting is an exhilarating aspect of ham radio that offers endless opportunities for learning and growth. As a Technician-class license holder, you can start small, explore the 10-meter band, and participate in digital contests. With persistence, patience, and a willingness to learn, you'll soon find yourself hooked on the thrill of contesting. Who knows, you might even be inspired to upgrade your license and unlock even more possibilities in the world of competitive ham radio.

HF BANDS FOR TECHNICIANS

80 Meters (3.525 – 3.600 MHz): CW only
40 Meters (7.025 – 7.125 MHz): CW only
15 Meters (21.025 – 21.200 MHz): CW only
10 Meters (28.000 – 28.300 MHz): CW, RTTY/Data
10 Meters (28.300 – 28.500 MHz): CW, Phone/SSB

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Analyzing Contest Results for Improved Scores

By Randy Thompson, K5ZD

Radio contests are a game — they have a focus, a defined playing field (one or more bands and modes), a set time, and a method for measuring success (a score). Like any game, there are different strategies pursued by the players to maximize their scores. This article will look at ways you can improve your contest scores by reviewing past results and logs to see what's working for others in your area or category.

Understanding Contest Basics

A contest score is typically made up of your contact points, multiplied by the total number of multipliers. In some contests, such as the ARRL DX Contest or November Sweepstakes, all contacts have the same point value. In a contest such as CQ WPX, the point values are different, depending on the band and whether the station contacted is in a different country or on another continent. For contests with varying points per contact, this is important to be aware of because contacting 50 Europeans may produce more points than making 250 contacts with stations in your country, if you're in the US.

Some contests allow participants to operate for as many hours as they can. Others mandate periods of off time, when participants must stop operating. For example, Sweepstakes allows for a maximum of 24 hours of operation within the 30 hours of the contest period. Knowing when to take these breaks is a critical element of an operating strategy.

Contests tend to be annual events held on the same weekend each year. This means the sunrise and sunset times are consistent from year to year. Gray line and other band openings will repeat with some variation, depending on sunspot numbers.

Demographic activity from different areas of the US or the world also tends to be consistent. Serious contesters may operate for an entire contest, but most participants operate for only a few hours. Casual contesters maintain their usual daily schedule, which will impact when they're active on the bands. It pays to know what bands are open during the most active times in various regions.

With this knowledge in hand, it becomes possible to look at previous contest results or logs and draw some insight into operating tactics.

Check Your Line Scores

Start by looking at your results from previous years' contests. Don't just look at the contact or multiplier totals; look at the band breakdowns. Notice how the totals change as we move through the sunspot cycle. Band totals give you an indication of where you should be spending your time during a contest.

Of course, not everyone has the same station, location, or operating skills. Think about each call sign in your results and what you know about them to determine if they're a good reference point for your efforts. The best comparison will be with someone

1090 results found
Page 1 of 11 Next › Last ››

#	Call	QTH	Year	Category	Score	160M q/z/c/s	80M q/z/c/s	40M q/z/c/s	20M q/z/c/s	15M q/z/c/s	10M q/z/c/s	Hours	Cert
1	N5DX	W2	2023	SO HIGH ALL	10,047,165	74/10/32	229/18/63	1,061/24/90	1,475/33/109	1,442/29/105	1,209/28/104	47.9	
2	K1LZ	W1	2023	SO HIGH ALL	8,459,496	61/ 9/28	218/11/51	1,064/25/86	1,178/31/105	1,582/27/95	1,270/25/93	48.0	
3	K4ZW	W4	2023	SO HIGH ALL	5,352,564	22/ 7/12	131/14/55	351/24/73	625/32/97	1,048/32/108	1,094/31/103	37.8	
4	K5TR	W5	2023	SO HIGH ALL	5,069,331	23/ 7/13	55/12/32	668/27/79	591/33/97	1,025/33/100	1,552/32/108	48.0	
5	W9RE	W9	2023	SO HIGH ALL	5,067,940	22/ 6/11	92/13/44	561/22/81	556/31/97	1,327/33/102	809/26/90	42.2	
6	NR3X	W4	2023	SO HIGH ALL	4,871,736	30/ 6/15	121/12/51	337/20/72	770/29/102	1,023/32/101	980/26/102	40.4	
7	K4AB	W4	2023	SO HIGH ALL	4,810,131	25/ 7/15	150/16/55	172/23/70	476/31/102	1,233/33/112	941/29/110	41.9	
8	K5GN	W5	2023	SO HIGH ALL	4,373,040	19/ 6/10	48/11/32	379/26/75	515/32/102	1,121/32/107	1,241/29/108	42.6	
9	N2IC	W5	2023	SO HIGH ALL	4,020,450	9/ 7/ 7	93/17/35	400/26/64	280/30/89	914/34/107	1,153/32/99	41.3	
10	ND7K	W7	2023	SO HIGH ALL	3,695,843	13/ 6/ 6	126/14/25	703/28/66	360/29/71	872/29/86	1,220/30/97	48.0	

An example of final scores with band breakdowns from the 2023 CQ WW SSB Contest.

```
Cabrillo Statistics            (Version 10g)            by K5KA & N6TV
http://bit.ly/cabstat

CALLSIGN: K5ZD
CATEGORY-OPERATOR: SINGLE-OP
CATEGORY-TRANSMITTER: ONE
CONTEST: ARRL-SS-CW
OPERATORS: K5ZD

---------- Q S O   R a t e   S u m m a r y ----------
Hour     160     80     40     20     15     10     Rate Total     Pct
-----------------------------------------------------------------------
2100       0      0      0     75     17      5      97    97     8.5
2200       0      0      0     35      0     76     111   208    18.3
2300       0      0     12     45     31      6      94   302    26.6
0000       0      0     34      0     62      0      96   398    35.0
0100       0      0     63     27      0      0      90   488    43.0
0200       0     21     54      0      0      0      75   563    49.6
0300       0     13     34     12      0      0      59   622    54.8
0400       0      7     52      1      0      0      60   682    60.0
0500       0     12     23      0      0      0      35   717    63.1
0600       0     11     21      0      0      0      32   749    65.9
0700       0      0      0      0      0      0       0   749    65.9
0800       0      0      0      0      0      0       0   749    65.9
0900       0      0      0      0      0      0       0   749    65.9
1000       0      4      0      0      0      0       4   753    66.3
1100       0     29     18      0      0      0      47   800    70.4
1200       0      2     21      2      0      0      25   825    72.6
1300       0      0     14     17      0      0      31   856    75.4
1400       0      0     16     15      0      0      31   887    78.1
1500       0      0     18     10      3      0      31   918    80.8
1600       0      0      1      5      0      0       6   924    81.3
1700       0      0      0     21     10      0      31   955    84.1
1800       0      0      5     16      1      3      25   980    86.3
1900       0      0      0      2      0      0       2   982    86.4
2000       0      0      0     10      2      5      17   999    87.9
2100       0      0      7     16      1      0      24  1023    90.1
2200       0      0      0     38      9      0      47  1070    94.2
2300       0      0     10     29      0      0      39  1109    97.6
0000       0      0      2      5      0      0       7  1116    98.2
0100       0      5     12      3      0      0      20  1136   100.0
0200       0      0      0      0      0      0       0  1136   100.0
-----------------------------------------------------------
Total      0    104    417    384    136     95    1136

Gross QSOs=1144        Dupes=8        Net QSOs=1136

Unique callsigns worked = 1136

The best 60 minute rate was 115/hour from 2221 to 2320
The best 30 minute rate was 126/hour from 2227 to 2256
The best 10 minute rate was 138/hour from 2238 to 2247
```

An example of a rate sheet.

who consistently enters contests, has a similar station to yours, and is located close by. Even a distance of 200 to 400 miles can make a difference in when openings occur and determining which bands are active.

Compare Rate Sheets

Many contests make submitted logs public on their website — these are gold mines of data for analysis.

Download a few logs from stations that are comparable to yours. There are programs available that will read a Cabrillo-formatted log and provide statistics about the number of contacts and multipliers that were made on each band for each hour (see the sidebar "Log Analysis Software" for more information). The statistics may also list the number of contacts in each multiplier (e.g., DXCC entity or ARRL Section). Comparing several logs with your own will quickly reveal the times when you were gaining or losing ground to your competitors on particular bands.

Some things to look for in public logs include: the hours and bands with the highest contact rates; the hours when contacts were low, but a lot of multipliers were contacted, and which regions or countries provided the most contacts. These are the times and directions you want to focus your attention and station capabilities on to improve your score.

Another thing to study is when your competitors took breaks from operating. Try to understand why they took the breaks they did, such as whether it was for personal reasons or if it was part of their operating strategy. For example, in Sweepstakes, many stations in the eastern part of the US take their breaks late at night and during the late afternoon on Sundays, while stations in the west take their 6 hours off on Sunday morning and operate straight through to the end of the contest. Both strategies are designed to maximize on-air time for the bands that produce the most contacts. Try to figure out what the top scorers are doing in your area.

Look for the times and bands that produce the most multipliers. In a DX contest, there are various numbers of DX entities available on each band. A new multiplier may be the same as making 10 contacts. You want to be active on the bands that'll give you access to the most multipliers. You'll notice the value of those extra multipliers as you get to the end of the contest and your score goes up faster and faster.

For contests like Sweepstakes, the maximum number of multipliers is limited to the number of ARRL and RAC Sections. Getting a *clean sweep* (contacting at least one station in every ARRL and RAC Section) is not only a great accomplishment, but it can also be the key to a winning score. Review the public logs and see when some of the rare Sections are active. Having this information in your operating plan will help you know where to look.

View Log-Checking Reports

Once all the logs have been submitted after a contest, the contest sponsor's log-checking software will grind through the submitted entries to confirm that contacts are logged with the correct call signs and exchange information. If an error is found, a penalty may be applied to your score. Many contests make these reports available to participants. These can be a valuable source of feedback to learn what aspects of your operating technique need more work. These are skills that will pay off in all your on-air activities!

LOG ANALYSIS SOFTWARE

CBS by K5KA and N6TV (**www.kkn.net/~n6tv/cbs**) runs on Windows command line and produces a full set of statistics for a Cabrillo log file.

SH5 by UA4WLI (**https://sites.google.com/site/sh5analyzer/download**) is Windows software that generates more than 40 pages of visual contest analytics for a Cabrillo log file.

QScope by ZL4YY (**www.qscope.org/public**) is a web-based log analysis tool that can accept ADIF or Cabrillo files.

Tips for Successful QRP Contesting

By Doug Zwiebel, KR2Q

If you want to try something new, give QRP contesting a try. Running QRP power (5 W or less) likely requires a realignment of your approach to making contacts. Let's face it, trying to make QRP contacts while almost everybody else is running 100 W or 1 kW might sound crazy. Most operators think that success comes from powering your way through — being louder than the other callers and crushing your competition. Well, with QRP, that's almost never the case. But, if you're smart about how you operate, you can "beat out" the other caller with some finesse. Adhering to being smart only requires determination.

If you're new to QRP but not to contesting, you should practice operating QRP before the contest. Get to know what it feels like. Call in some smaller pileup situations: a DX station, some POTA or SOTA operations, or maybe some state QSO parties. If you're new to contesting, I suggest reading "Ten Tips for New Contesters" by John Bee, N1GNV, in the November 2022 issue's Special Contest Insert.

Make sure you're running 5 W or less when QRP contesting. [Doug Zwiebel, KR2Q, photo]

Here are some suggestions for how to make your QRP efforts at contesting a success, while also having fun.

- The key element to remember is that you want your signal to stand out. If there are multiple other callers and you just "dump in" your call at the same time, your signal will get lost. Tune around the band and look for callers with few (or no) other callers. Your 5 W power against a background of just the noise level will make you easy to copy. Remember, the *runner* (operator calling CQ) is anxious to contact everybody. Runners don't look at their S-meter when deciding who to call — everybody listens for a signal that somehow stands out. If you're the only caller, you'll stand out. Sometimes, you may have to wait for one or two contacts to go by before you try calling against a background of just the noise level. That's OK. That's how you'll be successful when operating QRP.

- Set a limit on how many times you call the same station (without success)

before you decide to move on. When I'm QRP contesting, I turn the dial after three tries. If you like, you can write down that station's call sign and frequency to check back later. If you're using a logger with a band map, it'll keep track for you.

- Tune across the band in a logical manner — don't just spin the dial. Generally, in a big DX contest, runners occupy the bottom of the band, especially at the start of the contest. This might be the bottom 25 kHz or so. As a QRPer, I stay away from that for a while (hours). Starting higher in the band is recommended, as things tend to thin out. Some successful QRPers start at the top of the band and tune down. When operating CW, remember that the band doesn't end at 100 kHz up from the bottom. A lot of good contacts, with vastly fewer callers, are available above that.

- Another way to stand out from the background, at least on CW, is to not call on exactly the same frequency as the other callers. Try calling up, say, 0.1 kHz. If you're using DX cluster spots, don't just click on a spot and call there; it's almost a guarantee that you'll be calling on the exact same frequency as the QRO callers, so you won't stand out on that frequency.

- Stay positive. For every contact you make, remember that you've successfully contacted that station using QRP, before all the subsequent callers who are QRO. Celebrate each success!

- Call efficiently. Listen first, confirm that you have the operator's correct call sign, call once, and then listen. If you get called, give your exchange once, then listen for a confirmation that it was received. You want to be quick; after each contact, turn the dial and look for the next one.

- Never sign your call with "/QRP." During a contest, your call sign is the important part (then the exchange). Nobody (other than you) cares if you're operating high or low power. Also, some contesters don't like it and won't reply to you; or even worse, they will but won't log you.

The Yaesu FT-817 is my favorite "small" QRP radio. You don't need a "big" radio to be successful with QRP contesting, but they usually have more useful features for contesting. [Doug Zwiebel, KR2Q, photo]

- As a rule of thumb, when you're selecting stations to call, choose someone whose signal is strong at your end. Basic math tells us that if the other operator's signal strength is S9, you'll probably be around 3 to 5 S-units weaker at their end. But that means your S4 to S6 signal is still copyable, so go for it! But if the other operator's noise level is only S5 at your end, well, you'll probably be at or below their noise level.

- If you decide to hang out in a pileup because you really want that station in your log, listen first for who the sought-after station is coming back to. On CW, listen to how one operator's frequency compares to another's and what speed they're sending at. Listen for gaps when there are no callers, even though it's a pileup, and see if you can sneak in your call.

- Most stations who are the cause of a pileup are serious contesters. Keep in mind that they'll probably still be there in an hour, and even the next day. If the contest spans more than one day, rest assured there will be fewer callers for that station on the second day. Your odds of getting through will be greatly improved on day two.

- Be a contrarian. If the band is open to Europe, try finding other runners from different continents. From North America, you can easily contact runners from South America or parts of Africa when most operators want to contact European hams. Not only will you be adding contacts (and likely some multipliers), you'll feel good about making contacts while operating QRP and improving your score. If 20 meters is wide open, check 10 meters for transequatorial propagation. Ten meters loves QRP signals!

- Finally, don't cheat. If you plan to enter a contest in the QRP category, don't up your power to 10 W (or more) because you're frustrated. Be honest with yourself and the other QRP entrants.

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Sierra Harrop, W5DX, sharrop@arrl.org

Happenings

ARRL Defends 902 – 928 MHz Amateur Radio Band

ARRL has filed comments (**www.arrl.org/files/file/News/ARRL%20Letter/2024/09-12/ARRL902928Comments.pdf**) with the Federal Communications Commission (FCC) urging that the 902 – 928 MHz amateur radio band be protected. ARRL joins hundreds of licensed radio amateurs who utilize the band in opposing a proposal from NextNav Inc., a licensee in the 900 MHz Location and Monitoring Service (LMS), to completely reconfigure the 902 – 928 MHz band and replace the LMS with high-powered 5G cellular and related location services. Read more about NextNav's proposal at **www.arrl.org/news/arrl-urges-protecting-the-amateur-radio-902-928-mhz-band**.

ARRL's comments, filed by our Washington, DC counsel on behalf of ARRL members and radio amateurs, point out several problems with NextNav's request:

> Contrary to NextNav's assertions, the band is extremely crowded with millions of devices and transmitters in operation in multiple services, including the Amateur Service. Adoption of the proposal would result in either massive interference that would prevent proper operation or displacement to other bands. The difficulty is that there are no other bands known to be available, and in fact, some of the Amateur operations in this band are here because they were displaced when a portion of the 420 – 450 MHz band North of "Line A" was closed to the Amateur Service some years ago. Others were displaced from the same band when new Federal Government defense radars were initiated and continued Amateur secondary operations would have interfered with their operation.

Pushing amateur radio out of heavily used spectrum is a risk to public service, ARRL argues in the comments:

> When space can be found in this band, Amateurs employ it to establish wide-area voice and some television signal repeaters. Others are actively experimenting with digital mesh networks and associated control links. These networks are a testbed for digital design and experimentation, but also are available and used for back-up emergency communications purposes. Still others operate low-power beacons for propagation research. Weak-signal work — tuning and experimenting to communicate over the longest paths with the least power — also is popular and leads to improvements in equipment.

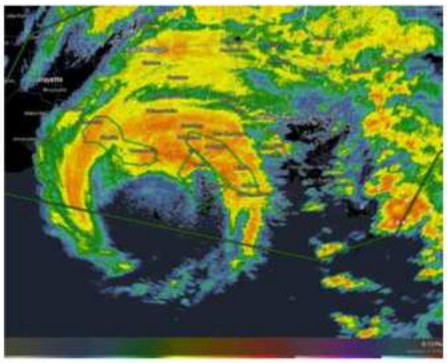
Mesh networks are becoming increasingly useful in emergency communications. As of press time, the ARRL Utah Section announced that dozens of Amateur Radio Emergency Service® (ARES®) volunteers are working to expand the mesh network around the state. The ARRL Utah Section already has a five-county mesh network in place. The proposal from NextNav will make it more difficult to operate networks like this one:

> Under NextNav's proposal, the much higher-powered transmitters would be ubiquitous and operating 24/7. The resulting interference would effectively exclude many of the current Amateur operations that are operating in the 902–928 MHz band.

The FCC docket for reply comments from the public closed on September 20, 2024. As of September 6, more than 800 comments were filed by amateurs and others who use this spectrum. The comments can be viewed at **https://tinyurl.com/ypxh583p**. ARRL will continue to defend amateur access to this and other threatened amateur allocations.

Amateur Radio Volunteers Serve During Hurricane Francine

Ham radio operators volunteering with the Amateur Radio Emergency Service® (ARES®) have successfully completed operations for Hurricane Francine, which is a tropical storm as of press time. "We had a huge, positive showing of ARES team members checking in. I sincerely appreciate everyone leaning into this activation," said Section Emergency Coordinator of the ARRL Mississippi Section Robert Hayes, KC5IMN.



Hurricane Francine at landfall, as depicted on a weather radar.

The National Hurricane Center (NHC) reported at 4:00 AM on September 12, 2024, that Hurricane Francine made landfall in Louisiana early in the evening on September 11 as a Category 2 hurricane before weakening to Category 1. It has since downgraded to a tropical storm.

The storm moved inland over southeastern Louisiana, with heavy rainfall spreading across Mississippi, Alabama, and the Florida panhandle. In the morning on September 12, the storm was 20 miles northwest of New Orleans, with maximum sustained winds of 50 mph, and moving northeast toward Mississippi at 14 mph. At least 419,942 people were without power at that time. PowerOutage.us reported 392,440 people without power in Louisiana and 27,502 in Mississippi.

On the forecast track as of press time, the center of Francine will move over central and northern portions of Mississippi through early September 13.

The Hurricane Watch Net (HWN) has secured operations, but it remains at HWN Alert Level 2 monitoring mode. During their 14-hour activation, Net Manager Bobby Graves, KB5HAV, said HWN collected and forwarded more than 40 surface reports from southeastern Louisiana and the Mississippi Gulf Coast to the NHC by way of WX4NHC, the amateur radio station at the NHC. A copy of these reports is available upon request. On many occasions, they also had direct contact with the Louisiana State Emergency Operations Center via WB5LHS in Baton Rouge on 14.325 MHz. The voice over IP (VoIP) Hurricane Net secured formal net operations on September 11 at 11:00 PM EDT/10:00 PM CDT. A total of 58 reports were submitted to WX4NHC, some of which were used in NHC advisories and tropical cyclone updates. Reports covered wind damage to buildings, tree and wire damage, coastal storm surge flooding, wind measurement, rain gauge, and rain-related street flooding.

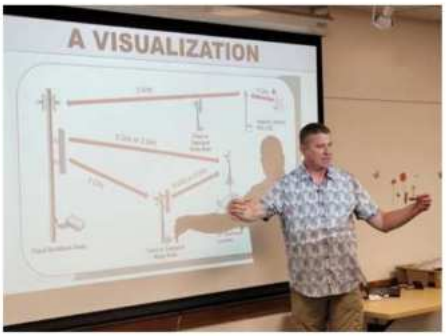
A complete list of the reports can be seen at **www.voipwx.net/qilan/nhcwx/list_VOIP_records1?auth=OK**.

ARRL Utah Section Expanding Emergency Communication Capabilities

A new and faster way to communicate during emergencies is being planned by the ARRL Utah Section Amateur Radio Emergency Service® (ARES®) group, which serves Salt Lake County, the most populous area in Utah.

Public Information Coordinator of the ARRL Utah Section Scott Rosenbush, K7HSR, said that discussion and planning for mesh networks using Amateur Radio Emergency Data Network® (AREDN®) technology is on the drawing board.

A recent meeting and presentation by ARRL Utah Section Emergency Coordinator Brett Pruitt, K7BDP, was attended by a large group of ARES amateur radio operators. More than a dozen Salt Lake County hams have already invested in AREDN technology with an interest in helping to create and support an emergency mesh network in the county. Southern Utah ARES groups have already created a five-county mesh network that can be used for emergency communications.



A large group of ARES amateur radio operators attended a recent meeting and presentation by ARRL Utah Section Emergency Coordinator Brett Pruitt, K7BDP.

"We hope to ultimately connect to Starlink and run the mesh network over that," said Pruitt. "On November 2, we will have an exercise with hospitals in the northern and southern Utah ARES groups using the regular internet. After that, if Starlink is more readily available, we will run the drill again without the internet to fully test the new technology." Pruitt said the goal is to have everything working by early 2025.

"The needs of participating agencies have evolved to require more than analog voice and low-speed data modes," said Rosenbush. "High-speed mesh networks using AREDN software will allow amateur radio to play a larger role in supporting these agencies in emergencies."

The ARRL Utah Section is working to extend this technology. Rosenbush added, "Our hope is to bring this technology to other parts of the state to increase the communications capability and value of amateur radio to partner agencies."

ARRL Expands Publications Archive

ARRL has expanded member access to its rich archive of publications. The **ARRL PERIODICALS ARCHIVE AND SEARCH** now includes content from two more popular ARRL magazines: *QEX*, which features technical articles and columns of interest to radio amateurs and communications professionals, and *NCJ*, which covers information, scores, and advice from the world of competitive radiosport and the contributions of top contesters.

Before accessing the archive, members should ensure they are first logged in to the ARRL website. Members may now view and download articles from across the extensively indexed archive of *QEX* from

An example of search results from *QEX* in the **ARRL PERIODICALS ARCHIVE AND SEARCH**.

1981 to 2011, and *NCJ* from 1973 to 2011. Members can access an index and view copies of articles from the huge ARRL periodicals archive.

The **ARRL PERIODICALS ARCHIVE AND SEARCH** was first introduced to members in 2008, providing PDF copies of articles from the *QST* magazine archive. Since then, thousands of members have enjoyed searching, viewing, and printing their favorite articles, projects, and more. The archive is populated with *QST* articles from 1915 to 2011.

While this archive includes access to downloading many older articles, the more recent and current issues of ARRL magazines continue to be available to members in a digital edition. Visit **www.arrl.org/magazines** for more information. ARRL members have access to four digital-edition magazines: *QST*, *On the Air*, *QEX*, and *NCJ*.

Section Manager Nomination Notice

To all ARRL members in Arizona, Arkansas, Iowa, Kentucky, Mississippi, Montana, North Texas, Orange, and Wyoming. 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, Dropbox Sign, and Signed PDF. Candidates who use an electronic signature platform to be nominated, as described above, do not have to send in original paper copies of the nominating documents. The packet that is sent to ARRL Headquarters must be complete. Multiple files or emails for a single petition will not be accepted.

We suggest the following format:

(Place and Date)

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

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

(Signature _____ Call Sign _____ City _____ ZIP _____)

Any candidate for the office of Section Manager must be a resident of the Section, an amateur radio licensee of Technician class or higher, and a full member of ARRL for a continuous term of at least 2 years immediately preceding receipt of a nominating petition. Petitions must be received at Headquarters by 4:00 PM Eastern Time on December 6, 2024. If more than one member is nominated in a single Section, ballots will be mailed from Headquarters no later than January 2, 2025, to full members of record as of December 6, 2024, which is the closing date for nominations. Returns will be counted February 18, 2025. Section Managers elected as a result of the above procedure will take office April 1, 2025.

If only one valid petition is received from a Section, that nominee shall be declared elected without opposition for a 2-year term beginning April 1, 2025. If no petitions are received from a Section by the specified closing date, such Section will be resolicited in the April issue of *QST*. A Section Manager elected through the resolicitation will serve a term of 18 months. A Section Manager vacancy occurring between elections is filled through appointment by the Field Services Manager. — *Mike Walters, W8ZY, Field Services Manager*

Contest Corral November 2024

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

Start - Finish				Bands	Contest Name	Mode	Exchange	Sponsor's Website
Date	Time	Date	Time					
1	0100	1	0130	See rules	NCCC FT4 Sprint	Dig	4-char grid square	**ncccsprint.com**
1	0145	1	0215	3.5-28	Weekly RTTY Test	Dig	Name, SPC	**radiosport.world/wrt.html**
1	0230	1	0300	See rules	NCCC Sprint	CW	Serial, name, QTH	**ncccsprint.com**
1	0600	1	0859	3.5,7	Silent Key Memorial Contest	CW	RST, SK call sign you wish to recognize	**www.skmc.hu/en/rules.html**
2	0600	2	1800	3.5-28	IPARC Contest, CW	CW	RST, serial, IPA, US state (if USA)	**www.iparc.de**
2	2100	4	0259	1.8-28	ARRL November Sweepstakes, CW	CW	Serial, precedence, your call, check, ARRL/RAC Section	**www.arrl.org/sweepstakes**
3	0600	3	1800	3.5-28	IPARC Contest, SSB	Ph	RST, serial, IPA, US state (if USA)	**www.iparc.de**
3	0800	3	1200	Any	EANET Sprint	CW Ph Dig	RS(T)	**fediea.org**
3	1400	3	1700	3.5-28	High Speed Club CW Contest	CW	RST, mbr or "NM"	**www.highspeedclub.org**
4	2000	4	2130	3.5	RSGB 80m Autumn Series, Data	Dig	RST, serial	**www.rsgbcc.org**
5	0100	5	0300	3.5-28	ARS Spartan Sprint	CW	RST, SPC, pwr	**ars-qrp.com**
6	2000	6	2100	3.5	UKEICC 80m Contest	Ph	6-char grid square	**www.ukeicc.com**
7	0000	8	0300	7	Walk for the Bacon QRP Contest	CW	13 WPM max; RST, SPC, name, mbr/pwr	**qrpcontest.com/pigwalk40**
7	1800	7	2200	28	NRAU 10m Activity Contest	CW Ph Dig	RS(T), 6-char grid square	**nrau.net**
7	2000	7	2200	1.8-28,50	SKCC Sprint Europe	CW	RST, SPC, name, mbr or "none"	**www.skccgroup.com**
9	0000	9	2359	3.5-28	FISTS Saturday Sprint	CW	RST, name, mbr or "0," SPC	**fistsna.org**
9	0000	10	2359	3.5-28	WAE DX Contest, RTTY	Dig	RST, serial	**www.darc.de**
9	0000	11	2359	1.8-7	PODXS 070 Club Triple Play Low Band Sprint	Dig	RST, SPC	**www.podxs070.com**
9	0001	10	2359	28	10-10 International Fall Contest, Digital	Dig	Name, mbr or "0," SPC	**www.ten-ten.org**
9	0700	10	1300	1.8-28	JIDX Phone Contest	Ph	RST, JA prefecture number or CQ zone	**www.jidx.org**
9	1200	10	1200	1.8-28	OK/OM DX Contest, CW	CW	RST, 3-letter OK/OM district code or serial	**okomdx.crk.cz**
9	1200	10	2359	1.8-28,50	SKCC Weekend Sprintathon	CW	RST, SPC, name, (SKCC no./"NONE")	**www.skccgroup.com**
9	1900	11	0500	1.8-28,50, 144,432	CQ-WE Contest	CW Ph Dg	Name, location code, years of service	**w8zpf.com/cqwe**
9	2300	18	0300	1.8-14	AWA Bruce Kelley 1929 QSO Party	CW	RST, name, QTH, equipment year/type/pwr	**antiquewireless.org**
10	0000	10	0400	3.5-14	North American SSB Sprint Contest	Ph	Other's call, your call, serial, name, SPC	**ssbsprint.com**
10	0700	10	1700	3.5-28	FIRAC HF Contest	Ph	RS(T), serial	**www.firac.de**
11	0000	11	0200	1.8-28	4 States QRP Group Second Sunday Sprint	CW Ph	RS(T), SPC, mbr or pwr	**www.4sqrp.com**
12	1900	12	2000	3.5	DARC FT4 Contest	FT4	RST, 4-char grid square	**www.darc.de**
13	2000	13	2130	3.5	RSGB 80m Autumn Series, SSB	Ph	RS, serial	**www.rsgbcc.org**
15	0100	15	0130	See rules	NCCC FT4 Sprint	Dig	4-char grid square	**ncccsprint.com**
15	0145	15	0215	3.5-28	Weekly RTTY Test	Dig	Name, SPC	**radiosport.world/wrt.html**
15	0230	15	0300	See rules	NCCC Sprint	CW	Serial, name, QTH	**ncccsprint.com**
16	0000	17	2359	50-1296	ARRL EME Contest	CW Ph Dig	4-char grid square	**www.arrl.org/eme-contest**
16	1200	17	1200	3.5-28	LZ DX Contest	CW Ph	RS(T), 2-letter LZ district or ITU zone	**lzdx.bfra.org**
16	1600	16	2359	1.8	All Austrian 160-Meter Contest	CW	RST, serial, OE district code (if OE)	**www.oevsv.at**
16	1700	16	2359	1.8	REF 160-Meter Contest	CW	RST, serial, department code	**concours.r-e-f.org**
16	1800	17	2100	3.5,7,21,28	South American Integration Contest CW	CW	See rules	**sacw.cwsp.com.br**
16	1900	16	2059	1.8-28,50	Feld Hell Sprint	Dig	RST, mbr, SPC, grid	**sites.google.com/site/feldhellclub**
16	1900	16	2300	1.8	RSGB 1.8 MHz Contest	CW	RST, serial, UK district code (if UK)	**www.rsgbcc.org**
16	2100	18	0259	1.8-28	ARRL November Sweepstakes, SSB	Ph	Serial, precedence, your call, check, ARRL/RAC Section	**www.arrl.org/sweepstakes**
17	0000	17	2359	3.5-28	FISTS Sunday Sprint	CW	RST, SPC, name, mbr or "0"	**fistsna.org**
17	1300	17	1700	3.5,7	Homebrew and Oldtime Equipment Party	CW	RST, serial, class	**www.qrpcc.de**
17	2300	18	0100	1.8-28	Run for the Bacon QRP Contest	CW	RST, SPC, mbr or pwr	**qrpcontest.com/pigrun**
18	2000	18	2130	3.5-28	RSGB FT4 Contest	Dig	Signal report	**www.rsgbcc.org**
21	0000	22	0300	14	Walk for the Bacon QRP Contest	CW	13 WPM max; RST, SPC, name, mbr/pwr	**qrpcontest.com/pigwalk20**
21	0130	21	0330	3.5-14	NAQCC CW Sprint	CW	RST, SPC, mbr or pwr	**naqcc.info**
21	1900	21	2000	3.5-14	NTC QSO Party	CW	25 WPM max; RST, mbr or "NM"	**pi4ntc.nl**
23	0000	24	2359	1.8-28	CQ Worldwide DX Contest, CW	CW	RST, CQ zone	**www.cqww.com**
27	0000	27	0200	1.8-28,50	SKCC Sprint	CW	RST, SPC, name, mbr or "none"	**www.skccgroup.com**
27	2000	27	2100	3.5	UKEICC 80m Contest	CW	6-char grid square	**www.ukeicc.com**
28	2000	28	2130	3.5	RSGB 80m Autumn Series, CW	CW	RST, serial	**www.rsgbcc.org**
29	0100	29	0130	See rules	NCCC FT4 Sprint	Dig	4-char grid square	**ncccsprint.com**
29	0145	29	0215	3.5-28	Weekly RTTY Test	Dig	Name, SPC	**radiosport.world/wrt.html**
29	0230	29	0300	See rules	NCCC Sprint	CW	Serial, name, QTH	**ncccsprint.com**

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

Frequency Measuring Test — November 2024

Paul Bourque, N1SFE, Contest Program Manager

The November Frequency Measuring Test (FMT) will have two transmitting stations: Michael Suhar, W8RKO, in Ohio, and Connie Marshall, K5CM, in Oklahoma. Transmissions will be made on 40 and 80 meters, in that order. This should give stations throughout North America an opportunity to receive and measure a strong signal.

If you've never entered an FMT before, information on how to measure the frequency of a carrier is available at **www.k5cm.com**.

Measurement Software

The free software tools are quite advanced. If you're already using the *WSJT-X* suite of FT8 or WSPR, you can use its frequency calibration mode as a sophisticated frequency measurement tool. Joe Taylor, K1JT, explains how to use *WSJT-X* for frequency measurement in "Accurate Frequency Measurements with your WSPR Setup" (**https://wsjt.sourceforge.io/FMT_User.pdf**).

FMT Schedule and Format

The FMT "runs" will start with a call up by W8RKO at 0229 UTC on November 8 (Thursday evening in North America). The call-up frequency may not be the exact frequency as during the key-down period (it may shift as much as 10 Hz). Although the call up is scheduled to start at a specific time, both stations will try to start earlier to establish a clear frequency. Every effort will be made to start key down at the published time in Table 1. The key-down period will be 1 minute.

Measure the transmitted frequency and report your results at **https://fmt.arrl.org**. Results must be submitted by 0200 UTC on November 11, at which time they'll be published on the website. Stations submitting measurements within 1 Hz for all transmissions from W8RKO and K5CM will be listed in the "Green Box" of the results.

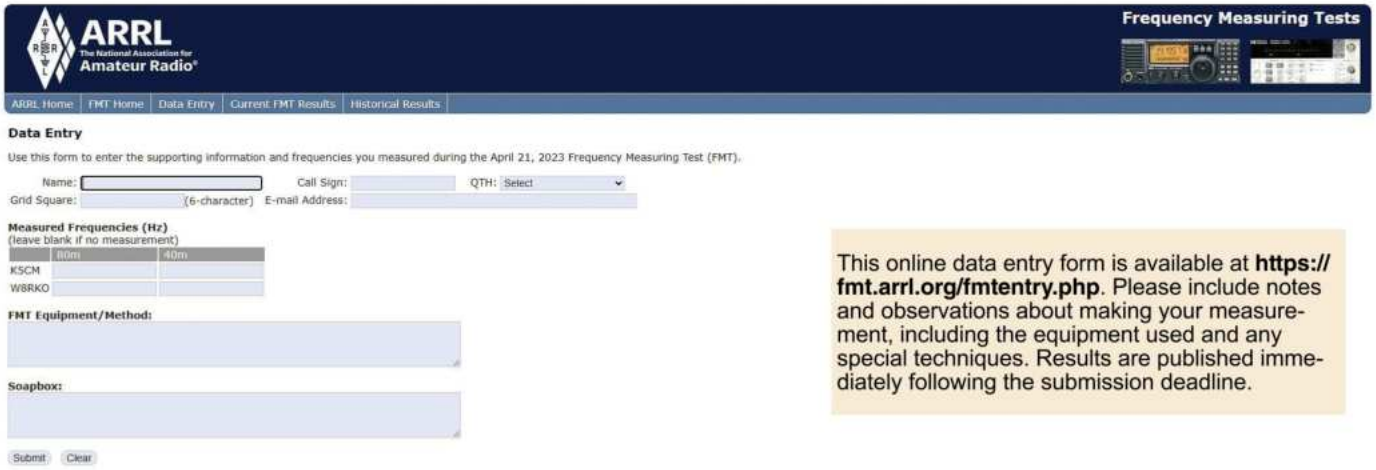
Table 1
Frequency Measuring Test Schedule

Start: November 8 at 02:29 UTC
(Thursday evening in North America)

Results: Submit measurements online until November 11 at 02:00 UTC (Sunday evening in North America)

40 Meters: W8RKO near 7064 kHz	**80 Meters: W8RKO near 3598 kHz**
02:29 Call up	02:59 Call up
02:34 Key down	03:04 Key down
02:35 End 40-meter run	03:05 End 40-meter run
40 Meters: K5CM near 7065 kHz	**80 Meters: K5CM near 3599 kHz**
02:44 Call up	03:14 Call up
02:49 Key down	03:19 Key down
02:50 End 40-meter run	03:20 End 80-meter run

If there's interference on the published frequency, tune around to find the FMT transmissions.



This online data entry form is available at **https://fmt.arrl.org/fmtentry.php**. Please include notes and observations about making your measurement, including the equipment used and any special techniques. Results are published immediately following the submission deadline.

The 2024 ARRL 160-Meter Contest

2200 UTC Friday, December 6 – 1559 UTC Sunday, December 8

ARRL's 160-meter, CW-only contest returns for the first full weekend of December. Even if you don't have a dedicated 160-meter antenna, you can load up any length of wire to make contacts. Give it a try, and you might be surprised by the results!

Highlights

• Operate using CW only (1.830 to 1.835 MHz should be used for intercontinental contacts only).

• Categories include Single Operator or Single Operator, Unlimited (spotting assistance allowed), at the high, low, or QRP power levels. There's also the option of operating Multioperator, Single Transmitter (use of spotting networks is permitted) at high or low power.

• DX stations work stations in ARRL/RAC Sections. W/VE stations work stations in ARRL/RAC Sections and DXCC entities.

Dennis Egan, W1UE, piloted HQ9X in Honduras to finish in third place, DX, in the Single Operator, Unlimited, High Power category in 2023. [Dennis Egan, W1UE, photo]

• KL7, KHØ – KH9 (including KH6), and KP1 – KP5 stations count as US Sections and may be contacted by DX, US, and VE stations.

7-Day Log Deadline: ARRL 160-Meter Contest logs must be uploaded via our web app (**http://contest-log-submission.arrl.org**) or postmarked by 1559 UTC December 15, 2024, and sent to ARRL 160-Meter Contest, 225 Main St., Newington, CT 06111.

Complete rules, multiplier lists, and forms can be found at www.arrl.org/160-meter.

The 2024 ARRL 10-Meter Contest

0000 UTC Saturday, December 14 – 2359 UTC Sunday, December 15

The 2024 ARRL 10-Meter Contest offers something for everyone. From newcomers with low power and wire antennas to experienced operators with directional antennas, the sky is the limit.

This contest relies in part on winter E-skip, so propagation may favor higher activity during daylight hours. Be on the lookout for unexpected band openings and favorable propagation thanks to Solar Cycle 25 being on the rise.

Work everyone you can on CW, phone, or both modes with categories for Single Operator and Multioperator entrants. Single Operator entrants can choose the Limited Antennas Overlay. Operation is limited to single-element antennas such as a single vertical, end-fed wire, or single dipole antenna no more than 50 feet above ground at its highest point. Multipliers include US and Mexican states, Canadian provinces, and DXCC countries (excluding the US, Mexico, and Canada).

Pedro Colla, LU7DZ, operated as LT7D in 2023. He took home first place, DX, in the Single Operator Unlimited, CW Only, QRP category. [Pedro Colla, LU7DZ, photo]

7-Day Log Deadline: ARRL 10-Meter Contest logs must be uploaded via our web app (**http://contest-log-submission.arrl.org**) or postmarked by 2359 UTC December 22, 2024, and sent to ARRL 10-Meter Contest, 225 Main St., Newington, CT 06111.

Complete rules, multiplier lists, and forms can be found at www.arrl.org/10-meter.

The December 2024 ARRL Rookie Roundup — CW

1800 UTC – 2359 UTC, Sunday, December 22

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

Rookies make as many contacts as possible during this 6-hour event. Rookies work everyone, and non-Rookies work only Rookies. Stations exchange call signs, first names, a two-digit year and state (US or Mexican) or Canadian province, or "DX."

You can enter as a Rookie if:

- You made or will make your first-ever contact this year or during the previous 3 calendar years (send the last two digits of the year of your first contact, or
- You've never made any contest contacts using CW (send the last two digits of the current year).

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

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

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

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

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

Volunteer Monitor Program Report

The Volunteer Monitor (VM) Program is a joint initiative between ARRL and the FCC to enhance compliance in the Amateur Radio Service. This is the August 2024 activity report of the VM Program.

- Licensees in New York, Virginia, and Georgia were issued advisory notices concerning excessively wide signals and splattering, resulting in interference to communications on 14.300 MHz. The Virginia and Georgia stations were also cautioned that the issue would have to be resolved before their licenses would be renewed.

- A licensee in Pennsylvania received an advisory notice concerning one-way transmissions and deliberate interference to Field Day operations on 7.200 MHz. A licensee in Georgia received an advisory notice for deliberate interference to the Jarvis Island N5J DXpedition operating CW on 3.527 MHz.

- An operator in California received an advisory notice concerning operation of a beacon on 28.244 MHz under an expired license. A licensee in Virginia received an advisory notice concerning deliberate interference on 3.933 MHz and was cautioned that the matter would have to be resolved before his license would be renewed.

- A Technician-class licensee in Georgia received an advisory notice concerning SSB operation on 40 meters. Technicians have no voice privileges on 40 meters.

- A licensee in Georgia received an advisory notice about causing deliberate interference to a DX station while he was acting as a net control station on 14.290 MHz.

- A good operator commendation was issued to a licensee in Illinois for exemplary operation on a 2-meter repeater, assisting new licensees with operating procedures and explaining special event stations.

- A volunteer monitor alert was issued on August 6 for interference from an experimental high-speed stock-trading station on 20 meters. Information gathered from the alert resulted in an FCC referral.

- The VM Program Administrator participated in one FCC meeting.

The totals for July 2024 monitoring were 1,516 hours on HF frequencies, and 2,857 hours on VHF frequencies and above, for a total of 4,373 hours. — *Thanks to Volunteer Monitor Program Administrator Riley Hollingsworth, K4ZDH*

Mike Walters, W8ZY, w8zy@arrl.org

Club Station

The 10-Meter Project: Helping Technicians Enjoy HF

Amateur radio has an extensive set of sub-interests — VHF repeaters, contests, 75 meters, and DX, among others — each with its own set of dynamics and protocols. In this month's column, Voice of Idaho Amateur Radio Club (VOIARC), W7VOI, Executive Vice President Dr. Jackson (Mike) Dunlap, K7MYU, shares how VOIARC has increased the exposure of these cultures to those who are new to the hobby.

Over the last decade or so, I've become increasingly concerned about new hams eventually abandoning the hobby due to lack of exposure and engagement. VOIARC offers a variety of activities throughout the year to help engage those who are new to the hobby so they remain hams. We offer a comprehensive repeater class once or twice a year to provide contact with experienced operators. We also have an Elmer Bureau; anyone can fill out the form on our website, and within a day, they're contacted by a club member who has expertise in the area of concern.

A 10-meter antenna built by one of the Technicians in VOIARC's antenna build program.

But, the joy and thrill of HF are often missing from the Technician's normal operations because they have very limited HF privileges. I believe that exposure to HF provides strong incentives for upgrading to General and that HF exposure is a key factor for retaining a person in the hobby. Much of what HF has to offer Technicians is CW, and the primary impediment is learning Morse code. Until recently, 10 meters has had limited propagation. Therefore, SSB and digital operations on HF have been restricted due to the sunspot cycle. Now, with Cycle 25 ramping up, 10 meters offers worldwide exposure to the range of HF.

We created the 10-Meter Project to expose new Technicians to HF without them needing to upgrade their license or spend more than $100 on equipment.

Technician-class licensees have access to 10 meters from 28.000 to 28.500 MHz, which allows for operation of SSB, CW, and digital. A basic dipole antenna for operating this band is about 16½ feet long and can be practically invisible. It's easy to mount at a half wavelength or more for good performance. Components to build a 10-meter dipole are available for less than $50, plus the price of coax. Most old transceivers cover 10 meters, and many hams have old equipment in working order that they no longer use.

Project Implementation

The 10-Meter Project can be executed by a single individual or can be applied more broadly by two or three. In our club, five individuals manage the entire project: one coordinates programs and the other four help on an individual basis, such as with mentoring Technicians.

VOIARC leadership agreed with one ham's idea of getting Technicians on 10 meters and encouraged him to continue. He reached out to the club's marketing team, who felt it fit well with their goals and the club's overall business plan. They helped with promotion of the project, such as announcing it in a club meeting and on the club's website.

From there, one person was tasked with creating the program. He recruited a few others to help as mentors, and they were all willing to donate several old transceivers to the project. Additionally, the club had quite a bit of equipment in working order that wasn't being used. Each mentor worked with one transceiver, and their job was to help their assigned Technician erect an antenna, instruct them on operating the radio, and serve as an experienced General-class operator.

One of VOIARC's dipole antenna experts held a series of antenna builds geared toward Technician-class operators (these antenna builds occur every 2 or 3 months, as the project continues). For most, the antenna build took half a day to complete, but some chose to stay for the full day to help others. There was no charge to participate.

Each participant built, tuned, and tested a 10-meter dipole. They could bring their own parts or purchase them at cost from the club. They learned how half-wave antennas work, as well as how to determine antenna bandwidth, tune and install a half-wave dipole, put coax connectors on the cable, and hide a 10-meter antenna (this was especially helpful for those who are part of a homeowners association). The antenna installation was provided by each Technician's assigned mentor.

Mentors were provided with their assigned participant's contact information, so participants could borrow the transceiver they used (if they wanted to). This delayed Technicians from purchasing a more expensive transceiver until they had a better idea of what they wanted and needed. It also provided an opportunity for them to purchase the borrowed transceiver, if the owner was willing to sell it, allowing them to purchase gear that they already knew how to operate.

The program received enthusiastic support from club members. So, for the following month, the program's presentation was on what Technicians can do on 10 meters. This was followed by a presentation on sunspots and propagation.

Personal Experiences

Stuart Pennington, KK7OYI

VOIARC's repeater class for newly licensed Technicians was an invaluable introduction [to an understanding of] how the ham world works. In another month or so, I'll be able to string my 10-meter antenna to a tree in [my backyard]. I believe 10 meters is the gateway to an enriched ham experience. I've learned a great deal by going through this process and engaging with experienced hams.

Jim McMahon, KM6KER

I've taken VOIARC's repeater class and used my two handheld radios to practice. I built a 10-meter dipole antenna from a [kit, and] later that week, I was able to mount [it] on the roof gables of my shop. After positioning and connecting my rig, I successfully made my first radio exchange with enthusiast[s] in Oregon [and North] Carolina… The result of this project is that I am much more involved in amateur radio.

Judy Beardsley

I am pursuing a ham radio license to be able to talk with family and friends in various locations within the US. I am also interested in the ability to talk with others in other countries. I'm fortunate to have found a group of individuals locally that are interested in helping a newcomer learn as much as possible and [helping me] build my first antenna. It's very exciting to have hands-on experience and to learn from experienced elmers.

Conclusion

The 10-Meter Project is ongoing and continues to be a benefit to VOIARC members. The programs are open to anyone with a Technician-class license or higher, regardless of their membership in the club. Projects like this have the potential to expand and energize amateur radio.

All photos by the author.

Write for "Club Station"

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

ARRL Special Service Clubs

ARRL offers the Special Service Club (SSC) program for clubs that demonstrate that they're working to improve the amateur radio community by completing special projects, holding license classes, and working with local groups on events, among other activities. Visit **www.arrl.org/ssc-application** for more information about this program. Below is a list of new and renewing SSCs as of September 12, 2024.

Renewing SSCs

Skyview Radio Society, K3MJW	New Kensington, PA
Spartanburg ARC, K4II	Spartanburg, SC
Edmond ARS, K5EOK	Edmond, OK
Santa Fe Trail ARC, KSØKS	Olathe, KS

Steve Goodgame, K5ATA, sgoodgame@arrl.org

Ham Media Playlist

Tech Minds

Matt Miller's, MØDQW, interest in radio started when he was a young teenager. His neighbor drove a lorry (or delivery truck, for those of us on this side of the Atlantic), and during the summer, Matt would go along for the ride. Like many truckers, Matt's neighbor had a CB radio in the truck. During these rides, Matt made contacts with other people on CB, eventually becoming hooked on radio. It wasn't until a few years later that he discovered that there was much more to explore with amateur radio.

Matt didn't have an amateur radio mentor. Everything he learned was through his own research and letting the thrill of discovery feed his journey. Matt began to study for his amateur radio license on his own, eventually becoming MØDQW.

Amateur Radio and YouTube

Like many HamTubers, Matt did not initially focus his channel on ham radio. He was doing product reviews for a variety of items, but it wasn't until he started to tinker with a software-defined radio (SDR) dongle that he found the connection between making YouTube videos and amateur radio. In his first video, titled "5 Cool Things You Can Do With An RTL SDR Receiver" (**https://tinyurl.com/techminds-sdr**), Matt discusses how, with an inexpensive receiver and *SDRSharp* software, you can listen to a variety of different radio signals, such as FM radio stations, air band, and others, including ham radio. He goes into detail with amateur radio, explaining some of the bands and modes that you can listen to.

It was this video that launched his foray into creating ham radio YouTube content. Currently nearing 950,000 views, part of its appeal is that Matt gives viewers a taste of what is possible, whetting their appetite to explore on their own. One interesting part of this video is that he shows how to use *SDRSharp* software to decode digital mobile radio (DMR) signals, which at the time were still relatively new in the ham radio world.

Matt Miller, MØDQW, explains some of the possible activities that can be enjoyed using an inexpensive SDR receiver.

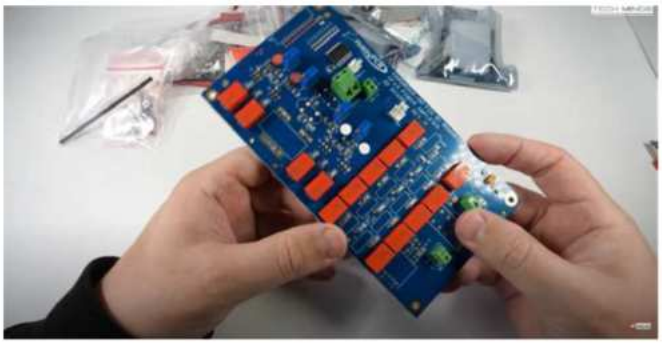
In a recent video, titled "60 Watt Multi-Mode 10 Meter Ham Radio Transceiver" (**https://tinyurl.com/techminds-10meter**), Matt reviews the Radioddity QT60 10-meter radio. He steps viewers through the various settings and features of the radio and films himself making contacts with it. Of particular note is that unlike many other product review videos out there, Matt records via an SDR to demonstrate the quality of the transmitted audio. This is beneficial to viewers, because often inexpensive transceivers have subpar audio when transmitting. This video is also timely because, due to Cycle 25, 10 meters has been extremely active lately.

Kit Building and Weather Balloons

Many amateur radio operators enjoy building kits, and Matt is no different. In his video "Step By Step Guide To Building The Hardrock 50 HF Amplifier" (**https://tinyurl.com/techminds-hardrock**), Matt begins by assuring hams new to building that the project is entirely doable if they are careful and follow the well-written instructions provided. He goes through the entire build, demonstrating how to perform each step and providing helpful tips, such as not forgetting to trim excess wire, etc. While Matt does not show the process of winding each toroid, he has them all laid out next to each other to show what each should look like when completed, referring builders to the provided instructions. He also gives timely advice, such as reminding builders to be careful when soldering the power switch, as it is plastic and too much heat could damage it. Matt then shows how to perform tests with a multimeter before applying power to the unit.

Finally, after stepping viewers through the entire build process and testing, Matt demonstrates the Hardrock-50 in operation, and refers to a second video detailing operation and further demonstration of the amplifier on the air.

Radio aficionados have taken to tracking and recovering radiosonde weather balloons. In his video



Matt Miller, M0DQW, shows the main board for the Hardrock-50 amplifier build.

Matt Miller, M0DQW, demonstrates how to set up a LILYGO transceiver to track radiosonde balloons.

"Weather Balloon Chasing With A Simple Portable Setup" (**https://tinyurl.com/techminds-balloon**), Matt demonstrates how to track radiosondes with inexpensive equipment, utilizing a LILYGO receiver and an Android tablet. This short video shows how to tinker with weather balloon tracking without purchasing expensive equipment.

Matt's Tech Minds channel has almost 500 videos covering a wide array of radio-related topics. With a strategy that might seem counterintuitive, Matt generates interest in amateur radio by covering areas that are not always directly related to amateur radio. Viewers often find his channel while seeking information about something specific, then fall down the proverbial YouTube rabbit hole, ending up watching videos that teach them about amateur radio.

Matt's presentation style is direct and to the point. He keeps strictly to the subject matter at hand. If you are looking for a channel with hours of great content, Tech Minds is the channel for you. Check it out at **www.youtube.com/@TechMindsOfficial**.

Field Organization Reports — August 2024

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**.

535
AC0KQ

475
AD8CM

380
N9VC

370
WA3EZN

330
W7EES

326
KE8BYC

280
W9RY

273
KM4WXX

255
N2LC

245
NW3X

235
WD8USA

230
KV2J

223
WM5N

213
KE8ANW

210
KK4PUX

200
KT2D

195
N4CNX

190
ND8W

185
W5WMC

184
WV5Q

180
N8SY

177
W9EEU

176
KD2NMG

175
AC8NP

173
KO4KUS

165
KC9FXE
KE8DON

160
K9LGU
KK3F
KW1U

157
W1LEM

150
WB9WKO
KR4PI
W4DNA

149
KC8YVF

145
W2PAX

WM2C

140
WA3QLW
WO2H

136
KB5PGY

135
AG9G
W3YVQ
N1ILZ

132
AE5MI

131
W8DJG

130
N2JBA
WK4WC
N1UMJ
WZ0C

126
KN4WX

125
W4CAC

122
KV8Z

121
K8MDA

120
WA4VGZ
WC4FSU
AD4DO
KO4OL
K3JL
KE4RS
KY2MMM
W2AH
KY2D
KA9QWC

117
WB8YYS
KF7ATJ

115
W8IM
KL7RF

114
W4CMH

112
KB3YRU

111
KT5EM

110
KD8UUB
KC8WH
KB2QO
WB8TQZ
N1IQI
N1LAH
KC1KVY
W1TCD

109
NI2W

108
W1RVY

105
KD2LPM
KD0HHN

104
N2DW

100
NX9K
KZ8Q
WB4RJW
KB8GUN
N8MRS
WB8SIQ

K3YAK
KA2ZHP
W1KX
W4EDN
K2MTG
KC1HHO

99
KE8CYC

97
K3EAM

95
KB8PGW

94
N3KRX

93
N3GE

90
KB9GO
KC9UC
KM4WHO
KT5SR
W4NHO
KD2TDG
K8KRA
N8OD
W8GSR
W8MAL
KB8HJJ
W2QMI
WB2VUF
KE8HKA
WB8R

K8ED
NT1N
AA3N
W4KX
AB9ZA
KC8T
N1CVO
WX2DX

88
KT4WX
W5XX

87
KC3FAU

86
K4FHR
KB8RCR
W2ARP

84
WA3QPX
N3SW
WW3S

82
N0JAR
KC3MAL
KB1NAL

81
W4TTO

80
AE2EY
KR4ST
KG5AOP
KA8BJA

KA1G
K2MJR
K2PHD

79
KO5B
KB1NMO

78
WB4ZDU

75
WB3FTQ
K1STM

74
W3ZR

73
N2GS

72
W2OOD
KN4AAG
KB0DTI

71
N0ET

Section Traffic Manager Reports

The following Section Traffic Managers reported: AK, AL, AR, CO, CT, DE, EMA, ENY, EPA, GA, IL, IN, KS, KY, LA, MDC, ME, MI, MO, MS, NC, ND, NFL, NLI, NM, NNJ, NNY, OH, OR, RI, SD, SFL, SNJ, STX, TN, VA, WCF, WI, WMA, WPA, WY.

Section Emergency Coordinator Reports

The following Section Emergency Coordinators reported: KY, MI, ND, NLI, SCV, VI.

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.

KY2D 1,649, NX9K 1,246, W2AH 1,221, KK3F 881, WB9WKO 750, WA3QLW, N9CK 597, KW1U 561.

Bernie McClenny, W3UR, w3ur@arrl.org

How's DX?

The DX Marathon Program

In this month's column, guest author Mark Wohlschlegel, WC3W, explains and answers key questions about the DX Marathon program.

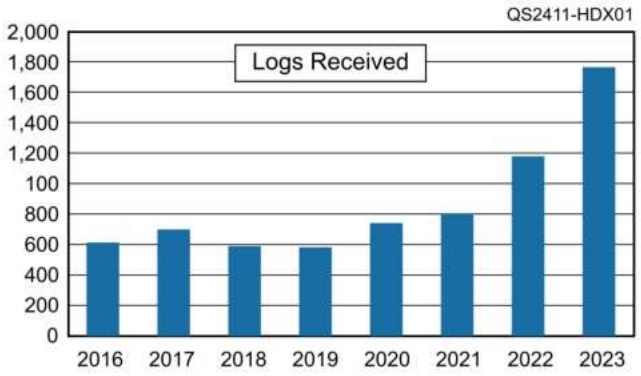
The original DX Marathon began in 1939. It was sponsored by *Radio* magazine, and it was similar to the current Marathon program. However, it lasted only 1 year due to the onset of World War II. It was restarted in 1948 by *CQ* magazine, but it was quickly abandoned in favor of the classic CQ World Wide contests.

CQ preferred to sponsor both programs, but to do so was too great of an administrative strain on the magazine's staff, so the Marathon was dropped. The complete history of what happened next is explained at **www.dxmarathon.com/year-of-dx**. It was written by Bob Locher, W9KNI, who suggested to former owner and publisher of *CQ* Dick Ross, K2MGA (SK), that it was time to reinstitute the DX Marathon program. The rules (**www.dxmarathon.com/rules**) were finalized, and the restart of the program was announced in spring 2005.

A search for a DX Marathon director was instituted, and John Sweeney, K9EL, agreed to serve as the administrative lead. John single-handedly managed the program for 17 consecutive years until the end of 2021, when he handed the baton to me. I now manage the program with Communications Manager John, K2CIB; IT Manager Sebastian, KI2D; Compliance Manager Doug, W4OX; Scoring Manager Larry, WO7R, and Data and Report Manager Jim, AD1C.

With this dedicated collection of volunteers, significant enhancements have been made, including an updated website (**www.dxmarathon.com**), a Groups.io reflector (**https://dxmarathon.groups.io**), and a Facebook page (**www.facebook.com/profile.php?id=61565429540333**). The submission tool has been simplified, and a highly streamlined scoring system has been implemented.

CQ no longer sponsors the program. The DX Marathon staff autonomously manage the program, and a large number of financial sponsors pay for the cost of the plaques.



Over the past 7 years, worldwide participation in the DX Marathon program has nearly tripled.

Program Q&A

The Marathon program is positioned for significant growth. In 2022, it grew by 46%, followed by 50% growth in 2023! I have conducted more than 75 Zoom meetings with clubs around the world. Here are the most frequently asked questions from those meetings:

Q "Why has the program grown so quickly?"

A The reason is increased visibility and the simplicity of the program. The simple rules are listed on the website. The program offers multiple ways to participate, such as by mode or band, and it has four distinct classes defined according to your operating conditions. The big stations are matched with other big stations, and the low-power stations are matched with their peers. Stations with dipoles and verticals running 100 W are grouped together. Also driving growth is the propagation associated with Solar Cycle 25, and the advent of FT8. These factors make it possible for anyone to enjoy the wonderful world of DX.

Q "I am a very experienced DXer with a superstation and have achieved ARRL Honor Roll status. Why should I participate in the DX Marathon program?"

A Many experienced DXers have worked nearly all of the possible DXCC entities. In the DX Marathon, the DX hunt resets every year. The new challenge for experienced DXers to see how many DX entities can be worked along with CQ Zones is refreshing and fun for these operators.

Q "I love DXing, but I have a modest station. How can I possibly be competitive?"

A Most hams have average operating conditions. More than 90% of the ham population does not operate mega stations running full legal limits with extensive antenna arrays. Through a targeted effort,

Bob Locher, W9KNI. In 2005, he approached Dick Ross, K2MGA (SK), to restart the DX Marathon program. He has been a serious participant ever since. [Bob Locher, W9KNI, photo]

the DX Marathon program increased participation in the Formula Class by a factor of four. The Formula Class is made up of those stations running 100 W with dipoles or verticals. Folks who live in apartment complexes with antennas in their attics, for example, are working amazing DX these days.

Q "I dislike FT8, and my true love is CW. What can the DX Marathon program offer me?"

A Participants can select a single mode of operation and make their submissions in a single mode. This entry is called Single Mode. Participants submit scores at the end of the year, either in SSB, CW, or a digital mode.

Q "I am new to ham radio and just turned 15 years old. What might I expect if I decide to participate in the DX Marathon program?"

A The DX Marathon program recently created plaques for the highest-scoring youths aged 25 and younger. Certificates are issued for the highest score in each of the six continents.

Q "I am a contester at heart. Can I participate in the DX Marathon program at the same time that I pursue my love for contests?"

A Participation in the DX Marathon program does not preclude participation in contests. In fact, any DX worked during a contest can be claimed for the DX Marathon program. Many participants increase their DX point score because of operating contests. Incrementally, there is no additional effort needed. If the DX is in your log, it qualifies for the DX Marathon program.

Q "I do not like competition. Is the DX Marathon program competitive?"

A Many folks participate in the DX Marathon program simply to establish a metric of performance against themselves from year to year. With the four classes of stations defined in the rules, it gives participants a way to compare their own scores against previous years. In addition, they can compare their scores against others around the world with similar operating conditions. On the flip side, there are many who are highly competitive and love the thrill of going for the gold each year.

In 2023, the program issued 30 plaques and 130 certificates of merit. In 2025, the DX Marathon staff wishes to increase recognition through the addition of 20 more plaques and 20 more certificates. For more information about the program's plaques and certificates, visit **www.dxmarathon.com/awards**.

How to Participate

There is no sign-up required. Simply retain logs of your yearly DX contacts, which include the 340 ARRL DX Century Club entities, the Worked All Europe entities, and the 40 CQ Zones. Each new entity or Zone worked scores a single point. There are no complicated multipliers, and no confirmations are required. Upload the ADIF files anytime through the submission tool described on the website. Final uploads are accepted January 1 – 5, 2025. That's it! The Marathon staff does the rest.

Club participation is encouraged, and in 2024, the plaque awards have been expanded to include clubs with 75 members or more, 26 – 74 members, or 25 members or less.

If you would like to hear more about the program or desire a Zoom meeting, please send inquiries to **wc3w@dxmarathon.com**.

John Sweeney, K9EL. He single-handedly managed the DX Marathon program for 17 years, and he is still active in the program. [John Sweeney, K9EL, photo]

Jon Jones, NØJK, n0jk@arrl.org

The World Above 50 MHz

The Fred Fish Memorial Award

What is the Fred Fish Memorial Award (FFMA)? How do you earn it? The award concept is simple, but it is daunting to achieve. The FFMA was created in honor of Fred Fish, W5FF (SK), who was the first amateur to have worked and confirmed all 488 Maidenhead grid squares in the 48 contiguous states on 6 meters. The award is given to any amateur who can duplicate W5FF's accomplishment. Unlike the ARRL DX Century Club (DXCC), which is open-ended (i.e., new countries may be added and others may be deleted), the FFMA has a fixed number of grids that have to be confirmed — no more and no less. Many of the grids are common, but some are as rare as a DXCC top 10 most-wanted country due to topography, location, and other issues. The award has been easier to achieve for 6-meter operators in the central area of the lower 48 states, as they can reach almost all of the grids needed on single-hop sporadic E or meteor scatter.

A few operators on the west and east coasts have achieved FFMA, such as K7CW in Washington state and K1TOL in Maine. Edfel, KP4AJ, and Tac, JA7QVI, are currently chasing FFMA, and they have worked many of the grids from thousands of miles away. A top-notch 6-meter station is helpful, but some have earned the FFMA with modest stations, such as NØLL and AAØMZ. Persistence, dedication, and patience are important. Some of the grids have no resident 6-meter operators, so rover and portable activations have been crucial. The FFMA Groups.io (**www.groups.io/g/ffma**) and Slack platforms are helpful for those pursuing this award.

Fred Fish, W5FF (SK).

Most grid expeditions take place during summer to take advantage of sporadic E. If the F2 openings discussed by W3LPL and others occur on 6 meters, this fall may be a golden opportunity for stations on each coast to work rare grids on the other coast via transcontinental F2 (and for DX stations such as KP4AJ and JA7QVI). Rovers may consider activating some of these extremely rare grids, including CM79, CM93, CN71, CN75, DM27, DN20, EL58, FN57, DL79, and DL88.

Bruce Broder's, W9XX, Journey to FFMA #57

Bruce Broder, W9XX, said the following about his journey toward achieving the FFMA:

> I started [operating on] 6 meters in 2011. Just before that, I heard chatter about 6 meters and how it was going to explode when TV went digital. I thought I would wait and see. Well, I started thinking of [getting] a new radio and saw the FTDX5000. So, I bought that, and then I bought a Moseley with a 6-meter dipole add-on. That Moseley lasted until 2015, I think. Then came an InnovAntennas six-element loop-fed array.
>
> In 2011, I started collecting grids. I thought it was a waste of time, as I would never achieve them all. First of all, I really didn't know what was rare or not. My first rare one was [via a contact with] K7BV, [who was] mobile on SSB, sitting in a driveway in DL79. After doing some research, I started to catch on [to which grids are rare]. I hunted a little more than half of the grids on SSB/CW.
>
> The big game changer was finding the FFMA group on Slack. There are so many people who made it fun to chase FFMA and who helped me out. The knowledge and communication that was there was unbelievable!
>
> The rovers are running all over the country for us. It is truly amazing, and no words could ever describe the feeling of gratitude I have for someone giving up their vacation, family time, weekends, money, etc., to brave the weather [and activate grids]. So many told stories on Slack. The last one [I needed was DL88]. I received three decodes during the two trips KM4TYV and WA5POK made to the grid, and the contact was completed on August 4, 2024.

Bruce appreciates the efforts of the following rovers: AG6EE, NI5P, ACØRA, KG5CCI, N7PHY, WB8LYJ, W7GJ, KB7Q, K5N, AA5PR, NØLL, K5ND, AL1VE, W5AJ, K7BG, K8JH, KN4JX, and KM4TYV/WA5POK.

Strong Geomagnetic Storm on August 17

A coronal mass ejection (CME) hit Earth's magnetic field on August 17 at about 1400 UTC, sparking a brief — but strong — G3-class geomagnetic storm. This CME arose from an X1-class solar flare from sunspot AR3784. Some 6-meter aurora in North America was noted by K9MU (EN44). He copied VE4VHF/B (EN19) and VE4ARM/B (EN09) at around 2125 UTC. N7BHC (EL15) spotted PY3SOL (GG30) on 50.313 MHz FT8 via transequatorial propagation (TEP) at 2150 UTC. MM0AMW, G8BCG, and EA5JCI noted PY2XB (GG66) at about the same time. The N5J Jarvis Island DXpedition team had a later opening to Japan on August 18, and they worked stations in the JA1 and JA8 call sign regions.

August Grid Expeditions

Larry Lambert, N0LL, conducted a roving expedition during the Perseid meteor shower weekend. He covered DN73, DN82, and DN91, and most of his activity was in DN73. Larry made a total of 187 mostly portable contacts using his mobile setup (he made 10 fixed mobile contacts while in DN72, 152 while portable in DN73, and 25 while in DN82). He gave W3UUM a DN73 contact for his grid #487. W3UUM needs only one more: CN75. While in DN73, Larry decoded — but did not work — KP4AJ at 1939 UTC on August 11.

On the Bands

50 MHz. Rich, K1HTV (FM19), found UW5ZM and UB7K via E_s on August 5. Roger, VE1SKY, worked EA8TL on August 9. Some aurora occurred on August 11. Ken, WB2AMU (FN30), logged VE3KG (FN24) on aurora CW at 2020 UTC. Aurora E_s also took place; this is sporadic E that forms around the aurora curtains. On August 12, at 0457 UTC, VE1SKY was decoded by AL7ID in Alaska on MSK144, and his signal was up to +21 dB on aurora E_s. WL7AI (BP64) called VE1SKY. On August 18, Mike, KM0T (EN13), worked Curt, KB9JQU (DN94), who uses a dipole on Q65-30. Abdallah, 9K2GS, worked XW4KV on August 19. Some E_s to TEP was found on August 21 by Phil Baldwin, N0PB (EM39). He said, "At 2057 UTC, I logged LU1DZW (GF05) for a new grid. I received a +13 [signal] report and returned a –06." Dan, WZ9W (EM39), worked FF44 and FF61 for new grids. The

The PSK flags showing that Roger Sturtevant, VE1SKY, in Nova Scotia, were decoded by John Antonuk, AL7ID, in Alaska on August 12, 2024. This occurred due to the peak of the Perseid meteor shower. [**www.pskreporter.info/pskmap**]

opening ended at 2142 UTC with a signal from LU7VB at –13 dB, and a signal from CE4MBH at –20 dB. VE7DAY (CO70) worked CE3MRO (FF46). I, N0JK (EM28), had E_s to NB2P (EL96), KC7MRQ (DN36), and N1KWF (FN32). On August 22, N7BHC (EL15) and K1TO (EL87) posted PSK flags for E51EME (BG08). John Price, WA2FZW (FN20), worked the CY9C St. Paul DXpedition on August 27. WW2DX was the CY9C 6-meter operator.

144 MHz. On August 9, Gary Krenzel, N0KQY (DM98), noted some tropospheric propagation east to AA9GL (EM49) and N9DG (EN53). Mike White, K7ULS (DN41), worked WM5L on August 12 via a "blue whizzer" (a long meteor burst) at 0855 UTC. John, WA2FZW (FN20), logged W0ATT (EN44) on MSK144. Mike, K7ULS (DN41), worked VE3WY (FN04) via Earth-moon-Earth (EME) on August 21 at 1129 UTC.

222 MHz. Dave Olean, K1WHS (FN43), reported making EME contacts with PJ4MM (FK52) and W0VB (DN74) on August 21.

Here and There

The Leonid meteor shower is predicted to peak on November 16 – 17. It produced a meteor storm in 1999 and 2001. Unfortunately, the next storm will be in 2099. The predicted rate this year is only 10 – 15 Leonid meteors per hour.

WA2GFN said he chases counties on 6 meters. For more information about county hunting, visit **www.countyhunter.com/cq.htm**.

Special Events

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

Oct. 1 – Oct. 31, 0118Z – 0119Z, VA2PEACE, Saint-Jérôme, QC. **Hope for Peace**. 7.030 14.030 18.090. QSL.* Jean Charron, 17 Rue Élisabeth, Saint-Jérôme J7Z 2S9, Canada. **www.qrz.com/db/va2peace**

Oct. 12, 1400Z – 1700Z, W0CXX, Cedar Rapids, IA. Collins Amateur Radio Club. **Collins Radio 91st Anniversary**. 14.263. QSL. Brice AntonJensen, 1110 Lyndhurst Dr., Hiawatha, IA 52233. **www.qrz.com/db/w0cxx**

Oct. 18, 1230Z – 2230Z, W9P, Plover, WI. Central Sands Amateur Radio Club. **National Mashed Potato Day**. 3.910 7.210 14.260 22.410. QSL. Phil Schobert, 300 Polk St., Stevens Point, WI 54481. **csarc2022@gmail.com**

Nov. 1 – Nov. 2, 2200Z – 2200Z, W9TAL, Ottawa, IL. The American Legion Post 33 Amateur Radio Club. **16th Annual Veteran Honor Guard Vigil at the Ottawa, Illinois War Memorial**. 3.573 3.9 7.074 7.2. QSL. Joe Tokarz, c/o The American Legion Post 33 Amateur Radio Club, 901 LaSalle St., Ottawa, IL 61350. **www.ottawaalpost33.com** or **w9tal@winlink.org**

Nov. 1 – Nov. 15, 0000Z – 2359Z, W8F, Livonia, MI. Livonia Amateur Radio Club. **49th Anniversary of the Sinking of the SS *Edmund Fitzgerald***. 7.050 7.260 14.050 14.260. Certificate. For certificate, go to **www.livoniaarc.com/qsl.** *Saturday, Nov. 9, 1530 – 2030 UTC, W8F will operate from Dossin Great Lakes Museum, Belle Isle State Park, Detroit, MI. (POTA US-1487 this date only). Nov. 1 – 15 club members signing as W8F will be on all bands/modes; see spotting sites.* **www.livoniaarc.com** or **www.qrz.com/db/w8f**

Nov. 2, 1400Z – 2100Z, W0AK, Des Moines, IA. Des Moines Radio Amateurs Association. **Massing of the Colors**. 14.260 21.375 28.450. Certificate. DMRAA, P.O. Box 88, Des Moines, IA 50303-0088. *Information on Massing of the Colors is at* **www.moww.org. www.dmraa.com**

Nov. 2 – Nov. 3, 1500Z – 2355Z, W0JH, Stillwater, MN. Stillwater (Minnesota) Amateur Radio Association (SARA). **2024 Remembering the *Edmund Fitzgerald***. 3.860 7.260 14.260 21.360. Certificate. Request certificate by email; certificate will be emailed to you: **w0jh24fitz@outlook.com**. **www.radioham.org** or **www.qrz.com/db/w0jh**

Nov. 2 – Nov. 10, 2100Z – 0600Z, K9O, Nashville, TN. Nashville Amateur Radio Club, Inc. **90th Anniversary Celebration of the Nashville Amateur Radio Club, Inc**. 7.060 7.180 14.060 14.230; all bands, all modes. Certificate & QSL. Nashville Amateur Radio Club, Inc., 205 Downeymeade Dr., Nashville, TN 37214. **www.nashvilleamateurradio.club**

Nov. 2 – Nov. 16, 0001Z – 2359Z, W9A, Salem, WI. W9AFB. **Operation Able Archer '83**. 14.250. Certificate & QSL. Scott Grams, General Delivery, Salem, WI 53168. *Commemorating the 1983 Cold War Able Archer Exercise. See website for operating times, modes, and additional details*. **www.qrz.com/db/w9a**

Nov. 2 – Nov. 16, 0001Z – 2359Z, W0A, Lincoln, NE. KF0NWQ. **Operation Able Archer '83**. 14.250. Certificate. Tyler Sandberg, General Delivery, Lincoln, NE 68512. *Commemorating the 1983 Cold War Able Archer Exercise. See website for operating times, modes, and additional details*. **www.qrz.com/db/w0a**

Nov. 3, 0000Z – 1200Z, various, many locations. AA8SH. **118th Anniversary of SOS and Maritime Calling Frequency 500 kHz**. 600 meters, CW from 472 to 475 kHz and *WSJT-X*; FST4 (60-second pass) at 474.2 kHz USB. Certificate. QSL to station worked. *Those interested should register with the Utilities Technology Council at* ***https://utc.org/plc-database-amateur-notification-process***. **aa8sh@aol.com**

Nov. 3, 1400Z – 2000Z, W4CA, Roanoke, VA. Roanoke Valley Amateur Radio Club. **Mill Mountain Star**. 7.650 14.265. QSL. Roanoke Valley ARC, P.O. Box 2002, Roanoke, VA 24009. **www.w4ca.com/special-events**

Nov. 5 – Nov. 11, 0500Z – 0459Z, KB2UNZ, Scott AFB, IL. Air Force MARS. **Air Force MARS 76th Special Event**. 3.890 7.210 14.325 28.350; amateur HF bands (80 – 6) in the General portion of the band and in the Technician portion of 10 meters using SSB, CW, and digital modes. Certificate. Chief Air Force MARS FOA ACC CCC, 203 W. Losey St., Bldg. 1700, Scott AFB, IL 62225. **https://community.apan.org/wg/afmars/air-force-mars-76th-special-event**

Nov. 6, 1700Z – 2359Z, NI6IW, San Diego, CA. USS *Midway* Museum Ship. **Commemorating Veterans Day (11/11/1919) and USMC Birthday (11/10/1715)**. 7.250 14.320; 14.070 PSK31 D-STAR on PAPA System repeaters. QSL. USS *Midway* Museum Ship COMEDTRA, 910 N. Harbor Dr., San Diego, CA 92101. **www.qrz.com/db/ni6iw**

Nov. 7 – Nov. 12, 1600Z – 2100Z, N4A, Stuart, FL. Martin County ARES and Martin County Amateur Radio Association. **Stuart (Florida) Air Show**. 7.260 14.260 21.260 28.460. QSL. MCARA N4A, P.O. Box 1901, Stuart, FL 34995. **www.mcaraweb.com**

Nov. 9, 1430Z – 2000Z, W2GSB, West Babylon, NY. Great South Bay Amateur Radio Club. **Walt Grosser, W2TE, Memorial SES**. 7.200 14.200 14.246 21.250 24.940 28.340; all modes, CW operators must bring their keys. E-certificate. Downloadable from **http://cert.elemcoshopfloor.com**, or P.O. Box 1356, West Babylon, NY 11704-0356. **www.gsbarc.org**

Nov. 9, 1500Z – 2300Z and Nov. 10, 1500Z – 2100Z, W9W, Oak Brook, IL. DuPage Amateur Radio Club. **Windycon 50, Science Fiction Convention**. 14.070 14.230 14.274 145.430 (local 107.2 PL). Certificate. DuPage Amateur Radio Club, P.O. Box 71, Clarendon Hills, IL 60514-0071. *Operating times are Nov. 9, 0900 – 1700 and Nov. 10, 0900 – 1500 local time (CST). See website for certificate and other information.* **www.qrz.com/db/w9w** or **www.w9dup.org**

Nov. 9 – Nov. 10, 1500Z – 2100Z, NB9QV, Manitowoc, WI. USS *Cobia* Amateur Radio Club. **USS *Cobia* Veterans Day Special Event**. 7.240 12.240. Certificate. E–certificate only, **kc9yl@arrl.net**. **www.qrz.com/db/nb9qv**

Nov. 11, 1500Z – 2000Z, KA4TAL, Conway, SC. Horry Post 111, The American Legion Amateur Radio Club. **Honoring Our Veterans and Celebrating Veterans Day 2024**. 7.185 7.264 14.255 14.275. E-certificate. From **talarc.ka4tal@gmail.com**.

Nov. 11, 1500Z – 2020Z, W2B, Bedford, VA. New River Valley Amateur Radio Club. **Veterans Day from the National D-Day Memorial in Bedford, Virginia**. 14.275. QSL. Danny Wylam, 710 McDaniel Dr., Christiansburg, VA 24073. **dannywylam@gmail.com**

Nov. 11, 1800Z – 2100Z, N3TAL, Lanham, MD. American Legion Post 275 Amateur Radio Team. **Veterans Day**. 7.275 LSB. QSL. American Legion Post 275 Amateur Radio Team, 8201 Martin Luther King Jr. Hwy., Lanham, MD 20706. **n3tal275@gmail.com** or **www.qrz.com/db/n3tal**

Nov. 11 – Nov. 16, 0000Z – 2359Z, W0W, Hattiesburg, MS. Pine Belt Amateur Radio Association. **In Support of the Annual Pow-Wow Being Held on the University of Southern Mississippi Campus**. 7.033 14.033 14.260; digital any band. QSL. N5CW, P.O. Box 52, Petal, MS 39465. **www.qrz.com/db/w0w**

Nov. 16, 1400Z – 2200Z, K3S, Baltimore, MD. Nuclear Ship *Savannah* Amateur Radio Club. **First Transatlantic Ham Radio QSO (1923)**. 7.1 14.1 21.1 28.1. QSL. K3LU, 980 Patuxent Rd., Odenton, MD 21113. *Please check spotting networks for frequencies*. **www.qrz.com/db/k3s**

Nov. 16, 1500Z – 1800Z, W0CXX, Cedar Rapids, IA. Collins Amateur Radio Club. **Collins ARC 41st Anniversary**. 14.263. QSL. Brice AntonJensen, 1110 Lyndhurst Dr., Hiawatha, IA 52233. **www.qrz.com/db/w0cxx**

Nov. 16 – Nov. 18, 0000Z – 0000Z, W6SFM, Fair Oaks, CA. Samuel F. Morse Amateur Radio Club. **W6SFM Bug Roundup**. 3.533 7.033 14.033 28.033. QSL. John Geyer, 4901 Minnesota Ave., Fair Oaks, CA 95628. *This is an operating event.* **www.w6sfm.org/bug-roundup**

Nov. 17, 1500Z – 2400Z, K7GST, Prescott Valley, AZ. Yavapai Amateur Radio Club. **Celebrating the 153rd Birthday of the NRA, Operating from Gunsite Academy in Paulden, Arizona**. 7.250 14.250 21.335 28.340. Certificate. Printable PDF available at **http://w4gkf.com/k7gst**. **www.w7yrc.org/nrabirthday**

Nov. 27 – Dec 1, 0000Z – 2359Z, NW7US, Fayetteville, OH. Olivia Digital DXers Club. **Autumnal Olivia Digital Mode QSO Party**. 7.071 14.071 21.071 28.121. Certificate. Tomas, NW7US, P.O. Box 110, Fayetteville, OH 45118. *This is an operating event.* **www.oliviadigitalmode.org**

Nov. 30 – Dec. 1, 1500Z – 2300Z, W9CAP, St. Charles, IL. Illinois Wing Civil Air Patrol. **83rd Anniversary of Civil Air Patrol**. 7.255 14.250 18.125 28.450. Certificate. Attn: Lt. Col. Robert Becker, P.O. Box 4027, St. Charles, IL 60174. **www.qrz.com/db/w9cap**

Certificates and QSL cards: To obtain a certificate from any of the special event stations offering them, send your QSO information along with a 9 × 12-inch self-addressed, stamped envelope (3 units of postage) to the address listed in the announcement. To receive a special event QSL card (when offered), be sure to include a self-addressed, stamped business envelope along with your QSL card and QSO information.

*Some clubs may ask for a nominal fee to cover the cost of the certificate or QSL. Request will be made on the 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**, or email information to **events@arrl.org.**

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

You can view all received Special Events at **www.arrl.org/special-event-stations.**

Strays

Happy 25th Birthday to PJ2T

The Caribbean Contesting Consortium, PJ2T, will celebrate its 25th birthday on November 23. The famous contester and DXer John Thompson, W1BIH (SK), founded the club. John visited Curacao in 1967 and loved the propagation conditions so much that he built a house there for contesting. John became PJ9JT, and many famous contest operations ensued. I bought the house from John in 2000. We selected our call sign, PJ2T (Papa John 2 Thompson), to honor him.

The start of the CQ Worldwide DX CW Contest will mark a quarter century since Jim, W0NB; Jeff, KU8E, and I made the first-ever contest contact under PJ2T. Since then, the station's activity has grown dramatically, with 1.27 million Logbook of The World contest contacts, more than a million non-contest contacts, hundreds of visiting operators, and having participated in 168 large-scale contests.
— *Geoff Howard, W0CG*

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

Florida (Coral Gables) — Nov. 23 F T
7 AM – noon. *Spr*: The Flamingo Net. University of Miami parking lot 102, 5101 San Amaro Dr. *TI*: 147.150 (94.8 Hz). *Adm*: None, other than UM parking fee of $2.50/hour.
www.flamingonet.8m.net

Florida (Dade City) — Nov. 2 F H R T V
7 AM – noon. *Spr*: East Pasco ARS. American Legion Post 15, 37745 Church Ave. *TI*: 146.88 (146.2 Hz). *Adm*: $5.
www.eparsonline.org

Florida (Ocala) — Dec. 7 D F H R T V
7 AM – noon. *Spr*: Silver Springs Radio Club. First Christian Church, 1908 E. Fort King St. *TI*: 146.61 (123.0 Hz). *Adm*: $10.
www.k4gso.us

Indiana (Brazil) — Nov. 30 F H R V
7 AM – noon. *Spr*: Wabash Valley ARA. Clay Co. 4-H Fairgrounds, 6550 N. IN-59. *TI*: 146.685 (151.4 Hz). *Adm*: $10.
www.w9uuu.org/hamfest/turkeyfest_2024.pdf

Indiana (Fort Wayne) — Nov. 16 – 17 D F H Q R S V
Sat. 9 AM – 4 PM, Sun. 9 AM – 2 PM. *Spr*: Allen Co. Amateur Radio Technical Society. Allen Co. War Memorial Coliseum, 4000 Parnell Ave. *TI*: 146.880 (141.3 Hz). *Adm*: $8 for both days, $4 for Sunday only. **www.fortwaynehamfest.com**

Louisiana (Slidell) — Nov. 15 – 16 D F H R S V
7 AM – noon. *Spr*: Ozone ARC. Slidell City Auditorium, 2056 2nd St. *TI*: 147.27 (114.8 Hz). *Adm*: $5; 12 and under, free.
www.w5sla.net

Michigan (Troy) — Dec. 1 D F H R V
7 AM – noon. *Spr*: L'Anse Creuse ARC. Balkan American Community Center, 1451 E. Big Beaver Rd. *TI*: 147.08 (100 Hz). *Adm*: $10. **www.n8lc.org**

Missouri (Nixa) — Nov. 9 D F H R S V
8 AM – 1 PM. *Spr*: Nixa ARC. Victory Baptist Church, 252 N. Nicholas Rd. *TI*: 147.015 (162.2 Hz). *Adm*: $10.
www.smlrs.info/narcfest2024

Nebraska (Norfolk) — Nov. 16 D F H R S V
8:30 AM – 2 PM. *Spr*: Elkhorn Valley ARC. CHC Hall, 105 Elm Ave. *TI*: 146.73 (131.8 Hz). *Adm*: $5. **www.qsl.net/evarc**

North Carolina (Benson) — Nov. 17 D F H V
8 AM – 1:30 PM. *Spr*: Johnston ARS. American Legion Complex, 605 N. Wall St. *TI*: 147.27. *Adm*: $9 Advance, $10 door.
www.jars.net

Ohio (Archbold) — Dec. 7 D F H R V
7 AM – noon. *Spr*: Fulton Co. ARC. Ruihley Park Pavilion, 320 W. Holland St. *TI*: 147.195 (103.5 Hz). *Adm*: $5.
www.k8bxq.org/hamfest

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. 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 **December 1** to be listed in the **February** issue. Information in this column is accurate as of our deadline; contact the sponsor or check the sponsor's website for possible late changes, driving directions, and other event details. Please note that postal regulations prohibit mention in *QST* of games of chance, such as raffles or bingo.

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

Certificate of Code Proficiency Recipients

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.

March 2024

Mark A. Jessing, N4OJE	10
Stephen M. Riley, WA9CWE	10
Kenneth F. Robinson, K8SCA	10
Steven L. Myers, AI7OL	20
Bernard A. Poskus, KF0QS	20

April 2024

Joseph P. Kononchik, KS1I	10
Bill Durham, KG5ZCI	15
Joseph P. Kononchik, KS1I	15
Glenn R. Barr, Jr., WB0KFC	20
Daryl I. Hammond, W0BZ	20
Gabriel E. Donley, WN7JT	25

May 2024

Tom J. Zajdel, AA3TZ	10
Tom J. Zajdel, AA3TZ	15
John H. Orkney, KA1LHJ	20
Tom J. Zajdel, AA3TZ	20
Daryl I. Hammond, W0BZ	25

June 2024

Robin L. Zinsmaster, N6PHP	25

July 2024

Theodore J. Jacobson, N6ZO	10
Jerry K. Nobles, N5MES	10
Charlene K. Lewis, K8XCO	15
David D. Koberstein, N9DK	20

August 2024

Thomas H. Busch, WB8WOR	10
Jeanne Martin, KC1SPX	10
Thomas S. Wright, ND9Z	10
Richard McCleaf, K3EYJ	15
Stephen C. Brandt, N7VS	30
George I. Levy, NC2M	30
Stephen C. Brandt, N7VS	35

Congratulations to all of the recipients.

November 2024 W1AW Qualifying Runs

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

November Qualifying Runs will be transmitted by W1AW in Newington, Connecticut, at the times shown on 1.8025, 3.5815, 7.0475, 14.0475, 18.0775, 21.0675, 28.0675, 50.350, and 147.555 MHz. The West Coast Qualifying Runs will be transmitted by K9JM on Wednesday, November 20, at 9 PM PST (0500 UTC on November 21) on 3590 and 7047.5 kHz. Unless indicated otherwise, sending speeds are from 10 to 35 WPM.

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

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

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

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

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

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

W1AW Qualifying Runs — November 2024
(All times are in Eastern Standard Time.)

Monday	Tuesday	Wednesday	Thursday	Friday
		11/6 4 PM – 2100Z 10 – 35 WPM	**11/7** 10 PM – 0300Z **(11/8 – UTC)** 10 – 40 WPM	**11/8** 9 AM – 1400Z 10 – 35 WPM
Veterans Day		**11/13** 10 PM – 0300Z **(11/14 – UTC)** 35 – 10 WPM	**11/14** 7 PM – 0000Z **(11/15 – UTC)** 10 – 35 WPM	**11/15** 4 PM – 2100Z 10 – 35 WPM
11/18 10 PM – 0300Z **(11/19 – UTC)** 35 – 10 WPM	**11/19** 9 AM – 1400Z 10 – 35 WPM			**11/22** 4 PM – 2100Z 10 – 40 WPM
11/25 10 PM – 0300Z **(11/26 – UTC)** 10 – 40 WPM	**11/26** 9 AM – 1400Z 35 – 10 WPM		**Thanksgiving**	**Thanksgiving**

Christina Lessard, KC1TDM, clessard@arrl.org

At the Foundation

New ARRL Foundation Grant Recipients

Following the June 2024 grant submission period, the ARRL Foundation Board of Directors voted to approve funding for the following six grant proposals.

ARRL Grant Recipients

The All Things Amateur Radio Association in Ohio received a $1,125 award for their project Operation FOTA — "Fair on the Air." Their goal is to attract visitors to their booth at the Fairfield County Fair on Kids Day using games with STEM-related prizes and hands-on activities, including the opportunity to get on the air to expose people of all ages to amateur radio.

CompassPoint Mentorship received a $3,000 award to provide underrepresented communities in the residential district of Alviso, California, with technological education through amateur radio. Radio equipment will also be purchased and used at a radio camp for low-income youths in Silicon Valley.

ARRL FOUNDATION

Five ARRL Library Book Sets will be donated to the Great Falls Masonic Amateur Radio Club. The club will donate them to local and rural libraries in Montana to ensure patrons have materials about amateur radio and licensing. The book sets will also be available on a bookmobile that travels to the small outlying areas that do not have libraries. The hope is to reach youths and adults who may have never considered getting an amateur radio license.

An award of $3,000 was given to the University of Illinois of Urbana-Champaign's Illinois Space Society to purchase equipment to engineer an onboard livestream of the liftoff of a high-power rocket.

The Knox County Amateur Radio Club in Williamsfield, Illinois, received $1,459 worth of ARRL publications for the Galesburg Public Library for recruitment, education, and outreach of potential new amateur radio operators. These new reference materials will also support the club's efforts to have amateur radio license classes at the library.

Olympia High School in Olympia, Washington, received $1,328 to purchase a portable software-defined radio receiver and antennas to download weather maps from orbiting GOES satellites, and to analyze spectrum usage, specifically on the 5 and 2.4 GHz bands they use for communication with their robots. Students will be able to tune in to a satellite, receive live data, and develop strategies to minimize interference between robots and control stations.

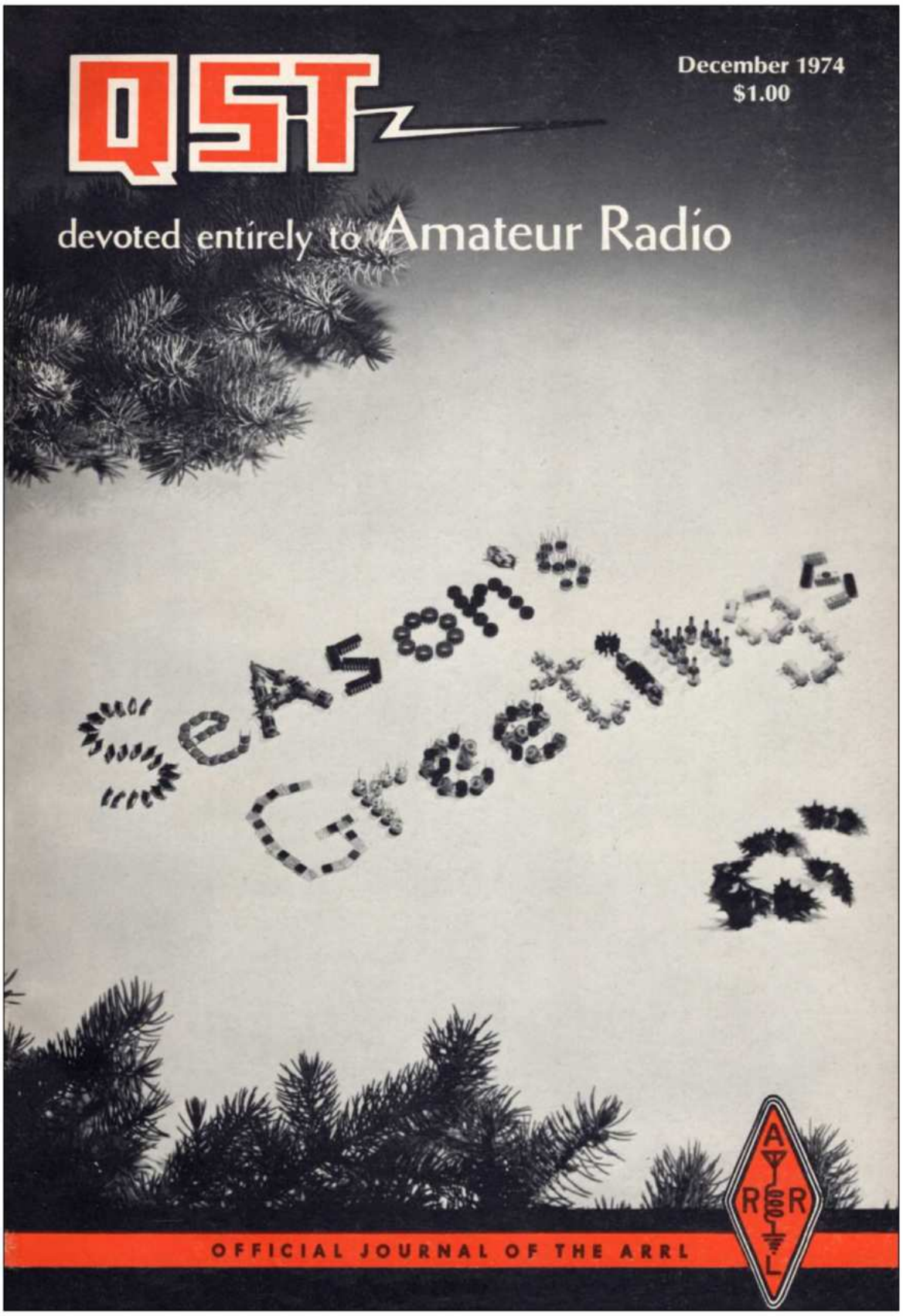
To learn more about the ARRL Foundation Grant Program and the next time the Foundation will be accepting proposals, please visit **www.arrl.org/amateur-radio-grants** or email **foundation@arrl.org**.

New Products

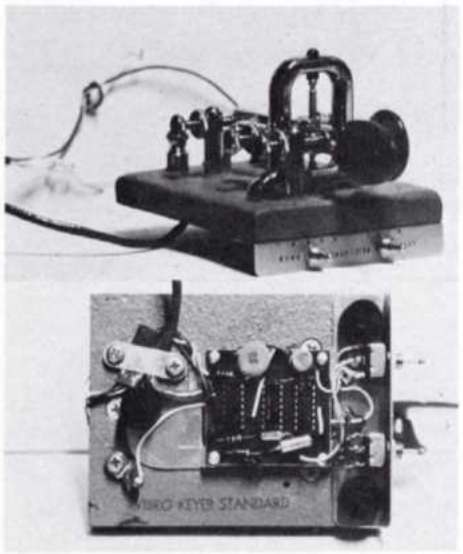
Begali 70th Anniversary Key

To celebrate their 70-year anniversary, Begali Keys has released a new 70th Anniversary Key. Emblazoned with the 70th anniversary logo, the limited-edition key is a Begali Stradivarius design produced in Italy. It is made of stainless steel with solid 14-karat gold contacts. The paddle's arms are short and made from lightweight alloy. The bottom of the key has a rubber ring to prevent movement and sliding while in use. Only 424 keys are available to purchase from **www.i2rtf.com/index.html** for about $680 each.

A Look Back


QST
December 1974
$1.00
devoted entirely to Amateur Radio
Season's Greetings
OFFICIAL JOURNAL OF THE ARRL
ARRL

Hints and Kinks For the Experimenter



A small circuit board (with keyer components mounted) will fit very neatly under the Vibroplex keyer paddle. The controls are placed either side of the paddle for maximum convenience.

CONVENIENT KEYER LOCATION

The electronic keyer described in *QST* for April, 1968, if built on a small printed circuit board, fits neatly under the Vibroplex paddle. A small panel (which serves also to fasten the circuit board to the key base) is used to hold two switches. Each switch has three positions, the left-hand switch functions as an **ON-OFF-HOLD** control. The one at the right is the **SPEED CONTROL** (regular, fast, slow speeds) determined by three fixed-value resistors. Only the power supply leads and keyed output cable are necessary for operation. – *Daniel Rozen, 4X4SK*

SB-220 ON 6 METERS

The Heath SB-220 amplifier can be converted for use on the 6-meter band by changing only a few components. A partial view of the schematic diagram is shown in Fig. 1. The following modifications should be made:

1) Move the 10-meter tap on the plate coil (L6) to a point 1-2/3 turns from the plate-tune capacitor. A grid-dip oscillator can be used to check resonance at 50 MHz.

2) Unwind the 10-meter input coil (L1), leaving 2-3/4 turns.

3) Replace C33 and C34 by a single 10-pF mica capacitor.

4) Change C35 (115 pF) to a 33-pF mica capacitor. This change to my SB-220 has proved to be an excellent addition to the 6-meter setup. – *John Roth, WA2TSJ*

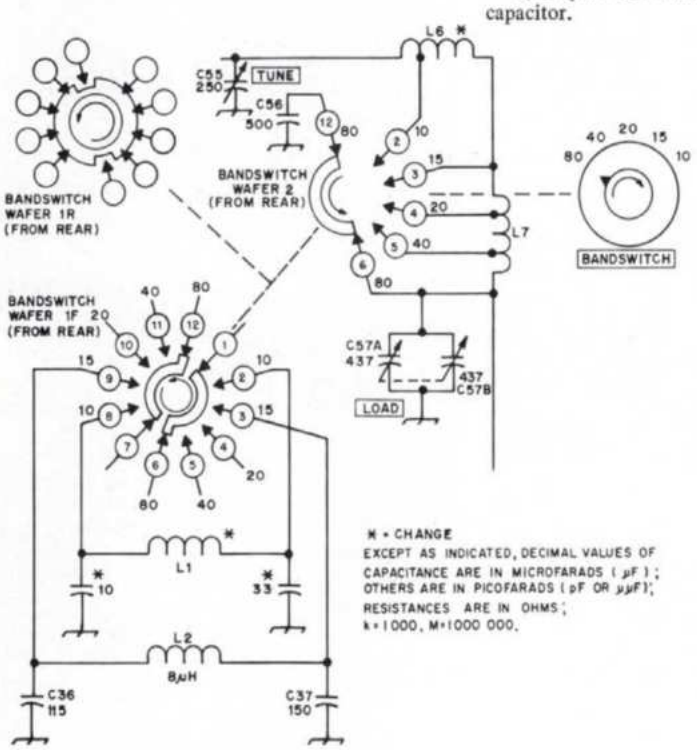


Fig. 1 – A portion of the SB-220 schematic diagram is shown and the circuit changes which are necessary to make this amplifier operate on 6 meters.

Celebrating Our Legacy

A Ham Friendship Through the Decades

In 1977, my Novice call sign was WB1HBB. Having graduated from citizens band radio, I became involved with a local club and fell hard for the hobby. A year after I became a ham, I gave Jeff, KD1NQ, a copy of *Tune in the World with Ham Radio*, and he and I have remained friends for almost 50 years.

I joined the Interstate Repeater Society in Derry, New Hampshire, and eventually became its president. In 1987, I started the New Hampshire Novice Traffic Net with Don, KB1XI (SK). The net had members from Maine to western New Hampshire. I beamed when I heard them on the National Traffic System nets around the state. It ultimately became an Official Emergency Station.

I began my upward journey through the license classes, eventually becoming the Vice Director for the New Hampshire Section. I continued club activities and was heavily devoted to ARES and public service. However, in 1996, I moved to Florida to take care of my dad, and unfortunately, I had to resign from all of my positions.

At 76, I am now living in a long-term care facility and remain friends with Jeff. He set me up with a handheld transceiver and homemade antenna when I moved in. He also brought me all the copies of *QST* that I missed. His loyalty has moved me to tears on occasion. There are too many memories to expound on during my 45 years as an amateur radio operator.

Warren Rothberg, W4WR
Amesbury, Massachusetts
Life Member

Coming Back to the Hobby After the Army

In 1956, when I was 16, I obtained my Novice license as KN4MHI when I lived in Leitchfield, Kentucky. As a lifeguard at a church summer camp, I used my lunch break to learn CW. I made it to 18 WPM and passed the General test a year later. After graduating with a degree in electrical engineering from Purdue University in 1962, I sold my equipment and became an Army Ordnance Second Lieutenant. I went to Germany, where I received the call sign DL5IW. I left the Army in 1968 as a Captain and returned to Lafayette, Indiana.

Building a Heathkit HW-16 to improve my CW skills renewed my interest in ham radio. After I received the ARRL Code Proficiency Certificate, I drove to Chicago and passed the Extra-class exam. Then I sold the HW-16 and upgraded to a Drake R-4B, an all-band vertical, and a three-element beam. I had a complete RTTY setup and an iambic keyer. By the time I left Indiana for a job with Motorola, I had been net control of the state net, county radio officer, county Emergency Coordinator, and president of the local amateur radio club. In 1973, I changed my call sign to W4LQG and then to N4CU.

I became active in several clubs and contesting, obtained the DXCC Award, and built several antennas. In my retirement, I now have a 100-foot tower and SteppIR antenna. I am not as active as I once was, but I still try to do my part. I plan to continue going to hamfests and working on club projects.

Robert Walker, N4CU
Holt, Florida

Moving to the Ham Community

In 1976, my wife and I were looking for a house. Bob Myers, K2TV, mentioned that the house next door to his was for sale, and we bought it. After moving, we discovered that there were several other active hams within a quarter-mile radius.

My first antenna was an end-fed 135-foot dipole, and eventually, I put up a Rohn 25 tower with a beam and a Ringo Ranger antenna.

Bob and I were in constant contact, either by phone or on 2 meters. We'd come up with an operating plan, times, and frequencies, and send in our combined scores for the Great South Bay Amateur Radio Club. Bob was also a great teacher. I had my station grounded to an old well pipe rather than the electric ground on the incoming water pipe. After I got a couple of nice RF blisters, he reminded me, "All grounds are not the same; everything must be bonded to the same ground." That cleared up a few problems.

Sadly, that era ended when Bob moved to Virginia, and his house was sold, unfortunately, to a non-ham. The club gave Bob a mag-loop antenna as a going-away present. Now, I tell him he can go after the Worked All States Award and some other awards as a low-power entry.

John Smale, K2IZ
Copiague, New York
Life Member

Send reminiscences of your early days in radio to **celebrate@arrl.org**. Submissions selected for publication will be edited for space and clarity. Material published in "Celebrating Our Legacy" may also appear in other ARRL media. The publishers of *QST* assume no responsibility for statements made in this column.

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

Classic Radio

Well-Known Manufacturers of Radios without Companions

Many radios that entered the amateur radio market were never followed by radios that had similar styling or the ability to transceive to make a new family of equipment. I've limited myself to the more well-known amateur radio manufacturers in this summary; companies with one or two efforts, like Robyn, are not covered.

Hammarlund

The first Hammarlund without other similar-looking radios was the Pro-310 from 1955. It had three large knobs and five smaller skirted knobs. It used double conversion and had general coverage from 550 kHz to 35.520 MHz. The Pro-310 had a second intermediate frequency (IF) of 52 kHz, where LC circuits gave selectivity choices of 4.0, 2.0, or 0.50 kHz. Hammarlund never made a receiver or transmitter that matched the styling of the Pro-310.

Another restyling that went nowhere was Hammarlund's HX-500 SSB/CW/AM/FM frequency-shift keying transmitter from 1960. It used a variable frequency oscillator (VFO) that tuned the same range on all bands and a crystal oscillator that was mixed with a tunable IF to reach 80/75 to 10 meters. The power supply was built in, but the HX-500 was a whopping 100 pounds. Its basic design could've been used with a suitable receiver to transceive, but the HX-500 didn't come with outputs to do so (and Hammarlund never made a receiver that could work with it). The lack of a suitable receiver from Hammarlund doomed the HX-500's long-term future.

The HX-50 and HX-50A SSB/CW/AM 80/75- to 10-meter transmitters were somewhat similar in concept to the earlier HX-500. They were considered companions to the HQ-170 and HQ-180 receivers, but these receivers had a free-running tunable first oscillator that was switched for each band. This meant they couldn't be companion receivers to the Hammarlund HX-50 because they were unable to transceive together. The HX-50 and HX-50A had a rear panel input for a VFO from a receiver that used the same frequency mixing scheme, but Hammarlund never made such a receiver.

The HT-37 and SX-111 had similar styling, knobs, and colors, but didn't transceive. [Photo courtesy of **www.radiopics.com**]

Hammarlund released the HQ-88 receiver in 1964. It had a crystal-controlled first conversion and a tunable first IF, but it wasn't compatible with the HX-50 because the IFs were different. The HQ-88 was the only Hammarlund product that looked anything like the HX-50, other than the HQ-66, which was built as a concept receiver and never produced for sale.

In 1967, Hammarlund updated their HQ-100 entry-level shortwave listening (SWL) receiver; it remained a Hammarlund product until the end of their amateur radio and SWL products in 1972. Hammarlund made a CB transceiver version of the HQ-200, like they did with the HQ-100. The HQ-105TR went with the HQ-100; the HQ-205 looked somewhat like the HQ-200.

The last new amateur band receiver from Hammarlund was the HQ-215, which covered the amateur radio bands in 200 kHz wide slices (as did the Collins S Line). The HQ-215 used the same tunable and fixed IF, as well as the same tuning range for the VFO as the Collins 75S-1 did. Hammarlund didn't make a transmitter to go with the HQ-215 receiver, but with a bit of work, it could transceive with the Collins S-Line transmitters. The HQ-215 was a solid-state receiver that used Collins mechanical filters; it came with a 2.1 kHz bandwidth filter already installed, and as an option, Hammarlund also sold Collins filters for it. The crystals to add coverage to the S Line and KWM-2 were the same frequencies as those for the HQ-215. An SWL version of the HQ-215 — to be called the HQ-225 — was planned, but never produced.

R. L. Drake Company

Drake never built a transmitter to go with its R7 and R7A receivers. The TR-7 solid-state transceiver was very similar to the R7 receiver and could be used with it. The Drake SPR-4 could be used with the 4-Line transmitters with an adapter sold by Drake. Drake also never made a transmitter to use with the R8 SWL and amateur radio receiver. They stopped building equipment specifically for amateur radio after the TR-7.

National Radio Company

National didn't build equipment that was focused on amateur radio until about 1969. After that, they only built two receiver products — the HRO500 and HRO600 — both of which weren't aimed at the amateur radio market. The last products from National were transceivers or receivers that were inappropriate to use for transceiving. The HRO500 and HRO600 were better suited and priced for laboratory use rather than ham radio. The National NCX-1000 was one of their last radios.

Hallicrafters

Hallicrafters did a fairly good job of integrating equipment in various families. The HT-44 transmitter and SX-117 receiver worked together, transceiving or operating on different frequencies at the flip of a switch; the SX-146 and HT-46 offered the same capability. The SX-101 or SX-115 went with the HT-32, and the HT-37 and SX-111 had similar styling, knobs, and colors, but didn't transceive.

Hallicrafters focused next on the FPM-300 80/75- to 10-meter transceiver and a few 2-meter FM radios before going out of business after trying UHF police radios and repeaters as a new business direction.

Davco

In 1964, Davco released their advanced solid-state amateur band receiver, the DR-30. It had outputs and inputs that enabled it to transceive with the DT-20 transmitter, which was announced but never manufactured. Davco stopped making the DR-30 in 1966 and disappeared completely after that.

Radio Manufacturing Engineers

RME was moderately successful with the RME-6900 from 1959 to 1962. They announced one singular amateur band receiver after that and exited the radio receiver business. RME made their last transmitter in 1963, and was later bought by Textron.

This advertisement for the Squires-Sanders SS-1R appeared in the November 1966 issue of *QST*.

Squires-Sanders Inc.

From 1963 to 1967, Squires-Sanders produced two receivers; the SS-1R amateur radio receiver was upgraded in 1966. The receivers had a crystal-controlled first conversion as well as inputs and outputs to allow transceiving with a transmitter that was planned, but never produced. Squires-Sanders went into manufacturing CB radio transceivers and divested themselves of the Clegg amateur radio manufacturer around 1968.

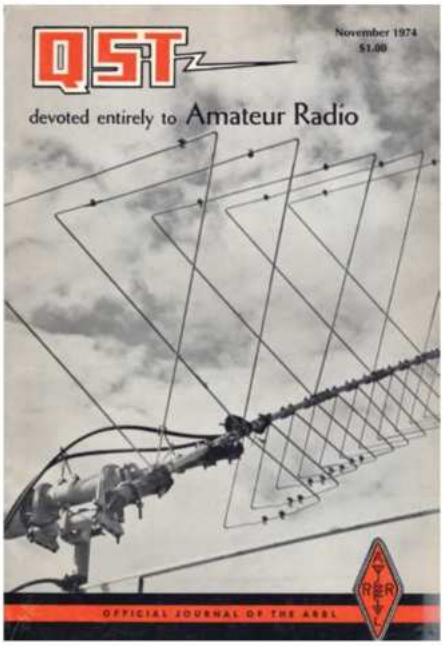
Swan Electronics

Swan Electronics offered the 600-R, a ham band receiver with an accessory that gave it general coverage, from 1970 to 1974. They also made the 600-T transmitter to capture the portion of the amateur radio market that preferred a separate receiver and transmitter rather than a transceiver. After 1974, all products from Swan, which had since become a division of Cubic Corporation, were all transceivers. Cubic Corporation continued to manufacture high-end, high-priced receivers, but made nothing for the amateur radio or SWL marketplace.

100, 50, and 25 Years Ago

November 1924

- The cover shows an illustration of "The One-Control Superheterodyne," by James L. McLaughlin, that appears in this issue. The article describes a set for broadcast wavelengths and is applicable to superheterodynes designed for any band.
- A.R.R.L. is reaching out to the growing class of amateurs, the ones who follow the hobby of radio, by increasing *QST*'s newsstand presence with a wider distribution. The "Editorial: Our Bigger Circulation" shares the details.
- 6BCP and 6CGW shatter all DX records when they work Z4AA, as reported by K.B. Warner, 1BHW, in "Communication With New Zealand."
- Donald H. Mix, 1TS/WNP, shares his adventures in riding with the "Bowdoin" in "My Radio Experience in the Far North."
- Some of the most interesting and important known facts of electric phenomena in our atmosphere, along with some theory, are shared by Dr. S.J. Mauchly in "Atmospheric Electricity."
- A good radiating system in a small yard is shared in "A Beautiful Antenna" by G. Wiley Bergman, 9CA.



November 1974

- The cover shows geometric patterns against the sky that form the basis for VE4AS's description of an Oscar antenna for 432 and 144 MHz. Allan A. Simpson, VE4AS, shares the details in "A Two-Band Delta-Loop Array for Oscar."
- "It Seems to Us…*QST* Advertising" discusses advertising policies and why they've been implemented.
- Artificial radio aurora (ARA), a new form of long-distance radio propagation, is explained in "Communicating at VHF via Artificial Radio Aurora" by V.R. Frank, WB6KAP; R.B. Fenwick, WB6FDV, and O.G. Villard, Jr., W6QYT.
- The world listened as the Northern California DX Club operators agonized for two days while searching for the island, then rejoiced during their fantastic 29 hour and 43 minute 5535 QSO operation. The story is in "Kingman Reef DXpedition" by Robert G. Ferrero, K6AHV; Charles K. ("Rusty") Epps, W6OAT; Peter S. Grabosky, WB6OOL, and James T. Rafferty, WA9UCE/6, as told to W6ISQ.
- William G. Gerlach, W6BG, shares some observations in connection with sending, particularly bug sending, in "Sending!"

November 1999

- The cover shows the DSP-10 transceiver with all its finishing touches. The latest installment of this article, "The DSP 10: An All-Mode 2-Meter Transceiver Using a DSP IF and PC-Controlled Front Panel," by Bob Larkin, W7PUA, appears in this issue.
- In "It Seems to Us…Them and Us," David Sumner, K1ZZ, gives some perspective on self-regulation in the Amateur Radio Service; when we permit that mutual respect to erode, the value of our common resources — our amateur allocations — erodes right along with it.
- Thanks to APRS, innovative software, and ham ingenuity, working meteor pings is becoming a new digital domain. Ev Tupis, W2EV, shares the details in "An Automated Meteor-Scatter Station."
- Don Gagnon, WB8HQS, shares some valuable tips on "How to Run a Hamfest in 63 Quick and Easy Steps."
- This primer on "Radio Waves and the Ionosphere," by Ian Poole, G3YWX, will help fill in the blanks and start you on a fascinating journey through the physics of the ionosphere.
- "Keeping Track of OSCAR: A Short History Amateur Radio's Race for Space," by Gil McElroy, VE1PKD, is a fascinating look at our first faltering steps into space.

Silent Keys

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

W1GT **Timmons**, Gerard M., Fredericksburg, VA
W1HBS **Serreze**, Harvey B., Pepperell, MA
vW1KMA **Kilpert**, Christopher, Warwick, RI
WA1MAG **Ransom**, Edward C., Shaftsbury, VT
vKR1MRG **Rogers**, Marston K., Saucier, MS
vWA1NGA **Hummel**, William C., Merrimack, NH
vW1RDM **Martin**, Raymond D., Cranston, RI
KB1SZJ **Christle**, Howard Blake, Lewisburg, WV
vK1VOA **Tyndall**, Leroy E., Greenville, NC
W2CEK **Kittner**, Charles E., Honesdale, PA
vKC2CUJ **Adsit**, Malcolm B., Adams Center, NY
•WB2HTH **Holtz**, David D., Fairport, NY
N2JJJ **Jones**, Janet P., Averill Park, NY
K2LNU **Gittere**, William, Clarence, NY
vK2MTW **Quagliana**, David F., Williamsville, NY
v•WB2ORA **Cuthbertson**, Robert J., Raleigh, NC
♦NA2R **Sawina**, John M., Barnegat, NJ
N2WKT **Johnson**, Mike, Jamestown, NY
vWA2WMJ **Blair**, Julian F., Sr., Walden, NY
KF2WS **Bath**, Warren O., Tonawanda, NY
vWB2YHY **Knief**, Jackie L., Hendersonville, NC
WA2YMR **Tauber**, Jerome, Montauk, NY
♦WB2YQH **Nadolny**, Robert E., Spring Brook, NY
vKA3BRL **Savino**, Michael T., Jr., Baltimore, MD
KB3DVI **Golas**, John P., Conshohocken, PA
♦WB3EFQ **Gutshall**, Lois J., Altoona, PA
•KB3FSU **Kane**, Andrew, Jr., Tamaqua, PA
WB3IGT **Deck**, Larry R., Lebanon, PA
♦N3IMD **Machia**, Nancy, Pasadena, MD
•W3IWG **Hensel**, Edward P., Pickerington, OH
vAA3JW **West**, John Russell, Palm Bay, FL
♦K3PP **O'Donnell**, Glenn D., Palmerton, PA
vW3QLC **Hibberd**, Joe, Stillwater, MN
W3TH **Hoffman**, Ted L., Camp Hill, PA
WA3YXX **Hampton**, James R., Smyrna, DE
vK4ADY **Stephens**, William F., Valdosta, GA
v•K4AOY **Scott**, Donald S., Wytheville, VA
vWA4BPW **Richardson**, Samuel R., Boiling Springs, NC
v•WD4DAH **Tucker**, Glenn G., Lake Park, GA
K4DMJ **Matthews**, David, Jr., Oak Island, NC
WA4EPH **Lambert**, Charles F., Richmond, VA
v•KI4HQ **Barrett**, Donald W., Hilton Head Island, SC
K4ICR **Hand**, Dennis W., Jr., Fairmount, GA
vK4JGR **McCoy**, Billy Bruce, Franklin, NC
KD4JOB **Hunter**, Walter N., Jr., Trenton, NC
W4KQS **Sohl**, John H., Jr., Kissimmee, FL
KE4KTB **Ratcliff**, Larry W., Saltville, VA
W4LAC **Chamblee**, Charles C., Jr., Arab, AL
v•KJ4LF **Lones**, Howard, Cleveland, TN
AB4LN **Wilson**, Daniel P., Holiday, FL
K4MJO **Simmons**, Samuel L., Sr., South Hill, VA
WB4PAC **Carpenter**, Phillip A., Knoxville, TN
KA4REY **Purvis**, Dwight J., Jacksonville, FL
vKG4SHY **Rice**, James O., Red Bank, TN
KF4TQF **Peek**, Brian K., York Haven, PA
W4UWS **Bass**, William H., Jr., Westport, CT
vK4VET **Greene**, William E., Richfield, NC
vKE4VOW **Gurosky**, Ricky N., Bessemer, AL
WA4VZV **Barbour**, Leon K., Fayetteville, NC
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vKR5BC **Chandler**, Robert R., Garland, TX
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vW5HWB **Remillard**, Gary D., Shreveport, LA
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K5QE **Williams**, Marshall P., Hemphill, TX
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v•KB5VGD **Whiting**, Jerry, Conroe, TX
vK5XA **Guida**, John, Leander, TX
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W6FM **Patterson**, Ronald O., Atascadero, CA
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W6RAR **Rogoway**, Raymond A., San Jose, CA
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vW6XZ **Hudick**, John A., Grants Pass, OR
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vAL7E **Foglesong**, Marvin D., Fairbanks, AK
KG7FJQ **Galbraith**, Aaron M., Las Vegas, NV
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•KL7IXX **Luke**, Edwin W., Lynnwood, WA
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W7VNO **Swenson**, John A., Mesa, AZ
v♦WB7VUM **Welch**, Dennis E., Colorado Springs, CO
•KB7WVR **Arveseth**, Allan L., Salt Lake City, UT
NW7Y **VanSant**, Jay P., Canby, OR
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KD8GSM **Russell**, Timothy P., Zanesville, OH
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vKB8POD **Hornsby**, Lawrence A., Sr., Waterford, MI
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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

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FTM-300DR | *C4FM/FM 144/430MHz Dual Band*

• 50W Output Power • Real Dual Band Operation • Full Color TFT Display • Band Scope • Built-in Bluetooth • WiRES-X Portable Digital Node/Fixed Node with HRI-200

FT-2980R | *Heavy-Duty 80W 2M FM Transceiver*

• 80 watts of RF power • Large 6 digit backlit LCD display for excellent visibility • 200 memory channels for serious users

FTM-200DR | *C4FM/FM 144/430MHz Dual Band*

• 1200/9600bps APRS® Data Communications • 2" High-Res Full-Color TFT Display • High-Speed Band Scope • Advanced C4FM Digital Mode • Voice Recording Function for TX/RX

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• Front Firing Acoustically Enhanced Speaker System • True Dual Band Operation, C4FM/C4FM Digital D-D Dual Receive • 2.4" High-Resolution Full-Color Touch Panel Display • Built-in High Precision GPS Receiver • Wireless Operation Capability with Optional Bluetooth® Headset

FT-70DR *C4FM/FM 144/430MHz Xcvr*

• System Fusion Compatible • Large Front Speaker delivers 700 mW of Loud Audio Output • Automatic Mode Select detects C4FM or Fm Analog and Switches Accordingly • Huge 1,105 Channel Memory Capacity • External DC Jack for DC Supply and Battery Charging

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

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

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- Use with separate passive speakers or headphones
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- DSP noise canceling versions EQ20-DSP, EQ20B-DSP (with added Bluetooth on input)

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

In-Line Module

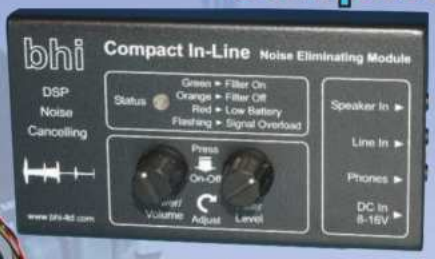
In-Line Module connections

5W amplified DSP noise canceling In-Line module - 8 filter levels 8 to 40dB - Use in-line with a loudspeaker - Audio bypass feature - 3.5mm mono inputs and outputs - Headphone socket - Audio input overload feature - Use with an extension speaker - Supplied with a fused DC power lead, 3.5mm mono jack plug lead and user manual

Dual In-Line

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

Compact In-Line



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

NEDSP1962-KBD 5W amplified DSP noise canceling extension speaker retrofit pcb module Easy to install!

DESKTOP MKII

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

NES10-2MK4

- 5W DSP Noise Canceling Speaker - 8 filter levels
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YAESU: FT-710, FT-891, FT-991A, FTDX-10, FTDX-101D

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- Antenna Design Software
- Antennas: General, Terms, Definitions
- The Feed Line and the Antenna
- Receiving Antennas
- The Dipole Antenna
- Vertical Antennas
- Large Loop Antennas
- Phased Arrays
- Other Arrays
- Yagis and Quads
- Low Band DXing from a Small Garden
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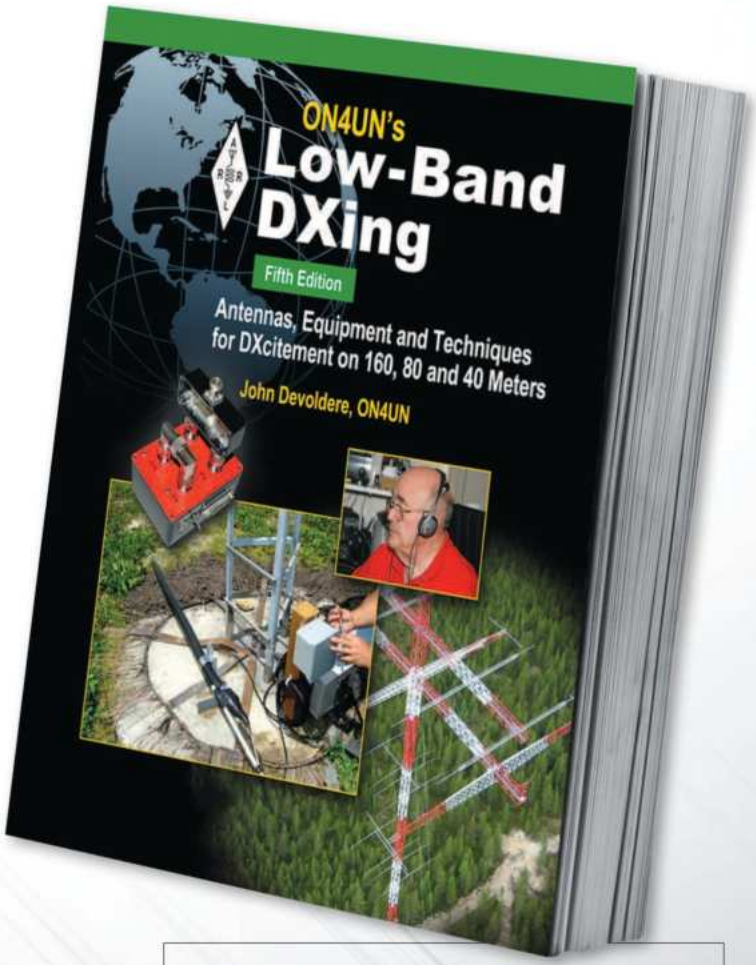

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The Amateur Radio Emergency Service (ARES)

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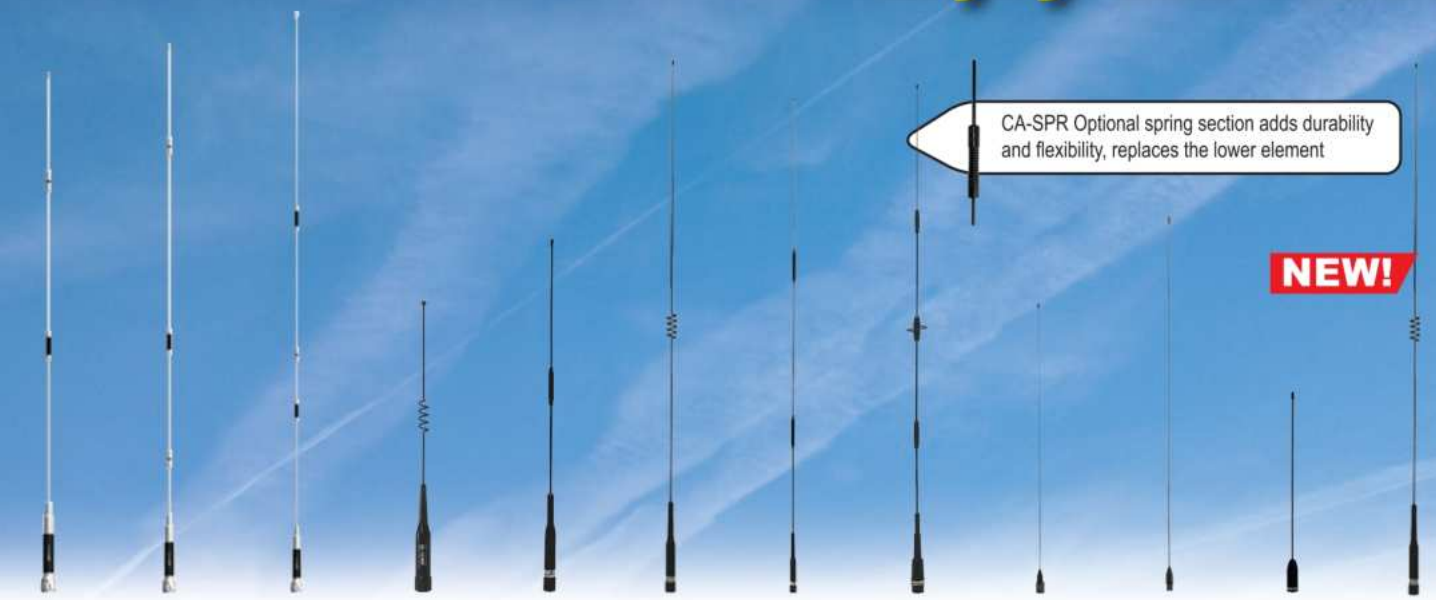

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