An Update on ARRL's Clean Signal Initiative | 66

QST
DIGITAL EDITION

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

Stacking for Success

A look at the tribanders in W2VP's antenna system.

QST Reviews

PreciseRF HG3 QRO-B Stepper Magnetic Loop Antenna

Polar Electric *MRP40* Morse Code Decoder and Sender Software

RigExpert Shackmaster Power 500

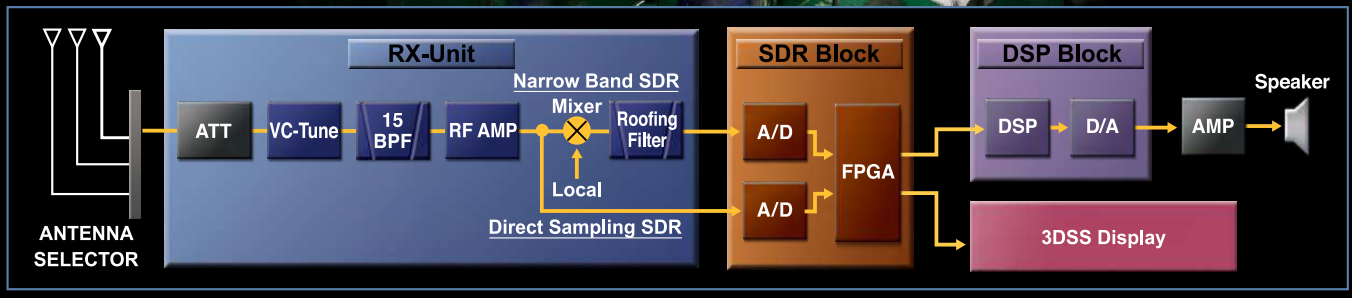
DX Engineering NCC-2 Receive Antenna Phasing Systems

The radio... YAESU

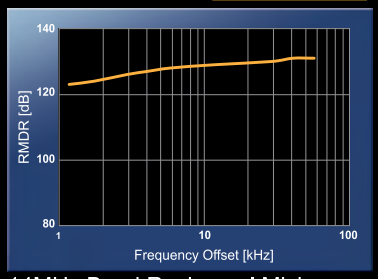
FTDX101 TECHNICAL HIGHLIGHT

True Performance
Hybrid SDR Configuration

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

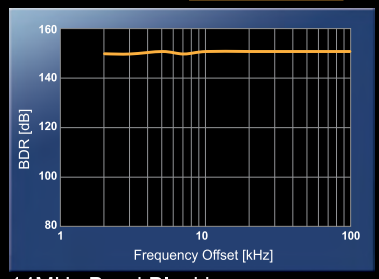


2kHz RMDR 123dB+



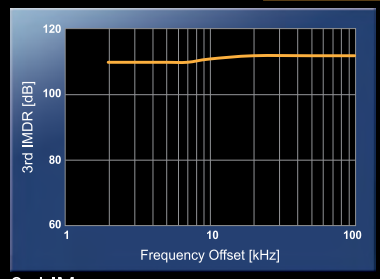
14MHz Band Reciprocal Mixing Dynamic Range (RMDR)

2kHz BDR 150dB+



14MHz Band Blocking Dynamic Range (BDR)

2kHz 3rd IMDR 110dB+



3rd IM Dynamic Range (IMDR)

HF/50MHz TRANSCEIVER
FTDX101MP 200W

HF/50MHz TRANSCEIVER
FTDX101D 100W

* Microphone M-1: Optional

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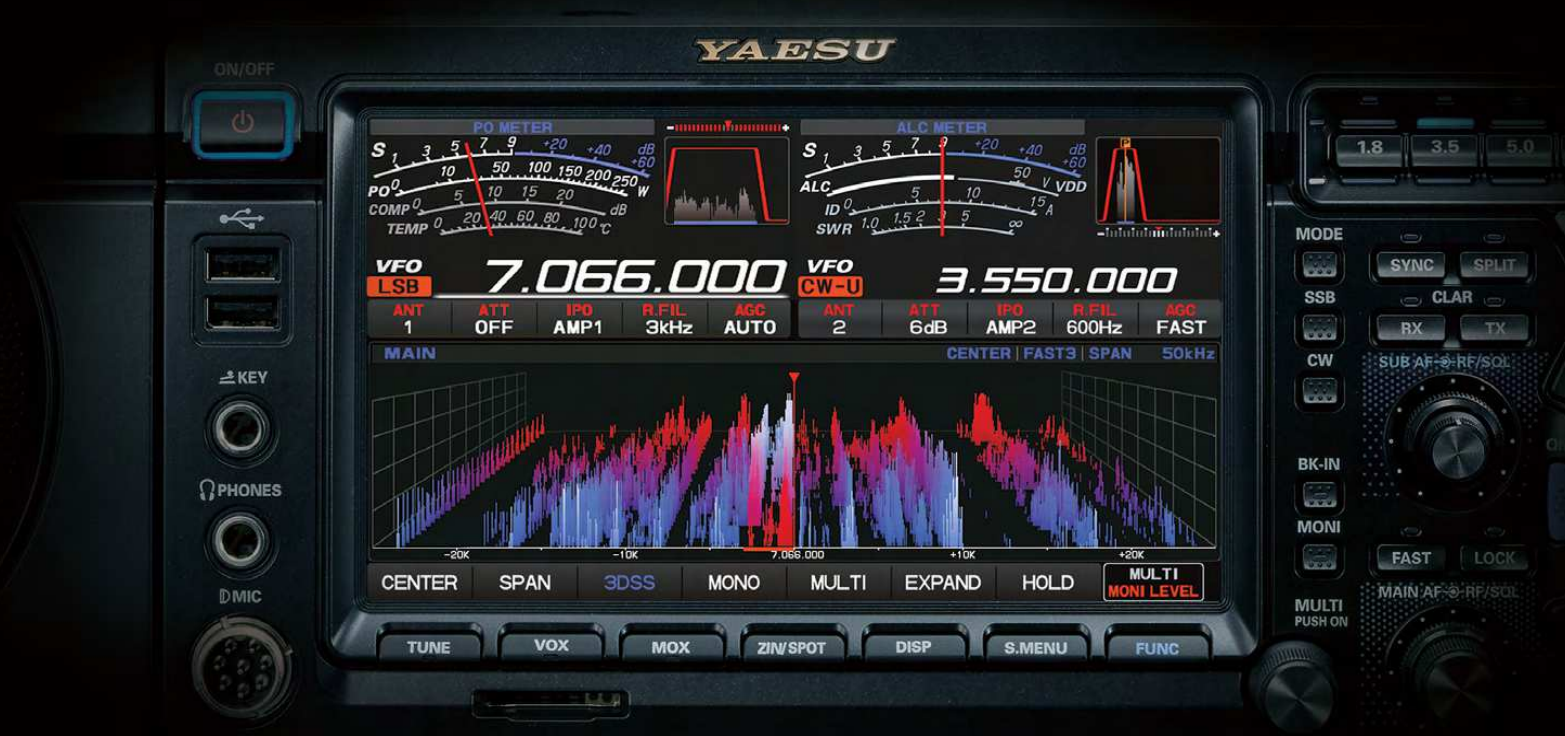
FTDX101 TECHNICAL HIGHLIGHT

3DSS (3-Dimensional Spectrum Stream)

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

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

3DSS
3D Spectrum Stream



HF/50MHz TRANSCEIVER
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* Microphone M-1: Optional

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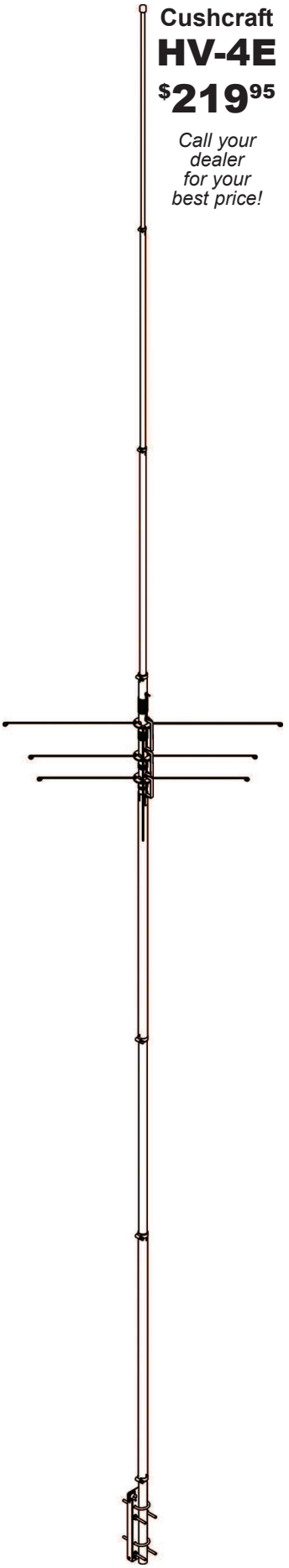
New! **Cushcraft HV-4E**

40/20/15/10 Meter *Low Profile* Vertical Antenna

1200 Watts SSB, 500W CW, 500W Digital on 40 Meters!



Cushcraft
HV-4E
$219.95

Call your dealer for your best price!

Cushcraft HV-4E 40/20/15/10 Meter low-profile Vertical Antenna spans continents and oceans while hiding from sight in your back yard.

Handles 1200 Watts SSB, 500 Watts CW, 500 Watts digital on 40 Meters -- run with the big dogs!!

- **Low angle** radiation focuses RF energy on the horizon for optimum DX coverage
- **High-angle** overhead null rejects noise and local interference
- **Automatic band-switching** uses high-tech parallel end resonators instead of lossy series traps
- **High-Q** top-loading resonators delivers less loss, higher gain on 20/15/10 Meters
- **Center loading** on 40 Meters improves efficiency and lowers center of gravity making HV-4E easier to handle and increases strong wind survivability
- **Individual resonators** are simple to tune for lowest-SWR with to-the-kHz accuracy on every band. No unwanted interactions or compromises!
- **Aluminum,** stainless steel, and fiberglass construction ensure years of reliable service
- **Weighs** just 5 pounds and is 19 feet tall. Built in water resistant SO-239 for radio -- no pigtail needed
- **Small footprint,** low center of gravity and lightweight lets you easily install it by yourself almost anywhere. Low profile blends in with natural surroundings

Compare price and compare performance.

The bands are currently teaming with DX from around the world, and the HV-4E is uniquely designed to put you in the hunt!

HV-4E-RK, $49.95. Eight 25 foot Radials(two sets of 4-Radials), each set with solder lug, (200 feet of weather resistance insulated wire).

HV-4E-TB, $29.95. Sturdy Tilt Base lets you lower antenna to convenient height for easy tuning and maintenance.

Cushcraft HV-4E VS Hustler 4-BTV	
Enhanced 40 Meter Performance: Extra-long center loaded radiator improves efficiency	**Reduced 40 M Performance:** 40M power goes through multiple power wasting series traps
Highly efficient end/center loading: Reduces loss for more power out	**Lossy Traps:** Power lost in traps
Parallel resonators: Let's you independently tune each band with little or no interaction. Makes tuning easy	**Series resonators:** Tuning a band interacts with other bands -- may require repeated back and forth adjustments
Parallel resonators: If one resonator fails only that band is impacted	**Series resonators:** If a single trap fails, multiple bands could be wiped out
Included simple instructions make installation and optimum tune up easy	**A "special instruction package"** is recommended for teaching users how to retune 4-BTV traps and optimize performance
Low center of gravity: Makes it easy to handle/install and gives better wind survivability	**High center of gravity** makes it hard to handle
Built-in SO-239 coax connector provides convenient water resistance connection	**Requires coax pigtail** at extra cost that invites water incursion
Low suggested retail cost $219.95 and free direct MFJ shipping	**STREET price Ranges** from $229.95 to $295.95 plus shipping

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

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

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

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

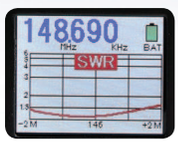
CAA-500MarkII Antenna Analyzer

1.8-500MHz

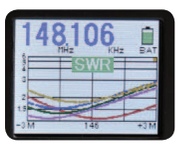
The CAA-500MarkII combines the simplicity and accuracy of an analog instrument, PLUS…a full color LCD graphic display Resistive (R) and Reactive (X) components of impedance graphed and displayed numerically SWR readings in both graphic and numerical results.

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

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



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



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

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

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

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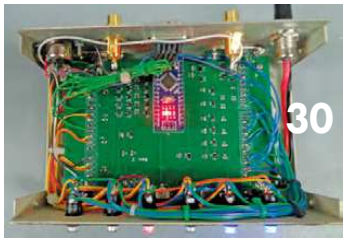
Write for *QST*

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

Our Cover
When John Small's, W2VP, plans for a retirement property on a hill didn't pan out, he achieved the low takeoff angle he wanted for his antenna system by stacking antennas. Get the details and data about the system, as well as a look at how it actually performs, in John's article "High-Performance Stacked Array with Tribanders." [John Small, W2VP, photo]



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Get ready for amateur radio's largest on-air operating event with official 2024 ARRL Field Day merchandise – t-shirts, hats, mugs, pins, patches, and more. The back of the t-shirt includes a check-off list of ARRL and RAC Sections – a fun way to keep track of your Field Day contacts.

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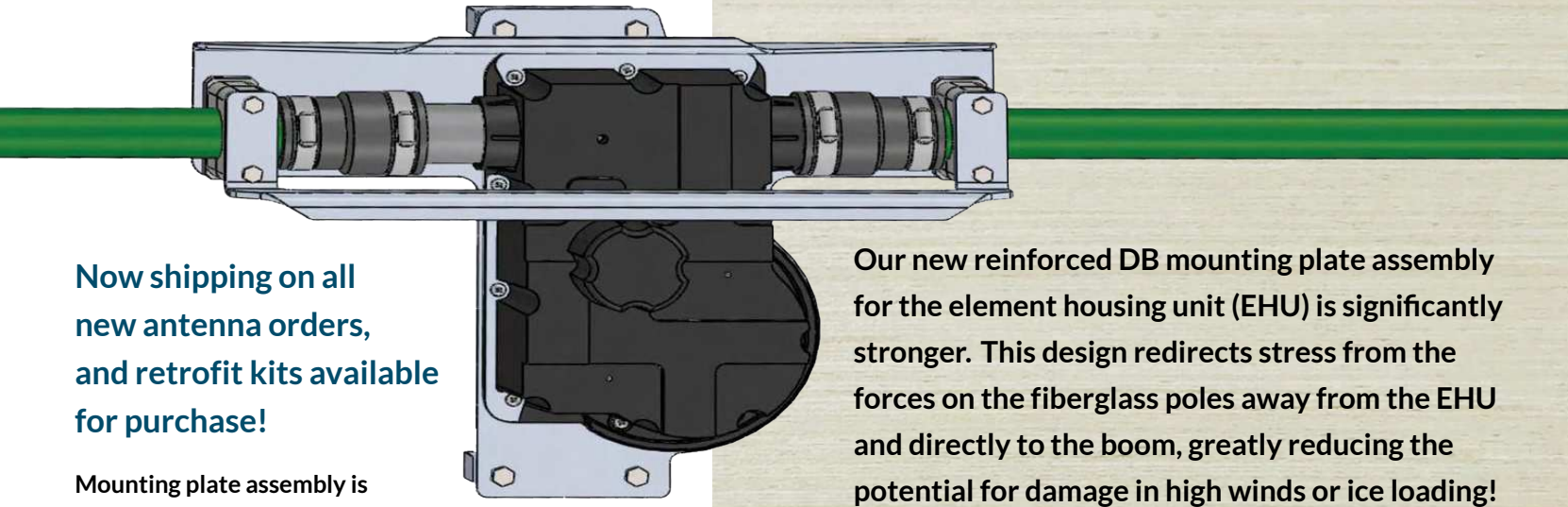
We are on a QUEST

to create the highest performing AND most reliable antennas available on the market

NEW REINFORCED DB MOUNTING PLATE ASSEMBLY



Now shipping on all new antenna orders, and retrofit kits available for purchase!

Mounting plate assembly is available for DB series Yagis only.

Our new reinforced DB mounting plate assembly for the element housing unit (EHU) is significantly stronger. This design redirects stress from the forces on the fiberglass poles away from the EHU and directly to the boom, greatly reducing the potential for damage in high winds or ice loading!

steppIR COMMUNICATION SYSTEMS

Price increases Effective June 15, 2024

Over the last 4 years, our engineering, manufacturing, and production team have spent countless hours working on and introducing significant improvements to all our antenna products. The new reinforced DB mounting plate assembly is a great example of our commitment to create the highest performing AND most reliable antenna systems in the world.

SteppIR antennas have long been considered premium products vs what else is available on the market, but that performance comes quite literally at a cost – our products are expensive to manufacture and there is no getting around that. On June 15th, most consumer prices will increase by up to 20%, depending on the product – we are reviewing line item by line item for pricing that will be realistic for SteppIR to continue to offer best-in-class products, while having as little impact as possible for our customers. We are implementing this new pricing mid-year, to give everyone time to get those Spring-time antenna projects completed at the lower price.

73 from all of us at SteppIR and thank you for your past, present and future support!

steppIR COMMUNICATION SYSTEMS

FOR DETAILS ON PRODUCTS AND TO ORDER: www.steppir.com 425-453-1910

DIAMOND ANTENNA

diamondantenna.net

X700HNA Special Features:

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

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

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

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

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

Here is a small sample of our wide variety of antennas

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

The Standard By Which All Others Are Judged

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

Second Century

We Need a Reset

Truer words were never spoken. This declaration came in a message from one of our Section Managers. The persistent bashing of ARRL has become ridiculous, especially when it is represented as "communications" by those in our small community who are bent on spreading misinformation, insults, and personal attacks. Critical comments can be very useful. Recreational attacks on social media and in other public forums, where participants "eat their own" and only serve to drive off good people within amateur radio, are counterproductive and reckless.

Why did you get into amateur radio? For me it was literally to "Tune in the World with Ham Radio." I've loved chasing WAS and DXCC since my earliest days in the hobby. Contesting was the next step, and even as someone whose family and career choices provided very little time for ham radio, I always made time to get on the air.

Maybe you got radio active because of your love of science, or public service events including EmComm. Or perhaps it was the technical side, including setting up and maintaining repeater sites, or computer controlling your satellite ground station, or designing UHF/SHF antennas, pushing for the tiniest improvements in signal gain.

Did you join amateur radio to play politics? Did you join because it gave you the chance to be a big fish in a small pond? I suspect the answer is no, but it's clear we have attracted (or harbor) some who take advantage of our small community for self-interest and a self-serving soapbox.

Since coming to ARRL as CEO some 3 and a half years ago, I've worked tirelessly at changing the culture at Headquarters. It began with a simple guiding principle: create a culture of "Yes." In order to accomplish that, we had to retool how we work together, and that required a shift from stovepiped departments to high-functioning collaboration. I've seen huge improvements in how we work, including our engagement with valued member-volunteers. And we've received fantastic feedback from members. We have much more to do as we pursue the digital transformation of ARRL, but so far the results have been gratifying.

Alongside all of that good work, there's an area in which I am failing. I am failing to make a cultural impact on our community. Certain members continue to run to their keyboards to spew hateful rhetoric in search of some self-gratification — where success is measured by a whopping 10 or 20 responses. I am failing to convince grown-ups with many years behind them that their rants against ARRL, and indeed against each other, will prevent us from getting younger people interested in joining and staying with amateur radio.

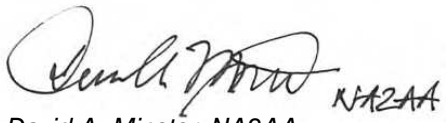
Recently, during a company meeting, ARRL employees challenged me as to why so much fiction is being propagated about the organization and its people — and more importantly, why we wouldn't take action against it. That's a hard question to answer after they've seen their colleagues on the editorial team attacked with an online petition that was started to remove them from their positions. In another instance, an ex-employee attacked our VEC because of an issue with 1 × 1 call signs. "Incompetent," the online rant claimed, only to be echoed by a former ARRL Director who exclaimed that everyone at HQ is incompetent! Why would we let these nonsensical claims go unchallenged?

A group of so-called "thought leaders" sent a letter to donors that could at best be classified as irresponsible and ill-advised. One of our donors called HQ to discuss it. His final comment represents how we corporately view these nonsensical comments. He said, "I carefully read the letter, walked across the room, and carefully placed it in recycling. Where it belongs." And that is the answer to ARRL employees: We see these public posts, we are no longer surprised by them, we look no further than the source, and we move on.

Sometimes that simple guidance becomes difficult to follow. The irresponsible behavior online recently rose to a new level. Seemingly in response to a post made in one of these rhetoric-filled Facebook groups, one member decided to execute an anonymous letter-writing campaign to other group members, attacking the author of that post along with one of our employees at HQ who had nothing to do with the post. The bounds have been pushed beyond civility.

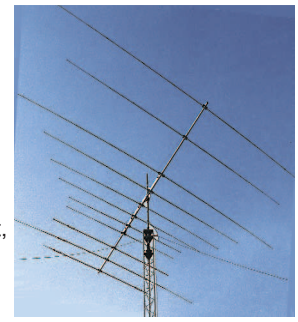
We need a reset. We cannot change the world. We cannot change our country. But we can make changes within our small community. We need to stop writing hall passes for bad behavior. There's no excuse. There are many people on social media who *are* doing great work, who we passionately work with every week. We should all be striving to follow in their footsteps, working for the promotion and protection of amateur radio.

As I finish this column, I am going to take my own advice to be radio active. I will turn on the radio and look for you on the air! If people around you are reading these nonsensical posts online, be that voice of reason that encourages them to get away from the pathology and politics, and get back to amateur radio. Disagree with this column? Come and see me at one of the conventions we attend, and let's talk!



David A. Minster, NA2AA
Chief Executive Officer

hy-gain HF Beam Antennas



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

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

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

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

TH-3JRS, $539.95. Compact 3-Element, 600 W PEP, 10, 15, 20 Meters. *Hy-gain's most popular and lowest-priced tri-bander fits smallest lot*, 14.75 ft turning radius, 21 lbs. Excellent gain and front-to-back let you compete with the "big guns"! 80 MPH wind survival.

hy-gain HF Verticals Antennas

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

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

AV-640, $659.95. Like AV-680 less 80M. 25'/2', 17'1/2 lbs.

AV-620, $599.95. Like AV-640 less 40M. 22'/2'/10'1/2 lbs.

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

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

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

See our website for even more hy-gain vertical antennas!

hy-gain Rotators . . . the first choice of hams around the world!

HAM-IV . . . $799.95

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

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

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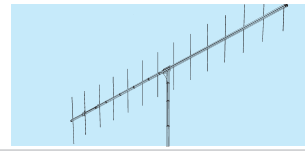

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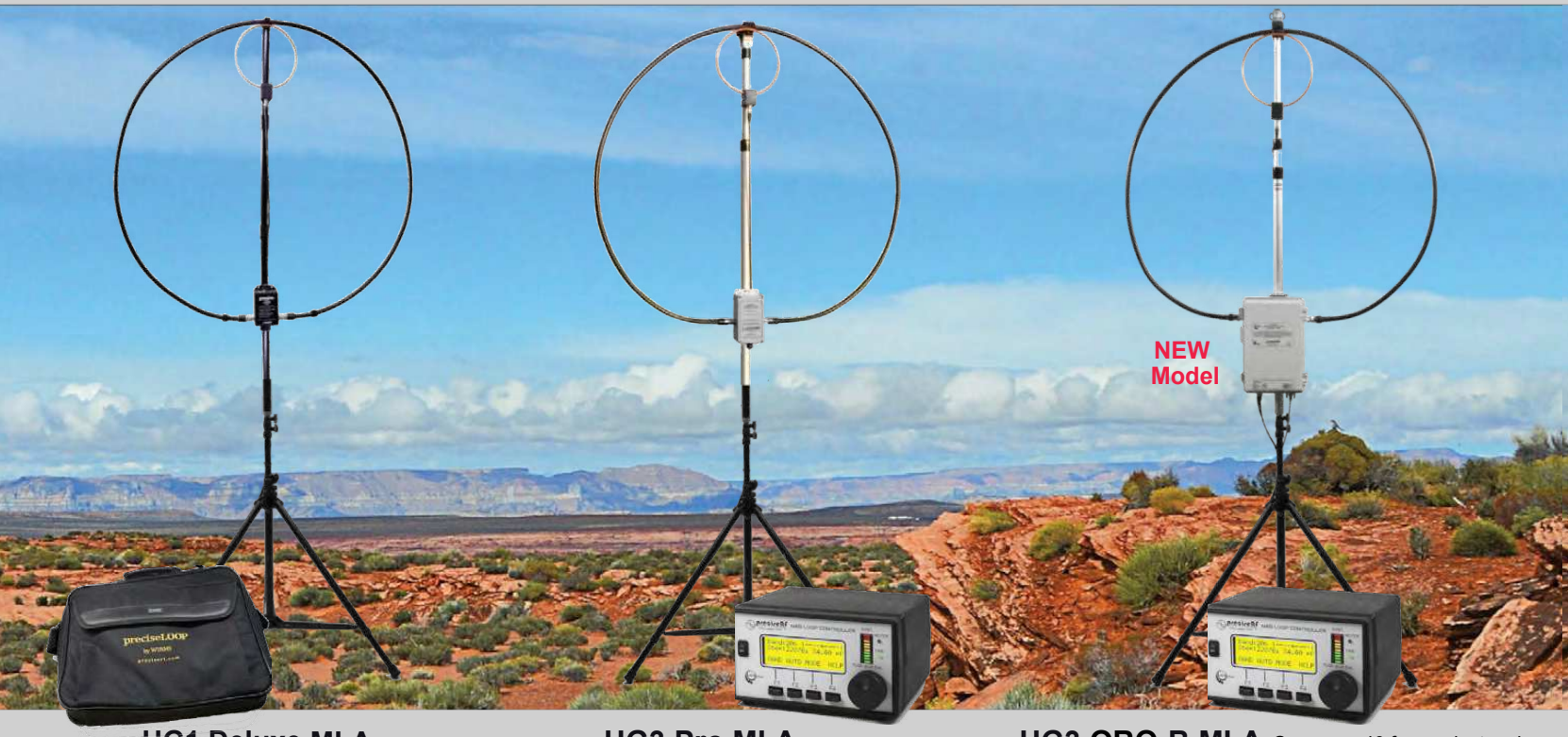

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Member Spotlight

Archibald "Del" Delfish, N2NWK

Del has surpassed 900 consecutive days of activating parks as a part of the Parks on the Air® (POTA) program, an accomplishment few other POTA participants can claim. It helps that he lives in Baltimore and commutes to DC, an area so rich in parks they often overlap. Fort McHenry (K-0928), a favorite haunt, counts as what's known as a *four-fer*, meaning a single outing can activate four POTA entities — in this case, Fort McHenry and three National Historic Trails (K-4567, K-4581, and K-4582). Since starting in the program, N2NWK has racked up more than 7,000 activations and nearly 240,000 QSOs, mostly using FT8, SSB, and satellites.

Discovering FT8 and POTA

By his own account, Del was a latecomer to FT8, not giving it a try until the pandemic lockdown forced changes in his operating behavior. Compromise antennas were all he could manage, and FT8 allowed him to hunt DX from his home. CQs filled his screen, many of them containing four strange letters: P, O, T, and A. Del had been a ham since 1991, when he received his no-code Technician license. He enjoyed working satellites and had come up through the ranks of packet and APRS operators. "You made good friends on packet because keyboard to keyboard you could talk to people," he said. So, he was familiar with the usual ham jargon, but this wasn't a Morse abbreviation or a Q code. This was something new. This was POTA. "I signed up on the app, [and] my name appeared with a lot of awards. I said, 'This thing is so cool.'"

His first activations were satellite only, but when he realized a little rain could shut him down, he decided to change tactics. Now, he runs FT8 on a Yaesu FT-891 with a laptop set up on a folding table outside his van when the weather's nice. He brings a Hustler antenna, a 20-meter modular antenna for mobile, a G5RV end-fed, and Hamsticks, and he always has his satellite gear with him. He recommends POTA operators bring a satellite setup to every activation because it's a great way to log a few extra contacts.

Park Encounters

Operating at urban parks in the Baltimore-DC metro area comes with more than the risk of inclement weather, as any serious urban park operator will tell you. Del has had the police called on him numerous times. Once a parkgoer stood next to him and dialed up the cops saying that Del was breaking into a car. Another time, the police came by because someone had called in "a black guy in the park with a VCR on his chest." During interactions like these, Del keeps his cool. He frequents the same parks and always parks in the same place, so the US Park Police, the DC Metropolitan Police, and the Secret Service — all of which he's encountered — recognize him. They generally wave when they drive by.

Ham Beginnings

Growing up in Trinidad and Tobago (9Y4NWK), Del first learned about ham radio in 1972, when an earthquake in Nicaragua leveled much of the city of Managua. At age nine, he heard hams on the nightly news, giving reports from the city's wreckage. It was "the only type of communication coming out of Nicaragua," he said. But his family wasn't wealthy, and he didn't have radio equipment of his own. It wasn't until he started working in national security that he had access to radios. When he moved to Brooklyn in 1988, he spent time at a local ham radio store. He might have suspected his questions to the sales reps would lead to a lifetime of ham radio enjoyment, but probably not the prominent place he has achieved in the pantheon of POTA activators.

"When you go to the park and all these people are calling you and sending you email, and everybody needs this and they need that, and then people are gonna send you an email to tell you they're glad to get DC or they're glad to get this four-fer or they're glad to get their awards. That's what keeps me going," he said. As of this writing, he's been giving the park hunters what they want for 908 consecutive days and counting.

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New!

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AMERITRON new ALS-1406 1.5-54 MHz solid state LDMOS no-tune Amplifier gives you 1200 Watts PEP output on all bands, including 6-Meters. Automatic bandswitching! No tuning! No warm-up! No tubes! Quiet!

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The ALS-1406 RF deck operates at 50 Volts for efficient, low distortion linear RF power service. It's cooled by a whisper quiet fan. Fan speed is regulated by temperature sensors, assuring minimum noise.

ALS-1406
$3499
Suggested Retail

Call your favorite dealer for your best price!

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

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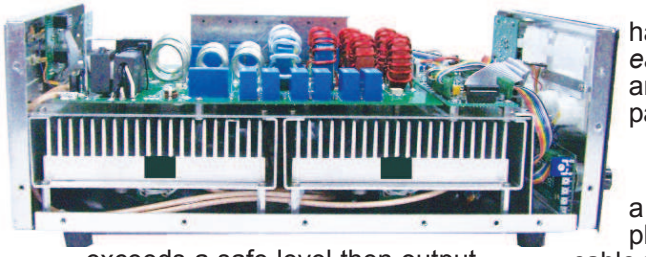
This compact operator-friendly and attractive desk-top amplifier fits neatly into any station. Just 10Wx6^{1}/2Hx18^{1}/2D inches. Weighs only 22 pounds.

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

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

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



Front-panel ALC control!

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

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

Automatic Bandswitching!

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

ALS-1406 automatic bandswitching reads band data from your transceiver and automatically changes bands as you change bands. An optional interface cable is required for your particular radio.

Clean, Modular Construction

Ameritron ALS-1406 amplifier has modular construction for *easy-servicing*, unlike other amplifiers that are so tightly packed they are un-serviceable.

ALS-1406 Power Supply

The ALS-1406 is powered by a 50 VDC switching power supply. Comes with a pre-wired cable to plug into the ALS-1406.

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

ALS-606S
600W FET Fixed Station Amp

ALS-606S
$2599
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600 Watts PEP/500W CW output, 160-6M with automatic instant bandswitching. Desktop size: 9^{3}/$_{4}$Wx7Hx14^{1}/$_{2}$D inches. Just 14.2 lbs. It's only 4 dB below 1500W -- less than an S-unit -- nobody can hear the difference! SWR/thermal protected, extremely quiet, lighted peak reading Cross-Needle SWR/Wattmeter, front panel ALC control. Includes 110 VAC switching power supply. 220 VAC selectable.

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

ALS-500M
500 Watt Mobile Amplifier

ALS-500M
$1199
Suggested Retail

500 Watts PEP/400W CW output, instant bandswitching, no tuning, no warm- up. SWR, load fault, thermal overload protected. On/Off/Bypass switch. Remote on/off control. DC current meter. Very quiet fan. 1.5-22 MHz (10/12 Meters with MOD-10M, $29.95). Requires 13.8 VDC. 9Wx3^{1}/2Hx15D in., 7 lbs.

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600 Watt FET Amp

ALS-600S
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Modular, hybrid architecture adapts to your needs

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

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

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

Comprehensive I/O, plus full remote control

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

K4 KEY FEATURES

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

The K4 interfaces seamlessly with the KPA500 and KPA1500 amplifiers

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Up Front

Pico Balloon Launch

On May 7, 2023, the Milwaukee School of Engineering Amateur Radio Club, W9HHX, teamed up with the Milwaukee Radio Amateurs' Club, W9RH, to launch two balloons from Lakeshore State Park in Milwaukee, Wisconsin.

Windy conditions made the launch tricky, as enough helium had to be used to compensate for the wind, yet not too much to allow for altitude expansion. Pico balloons have been known to circumvent the Earth, but this launch came with some disappointment. One balloon ended up in Michigan, and the other barely made it to the Atlantic Ocean. Undaunted, the Milwaukee School of Engineering Amateur Radio Club is planning more launches in the future. [Leroy Skalstad, WD9HOT, photo]

Jerry Marowsky, NØIMJ, launching one of the pico balloons.

Frequency

Hank Borawski, K2HJB, noticed the Frequency Store while waiting for his flight at the Dubrovnik Airport in Croatia. The unique design of this gift shop is based on the frequency of airport sound waves and the frequency of passengers.

The Triangle X Radio Museum

Bruce Littlefield, WA1HGJ, always wondered about the W7HFE call sign plaque he saw hanging at the Triangle X Ranch, a horseback riding-oriented dude ranch in Moose, Wyoming, that his family has been visiting for some time.

A few years back, the Triangle X Ranch set up a small museum to showcase the history of the ranch and the Turner family, who have run the ranch for the last hundred years. In the museum is a portable ham station from the late 1940s built by Harold "Skipper" Mapes, W7DXV, grandfather and great grandfather of the current Turner generations running the ranch. The portable station was built into a wooden pannier to hang on a packhorse, with the opposite pannier carrying automobile batteries to balance the load. The Triangle X Ranch used this as their only means of communicating with their wilderness pack and for hunting trips into the immense and remote Teton Wilderness area. W7HFE belonged to Louise Mapes, Skipper's daughter. Louise married John C. Turner and became part of the Triangle X Ranch family legacy. [Bruce Littlefield, WA1HGJ, photos]

The portable ham station built by Harold "Skipper" Mapes, W7DXV. Taped to the desk, instructions indicate "orient the wilderness antenna east and west between tent and tree," presumably to maximize 80-meter ground-wave propagation to the W7HFE home station back at the ranch (30 – 40 miles away).

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

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Correspondence

Letters from Our Members

My Ham Radio Odyssey Project

Operating portable in Europe at World War I and World War II historical sites for my project that I call "Ham Radio Odyssey" took me to Luxembourg. Steve Blaschette, LX1XC, and members of the Luxembourg Amateur Radio Union (LARU) gave me a warm welcome and a tour of the battlefields. I advise hams to consider Luxembourg and connect with the LARU. Ham radio and history will continue combining in my Odyssey project at Texas World War I and World War II Army airfields. Check out Ham Radio Odyssey on Facebook.

Larry Stewart, KG5RVR
San Antonio, Texas

Achieving a Milestone

In September 2023, I received my #1 DXCC Honor Roll certificate. I was first licensed as a Novice in 1965. When I entered the military in 1966, my ham radio operations were limited due to deployments and frequent moves. However, when I retired in 1990, I began to operate more seriously and applied for my first DXCC credits in 1996, with 125 confirmed. My final Honor Roll contact was with FT8XX in December 2022.

I never thought it would be possible because of the scarcity of many rare stations. In my experience, it takes perseverance and monitoring the DX bulletins and other notices that report DXpeditions. Luck certainly plays a part in this process, too. I think having an amplifier is also helpful, especially with the huge pileups associated with rare entities.

When I reflect on some of the more challenging contacts, North Korea, Scarborough Reef, the Antarctic islands, and Crozet Island come to mind. It is a thrill to finally reach this pinnacle in my amateur radio experience spanning 58 years.

Romuald Stone, N3AF
Leavenworth, Kansas
Life Member

Sharing the Knowledge

I read *QST* cover to cover each month, which includes comments from ARRL leadership, articles, letters to the editor, problem-solving tips, operating hints, event calendars, contest results, and more. Most often, by the time I finish reading the magazine, I have learned something new. I often gain knowledge or insight from advertisements, too.

Each month, I donate the previous month's magazines, on a rotating basis, to our local middle school, high school, or public library to place in their periodical reading section. I will likely never know if I inspired someone to pursue amateur radio by offering them a glimpse into *QST*, but I can hope so.

John Quinzio, W7JMQ
Star, Idaho

POTA: The Ultimate On-the-Air Symbiosis

During my last Parks on the Air (POTA) activation, a few hunters graciously thanked me for being at a park and making an activation possible. I am always touched when they do this, but usually, I'm on a roll, making as many contacts as I can during a limited amount of time and while the propagation is still good. Consequently, I don't always stop to adequately thank them for making it happen for me. So, on behalf of myself and all activators, we extend a big thank you to the hunters. Without you, contacts couldn't happen. It's great on-the-air communications symbiosis.

Colin Wheatley, W9UPK
Dubuque, Iowa

VOTA Success

Volunteers On the Air (VOTA) was great. I was motivated to renew my Logbook of The World (LoTW) certificate, which enabled me to gain 321 DXCC band points for the last calendar year. At the start of VOTA, my station was ranked at the bottom. With the help of my functioning LoTW account and diligent on-air activity, I worked up to rank 33 in Ohio.

Thank you, ARRL, for sponsoring such a wonderful operating event, and LoTW, for allowing such easy and convenient contacts!

Robert H. Pusch, WD8NVN
Columbus, Ohio

Learning Incentives

To follow up on David A. Okrent's, W7DAO, "Correspondence" entry, "Attracting Young People to Amateur Radio," in the February 2024 issue of *QST*, the first thing new hams often do is buy a handheld radio and, sometimes, read the manual. Maybe they get discouraged from not knowing enough about frequencies, band plans, radios, antennas, and propagation.

A beginner's license requiring basic knowledge and giving minimal privileges for a short term (a year or so) would allow people to learn their way into our hobby, driven by a learning incentive to remain on the air. The incentive would make those inactive hams disappear, and active hams would seem more capable in the public interest.

Arthur Feller, W4ART
Arlington, Virginia
Life Member

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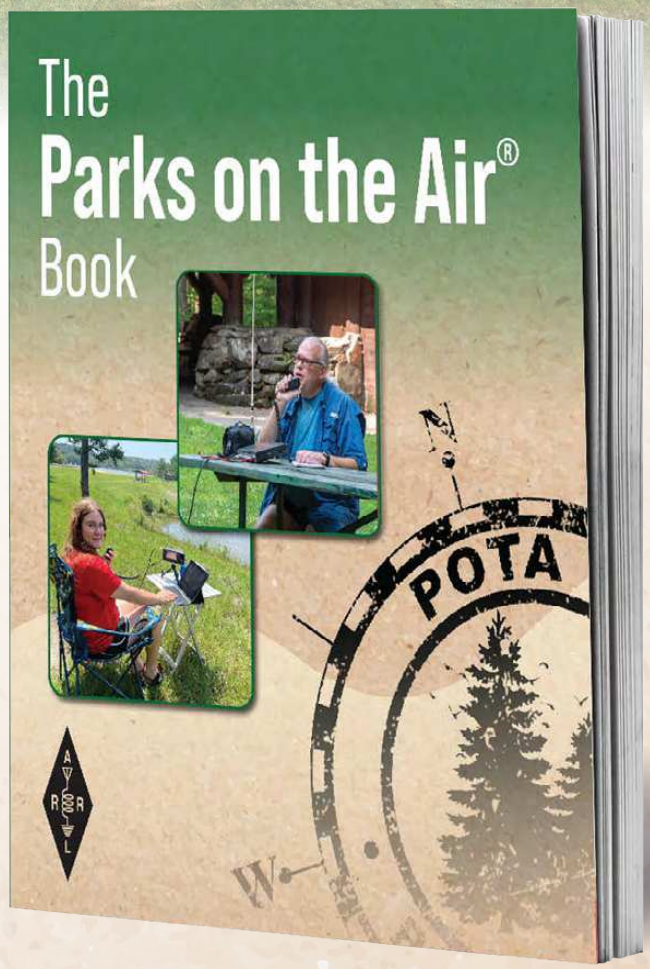

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6 AM	7 AM	8 AM	9 AM	1300		FAST CODE	SLOW CODE	FAST CODE	SLOW CODE
7 AM-12^{45} PM	8 AM-1^{45} PM	9 AM-2^{45} PM	10 AM-3^{45} PM	1400-1945	VISITING OPERATOR TIME				
1 PM	2 PM	3 PM	4 PM	2000	FAST CODE	SLOW CODE	FAST CODE	SLOW CODE	FAST CODE
2 PM	3 PM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

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

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

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

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

Code bulletins are sent at 18 WPM.

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

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

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

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

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

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

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

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

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

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The RAS2 — A Remote Antenna Switch

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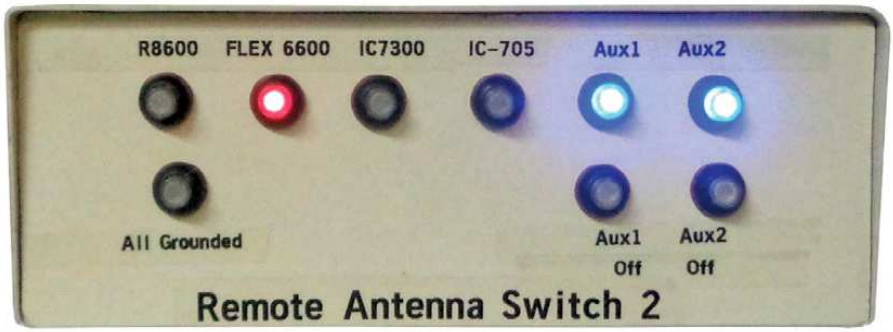


Figure 1 — The RAS2 controller.

John Albert, WA9FVP

The RAS2 is a flexible antenna relay control system that's easily modified by software and consists of a controller box and a separate antenna switch box. The controller (see Figure 1) is placed at the operating position, and the relay box (see Figure 2) is mounted where the coax enters the shack. All unswitched SO-239 ports are shorted to ground. When you're not in the shack, a remote desktop laptop connection provides you with remote control of the controller.

This project involves knowing how to code. If you need more information on how to do so, see the sidebar, "Resources for Learning Code."

Operational Description

The Arduino Nano microcontroller is programmed with nine inputs and eight open collector outputs. Four outputs drive relays, and one output is used for keying an amplifier. Four inputs are for transceiver connections using a transceiver's send relay or open collector output. When connected to one of the four Nano inputs, the send output automatically activates the relay that connects the selected transceiver to the antenna. Simultaneously, a second Arduino output keys the amplifier. Because receivers don't have a send output, pushbuttons on the control box connect the selected receiver to the antenna. In this case, the amplifier is not keyed. Two auxiliary inputs and outputs are reserved for controlling ancillary devices. In my case, one auxiliary output controls my Astron Corporation power supply with a solid-state relay (see Figure 3), and a second

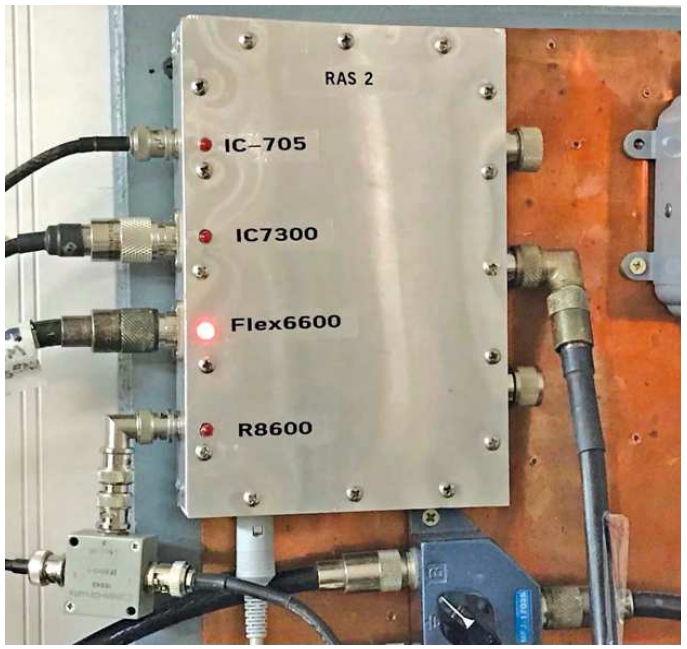


Figure 2 — The RAS2 switch box.

Figure 3 — Astron Corporation power supply remote-control interface with bypass switch.

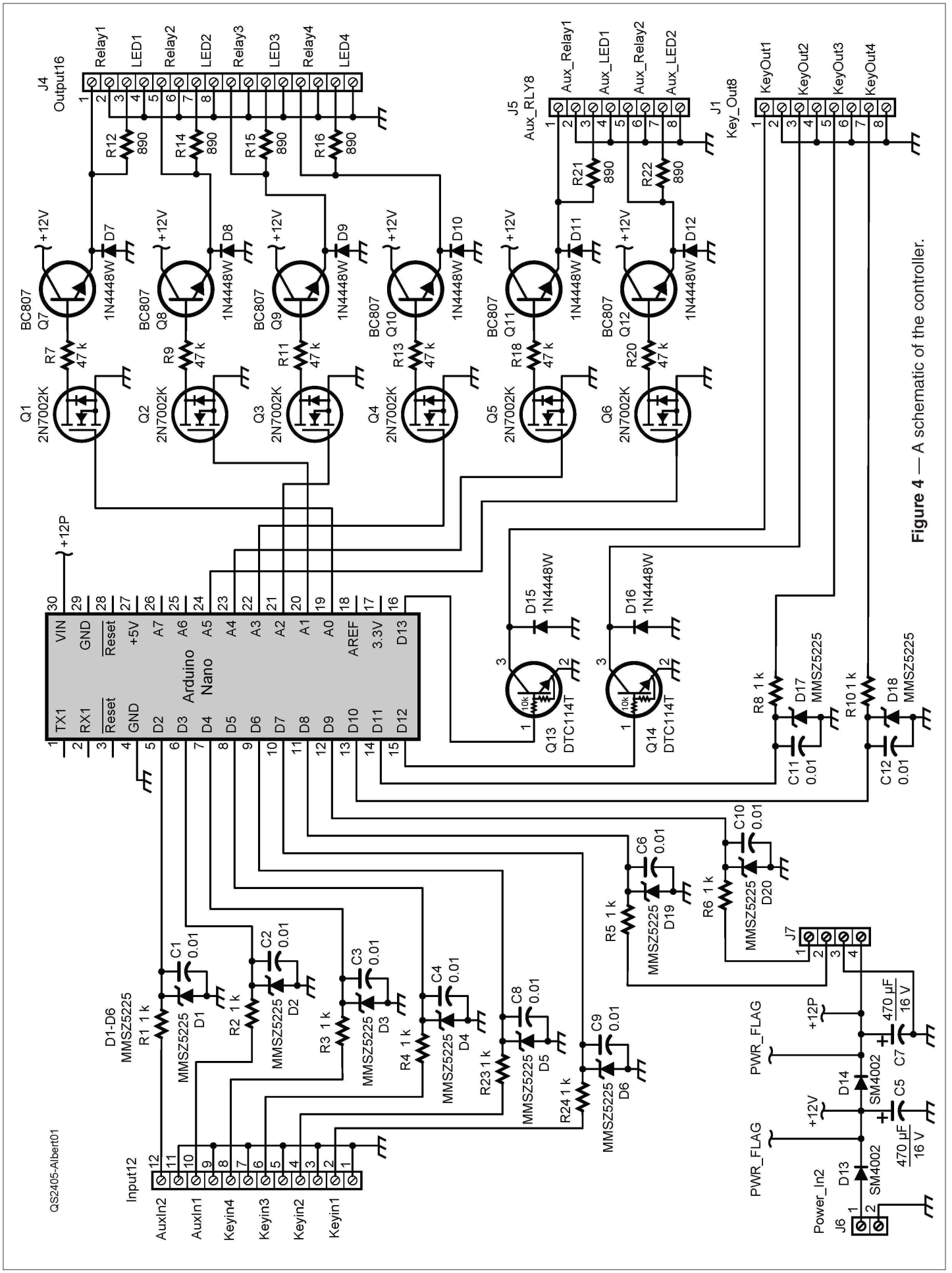


Figure 4 — A schematic of the controller.

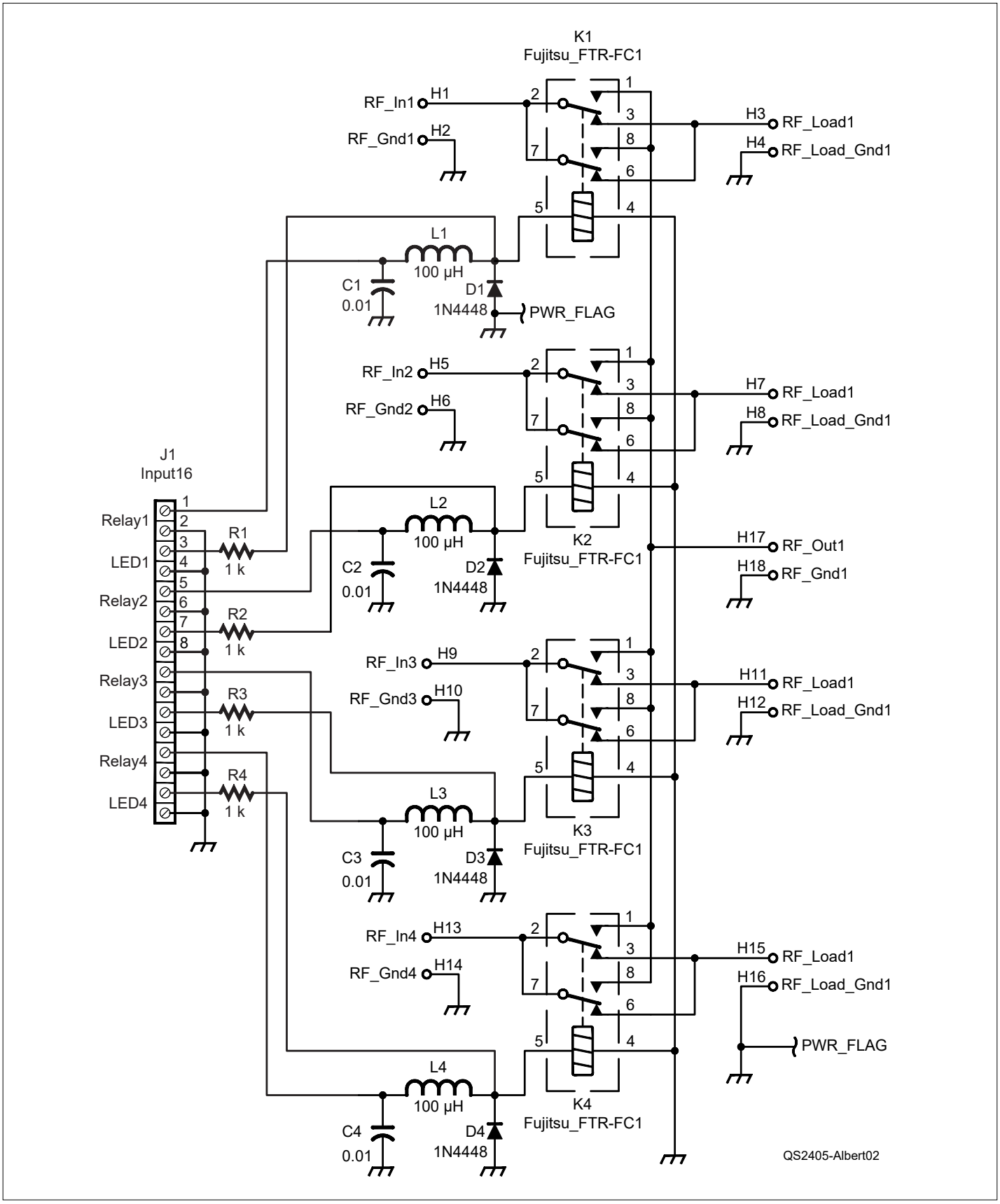


Figure 5 — A schematic of the relay box.

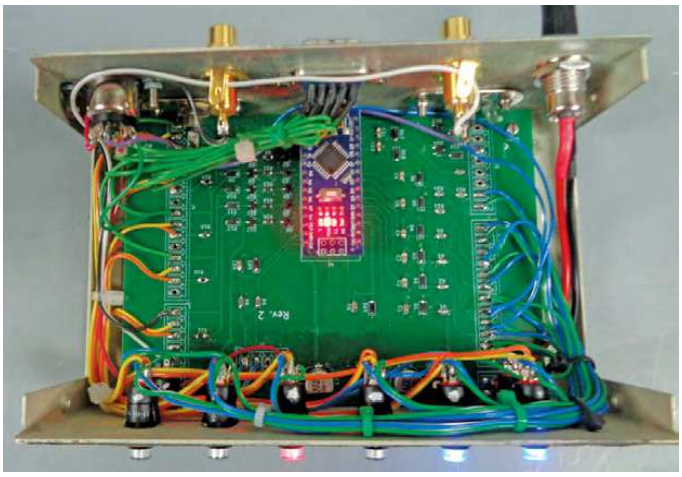


Figure 6 — Inside the controller.

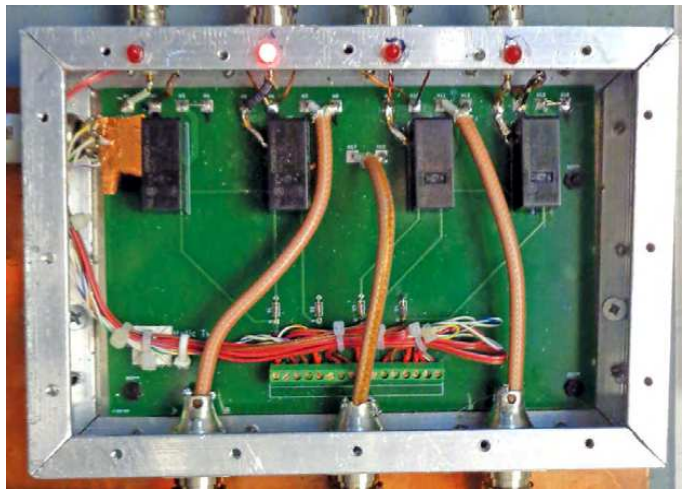


Figure 7 — Inside the relay antenna switch.

auxiliary output provides a remote signal that turns on my FLEX-6600. The sketch (software), list of materials, and CAD files are available on the *QST* in Depth web page (**www.arrl.org/qst-in-depth**). See Figures 4 and 5 for schematics.

The RAS2 Controller

The controller printed circuit board (PCB) measures 5 × 3½ inches and is mounted in a repurposed serial port A/B switch box, as shown in Figure 6. I glued a thin PCB over the front panel and punched new holes for the nine LED pushbutton switches. The four radio buttons are grouped together and light up when pressed. A **GROUND ALL** button grounds all the antenna ports. Separate from the radio buttons are the two auxiliary on/off buttons.

I covered two DB9 holes on the rear panel with blank cover plates and punched holes in the plates for two female RCA jacks for the two auxiliary outputs. Because the Arduino USB port faces the rear panel, I punched a hole below the center DB9 connector for access to this port. External equipment can be accessed via a six-pin DIN socket. Other outputs are available for other ancillary devices if desired. For example, I can use a multiplexer unit to transfer band data from the selected transceiver to my KPA500 amplifier. Only five wires are needed to interface with the antenna switch box.

The Relay Switch Box

The antenna relay PCB is approximately 6½ × 4¼ inches. While I made my own box, a Bud Industries CU-3008-A would be a good enclosure. The RF switching side of the relays, each of which can handle up to 100 W, is as close as possible to the connectors to minimize voltage standing wave ratio (VSWR). A bottom-side solid copper fill runs under the RF copper tracks and the relay contacts. The ground connections to the relay coils have a ground fill that is separate from the RF ground to improve isolation. To improve the isolation between radio ports, I removed the coax connecting to the 50 Ω loads and reconnected the relay pins directly to the RF ground. This also reduced any electromagnetic interference that might leak across the board. The worst-case VSWR is 1.05:1 on 6 meters. An internal view of the relay switch box is shown in Figure 7.

The Software

The open-source *Arduino IDE* software (**www.arduino.cc/en/software**) makes it easy to write code (sketch) and upload it to the Arduino Nano, which connects to my shack PC via the USB port. The sketch manages the input commands from the pushbuttons, the radio's push-to-talk, or commands from the USB port. Whether the commands are hardware or software driven, the results are the

Resources for Learning Code

- "2023 Arduino Tutorial for Beginners 01 — Introduction" (**www.youtube.com/watch?v=JnJIKX5J0Cc&t=42s**)
- Arduino Programming Language Documentation (**https://docs.arduino.cc/learn/programming/reference**)
- Arduino Language Reference (**www.arduino.cc/reference/en**)

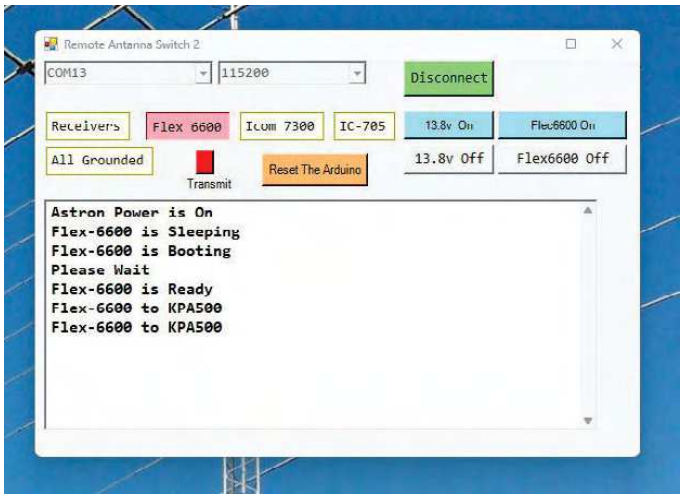


Figure 8 — Remote control display.

same. Pressing radio button one activates relay one. Commands coming down the USB pipe are simple one-digit numbers. So, number one activates relay one, number two activates relay two, number five activates the auxiliary one output, and number seven turns off auxiliary one.

Visual Studio 2022 (**https://visualstudio.microsoft.com/downloads**) permits running a remote-control console (see the *QST* in Depth web page for the latest versions of these files). The console includes virtual buttons that mimic the physical front panel. There's a pull-down list to select the port number and baud rate. When you press a virtual radio button, the Arduino receives the command and returns a response that can be viewed in the console text box. The remote control display is shown in Figure 8.

See *QST* in Depth for More!

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

- ✓ *Arduino IDE* sketch
- ✓ List of materials
- ✓ Visual Studio file
- ✓ CAD files

Conclusion

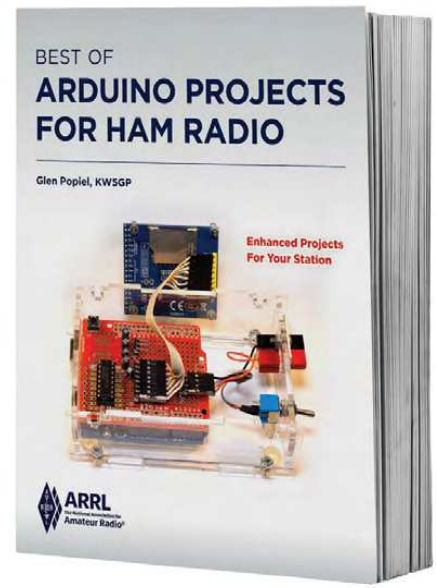
The RAS2 is a very flexible unit. However, you should definitely think about future applications. This means consideration of Arduino input/output ports, program memory, and physical interfaces. Besides antenna switching, you may want to eventually control your radio and amplifier powering, as well as other devices in your station.

I would like to thank Bob Beckstrom, W9ZV, for helping me with the "Flex handler" timing software.

All photos provided by the author.

John Albert, WA9FVP, served in the US Army Signal Corps from 1967 to 1970, and ran a small consumer electronics repair business from 1971 to 1979. Future employment included Rockwell Collins Telecom Division, Tellabs, and Argonne National Laboratory. After leaving Argonne, John was self-employed as DBA Willco Electronics from 2006 to 2020, where he primarily repaired amateur radio equipment. Since retiring in 2020, John has spent his time designing and homebrewing ham radio projects. John can be reached at **wa9fvp@arrl.net**.

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



Looking to build your own Arduino project? ARRL's new book by Arduino enthusiast Glen Popiel, KW5GP, includes 16 Arduino projects to build your programming and microcontroller skills. *Best of Arduino Projects for Ham Radio* will be available soon from the ARRL online store (**www.arrl.org/shop**) and ARRL dealers.

High-Performance Stacked Array with Tribanders

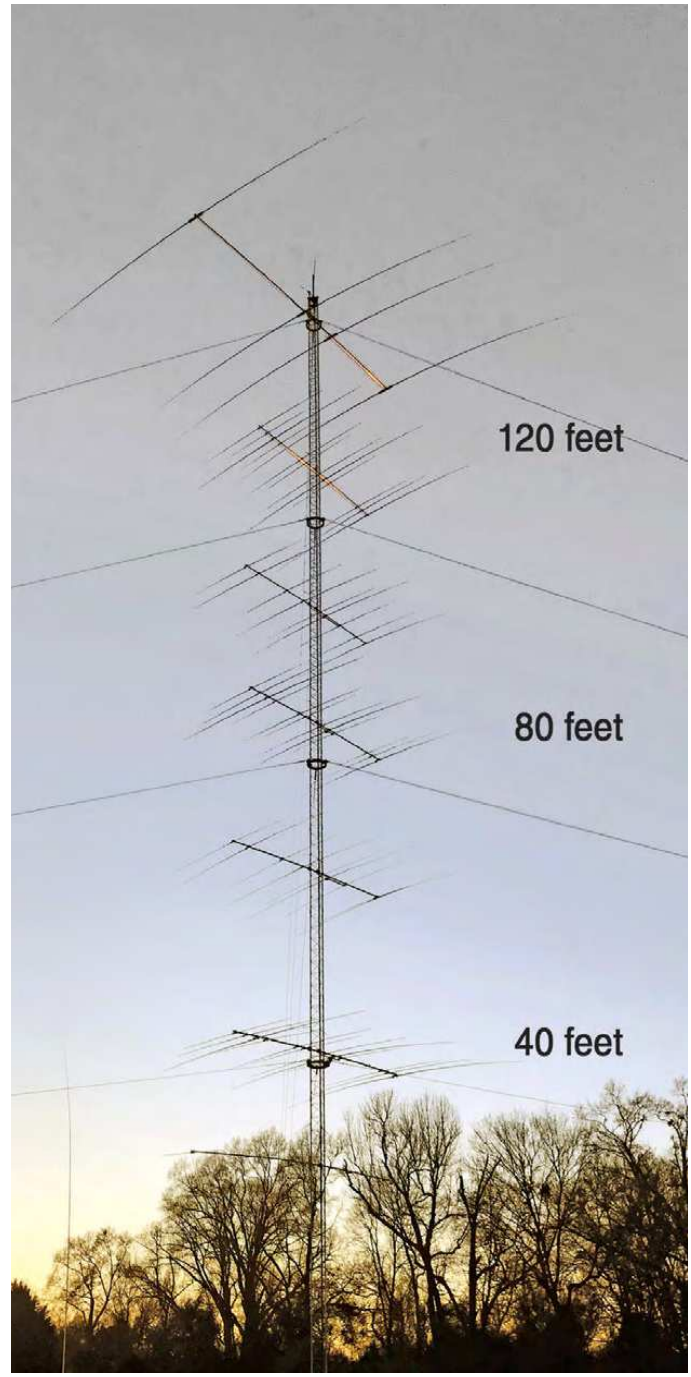
Controlling the takeoff angle of your antenna provides a big advantage.

John C. Small, W2VP

There are many different aspects of ham radio on which operators tend to focus their attention. In my case, it is chasing and working DX stations all over the world. The main challenge of working DX is being able to hear and work weak DX stations, so having a high-performance antenna system is important. When I earned my first ham radio license in 1968, I had a modest station consisting of a Mosley Electronics TA-33-JR antenna elevated 40 feet, and 90 W AM. For many years later, I worked DX using a more typical multiband antenna on top of a 60-foot crank-up tower. Since retiring, I wanted to install the antenna system of my dreams to better enjoy working DX.

In my retirement, I wanted to move to a different state, purchase a new home on a larger property, and in doing so, install a specialized, improved antenna system that is different from a multiband antenna on a 60-foot tower. I wanted to install a very tall tower and a high-performance antenna system. However, I knew that to significantly improve upon the performance of a Yagi antenna elevated 60 feet, I had to think big. There is a popular ham expression: "Get as much metal as you can as high in the air as you can." I initially wanted to buy a home on a hill in order to have a low takeoff angle (TOA), which is generally important for working DX. Local terrain can have a substantial impact on the actual antenna pattern. Fortunately, the *High-Frequency Terrain Assessment* (*HFTA*) program, written by Dean Straw, N6BV, and available for download with *The ARRL Antenna Book*, can analyze terrain's interaction with antenna patterns. Finding a home on a hill proved difficult, so in the end, I purchased one on 12 acres of relatively flat ground. This made it especially important to have an antenna system with a low TOA and plenty of gain.

The system I chose to install is a 150-foot rotating tower that covers the 40 – 10-meter bands, raises all of my antennas high off the ground, and yields plenty



The stacked Yagis and their corresponding elevations. [John Small, W2VP, photo]

of space for stacking antennas. The same system I describe in this article was featured on the cover of the April 2019 issue of *QST*. I installed a total of seven antennas on the tower. The antenna with the lowest frequency is a single, 40-meter monoband Yagi at 150 feet. A stack of three identical tribanders are at 40, 80, and 120 feet for 10, 15, and 20 meters. A stack of two dualbanders for 12 and 17 meters are at 60 and 100 feet, and a 6-meter beam is at 30 feet. For the purpose of this article, I want to focus on the stack of three tribanders. These JK Antennas Mid-Tri antennas have five elements on 10 meters, four elements on 15 meters, and three elements on 20 meters. They have no traps. Note that my antenna system is designed for DXing, and a design for a contest station would be significantly different.

Gain and Stacking Distance

Early in my ham radio career, one of the most popular ways to achieve higher gain than a simple dipole was to install a multiband antenna on top of a tower. The next step was to use stacked, long-boom monoband Yagis — one for each band. But in recent years, thanks to antenna modeling software, stacked multiband antennas with shorter booms have been shown to have certain advantages over long-boom monoband Yagis. To increase the gain of the antenna by approximately 3 dB, you have to double the boom length. A JK Antennas Mid-Tri antenna has a boom length of 24 feet; to achieve a 3 dB gain, the boom length would have to be extended to 48 feet, which would be challenging from a mechanical perspective. Long-boom antennas have limited placement on guyed towers because of the need to clear the sloping guy wires when rotating the antennas.

A stack of antennas with shorter booms can achieve gain equal to or greater than a long-boom monoband antenna. The added gain of two stacked antennas is 2 – 3 dB. Stacked antennas form a lobe with increased gain and a lower TOA. More antenna directivity is ideal because it increases the signal strength of the desired signal and reduces the signal strength of unwanted stations. The gain achieved from stacked antennas varies with stacking distance and is highest between 0.5 and 1.0 wavelength. Spacing antennas closer than 0.5 of a wavelength causes the two antennas to interact, and the patterns of the antennas will degrade. Gain gradually increases as the spacing (in terms of wavelength) is increased between individual Yagis in the stack, and then it slowly decreases beyond 1 wavelength. However, the difference in gain between spacings of 0.5 and 1.0 wavelength is only a fraction of a dB. When using monoband antennas, spacing can be optimized for each band. The spacing between Yagis is a compromise when it comes to tribanders. I used a spacing of 40 feet based on the 15-meter band. The stacking distance of 40 feet is 0.82 of a wavelength for 15 meters, 0.61 of a wavelength for 20 meters, and 1.2 wavelengths for 10 meters. Greg Ordy, W8WWV, modeled my three-stack triband array antenna system using *HFTA*, and the resulting data indicates an excellent gain of 18.6 dBi on 10 meters, 17.6 dBi on 15 meters, and 16.0 dBi on 20 meters. For a detailed look at the data and how it was generated, see the sidebar, "Generating the Data."

Changing the Vertical TOA

The TOA changes based on the height of the antenna above ground. As detailed earlier, the triband antennas are installed at different heights above ground: 40, 80, and 120 feet (see the lead photo). This allows me to instantly change the TOA by switching different antenna combinations. Feeding the antennas in phase and out of phase also changes the TOA. I can change antenna combinations and phase using the DX Engineering PS-3B stack match. With the PS-3B and stack of three antennas, I can select more than 10 different antenna combinations — any single antenna, the top two, the bottom two, or all three — with one of them out of phase. This changes the main lobe to a low, middle, or high angle.

The impedance of a single resonant Yagi is approximately 50 Ω, but with combinations of two or three antennas, the impedance changes. For two antennas combined, the impedance is about 25 Ω, and for three antennas, the impedance is about 17 Ω. The PS-3B phasing relay unit has a broad-bandwidth, high-power, impedance-matching transformer that takes the lower resistances of 25 or 17 Ω and matches them to 50 Ω. To maintain proper phasing, the feed lines to each antenna should be the same lengths.

The largest advantage of stacking antennas is not necessarily the additional gain, but the ability to move antenna nulls so a desired signal doesn't fall into one. While gain makes a marginal improvement, moving a null can make the difference between a barely readable signal and one that is strong enough to make a rare DX contact. You will always want the desired signal to be in the main lobe of the antenna rather than a side lobe, and definitely not in a deep null.

A Yagi at the top of a 60-foot tower has a main lobe that is not always optimal for the desired path. This is because the TOA for the desired signal is not the same as the antenna's main lobe. A single antenna

installed at more than 1 wavelength above ground has several low-angle lobes, with deep nulls between each lobe. These nulls can be –20 dB or greater.

From my location in Georgia, Australia is about 10,000 miles away, Italy is about 5,000 miles away, and Saint Lucia is about 2,000 miles away. The optimal TOA is quite different for each of these locations. For a far-away DX station, lower TOAs are the most useful. For closer stations, higher TOAs are more useful. When using a stacked array, you can maintain communication over the desired path because you can instantaneously change the TOA. You can select combinations of stacked antennas, or a single antenna, to put the DX station in the main lobe of the antenna instead of a deep null. Alternatively, you can drop a strong, interfering station into the null of the antenna pattern so that you can copy the desired signal. You can also move the main lobe and nulls by feeding some of the antennas out of phase.

With its different TOAs, a stacked array is helpful for maintaining contact during changing and marginal band conditions. During a DX band opening, the initial signals usually appear at low elevation angles. As the band strengthens and spreads, signals at higher elevation angles are the strongest. As the band closes, signals at low angles will again be the strongest. Because a stacked array allows for different TOAs and additional gain, it stretches the band opening. You can sometimes contact DX stations before other local stations can hear them, in addition to working them long after other local stations lose propagation. Stacked arrays also tend to reduce the amount of fading (QSB) on the received signal. QSB is caused by a signal taking two different paths that arrive at different angles. The two signals can momentarily cancel and cause dropouts in reception. If you null one of the paths, the QSB will go away.

To better understand which heights and phase combinations produce a given TOA, a computer analysis is required. An *HFTA* analysis of my stack of three tribband Yagis (see Figure 1) showed the best combinations for specific TOAs, and I saw that the best combination for 20 meters is as follows:

- All three antennas in phase for 0 – 15 degrees (purple)
- Two antennas (bottom and middle) in phase for 15 – 19 degrees (green)
- All three antennas (bottom and middle in phase, top out of phase) for 19 – 29 degrees (blue)
- Two antennas (middle and top) in phase above 29 degrees (red)

Out of the 10 possible combinations for 20 meters, only two are ideal. The combinations listed in the first and third bullet points are best because they provide the highest gain for most of the angles. The only exception is the small range between 15 and 19 degrees, which is where the bottom and middle antenna combination is best. Visit **www.arrl.org/qst-in-depth** for similar analyses for 15 and 10 meters.

The Stacked Array in Practice

After installing and operating a high-performance, phased stacked array antenna system, I not only can change the azimuth direction of my array, but I can also change the vertical elevation TOA by switching between different antenna combinations and/or phase relationships between the three stacked tribanders. The stacked array has been extremely exciting to operate. I can often work DX stations on the first call, even when others cannot hear them. I also frequently get reports that my signal is among the strongest on the band. I have enjoyed many contacts with DX stations around the world via both short path and long path. For instance, to work Frank Wright, VK4DO, on 10-meter short path, I initially used a medium TOA combination. But as the band was going out, I switched to a lower TOA combination and was able to maintain the contact for much longer. Frank's signal completely disappeared on the medium TOA combination, but it was loud and clear on the lower TOA combination. During a 15,000-mile, 20-meter long-path opening to Australia, I was able to work Peter Parker, VK3YE/M, who was using a vertical and only 5 W!

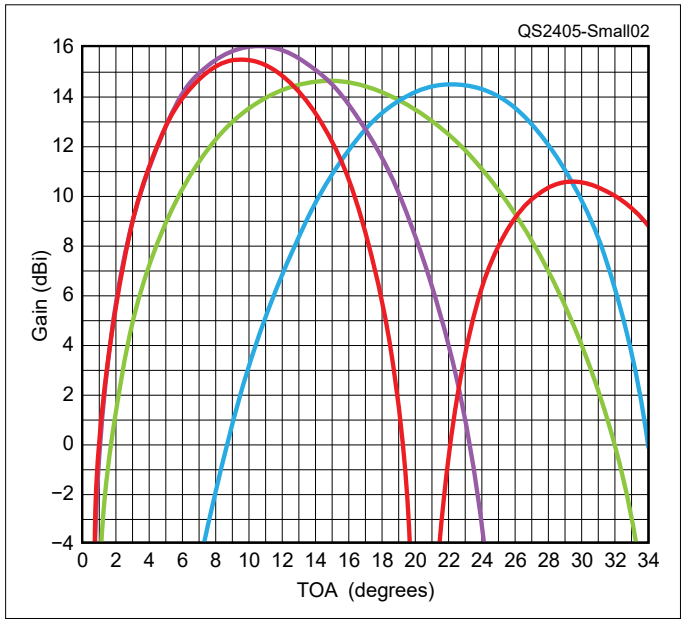


Figure 1 — An *HFTA* analysis of the most useful combinations, redrawn for clarity.

Generating the Data

High-Frequency Terrain Assessment (*HFTA*) is a program written by Dean Straw, N6BV, and available for download with *The ARRL Antenna Book*. All of the Yagis on my antenna system are the same model: JK Antennas Mid-Tri antennas (**www.jkantennas.com/jkmidtri.html**). They are installed 40, 80, and 120 feet off the ground. The 20-meter Yagi has three elements, the 15-meter Yagi has four elements, and the 10-meter Yagi has five elements. The boom length of each is 24 feet. The Yagis are combined using the DX Engineering PS-3B Pro-Stack phasing system, which provides 12 stacking combinations. The lowest Yagi in the stack is number 1, the middle Yagi is number 2, and the highest Yagi is number 3 at 120 feet. The combinations available with this phasing system are the first 12 items shown in Table 1.

A number that is displayed in red means that the corresponding Yagi was phase-inverted (180 degrees) before being combined. One potentially useful combination is 1 + 2, which will be investigated via *HFTA* to see if it provides something not available in the other choices; this is the last combination listed in Table 1.

Figure 2 is a screen capture of the main *HFTA* window. The program can display up to four antenna configurations at the same time, and it allows for a stack consisting of up to four identical Yagis. Elevation changes can have a profound effect on antenna performance. A stack can be analyzed over an actual terrain file for a specific point on the ground. This is a very powerful feature of the software, but it requires you to generate a file showing the profile of the ground in front of your antenna. For our runs, the **FLAT.PRO** file was used, which means the ground in front of the antenna was perfectly flat. The frequency is specified as 14.1 MHz. In the four different configurations to be calculated, all of the Yagis are specified as having three elements. Combination number 1 has three Yagis at heights of 40, 80, and 120 feet — my exact stack configuration. The other three configurations are single Yagis at 40, 80, and 120 feet. After specifying the configurations, selecting the **COMPUTE!** button produces the graph shown in Figure 3. I listed these results as the first four combinations in Table 1. The gains and TOAs for many other combinations, which were tabulated from additional runs of *HFTA*, are also shown in the table.

Table 1 — 20-Meter Stack Performance

Combination	Maximum Gain (dBi)	Maximum TOA (degrees)	First Null (degrees)
1	12.3	24	34+
2	12.8	13	25
3	12.9	8	16
1 + 2 + 3	16.0	11	24
1 + 2 + 3	11.0	8	16
1 + 2 + 3	4.2	8	15
1 + 2 + 3	14.5	22	34+
1 + 3	13.6	10	22
2 + 3	15.5	10	20
1 + 2	1.5	9	15
2 + 3	–3.0	5	7
1 + 3	4.9	6	12
1 + 2	14.6	15	34

Figure 2 — A screenshot of the main *HFTA* window.

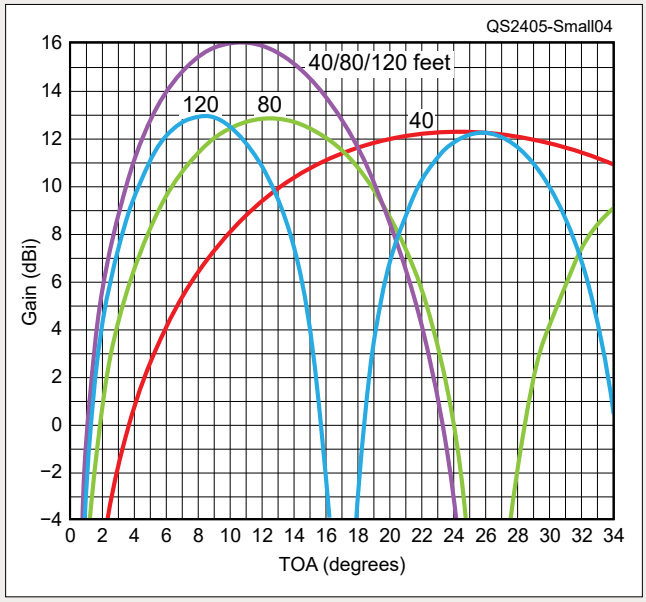


Figure 3 — An *HFTA* analysis of the first four combinations in Table 1, redrawn for clarity.

I hope this article has shown you the many advantages of using stacked antennas, and that it will inspire you to install a stacked array system of your own — particularly now that Solar Cycle 25 is ramping up.

Click here to watch John Small, W2VP, answer questions about his high-performance stacked array antenna system.

I want to thank Greg, W8WWV, for his technical assistance, and Frank, VK4DO, for helping me perform numerous tests to verify the stacked array's performance.

See *QST* in Depth for More!

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

✓ TOA plots for the 10- and 15-meter bands

John C. Small, W2VP, has been a ham for more than 50 years. He is an ARRL Life Member, and he holds an Amateur Extra-class license. John's main interest in ham radio is working DX; he has several DX awards, including DXCC Honor Roll and 5-Band DXCC. John has built many different types of antennas and installed several towers over the years. His current antenna system consists of a 150-foot rotating tower with seven Yagis. He can be reached at **jcsmall78@gmail.com**.

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

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February 2024
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John Portune, W6NBC, and Jim Bailey, W6OEK

In their article, "The Un-Ugly Balun Form," John and Jim explain how to build 3D-printed mounting brackets and balun bobbins that have no tie wraps, mounting holes, or messy adhesive.

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The Un-Ugly Balun Form

Build baluns for 160 – 6 meters using these 3D-printed frequency-customizable bobbins.

John Portune, W6NBC, and Jim Bailey, W6OEK

This article explains how to build two 3D-printed coax balun bobbins that eliminate tie wraps, mounting holes in the form, or messy adhesive to secure the coax. Information for 3D-printed mounting brackets is included as well. See Chapter 23.10 in the 100th edition of *The ARRL Handbook* for details on 3D printing.

Pole-mounted 160-meter un-ugly balun.

The Design

These much-improved 3D-printed bobbins (see the lead photo) are easily customized for any frequency between 160 and 6 meters. That's because the body of the bobbin is not 3D-printed but is a short length of 2- or 4-inch PVC pipe (see Figure 1). The printed ends are glued to the PVC pipe. Figure 2 shows two sizes: one for RG-8X (Mini-8) and one for RG-8 coaxial cable. The smaller bobbin also works with RG-58 coaxial cable.

A Handy Coax Balun Design Calculator

Turns and pipe lengths (see Tables 1 and 2) were developed using the coax balun calculator at **https://tinyurl.com/b2sjcxv9**. We added one additional turn because the calculator outputs a center-to-center winding length. The calculator needs the following data:

- Form diameter: 2 inches of PVC with a 2.375-inch outer diameter, or 4 inches of PVC with a 4.5-inch outer diameter

Figure 1 — End caps and body pipes. Note ramps on rings to keep turns together.

Figure 2 — Completed small 40-meter and large 80-meter un-ugly baluns.

Table 1 — 2-inch PVC with RG-8X (Mini-8)

Band	uH	Turns	PVC (inches)
160	17.7	30	7.7
80	9.1	17	4.6
40	4.5	10	2.9
20	2.3	6	2
10/6	1.1	4	1.5

Table 2 — 4-inch PVC with RG-8

Band	uH	Turns	PVC (inches)
160	17.7	17	7.7
80	9.1	10	4.9
40	4.5	6	3.2
20	2.3	4	2.4
10/6	1.1	2.6	1.9

Pascal Villeneuve, VA2PV, va2pv@arrl.org

Product Review

PreciseRF HG3 QRO-B Stepper Magnetic Loop Antenna

Reviewed by Phil Salas, AD5X
ad5x@arrl.net

I've had the opportunity to review the PreciseRF HG-1 (in the June 2019 issue of *QST*) and the HG3 PRO stepper-controlled magnetic loop antenna (in the January 2021 issue of *QST*). Now that PreciseRF has released the HG3 QRO-B, I was pleased to be able to review this antenna.

Description

The HG3 QRO-B is the high-power version of the PreciseRF HG3 Stepper Magnetic Loop Antenna series. The new HG3 plus controller is now the controller used with the HG3 EXPRESS, PRO, and QRO-B antennas. The main physical difference is that it has both an RJ45 control interface for the EXPRESS and PRO models, and a DB9 control interface for the QRO-B. The HG3 QRO-B covers 6 – 30 MHz and is rated up to 1000 W PEP depending on the band and mode. It consists of a 32.5-inch-diameter LMR-600 radiator loop; a copper tube induction loop; a high-resolution, remotely tuned, 45,000-position stepper motor-positioned large vacuum variable capacitor with a 5:1 planetary gear; the HG3 plus controller; an aluminum support mast; a dc power cable; and a 50-foot DB9-terminated weatherproof controller cable. There is also a 4-foot BNC/BNC cable that connects the remote tuner to the induction loop. Also available is an optional 80 – 30-meter add-on kit, which consists of a second loop that attaches in series with the supplied loop. When this option is installed, the antenna will not operate on 20 – 10 meters. Finally, a comprehensive illustrated user guide is included. Figure 1 shows the large vacuum variable capacitor inside of the tuning unit, and Tables 1 and 2 detail the HG3 QRO-B specifications.

Assembling the HG3 QRO-B

The HG3 QRO-B comes in two boxes. A 37 × 3.25-inch-diameter box contains the aluminum mast, and a 31 × 18 × 6-inch box contains the rest of the parts (see Figures 2 and 3).

PreciseRF recommends the use of a RadioWavz B1:1 ISO choke balun when high power is used. Because the coupling induction loop is balanced and the coax feed is unbalanced, common-mode currents will occur without the balun. This can cause issues with the control signals, as well as distort the radiation

Bottom Line

The HG3 QRO-B is designed for both portable and fixed station operation at up to 1000 W PEP. The remote-tuned stepper-controlled tuning results in precise, repeatable operation.

Table 1
PreciseRF HG3 QRO-B Magnetic Loop Antenna

Manufacturer's Specifications (not tested by the ARRL Lab)	
SWR/return loss (RL)	Typically less than 1.2:1/21 dB RL at resonance
Impedance	50 Ω
Transmit power	See Table 2
Resolution bandwidth	600 Hz
Continuous tuning range	6 – 30 MHz
Tuning	Manual and auto
Tuning method	45K-step stepper motor (NEMA 17 Unipolar)
Radiation loop	LMR600, 113 square inches
Tuning capacitor	High-voltage vacuum variable
Quality factor (Q)	1765
Loop radiation resistance	0.054 Ω/14 MHz, 1.15 Ω/30 MHz
Vacuum capacitor equivalent	12.5 mΩ series resistance (ESR)
Power loss	1.46 dB/14 MHz, 0.14 dB/30 MHz
Efficiency	84.5%/14 MHz, 98.4%/30 MHz
Power requirement	12 – 14 V dc @ 2 A max; typically 1.5 A tuning, 0.2 A idle
Environmental	0 – 35 °C, < 70% RH, water-resistant but not waterproof

Figure 1 — The HG3 QRO-B high-power tuning unit.

Table 2
Maximum Power Directly Into the HG3 QRO-B

Manufacturer's Specifications (not tested by the ARRL Lab)			
Frequency (MHz)	**Digital/TTY**	**CW**	**SSB**
7	400 W	600 W	800 W
14	600 W	600 W	800 W
28	600 W	800 W	1 kW

Figure 2 — The reviewer, Phil Salas, AD5X, with the boxed-up PreciseRF HG3 QRO-B.

pattern. PreciseRF has an excellent video that shows the assembly and initial setup of the antenna (**www.youtube.com/watch?v=QzqPZtdXzHA**). Assembly is quite easy and will take you less than 30 minutes. The only thing missing in the video is how to mount the recommended choke balun. The Radio-Wavz choke balun has UHF connectors. So rather than using the supplied 4-foot RG58 BNC/BNC tuner-to-loop cable with UHF adapters, I purchased an RG58 12-inch BNC/PL259 cable and an RG58 20-inch BNC/PL259 cable from Amazon. The 12-inch cable connects from the balun to the induction loop, and the 20-inch cable connects from the balun to the tuning unit. I tie-wrapped the balun to the aluminum mast just above the tuning unit, as you can see in the lead photo.

Figure 3 — The PreciseRF HG3 QRO-B opened boxes.

Installing the HG3 QRO-B

The HG3 QRO-B is easily handled by one person. It may be installed in a temporary or permanent location. Its aluminum mast can be attached to a secure support using U-bolts (not included), or to a tripod using its ½-inch pipe thread. The antenna is easily rotated with most rotators, including an inexpensive TV-type rotator or the PreciseRF VH226E programmable rotator, which is appropriate for either portable or fixed station use. The HG3 plus controller and the remote high-power tuner RF input use standard UHF SO-239 connectors.

For this review, I mounted the HG3 QRO-B to a mast attached to the side of my house at about the 15-foot level, as you can see in Figure 4. It is rotated with my Yaesu G-450ADC medium-duty rotator. Because the HG3 QRO-B is bidirectional, only a 90-degree rotation capability is needed. I shimmed up the QRO-B aluminum mast with some scrap PVC, as the QRO-B mast diameter was too small for my rotator.

Figure 4 — The HG3 QRO-B mounted on a pole at the reviewer's house.

Operating the HG3 QRO-B

Keep in mind that there is a very high RF field around the QRO-B, especially when running high power. PreciseRF recommends that the operator stay at least 25 feet from the antenna when transmitting.

The HG3 plus controller is powered by 12 – 14 V dc applied through the included 2.1 × 5.5-millimeter power cable. When the controller is powered on, it will ask if you want to initialize the tuner. This sets the minimum and maximum range of the vacuum variable, as well as sets the approximate capacitance for each of the ham bands. The initialization procedure takes only a minute or so. While you don't need to do this every time, you definitely want to do it your first time and any time you make changes to the antenna location. After initialization, the controller defaults to the basic operating screen and sets the band to 20 meters.

There are four soft keys labeled **F1** through **F4**. The display indicates the function of these keys, and changes when keys are pressed to indicate the necessary next functions. The **MODE** (**F3**) key changes the display to show 80 – 30-meter information if the 80 – 30-meter kit is installed. The **HELP** (**F4**) key provides tuning information. The initialization and default screens are shown in Figures 5 and 6.

Figure 5 — The PreciseRF magnetic loop controller initialization screen.

Figure 6 — The PreciseRF magnetic loop controller default screen after initialization.

Once the default 20-meter screen is displayed, you can press the **BAND F1** key to permit decrementing (**F1**) or incrementing (**F2**) the bands. When tuning stops in the desired band, press **OK** (**F4**). Now you will normally tune for maximum noise using the **TUNE** control. Tapping the **TUNE** control enables fine-tuning. You can then transmit a low-level signal and tune for best standing wave ratio (SWR). This is quick and easy to do by observing the SWR bar graph. It is interesting to note that when you change direction during tuning, the controller takes up any backlash by tuning in the opposite direction, followed by tuning in the desired direction. This causes a momentary increase in SWR. This is normal and doesn't affect tuning, though you should hesitate momentarily when manually changing tuning direction. Also, if you record the step count for your favorite frequencies, you can re-tune the QRO-B in short order when changing frequencies and bands.

There is a very effective auto-assisted tuning feature. To enable auto-tune, tune the controller for maximum noise on your transceiver. Then press **AUTO** (**F2**). The controller will display "Transmit 2-10 watt CW." If you transmit over 10 W, the auto-tune feature may not always work. Transmit a low-power carrier and press **OK** (**F2**). The HG3 QRO-B is automatically tuned until the lowest SWR point is found. This entire process takes just a few seconds and worked very well for me. I found that I didn't even need to tune for maximum noise first. Whenever I changed bands or frequencies within a band, I just went to **AUTO** and started the auto-tune process. In most cases, it tuned perfectly on the first try. If not, I would just repeat the **AUTO** process, and it would always find the correct solution the second time. I wound up using the **AUTO** feature whenever I changed bands and/or frequencies.

On-the-Air Operation

I made several measurements of the antenna resonance and bandwidth prior to my on-the-air tests. The results are shown in Table 3.

I operated with a transmit power up to 500 W using my K3/KPA500 setup (100 W maximum on 30 meters, of course). I operated CW (my preferred mode) on 30 meters, but focused on SSB on the other bands. I could pretty much work anyone I could hear. I also made many A/B comparisons between the HG3 QRO-B and my 43-foot vertical. On average, I found the HG3 QRO-B to be about 2 – 3 S-units below the 43-foot vertical on 40 meters, and 1 – 2 S-units below the 43-footer on 30 meters. On 20 – 10 meters, the QRO-B was often equivalent to the 43-foot vertical and sometimes would outperform it. Of course, there were situations where one antenna significantly outperformed the other, but on average I observed the results stated. The HG3 QRO-B also had a better signal-to-noise ratio on all bands when compared to the 43-foot vertical.

Table 3
Antenna Parameters Measured When the HG3 QRO-B Is Fed Through About 35 Feet of LMR-400 Cable

The SWR was recorded from the HG3 plus controller display.

Band	SWR Minimum	2:1 SWR Bandwidth
40 m	1.3:1	16 kHz
30 m	1.3:1	20 kHz
20 m	1.2:1	50 kHz
17 m	1.1:1	70 kHz
15 m	1:1	85 kHz
12 m	1:1	Greater than full band
10 m	1.1:1	215 kHz

Firmware Update

While the HG3 QRO-B manual states that firmware can be upgraded by the user, no information on doing this is provided. There is a warning that damage to the unit due to a user upgrade is not covered by the warranty. So, if you need to update the firmware, you should contact PreciseRF.

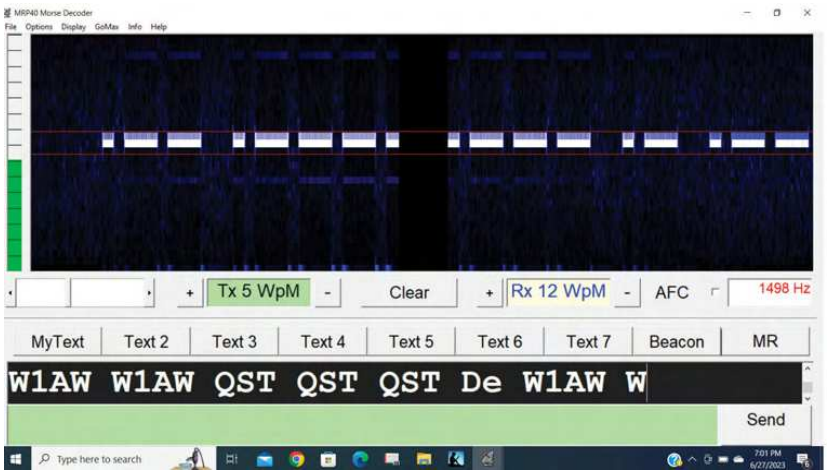
Conclusion

The PreciseRF HG3 QRO-B is an effective antenna worth considering for restricted antenna locations and portable operation at power levels up to about 1000 W PEP. Because it is remotely tuned, the high-intensity RF field can always be kept well away from the operator. You can review the HG3 QRO-B operation manual, the installation guide, and the installation video on the PreciseRF website.

Manufacturer: PreciseRF, 13690 Wisteria Dr. NE, Aurora, OR 97002, **www.preciserf.com**. Price: HG3 QRO-B, $3,025; VH226F programmable outdoor antenna rotator, $275; HG3 QRO 80 – 30-meter add-on kit, $355.

Polar Electric *MRP40* Morse Code Decoder and Sender Software

Reviewed by Charles "Chip" Veres, KM4SJN
km4sjn@arrl.net



This review is an attempt to locate today's best Morse code decoder program. My motivation is to try to encourage CW (code) communications by Technician-class operators on 80, 40, or 15 meters. This seems to be a sadly underused resource. The *MRP40* is among the best programs available for automatic telegraphy. Most of today's Technicians became hams without learning code. Expecting them to turn around and learn to send by hand and receive by ear is optimistic.

Description

The *MRP40* is a Windows software package that you can download from **www.polar-electric.com/Morse/MRP40-EN**. You will also need an SSB transceiver and an audio interface to get the signals from the radio to the computer. The lead photo is a screenshot of the *MRP40* software decoding W1AW. You may need to temporarily disable your antivirus software, although mine just asked me if I wanted to continue, and I did. The program installs itself.

Setting Up Your Transceiver

We are going to "cheat" and send CW by applying pure tones to an upper sideband (USB) transmitter. It is important to keep the tones pure, so you transmit on only one frequency. The most likely problem here is overdriving. If your transceiver has an ALC meter, adjust the audio input until the meter just moves, no more. As a general rule, the transmitter should be putting out about half of its ALC maximum rating. Other helpful settings on the transceiver are the **USB** filter bandwidth, which should be left on, and the **AGC**, which should be shut off if possible. You may need to be persistent to turn down the audio level. On my computer I needed to go into "Advanced Sound Properties" and turn down the *MRP40* level specifically.

The Sound Interface

This can be the hardest or the easiest part of the installation depending on luck and how much money you throw at the problem. I am in the very lucky category, as my Icom IC-7100 has a built-in computer interface — two cables and that's it. One is the USB cable that carries the audio in both directions. The other is a push-to-talk (PTT) cable from the computer to the radio. That's activated by a function of the *MRP40* under **OPTIONS**, **TX SETTINGS**, **EDIT COM PORT**. The COM port "pushes" the PTT switch so you don't have to. You will find the one-transistor schematic in Figure 7.

My friend John's, WA4PYQ, installation was of medium complexity. He likes to both save money and build ham radio projects. So, he got a KF5INZ Easy Digi kit interface from eBay and three cables from DigiKey. His total cost was about $25. The Easy Digi interface assembled by KF5INZ runs between $30 and $45. An MFJ-1205 interface costs $145, but it does all the work for you. Note that all these interfaces do exactly the same thing. It's just a matter of how much sweat equity you put into it.

Receiving and Sending CW with the *MRP40*

In the big blue box on the screen, point at the signal you want to receive and click on it. This sets both the receive and transmit frequencies. The first station I

Bottom Line

The *MRP40* software can decode CW signals as long as you can hear them and even after they no longer move the S-meter.

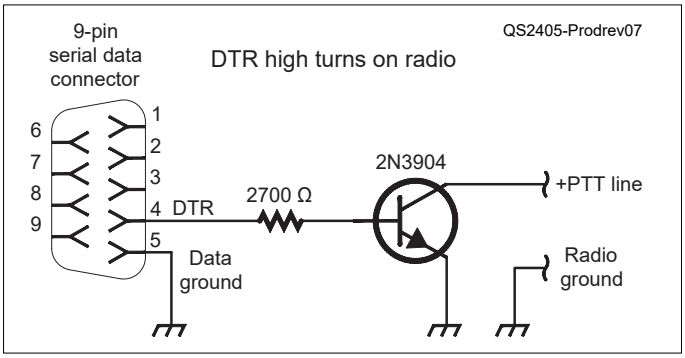


Figure 7 — Schematic of the PTT "button pusher."

tried to receive was W1AW. In general, this was a great success. They send bulletins and code practice three times every weekday evening, and they usually put an S-9 signal on my station in south Florida. Just to try it, I mis-tuned my antenna tuner until the signals faded out. I found that the *MRP40* would continue to correctly copy them as long as I could hear them and after they no longer moved the S-meter. Receiving W1AW, I noticed one strange effect. Below 10 WPM, the *MRP40* would put a word space after each letter — still fully readable but funny to look at. On my fifth try, it finally dawned on me that it was sending with the Farnsworth method, with the letters at 13 WPM and extra-long spaces between them. The *MRP40* was faithfully printing out what it heard.

After receiving W1AW 10 times, the next step was to try other stations. Tuning around, I found several more stations. The program provided similar performance to a human operator, but its strong and weak points were different. The program is capable of 52 WPM, so most operators can't out-speed it. But in some situations, it can be intolerant of bad spacing and fading (just like humans), and of course performance is at its best when the receiving text is generated by another machine.

The *MRP40* has nine memory buttons between the frequency screen and the decoded text. Right-clicking these buttons brings up a text entry screen where you can store your name, rig, QTH, or anything you like. You can even change the name of the button to remember what's where. Once saved, left-clicking these buttons merges them into your transmitted text. The attached mini log stores the following variables: call, name, QTH, and RST. They can be merged into a memory button — for example, <CALL> de KM4SJN K.

A Different Experience

For an old-timer like me, the *MRP40* provides a very different experience — more like FT8 than like hand-sent CW. I don't touch-type, so I found myself wanting to reach through the radio and say, "Hold your horses, Buster! I'm still typing." I'm sure younger people and touch typists will be more comfortable. I may go back to my old key and just let the *MRP40* help with reception.

Tune Button

There is no tune button to transmit continuously for adjustments (except in the menu for WinKeyer). I found I could adequately simulate one by turning the sending speed down to 1 WPM and sending several "T"s. That permitted me to adjust my antenna tuner and transmit power.

My station consists of an Icom IC-7100, a Hustler 4-BTV vertical at roof height, and an HP 8570p laptop computer. For this review I used the *MRP40* encoder-decoder program exclusively.

John, WA4PYQ, was my partner for the local two-way tests. His station includes a Kenwood TS-570D transceiver and a Dell Latitude E5530 computer. His antenna is a 40-meter dipole laid on the tile roof about 10 feet up. Our stations are separated by about 14 miles. He also used the *MRP40* program with his homebrew audio interface.

At WA4PYQ's station, the *MRP40* wouldn't run at first. It reported the absence of Mscomm32.ocx. That is a program Windows uses to communicate with the serial port. We got a fresh copy and installed it in Windows/System/SysWoW64. That cleared the problem.

This whole process may be a bit bewildering for a new operator. If you can, find a more experienced person to help.

Conclusion

This program and others like it can vastly extend the range of Technician-class stations.

Manufacturer: Polar Electric (Norbert Pieper), Max-Planck Str. 11, D-59399, Olfen, Germany, **www.polar-electric.com**. Price: $65.00 after 1-month free trial.

RigExpert Shackmaster Power 500

Reviewed by Harold Kramer, WJ1B
wj1b@arrl.net

The Shackmaster Power 500 from RigExpert is a compact, quiet power supply with an informative LCD touch display. The rated power is 500 W, and it can provide 13.8 V dc at up to 35 A, along with 5 V dc USB outputs to charge smartphones and tablets. When connected to a computer, it has extensive monitoring and configuration capabilities.

Description

The Power 500 arrived nicely boxed and sturdily packaged. The box includes a vertical mounting bracket and a comprehensive instruction manual. Also included is a heavy-duty ac cord and a USB-C-to-USB-A cable that is used to connect the Power 500 to a computer.

The ac input voltage is specified as anywhere from 80 V ac to 264 V ac. There are no external switches or jumpers required when the input voltage is changed. The power supply senses the ac input voltage and adjusts accordingly. It is small and compact, measuring about 6.5 inches across and deep, and 2 inches high. It weighs only about 2.4 pounds, and it can be mounted either horizontally or vertically. That could be a real space saver on a crowded operating desk. The Power 500 has a cooling fan and a fan outlet in the rear (see Figure 8), but I never heard any acoustic noise from it even after hours of operation.

I did not see any RFI on the spectrum scope of my Icom IC-7610 or hear any RF noise on the HF bands when the Power 500 was running. There is an FCC and a CE (European) certification label affixed to the box. Conducted emissions testing done by the ARRL Lab shows that the Power 500 meets FCC regulations when tested both at lower loads and with a transmitter, producing an approximate 20 A load.

Inputs and Outputs

The Power 500 has several different dc output connectors. Please note that all the PowerPole connectors on this unit are rated for 45 A, allowing each one of them to use the full 35 A capacity. There are two Anderson PowerPole connectors on the rear. Also, on the rear is a USB-C connector that connects to a computer for monitoring the power supply. On the front of the Power 500, there are two more PowerPole connectors along with two USB-A connectors and two USB-C connectors that can be used to charge smartphones or similar USB-powered devices.

I did not want to push my luck testing this functionality, but according to RigExpert, the Power 500 features “an advanced Intelligent Protection System” that protects it from overcurrent, overvoltage, and overheating.

Display

The Power 500 has a bright, legible display on its front with white, green, and red characters. The display’s function is changed by touching and/or swiping the display panel, similar to changing the display on a smartphone. Here are the screens that are displayed (the PC software screen capture shown in Figure 9

Bottom Line

The RigExpert Shackmaster Power 500 is a high-quality, compact, and quiet 35 A power supply with advanced capabilities.

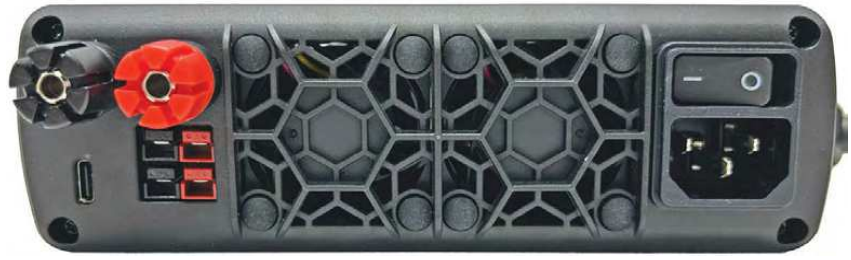


Figure 8 — The RigExpert Shackmaster Power 500 rear panel.

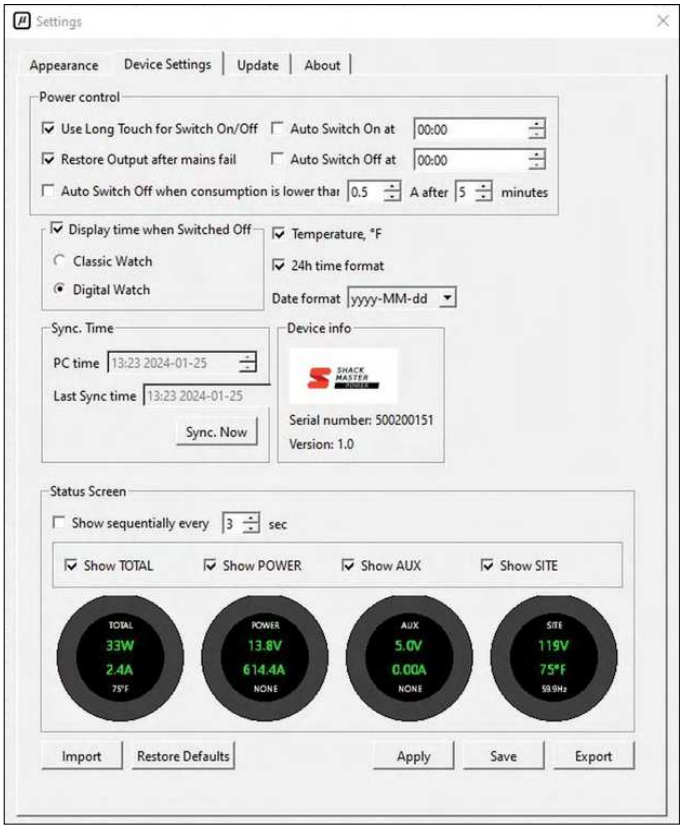


Figure 9 — The *REAMP* (RigExpert Analyzer for Micro Power) software device settings.

shows the different available **STATUS SCREEN**s for the display):

TOTAL — Displays the total power consumed in watts, current consumption, and ambient temperature of the device.

POWER — Displays the voltage and current of the 13.8 V output.

AUX — Displays the USB voltage and current output.

SITE — Displays the ac input voltage and frequency (e.g., 59.9 Hz) and the internal temperature of the power supply (listed as "Conditions" in the manual).

When the on/off switch on the rear is on and ac power is applied, swiping the display turns on the power supply and another swipe turns it off. When the Power 500 is off but ac power is on, it displays the time in UTC.

Computer Connection

A unique feature of the Power 500 is that RigExpert supplies free software called *REAMP* (RigExpert Analyzer for Micro Power) that is used to control the Power 500 from a computer. The software is available for Windows, macOS, and Linux. I downloaded the software to my Windows 10 computer, and it installed with no problems. The Power 500 connects to a computer through a USB-C connector on the rear of the power supply. The software graphically monitors the operation of the power supply, and it can display up to five parameters, such as 13.8 V dc output and current, on its graph display. It can measure these parameters in real time, or they can be stored files for future reference. The software worked fine on my computer, and it was interesting to see how the USB output current varied while my iPhone was charging.

The *REAMP* software can change how the input screens are displayed, adjust the time clock settings, and turn the power supply on or off at certain times. There is also a provision for remote control of the power supply. I have mentioned only a few of the features of the *REAMP* software. There are many additional capabilities for operating, monitoring, and customizing the Power 500 to your personal operating needs.

Conclusion

While the Power 500 is somewhat expensive for an amateur radio power supply, it's worth the money if you are in the market for a compact and quiet power supply with advanced capabilities and options.

The Power 500 is a high-quality, compact 35 A power supply that can easily power a 100 W HF transceiver along with providing power for USB devices. It displays many operating parameters that can be monitored and customized to the users' needs when connected to the RigExpert software and a computer.

Manufacturer: Rig Expert Ukraine Ltd., Solom'yans'ka Square, 2, 03035, Kyiv, Ukraine, **www.rigexpert.com**. Available from several US dealers. Price: $360.

DX Engineering NCC-2 Receive Antenna Phasing Systems

Reviewed by Pascal Villeneuve, VA2PV
va2pv@arrl.org

The DX Engineering NCC-2 is identified as a Receive Antenna Phasing System on the manufacturer's website, but you will find out with this review that it is way more than that. The NCC-2 is an upgraded version of the previous model, the NCC-1.

At the 2013 Hamvention, I was looking for a way to protect a second receiver using the same HF antenna system. I started asking questions to a few manufacturers, who referred me to the DX Engineering booth. So, I went, and they brought up a solution using the RTR-1A Modular Receive-Transmit Interfaces. A few days after Hamvention, I received the unit and started to figure out how to connect it. There are so many ways to connect it that you need to sit down and figure out the best setup for what you want to do. I drew a diagram and sent it to DX Engineering support; they answered promptly with a different suggestion. After I proceeded with all the connections, everything worked as expected.

I've had the RTR-1A in the shack for several years, and it serves its purpose well. I had another brand of noise canceler and an HF beam for 10, 15, and 20 meters with an inverted **V** dipole on 80 meters. The setup worked well with the second receiver, but to use the noise canceling system I needed a second receive antenna that was a long wire around 10 feet above the ground. For the receive antenna I also had an external preamp to be efficient on most bands. At some point I had the local utility resolve many interference issues. The noise cancellation system was not required anymore, so I removed everything to reduce all the cabling behind the desk, as there were many devices involved — the RTR-1A, the noise canceler, the RX antenna preamp, and a protection relay to protect the RX antenna from transmitted RF.

Remember, the NCC-2 is way more than a noise canceler. It can include all the functionalities of my previous setup in one piece of equipment, reducing considerably the cables needed for the connections and the error risk associated with too many of these.

The NCC-2 now has a built-in receive-transmit interface relay system (equivalent to the RTR-1A), and the unit has six plug-in modular circuit board sockets (three for each receive antenna), allowing the unit to serve many purposes. By default, there are six bypass modules installed, and you will need to remove one to install any of the optional modules (more on this later). The options are the Receive Preamplifier Plug-In Module (DXE-RPA-2-PM), the Receiver Guard 5000HD Plug-In Module (DXE-RG5000HD), the 75 to 50 Ω Impedance Transformer Plug-In Module (passive) to match 75 Ω RX ANT feed lines to NCC-2 50 Ω internal impedance, and the NCC-2 Receive Filter Sets (passive, non-switchable): high-pass, band-pass, and low-pass filters.

Figure 10 — The NCC-2 internal add-on modules: the DXE-RG5000HD Receiver Guard located in option 2 (middle module on the left side) and the DXE-RPA-2-PM preamplifier module located at the bottom.

Bottom Line

The DX Engineering NCC-2 is more than just a noise canceler. It provides an all-in-one solution for different applications while reducing the external connections.

You can also combine the NCC-2 with the DX Engineering Active Vertical Receive Antenna System. Because of my limited space (6500-square-foot lot), for this review I used a 40-meter dipole about 15 feet above the ground. I also added two optional modules for the receive antenna: the DXE-RG5000HD Receiver Guard and the DXE-RPA-2-PM preamplifier module (see Figure 10). Also, the NCC-2 can provide Bias Tee for its two receive antenna ports for coax-fed active verticals and other accessories.

Physical Description

The first thing you will notice is the overall quality, with its steel enclosure, sturdy knobs, and weight (more than 8 pounds). Keep in mind that this unit frequency coverage is 0.3 to 30 MHz, and it cannot be used on 6 meters.

On the front panel (see the lead photo), starting from the left, you have the **POWER** switch. When the unit is off, it is bypassed with your main antenna (TX) going to your rig directly. Above the **POWER** switch, you have a three-position switch with an LED just above showing the receive/transmit relay (RTR) feature status. When in the **NORM** position, the RTR is active and the LED is blue. In the **MAIN ON** position, the RTR is off and the LED is red. The bottom **MAIN ON** position is the same as the previous top one, but it's a momentary switch to quickly monitor the main antenna while holding it down.

The next set of controls is for channel A (**CH A**). In my setup, this is for the main antenna, as I have only one receive antenna on channel B (**CH B**). There is an **A dB** rotary attenuator switch to reduce the antenna signal for **CH A** from –10 to –30 dB; this is useful to match the received antenna signal strength. Below the attenuator switch there is an **OPTION** switch for **CH A** with a yellow status LED above when it's in the **ON** position; this is used to turn on and off the optional preamplifier module, if installed for **CH A**. In my case, there is none, so switching this one has no effect. The **BALANCE** knob is for balancing the signal between **CH A** and **CH B** antennas for noise cancellation. Next is the rotary switch attenuator for **CH B**, and just below is the **CH B OPTION** switch; in my case, this switches the preamp on for my receive antenna. On your right, you have the **PHASE** knob for the noise cancellation. Below, on the left, you have the **B PHASE** switch, **NORM** and **REV** position; in some cases, you will need to switch the phase in order to null a noise. The last one on the right is the **BAND** switch; **L** position is for the low band, 40 meters and above, and **H** is for below 20 meters.

Figure 11 — The NCC-2 rear panel.

On the rear panel (see Figure 11), you have two SO-239 antenna ports — one is to connect your main transmit antenna (**MAIN ANT IN**), and the other is for the **RADIO**. For both **CH A** and **CH B** receive antenna inputs, you have the option of using either the 50 Ω BNC or the F-style connector (you can use either of these). Using a 75 Ω input, you need the optional transformer module. When I was making the connection, I wondered why they were using these types of connectors for the receive antenna because most of us will need to use adaptors. Well, the answer is in the manual — it is to prevent any accidental connection to the transmitting equipment. I mentioned earlier the risk of my previous setup — having three different boxes to achieve the same result. This is what I was talking about, so it's a good thing they used these to reduce any risk. When the RTR is on, the receive signal from the main antenna is sent to the **MAIN ANT OUT** connector that you can use to connect a second receiver. In the middle of the rear panel, you have two RCA connectors for the **RADIO PTT** and the **ACC PTT** to connect an accessory such as an HF amplifier. Beside the RCA connectors you have the **+12 TO 21 VDC** input.

Connecting the NCC-2

This is where the fun begins. First, you will need to figure out how to connect your antennas and equipment depending on your intended use. In the user manual, you will find six setup examples, from pages 27 to 32. You can download the manual from the following link: **www.dxengineering.com/parts/dxe-ncc-2#InstructionArea**.

There are many ways to connect the NCC-2, and you will need to identify the best way for your setup — you may plan to use the RTR feature to feed a second receiver, like a software-defined radio (SDR), or you may have one or two receive antennas. If you need to provide power via the coax to either one or two receive active antennas, you will have to open the NCC-2 cover and change the jumper of one or two

channels to enable the Bias Tee; by default, both are disabled.

My connections are a mix and match of different diagrams shown in the manual. In case of any doubt, contact the DX Engineering technical support to ensure your setup is okay, as there are many possibilities.

I have only one receive antenna, which is not active, and no Bias Tee was needed. I also have an amplifier, which is the reason I got the receiver guard module for the receive antenna. Keep in mind that if you have an amplifier, it needs to be connected after the NCC-2, as the maximum power through this unit is 200 W. All my HF transmit antennas come into the station using only one coax from a remote switch located in the tower.

I started with diagram 1 on page 27 of the manual ("Phasing a Transmit Antenna with a single Active Receive Antenna using the RTR function"). My antenna is not active, as mentioned previously, but other than the Bias Tee being disabled, the connections are the same. The NCC-2 has two receive antenna inputs for the antenna phasing system. When you have only one receive antenna and one transmit antenna, you will need to feed the **CH A ANT IN** with the **MAIN ANT OUT** using the included BNC-to-BNC jumper. If you want to feed a second SDR receiver using the RTR function, you can insert a splitter between the **CH A ANT IN** and the **MAIN ANT OUT**, as shown in diagram 4 on page 30 of the manual.

In my station, I have a coax switch to switch between the antenna to different HF radios. I also have a 1 kW amplifier and a station monitor that has two RF couplers, one before the amplifier and one after, so the coax output of the radio's coax switch connects to the input of the first RF coupler, and the output of this coupler is connected to the **RADIO** input of the NCC-2.

The **MAIN ANT IN** input on the NCC-2 is connected to my HF amplifier RF input, the amplifier RF output is connected to the second RF coupler input, and the output of this coupler is connected to the outside antenna's coax switch. The RF power going through the NCC-2 will be a maximum of 100 W.

I used the included BNC jumper to connect the **MAIN ANT OUT** to the **CH A RX ANT IN** on the NCC-2, and I connected my RX dipole antenna to the **CH B ANT IN** using an SO-239 to a BNC adapter. I hope I didn't lose you with all these connections — it's easier when you have the units in front of you.

I connected the PTT coming from the radio to the **RADIO PTT** on the NCC-2, and the **ACC PTT** on the NCC-2 to the amplifier PTT input. And I connected the dc power from one of my shack power supplies to the NCC-2. To power the NCC-2, you will need a well-filtered 2 A dc source from +13 to 21 V dc. The dc connector is included, but you will have to build your cable.

Before I made all these connections, I opened the NCC-2 and installed the optional DXE-RG5000HD-PM Receiver Guard and the DXE-RPA-2-PM Receive Preamplifier modules. This is important, as both modules can be installed on either channel A or B or even both. I have only one of each of these optional modules, and in my case, these needed to be installed in-line only on my RX antenna, channel B. There are three optional slots for each channel. From top to bottom, you have option 1, option 2, and option 3. The receiver guard goes into option 2, and the preamplifier goes in the option 3 slot. See the online manual for more details, as these have their specific positions.

On-the-Air Operations

Before I could use the NCC-2, I had to wait for winter to arrive. I don't usually have any interference during summer, and I install my receive antenna only in winters, because it's installed low above the ground and close to the pool.

Now that everything was installed, I could try the NCC-2. The RTR feature is the best way to protect a second receiver from unwanted RF; it allows you to share your antenna and the phasing system with your main receiver. It's great that this feature is included with the NCC-2, and this works very well.

When it comes to noise cancellation, your results will vary depending on the performance of your receive antenna system. Having the preamplifier option built in is a great addition if you're using an antenna that does not perform equally on all the bands. My receive dipole antenna works best on 40 meters, and the preamplifier is needed when I want to null a noise on 80 meters, because to efficiently null a noise you will need to be able to match the signal strength of both antennas as close as possible using the **BALANCE** knob. If there's too much of a difference, you won't be able to obtain a great result. That's the reason you also have a variable attenuator for each receive antenna. As for the preamplifier, on 80 meters my radio signal meter shows a difference of +4 dB when I turned this option on, and on 40 meters it's up to 8 dB. The other bands show similar results. Keep in

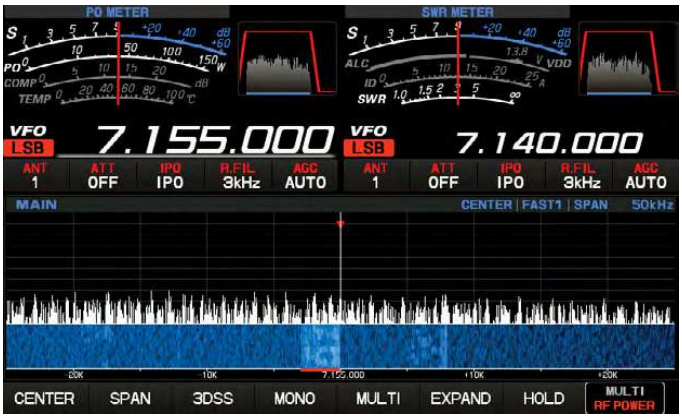


Figure 12 — The Yaesu FTDX101D waterfall screen capture showing noise interference before using the NCC-2 noise canceler.

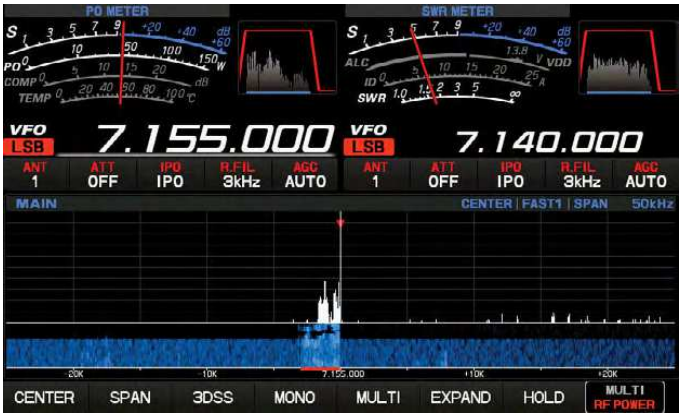


Figure 13 — The Yaesu FTDX101D waterfall screen capture just after switching on the pre-adjusted NCC-2 noise canceler.

mind that this is not a laboratory measurement; it's just my observation with my current setup. The DXE-RPA-2-PM specifications on the manufacturer's website mentioned a gain of 16 dB, and ± 1.5 dB, from 300 kHz through 35 MHz. In my case, the preamplifier of my receive antenna was necessary, and it works very well.

My lot is small, and I didn't install an external protection relay on the receive antenna, so I was a bit worried that if I was using the amplifier, the RF picked up by the receive antenna could damage the NCC-2. That's the reason I installed the optional receiver guard module. It looks like it survives a 1 kW transmission test even with the preamp on. The preamplifier LED stays on when I transmit, but I'm pretty sure it's deactivated. This is great, as no external relay is needed when using the NCC-2 with the optional receiver guard module.

I had to wait for noise interference on a cold winter day to really test the efficiency of the noise canceling system of the NCC-2. One morning in January, it happened on 40 meters; the noise peaked up to 20 dB over S-9. Keep in mind that the NCC-2 is able to null the noise before it even gets into your receiver, which is way better, as it won't add distortion on the received strong signal audio. To null the noise, I set the **PHASE** knob in the middle (5) and started to play with the **BALANCED** knob. I was unable to null the noise right away, so I switched the **B PHASE** switch to **REV** and played with the **PHASE** knob, and the noise was almost gone. Then I fine-tuned using the **BALANCED** and **PHASE** knob. I was able to make the noise disappear completely. You will need to play with the knobs very slowly to fine-tune and achieve the best performance. The NCC-2 made the difference between turning off the radio (as I couldn't hear anything) and listening to an interference-free quality signal. You can see the signal difference in the screen captures from my Yaesu FTDX101D when I switched the NCC-2 on and off (see the transition in Figures 12 and 13). In Figure 12, the NCC-2 is off. Look at the noise on the S-meters in both VFOs. In Figure 13, we can see when the NCC-2 was turned on (it was pre-adjusted). On the main VFO (left) the desired station signal is actually stronger than before, and I can now hear it clearly. If you compare sub VFO signal in Figures 12 and 13 (right), you can actually see the noise drop to the receive signal at this frequency when the NCC-2 was in-line.

I noticed that after nulling a noise that is present on most of the band, you have to adjust the **PHASE** knob if you move more than 40 kHz from where you've made the first adjustment, but this can be achieved very quickly.

Conclusion

If I had enough room in my backyard, I would have loved to test the NCC-2 with two of the active receive antennas from DX Engineering. The results must be astonishing with this setup. Nevertheless, using the NCC-2 with a non-active antenna combined with the preamplifier will give you the ability to null most of the noise.

The NCC-2 provides an all-in-one solution for different applications while reducing the risk by using fewer external connections.

Manufacturer: DX Engineering, 1200 Southeast Ave., Tallmadge, OH 44278, **www.dxengineering.com**. Price: $949.99 for the main unit, $64.99 for the optional DXE-RPA-2-PM Receive Preamplifier modules, $79.99 for the optional DXE-RG5000HD-PM Receiver Guard 5000HD module. Other options are available on the manufacturer's website.

Dave Casler, KEØOG, askdave@arrl.org

Ask Dave

Get more information from the "*QST:* Ask Dave" YouTube playlist at **https://bit.ly/3z2MBMl**.

Antenna Configurations

Antenna Symmetry Pays Dividends

Q Glen, NØQFT, asks: I have a small yard and don't have room for longer dipoles required for 40 and 80 meters. Will the antenna in Figure 1 work as a horizontal dipole? One side of it is a full quarter wavelength (λ/4), and the other side contains lumped capacitance and lumped inductance to make it an electrical λ/4 but physically shorter. Both sides have the same reactance.

A Yes, it will work. You will be able to tune it on a single frequency or over a narrow bandwidth. The issue is that on a single frequency, the left-hand capacitive reactance will work with the inductive reactance and that half of the antenna will resonate. The resistance of the shortened side will be less than 35 Ω. The right-hand side of the antenna is near resonance across the band (assuming it's cut for 40 meters or higher). However, the shortened end will determine the SWR bandwidth, and it will be fairly narrow.

There are multiple ways to approach this situation. You can stretch the antenna as far as possible and hang down the last few feet of each side, as shown in Figure 2. Or you can load each side of the antenna to fit into a smaller space, as shown in Figure 3. A dipole less than a half wave presents the feed line with a capacitive reactance, which can be corrected by adding inductive loading to each side. There are formulas for determining how much inductance is required, but the best method is trial and error. Like your suggested solution, the input R will be less than 50 Ω. A step-down transformer balun can be constructed to convert the 50 Ω on the feed line to the antenna's input impedance. Inserting a loading coil means you have a compromise antenna with reduced bandwidth, so an antenna that covers the entire band when fully stretched out may no longer cover the entire band once it's shortened and loaded. Sometimes, this is a necessary compromise.

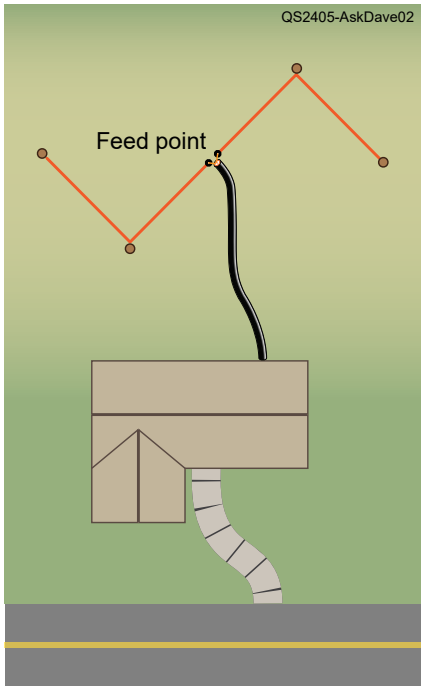


Figure 2 — A dipole does not need to run in a straight line. If it's too long for your space, run it as a zigzag, as shown in the diagram, or run it straight as much as possible and let the excess hang down. Make sure no one comes in contact with the parts hanging down.

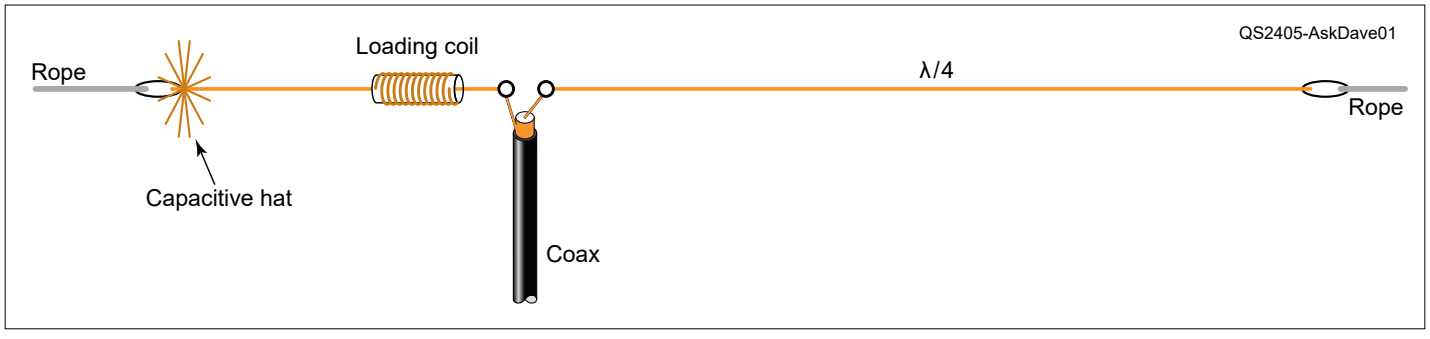


Figure 1 — Glen's, NØQFT, diagram proposes a dipole that is shortened on one side. He adds reactance to shorten up the left-hand side and stretches the right-hand side to its entire length. See Figure 3 for Dave's suggested rearrangement.

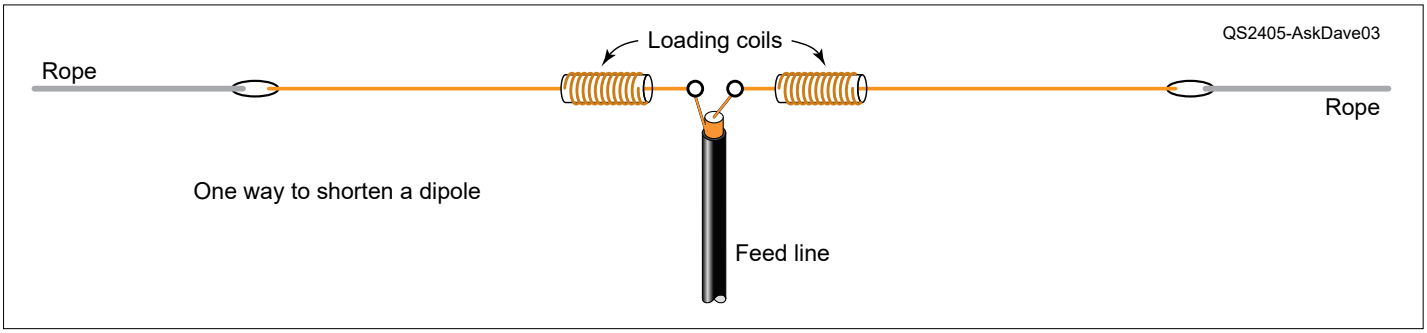


Figure 3 — If you need to shorten a dipole, try to make it symmetric. That way, both sides behave similarly, making the antenna easier to tune.

You may want to consider alternative antennas. Two Hamstick antennas back-to-back on the same band effectively imitate a dipole and are only 16 feet long. You could try the MFJ-2104X Octopus antenna or the multiband MFJ-1838 Cobweb antenna. Today, some verticals are shortened end-fed half-wave vertical dipoles. One example is the Hy-Gain AV-640. No radials are required. The antenna works best when the bottom is elevated 10 feet or more. You could also consider a small HF loop (commonly called a magnetic loop) antenna. Another option is the DX Commander Classic antenna. This interesting antenna is a fan vertical, meaning there's a wire element for each band. The radials can be shortened to fit in your yard. Or, for a lower expense, put up a horizontal loop antenna at about 20 feet, circling your backyard, fed with a window line, and tune it with a wide-range external tuner. This will give you several bands from a single antenna. You have many choices for limited space.

Destructive Winds Threaten Dipole

Q Marty Glapa, WTØZ, asks: Do you have any suggestions to best secure sloping end-fed half-wave (EFHW) antennas in an extremely windy environment so they do not snap? What about a very taut wire, leaving some slack in the wire, or attaching some elastic material? I assume this applies to many wire antenna configurations like horizontal, inverted **V**, etc.

A You have some choices here, including copper-clad (copper-coated) steel wire such as Copperweld. Copper-clad steel is used when great strength is required. If you have permanent mounts for each end of your antennas, you can stretch this tightly. If, however, one of the ends moves with the wind, you will need to add something elastic to keep the wire from snapping. Note that copper-clad steel has a reputation for being hard to work with.

For antennas, I like to use the standard (soft) copper wire used for house wiring. One example is a 500-foot roll of #14 AWG THHN stranded copper wire, Home Depot SKU 320153, available in several colors. Stranded wire is far easier to deal with than solid wire and is more forgiving of constant wind-induced motion. This is a single-conductor cable that is excellent for antennas. Over time, it will stretch a bit, though, in my experience, it doesn't stretch much. You can pull it tight but not overly tight. You can add some elastic support (bungee cords or something equivalent) to provide some give in windy conditions.

A word of caution: Don't use a weight to hold it tight. The wind will eventually blow in one direction while the mass goes in a different direction, thus snapping your wire. In mechanical engineering, springs and mass are opposite forms of reactance, and friction is the mechanical equivalent of resistance, so you want the spring.

I advise against a slack wire. A wire antenna has an electrical resonant frequency and a mechanical resonant frequency. A strong wind is like a broadband RF circuit in that it has many frequencies at once. With enough wind, it will eventually induce oscillation in the wire. A loose wire will gather energy until it snaps.

The minimum achievable sag before a wire breaks depends only on the material from which the wire is made. A #16 AWG THHN copper wire can be tensioned to a given sag as easily as #14 or even #6. Of course, more tension is needed for the larger wire. See Andy Przedpelski's, KØABP, letter "Wire Antenna Considerations" in the "Technical Correspondence" column of the May 2015 issue of *QST*.

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

Tiny Cases for Tiny Gear; Sharing a Code Practice Oscillator; Handy Torus Knots

Inexpensive Test Instrument Cases

Thanks to innovations in circuits and miniaturization, hams can now have sophisticated test equipment at affordable prices. For $25 – $80 each, I have acquired a vector analyzer, a spectrum analyzer, an LCR meter, and a USB tester. All of these are smaller than a cell phone. But how can I safely carry them, their cables, and their adapters?

I found protective cases for Texas Instruments graphing calculators to be ideal for storing these items. Available from a number of retailers in the $10 – $20 range, they have a tough outer shell, a cushioned interior, and a flexible section of netting for the cables and adapters. They even have a carrying strap. Figures 1 and 2 show two that I purchased for my tiny instruments.
— *73, Bruce MacAlister, W4BRU,* **w4bru@arrl.net**

Figure 2 — In this view, the case on the right is closed. You can see the zipper that holds the case halves together, as well as the carrying strap. [Bruce MacAlister, W4BRU, photo]

Sharing an Oscillator for Code Practice

When I was learning Morse code a few years ago, I practiced with an MFJ-557 oscillator. The unit consisted of a straight key and an oscillator with **TONE** and **VOLUME** controls.

Figure 1 — Two open cases with test instruments. Note the straps to hold the instruments in place and the pockets for cables and other components. [Bruce MacAlister, W4BRU, photo]

My brothers were also learning Morse code at the time, but we had only the single MFJ-557 to share. I thought it would have been helpful to have two separate straight keys actuating the same oscillator, allowing us to send code back and forth and simulate real on-air contacts.

My solution was to take a spare straight key that I had on hand and wire it to the MFJ-557. That way, either key could key the oscillator. To accomplish this, I began by acquiring about 25 feet of CAT5e cable. I chose that length so I could separate the keys at an extended distance. At both ends of the cable, I removed the insulation and selected the solid orange and solid brown wires. I also teased out the white- and orange-striped and white- and brown-striped wires at both ends. I trimmed all of the remaining wires.

I stripped some insulation from the selected wires and twisted the conductors of the solid orange and the white- and orange-striped wires together at both ends. I did the same with the solid brown and white- and brown-striped wires. I soldered spade lugs to both

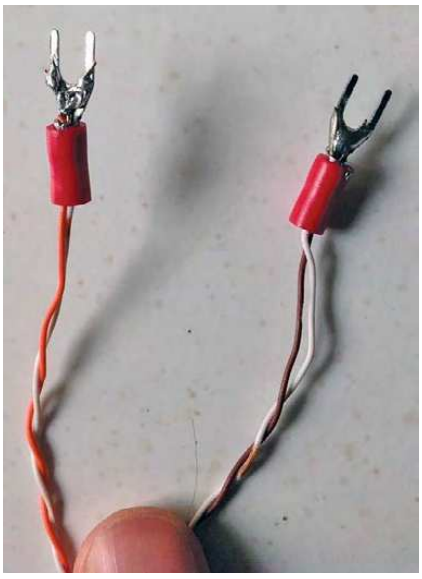


Figure 3 — After removing some insulation, twist the conductors of the solid-orange and the white- and orange-striped wires together at both ends. Do the same with the solid brown and white- and brown-striped wires. Solder spade lugs to both sets of wires. [Jakin Messer, AG7WW, photo]

Figure 4 — The finished shared oscillator system. The oscillator sounds whenever either key is closed. [Jakin Messer, AG7WW, photo]

sets of wires (see Figure 3). I used two wires primarily for durability; the cable would be subjected to a lot of flexing at the spade lug connections, and having two conductors on each lug enhanced the strength at those points.

I successfully attached the lugs at each end to the key terminals (see Figure 4). It was an ultra-simple solution, but it worked perfectly! — *73, Jakin Messer, AG7WW,* **j.ag7ww@gmail.com**

Torus Knot Coaxial Baluns and Traps

Seen often in the craft of paracord knot tying, the torus knot has a useful application in ham radio, specifically when building ugly baluns and antenna traps from coax. We often see coaxial trap and balun bundles held together with zip ties. I argue that securing them with a torus knot is much better.

Figure 5 — A bundled coaxial torus spiral wrapped with the end of the coax. This is suitable for all HF ham bands and 160 meters. [John Portune, W6NBC, photo]

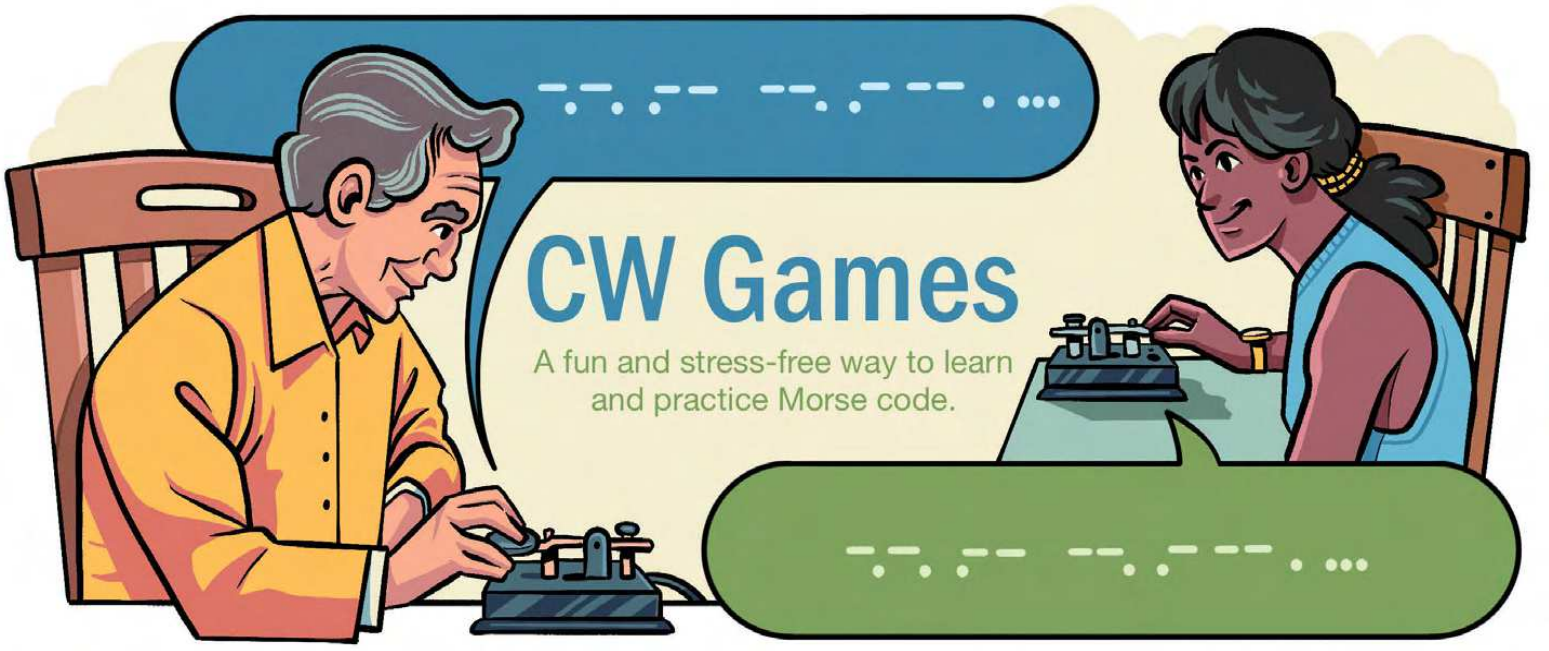
Figure 5 is an example of a torus-knotted balun. This one is a 1:1 coaxial choke current balun, and it is 4 inches in diameter with a 16-turn torus-knotted bundle of Mini RG-8 coaxial cable. It is suitable for the entire HF ham band and usable at 160 meters, with a minimum adequate choking reactance of 200 Ω.

To form the balun, simply wind most of the coax into a 4-inch-diameter torus (bundle) and leave roughly four turns unbundled. Loop the remaining end of the coax around the torus. Add or subtract outside wraps until the coil ends are even. Secure the final outside wrap under the first.

RG-8 coax can also be used, but in a larger-diameter bundle. For design details, see my article in the February 2021 issue of *QST*, "Create Your Own 1:1 Coax Choke Baluns." Remember to not exceed the bending radius of the coax. For the most common types of coax, the diameter of the bundle should be at least five times the outer diameter of the coax. — *73, John Portune, W6NBC,* **jportune@aol.com**

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

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



Jeff Wandling, W7BRS

Many amateurs feel timid about learning CW. Others are not comfortable using computers or software programs, and have difficulty integrating third-party CW decoders and other products due to the expense or complexity of the setup. So, I designed three games that can be played on the air to teach new CW operators how to copy Morse code. The intended result of the games is that all players will increase their skill level and confidence. In addition, it's a fun way to use the bands, and before long, making CW contacts will be easier.

The three games — "Echo," "Call You, Call Me," and "QSO" — are played at levels based on the player's skill. Each game builds the player's skills and confidence for the next level. By the time the player has reached the QSO game, they are holding a CW QSO, and before they know it, they will be having CW QSOs with other stations.

Basic Rules

1 Use MF or HF on the air. Pick a clear frequency somewhere in the CW portion of the amateur band. See the sidebar, "Advice for Choosing a Frequency," for frequency suggestions and other tips.

Advice for Choosing a Frequency

Coordinating with your mentor is the first step when choosing an HF frequency. Each band has many allocations for various modes and uses. Good options are 3.562 MHz on 80 meters and 7.062 MHz on 40 meters. If you're using 20 meters, you can try 14.062 MHz. These frequencies should be fine, but consult with your mentor and be flexible.

Because the CW games are primarily for learning Morse code, keeping clear of DXers and contests is important.

The CW games were designed for on-air activity, but that is only a suggestion. Instead of using the HF bands, you can use an online video teleconference platform with your mentor, or use a tabletop CW code practice oscillator in person. The main objective is that your mentor can hear your signal and you can copy theirs.

2 Choose a partner whom you know and trust. That person will be the "Game Runner" and should be an experienced CW operator. New CW operators may feel anxious about using CW with strangers who may not be patient. So, choose a partner who is understanding.

3 Play the games regularly, and set a practical schedule. Play long enough to get some time sending and copying CW. Start with a few sessions per week at 10 to 15 minutes per session, and adjust your schedule. Practice makes perfect.

4 Adjust the rules of each game to suit the player. The rules are not rigid, so consider them a starting point. However, sticking to the rules will help the player stay focused.

Echo

The goal of this game is to copy the letters, numbers, and symbols you hear and resend them. This will help you hear individual characters, and over time, you'll recognize them, and it will help you send what you intend to. Echo offers a simple form of copying the unexpected, which is what CW operators do.

The Game Runner will begin by sending a letter, number, or symbol three times. The player should send back, or *echo*, what the Game Runner sends once. For instance, if the Game Runner sends A A A K, the player should send back A K (the letter K means "That's the end of my message"). As the player gets better at recognizing the letter, number, or symbol and can copy the message well, the Game Runner should send the message two times and then only once. The Game Runner should change the message periodically so the player can learn different characters.

Once the player correctly sends back everything the Game Runner sent, the Game Runner should add more letters, numbers, or symbols. If you are playing on the air, make sure to send call signs at least every 10 minutes to comply with station identification (ID) rules. To end the game, send SK.

Echo Example

The Game Runner is KE7JVD, and the player is WJ7DW.

The Game Runner Sends:	The Player Replies:
WJ7DW DE KE7JVD Q Q Q K	Q K
7 7 7 K	7 K
Z Z Z K	Z K
Q Q Q K	Q K
WJ7DW DE KE7JVD Z Z Z K	KE7JVD DE WJ7DW Z K
Q Q Q K	KE7JVD DE WJ7DW SK

The Game Runner should not send more than one letter, number, or symbol followed by K unless the player can reliably echo the Game Runner. After some sessions have transpired, the Game Runner can add more symbols per message, and the game may progress as follows:

The Game Runner Sends:	The Player Replies:
WJ7DW DE KE7JVD UR UR UR K	UR K
BT BT BT K	BT K
GD GD GD K	? K
GD GD GD K	GD K
BT BT K	BT K
WJ7DW DE KE7JVD GE GE GE K	KE7JVD DE WJ7DW GE K
FB FB FB K	FB K
BT K	KE7JVD DE WJ7DW SK

Notes

✓ Use the Call Sign DE Call Sign formality only if the Game Runner does so. This is to remind you to ID your station call sign at the required intervals, and it's a good habit to have for periodically making the ID transmission.

✓ If the player hears a character or group of characters and cannot copy it, they can send a question mark (?), and the Game Runner will resend their message. This will initially seem repetitive, as the player learning CW may need more tries to copy the short burst of characters. It's not a waste to ask to repeat a transmission during the game because this may happen with a real QSO.

✓ The Game Runner can resend the same letters, numbers, or symbols sporadically to reinforce them. The Game Runner must effectively act like a referee at times to judge the player's progress. This is why the Game Runner should be patient — to let the player learn and make mistakes. If the player fails to copy something, the Game Runner should let the player ask to repeat it before trying to pile on something new.

Call You, Call Me

The goal of this game is to quickly recognize your call sign when it is being sent to you. This is a very important skill to practice because just about everything in amateur radio involves knowing when you are being called. Imagine trying to work a DX station. If you give your call sign and the DX station calls you, you need to be able to recognize your own call sign. Another case is when you call CQ. The station that responds will surely send your call sign. Understanding your call sign seems kind of obvious and basic, but that's the point. Being able to copy your call sign when you hear it is an essential skill.

The Game Runner will call the player by their call sign first. To respond, the player will call back the Game Runner by their call sign. When the player calls the Game Runner, the Game Runner will call the player again, and so on. The Game Runner and the player practice this so the player can learn to hear and understand their call sign when someone is trying to call them. Some players may find it repetitive, but it is still good practice, especially when you find yourself in unsettled band conditions where it may be necessary to copy the call sign of your QSO partner.

The letter R should be sent at the end of every call (the letter R means "Okay, keep going"). Like during Echo, the player can send SK at the end of their call instead of R to let the Game Runner know the game is over.

Call You, Call Me Example

There are three rounds in this example.

The Game Runner Sends:	The Player Replies:
WJ7DW DE KE7JVD R	KE7JVD DE WJ7DW R
WJ7DW DE KE7JVD R	KE7JVD DE WJ7DW R
WJ7DW DE KE7JVD R	KE7JVD DE WJ7DW SK

QSO

The goal of this game is to understand full-length questions and sentences and be able to answer them. By now, the players should have practiced two- to four-letter groups.

The Game Runner will send simple questions. The questions can be tailored to the player's skill level, but the questions should be short and yield short answers from the player. There is no wrong answer. For beginners, avoid asking questions like the make and model of their transceiver or the brand of antenna they use. The Game Runner may ask those questions if that is where they feel the player's skill level is. It would be best to stick to one-word questions that yield simple one- or two-word answers. The player should apply the skills acquired from Echo and Call You, Call Me.

Like during Echo, if the player does not understand the question, they should send the question mark so

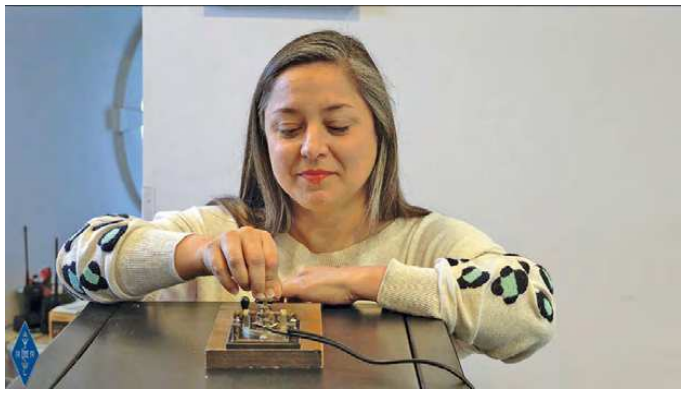
that the Game Runner can repeat the question. A new question should be asked when the player copies the previous question well. Similar to Echo, the Game Runner will ask the same questions again in a random order. Before they know it, players will be able to copy a real QSO.

QSO Example

This example is annotated with the meaning of the questions and answers.

The Game Runner Sends:	The Player Replies:
WJ7DW DE KE7JVD UR NAME ? K (Your name?)	NAME IS BOB K (My name is Bob)
UR QTH ? K (Your location?)	QTH IS FALL CITY K (My location is Fall City)
MY RST ? K (What is my report?)	UR RST 5NN K (You are 599)
HW CPY ? K (How copy?)	FB CPY K (Fine business copy)
QSL ? K (Confirm?)	QSL K (Confirmed)
UR PWR ? K (What is your power?)	? (I didn't copy, send again)
UR PWR ? K (What is your power?)	R 100 W K (Okay, 100 W)
QSL MGR ? K (How do I QSL?)	QSL VIA WA6SLI K (Send QSL to WA6SLI)
FB QSO TU 73 K (Great conversation, thank you, best regards)	R R TU 73 K (Yes, yes, thanks, best regards)

Even though these games target the player to learn CW, the Game Runner will get a good workout with their CW key or paddle, too, which makes it worthwhile. Our local CW net utilizes these games, and I hope other amateurs who are aspiring CW operators will as well.



Click here to see ARRL's CEO David Minster, NA2AA; Education and Development Manager Steve Goodgame, K5ATA; Public Relations and Outreach Manager Sierra Harrop, W5DX, and Director of Publications and Editorial Becky Schoenfeld, W1BXY, play the CW Games.

Jeff Wandling, W7BRS, is a lifelong resident of the Seattle, Washington area. His call sign has been in his family since 1931. Jeff's main interests include learning CW, contesting, and DX. He aspires to join a DXpedition team in the near future. Jeff is a member of the Western Washington DX Club. He can be reached at **jdw@w7brs.com**.

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

Feedback

In "Arizona Hams Hit Their Local Parks" by Gary Laatsch, KI7PBR, in the April 2024 issue, the last photo is captioned and credited incorrectly. In the photo, Bruce, KK7HTE, is on the left, and Rick, K7RCR, is on the right. The photo is credited to Bert, K7DIP. This has since been corrected in the digital edition.

21-Day POTA Road Trip from Florida to Connecticut

This veteran POTA operator thinks outside her shack in order to achieve successful cross-country activations.

Lisa Neuscheler, KC1YL

Every year, I take a road trip from Florida to my hometown in Connecticut to visit friends, and in 2022 I decided to incorporate amateur radio adventures while traveling. On August 17, 2022, I began a 21-day journey traveling nearly 4,000 miles through 12 states — Florida, Georgia, South Carolina, North Carolina, Virginia, Maryland, Pennsylvania, New Jersey, New York, Connecticut, Rhode Island, and Massachusetts — and activating 36 Parks on the Air® (POTA) locations, 32 of which were new to me.

Packing the Right Gear

I'm an active POTA operator, and I've learned what you need for fast and easy portable operations. A lot of hams overthink the gear — you just need to bring the basics and get on the air! For this trip, I packed my standard kit with a few extra items because it was such a long trip.

My equipment included a Yaesu FT-891 in a waterproof box with good padding and a secure closure that I found at Harbor Freight Tools, two Bioenno batteries (15 Ah and 9 Ah), a Paradan Radio BPC-1503 to charge the batteries while driving, two homebrew end-fed half-wave (EFHW) antennas, an assortment of Hamstick antennas, and a Yaesu ATAS-120A antenna. I set up the EFHWs on a 31-foot Jackite antenna mast in a hitch mount, the Hamsticks were deployed on either a trunk lip mount or a tripod, and the Yaesu ATAS-120A was on a trunk lip mount.

Lisa Neuscheler, KC1YL, and Paul LaVorgna, W1PPL, hanging an "inverted vertical" from the Walkway Over the Hudson in New York.

The trunk of Lisa Neuscheler's, KC1YL, car packed and ready for POTA adventures.

In 2019, Lisa Neuscheler, KC1YL, made her first POTA activation at Bennett's Pond State Park in Connecticut. Since then, she's learned what essentials to pack, such as a table, a chair, coax, a tripod, and radials (and shoes). In this photo, she was working off of her Hamstick on the car with coax coming out of the door.

My backpack always has two rolls of RG-8X coax, barrel connectors, zip ties, electrical tape, bug spray, logbooks, the ARRL "Considerate Operator's Frequency Guide" (**www.arrl.org/band-plan**), pens and pencils, caution tape, an antenna analyzer, and disposable ponchos. I also packed a small camping table and stool in my car.

Ham radio adventures always require food! I usually pack things that are easy to eat and come in small servings, like cheese, carrot sticks, hummus, granola bars, crackers, water, etc. I try to stay away from sugars and carbohydrates that will make me tired. One cooler full of food lasts me all day, and then I restock as needed at the next stop.

This all might sound like a lot of equipment and supplies, but if packed strategically, they can fit in just a couple of cases and a backpack. I intentionally pack my bags in a way that allows me to only have to unload what I need to operate with at a particular location. Also, I keep tags with a list of contents on my radio box and backpack.

Trip Planning

It helps to have a game plan for each day of the trip. I take the time to visit state park department websites for maps and other resources to make sure the park will be open and to get an idea of where I want to set up. Many parks are huge, so it helps to pick a spot ahead of time.

My Trip Itinerary

August 17: After leaving my home near Tampa, Florida, I traveled to parks in Georgia, South Carolina, and North Carolina, where I stayed for the night.

August 18: The first park I stopped at was in Virginia. Then I traveled to a park in Maryland, which was located near my next hotel.

August 19: My first park of the day was in Pennsylvania. Then I went to a park in New Jersey, where I met Tobi Massano, AD2CD.

August 20: I traveled to Connecticut, where I activated Sheffield Island with the Greater Norwalk Amateur Radio Club for the International Lighthouse and Lightship Weekend.

August 21: I stopped at four parks in Cape Cod on my way to Orleans, Massachusetts. I stayed in Cape Cod for a week and activated three parks.

August 29: I left Cape Cod and visited four parks in the Connecticut and Rhode Island areas.

August 30: I activated four parks on the way to a friend's house in Connecticut.

August 31: My friend Paul LaVorgna, W1PPL, and I activated the Walkway Over the Hudson in New York.

September 2: Paul Lourd, W1IP, and I planned to meet up with Brian Duddy, N2BTD, and the three of us activated a park in New York. W1IP and I stopped at another park in New York on our way back to Connecticut.

September 3: I activated three more parks in Connecticut.

September 5: My final park activation before traveling back home was in Connecticut with W1IP and W1PPL.

September 6: I began my trip back to Florida and activated two parks in Virginia.

September 7: I activated a park in South Carolina and another in Georgia.

September 8: I activated two final parks in Florida before completing my trip and arriving back home.

I planned on activating three or four parks between each hotel stay (see the sidebar, "My Trip Itinerary," for more information). I picked parks that weren't too far off my route; I drive the inland route, which goes through the mountains of North Carolina and Virginia — it's a beautiful drive. The first park I was planning to stop at was Hofwyl-Broadfield Plantation in Georgia. Prior to my trip, I checked the POTA map (**https://pota.app/#**) to see how many times it had been activated and if there were any restrictions. Then, I emailed someone who had activated that park to see if they had any advice. Next, I looked at the Georgia State Parks website to locate parking, restrooms, pavilions, etc. The street view on Google Maps is also a great resource.

When I arrive at a park, I usually set up an EFHW, find a picnic table, and get on the air. If there isn't a picnic table nearby (and it isn't raining), I set up my small table and camp stool. If it is raining, I sit inside my car with the coax coming through a back window that has a pool noodle on the edge of the glass so the coax doesn't get squished and rain doesn't come in.

In the evenings, I use my car-mounted antennas to participate in the 3905 Century Club (**https://3905ccn.org**) nets. The 3905 Century Club operates Worked All States, DX, and awards nets, and offers a variety of awards. If I'm operating one of their nets that occurs at night, I feel safer operating from a locked car using my Hamsticks or ATAS-120 (see the sidebar, "Practicing Situational Awareness during Mobile Operations," for more information).

Making Memorable Activations

During my trip, I met other ham radio operators at the parks, along with three park rangers who were hams. While I stayed in Cape Cod for a week, I activated three parks. One of the rangers at Nickerson State Park is a ham, and they remembered me from last year. At Monomoy National Wildlife Refuge, I met Frank Pitzi, N1GDO, another ranger who's a ham. He was very interested in my setup and POTA operations.

I arranged a meetup with Tobi Massano, AD2CD, an avid POTA hunter who often calls me when I activate, at Round Valley Recreation Area in New Jersey. As a hunter, Tobi calls stations that are activating parks, but doesn't go out herself. I showed her how I activate a park, and she ordered a mast and is having a hitch mount made so she can go out to parks, too.

One of my favorite activations during the trip was hanging my antenna off the Walkway Over the Hudson in New York. I tied a tennis ball filled with fishing weights to the end of my 20-meter EFHW and lowered it off the bridge at about 212 feet above the Hudson River — it worked great! Paul Lourd, W1IP, and Paul LaVorgna, W1PPL, came with me for that adventure.

Practicing Situational Awareness during Mobile Operations

I've gone on this road trip by myself for the past 5 years, and situational awareness is key when I'm activating a park, stopping at a rest area, or inside the hotel. I don't drive alone at night in an area I'm not familiar with. I always keep APRS running so my location can be tracked, and my family checks in by phone during the day. When I'm at a park, I make sure to position myself so that I face toward the direction where people are walking. If I'm operating in the car, I park with my car facing the exit; I can drive away with my Hamsticks on the car if I start to feel uncomfortable with my surroundings. I opt out of stopping at rest areas, parks, or gas stations that seem suspicious, even if the area was part of my plan. Lastly, I make sure someone (preferably a ham) knows my daily schedule so they know where I'm going and about when I should be getting there. If I get lost or am not at a park when I'm supposed to be, they will text me. If I don't have cell service, they can look for me on a specified frequency.

A typical setup for Lisa Neuscheler's, KC1YL, POTA operations.

While in Connecticut, I participated in the International Lighthouse and Lightship Weekend with the Greater Norwalk Amateur Radio Club. I hung my antenna from the railing at the top of the Sheffield Island Lighthouse — what a view! I'm also an avid kite flyer, and sometimes I'm able to fly my antennas using a kite for POTA activations. But during this trip, the wind wasn't cooperating when I was in Connecticut, so the kites stayed in the car.

It was pouring rain during my last two activations before arriving back home in Florida, but I didn't let it stop me. I set up my Hamstick on the car while I sat inside and activated O'Leno State Park and San Felasco Hammock Preserve State Park in Florida.

Lisa Neuscheler, KC1YL, setting up her antennas for a park activation.

POTA with a view! Lisa Neuscheler, KC1YL, activated Marconi Beach near the southern end of Cape Cod National Seashore in Massachusetts. The weather was cooperative, so she flew her kite for the operation.

Adventure Awaits You

If you want to get outside and play radio, either locally or on a trip, get out there and try it — you might already have all the gear. Local clubs, the POTA Facebook page, and other forums can provide ideas, and you might even find folks to meet up with. For additional details about my POTA road trip, pick up a copy of ARRL's *The Parks on the Air® Book,* available in the ARRL online store (**www.arrl.org/shop**) and from ARRL dealers.

You can have ham radio adventures almost anywhere, and it makes a long journey far more interesting. Fresh air, beautiful scenery, wildlife, and new friends are waiting for you!

Click here to watch a video of KC1YL offering tips on how to get started with POTA, sharing more details about her adventures, and more.

All photos by the author.

Lisa Neuscheler, KC1YL, earned her Technician-class license in 2015, and upgraded to her General and Extra class in 2016. Her ham adventures started at the Greater Norwalk Amateur Radio Club in Norwalk, Connecticut. When Lisa retired, she moved to Florida, where she's a member of the St. Petersburg Amateur Radio Club and is president of the American Victory Museum Ship Amateur Radio Club. Lisa enjoys driving around activating parks for POTA and has activated more than 300 parks. Lisa can be reached at **kc1yl@yahoo.com**.

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

Work DX with FT8

How to reap the rewards this mode offers.

Gregory P. Widin, KØGW

Since its introduction, FT8 has rapidly become one of the most popular ham radio modes. Many people have found that 100 W and a wire antenna are enough to work many stations around the US and beyond.

No matter which mode you use — and FT8 is no exception — DXing puts your operating prowess to the test. There are many advantages of using FT8 for DXing:

- It permits contacts with signal-to-noise ratios (SNRs) of –20 dB or lower. This means you can successfully work other stations that you might not be able to hear while using an analog mode. It also means other stations may hear you even if your station does not produce the best signals.
- You will have an easier time finding DX stations because the receive pane lists the current traffic. It's like seeing the whole band in front of you, which means you don't have to tune up and down.
- Because FT8 contacts are digitized, it's easy for stations to confirm contacts via Logbook of The World (LoTW). This results in a much higher confirmation rate than with non-digital modes.
- FT8's digital confirmations typically occur sooner than with other modes. Digital confirmation is also much cheaper and requires less work than paper QSLing.
- FT8's digital logs allow you to easily track your DXCC or other award progress with your logbook or other computerized tools.

Working DX generally means contacting stations outside your home country, but there are exceptions. For example, Hawaii and Alaska are considered DX for stations in the mainland US.

It is possible to work DX stations now and then on FT8 without special preparation, but if you want to get serious about using the mode for DX contacts, you will have to put in the effort. DXing on FT8 demands the same on-air skills that are required for DXing on any other mode. Though all of the advice I provide in this article is specialized for FT8, it can be applied to operating on any mode. These suggestions assume you are already proficient with FT8; if you consider yourself to be a beginner, there are various online resources available. You can read the *WSJT-X* User Guide at **https://wsjt.sourceforge.io/wsjtx-doc/wsjtx-main-2.6.1.html**, find YouTube videos on setting up a station for FT8, and search the internet for general FT8 operating tips. The third edition of Steve Ford's, WB8IMY, *Get On the Air with HF Digital* is another great resource for FT8 newcomers.

Improving the Chase

When chasing DX on FT8, you should call only if you can hear the other station. The station you are decoding will always be the second one on a given line in the receive pane (see Figure 1). If you don't see the station that you want to work on the line, you won't be able to hear them if they call back.

Figure 1 — A screenshot of the FT8 receive pane. [Gary Hinson, ZL2IFB, photo]

As FT8 usage becomes more widespread, the bands sometimes become congested. A standard practice has evolved for whether you should transmit on the odd or even sequence. The station to the east generally should transmit on even sequences, and the station to the west should transmit on odd sequences. Of course, when you call another station, you will transmit on the opposite sequence.

Find a clear frequency before you transmit. Between your calls, the FT8 waterfall can show the band only when you are *receiving*, not *transmitting*. If your calls aren't being answered, stop transmitting for a while and watch the waterfall. Is the frequency that you were transmitting on clear during the intervals when you were calling the DX station? Remember that what you see on the waterfall isn't what the DX station is decoding. Change the frequency if one isn't working, as there may be a high level of noise on a frequency that looks clear to you.

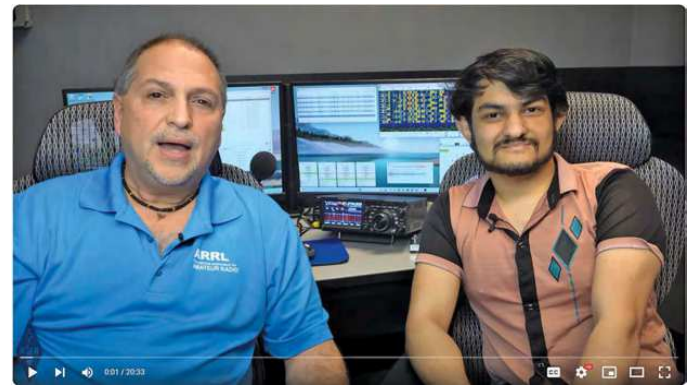
If the receive level of the DX station is low, you may be able to improve it by adding audio filtering in your receiver. Filtering can boost the SNR by reducing energy from off-frequency stations, especially if they are strong. Be sure to restore your receiver's wideband setting when you move on to the next contact. Because the DX station may also be filtering, you may be more successful calling on frequencies close to its frequency.

Courtesy must also be considered. Some stations resent on-frequency replies to their calls, and as such, they will ignore said replies. However, if you make an on-frequency call, complete the contact and do not call again on the same frequency if the DX station was there first. You need a DX entity only once per band or mode. Working several stations from one entity may be exciting, and it might get you many confirmations or QSL cards, but that time and effort could be better spent chasing an all-time new one (ATNO). When it comes to maximizing your ATNOs, answering calls can be more efficient than calling CQ yourself. Stations that call "CQ DX" are looking for others outside of their own entity, and they are not chasing grids. Don't try to answer such calls if you are in the same entity. For a more tongue-in-cheek list of DX practices to avoid, visit **www.dxmaps.com/ft8.html**.

Having a good logging program is essential. While *WSJT* maintains a log of your contacts, it will be up to you to do the QSLing if you rely solely on *WSJT*'s log. Many programs can receive the contact information from *WSJT* in real time and automate uploading and confirmation checking for LoTW.

You can utilize online DX spotting resources for real-time guidance. PSK Reporter (**www.pskreporter.info/pskmap**) will show you a map of contacts being made across the world on your band(s) of choice. A basic internet search for "DX cluster lists" will allow you to find lists of DX spotting resources. Some are regional, so you may not be able to hear everything listed. There are many free DX bulletins, such as ARRL's weekly DX bulletin, that will tell you when an entity will be on the air and which bands they will be using. Taking advantage of these online tools can help you find and hear a rare DX station before other hams start calling it. That said, teaming up with others can be fun. You can text fellow operators when new DX entities show up on the bands, and you can compare notes during a pileup.

DXing can take your radio skills beyond casual operating. The challenge of collecting different DX entities and earning awards like DXCC adds to the enjoyment. For more information about DXing with FT8, consult Gary Hinson's, ZL2IFB, "FT8 Operating Guide" at **www.g4ifb.com/FT8_Hinson_tips_for_HF_DXers.pdf**.



Click here to watch Joe Carcia, NJ1Q, and John McAuliffe, KD2ZWN, discuss good operating practices and station setup for FT8 operation.

Greg Widin, KØGW, recently worked an ATNO on FT8 despite already being on the DXCC Honor Roll. He has been Chair of the LoTW Logbook Committee for the past 10 years, and his primary operating interests are HF and 6-meter DXing. Greg can be reached at **k0gw@arrl.net**.

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

ARRL's Clean Signal Initiative Adopts Metrics for Transmitter Performance

This program, which is currently being developed, is tasked with helping to improve transmitter performance.

ARRL CSI Working Group

Transceiver performance is an essential consideration for efficient amateur communications. The combination of the availability of higher-performance semiconductors and the manufacturer's attention to receiver performance has resulted in significant receive improvements. Compared to 20 years ago, a typical receiver's capability to separate weak stations surrounded by strong QRM has improved dramatically. The receive performance of most radios today is much better than is typically needed for most operating environments. On the other hand, the transmit performance has not improved in parallel with the receive functions; the reception limit in QRM pileups is not from one's own receiver but the transmit bandwidth of nearby signals. This may be due to excessive CW key clicks, SSB splatter, or wideband transmit composite noise.

ARRL has adopted the goal of improving transmitter performance by recommending performance standards in an effort to encourage radio manufacturers to improve their designs. This concept grew into ARRL's Clean Signal Initiative (CSI), which has been in development since 2022. Voting members of the CSI include ARRL Lab staff, representatives from manufacturers, and renowned experts on amateur radio testing. This working group has come up with performance metrics that, if implemented by original equipment manufacturers (OEMs), can reduce QRM over time as transmitters begin to catch up with how well receivers perform. Because most modern transceivers have firmware that can be updated by the operator, improvements can often be applied to existing equipment.

Metrics to Strive For

Currently, CSI has adopted three metrics for OEMs to work toward.

CW bandwidth can be expressed visually with a mask displaying the maximum desirable key click bandwidth. The width of a CW signal in current equipment is often determined in software and can be easily adjusted. If a signal meets the suggested mask, CW key clicks should be down to at least 60 dB with a bandwidth of 675 Hz or less. Figure 1

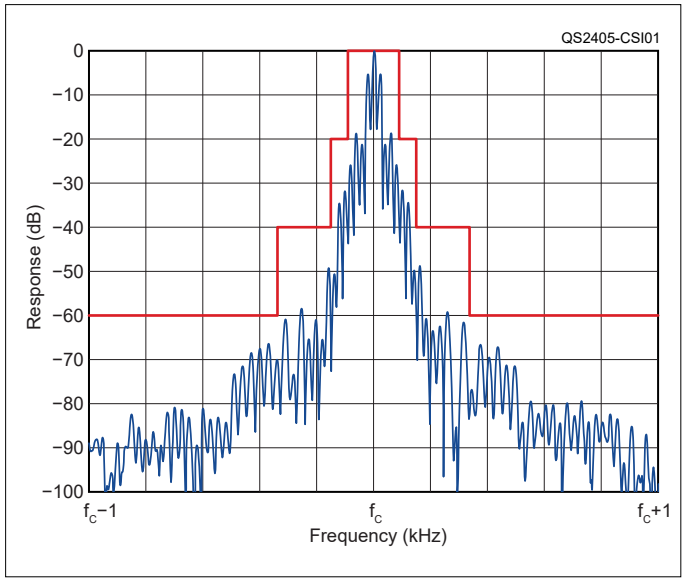


Figure 1 — This graph shows what a clean CW signal would look like (in blue) in relation to the CSI mask (in red). Because no part of the signal exceeds the mask at any point, this transmitter would meet the mask.

shows mask values for a CW signal (key clicks) being equal to or narrower than the following: –20 dBc at 180 Hz, –40 dBc at 300 Hz, and –60 dBc at 675 Hz.

SSB intermodulation splatter is a more difficult problem to solve. However, presently, two OEMs have implemented ways to deal with this issue. To date, this has been addressed in pre-distortion software. Each OEM will likely have a different approach to cleaner (narrower) SSB signals. Transmitter performance is often judged in terms of linearity, meaning the signal coming out of the final amplifier is identical to the input signal but at a higher amplitude. Small, non-linearities in the transmitter cause the generation of artifacts that extend beyond the targeted, or ideal, RF bandwidth. These artifacts result in intermodulation distortion (IMD) that encroaches on adjacent spectrum.

On SSB, the IMD (splatter) mask values in peak envelope power (PEP) are as follows: third order, –42 dB (–36 dBc); fifth order, –48 dB (–42 dBc), and seventh order, –54 dB (–48 dBc). Higher-order products should exhibit an overall 3 dB slope approaching the noise (see Figure 2).

The last metric is transmit composite noise, which isn't mode-specific. Composite noise interference typically exists where the offending signal is very strong and likely line of sight. The stretch goal is a metric for which OEMs should strive to meet with their future designs. Currently, the ARRL Lab reports phase noise — which is one component of composite noise, along with amplitude noise — but will soon be reporting composite noise, as it paints the entire picture of noise that can affect transmissions (see Table 1).

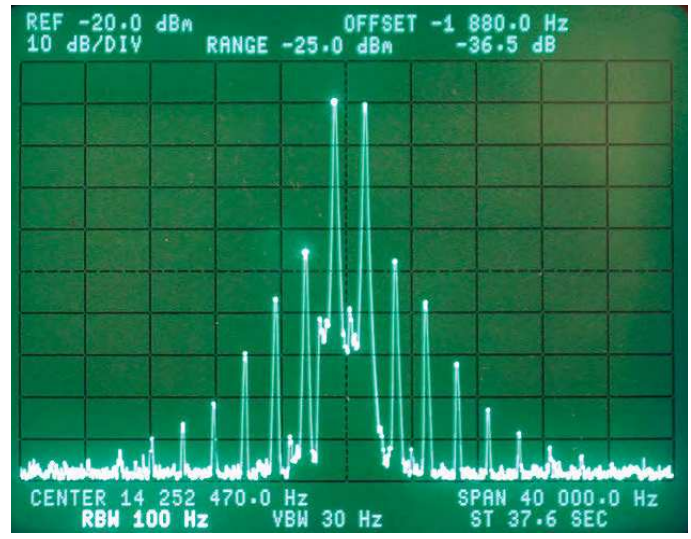


Figure 2 — An example displaying dBc of a transmitter that meets the SSB mask. [ARRL CSI Working Group, photo]

Table 1 — Current CSI Standards

CW Signal Mask	
Attenuation	**Bandwidth**
–20 dBc	180 Hz
–40 dBc	300 Hz
–60 dBc	675 Hz
IMD Mask*	
Harmonic	**Attenuation**
Third order	–42 dB PEP (–36 dBc)
Fifth order	–48 dB PEP (–42 dBc)
Seventh order	–54 dB PEP (–48 dBc)

Composite Noise Mask		
Spacing from Carrier	**Working Mask**	**Stretch Goal**
10 kHz	–136 dBc/Hz	–142 dBc/Hz
20 kHz	–139 dBc/Hz	–145 dBc/Hz
100 kHz	–142 dBc/Hz	–148 dBc/Hz

*Higher-order products should exhibit an overall 3 dB slope approaching the noise.

Moving Forward

The CSI ratings will help amateurs compare transceivers and make informed decisions, in addition to the full battery of test results reported by the ARRL Lab. Look for the official rollout of the CSI program to happen soon. More details about the test methods and rating system are forthcoming.

Just as this article was going to press, we learned that our good friend and CSI Working Group voting member Adam Farson, AB4OJ/VA7OJ, had become a Silent Key. Adam grew up in South Africa and was first licensed as ZS1ZG in 1962. He had a long and interesting career as a telecom engineer. After earning his bachelor and master of science degrees in electrical engineering from the University of Cape Town, Adam worked for the Marconi Company in the UK and at the CERN particle collider near Geneva, Switzerland. He was also a Senior Life Member of the Institute of Electrical and Electronics Engineers. Adam spent enormous amounts of time over the years testing amateur transceivers, with a great deal of his work being focused on Icom products. We appreciate his contributions to the CSI, and he will be missed by the amateur radio community. His website, **www.ab4oj.com**, is still currently online and is a great resource for technical information.

2023 California QSO Party

A QSO party is a fun opportunity to introduce a new ham to contesting.

Jim Peterson, K6EI

The California QSO Party (CQP) occurs each October when hams nationwide try to contact all 58 California counties. CQP is an opportunity to pursue a high score and possibly receive a plaque. The 2023 event was not destined to be one of those years for me, but that didn't stop me from having a lot of fun and introducing a new ham to the joy of contesting.

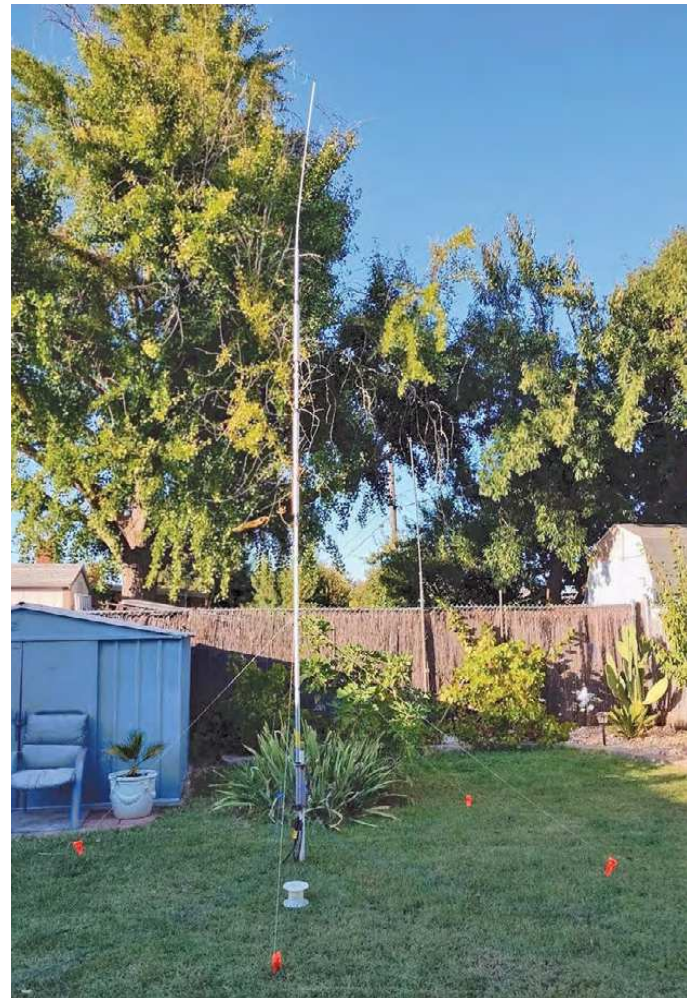
In a typical year, Tom Dunbar, W6ESL, and I assist Bob Olson, W6BO, in activating his Sutter County, California, multi-tower contest station that's equipped for multioperator and multitransmitter operations. Bob owns 10 acres, an impressive antenna farm, and plenty of space for additional temporary antennas. Three weeks before the 2023 contest, Bob said that he would be out of state during CQP weekend, and his station would not be ready. Tom and I needed to come up with an alternative quickly.

The Location and Setup

We were already committed to activating Sutter County, a sparsely populated county consisting of rice fields, which is a rare multiplier, so a small-scale county expedition was the way to go. A quick Google search revealed that there were no camping options. Given that it was already mid-September, short-term housing options were rapidly dwindling. We ended up renting a house on a small lot in Yuba City — Sutter County's biggest town. The location wasn't ideal from an RF standpoint (limited space for antennas, nearby power lines, etc.), but it was the best option available considering our circumstances. Given our schedule constraints, we decided to operate in the One-Day Expedition category to focus 12 hours of radio time on Saturday.

We installed a few simple, low-profile antennas to enable us to run two transmitters (Tom on SSB and me on CW) on 10 through 80 meters. Having never been to this location before, we relied on Google Maps' overhead view feature to preview the property's layout and the location of nearby power lines.

The house had a small backyard and an even smaller front yard, so we came up with four basic multiband antennas that could fit on the available property. One was a Hy-Gain AV-14AVQ ¼-wave trap vertical antenna (covering 10, 15, 20, and 40 meters) with 20 radials. Another was a rotatable trap dipole (covering 10, 15, and 20 meters) up 20 feet high. We also had an end-fed (EF) dipole (covering 10, 15, 20, and 40 meters) supported by a 30-foot fiberglass mast. The last antenna was a Buckmaster off-center-fed (OCF) dipole (covering 10, 20, 40,



The Hy-Gain AV-14AVQ trap antenna with 20 ground radials in the backyard.

and 80 meters) with its feed point supported by a 30-foot steel push-up mast.

We completed the installation on Friday afternoon and set up our two stations in the dining and living rooms using Comet CTC-50M window feed-through jumpers to get each feed line into the house. We had a triplexer for 10, 15, and 20 meters that we used to share our antennas between our stations as needed, and individual band-pass filters to reduce unwanted harmonics when using separate antennas.

Making It All Work

We spent Friday evening debugging our installation. There was significant radio frequency interference (RFI) on 15 meters from the AV-14AVQ trap vertical antenna that locked up my logging PC. I had placed an RF choke at the feed point of the vertical, but the feed line lay on the ground adjacent to the radials, which induced common-mode current on the exterior of the coaxial cable's braid. The simple solution was to add a second RF choke where the feed line from the antenna entered the house. This completely solved the problem.

The observed noise levels with the four antennas were similar on the receiving end. In terms of transmit effectiveness, using the Reverse Beacon Network showed that on 20 and 40 meters, the OCF dipole (with its legs extending east and west) was superior for west coast contacts. In contrast, east coast signal reports associated with the rotatable trap dipole, EF dipole, and AV-14AVQ trap vertical antenna were all roughly equivalent. This is not ideal, but it was enough to get our stations on the air.

The Contest Begins

A week or so before the contest, a new ham, Gina Salazar, KN6ZMT, posted on our club's email reflector that she was interested in participating in a contest. Gina had passed her licensing exam a few months before and was interested in seeing what SSB contesting was about. Tom and I realized that our small-scale expedition was a perfect venue to introduce a new ham to the fun of contesting, so we let Gina know that she was welcome to help us out.

When Gina arrived, Tom immediately put her on the air to give out Sutter County multipliers. This was Gina's first opportunity to operate phone in a contest. Though she had seemed a bit nervous during her first few contacts, she quickly got up to speed. While they ran the SSB station using a 35-year-old Kenwood TS-440S transceiver, I kept busy running CW contacts with my Elecraft K3S.

The view from the street. The steel push-up mast supports the OCF dipole (left) and the rotatable trap dipole (right).

As the contest progressed, it became clear that the local noise level would be challenging. We were running low power (100 W), but we couldn't copy some stations that called us. Some of our RFI issues were undoubtedly from using switching power supplies (with ferrites on the dc lines) for both of our stations. Being adjacent to overhead power lines didn't help either.

The other obvious noise source came from the home's air conditioner, which was situated in the backyard, not far from our ground-mounted AV-14AVQ antenna. When it was running, the noise level from the AV-14AVQ would jump about 10 dB. The simple solution was to run the AC when we weren't using the AV-14AVQ.

We used Dunestar band-pass filters to avoid cross-band interference because we used multiband antennas that could easily radiate harmonics. This resulted in additional loss. Previous tests of all our band-pass filters had indicated that these filters introduced between 0.6 and 1.2 dB of insertion loss, and whichever band-pass filter was in use became physically warm after a few minutes of calling CQ.

Tom, W6ESL, and Gina, KN6ZMT, running the SSB station. Gina was a Technician at the time (she has since upgraded to General), so Tom served as control operator.

In an ideal setting, we would have deployed a set of monoband antennas with plenty of physical isolation so that band-pass filters would not be needed (or at least we would use higher-quality filters with less insertion loss).

Despite our site's limitations, CQP was great. Our call sign was the only one active from Sutter County on Saturday, and the excitement of some operators who worked us was palpable. I never got tired of listening to pileups when multiple stations competed to get our response. On at least four occasions, we were told that our contact was the final county, enabling a non-California participant a clean sweep of all 58 counties. By the time we pulled the plug Saturday evening after 12 hours on the air, we had completed almost 600 contacts and worked all 58 multipliers for a final score of nearly 100,000. While this isn't a high score, we were pleased that we had been able to provide a rare county multiplier to so many out-of-state CQP participants.

All photos by the author.

Jim Peterson, K6EI, has been a licensed radio amateur for more than 50 years and enjoys CW, RTTY, contesting, designing and building antennas, and operating portable. He considers Field Day the high point of the year. Jim retired in 2019 after 38 years as a system engineer at Electromagnetic Systems Laboratory, a subsidiary of TRW, acquired by the Northrop Grumman Corporation. He has an MSEE from The Ohio State University and two BS degrees, one in electrical engineering and another in atmospheric science from the University of California, Davis. Jim can be reached at **k6ei@arrl.net**.

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

The ARRL Ham Radio Equipment Insurance Plan

This policy covers radios and related equipment, with a lower deductible than most homeowners policies.

There are all kinds of ways to lose valuable gear in an instant. ARRL offers a ham radio equipment insurance plan as a benefit to members. Through this insurance, members can cover all of their equipment at a low price and ease their fears.

Tom McDonough, Senior Vice President of Risk Strategies Insurance, Inc., is the broker and administrator for this program with ARRL. He said, "The equipment insurance plan covers your radio equipment and all related equipment — whether you include computers, portable gear, miscellaneous cables and accessories, handhelds, etc."

The insurance covers mobile and home station equipment from damage by fire, lightning, wind, collisions, theft, and other accidents or natural hazards. It also covers loss of or damage to antennas, towers, and rotators.

The insurance coverage available to ARRL members can help safeguard your equipment in the event of theft or damage. [Geoffrey Allsup, W1OH (SK), photo]

How to Enroll

The ARRL Ham Radio Equipment Insurance Plan is available to all ARRL members who live in the United States. To enroll, visit **www.arrlinsurance.com**, where you can sign up, schedule your equipment, and pay your premium using a credit card or check. Make sure you list all radio equipment in use and its replacement value.

You must notify the plan administrator (Risk Strategies) of new equipment within 60 days of acquisition. With no additional premium, coverage for up to $2,000 of new equipment is included until your next renewal date. For assistance, please call Risk Strategies' toll-free number, 866-819-0209.

Protection begins as soon as the premium is processed. For more information, visit **www.arrlinsurance.com**.

ARRL Insurance Plan vs. Homeowners Policies

McDonough explained how the ARRL insurance plan compares to homeowners policies:

> The premium is based on a rate well below typical homeowners policy rates, and the deductible of $50 to replace and $25 to repair is far below the deductible on most homeowners policies. Your homeowners policy is protecting you from a major economic loss — such as a fire — to your home. That is why most homeowners policies have minimum deductibles of $500 per claim. You can reduce premiums by having a $1,000 deductible on your homeowners policy, and even more if you raise it to $2,500 or higher. This will save you on premium costs while still protecting you from the catastrophic loss due to a fire or damage from a fallen tree. The downside of that is your radio transceiver or other station equipment can be worth less than the homeowners deductible, and if lightning strikes, burning out the equipment, you could be faced with a significant expense to replace the equipment and get back on the air. Insuring the equipment in the ARRL program may help you reduce your premium on your homeowners policy and give you coverage that would not be available under the homeowners policy, because the deductible alone would prevent a covered claim.

Tom McDonough has supported the ARRL Ham Radio Equipment Insurance Plan for over 30 years.

The annual premium for this plan is just $1.40 per $100 of replacement cost value (with a minimum premium of $20), whereas other coverage available typically runs $5 – $8 per $100 of replacement cost value. The plan doesn't cover normal wear and tear on the equipment, dishonest acts by the policyholder, and other similar situations that are excluded in the policy.

FCC Job Opportunity for Recent Engineering Graduates

The Federal Communications Commission (FCC) has a job opening that might benefit recently graduated amateur radio operators who have knowledge of the spectrum and RF.

This is a Recent Graduates position in the FCC's Pathways Program, and it will be located in the FCC Office of Engineering and Technology in Washington, DC. Applications are being accepted for engineering graduates who earned their degree in 2022 or later. For veteran applicants, earlier graduates qualify based upon their military service, including students expecting to graduate in May 2024.

There will be on-the-job training for the position. Some of the duties range from performing propagation analysis of terrestrial, satellite, and/or airborne systems, to evaluating the emission characteristics of various transmitters to validate coexistence with neighboring systems. Projects may involve various computer software engineering and scientific applications. Applications are being accepted through July 2, 2024, and a complete job description and required qualifications can be found at **www.usajobs.gov/job/767902700**.

Dayton Hamvention® 2024 Award Winners Announced

The recipients of the 2024 Dayton Hamvention® awards were announced on March 8, 2024. This year's Hamvention will be held on May 17 – 19.

Members of the Young Ladies' Radio League at their Washington state convention in 2014. [Dayton Hamvention® photo]

Special Achievement Award: Anthony Luscre, K8ZT

Luscre is from near Akron, Ohio, and he was first licensed in 1981. He has been a low-power operator, contester, and teacher throughout his amateur radio career. He received his Amateur Extra-class license in 2000. Luscre is active on HF and VHF/UHF, and he operates on CW, phone, and digital modes. His low-power contacts now top 115,000. Between licensing classes, club programs, webinars, hamfests, conferences, youth and school radio demonstrations, and other in-person and online talks, Luscre has presented more than 500 sessions since the beginning of the COVID-19 pandemic. He has presented multiple times for Contest University, the QSO Today Virtual Ham Expo, and Hamvention. He holds a weekly class, "The Joy of Operating," for the Long Island CW Club. Luscre serves as the ARRL Ohio Section Youth Coordinator and is an officer in the Cuyahoga Falls Amateur Radio Club.

Club of the Year Award: The Young Ladies' Radio League (YLRL)

The Young Ladies' Radio League, Inc. (YLRL), is proud to be celebrating its 85th anniversary this year. With many international members, the organization has been involved in everything from contests, to emergency events, to helping new hams get licensed and on the air. Established in 1939, YLRL has been found at hamfests and conventions all over the world. The club is proud to have had a booth at Hamvention every year since the 1950s and a YL Forum since the 1960s. "Women helping women in amateur radio" is a mission statement for this organization, but there are also contest and award opportunities for the men who support ham women. YLRL has the motto, "QRV I am ready," as they are always ready to assist in the radio community.

Technical Achievement Award: Ward Silver, NØAX

For the past 15 years, Silver has been the Lead Editor of *The ARRL Handbook* and *The ARRL Antenna Book*, and he was a primary author of all three ARRL

Bob Heil, K9EID, Silent Key

Bob Heil, K9EID (SK).

The man who defined the sound of live rock and roll music and brought audio engineering principals into mainstream amateur radio use, Dr. Bob Heil, K9EID, has passed away at the age of 83.

He was an ARRL Life Member and in the ARRL Maxim Society. A Facebook post from Heil Ham Radio paid tribute to their founder: "Bob fought a valiant, yearlong battle with cancer, and passed peacefully surrounded by his family."

Heil founded Heil Sound in 1966, through which he created the template for modern concert sound systems for musicians like the Grateful Dead, The Who, Joe Walsh, and Peter Frampton.

The talk box used on iconic live record *Frampton Comes Alive!* was Heil's design. His audio engineering products have been featured in the Rock and Roll Hall of Fame, and he was honored in 2007 with the Parnelli Audio Innovator Award for his impact on the live sound industry. "My life has been about achieving great sound, whether on the concert stage or in the amateur radio world," Bob Heil recounted in 2022 (see **www.arrl.org/news/heil-sound-changes-hands**). "I've watched Heil Sound go from a regional sound company to a world-class microphone manufacturer. This company has been my passion," he said.

Parallel to his commercial and artistic success in live music was his passion for amateur radio. He was active in ham radio from a young age, and he merged his expertise in audio engineering with his love for radio. Heil Ham Radio was founded to produce microphones, headsets, and other gear for radio amateurs with an emphasis on high-quality audio.

Heil was known as a mentor who enjoyed helping others find success in ham radio. Recently, his grandson, Charlie Hartley, KFØOOP, became a licensed ham to surprise Heil for his birthday. The pair attended the ARRL Midwest Convention/Winterfest in St. Louis, Missouri, on January 27, 2024.

Heil was a generous donor to amateur radio organizations, including ARRL. Recently, he donated a host of new audio gear to the Hiram Percy Maxim Memorial Station, W1AW (see **www.arrl.org/news/heil-ham-radio-donates-equipment-to-w1aw**).

His generosity and kind nature will be missed by many, including ARRL Director of Development Kevin Beal, K8EAL. "Bob was a titan in many areas. He was generous with his time, offered keen insights, and had the heart of a philanthropist in the ARRL Maxim Society," Beal said. "He was a gentleman to his core, making friends easily and everywhere he went, from rock stars to captains of industry. I consider it a real privilege to have become a friend to him, too, all because of amateur radio."

Heil was known for his passion for AM operations. He served for many years as an on-camera host of the Ham Nation podcast. Tributes to Heil have been flooding social media, including from his co-hosts.

ARRL President Rick Roderick, K5UR, said Heil's passing is a significant loss. "Bob Heil's technical achievements that brought high-quality audio to amateur radio pale in comparison to his generosity and willingness to help his fellow ham. He's long been known as someone eager to help mentor and teach. His legacy on our hobby will be long-lasting. Our thoughts are with his loved ones."

license manuals and study guides from 2004 until his retirement in 2023.

As an electrical engineer, he designed microprocessor-based products and medical devices for 20 years before beginning a second career as a teacher and writer. Licensed since 1972, he is a co-founder of the World Radiosport Team Championship and was inducted into the CQ Contest Hall of Fame in 2015, with numerous top scores and records. He is President of the Yasme Foundation, and he is also a board member of the Ham Radio Science Citizen Investigation collaborative research group. Silver's primary interests in amateur radio include radiosport, antenna design, and supporting his local emergency response team.

Amateur of The Year Award: Edward Engleman, KG8CX

Engleman, KG8CX, is from Menominee, Michigan. He is the co-founder of the Young Amateurs Communications Ham Team. He was first licensed in 1991 and received his Amateur Extra-class license in 2000. He

has been a member of ARRL since 1991. Engleman serves his home club, the Marinette & Menominee Amateur Radio Club, as a Volunteer Examiner. Engleman's 33-year background as an elementary educator and principal was instrumental in developing the talents he now uses in his work with young amateurs.

Bob Vallio, W6RGG, Named ARRL Honorary Vice President

Robert B. "Bob" Vallio, W6RGG, has been honored by the ARRL Board of Directors as an Honorary Vice President.

Bob Vallio, W6RGG.

In a motion that passed with an extended standing ovation, the Board awarded the honor at their Annual Meeting in January 2024.

The motion honored Vallio's lifetime of service to ARRL and amateur radio. He was first licensed as a Novice with the call sign WN6RGG in July 1952, and he later upgraded to General class as W6RGG in 1953. He has held an Amateur Extra-class license since its inception in 1968.

His tenure of service to ARRL started 46 years ago. He served as Communications Manager of the ARRL East Bay Section from 1978 to 1983, Section Manager of the East Bay Section from 1984 to 1999, Vice Director of the Pacific Division from 2000 to 2003, Director of the Pacific Division from 2003 to 2017, and Second Vice President of ARRL from 2018 to 2023.

The motion continued, in part:

> Robert B. Vallio has also served diligently as a member of the Executive Committee numerous times, a member of the Programs and Services Committee, a member of the Administration & Finance Committee, and many more.

Vallio has been active in a number of high-profile DXpeditions, and he is an active contester.

Section Manager Nomination Notice

To all ARRL members in Connecticut, Idaho, Minnesota, North Dakota, Ohio, Oklahoma, Southern Florida, Western New York, Puerto Rico, and the US Virgin Islands. 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 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 June 7, 2024. If more than one member is nominated in a single Section, ballots will be mailed from Headquarters no later than July 1, 2024, to full members of record as of June 7, 2024, which is the closing date for nominations. Returns will be counted on August 20, 2024. Section Managers elected as a result of the above procedure will take office October 1, 2024.

If only one valid petition is received from a Section, that nominee shall be declared elected without opposition for a 2-year term beginning July 1, 2024. If no petitions are received from a Section by the specified closing date, such Section will be resolicited in the October issue of *QST*. A Section Manager elected through the resolicitation will serve a term of 18 months. A Section Manager vacancy occurring between elections is filled through appointment by the Field Services Manager. — *Mike Walters, W8ZY, Field Services Manager*

Rick Palm, K1CE, k1ce@arrl.net

Public Service

Practical EmComm Operating Tips

This month, we'll consider an assortment of items of interest and mandates for all licensees regarding emergency communications.

Let's start by reviewing the first item in Part 97 of the FCC rules, which explains that the basis and purpose of the Amateur Radio Service is: "Recognition and enhancement of the value of the amateur service to the public as a voluntary noncommercial communication service, particularly with respect to providing emergency communications." That means that above all other interests, each one of us has a statutory obligation to maintain our stations, operating skills, and acumen for emergency communications service in the public's interest.

There exists the perfect opportunity to meet this mandate: register your capabilities and station equipment with your local Amateur Radio Emergency Service® (ARES®) Emergency Coordinator (EC). If you don't know who your local EC is, contact your Section Manager (see page 16 of this issue for the most up-to-date list of ARRL Section Managers).

Trust the Minimum Power Regulation

An amateur station must use the minimum transmitter power necessary to carry out the desired communications [§97.313(a)]. Well, I decided to test my compliance with this longstanding regulation. After years of checking into the Northern Florida ARES Net every morning on the 40-meter phone band with the ubiquitous 100 W transceiver, I throttled back to just 10 W one morning as an experiment — there was no change! My check-in was recognized every time, as usual, without any issues. Then, I dialed it back to 5 W. Again, net control stations had no problem copying my check-in.

An added benefit beyond rules compliance is the reduction of dc input power required to maintain communications; at 10 W RF output, my radio draws a scant 2 A. Think about the savings on limiting battery power, which is especially valuable during an emergency or disaster situation where there is no commercial power available.

Consider a Ham Weather Station

In "Hurricane Idalia: Lessons from a Disaster Area" in the "Public Service" column in the January 2024 issue, I wrote about my experience during Hurricane Idalia, which hit our area hard late last August. During the storm, I had checked into the Hurricane Watch Net on 14.325 MHz to report conditions on the ground at my home — it was the first time I had ever checked into the net for this purpose. The net control station asked for my location, the weather conditions, and the measured wind speed and direction. But I didn't have the meteorological sensors to measure this and provide the critical data.

The Peet Bros. Co. weather vane and anemometer atop the antenna mast at Rick Palm's, K1CE, station.

At Orlando HamCation® this past February, I stopped by the Peet Bros. Co. (an established and affordable weather-sensing technology company) booth to check out their weather instruments. I purchased an Ultimeter® 100 weather station, which is their basic model (**www.peetbros.com/shop/item.aspx?itemid=4**), and it includes all the necessary cables. I found the units to be easily installed. I mounted the wind instruments on top of one of my antenna masts, and I mounted the temperature sensor on a ground rod clamp.

The technical advisor at the company's booth was knowledgeable, friendly, and helpful. I followed his sug-

Rick Palm, K1CE, set up the Ultimeter 100 weather station with the display panel mounted on the wall.

gestion and later purchased a rain gauge and cable to use with the system. I will probably add a barometer to the mix, too.

Peet Bros. Co. has many models and systems to choose from, including a large wall-mount data monitor — The Weather Picture — that could be useful in the command center at an Emergency Operations Center (EOC).

Understand the AUXC Position and Requirements

At this year's HamCation, I attended the Disaster Response Communications and AUXCOMM Florida forum. Panelists included Statewide Interoperability Coordinator from the Florida Department of Emergency Management (FDEM) Roger Lord, Justin Watters from the US Department of Homeland Security's Cybersecurity and Infrastructure Security Agency, and Department of Homeland Security's Office of Emergency Communications COML Instructor Dave Byrum, KA4EBX.

The panelists discussed two 2023 deployments for which the radio room at the state EOC activated: August's Hurricane Idalia and a spate of tornadoes. Primary communications systems included SARnet (a dedicated 70-centimeter FM repeater network that links all of the counties in the entire state of Florida), the ShakeAlert® Earthquake Early Warning System, and Winlink.

Scott Farrell's, KE4WMF, ARES communications vehicle was on display at the 2024 HamCation.

Lord explained the FDEM's State Emergency Response Team (SERT) Training Resources and Activity Center (TRAC) utility. SERT TRAC is a calendar and registration tool for tracking attendance and completion of courses. He explained the Auxiliary Communicator (AUXC) position and requirements; the state conveys the title to those who have completed the 20-hour AUXCOMM course and the "AUXC Position Task Book."

Think Twice Before Storing Repeater Frequencies

If you're like me, you have a spate of VHF FM ARES nets to check into one night a week; they represent the region's various county ARES programs and their registrants. I had originally stored the nets' repeater frequencies, offsets, and access tones in my radio's memory channels, and even named them. But I realized that I wouldn't be able to readily recall them by memory if I didn't have that radio with me. I now manually enter each net's repeater parameters from my own memory each time, so I can communicate them to anybody when necessary.

Amateur Radio at the National Hurricane Conference

The 2024 National Hurricane Conference in Orlando, Florida, took place in late March. This year's amateur radio training session focused on the importance of amateur radio surface reports to the hurricane forecasting process, the VoIP Hurricane Net and best practices in SKYWARN operations, and national/international amateur radio hurricane responses, among other presentations. You should be able to view the proceedings from this year's event on YouTube.

All photos provided by the author.

Contest Corral May 2024

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

Start - Finish Date-Time				Bands	Contest Name	Mode	Exchange	Sponsor's Website
1	1300	1	1900	3.5-28	AGCW QRP/QRP Party	CW	RST, serial, class (A/B)	**www.agcw.de**
1	1700	1	2100	144	VHF-UHF FT8 Activity Contest	FT8	4-char grid	**www.ft8activity.eu**
2	0000	3	0300	7	Walk for the Bacon QRP Contest	CW	RST, SPC, name, mbr or pwr; max 13 WPM	**qrpcontest.com/pigwalk40**
2	1800	2	2200	28	NRAU 10m Activity Contest	CW,Ph,Dig	RS(T), 6-char grid	**nrau.net/nrau-contests-in-general**
2	2000	2	2200	1.8-28,50	SKCC Sprint Europe	CW	RST, SPC, name, mbr or "none"	**www.skccgroup.com**
4	0001	5	2359	28	10-10 International Spring Contest, CW	CW	Name, mbr or "none," SPC	**www.ten-ten.org**
4	0300	4	0859	3.5-28	RCC Cup	CW,Ph	RS(T), mbr or ITU zone	**rcccup.ru**
4	0600	5	2359	2.3 GHz and up	SBMS 2.3 GHz and Up Contest and Club Challenge	CW,Ph,Dig	6-char grid	**w6ife.com/Page/2GHzContest**
4	0800	4	1400	All above 902	Microwave Spring Sprint	Not specified	6-char grid	**sites.google.com/site/springvhfupsprints/2024-information**
4	1200	5	1159	3.5-28	ARI International DX Contest	CW,Ph,Dig	RS(T), 2-letter province or serial	**www.ari.it**
4	1200	5	1200	3.5-28,144	F9AA Cup, PSK	Dig	RST, serial	**www.site.urc.asso.fr**
4	1300	5	0700	1.8-28	7th Call Area QSO Party	CW,Ph,Dig	RS(T), 5-letter state/county code or SPC	**7qp.org**
4	1500	5	0300	1.8-28	Indiana QSO Party	CW,Ph	RS(T), IN county or SPC	**www.hdxcc.org**
4	1700	5	2359	1.8-28, VHF	Delaware QSO Party	CW,Ph,Dig	RS(T), DE county or SPC	**www.fsarc.org**
4	2000	5	2359	3.5-28	New England QSO Party	CW,Ph,Dig	RS(T), New England county/state or SPC	**neqp.org/rules**
4	2300	5	0300	1.8-28, VHF/UHF	MIE 33 Contest	CW,Ph	RS(T), age, "ME" or "MEJ" or none	**www.ztv.ne.jp**
5	1000	5	1400	7	WAB 7 MHz Phone	Ph	RS, serial, WAB square or SPC	**wab.intermip.net**
7	0100	7	0300	3.5-28	ARS Spartan Sprint	CW	RST, SPC, pwr	**arsqrp.blogspot.com**
8	1700	8	2100	432	VHF-UHF FT8 Activity Contest	FT8	4-char grid	**www.ft8activity.eu/index.php/en**
9	1400	9	2200	3.5,7	QRP Minimal Art Session	CW	RST, "/", class, number of components	**qrpcc.de**
11	0000	11	2359	3.5-28	FISTS Saturday Sprint	CW	RST, first name, mbr or "0," SPC	**fistsna.org**
11	1200	12	1159	1.8-28	CQ-M International DX Contest	CW,Ph	RS(T), serial	**cqm.srr.ru**
11	1200	12	1200	3.5-28	VOLTA WW RTTY Contest	Dig	RST, serial, CQ zone	**www.contestvolta.it**
11	1200	12	2359	1.8-28,50	SKCC Weekend Sprintathon	CW	RST, SPC, name, mbr or "none"	**www.skccgroup.com**
11	1700	12	0300	7-28	Canadian Prairies QSO Party	CW,Ph	RS(T), VE4/5/6 district code or SPC	**cpqp.ve6hams.ca**
11	2300	12	0300	50	50 MHz Spring Sprint	CW,Ph,Dig	4-char grid	**sites.google.com/site/springvhfupsprints/2024-information**
13	0000	13	0200	1.8-28	4 States QRP Group Second Sunday Sprint	CW,Ph	RS(T), SPC, mbr or pwr	**www.4sqrp.com**
13	1900	13	2030	3.5	RSGB 80m Club Championship, SSB	Ph	RS, serial	**www.rsgbcc.org**
14	1900	14	2000	3.5	DARC FT4 Contest	FT4	RST, 4-char grid	**www.darc.de**
15	1700	15	2100	1.2G	VHF-UHF FT8 Activity Contest	FT8	4-char grid	**www.ft8activity.eu/index.php/en**
16	0000	17	0300	14	Walk for the Bacon QRP Contest	CW	RST, SPC, name, mbr or pwr; max 13 WPM	**qrpcontest.com/pigwalk20**
16	0030	16	0230	3.5-14	NAQCC CW Sprint	CW	RST, SPC, mbr or pwr	**naqcc.info/sprint_rules.html**
16	1900	16	2000	3.5-14	NTC QSO Party	CW	RST, mbr or "NM"; max 25 WPM	**pi4ntc.nl/ntcqp**
18	0600	18	2100	3.5-28	UN DX Contest	CW,Ph	RS(T), Kazakhstan district code or serial	**undxc.kz/rules-eng**
18	0800	19	1100	3.5	NZART Sangster Shield Contest	CW	RST, serial or branch number (if ZL)	**www.nzart.org.nz**
18	1200	19	1200	1.8-28	His Maj. King of Spain Contest, CW	CW	RST, EA province or serial	**concursos.ure.es**
18	1200	19	1200	3.5-28	EU PSK DX Contest	Dig	RST, EU area or serial	**eupsk.club**
18	1400	19	0200	1.8-144	Arkansas QSO Party	CW,Ph,Dig	RS(T), AR county or SPC	**www.arkqp.com**
18	1600	18	2000	28	Feld Hell Sprint	Dig	See rules	**sites.google.com/site/feldhellclub**
18	2100	19	0200	3.5	Baltic Contest	CW,Ph	RS(T), serial	**www.lrsf.lt**
19	0000	19	2359	3.5-28	FISTS Sunday Sprint	CW	RST, SPC, first name, mbr or "0"	**fistsna.org**
19	2300	20	0100	1.8-28	Run for the Bacon QRP Contest	CW	RST, SPC, mbr or pwr	**qrpcontest.com/pigrun**
20	1900	20	2030	3.5-28	RSGB FT4 Contest	FT4	Signal report	**www.rsgbcc.org**
22	0000	22	0200	1.8-28,50	SKCC Sprint	CW	RST, SPC, name, mbr or "none"	**www.skccgroup.com**
22	1900	22	2030	3.5	RSGB 80m Club Championship, Data	Dig	RST, serial	**www.rsgbcc.org**
25	0000	26	2359	1.8-28	CQ WW WPX Contest, CW	CW	RST, serial	**www.cqwpx.com**
27	0000	27	0100	1.8-28	QRP ARCI Hootowl Sprint	CW	RST, SPC, mbr or pwr	**qrparci.org**
30	1900	30	2030	3.5	RSGB 80m Club Championship, CW	CW	RST, serial	**www.rsgbcc.org**
31	0000	2	2359	1.8-28,50	PODXS 070 Club Three Day Weekend Contest	Dig	mbr or "0000"	**www.podxs070.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.*

The largest on-air amateur radio event in the world returns June 22 – 23, 2024. It will run from 1800 UTC Saturday, June 22 to 1759 UTC Sunday, June 23.

Bands and Modes: Participants may only operate on the 160-, 80-, 40-, 20-, 15-, and 10-meter HF bands, and may use all bands 50 MHz and above using phone, CW, and/or digital modes.

Setup: Class A and B stations that wish to operate for only 24 hours may begin their setup at 0000 UTC on the Friday (Thursday afternoon or evening local time) preceding the ARRL Field Day period. Cumulative setup time for those stations may not exceed a total of 24 hours. Class A and B stations that wish to operate the full 27-hour Field Day period may not begin setup until 1800 UTC on Saturday.

Reporting Your Score: All entries must be received at ARRL Headquarters no later than Tuesday, July 23, 2024. Participants are strongly encouraged to use the online ARRL Field Day score reporting system at **www.field-day.arrl.org**. Online entrants will receive an email confirmation that their entry was accepted, as well as 50 bonus points for submitting their score electronically.

Rule Changes for 2024: The public location bonus point criteria for Class A, B, and F have been updated. Additionally, new bonus points are available for Class B, C, D, E, and F stations. See the complete list of 2024 Field Day rules and more information at **www.arrl.org/field-day**.

Let everyone know where you will be operating for Field Day by using the Field Day Locator at **www.arrl.org/field-day-locator**. It can also be used to find a nearby Field Day site, or an operation to join if you're traveling out of town.

Groups that actively promote their Field Day event on Facebook, Instagram, or X can earn 100 bonus points. Use the hashtag **#ARRLFD** to share your plans, tips, and tricks for a successful Field Day. See the full ARRL Field Day packet for more information on all of the bonus points available.

Participants should download and review the material found in the 2024 Field Day packet available at **www.arrl.org/field-day**. Email any questions to **fdinfo@arrl.org**.

Twelve young members, ranging from 9 to 17 years old, of the Holland Amateur Radio Club in Holland, Michigan, participated in the 2023 ARRL Field Day. They all hold amateur radio licenses from the Technician to Extra class. [Tom Bosscher, K8TB, photo]

Kelly Taylor, VE4XT, ve4xt@mymts.net

2023 ARRL November Sweepstakes — CW

Last year's ARRL November Sweepstakes (CW weekend) was held November 4 – 6, 2023.

Plaque Sponsors

ARRL is pleased to award a Sweepstakes Plaque to the Overall and Division Leaders in each category, thanks to Icom America, clubs, and individuals who sponsor these awards. For more information on plaque sponsorship or to order a duplicate plaque, contact the ARRL Contest Program at 860-594-0232 or **contests@arrl.org**. Plaques cost $90, which includes all shipping charges.

Winner	Division	Category	Sponsor
N2IC	Overall	Single Operator, High Power	Trey Garlough, N5KO
K4BAI	Overall	Single Operator Limited Antenna, High Power	Rich Zalewski, W7ZR
WJ9B	Overall	Single Operator, Low Power	Radiosport Manitoba — VE4VV Memorial
KØEJ	Overall	Single Operator, QRP	Icom America
N5ZO	Overall	Single Operator Unlimited, High Power	Icom America
N4ZZ	Overall	Single Operator Unlimited, Low Power	Icom America
NØAX	Overall	Single Operator Unlimited, QRP	Icom America
K5CM	Overall	Multioperator, High Power	Icom America
W8TK	Overall	Multioperator, Low Power	Icom America
KØHC	Overall	School Club	Icom America
AA3B	Atlantic	Single Operator, High Power	Icom America
K3WU	Atlantic	Single Operator, Low Power	John Thompson, K3MD
WR3R	Atlantic	Single Operator, QRP	Icom America
K3MM	Atlantic	Single Operator Unlimited, High Power	Icom America
K3QP	Atlantic	Single Operator Unlimited, Low Power	Icom America
W2GD	Atlantic	Single Operator Unlimited, QRP	Icom America
K3AJ	Atlantic	Multioperator, High Power	Icom America
W3ZGD	Atlantic	Multioperator, Low Power	Icom America
W9RE	Central	Single Operator, High Power	Society of Midwest Contesters
K9UIY	Central	Single Operator, Low Power	Society of Midwest Contesters
N9SE	Central	Single Operator, QRP	Icom America
K9CT	Central	Single Operator Unlimited, High Power	Society of Midwest Contesters
N9CO	Central	Single Operator Unlimited, Low Power	Society of Midwest Contesters
KX9X	Central	Single Operator Unlimited, QRP	Icom America
KV3T	Central	Multioperator, High Power	Icom America
KA9VVQ	Central	Multioperator, Low Power	Icom America
WØSD (KEØZ, op)	Dakota	Single Operator, High Power	Minnesota Wireless Association — In memory of Tod Olson, KØTO
NAØN (@WØZT)	Dakota	Single Operator, Low Power	Minnesota Wireless Association
WDØT	Dakota	Single Operator, QRP	Icom America
KTØA	Dakota	Single Operator Unlimited, High Power	Minnesota Wireless Association — In memory of Jim Dokmo, KØFVF
NØAT	Dakota	Single Operator Unlimited, Low Power	Minnesota Wireless Association
NØUR	Dakota	Single Operator Unlimited, QRP	Icom America
N7IV	Dakota	Multioperator, High Power	Icom America
N4OGW	Delta	Single Operator, High Power	Icom America
W9SN	Delta	Single Operator, Low Power	Icom America
KØEJ	Delta	Single Operator, QRP	Icom America
K5DB	Delta	Single Operator Unlimited, High Power	Icom America
N4ZZ	Delta	Single Operator Unlimited, Low Power	Icom America
N4UW	Delta	Single Operator Unlimited, QRP	Icom America
W5GAD	Delta	Multioperator, Low Power	Icom America
KE4KY	Great Lakes	Single Operator, High Power	Icom America
W8WTS	Great Lakes	Single Operator, Low Power	Icom America
N4TY	Great Lakes	Single Operator, QRP	Icom America
K1LT	Great Lakes	Single Operator Unlimited, High Power	Icom America
K8BL	Great Lakes	Single Operator Unlimited, Low Power	Icom America
K4FN	Great Lakes	Single Operator Unlimited, QRP	Icom America
K8LX	Great Lakes	Multioperator, High Power	Icom America
W8SH	Great Lakes	School Club	Icom America
N2NT (N2NC, op)	Hudson	Single Operator, High Power	Icom America
KU2M	Hudson	Single Operator, Low Power	Icom America
AC2YD	Hudson	Single Operator, QRP	Icom America
N2GC	Hudson	Single Operator Unlimited, High Power	Icom America
K2DFC	Hudson	Single Operator Unlimited, Low Power	John Thompson, K3MD
KR2H	Hudson	Single Operator Unlimited, QRP	Icom America
WA2DNI	Hudson	Multioperator, High Power	Icom America
NJ1F	Hudson	Multioperator, Low Power	Icom America
NØNI	Midwest	Single Operator, High Power	Icom America
NØTT	Midwest	Single Operator, Low Power	Icom America
NØSSM	Midwest	Single Operator, QRP	Icom America
NSØR	Midwest	Single Operator Unlimited, High Power	Icom America
WØZA	Midwest	Single Operator Unlimited, Low Power	Icom America
NØAX	Midwest	Single Operator Unlimited, QRP	Icom America
ABØS	Midwest	Multioperator, High Power	Icom America
KRØP	Midwest	Multioperator, Low Power	Icom America
KØHC	Midwest	School Club	Icom America
K5ZD	New England	Single Operator, High Power	Icom America
K1XM	New England	Single Operator, Low Power	Icom America
KO1H	New England	Single Operator, QRP	Icom America
W1SJ	New England	Single Operator Unlimited, High Power	Icom America
KI1G	New England	Single Operator Unlimited, Low Power	Icom America
W1FA	New England	Single Operator Unlimited, QRP	Icom America
W1FM	New England	Multioperator, High Power	Icom America
NC1CC	New England	Multioperator, Low Power	Icom America
N9RV	Northwestern	Single Operator, High Power	Icom America
WJ9B	Northwestern	Single Operator, Low Power	Icom America
W7YAQ	Northwestern	Single Operator, QRP	Icom America
KØSN	Northwestern	Single Operator Unlimited, High Power	Icom America
W7ZRC	Northwestern	Single Operator Unlimited, Low Power	Icom America
K7QA	Northwestern	Single Operator Unlimited, QRP	Icom America
N7DX	Northwestern	Multioperator, High Power	Icom America
W7RN (N6TV, op)	Pacific	Single Operator, High Power	Icom America
AH6KO	Pacific	Single Operator, Low Power	Icom America
W6JTI	Pacific	Single Operator, QRP	Icom America
N6ZFO	Pacific	Single Operator Unlimited, High Power	Icom America
K6EI	Pacific	Single Operator Unlimited, Low Power	Icom America
K6GHA	Pacific	Single Operator Unlimited, QRP	Icom America
W6MVM	Pacific	Multioperator, High Power	Icom America
W8FN	Roanoke	Single Operator, High Power	Potomac Valley Radio Club
N8II	Roanoke	Single Operator, Low Power	Icom America
N4CF	Roanoke	Single Operator, QRP	Icom America
K2AV	Roanoke	Single Operator Unlimited, High Power	Icom America
N2YO	Roanoke	Single Operator Unlimited, Low Power	Icom America
WU4G	Roanoke	Single Operator Unlimited, QRP	Icom America
W4RM	Roanoke	Multioperator, High Power	Icom America
W4TG	Roanoke	Multioperator, Low Power	Icom America
N2IC	Rocky Mountain	Single Operator, High Power	Icom America
WA7LNW	Rocky Mountain	Single Operator, Low Power	Icom America
WBØGAZ	Rocky Mountain	Single Operator, QRP	Icom America
KØEU	Rocky Mountain	Single Operator Unlimited, High Power	Icom America
AD1C	Rocky Mountain	Single Operator Unlimited, Low Power	Icom America
WC7S	Rocky Mountain	Single Operator Unlimited, QRP	Icom America
KK5OV	Rocky Mountain	Multioperator, Low Power	Icom America
NX4N	Southeastern	Single Operator, High Power	Icom America
K4OJ (N4KM, op)	Southeastern	Single Operator, Low Power	Icom America
K3TW	Southeastern	Single Operator, QRP	Icom America
N4BP	Southeastern	Single Operator Unlimited, High Power	Icom America
N4AO (WC4E, op)	Southeastern	Single Operator Unlimited, Low Power	Icom America
N3HCN	Southeastern	Single Operator Unlimited, QRP	Icom America
KT4XA	Southeastern	Multioperator, Low Power	Icom America
KH7X (KH6ND, op)	Southwestern	Single Operator, High Power	Icom America
N7VM	Southwestern	Single Operator, Low Power	Icom America
N7IR	Southwestern	Single Operator, QRP	Icom America
N5ZO	Southwestern	Single Operator Unlimited, High Power	Icom America
K6WSC	Southwestern	Single Operator Unlimited, Low Power	Icom America
WQ6X	Southwestern	Single Operator Unlimited, QRP	Icom America
K8IA	Southwestern	Multioperator, High Power	Icom America
W8TK	Southwestern	Multioperator, Low Power	Icom America
WXØB (AD5Q, op)	West Gulf	Single Operator, High Power	Icom America
K5MR	West Gulf	Single Operator, Low Power	Icom America
WK8V	West Gulf	Single Operator, QRP	Icom America
N5NA	West Gulf	Single Operator Unlimited, High Power	Icom America
WA8ZBT	West Gulf	Single Operator Unlimited, Low Power	Icom America
W5NE	West Gulf	Single Operator Unlimited, QRP	Icom America
K5CM	West Gulf	Multioperator, High Power	Icom America
WDØGTY	West Gulf	Multioperator, Low Power	Icom America
VY2TT	Canada	Single Operator, High Power	Icom America
VE5SF	Canada	Single Operator, Low Power	Icom America
VE3KI	Canada	Single Operator, QRP	Icom America
VE3NNT	Canada	Single Operator Unlimited, High Power	Icom America
VE3YT	Canada	Single Operator Unlimited, Low Power	Icom America
VE3GMZ	Canada	Single Operator Unlimited, QRP	Icom America
VY1CO	Canada	Multioperator, High Power	Icom America

Top Ten

Single Operator, High Power

N2IC	214,370
NØNI	200,940
AA3B	198,730
N4OGW	197,710
W9RE	196,350
N9RV	196,180
WXØB (AD5Q, op)	194,310
K4RO	193,630
VY2TT	191,420
W7RN (N6TV, op)	190,570

Single Operator, Low Power

WJ9B	149,352
K1XM	145,320
N7VM	144,160
W9SN	143,990
W8WTS	143,808
N7XU (K4XU, op)	142,290
K4OJ (N4KM, op)	141,780
N5EE	140,760
K1VUT	140,616
WA1S	140,080

Single Operator, QRP

KØEJ	129,880
WDØT	102,222
N4TY	101,640
N7IR	91,020
VE3KI	88,888
W6JTI	88,312
WR3R	77,190
K3TW	74,682
N9SE	66,906
W7YAQ	63,342

Single Operator Unlimited, High Power

N5ZO	197,200
KØEU	192,950
K3MM	187,340
K9CT	186,490
KD4D	174,080
K2AV	171,696
W4NF	171,024
W1SJ	169,344
NSØR	168,980
N4BP	168,640

Single Operator Unlimited, Low Power

N4ZZ	184,960
KI1G	158,950
N2YO	158,928
W4AAA (KK9A, op)	158,440
N9CO	151,640
K1TR	149,260
N3HEE	145,350
VE3YT	144,160
KG9X	140,930
KM5G	139,272

Single Operator Unlimited, QRP

NØAX	134,640
W2GD	131,920
K4FN	99,110
K7QA	95,030
AB3CX	94,752
W5NE	85,848
KX9X	79,704
KØVBU	77,350
KKØU	71,400
N4ROA (W6LX, op)	69,056

Multioperator, Single Transmitter, High Power

K5CM	182,240
W4RM	177,820
K8IA	170,510
K3AJ	162,520
ABØS	161,952
K8LX	154,530
N7DX	144,500
W7VJ	135,912
VY1CO	122,176
N7IV	115,784

Multioperator, Single Transmitter, Low Power

W8TK	136,416
NX6T	133,790
W5GAD	129,396
NC1CC	115,292
KT4XA	103,194
W4TG	95,540
W3ZGD	74,128
WDØGTY	73,950
KRØP	65,072
KA9VVQ	64,464

School Club

KØHC	155,040
W8SH	11,200

Division Winners

Single Operator, High Power

Atlantic	AA3B	198,730
Central	W9RE	196,350
Dakota	WØSD (KEØZ, op)	138,112
Delta	N4OGW	197,710
Great Lakes	KE4KY	132,246
Hudson	N2NT (N2NC, op)	188,870
Midwest	NØNI	200,940
New England	K5ZD	189,720
Northwestern	N9RV	196,180
Pacific	W7RN (N6TV, op)	190,570
Roanoke	W8FN	147,000
Rocky Mountain	N2IC	214,370
Southeastern	NX4N	174,552
Southwestern	KH7X (KH6ND, op)	142,844
West Gulf	WXØB (AD5Q, op)	194,310
Canada	VY2TT	191,420

Single Operator, Low Power

Atlantic	K3WU	127,840
Central	K9UIY	101,758
Dakota	NAØN (@WØZT)	139,230
Delta	W9SN	143,990
Great Lakes	W8WTS	143,808
Hudson	KU2M	111,942
Midwest	NØTT	100,320
New England	K1XM	145,320
Northwestern	WJ9B	149,352
Pacific	AH6KO	130,310
Roanoke	N8II	120,184
Rocky Mountain	WA7LNW	137,614
Southeastern	K4OJ (N4KM, op)	141,780
Southwestern	N7VM	144,160
West Gulf	K5MR	129,192
Canada	VE5SF	114,072

Single Operator, QRP

Atlantic	WR3R	77,190
Central	N9SE	66,906
Dakota	WDØT	102,222
Delta	KØEJ	129,880
Great Lakes	N4TY	101,640
Hudson	AC2YD	62,880
Midwest	NØSSM	28,968
New England	KO1H	29,760
Northwestern	W7YAQ	63,342
Pacific	W6JTI	88,312
Roanoke	N4CF	39,312
Rocky Mountain	WBØGAZ	31,548
Southeastern	K3TW	74,682
Southwestern	N7IR	91,020
West Gulf	WK8V	4,810
Canada	VE3KI	88,888

Single Operator Unlimited, High Power

Atlantic	K3MM	187,340
Central	K9CT	186,490
Dakota	KTØA	133,224
Delta	K5DB	129,710
Great Lakes	K1LT	138,380
Hudson	N2GC	164,390
Midwest	NSØR	168,980
New England	W1SJ	169,344
Northwestern	KØSN	117,130
Pacific	N6ZFO	144,330
Roanoke	K2AV	171,696
Rocky Mountain	KØEU	192,950
Southeastern	N4BP	168,640
Southwestern	N5ZO	197,200
West Gulf	N5NA	162,010
Canada	VE3NNT	166,320

Single Operator Unlimited, Low Power

Atlantic	K3QP	116,450
Central	N9CO	151,640
Dakota	NØAT	122,570
Delta	N4ZZ	184,960
Great Lakes	K8BL	131,410
Hudson	K2DFC	82,152
Midwest	WØZA	137,946
New England	KI1G	158,950
Northwestern	W7ZRC	70,550
Pacific	K6EI	103,020
Roanoke	N2YO	158,928
Rocky Mountain	AD1C	83,160
Southeastern	N4AO (WC4E, op)	137,700
Southwestern	K6WSC	121,890
West Gulf	WA8ZBT	85,936
Canada	VE3YT	144,160

Single Operator Unlimited, QRP

Atlantic	W2GD	131,920
Central	KX9X	79,704
Dakota	NØUR	64,218
Delta	N4UW	61,464
Great Lakes	K4FN	99,110
Hudson	KR2H	41,272
Midwest	NØAX	134,640
New England	W1FA	21,868
Northwestern	K7QA	95,030
Pacific	K6GHA	19,110
Roanoke	WU4G	11,648
Rocky Mountain	WC7S	32,964
Southeastern	N3HCN	39,450
Southwestern	WQ6X	56,320
West Gulf	W5NE	85,848
Canada	VE3GMZ	1,144

Multioperator, Single Transmitter, High Power

Atlantic	K3AJ	162,520
Central	KV3T	107,070
Dakota	N7IV	115,784
Great Lakes	K8LX	154,530
Hudson	WA2DNI	54,054
Midwest	ABØS	161,952
New England	W1FM	97,088
Northwestern	N7DX	144,500
Pacific	W6MVM	72,324
Roanoke	W4RM	177,820
Southwestern	K8IA	170,510
West Gulf	K5CM	182,240
Canada	VY1CO	122,176

Multioperator, Single Transmitter, Low Power

Atlantic	W3ZGD	74,128
Central	KA9VVQ	64,464
Delta	W5GAD	129,396
Hudson	NJ1F	1,050
Midwest	KRØP	65,072
New England	NC1CC	115,292
Roanoke	W4TG	95,540
Rocky Mountain	KK5OV	15,312
Southeastern	KT4XA	103,194
Southwestern	W8TK	136,416
West Gulf	WDØGTY	73,950

School Club

Great Lakes	W8SH	11,200
Midwest	KØHC	155,040

Jim Smith, KKØU, credits his second clean sweep in a row to his lucky pink fleece pajama pants and matching headphones. He placed ninth overall in the Single Operator Unlimited, QRP category. [Jim Smith, KKØU, photo]

Full Results Online

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

The 2024 ARRL November Sweepstakes (CW weekend) will be held November 2 – 4, 2024.

C. R. "Skip" Paulsen, W1PV, flathood@rcn.com

2023 ARRL International EME Contest

Last year, the 2.3 GHz and Up weekends of the ARRL International EME Contest were held August 12 – 13 and September 9 – 10. The 50 – 1296 MHz weekends took place October 28 – 29 and November 25 – 26.

Multioperator Scores by Category

Call Sign	Score	QSOs	Mults
Multioperator, All Mode, All Band			
UA5Y	8,140,500	405	201
K5QE	7,924,800	381	208
W2ZQ	5,767,200	324	178
NC1I	1,327,200	158	84
OH1LRY	1,307,200	152	86
DL3WDG	1,177,100	149	79
W3SZ	775,000	125	62
W4ZST	700,000	100	70
LU8ENU	499,200	96	52
OZ9KY	138,000	46	30
Multioperator, All Mode, 144 MHz			
S51ZO	819,000	130	63
SK6EI	455,700	93	49
JF1AMX	369,600	88	42
N4SVC	366,600	78	47
W9VW	234,000	60	39
F6HEO	188,700	51	37
KE4HAM	400	2	2
Multioperator, All Mode, 1.2 GHz			
SP3YDE	603,200	116	52
IQ2DB	582,400	112	52
IK5VLS	478,400	104	46
VA7MM	288,600	74	39
W3HZU	259,000	70	37
SK0CT	250,800	76	33
Multioperator, All Mode, 10 GHz			
GB2FRA	159,500	55	29
PA3CSG	21,600	18	12
Multioperator, All Mode, 24 GHz			
OK1KIR	100	1	1
Multioperator, CW Only, All Band			
SP6JLW	442,000	85	52

Single Operator Scores by Category

Call	Score	QSOs	Mults
Single Operator, All Mode, All Band			
PA5Y	1,568,000	160	98
N1AV	1,050,200	118	89
S57Q	1,047,200	136	77
K3WM	792,000	132	60
IK3COJ	785,400	119	66
JJ3JHP	748,800	117	64
N0AKC	651,000	93	70
DL4DTU	540,000	100	54
PA2CHR	440,000	80	55
YB2MDU	347,600	79	44
G4RGK	317,400	69	46
YL2GD	222,300	57	39
K4EME	220,000	55	40
WA3GFZ	203,000	58	35
R1NW	155,100	47	33
NH6Y	139,400	41	34
DF2VJ	136,000	40	34
WQ5S	129,000	43	30
UR3VKC	118,800	44	27
SV8CS	96,200	37	26
W2LPL	80,600	31	26
AG4W	79,200	33	24
HG5BMU	60,800	32	19
KN2K	58,800	28	21
F5JWF	58,000	29	20
K0DSP	15,400	14	11
W8TN	12,100	11	11
DJ3AK	4,900	7	7
SM5EPO	2,500	5	5
Single Operator, All Mode, 50 MHz			
KJ9I	702,100	119	59
N3FTI	400	2	2
Single Operator, All Mode, 144 MHz			
OK1DIX	1,497,600	192	78
IW4ARD	889,600	139	64
W9IP	888,300	141	63
SM2BYC	792,000	132	60
OG3Z	736,600	127	58
7K3LGC	565,000	113	50
G8RWG	417,600	87	48
WB9UWA	417,600	87	48
VE7PS	410,000	82	50
KA1W	403,200	84	48
K1FMS	332,100	81	41
PJ4MM	252,000	63	40
UA9YJM	240,500	65	37
JP3EXR	219,600	61	36
KG6NK	187,000	55	34
K1DG	183,600	51	36
KK4MA	173,400	51	34
SM5CUI	170,200	46	37
JA1DYB	170,000	50	34
N3RG	141,900	43	33
YU7MS	137,200	49	28
ND4X	134,400	42	32
DL5BBH	110,700	41	27
K8DIO	85,800	33	26
ON4KHG	82,500	33	25
TA2NC	81,900	39	21
K0TPP	80,600	31	26
N9FN	79,200	33	24
DL6MI	76,800	32	24
NJ9R	76,800	32	24
VE3WY	74,800	34	22
CT7ABA	72,600	33	22
JH0WJF	70,400	32	22
R2DMD	58,000	29	20
UA6LQZ	55,100	29	19
ON7EQ	54,000	27	20
YO5TP	43,700	23	19
E27EK	36,000	24	15
UA1OEJ	34,000	20	17
DJ5NN	32,500	25	13
N4HB	32,000	20	16
OM4CW	30,400	19	16
R5BI	27,200	17	16
W8KEN	18,200	14	13
UA6ACF	15,400	14	11
WA3DRC	13,200	12	11
UA9HO	7,200	9	8
K6UFO	4,900	7	7
DL3DQL	3,000	6	5
HI8D	2,500	5	5
LZ2XF	2,500	5	5
IU4NYV	1,600	4	4
ON4EC	1,600	4	4
YO6XK	1,600	4	4
HI8AN	900	3	3
DM5A	100	1	1
LU2FGL	100	1	1
SQ1GU	100	1	1
UA6AQN	100	1	1
Single Operator, All Mode, 222 MHz			
KC7OOY	400	2	2
Single Operator, All Mode, 432 MHz			
SM4GGC	322,500	75	43
VK2CMP	281,400	67	42
KD2LGX	218,300	59	37
VK4EME	179,200	56	32
S56P	127,600	44	29
OK1TEH	63,000	30	21
RD3FD	58,900	31	19
DL1VPL	58,800	28	21
SP2WRH	55,000	25	22
W7TZ	42,500	25	17
GD0TEP	41,400	23	18
DM9EE	39,900	21	19
BV3CE	35,200	22	16
AE6EQ	28,500	19	15
JR0WFY	8,000	10	8
OM4EX	7,200	9	8
K7ATN	5,600	8	7
UT5DL	4,200	7	6
VE3GKT	3,600	6	6
UD2F	3,000	6	5
NY1V	1,600	4	4
XQ3SA	900	3	3
JA0RWF	400	2	2
JG2XWH	400	2	2
KG0D	400	2	2
VA3MW	400	2	2
BI1QGX	100	1	1
Single Operator, All Mode, 1.2 GHz			
OK1DFC	1,489,200	204	73
OK2DL	1,363,200	192	71
DF3RU	911,400	147	62
PA3FXB	763,800	134	57
DL7UDA	630,700	119	53
OM4XA	489,600	102	48
OK1KKD	483,000	105	46
KA1GT	475,000	95	50
YO2LAM	448,800	102	44
OK2ULQ	435,600	99	44
KB2SA	432,400	94	46
DL1SUZ	426,400	104	41
G7TZZ	409,200	93	44
IK2DDR	382,500	85	45
SP5GDM	378,400	88	43
LA3PNA	361,200	86	42
RA4HL	336,200	82	41
OK1IL	320,000	80	40
PA0TBR	319,800	82	39
WA3RGQ	300,300	77	39
UA9FAD	288,000	72	40
OK1USW	277,500	75	37
VK3VJP	254,100	77	33
PE1LWT	252,000	70	36
N5TM	244,800	68	36
RX3DR	213,900	69	31
AA6I	199,500	57	35
YU1SAN	195,200	61	32
ES3RF	184,800	66	28
UA4AAV	169,600	53	32
UA4LCF	164,300	53	31
N6NU	160,000	50	32
VK4CDI	159,000	53	30
W1PV	148,500	55	27
K5DN	147,900	51	29
DL0SHF	127,200	53	24
AA4MD	120,400	43	28
VE4SA	111,800	43	26
F4KLO	108,100	47	23
W3HMS	90,200	41	22
K8ZR	79,800	38	21
W5AFY	70,000	35	20
DF7KB	66,000	33	20
DK1KW	62,000	31	20
IQ0RM	32,500	25	13
CE3VRT	31,500	21	15
OH3MCK	28,800	24	12
DL7AIG	20,900	19	11
F6KRK	15,400	14	11
F8DBY	15,300	17	9
G0HIK	12,600	18	7
OH3DP	12,600	14	9
OH3LWP	11,700	13	9
K5WO	7,000	10	7
JA4UMN	6,600	11	6
PJ2BR	4,000	8	5
W3IPA	2,400	6	4
4X1AJ	2,000	5	4
RX6AIA	1,800	6	3
JA4LJB	400	2	2
Single Operator, All Mode, 2.3 GHz			
KL6M	19,200	16	12
KU4XO	8,800	11	8
SQ6QV	100	1	1
Single Operator, All Mode, 5.7 GHz			
OK1CA	33,600	21	16
PY2BS	14,300	13	11
Single Operator, All Mode, 10 GHz			
OZ1LPR	198,400	64	31
PA0PLY	112,000	40	28
OK2AQ	103,200	43	24
LZ4OC	39,000	26	15
F2CT	37,500	25	15
I4TTZ	6,300	9	7
VK7ZBX	5,400	9	6
YO8RHI	4,800	8	6
GW3TKH	4,200	7	6
Single Operator, CW Only, All Band			
G3LTF	630,000	105	60
SP9VFD	352,000	80	44
AI1K	289,800	69	42
WA6PY	196,100	53	37
SP3XBO	98,800	38	26
OM6AA	9,900	11	9
Single Operator, CW Only, 1.2 GHz			
G4CCH	390,600	93	42
SP6ITF	168,200	58	29
RD9SAC	151,200	54	28
DL1AT	94,500	45	21
JH1KRC	73,500	35	21
OK2PE	55,500	37	15
S59DCD	27,600	23	12
F6ETI	22,800	19	12
DJ3JJ	18,000	18	10

Full Results Online

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

Total Reported QSOs by Mode

Digital	11,617
CW/Phone	1,304
Total	12,921

Total Reported QSOs by Band

50 MHz	172	3.4 GHz	15
144 MHz	4,163	5.7 GHz	118
222 MHz	51	10 GHz	514
432 MHz	1,311	24 GHz	1
902 MHz	17	Total	12,921
1.2 GHz	6,371		
2.3 GHz	188		

The 2024 ARRL International EME Contest weekends are scheduled for August 24 – 25 and September 21 – 22 (2.3 GHz and Up weekends), as well as October 19 – 20 and November 16 – 17 (50 – 1296 MHz weekends).

2024 ARRL International Digital Contest

1800 UTC Saturday, June 1 – 2359 UTC Sunday, June 2

Digital operating does not have to be confined to your home station. Erwin Grafe, DH9DX, operated using this portable setup during the 2023 ARRL International Digital Contest. [Erwin Grafe, DH9DX, photo]

The ARRL International Digital Contest is a digital competition on the 160-, 80-, 20-, 15-, 10-, and 6-meter bands, with Single Operator and Multioperator, Single Transmitter categories. With the exception of RTTY, all digital modes that can support the contest exchange are permitted.

Single-operator categories include Single Operator, One Radio (SO1R) and Single Operator, Two Radio (SO2R). SO1R and SO2R stations may operate 24 hours out of the 30-hour contest period. Multioperator stations may operate the entire 30 hours. There's also a Limited Operating Time category for single-operator stations, where a maximum 8 hours of operating time is allowed.

Power categories are QRP (5 W PEP transmitter output or less) and low power (100 W PEP transmitter output). There is no high-power category for this event.

The contest exchange is the station's four-character grid square. For more information about grid squares, visit **www.arrl.org/grid-squares**.

Participants earn one point per contact, plus one point for every 500-kilometer distance between stations. The total score is the sum of all contact points. See **http://arrl.org/arrl-digital-contest** for scoring examples.

Stations may work each other once per band, regardless of digital mode (excluding RTTY).

Participants may contribute their scores to the ARRL Affiliated Club Competition, as well as form a team with fellow participants. Teams must consist of two to five single-operator stations that are operating within a 175-mile radius, and whose individual scores can be combined to produce a team score. Teams must be registered at **http://contests.arrl.org/teamreg.php?eid=31** prior to the start of the contest.

Logs must be submitted via the contest web app at **http://contest-log-submission.arrl.org** no later than 2359 UTC on June 9, 2024. Only Cabrillo-formatted electronic logs will be accepted for this event.

Visit **http://arrl.org/arrl-digital-contest** for full rules and details.

The 2024 ARRL June VHF Contest

1800 UTC Saturday, June 8 – 0259 UTC Monday, June 10

The June VHF Contest is right around the corner! The late-spring weather brings enhanced tropospheric ducting and meteor scatter. Plus, it's the peak of the sporadic-E season. Take advantage of these propagation enhancements and have some fun on the VHF and UHF bands. With several different categories to participate in, there's something to match your favorite style of operating. Single-operator participants can enter in either all-mode or analog-only (CW/phone) categories.

The exchange is simple: just the four-digit Maidenhead grid square you're operating from. For more information on grid squares, visit **www.arrl.org/grid-squares**. All authorized modes on 50 MHz bands and higher are permitted to be used in the contest.

Log submission: Upload your Cabrillo log file to the contest web app at **http://contest-log-submission.arrl.org**. Paper logs can be mailed to ARRL — June VHF Contest, 225 Main St., Newington, CT 06111.

Ten-day deadline: All logs must be uploaded or postmarked no later than 0259 UTC, June 20, 2024.

Assistance is permitted in all ARRL VHF contests — you can make announcements or chat with others about your contest activity (as long as the contact is completed over the air).

Rule Changes for 2024

Participants in the FM Only category can now count contacts made on 902 MHz and 1.2 GHz toward their scores. Previously, only contacts on the four lowest VHF bands (50, 144, 222, and 432 MHz) counted toward participants' scores in this category.

Share your photos and VHF contest stories to the ARRL Contest Soapbox at **https://contests.arrl.org/junvhf/soaps**.

The KØAXX/R station in operation during the 2023 ARRL June VHF Contest. Will Parr, KØAXX, and Ryan Jones, NV5E, took fourth place overall in the Unlimited Rover category. [Will Parr, KØAXX, photo]

Complete rules can be found at www.arrl.org/june-vhf.

The June 2024 Kids Day

1800 UTC – 2359 UTC Saturday, June 15, 2024

Twelve-year-old Milo Shaviaka participated in the January 2024 Kids Day with his father, Ruslan, NT2DR. Milo was nervous at first, but he made several contacts once he got comfortable using the microphone. [Ruslan Shaviaka, NT2DR, photo]

The third Saturday in June is a great time to encourage youngsters to get on the air and share in the excitement and fun that amateur radio can provide!

Sponsored by the Boring (Oregon) Amateur Radio Club, this event has a simple exchange suitable for a younger operator: first name, age, location, and favorite color. After that, the contact can be as long or short as each participant likes.

Kids Day is the perfect opportunity for you or your club to open your shack doors and invite kids over to discover what amateur radio is all about!

Share your photos and stories of Kids Day via the ARRL soapbox at **www.arrl.org/contests/soapbox.**

Complete rules can be found at www.arrl.org/kids-day.

Mike Walters, W8ZY, mwalters@arrl.org

Club Station

Essential Pillars for a Thriving Ham Community

The Southwest Columbus Ham Radio Club (SWCHRC), WB8MMR, in Columbus, Ohio, has spent more than 30 years developing what they refer to as the club's greatest success — a welcoming community for its members. In this month's column, SWCHRC member Calvin Long, N8RFY, lets readers in on how they've built and sustained their community over the years.

There are a variety of elements that provide the necessary support for creating a successful ham radio club community and ensuring that you're keeping members active and involved. Here are three pillars that SWCHRC has established over time to maintain a welcoming club community.

Pillar One: Provide Consistent Communication

A community can't exist without communication. We always keep our members in the know about upcoming club events by regularly holding meetings, conducting radio nets, posting on our club website, and sending group texts and emails. We try to communicate information to members about 2 weeks in advance of an event so those who want to attend can plan ahead, but the methods of communication can vary depending on the event. If an event requires extensive planning and numerous volunteers, we'll discuss it at a club meeting, where event organizers can ask for volunteers. If it's needed, a request for volunteers will be sent using all of the communication methods listed above. After an event is finalized, it gets published on our website, announced on our weekly net the week before, and sent in an email with the organizers' names and contact information so they can be reached regarding any questions.

We don't put limitations on who can host an event — any member can host any event they feel qualified for. While we don't keep a log of event attendees, we always take a group photo and post it on our website with the names and call signs of participants. On average, attendees of the various events held throughout the year are usually comprised of four to eight longtime members who've been with the club more than 5 years, mixed with some newer members and visitors.

Randall Abram, KD8NKY, teaching Calvin Long, N8RFY, and David Doerschuk, KE8TZF, the finer points of making contacts during Winter Field Day 2023. [Calvin Long, N8RFY, photo]

Pillar Two: Diversify Your Events

Clubs are made up of unique members who have varying ham interests. If you're a general interest club, limiting your events to only one aspect of the hobby (e.g., contests) may hinder your club's ability to build a welcoming community for all of its members. SWCHRC tries to include a variety of events throughout the year that allow members, no matter which aspect of the hobby they enjoy most, to join the community.

Antenna builds are a popular event for SWCHRC. They're usually held at a member's home and draw an

average of 12 participants. Mentors within the club are often the hosts of these build events and find that the antennas our members are most interested in building are 2-meter J-poles and 20- and 40-meter dipoles. We post a list of materials on our website, and participants are encouraged to bring everything they need to build their antenna of choice. Even if a club member isn't interested in this aspect of amateur radio, we still encourage them to attend because they can learn valuable ham radio skills, such as how to properly solder, use an antenna analyzer, and trim an antenna to get the lowest standing wave ratio possible.

Members who enjoy operating events like to participate with the club during ARRL Field Day and Winter Field Day. After setting up for these events, members have the opportunity to socialize while waiting for the event to start. This allows members to share their latest equipment purchases, catch up with friends, and answer questions. We are always eager to share our knowledge with each other and to discuss amateur radio with visitors and fellow hams.

In addition to hosting club-specific events, consider setting up a booth for your club at a local hamfest and allowing members to volunteer at the booth. SWCHRC does this every year at the Columbus Hamfest, and members are always willing to help. Not only does this let them enjoy each other's company outside of operating, it also generates new members. I usually volunteer at the booth and always enjoy talking to curious hams who stop by.

Every Thursday, SWCHRC hosts a 10-meter net at 8:00 PM, immediately followed by a 2-meter net at 8:30 PM. The club opens these nets to all licensed amateurs, not just members. On average, about 10 hams (members and non-members) join each net weekly. These nets are a great way to raise awareness about ham events in the area, to learn how to polish operating techniques, and to learn more about the hobby in general.

Pillar Three: Offer Opportunities for Camaraderie

SWCHRC has formed a community that allows members to help each other more fully participate in the amateur radio hobby. Some examples include assisting with station setups and equipment maintenance, mentoring new members and hams, and aiding disabled club members. When one of our members became a Silent Key, several others offered to help his family sell his radio equipment at the Columbus Hamfest. We also make sure our members know about opportunities for volunteering at marathons and triathlons through the Franklin County Ohio Amateur Radio Emergency Service®.

SWCHRC's most popular event happens to be non-ham-related — a breakfast we call "Hams and Eggs" on the first Saturday of every month. Members and non-members are all welcome to join; there's an open invitation posted on our website, and it's announced on the weekly nets. Attendees get to enjoy a delicious breakfast, as well as establish and renew ties with each other. New members and prospective new hams also get to learn about the club and amateur radio in an open, friendly environment. A lot of our club events begin as a discussion topic at this breakfast.

In Summary

Implementing these pillars has allowed SWCHRC to sustain a welcoming community for its members and maintain a steady membership growth. This foundation allows members to reconnect with friends and make new ones, all while enjoying amateur radio. The SWCHRC is a fellowship, and amateur radio is the tie that binds us together.

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 February 23, 2024.

New SSCs

Charlotte ARS, Inc., WX4E	Punta Gorda, FL

Renewing SSCs

Chesapeake Amateur Radio Service, Inc., W4CAR	Chesapeake, VA
Kershaw County ARC, KC4RC	Camden, SC
Yavapai ARC, W7YRC	Prescott, AZ

Steve Goodgame, K5ATA, sgoodgame@arrl.org

Ham Media Playlist

KB9VBR Antennas — Entertaining and Educating Ham Radio Operators

Many amateurs get a taste for radio at a young age. Some of us find radio by playing with inexpensive walkie-talkies, others through experiencing shortwave radio. Michael Martens, KB9VBR, has been fascinated with radio since the age of 12, when he received a world band receiver for Christmas that year.

Michael, unlike many amateur radio YouTube personalities, does not work in a technical field, and he doesn't hold a technical degree. Instead, he earned his degree in communications. Michael's career has been on the creative side of things. He has worked professionally in still photography, video, and sales/marketing.

Entering the Amateur Radio Community

While Michael's fascination with radio began when he was 12, it took many years for him to make the decision to get his amateur radio license. In the mid-1990s, Michael picked up a copy of *Now You're Talking!* and a set of Morse code instruction cassettes by Gordon West, WB6NOA. He was determined to earn his Technician-Plus license.

Michael's entry into amateur radio highlights the importance of clubs. As soon as his license was granted, he sought out and joined his local amateur radio club, the Wisconsin Valley Radio Association. Upon joining, Michael found immediate guidance and mentoring through about a half dozen fellow members. Michael wanted to experience everything amateur radio had to offer and felt blessed to have a vibrant club with members who were active in a variety of aspects of amateur radio. This allowed him to indulge in his diverse interests. Michael learned early on who were good mentors and who could talk to him about particular facets of amateur radio.

In the early 2000s, Michael started building and selling VHF/UHF antennas, mostly as a means to fund his growing love for the hobby. By 2010, his business was taking off, so he began writing blog posts. Eventually, by 2015, he decided to create YouTube content regularly. It took Michael a couple of years to find his style and voice, but by 2017, he was creating weekly videos on YouTube.

POTA Activations and Video Creation

It shouldn't surprise anyone that one of Michael's favorite amateur radio activities is activating parks as a part of the Parks on the Air® (POTA) program. When it comes to having a favorite type of video to create, POTA activations take the cake. While Michael understands that these videos are usually not the most viewed videos on his channel, he continues to create them because of his love of activating.

In one recent POTA video, titled "It's The ULTIMATE Parks on the Air activation! The Wisconsin POTA Campout" (**https://tinyurl.com/kb9vbr-pota**), Michael arranged a gathering in which several fellow amateur radio operators met at the Clear Lake Campground in the Northern Highland American Legion State Forest (K-7260). In this video, Michael and the crew operated for a weekend in the fall. Michael points out that by having so many operators in the park, everyone had the opportunity to learn something new. People spent time checking out each other's setups, watching how they operate, and asking questions and getting to know each other.

Michael, KB9VBR, wakes up the other campers by radio to get another day of POTA activations started.

Michael, KB9VBR, connects his radio to his LiFePo battery at a park.

Michael, KB9VBR, activates a park using FT8 from the back of his Subaru.

One challenge of portable operating for POTA is how you will power your station at the site. In his video "Picking the best battery for portable Ham Radio" (**https://tinyurl.com/kb9vbr-battery**), Michael discusses the differences between different battery chemistries. He then shares some reasons that a ham might choose one type over another. Later in this video, Michael shows some of the batteries he regularly uses for POTA activations. He discusses what battery he uses for different types of activations, and shares his experiences with each one.

Digital modes, especially FT8, are incredibly popular. In his video "Better FT8 on the FT-891! Digirig Mobile Interface" (**https://tinyurl.com/kb9vbr-ft8**), Michael discusses some of the challenges he has faced with operating digital modes as part of a POTA activation. In an attempt to tackle some of these issues, Michael looks into a mobile interface, the Digirig. He takes the time to step viewers through the process of ordering the correct interface for the radio. He also goes into detail about the required cable set and connecting the interface to the radio and computer.

As many hams have experienced, getting the right settings inside *WSJT*-X can take a bit of trial and error. Michael alleviates that hurdle for the FT-891 by stepping viewers through each setting in the software. Many videos online detail the software settings, but Michael takes his one step further by going through the FT-891 menu system to get the transceiver set up for optimum performance on FT8. Getting these settings just right can take some time, so it's nice to have a video that demonstrates every step in the process.

Michael, KB9VBR, sets up his vertical antenna to test his portable FT8 setup at the Dells of the Eau Claire County Park in Wisconsin.

After showing the entire process of setting things up, Michael takes viewers to the Dells of the Eau Claire County Park in Wisconsin to test his setup as a portable operation. Michael made 42 contacts on FT8, so I would say his activation was a success.

Michael's channel is full of videos ranging from how-to videos, videos detailing various components of an amateur radio station, and a nice collection of camping/POTA videos. If you are looking for an educational channel that can also entertain you, KB9VBR Antennas fits the bill. You can find Michael at **www.youtube.com/@KB9VBRAntennas**.

Bernie McClenny, W3UR, w3ur@arrl.org

OJØ — Market Reef

Market Reef, also known as *Märket*, is an uninhabited 3.3-hectare (8.2-acre) rock reef divided by a unique border, as it is owned half by Finland and half by Sweden. The reef is located about halfway between Sweden and the Åland Islands. Situated on the Finnish side of Market Reef is a lighthouse that has remained unmanned since 1979.

A map of Market Reef, which currently ranks number 156 on Club Log's DXCC Most Wanted List. A sharp-angled border separates the Swedish side of the reef from the Finnish side.

DXCC History

Market Reef was not on the original postwar DXCC list. In the March 1970 issue of *QST*, its addition was announced in the "DXCC Notes" section on page 84. This was made "in accordance with Point 3 of the [DXCC] criteria (see page 88, February 1969 *QST*)." The first DXpedition to Market Reef was OJØMR in late December 1969, and shortly after, the Market Reef lighthouse keeper, Karl-Erik, became licensed as OJØMA. Since that initial DXpedition, there have been more than 50 operations from what currently ranks number 156 on Club Log's DXCC Most Wanted List.

Upcoming Market Reef DXpedition

Stian Soreng, LB5SH, is organizing a group for what will be his third DXpedition to OJØ. "During our previous DXpedition to Market Reef, we had to leave 2 days early, and everyone felt that they left the reef with unfinished business," he said. Last year's team of Bjørn Gjerde, LA1UW; Tor Pettersen, LA3WAA; Kristoffer Selbekk Hille, LBØVG, and Stian is hoping to finish the job by getting a "short group call sign" and returning to operate on April 27 – May 4, 2024.

If they are unable to get the short OJØx call sign, their backup plan is to use European Conference of Postal and Telecommunications Administrations licenses like they did last year, and they will operate as OJØ/LA1UW, OJØ/LA3WAA, OJØ/LB5SH, and OJØ/LBØVG. They plan to be active on single sideband (SSB), CW, and FT8 Fox and Hound on 160 – 6 meters, including the 1979 World Administrative Radio Conference bands. They anticipate having as many as four stations on the air simultaneously. Per their website (**https://oj0.no**), they will be using a Yaesu FT-950, an Icom IC-7300, a Yaesu FT-450D, and a Yaesu FT-857D. In addition to a homebrew amplifier, they will also use an MFJ Enterprises Ameritron AL-80B and an SPE Expert 1K-FA. Their antennas will include a DX Commander for 40 – 6 meters, a Windom for 80 – 10 meters, a Yagi for 6 meters, and various wire antennas. For those seeking a Market Reef contact for an all-time new one, the team is open to arranging schedules as of press time.

Pedro Miguel Ronda Monsell, EA5GL, will be handling the QSL duties. All contacts will be uploaded to Club Log, Logbook of The World (LoTW), QRZ, etc., and the team will be using Club Log's live stream feature. Keep an eye on their website and your favorite DX outlets for any last-minute updates.

DX News from Around the World

JD1/O — Ogasawara Islands

As mentioned in the March 2024 "How's DX?" column, the Ogasawara Islands are the easier of the two JD1s to work because several hams live there. JD1/O is currently ranked number 127 on Club Log's DXCC Most Wanted List. Koutarou Watanabe, JP1IHD, is planning to return to

Chichijima, where he will operate on SSB as JD1BQP from April 22 to May 3. He will focus on 15 – 6 meters. For antennas, Koutarou will be using a two-element HB9CV on 10 and 15 meters and a dipole on 17 and 12 meters. For 6 meters, he will use a two-element delta loop and a seven-element Yagi. Contacts will be uploaded to Club Log at **https://clublog.org/logsearch/jd1bqp**; you can QSL directly or via the bureau to his home call sign.

KH9 — Wake Island

During February this year, Tom Mayhan, NL7RR, was once again working on Wake Island, which currently ranks number 29 worldwide on Club Log's DXCC Most Wanted List. He was operating as both NL7RR/KH9 and KH9/NL7RR, which confused some hams who worked him or tried to work him. His QSL card said KH9/NL7RR, as did his LoTW certificate. On April 19, Tom plans to be back on Wake Island for another 4-week work assignment. During his February 2024 activation, he could be found on 20-meter SSB as early as 0400Z and as late as 0830Z, usually on 14.255 MHz. You can QSL directly to Tom Mayhan, P.O. Box 2387, Homer, Alaska 99603, USA.

V4 — Saint Kitts and Nevis

Tim Hutchings, N5TCH, will be operating from the V47JA (W5JON) rental station in Calypso Bay, Saint Kitts, on May 10 – 17. He'll be signing V4/N5TCH in his spare time — most likely during the local early mornings. QSL via QRZ and LoTW. There will not be any hard-copy QSL cards.

XU — Cambodia

ARRL Radiosport and Regulatory Information Manager Bart Jahnke, W9JJ, reported that "the political/regulatory climate in Cambodia has changed, and despite a pause in early 2023, amateur radio licenses are once again being issued." He continued, "Any previous suspension of ARRL award credit for various XU call signs that were active between January 2023 and the present has been rescinded." For some, that means your contacts with Thomas Hubert, XU7GNY, now count for DXCC credit.

XW — Laos

After the November 2023 XW4DX DXpedition, operator Vincent Colombo, F4BKV, stayed in Vang Vieng, Laos, and has been operating as XW4KV. He has been running low power on 15 and 10 meters on SSB and FT8. Vincent has also been using a quad loop on 21 MHz and a vertical dipole on 28 MHz. He expects to remain in Laos until June 2024. QSL via LoTW and OQRS through Club Log (either directly or via the bureau). Do not QSL directly to the bureau.

Z8 — South Sudan

Diya Al-Asadi, YI1DZ, does contract work in Juba, South Sudan. His contract is scheduled to end in May this year, but he might extend it for another 6 months. In his spare time, Diya can be found on SSB and FT8 on 20 – 10 meters. QSL via Stefan Horecky, OM3JW.

OC-144 — Ketawai Island

Members of the Bangka Belitung DXpedition Team are planning to operate from Ketawai Island in Indonesia, which has the Islands on the Air (IOTA) reference number OC-144. They will use the special call sign 7B4K on May 24 – 26, 2024. For more information about this IOTA DXpedition, visit their QRZ web page at **www.qrz.com/db/7b4k**.

Breaking News

In the March 2024 "How's DX?" column, we announced a March 2024 DXpedition to the Glorioso Islands. The operation did not happen at that time, and it has been rescheduled for May 24 – June 19, 2024.

Wrap-Up

That's it for this month, with thanks to Rich, KE3Q; Tom, KH9/NL7RR; Stian, LB5SH; Bart, W9JJ, and The Daily DX (**www.dailydx.com**) for helping to make this month's column possible. I look forward to seeing all of the attendees of this year's Dayton Hamvention® — I'll be in the usual hangouts: the ARRL donor dinner on Thursday night, the SouthWest Ohio DX Association DX Dinner on Friday night, and the Contest dinner on Saturday night. Please send your DX news, photos, and club newsletters to **bernie@dailydx.com**. Until next month, see you in the pileups! — *Bernie, W3UR*

Strays

Quarter Century Wireless Association Honors Asheville Radio Museum

The Quarter Century Wireless Association (QCWA) has gifted the Asheville Radio Museum $2,000 to support its mission. Founded in 2001, the nonprofit museum provides visitors of all ages with a personalized learning experience about radio technology's economic and cultural impact, enabling cell phones, GPS, Bluetooth, and more. The museum holds more than 100 vintage amateur and commercial radios from the early to the mid-20th century. Established in 1947, QCWA promotes friendship and cooperation among amateur radio operators while fostering interest in radio communications and the advancement of electronic art. The association also provides scholarships to hams pursuing higher educational objectives. — *Peter Abzug, N3TIP*

Jon Jones, NØJK, n0jk@arrl.org

Solar Cycle 25 Benefits CBØZA DXpedition

Sporadic-E propagation in North America has abruptly slowed in February 2024. However, Solar Cycle 25 picked up the slack with some F2 and transequatorial propagation (TEP) openings on 6 meters. The CBØZA Robinson Crusoe Island DXpedition was in the right spot at the right time to benefit from these Solar Cycle 25 openings. Mike Crownover, Jr., AB5EB, was the team's primary VHF operator. They used an M2 Antenna Systems 6M8GJ Yagi on a mountaintop for 6-meter Earth-Moon-Earth (EME) and terrestrial work. Mike observed the following:

The CBØZA team's 6-meter M2 Antenna Systems 6M8GJ Yagi with Mike Crownover, Jr., AB5EB. [Mike Crownover, Jr., AB5EB, photo]

> We had several nice openings to both Europe and Japan. The Europe openings happened just as Dale Green, CE2SV, had described them to me while at a barbecue at Roberto Ramírez's, CE3CT, house. I would hear Brazil first and then jump to the Canary Islands — if there was going to be another hop, Europe was next. [During] the only time I got past northern Spain, the opening went straight from Brazil to Portugal, and then it went into France. I worked a few France stations, but that was a frustrating opening. I could clearly copy the France stations better than they could hear me. Of course, I usually had an S0 noise level. One interesting decode was when [stations in Brazil were] working [stations in Japan] in the evening, in what appeared to be long path. I decoded one Japan station in that opening. Turning to Japan did not produce any signals.
>
> The North American openings were limited to the southern US. There seemed to be a wall around northern Mexico and Florida that I was able to get into just about every evening. However, that next hop was difficult. During one opening into southern Texas (February 22), I had very strong signals, but it seemed that the TEP was distorting the signals so that I was not decoding many.

Jim Wilson, K5ND (EM12), said, "CBØZA was coming in [strong] on 6 meters on February 22. At times, he was running four streams on *MSHV*. At other times, he was sending CQ over and over, with no response. It almost appeared to be a Texas spotlight. Mike, AB5EB, noted in the ON4KST chat room that he was concerned about only working Texas stations!" Mike commented, "I then went to 50.105 CW and worked several stations in the US on 6 meters." I replied to state that evening TEP often has flutter distortion on signals sounding like aurora, which can prevent FT8 from decoding. MSK144, Q65A, and CW may work in such instances. Mike added that the team had only two good openings to Japan. He said:

> On 50 MHz EME, we worked 27 stations. Most were [during] my moonrise, but I made some common moon contacts. It was exciting to make the first 6-meter EME contacts from CEØZ, and what are believed to be the

first 6-meter EME contacts from anywhere in Chile. [On February 14 at 1824 UTC, Mario, K2ZD, worked CBØZA on EME at –27 dB.] The wind made things very challenging, and it was strong enough to break the bolt in the elevator device of the antenna. Mounting the antenna to the mast took some figuring out, but we were able to get the station back on the air the next morning.

I noted that CBØZA had a brief chordal hop F2 opening to the midwest states on February 13. The geomagnetic field was active with a K index of 3. Mike, AB5EB, worked stations in the midwest on FT8 Fox and Hound for about an hour, including Mike, KMØT (EN13), at 1724 UTC, and Phil, NØPB (EM39), at 1734 UTC. On February 23, stations in Arizona, Colorado (W9RM), Nevada (K5XI), New Mexico, and even Idaho (W7OUU) spotted CBØZA.

PY2XB Remote Station, PR7XB

Fred Carvalho, PY2XB, has set up a remote 6-meter station at the PR7AB/PX2A site in Brazil. He explained:

The setup is in Paraíba (grid HI22jr). It is a low-cost, digital-mode station that uses cheap components and whatever we had on hand. The core is a TS-480S (70 W) and a seven-element loop-fed array (LFA) Yagi (8.7-meter boom) at 17 meters. The station was finished on September 24, 2023. After 49 days of remote operation, I have [contacted more than] 1,000 stations on FT8, 95 entities in all continents except Antarctica, and I have confirmed 377 grids, including an amazing long-path contact with UN8GEQ (17,202 miles away). This PR7-UN8 contact was a first between Brazil and Kazakhstan.

Although this was achieved close to the peak of Solar Cycle 25, this region of Brazil has shown good potential for DXing on 50 MHz. There are different openings than those I experiment with in PY2. Strong signals from Africa are often heard, and openings to southeast Asia and the Indian Ocean occurred during this brief period. Like the US, Brazil is a large country, and 50 MHz behaves very differently depending on where you are located. Remote-controlled stations are nice tools [you can use] to take advantage of different propagation patterns and boost your DXCC score.

On February 21, Fred used his remote station on Q65A to work ZS4TX/6 and ZS6NK over a difficult skew path.

On the Bands

50 MHz. At 2113 UTC on February 13, Paul Sobon, NOØT (DN70), received Don, 7Q6M (KH67), at –13 dB. The H4ØWA Temotu DXpedition had strong evening openings to Japan on March 1 and 2; on March 2, they posted a picture of their computer monitor to their Facebook page (**www.facebook.com/groups/h40wa**) to show a red screen full of Japan stations calling them on FT8! I wonder how one picks a station to reply to. On February 22, Steve Sacco, NN4X (EL98), and N4TB (EL97) worked 7Q6M at around 2115 UTC.

On February 27, Juan, TG9AJR (EK44), worked Meralda, VP6MW (CG44), on Pitcairn Island after seeing her call CQ on FT8. In an email to Juan, Meralda said, "Thank you so much for being my first 6-meter contact. Wow — what a great one."

A strong, classic 6-meter single-hop F2 opening took place in the afternoon on February 28. Stations from Maine to New Mexico reported that HC1MD/2, HC1BI, and HC2FG were in, starting at 2000 UTC. Former ARRL President and current International Amateur Radio Union Secretary Joel Harrison, W5ZN (EM45), spotted HC1MD/2 at 2251 UTC. Stations in Florida spotted Derek, J35X (FK95), and W4TAA reported a contact with him at 2055 UTC. The K index was only 0. Sometimes, the F-layer maximum usable frequency will rise without extra geomagnetic activity.

222 MHz. Dave Olean, K1WHS, said, "On February 13, the moon was setting, and a few of the regulars on the Tuesday activity night were listening after local activity had died down (0300 UTC). WA1NLG, WA3EOQ, and W5EME all copied Q65 EME signals off the moon with their single Yagis. WA3EOQ was copying me at about –21 dB via the moon." Dave recommends that single-Yagi stations consider trying EME. He also noted that Martin, PJ4MM, in Bonaire, is on 222 MHz EME with 300 W and a single 17-element LFA Yagi.

1296 MHz. The TX5S Clipperton Island DXpedition team used a 2.4-meter dish and 400 W on 23-centimeter EME. The first contact they logged was with HB9Q, followed by OK1DFC, OK2DL, OK1KIR, and OK1IL. As an afterthought, they used their 70-centimeter satellite system, an 11-element Yagi, and 70 W with an Icom IC-9700 to make EME contacts with NC1I and DL7APV! On 1296 MHz EME, they made 57 contacts and worked 17 DXCC entities. DU3T is now active on 23-centimeter EME with a 4.6-meter dish antenna. These reports are courtesy of the "432 MHz and Above EME Newsletter."

Here and There

Larry Lambert, NØLL, is considering going to a site in rare grid DN73 to operate on 6 meters for the 2024 sporadic-E season or the Perseid meteor shower. He is thinking about staying for a week. The Eta Aquarid meteor shower will peak on May 5 – 6; Larry may operate from DN91 for this one.

Special Event Stations

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

Feb. 27 – Apr 30, 0000Z – 2359Z, HI18ØRD, Dominican Republic. Radio Club Dominicano; Union Dominicana de Radio Aficionados; Hotel-India DX Club; Union Radioaficionados del Sur-Oestre, and Liga Dominicana de Radio Amateurs. **180th Anniversary of the Declaration of Independence of the Dominican Republic**. 14.326 21.325 24.980 28.380. Certificate. QSL via qrz.com, eQSL (LoTW to be enabled shortly). **www.qrz.com/db/hi180rd**

Apr. 27, 1300Z – 2100Z, K3S, Baltimore, MD. Nuclear Ship *Savannah* Amateur Radio Club. **International Marconi Day Award Station**. 7.1 14.1 21.1 28.1. QSL. K3LU, 980 Patuxent Rd., Odenton, MD 21113. *Check spotting networks for frequencies*. **www.qrz.com/db/k3s**

Apr. 27, 1600Z – 2300Z, K5S, Port Bolivar, TX. Beaumont Amateur Radio Club. **Bolivar Lighthouse**. 7.220 14.250 28.405 146.520. Certificate. Beaumont Amateur Radio Club, 4839 Highway 326N, Kountze, TX 77625. **www.w5rin.com**

Apr. 27 – Apr. 28, 1700Z – 1700Z, N1D, Athens, GA. Radio Club at the University of Georgia. **N1D/Number One Dawgs — University of Georgia Football Team National Championship**. 3.925 7.250 14.200. QSL. Athens Radio Club, P.O. Box 782, Athens, GA 30603. **www.athensradioclub.org**

May 1 – May 15, 0414Z – 0418Z, WØT, Dickson, TN. Dickson County Amateur Radio Club. **Dickson County Old Timers Day**. 7.235 14.280 18.130. Certificate. Suzanne Bennett, 1203 Old Highway 48 N., Cumberland Furnace, TN 37051. **www.wc4dc.org**

May 3 – May 4, 1200Z – 2300Z, K4C, Concord, NC. Cabarrus Amateur Radio Society. **10th Annual Jiggy with the Piggy — Barbecue Cook Off**. 7.230 14.310 28.430. Certificate. Cabarrus Amateur Radio Society, P.O. Box 785, Concord, NC 28026. **www.facebook.com/cabarrusars** or **www.cabarrusars.org**

May 3 – May 5, 1300Z – 0100Z, W4T, Carthage, TN. Five Oh First Group. **Tennessee Maneuvers Remembered**. 3.885 7.270. QSL. Garret Scott — W4T, 10236 Birch Hill Ln., Knoxville, TN 37932. AM and CW modes only; frequencies may change. *See website for updates*. **www.w4t.us** or **www.facebook.com/events/715919310088586**

May 4, 0900Z – 1600Z, W4M, Statesboro, GA. Statesboro Amateur Radio Society and Southeastern Amateur Radio Association. **Blind Willie McTell Birthday Celebration**. 7.250. Certificate & QSL. Douglas Hess, 108 Greenwood Ave., Statesboro, GA 30461. *Check DX Summit for frequencies*. **www.qrz.com/db/w4m** or **statesboroamateurr.wixsite.com/home**

May 4, 1300Z – 2100Z, KD3KA, Wexford, PA. Allegheny Valley Radio Association. **Frank Conrad Sesquicentennial**. 7.040 7.240 14.040 14.240. QSL. Allegheny Valley Radio Association, P.O. Box 550, Wexford, PA 15090. **www.alleghenyvalley.net** or **www.qrz.com/db/kd3ka**

May 4, 1400Z – 2000Z, NØT, Newport, MN. South East Metro Amateur Radio Club. **Milwaukee Road Railroad-Newport Tower, 118th Anniversary**. CW: 7.040 14.035; SSB: 7.220 14.260. Certificate. David Blume, 8791 77th St. S., Cottage Grove, MN 55016. *Certificates will be available for download 30 days after the event*. **kd0irf@yahoo.com** or **www.semarc.org**

May 4 – May 18, 0000Z – 2359Z, KØC, Brick, NJ. New Jersey Knights of Columbus Amateur Radio Club. **New Jersey Knights of Columbus 128th State Convention**. 7.225 14.240 21.350 28.340. Certificate & QSL. Art Olson, 339 18th Ave., Brick, NJ 08724. **olson339@comcast.net** or **www.qrz.com/db/k0c**

May 4 – Jul 21, 0000Z – 0000Z, TM24JB, Fort Blackmore, France. F1SXC. **Homage to Josephine Baker, the Voice of the Paris Olympic Games 2024**. 7.124 14.154 18.124 28.424. QSL. David, F1SXC/Radio-club de Saint-Quentin-en-Yvelines, F6KRK, 1 bis avenue des Frênes, Montigny le Bretonneux 78180, France. **www.qrz.com/db/tm24jb**

May 10 – May 11, 1500Z – 2300Z, W7G, Corinne, UT. Ogden Amateur Radio Club, W7SU. **Golden Spike Celebration**. 7.040 7.235 14.040 14.255. QSL. Ogden Amateur Radio Club, W7SU, P.O. Box 3353, Ogden, UT 84409. **www.ogdenarc.org**, **www.nps.gov/gosp/index.htm**, or **www.w7g.org**

May 11, 1400Z – 2000Z, NØF, Anoka, MN. Anoka County Radio Club. **Minnesota Fishing Opener**. SSB: 7.255 14.255; FT8: 7.056 14.091. QSL. Anoka County Radio Club, P.O. Box 982, Anoka, MN 55303. **www.anokaradio.org**

May 11, 1400Z – 2000Z, K4RC, Williamsburg, VA. Williamsburg Area Amateur Radio Club. **Jamestown Landing Day Event**. 7.265 14.265. Certificate & QSL. QSL Manager, WAARC, P.O. Box 1470, Williamsburg, VA 23187. *The Virginia Historic Triangle Certificate is available for contacting the Jamestown, Williamsburg, and Yorktown Special Event Stations*. **qslmgr@k4rc.net** or **www.k4rc.net/events/special-event-stations**

May 11, 1600Z – 2300Z, NI6IW, San Diego, CA. USS *Midway* Museum Ship. **Commemorating Armed Forces Day**. 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**

May 12 – May 18, 0000Z – 0000Z, N4P, Gainesville, FL. W.T. Loften High School Amateur Radio Club (K4WTL). **Police Services Week**. 14.335. Certificate. Robert Lightner, 3435 NW 34th Ter., Gainesville, FL 32605. **www.qrz.com/db/k4wtl**

May 16, 1500Z – 2000Z, KA4TAL, Conway, SC. Horry Post 111, The American Legion Amateur Radio Club. **Honoring the Serving Members and Veterans of Our Armed Forces**. 7.185 7.264 14.255 14.275. Certificate. The American Legion Amateur Radio Club, 3003 Highway 701, North, Conway, SC 29526. *E-Certificate available*. **talarc.ka4tal@gmail.com** or **talarc.ka4tal@gmail.com**

May 18, 1300Z – 2100Z, K3S, Baltimore, MD. Nuclear Ship *Savannah* Amateur Radio Club. **National Maritime Day**. 7.1 14.1 21.1 28.1. QSL. K3LU, 980 Patuxent Rd., Odenton, MD 21113. *Check spotting networks for frequencies*. **www.qrz.com/db/k3s**

May 18 – May 19, 1700Z – 0100Z, K6SOA, Mission Viejo, CA. South Orange Amateur Radio Association. **50th Anniversary**. 7.200 14.250 21.350 28.375. QSL. SOARA Special Event, P.O. Box 2545, Mission Viejo, CA 92690. **www.soara.org**

May 18 – May 20, 0000Z – 0000Z, W6SFM, Fair Oaks, CA. Samuel F. Morse Amateur Radio Club. **W6SFM Bug Roundup**. 3.533 7.033 14.033 28.033. QSL. Samuel F. Morse Amateur Radio Club, 4901 Minnesota Ave., Fair Oaks, CA 95628. **www.w6sfm.org/bug-roundup**

May 19 – May 25, 0000Z – 0000Z, N4E, Gainesville, FL. W.T. Loften High School Amateur Radio Club. **National EMS Week**. 14.335. QSL. W.T. Loften High School ARC, 3000 E. University Ave., Gainesville, FL 32641. **www.qrz.com/db/k4wtl**

May 21, 1500Z – 1800Z, WE4NC, Heathsville, VA. Northumberland County Virginia Communicators. **Red Cross Founders Day**. JS8Call: 7.078; FT8: 7.074; SSB: 14.250. QSL. WE4NC Special Event, 2705 Northumberland Hwy., Lottsburg, VA 22511. *All digital 15:30 – 19:30 UTC; SSB on 20 meters 1930 – 2030 UTC*.

May 24 – May 25, 2200Z – 2200Z, K9V, Columbia City, IN. Whitley County Amateur Radio Club. **Vietnam Veterans Memorial Special Event Station**. 7.243 14.243 21.343 28.343; FT8 on all frequencies (10 through 80 meters). QSL. WC9AR/K9V, P.O. Box 652, Columbia City, IN 46725. **www.wcarc.org**

May 26, 1200Z – 2358Z, WØFUN, Denmark, IA. Iowa Radiosport Society. **The Event of the Month, Day, and Year Being the Same as Our ZIP Code**. 7.054 7.235 10.121 14.235. QSL. Iowa Radiosport Society, WØFUN, P.O. Box 73, Denmark, IA 52624.

May 27, 1800Z – 2100Z, N3TAL, Lanham, MD. American Legion Post 275 Amateur Radio Team. **Memorial Day**. 7.275. 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**

May 31 – June 1, 1500Z – 2359Z, W4H, Georgiana, AL. Jim Bell Wireless Association. **45th Hank Williams Senior Festival**. SSB: 7.189 14.250; FT8: 7.074 14.074. QSL. JBWA/W4H, 274 W. Pettibone Rd., Georgiana, AL 36033. **hank@k4tns.com** or **www.k4tns.com/hank**

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

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

Submissions must be received by ARRL HQ no later than the 1st of the second month preceding the publication date; a special event listing for **August** *QST* would have to be received by **June 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**.

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 February 2024 activity report of the VM Program.

♦Operators in Indiana and North Carolina received advisory notices for improper bandwidth. The operators were transmitting over 6 kHz wide. Section 97.307(a) of Commission rules states that no station shall occupy more bandwidth than necessary for the information rate and emission being transmitted.

♦An operator in Indiana received an advisory notice for deliberate interference on 3.933 MHz, and the matter is under consideration for referral to the FCC.

♦Advisory notices were sent to Technician-class operators in Florida, Minnesota, and North Carolina for FT8 operation on 7.074 MHz. Technicians have only CW privileges on 40 meters. An advisory notice was also sent to a Technician operator in Arizona for FT8 operation on 15 meters. Technicians have only CW privileges on 15 meters.

♦An advisory notice was sent to a licensee in California for interference to a coordinated repeater by his operation of a cross-band repeater, with no identification and no tone control, on the input of the coordinated repeater.

♦An operator in California received an advisory notice for operation on a 60-meter frequency not assigned to amateur operators in the United States.

♦An operator in Ohio received a commendation for sustained extraordinary efforts in getting elementary students on the air during the School Club Roundup event on 20 meters.

♦One case was referred by the FCC to the VM Program for evidence gathering, and one case was referred by the VM Program to the FCC for enforcement action.

♦A presentation on the VM Program was given to the Vienna Wireless Society in Vienna, Virginia, on February 9.

The totals for January 2024 monitoring were 2,085 hours on HF frequencies, and 2,599 hours on VHF frequencies and above, for a total of 4,684 hours. — *Thanks to Volunteer Monitor Program Administrator Riley Hollingsworth, K4ZDH*

Convention and Hamfest Calendar

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

Abbreviations

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

Colorado (Delta) — June 1 T
8 AM – 11 AM. *Spr:* Montrose ARC. Lions Club Pavilion, 510 N. Palmer St. *Tl:* 147.195 (107.2 Hz). *Adm:* Free. **www.montrosehamradio.org**

Connecticut (Goshen) — May 18 D F H R T V
8 AM – noon. *Spr:* Southern Berkshire ARC. Goshen Fairgrounds, 116 Old Middle St. (Rte. 63). *Tl:* 147.285 (77.0 Hz). *Adm:* $5. **www.sberk.org**

Florida (Pinellas Park) — May 25 D F T
8 AM – noon. *Spr:* The Glorious Society of The Wormhole. Freedom Lake Park, 9990 46th St. N. *Tl:* 146.850 (146.2 Hz). *Adm:* Free. **www.w4orm.org**

Georgia (Forsyth) — May 11 H R T
6:30 AM – 2 PM. *Spr:* Barnesville GA Repeater Net. Monroe Co. Recreation Complex, 100 Dan Pitts Dr. *Tl:* 147.225. *Adm:* Free. **www.barnesvillega.net**

ARRL GEORGIA SECTION CONVENTION

June 1, Marietta, Georgia

D F H Q R S T V
8 AM – 3 PM. *Spr:* Atlanta Radio Club, Kennehoochee ARC. Jim R. Miller Park, 2245 Callaway Rd. SW. *Tl:* 146.820 (146.2 Hz). *Adm:* $8 Advance, $10 door. **www.atlantahamfest.com**

Idaho (Boise) — May 11 F H S V
8 AM – noon. *Spr:* South West Idaho ARC. Peace Valley Charter School, 1845 S. Federal Way. *Tl:* 146.52. *Adm:* Free. **www.dosomethingradio.com**

Illinois (Granite City) — June 9 D F H R T V
7 AM – noon. *Spr:* Egyptian Radio Club. Holy Family Church Community Center, 2606 Washington Ave. *Tl:* 146.760 (141.3 Hz). *Adm:* $8 Advance, $10 door. **www.w9aiu.org**

Illinois (Mendota) — June 2 D F H R T V
8 AM – 1 PM. *Spr:* Starved Rock Radio Club. Mendota Tri-County Fairgrounds, 503 1st Ave. *Tl:* 147.120 (103.5 Hz). *Adm:* $8 Advance, $10 door. Email: **starvedrockhamfest@gmail.com**

Iowa (Creston) — June 8 D F R T V
8 AM – noon. *Spr:* Southwest Iowa ARA. Union Co. Emergency Management, 705 E. Taylor St. *Tl:* 146.790 (136.5 Hz). *Adm:* Free. **www.facebook.com/groups/327085807349791**

Louisiana (Monroe) — June 1 D F H R T V
8 AM – 1 PM. *Spr:* Louisiana Delta Radio Club. Barak Shriners Lodge, 6620 Frontage Rd. *Tl:* 147.135 (127.3 Hz). *Adm:* $10. **www.kc5dr.org**

Maryland (West Friendship) — May 26 D F H Q R T
8 AM – noon. *Spr:* Maryland FM Association. Howard Co. Fairgrounds, 2210 Fairgrounds Rd. *Tl:* 146.76, 224.76, 444.00 (107.2 Hz). *Adm:* $10. **www.marylandfm.org**

Michigan (Chelsea) — June 2 D F H R T V
8 AM – noon. *Spr:* Chelsea ARC. Chelsea Community Fairgrounds, 20501 W. Old US Hwy. 12. *Tl:* 145.450 (100 Hz). *Adm:* $5. **www.wd8iel.com**

Michigan (Hudsonville) — June 1 F H R T V
8 AM – noon. *Spr:* Independent Repeater Association. Hudsonville Fairgrounds, 5235 Park Ave. *Tl:* 147.16 (94.8 Hz). *Adm:* $8. **www.w8ira.org**

Michigan (Newberry) — June 8 D F H R V
8 AM – noon. *Spr:* Luce Amateur Radio Services. Luce-West Mackinac Co. Fairgrounds, 11555 N. Co. Rd. 399. *Tl:* 146.61 (114.8 Hz). *Adm:* $5. **www.w8nby.org**

AURORA '24

June 1, Plymouth, Minnesota

F H Q S T
9 AM – 5 PM. *Spr:* Northern Lights Radio Society. West Medicine Lake Community Club, 1705 Forestview Ln. N. *Adm:* $5. **www.nlrs.club**

Missouri (Springfield) — June 1 D F H R S T V
8 AM – 1 PM. *Spr:* Southwest Missouri ARC. Salvation Army, 1707 W. Chestnut Expy. *Tl:* 146.910 (162.2 Hz). *Adm:* $7 Advance, $10 door. **www.smarc.org/smarc-pre-field-day-hamfest-june-1st**

ARRL NEBRASKA STATE CONVENTION

May 11, Lincoln, Nebraska

D F H Q R S V
8 AM – 3 PM. *Spr:* Lincoln ARC. Sandhills Global Event Center, 4100 N. 84th St. *Tl:* 146.760. *Adm:* $8. **www.lincolnhamfest.org**

Nevada (Minden) — June 1 F
7 AM. *Spr:* N7RCA. 1780 Bobcat Ct. *Adm:* Free. **www.n7rca.com**

Nevada (Reno) — May 11 F R T
8 AM – noon. *Spr:* Sierra Nevada ARS. Cabela's Reno, 8650 Boomtown Garson Rd. *Tl:* 147.210 (100.0 Hz). *Adm:* Free. **www.renohamswap.com**

New Jersey (Spring Lake) — June 1 D F H R T V
7:30 AM – 1 PM. *Spr:* Ocean Monmouth ARC. Spring Lake Heights Volunteer Fire Company No. 1, 700 Sixth Ave. *Tl:* 145.110 (127.3 Hz). *Adm:* $5; kids 12 and under, free. **www.n2mo.org**

New Jersey (Surf City) — May 11 F H R T V
8 AM – 1 PM. *Spr:* Old Barney ARC. Surf City Firehouse, 713 Long Beach Blvd. *Tl:* 146.835 (127.3 Hz). *Adm:* $5. **www.obarc.org**

New Mexico (Las Cruces) — May 25 F H T V
7 AM – 11 AM. *Spr:* Mesilla Valley Radio Club. MVRC club house, 6609 Jefferson Ln. *Tl:* 146.640 (100 Hz). *Adm:* Free. Email: **wd8ajj@yahoo.com**

New Mexico (Roswell) — May 11 R
8 AM – 2 PM. *Spr:* Pecos Valley ARC. Beginnings, 3908 SE. Main St. *Tl:* 147.320 (146.2 Hz). *Adm:* $5. Email: **w0cox123@gmail.com**

New York (Bethpage) — June 2 D F H Q R
8:45 AM. *Spr:* Long Island Mobile ARC. 999 Stewart Ave. *Tl:* 146.85 (136.5 Hz). *Adm:* $6; non-ham XYLs and children under 23, free. **www.limarc.org**

New York (Cortland) — June 8 F H R T V
7 AM – noon. *Spr:* Skyline ARC. Cortland Co. Fairgrounds, 4301 Fairgrounds Dr. *Tl:* 147.180 (71.9 Hz). *Adm:* $6. **www.skylinehamradioclub.org**

New York (Depauville) — May 18 D F H R T V
8 AM – noon. *Spr:* Thousand Islands Repeater Club. Depauville Fire Dept. Community Center, 15191 School St. *Tl:* 147.030 (151.4 Hz). *Adm:* $2. **www.tirepeaterclub.com**

New York (Mountainville) — May 5 D F H Q R T V
8 AM – noon. *Spr:* Orange Co. ARC. Blackrock Fish & Game Club, 5 Pleasant Hill Rd. *Tl:* 147.105 (114.8 Hz). *Adm:* $6. **www.ocarcny.org**

New York (Rensselaer) — June 2 D F R T
8:45 AM. *Spr:* East Greenbush ARA. East Greenbush Volunteer Fire Department, 68 Phillips Rd. *Tl:* 147.27 (94.8 Hz). *Adm:* $8. **www.egara.club**

FOUR DAYS IN MAY

May 16 – 19, Fairborn, Ohio
9 AM – 10 PM. *Spr:* QRP ARCI. Holiday Inn, 2800 Presidential Dr. *Adm:* Evening events free; $40 conference. **www.qrparci.org/fdim**

RV RADIO NETWORK

May 11 – 16, Millersburg, Ohio
All day, each day. *Spr:* RV Radio Network. Berlin RV Park & Campground, 5898 State Rte. 39. *Tl:* 146.52. *Adm:* Free. Email: **shrine94@aol.com**

ARRL NATIONAL CONVENTION

May 17 – 19, Xenia, Ohio
D F H Q R S V
Fri. & Sat. 9 AM – 5 PM, Sun. 9 AM – 1 PM. *Spr:* Dayton ARA. Greene Co. Fairgrounds and Expo Center, 210 Fairground Rd. *Tl:* 146.94 (123.0 Hz). *Adm:* $26 Advance, $30 door. **www.hamvention.org**

ARRL NORTHWESTERN DIVISION CONVENTION

May 31 – June 2, Seaside, Oregon
D F H Q R S V
Fri. & Sat. 9 AM – 5 PM, Sun. 9 AM – 2 PM. *Spr:* Oregon Tualatin Valley ARC, Clark Co. ARC. *Tl:* 145.45 (PL 118.8), 145.49 (PL 118.8), 146.52. *Adm:* $15 Online, $20 Sat., reduced on Sun. **www.seapac.org**

ARRL WESTERN PENNSYLVANIA SECTION CONVENTION

June 9, Butler, Pennsylvania
D F H Q R S T V
8 AM – 2 PM. *Spr:* Breezeshooters ARC. Butler Farm Show Grounds, 625 Evans City Rd. *Tl:* 147.300 (131.8 Hz). *Adm:* $8 Advance, $10 door. **www.breezeshooters.org**

Virginia (Manassas Park) — June 1 Q T

7 AM – 1 PM. *Spr:* Ole Virginia Hams. The field across from Signal Hill Park, 9300 Signal View Dr. *Tl:* 146.970. *Adm:* $5; kids under 18, free. **www.w4ovh.net/tailgate**

Washington (Dryden) — June 7 – 9 F H R S T V

6:30 AM daily. *Spr:* Apple City ARC. Dryden Gun Club, Saunders Rd. *Tl:* 146.68 (156.7 Hz). *Adm:* $8. **www.applecityarc.com**

Washington (Stanwood) — May 11 F H R V

9 AM – 1 PM. *Spr:* Stanwood-Camano ARC. Stanwood Middle School, 9405 271st St. NW. 147.360 (127.3 Hz). *Adm:* $5. **www.scarcwa.org**

West Virginia (Ripley) — May 5 D F H S T V

8 AM – noon. *Spr:* Jackson Co. ARC. Ripley Middle School, 1 W. School St. *Tl:* 146.67 (107.2 Hz). *Adm:* $5. **www.jcarc.net**

Wisconsin (Green Bay) — June 1 D F H R T V

8 AM – noon. *Spr:* Green Bay Mike & Key Club. Our Saviour Lutheran Church, 120 S. Henry St. *Tl:* 147.120 (107.2 Hz). *Adm:* $5. **www.k9eam.org**

To All Event Sponsors

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

Events that are sanctioned by ARRL receive special bene-fits, including an announcement in these listings and online. Sanctioned conventions are also listed in *The ARRL Letter.*

Field Organization Reports — February 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**.

585
AD8CM

380
WA3EZN

370
N9VC
W7EES

337
W9EEU

326
KE8BYC

277
W7PAT

260
N2LC

255
WØPZD

250
KT2D

220
KC8YVF
ND8W

204
KD2LPM

200
WB8YYS

195
K8AMH

186
WV5Q

180
AC8NP
KV8Z
N8SY
W4DNA

165
N4CNX

164
KE8DON

161
KD2QAR

160
WA3QLW

158
WM2C
KB3YRU

155
KC8WH

152
ACØKQ
KE8ANW

149
KO4KUS

145
KD8ZCM

140
K7OED

WO2H
KF5OMH
KW1U
N1ILZ

137
W4CAC
KC8T

135
KB9IME
KC9FXE
W2PAX

132
W3YVQ

130
AG9G
KM4WXX
KD8UUB
N2JBA
K4DL
KR4PI
N1UMJ
WZØC

125
K4NWX
K9LGU
KE8RS
KE5YTA

121
W7FSC
K8MDA

120
WC4FSU
WA4VGZ
N2DW
KA9QWC
NA7G
N7IE
W4CMH
K3JL
W2AH

115
WB9WKO
NI2W
KF5IOU
KC1HHO

114
K3EAM

110
AD4DO
NØDMP
WB8TQZ
KDØHHN
K1UAF
K5ANP
KA2HZP
KB2QO
NW3X
N1IQI
W1RVY
N1LAH
KC1KVY

106
WD8SDH

102
KT4WX

100
KZ8Q
WB4RJW
KM4WHO
NX9K
KB8PGW
KB8GUN
WB8SIQ
AA3SB
W4EDN
K1CFI
KA5AZK
K3YAK
W1LEM
W1TCD

99
WK4WC
WW3S

97
KG5NNA

96
KV2J

95
KE8HKA
W8GSR
N8MRS
K2MTG

94
KC3MAL

93
KG5AOP
KB1NMO

92
KD2TDG
WB2VUF

90
KB9GO
KC9UC
W8IM
N3SW
WB8R
K8ED
KL7RF
K8KRA
KB8HJJ
W8MAL
N8OD
W4KX
N2GS
W2QMI
WX2DX
N1CVO

89
W2OOD

88
KF7GC
AB9ZA
WA3QPX

87
WB8RGE

85
W7MIN
AA3N

84
KB1NAL
N1PZP
K4FHR

83
KBØDTI

82
NØET
W4TTO
WA2BSS

81
KB3MXK

80
KB4OLY
AE2EY
KA8BJA
KR4ST

78
K1XFC

77
W5XX
N5RH

76
K8RDN

75
WB4ZDU
W4NHO

74
KAØDBK

73
KE8CYC
N7UWX

72
N2TSO

71
K6RAU
KD2YYK
K2PHD

70
W9BGJ
KN4AAG

The following stations qualified for PSHR in previous months, but were not acknowledged in this column yet. (Jan. 2024) K1UAF 110, W1FEA 108, N1PZP 86, KAØDBK 77.

Section Traffic Manager Reports

The following Section Traffic Managers reported: AK, AL, AR, AZ, CO, CT, DE, EMA, ENY, EPA, IN, KS, KY, LA, MDC, MI, MO, MS, NC, ND, NE, NFL, NH, NLI, NNJ, NTX, OH, OR, RI, SD, SJV, SNJ, TN, UT, VA, WCF, WMA, WPA, WV, WY.

Section Emergency Coordinator Reports

The following Section Emergency Coordinators reported: CT, DE, ENY, EPA, GA, MI, MO, NE, NFL, NLI, NM, NNY, NV, OH, PAC, SCV, SNJ, STX, TN, VA, WCF, WMA, WPA, WY.

Brass Pounders League

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

NX9K 2,484, W2AH 1,347, WB9WKO 983, KW1U 847, N1IQI 842, KE5YTA 784, WA3QLW 720, N9CK 610, K8ED 588.

Christina Lessard, KC1TDM, clessard@arrl.org

At the Foundation

New ARRL Foundation Grant Recipients and Updates

Following the October 2023 grant submission period, the ARRL Foundation Board of Directors voted to approve funding for five grant proposals.

ARRL Grant Recipients

The Montgomery Amateur Radio Club (MARC) in Silver Spring, Maryland, received a grant for instructional materials for 40 Boy Scouts to participate in the Radio Merit Badge program during the MARC and Damascus Emergency Communications Team joint Field Day.

The Yonkers Amateur Radio Club in Yonkers, New York, received a grant to purchase ARRL publications, including *The ARRL Handbook*, antenna manuals, five US frequency band charts, and the *ARES Field Resources Manual*, and 10 handheld radios for training and instructional demonstrations.

A grant was given to the Afterschool Programs of Lancaster, Ohio, to hold a Wireless Technology and Family STEM Night at five elementary schools. Activities will include learning the history of Morse code, writing and spelling words in Morse code, using an MFJ oscillating keyer, exposure to a STEM trailer, and building a paper circuit.

Augusta Preparatory Day School in Augusta, Georgia, received a grant to purchase additional parts for their AMSAT CubeSAT Simulator.

The Alabama School of Cyber Technology and Engineering in Huntsville, Alabama, received an award to purchase two complete sets of foxhunting equipment.

To learn more about the ARRL Foundation Grant Program, please visit **www.arrl.org/amateur-radio-grants** or contact ARRL's Development Operations Manager Christina Lessard, KC1TDM, at **clessard@arrl.org**.

ARRL Foundation Receives $2.1 Million Funding Commitment from ARDC

In a December 2023 news release (**www.arrl.org/news/ardc-and-arrl-announce-2-1-million-for-the-next-generation-of-amateur-radio**), ARRL announced a $2.1 million funding commitment from Amateur Radio Digital Communications (ARDC) to support three areas, including scholarships for higher education, STEM education programs, and the ARRL Club Grant Program. Through its philanthropy, ARDC is supporting transformational programs that will significantly impact amateur radio's future. Many thanks to the ARDC board for its strong vision for the future.

Conceived in 2022, the ARRL Club Grant Program is administered by the ARRL Foundation conjointly with the ARRL Field Organization. After the success of the first two rounds of funding, ARDC and ARRL want to continue this important program by encouraging clubs to revitalize the critical aspect of their role, with the support of available funding in one of the following categories: ham skills development, STEAM education, or club station improvement, among others. More details are available on the ARRL Foundation website at **www.arrl.org/club-grant-program**.

New ARRL Foundation Elections

Elections were held at the Foundation's Annual Meeting on January 30, 2024. David Norris, K5UZ, was reelected as President. David Minster, NA2AA, was elected Vice President. Rick Niswander, K7GM, was reelected as Treasurer, and Christina Lessard, KC1TDM, was elected Secretary. Mark Tharp, KB7HDX, was elected as a Director of the Board, and Mike Ritz, W7VO, came off the Foundation's Board of Directors to serve as Second Vice President of the ARRL Board.

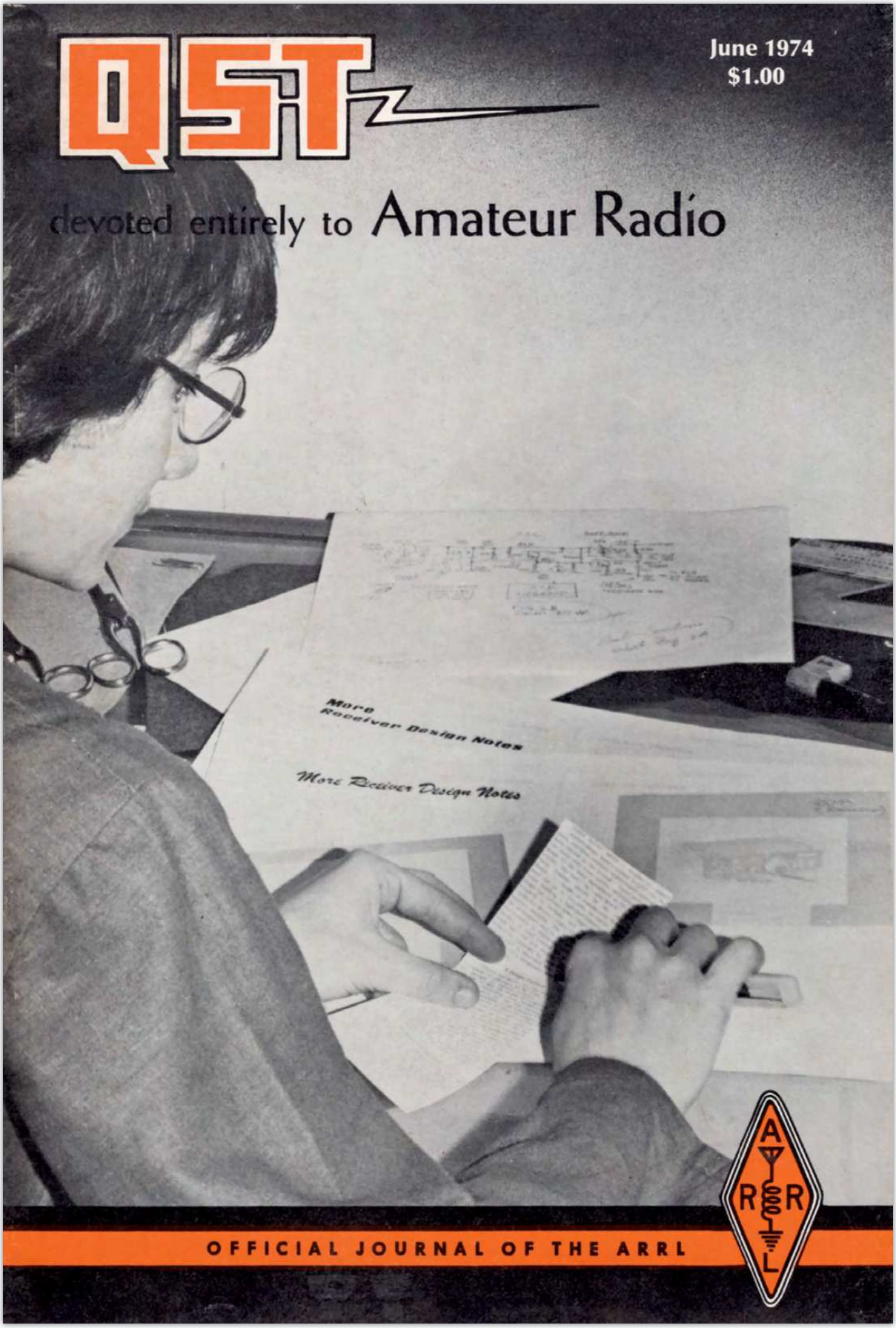
The Foundation Board is comprised of the following individuals: President David Norris, K5UZ; Vice President David Minster, NA2AA; Treasurer Rick Niswander, K7GM, and Secretary Christina Lessard, KC1TDM. The following individuals are Directors of the Board: Kermit Carlson, W9XA; Bill Lippert, AC0W; Carl Luetzelschwab, K9LA; Ed Snyder, W1YSM; Mark Tharp, KB7HDX; Craig Thompson, K9CT, and Art Zygielbaum, K0AIZ.

Strays

QST Congratulates...

The Young Ladies Radio League (YLRL), K4LMB, for achieving their 85th anniversary. Ethel Smith, W7FWB, began the YLRL in 1939 to encourage women to enter the realm of ham radio. Today, the YLRL nets and members can be found all over the world. The YLRL will host their anniversary convention on July 11 – 14, 2024, at the Dixie Convention Center in St. George, Utah, in conjunction with HamCon:Zion and the ARRL Rocky Mountain Division Convention.

A Look Back


QST
June 1974
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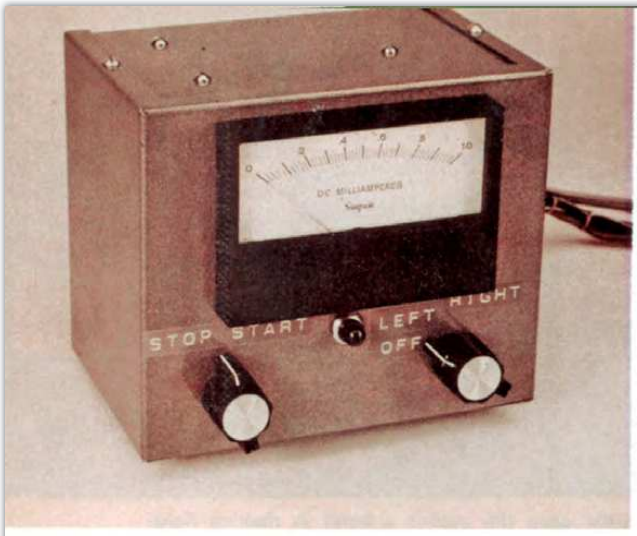
devoted entirely to Amateur Radio
More Receiver Design Notes
OFFICIAL JOURNAL OF THE ARRL



A Directional Indicator for the Hy-Gain Model 400 Rotor

BY ROBERT M. MYERS,* W1FBY

THE HY-GAIN rotator system is a heavy-duty rotational device which can be used to turn large arrays. The control box is designed to have a direction dialed on the front-panel compass face and when power is applied to the unit, the rotator will turn the antenna to the designated heading and then shut off automatically. While the automatic feature is handy for casual operating, the dedicated DXer or contester might like to have an indication of the antenna (or rotator) position during the turning period. The control system described below was designed to be used in place of the Hy-Gain control unit, and with the exception of the motor capacitor, no parts from the original control box are used. The rectifying components which power the rotator brake are located in the rotator as provided by the manufacturer. If a component fails the rotator must be removed from the tower for repairs. For this reason, two extra conductors were added to the existing control cable and the brake power components were placed in the control box.

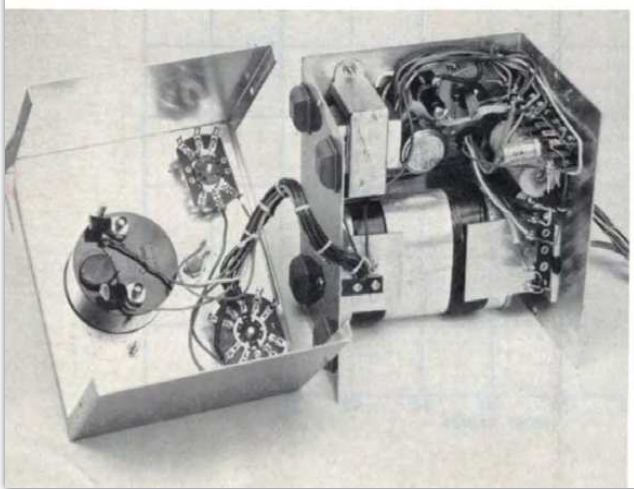
The modification of the rotator is best done in the workshop. These modifications can be performed while standing on the tower with the mechanism mounted in position, but it is much more difficult.

* Asst. Technical Editor, *QST*.

The first step is to remove the two diodes, the electrolytic capacitor, and the 10-ohm resistor from the motor housing. The terminal strip is set up for five screw positions. Originally the two diodes were connected to a sixth terminal which will be used for the brake control. A seventh wire will be required for the indicator system. Connect this wire to the *unused* terminal of the potentiometer and route it out through the rubber bushing. It then may be spliced into the rotator control cable which has been modified for seven conductors. The two new wires do not handle much current and therefore need not be greater than No. 18 for runs up to 250 or 300 feet. This completes the modification of the rotator motor assembly.

The construction of a control box is the most difficult portion of the project. For the model shown in the photographs, a Minibox, sized to house the meter and control knobs, was used. The overall dimensions of the housing will be determined by the size of the meter frame. For calibration purposes, a large meter-face area is desirable.

The Hy-Gain 400 rotator is designed to have about 30 degrees of rotational overlap. Unfortunately there are no end-of-rotation limit switches provided, and it is possible to turn the motor around several times in the same direction. Needless to say, the coaxial feed line will not withstand this kind of treatment. In order to keep



Inside view of the rotator control box. The meter and two switches are located on one half of the housing. A long cable is used to connect the switches and meter to the other half of the container.

QST for

the control circuitry simple, it was decided to use two switches, one for turning on the power to the system, and one for determining the direction of rotation. The ROTATE switch needs to be spring-loaded for the OFF position. The purpose is to assure that the operator keeps his mind on what he is doing while the antenna is rotating. The spring loading acts as a "dead-man" switch – one cannot go away and leave it turned on.

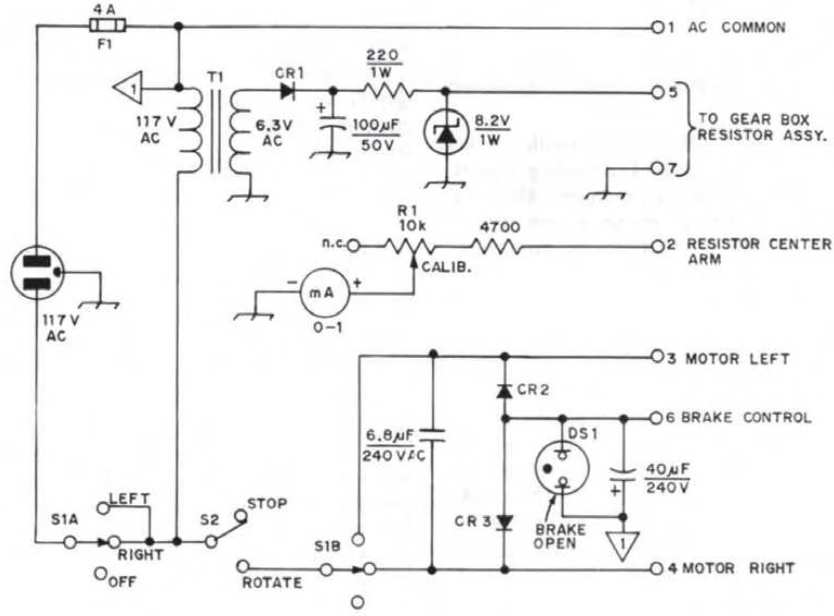
The circuit for the control box is given in Fig. 1. A conventional low-current (less than one ampere at 6.3 V) transformer is used to provide a regulated 8.2 volts dc to drive the indicator circuit. The value of the voltage is not critical, and any voltage from about six to as high as ten will suffice. Regulation is desirable to assure the calibration won't change under different line-voltage conditions. R1 is a linear-taper, two-watt composition control. The meter is a Simpson Electric model 523. The internal resistance is 43 ohms.

Control of the brake at the rotator is provided by the 120 volts of dc developed by CR2 or CR3 in the control box. The voltage appears at terminal six each time voltage is applied to the rotator motor. A small pilot lamp is included to assure the operator that the brake-release mechanism is receiving power.

The potentiometer in the rotator housing is gear driven to allow the antenna to turn approximately 380 degrees while the resistor turns through only about 270 degrees. The easiest way to calibrate the overall system is to turn the rotator motor until the potentiometer is at midposition of its travel. This can be determined with an ohmmeter by observing the resistance between control wires two and seven. Since the value of the potentiometer is approximately 5000 ohms, an ohmmeter reading of 2500 will indicate correct positioning. Next, the rotator should be installed and the antenna pointed so that its heading is correct for the center heading given by the indicator. Then the antenna should be rotated 180 degrees as *noted by visual inspection of it.* Do not use the control box for the indication. After the antenna has been rotated 180 degrees, the indicator may be labeled for the correct position. Rotate the antenna 360 degrees in the opposite direction, again observing the antenna (not the control box). When the array is at the correct heading, the control-box indicator may be marked accordingly. With the system shown in the photographs, the center was set for north. South appears on the meter at 15 and 85 percent of full-scale deflection.

Operation of the new control box is simple. The operator should first select the direction he wants to turn the antenna, then select the ROTATE position of S2. Since the indicator provides continuous indication of the antenna heading, one can observe the bearing even when the antenna is not rotating. Selecting the OFF position of S1 completely disables the rotator control box. QST

Fig. 1 — Circuit diagram for the rotator control box. The 6.8-μF, 240-V ac capacitor is taken from the original Hy Gain control box. CR1, CR2, and CR3 are conventional power diodes, 1000 PRV at 1 A. T1 is rated for one ampere. R1 is a linear-taper composition two-watt control. S2 is a spring-return type of rotary switch.

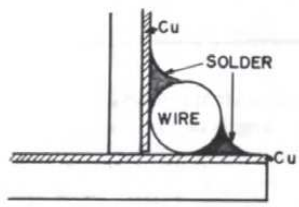


Hints and Kinks For the Experimenter

RF-TIGHT ENCLOSURES FROM PC BOARD

When constructing high-performance receiving equipment for the vhf and uhf bands, proper shielding from the outside world and between various sections of a system is mandatory. A popular and very inexpensive means to achieve this end is to build small boxes from scraps of double-sided pc board. While the results are nearly as good as the most exotic professional techniques, the method has one deficiency – once the box is soldered together, it's nearly impossible to get it apart again! This is a bit frustrating when expensive components are used and circuit modifications are contemplated.

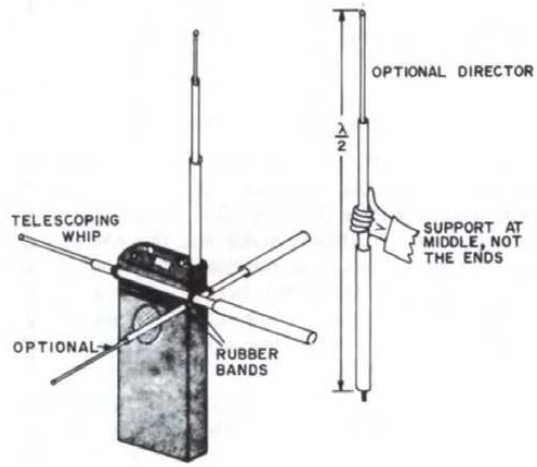
A less committable approach to the problem is to build an rf-tight box without the usual lid, again using double-sided pc board. Then, after initial circuit adjustments are made, the shielding is completed with a lid which is soldered to the box. However, prior to final soldering, a file is used on the edges of the box to remove the copper adjacent to the lid. A piece of bare copper wire is then used to bridge the electrical gap that would otherwise exist. A cross-sectional view is shown in the drawing. Later, when (*not if*) it's necessary to change the circuit, the wire is easily peeled away with a pair of long-nose pliers and a medium-sized soldering iron. – *Wes Hayward, W7ZOI*



INSTANT GROUND PLANE FOR WALKIE-TALKIES

The performance of hand-held equipment can often be improved by the addition of a simple ground plane. Attach a whip antenna (such as that used with a transistor radio) with rubber bands to the base of the walkie-talkie as shown. You will note a difference in radiation efficiency.[1]

The radials should be adjusted in length to a quarter wavelength or better yet, they should be tuned by watching a field strength meter. A simple field-strength meter can be jury rigged by placing a 1N34A diode (or equivalent) across the test-lead terminals of a VOM set in the microampere range. The test leads themselves act as the pickup antenna.



By holding a telescoping whip in front of the radiator with the radial(s), you should note an increase in signal strength. Stand with your back against a metal post which will act as a reflector. Even a quarter-wavelength wire is better than no counterpoise. – *Katashi Nose, KH6IJ*

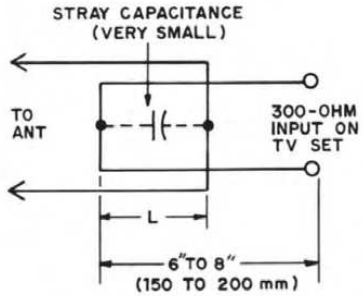
A SIMPLE CURE FOR TVI

The seemingly ever-present problem of TVI may occur even though the rig may be properly shielded and adjusted to prevent harmonic radiation. The TVI is then likely to be caused by pickup on the television Twin-Lead and being coupled into the front end of the TV receiver, overloading it. This signal energy is coupled to the TV set in "common-mode" fashion – that is, the Twin Lead acting as a single conductor.

Most TV sets have very little rejection to this type of signal, as may be demonstrated by disconnecting one side of the Twin-Lead. A simple method of increasing this common-mode rejection, and thereby reducing TVI, is to add an inductive coupling loop in the Twin-Lead. The procedure is to cut the Twin-Lead about 6 to 8 inches (150 to 200 mm) from where it enters the set. Short each of the cut ends and overlap the ends approximately 1 to 4 inches (25 to 102 mm). The amount of overlap used should be the smallest amount

[1] [EDITOR'S NOTE: The roof of a car also makes an effective ground plane for small hand-held vhf receivers such as those used for ESSA weather broadcasts. While not very convenient for transmitting applications, it can often mean the difference between solid copy and not hearing the station at all.]

possible that will still give a satisfactory picture on all channels. It would be wise to start with the lower frequency channels first. Once the proper amount of overlap is found, secure the two leads with electrical tape. This trick will often cure TVI problems without resorting to buying high-pass filters or making modifications to the TV set. Doubtless, the TV owner would appreciate not having to incur service charges for this type of problem.



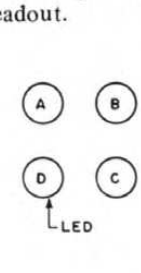
The circuit functions as a one-to-one transformer. The overlap distance, *L*, controls the coupling and inductance. The balanced currents from the antenna are coupled with little attenuation. Common-mode signals, on the other hand, must be capacitively coupled by the conductor-to-conductor capacitance which is very small due to the short overlap distance. – *Wilmer Radke, K7MCL*

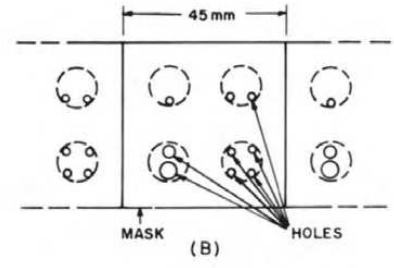
A SIMPLE BCD CONVERTER AND READOUT

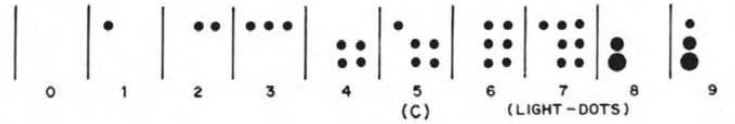
The arrangement shown will take a binary input and convert it directly to a decimal readout using four lamps (or LEDs). This eliminates the need for decoder/drivers, Nixie tubes or neon lamps and provides the ultimate in a low-cost readout.

Each decade digit consists of four lamps in back of a mask as shown in the drawing. The lamps correspond to the binary positions for 1, 2, 4, and 8. One hole is drilled in the mask for the "1" position, two holes for the "2" position, and four holes for the "4" position. A small hole over a larger one is drilled to represent the "8"

In reading the display, one could merely count up the lighted dots (except for 8 and 9). But with a little practice, the digits can be read on sight. The figures for 1, 2, 3, 4, and 6 resemble the numbers themselves (with a little imagination). Only 5 and 9 are new but can be learned with little difficulty. – *Peter Hansen, DK4YD*





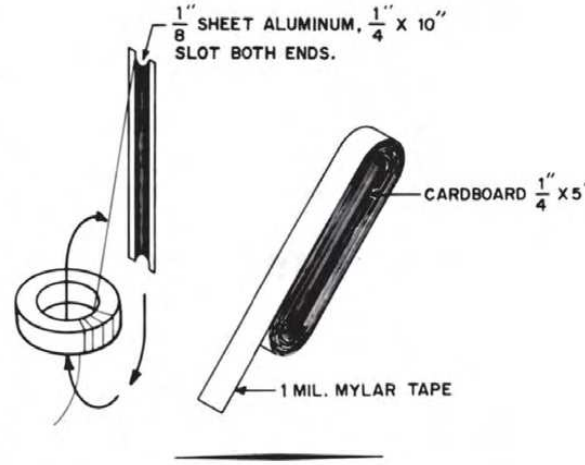


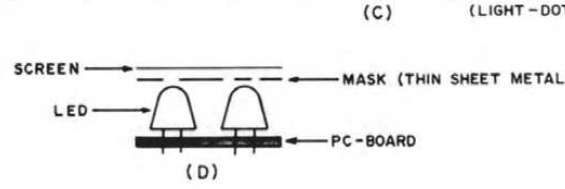
EASY WAY OF WINDING TOROIDS

Here is a way of winding toroid inductors, especially ones with many turns. A bobbin is made from thin aluminum stock (No. 18 to No. 14) 1/4 × 10 inches (0.6 × 25 cm) on each side. Thinner or wider bobbins can be made for particular toroid diameters. A slot is made in each end (make two cuts with a hacksaw and break the tab with a pair of long-nosed pliers) and the wire is then wound on the bobbin as shown.

The bobbin and the wire can then be passed through the core all at once, alleviating the need to pull ten or twenty feet of fragile wire through for each turn. Remember that the diameter of the hole will decrease as the number of turns increases.

Also, for the professional touch, and some extra protection for the windings, a layer of tape can be added in much the same way. Wind 1-mil Mylar tape on a suitable piece of cardboard and then rewind it back over the inductor. The above method results in a toroid that is easier to build and is better to look at. – *Ken Voelker, WB6KBI*





Certificate of Code Proficiency Recipients

Sponsored by

www.i2rtf.com

This month, ARRL recognizes merit and progress in Morse code proficiency on the part of the following individuals, who have achieved proficiency at the following rates, in words per minute.

October 2023

Joseph P. Kononchik, KS1I	20

November 2023

Eric D. Benjaminson, WA9CEK	10
Paul K. Earhart, WD4OQH	10
Paul K. Earhart, WD4OQH	15
Alfred F. Hanzl, K2AL	15
Jerry W. Kerns, K6FN	15
Jerry W. Kerns, K6FN	20
John P. King, KA2F	20
David A. Rose, N8GZ	20
Robert D. Spearman, N5VUC	20
James C. Stekas, K2UI	20
Jerry W. Kerns, K6FN	25
John P. King, KA2F	25
Scott T. McNutt, N3ADP	25
Donald W. Brown, WØAF	30

December 2023

Matthew K. Jamison, KI5PGL	10
Andrew C. Kirk, WB2C	10
Richard F. Phillips, AEØQH	10
Erica W. Zavaleta, W7WXR	10
Russell L. Bast, Jr., AD2BO	20
James W. Carter, K7IOL	20
Alfred F. Hanzl, K2AL	20

January 2024

Charles W. Campbell, KØCWC	15
Douglas B. Diegert, N2KGT	15
George Wayne Moore, W8SUN	20

February 2024

Charlene K. Lewis, K8XCO	10
Douglas B. Powers, KD5DBP	10
Timothy J. Sinnott, KE2UM	10
Margot L. Wasz, KM6JWY	10
Lawrence Schall, KB2MN	20
Albert J. Whetter, W9WJ	20

March 2024

Bernard A. Poskus, KFØQS	20

Congratulations to all of the recipients.

May 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.

May Qualifying Runs will be transmitted by W1AW in Newington, Connecticut, at the times shown on 1.8025, 3.5815, 7.0475, 14.0475, 18.0975, 21.0675, 28.0675, 50.350, and 147.555 MHz. The West Coast Qualifying Runs will be transmitted by K9JM on Wednesday, May 22, at 9 PM PDT (0400 UTC on May 23) 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 test will be checked against the actual transmissions to determine if you have qualified.

Members of the North Fulton (Georgia) Amateur Radio League (**https://nfarl.org**) are offering to subsidize the total cost of a Code Proficiency certificate or endorsement submission for any individual age 21 years and younger, and who reside in either the US or Canada.

Participants who wish to make use of this offer should indicate on their Qualifying Run submissions they are age 21 or younger, and certify as such via their signature. Eligible participants are not required to send any fee with their Code Proficiency submissions.

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

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

W1AW Qualifying Runs — May 2024
(All times are in Eastern Daylight Time.)

Monday	Tuesday	Wednesday	Thursday	Friday
5/6 4 PM – 2000Z 10 – 35 WPM	**5/7** 7 PM – 2300Z 35 – 10 WPM		**5/9** 9 AM – 1300Z 10 – 35 WPM	
	5/14 4 PM – 2000Z 10 – 35 WPM	**5/15** 7 PM – 2300Z 10 – 40 WPM	**5/16** 9 AM – 1300Z 35 – 10 WPM	**5/17** 10 PM – 0200Z **(5/18 – UTC)** 10 – 35 WPM
5/20 4 PM – 2000Z 10 – 40 WPM	**5/21** 9 AM – 1300Z 10 – 35 WPM		**5/23** 7 PM – 2300Z 10 – 35 WPM	
	5/28 9 AM – 1300Z 35 – 10 WPM		**5/30** 4 PM – 2000Z 35 – 10 WPM	**5/31** 7 PM – 2300Z 10 – 35 WPM

Celebrating Our Legacy

Call Sign Coming Full Circle

At the National Museum of the United States Air Force, in the World War II Gallery, you'll discover the Bell P-39 Airacobra plane (**www.nationalmuseum.af.mil/Visit/Museum-Exhibits/Fact-Sheets/Display/Article/196306/bell-p-39q-airacobra**). Closer inspection will reveal the pilot's name, Lieutenant Leslie Spoonts, painted below the cockpit window. He served in Alaska with the 57th Fighter Squadron in 1942. I knew him as Uncle Les, W5WWX (SK).

Jim Giammanco, N5IB, at his station in 1964. Some of the equipment featured includes a Knight-Kit R-100A receiver and a Johnson Viking Challenger transmitter. [Jim Giammanco, N5IB, photo]

When I was 11, Uncle Les sent me a Heathkit CR-1 crystal radio kit for Christmas. My dad and I assembled it, I strung a wire outside my bedroom window, and the radio bug bit me. I wanted nothing more than to have a call sign of my own. At 16, with the help of my mentors, Dick, K5FXJ, and Joe, K5FZU, my Novice and Technician licenses became a reality. It wasn't long before that fascination morphed into a career path, and I knew I wanted to become an electrical engineer.

About 45 years later, after becoming an electrical engineer and a physics teacher at Louisiana State University, I was browsing the web for ham-related items. On a whim, I searched W5WWX online, and a QSL card popped up from the late 1950s! The card came home to my shack to be framed and displayed in a place of honor. My son Ian became W5WWX, and that old QSL card now graces his study.

Jim Giammanco, N5IB
Baton Rouge, Louisiana

I Owe It to the Navy

Growing up on a dairy farm near a small town, I don't remember ever seeing a backyard full of antennas or hearing the words "ham radio." In 1958, at age 17, I became a Navy sailor. Many antennas were on the aircraft carriers, but none seemed to be attached to ham stations.

My patrol squadron was deployed to the Philippines, where I saw an antenna attached to a building with a sign on the front that said, "Navy MARS Station." I entered the room full of glowing tubes, and in a short time, I was operating a daily RTTY schedule and occasional phone patches. The first rig I operated was part of the Collins S-Line on a log-periodic antenna.

I wanted to continue this public service when we returned to our base in northern Florida, so I had to get my ham license. That's when I met Derrick, WA4TWM (SK), at the base's amateur radio club. He had his General license, was about 8 years younger than me, and had been in the Navy for about a year. I had been in the Navy for more than 9 years. He became my ham radio mentor, and I became his Navy mentor.

I got my Novice license and bought a Drake R-4B and T-4XB for my first rigs. I built a wide-range antenna coupler from the 1962 *ARRL Handbook*, which is still in use today, and I acquired a Model 15 teletype machine. I eventually upgraded to the Technician license, and as time went on, I operated MARS from Florida; Washington, DC; Mississippi; Guam, and Diego Garcia.

After I retired from the Navy, I operated with a search and rescue group for a number of years, but with my kids getting older and my career advancing, ham radio took a back seat for a while.

Now, I am retired again and have found enjoyment on the air. I don't think I will ever forget being in a room with all those glowing tubes.

Mike Brown, WA7JLL
Grand Junction, Colorado

The 40-Meter Novice Group

We were a group of high school kids living in the New York City area in the early 1950s. We met on the 40-meter Novice band daily. Novices were limited to 75 W crystal controlled in band segments on 80, 40, and 11 meters. My first call sign was KN2DGR.

The 11-meter band was often out of bounds due to television interference, so 40 meters was the band of choice because the antennas were smaller than 80-meter antennas and were better suited for our urban environment. However, in the late afternoons and evenings, powerhouse broadcasting stations such as BBC and Radio Moscow filled up most of the 40-meter space, so there was only a narrow sliver we could use, and there we met.

We were survivors of the attraction to 2-meter AM. Many of our compatriots got Novice licenses and SCR-522 surplus units. They spent a year on 2 meters, and when their license expired, so did their ham career.

One by one, we disappeared from the 40-meter Novice group. Occasionally, I've run into a ham with a call sign starting with K2D or K2DG, and when I mention my original call sign, there is instant recognition of those days.

Paul Danzer, N1II
Norwalk, Connecticut

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

George Misic, KE8RN, ke8rn@comcast.net

Classic Radio

The Hammarlund HQ-215 and Similar Radios of Its Time

The HQ-215 was the last product Hammarlund made that was aimed specifically at the ham radio market. It came out in 1968 and was similar in size, styling, and frequency conversion scheme to the highly successful Collins Radio 75S-1, 75S-3, and 75S-3B. It also used the same mechanical filters as the 75S-3B and 75S-3C receivers and had the same crystals used to activate frequency coverage as the Collins Radio S-Line and KWM-2. The HQ-215 could accommodate 13 extra crystals for added frequency coverage.

The Collins Radio 75S-3C used the same mechanical filters as the Hammarlund HQ-215. [Photo courtesy of **www.radiopics.com**]

The HQ-215 was a solid-state receiver at a time when most ham gear used vacuum tubes, either exclusively or predominantly. The SideBand Engineers (SBE) SB-33 and SB-34 transceivers for 75 to 15 meters were part of the first big breakout into solid-state ham equipment. They each used only three tubes, two final amplifiers and one driver amplifier in the transmitter. The Galaxy III and V SSB/CW transceivers for 80 to 20 or 80 to 10 meters used a few solid-state devices, along with mostly vacuum-tube devices. Transistors were not in use yet for the output stages in the 100 W output class of ham radio transmitters and transceivers.

Overall Design

The Hammarlund HQ-215 was built with bipolar negative-positive-negative silicon transistors that were used throughout the receiver. It was new enough to avoid the use of germanium transistors like those used in the earlier mostly solid-state SBE SB-33 75- to 15-meter SSB transceiver and the highly regarded Davco Electronics DR-30 SSB/CW/AM receiver. No field-effect transistors or integrated circuits were used in the HQ-215. They had already been invented at this time but had not trickled down to consumer products yet.

The HQ-215 followed the block diagram of the S-Line receivers quite well, with each stage redesigned to use bipolar transistors in place of vacuum tubes, which were used virtually everywhere outside of advanced military designs and in the few items of ham equipment using solid-state engineering. None of the circuitry was unique or new. It worked quite well and would match the performance of most of its contemporaries. Having been built with all bipolar transistors, its dynamic range was not quite as good as some of the well-engineered vacuum-tube receivers of the time, but in most operating situations this wasn't an issue.

VFO and BFO

The variable frequency oscillator (VFO), like the permeability tuned oscillator used in the Collins Radio S-Line and KWM-2, covered 2.50 to 2.70 MHz. When switching sidebands, the VFO in all the radios mentioned in this article shifted the VFO frequency to compensate for the slight shift of the beat frequency oscillator (BFO) from one side of the mechanical filter passband to the other. This was done with virtually all equipment, except for the R. L. Drake TR-3 and TR-4 transceivers, which used two separate crystal-lattice filters — one for USB and one for LSB — both with the same carrier frequency. The SBE SB-33 and SB-34 eliminated any shift in frequency when switching sidebands with the clever circuit design of a fixed second IF of five times the first IF of 455 kHz. Conversion

from 455 to 2275 kHz was done by mixing four or six times the first IF carrier frequency with the 455 kHz IF after the mechanical filter for selectivity. This gave an output at the second IF using LSB or USB, depending on whether four or six times the 455 kHz was used. Some radios, like those of Swan Electronics, used two curser lines (one for each sideband). This was crude but fairly effective.

Like the later Collins S-Line receivers, the HQ-215 used a crystal-controlled BFO on sideband and a free running tunable BFO for CW and frequency-shift keying operation. With a frequency readout of greater than 1 kHz, the Collins rigs and the Hammarlund HQ-215 needed to have the VFO shifted to read out the received frequency accurately when operating on SSB.

An advertisement introducing the Hammarlund HQ-215 to the market was printed in the March 1968 issue of *QST*.

Hammarlund's Dissolution

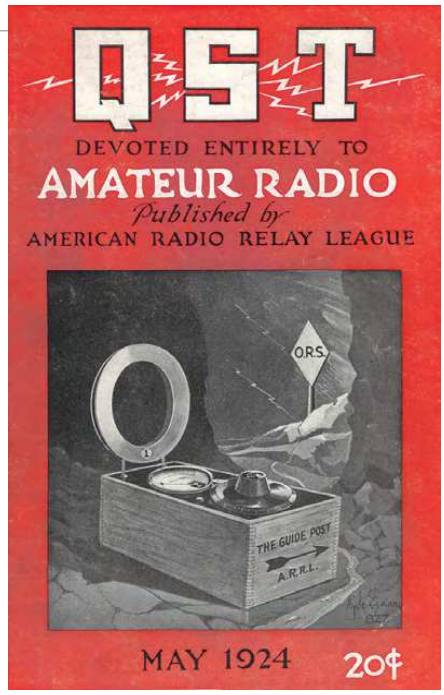
Collins Radio paved the way for many ham radio manufacturers. Companies that followed their lead, such as Heathkit, R. L. Drake Company, and a variety of Japanese manufacturers, often found success. Others who didn't, like Hammarlund, National Radio Company, and Radio Manufacturing Engineers (RME), were unable to last as long in the market.

Collins Radio taught the concept of a crystal-controlled first conversion to achieve much greater frequency stability and frequency readout. This concept — which was widely copied by other successful ham radio manufacturers — was used in creating the Collins 75A receiver in 1946. Collins built the first transceiver for SSB and CW in 1957, but Hammarlund and RME never made transceivers. Collins also made receivers and transmitters that could transceive with the operating frequency of both being controlled by one unit. R. L. Drake Company and Heathkit picked this up right away, as did Japanese manufacturers, but National Radio Company, Hammarlund, and RME never used the idea.

Starting with the KWM-1 transceiver and the S-Line receiver and transmitter pair, Collins Radio began making their equipment smaller, lighter, and more physically attractive. National Radio Company and Hallicrafters made a few transceivers that were quite successful for a while. The HQ-215 was the right size, style, and frequency stability to be successful, but Hammarlund never made a companion unit for an integrated station that looked like a set. Collins Radio, Heathkit, R. L. Drake Company, and Japanese manufacturers like Yaesu and Kenwood made all of their units capable of being part of a matching, complete ham radio station that included a transmitter, receiver, station console, and linear amplifier. The only Hammarlund transmitter that had outputs to facilitate transceiving was the HX-50 SSB/AM/CW transmitter. Hammarlund never made a receiver that could transceive with their HX-50, which was usually shown with a Hammarlund HQ-170A or HQ-180A, both of which were not good candidates to transceive with anything. The HQ-215 used the same frequency mixing scheme as the Collins Radio S-Line receivers, and with some effort, the HQ-215 could have been made to transceive with an S-Line transmitter, but I doubt this was ever done. The Hammarlund HQ-215 and HX-50 couldn't transceive with each other because the IF and the frequency mixing scheme in each design were incompatible.

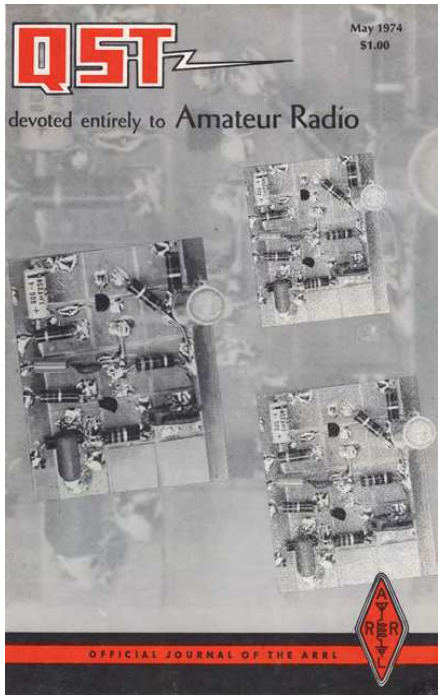
Eventually, Hammarlund dissolved in 1973 as one of the oldest companies in the US to produce radio equipment.

100, 50, and 25 Years Ago



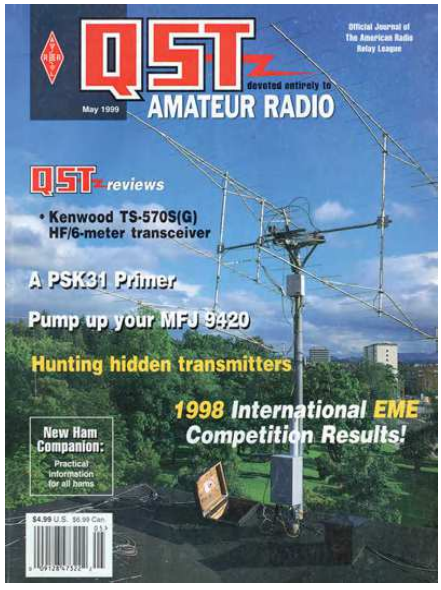
May 1924

- The cover illustration shows that A.R.R.L. is "the guide post" to the prestigious O.R.S. appointment.
- "Editorials: The New White Bill" discusses the White Bill (H.R.7357), pointing out that, if passed, it would replace the 1912 radio statute, and would not mention amateur radio by name at all.
- Dr. A. Hoyt Taylor reports on "The Navy's Work On Short Waves" and urges amateurs to continue to submit listeners' reports on the USS *Shenandoah*'s new 100-meter set.
- During a meeting in Paris, France, on March 12, 1924, a gathering of nine country representatives discussed the formation of the "International Amateur Radio Union." Hiram Percy Maxim, 1AW, shares the details.
- F.H. Schnell, 1MO, announces the standard A.R.R.L. practice of using CQ in "How To Use CQ."
- How desired measurements can be made using instruments owned by an average amateur is explored in "Capacity and Inductance Measurements for the Amateur" by Frank Reid Stansel.
- A stay on Stannard Rock Lighthouse is related in "An Amateur in the Lighthouse Service" by C.H. Wesser.



May 1974

- The cover shows the assembled audio board made in "Learning to Work with Semiconductors, Part II" by Doug DeMaw, W1CER, and Lew McCoy, W1ICP. This part of the project continues with rules of thumb for building a suitable high-gain bipolar-transistor receiver audio section.
- "It Seems to Us…Why 'IARU News'?" discusses the reasons that the activities of the IARU are important.
- If audio hum and hiss are bothersome, "The SSB Crud-O-Ject" by Robert M. Myers, W1FBY, a band-pass filter for phone operation, may help.
- Construction and alignment instructions for a complete-coverage transceiver that is flexible enough to add one's own ideas are shown in "The VE3GSD Transceiver" by William Weiser, VE3GSD.
- Up-to-date tips on making the most of an exciting VHF DX medium — meteor scatter — appear in "VHF Propagation by Meteor-Trail Ionization" by Walter F. Bain, W4LTU.
- In "Hints and Kinks," Richard M. Smith, W1FTX, shares his method of "Adding Elevation Control to a VHF Yagi."
- Questions on operating Oscar are answered in "Oscar News: How Do I Work Through Oscar?" by David Sumner, K1ZND.



May 1999

- An EME antenna array at LA1K, the Akademisk Radioklubb in Trondheim, Norway, is shown on the cover.
- The Golden Age of Amateur Radio is *right now*. David Sumner, K1ZZ, shares his thoughts in "It Seems to Us…Just Do It."
- The 1998 IARU World Championships were the first time an ARRL team competed against the world's best Radio Orienteers in the forests of eastern Hungary. The story is in "Amateur Radio Direction Finding" by Dale Hunt, WB6BYU.
- A radio-direction finder is useful in locating repeater interference and transmitter "fox hunting." Join the fun with "A Doppler Radio-Direction Finder, Part 1" by Mike Kossor, WA2EBY.
- A handheld and a reciprocal license provide a lot of international fun and goodwill. Bob Witte's, KBØCY/7J1AUE, story is in "VHF FM Portable in Japan."
- Administration changes are shared in "Amateur Radio World: New IARU Leadership Team Chosen."
- In "Public Service: A Halloween to Remember in Kansas," Roger N. Wilson, KDØAY, relates the events of the 1998 Halloween flood near Wichita, and Amateur Radio's response.

Silent Keys

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

v K1BBZ **Milardo**, Patrick S., Venice, FL
K1BO **Walker**, William B., III, Hickory, NC
KD1C **Cutbush**, David E., Byron, GA
vW1CGI **Perrone**, Anthony, Jr., Pawcatuck, CT
v•K1FIR **Little**, Paul A., Port St. Lucie, FL
♦K1GB **Bello**, Gordon T., Waltham, MA
v♦KB1I **Tourigny**, James L., Warwick, RI
•W1JMH **Himmelfarb**, Martin, St. Petersburg, FL
♦KA1QG **Conner**, Jack E., II, South Freeport, ME
N1ZJR **Howard**, Herbert G., Bethany, CT
W1ZS **Eldridge**, Burton F., Brattleboro, VT
vKD2DUI **Birdsong**, Edward L., Somerset, NJ
vKR2E **Plache**, Paul John, Scottsdale, AZ
vWB2EJG **Martin**, James V., Jr., Oneida, NY
AC2GF **Barker**, Chuck, Cheektowaga, NY
v♦W2GJS **Abercrombie**, Albert D., Hendersonville, NC
♦W2IX **Lauri**, Frank J., Orlando, FL
v♦K2IYE **Camposano**, Frank W., Jr., Whiting, NJ
N2KDK **Campano**, Paul F., Berkeley Heights, NJ
vW2KSO **Suominen**, Kenneth, Toms River, NJ
•N2NJJ **Skibinski**, Edward E., Tonawanda, NY
WA2PYK **Cottrell**, John, Farmingdale, NY
WB2QJA **Benda**, Richard L., Spofford, NH
vWB2TAD **Callahan**, Robert A., Clay, NY
K2WO **Sereikas**, George A., St. Augustine, FL
NN3AS **Walker**, Norman L., Waynesboro, PA
KA3CQM **Olson**, Gary A., Kane, PA
v♦W3FXE **Miller**, Ralph P., Elizabethtown, PA
K3JPT **Thompson**, Jim P., North Hopewell Township, PA
vW3LM **Davis**, Roger L., Clermont, FL
vW3NR **Dout**, Edward S., Chickamauga, GA
KC3POG **Thompson**, Jeffrey W., Orefield, PA
KB3PQP **Minerly**, Harry E., Elmwood Park, NJ
vKB3VS **Folmar**, Robert W., Sweet Valley, PA
WB4ACC **Tincher**, William I., Winchester, VA
vKK4AQX **Sheats**, Lilburne Dean, Gainesville, VA
N4BBB **Yates**, George Scott, Columbia, TN
v♦W4BLO **Steingold**, Lewis B., Virginia Beach, VA
vW4CBM **Shupe**, Richard D., Dublin, VA
W4CHC **McCook**, James W., III, Macon, GA
vK4CLF **Fussell**, Clifton L., Polk City, FL
WB4DMM **Collier**, Monroe, Jr., Tallahassee, FL
KI4ENU **McCormick**, Jeanette L., Georgetown, KY
vKR4ET **Fletcher**, John T., Tuscaloosa, AL
vWA4EZR **Schirra**, Charles N., Powhatan, VA
KO4FCO **Moore**, Robert W., Dyer, TN
vKC4FIG **Johnston**, L. Thomas, Monroeville, AL
vK4FJK **Semones**, David G., Jeffersontown, KY
KG4FJW **Kauffman**, Keith F., Scottsboro, AL
KI4FKZ **Sorrow**, Henry F., Carlton, GA
KE4FL **Barra**, Jose S., Palm Coast, FL
WA4GEH **Williams**, Lynwood A., Jr., Clayton, NC
vW4GFJ **McAdoo**, John B., Jr., Greensboro, NC
vK4HJH **Holmes**, Harry J., Lilburn, GA
W4JWO **Barr**, Jack C., Canton, GA
K4KWH **Oxendine**, Jerry W., Belmont, NC
vKE4LXW **Winner**, Fred P., Castalia, NC
vW4MFE **Eisenberg**, Marvin, Brookline, MA
W4MPJ **Speck**, Robert C., Punta Gorda, FL
vWB4MTK **Raines**, William F., Taylor, AL
vKJ4NB **Ridge**, Gary W., Moncks Corner, SC
vKD4NFI **Reynolds**, Robert J., Bloxom, VA
KN4NOZ **Genter**, Richard N., King George, VA
KK4NWR **Coleman**, Amy S., Thomasville, NC
vAB4OT **Whitener**, James E., Gastonia, NC
•KY4P **Lewis**, Charles L., West Jefferson, NC
vKE4QLL **Parker**, Joe C., Theodore, AL
v•KD4RPG **Mercer**, Jack A., Sr., Mount Holly, NC
KI4SLW **Koehler**, Bradley, Kennewick, WA
vKC4TMV **Jackson**, George E., Hopkinsville, KY
♦♦K4UEE **Allphin**, Robert C., Jr., Marietta, GA
vWA4VAG **Munson**, Joe, Walton, KY
vK4VDH **Hensley**, Jerry, Snowflake, VA
•KG4WEC **Pfendler**, Roger D., Camden, NY
W4WXA **Haskins**, Thomas H., Jr., Warner Robins, GA
K4ZXM **Krieger**, Don, Hanover, VA
WB5FQJ **Rinn**, Mel T., Hockley, TX
N5GHN **Reynolds**, Deborah, El Paso, TX
KD5JAQ **Krize**, Joy, Natchez, MS
vK5LGJ **Newport**, Ted J., Shreveport, LA
vK5MUO **Butler**, Thomas F., Magnolia, AR
K5SGO **Breaux**, Ira A., Jr., Morgan City, LA
vKE5SJ **Wolf**, Frederick W., Gautier, MS
vAA5SK **Kirsch**, Samuel H., Gulfport, MS
vK5TD **Tucker**, Robert L., Tulsa, OK
vKC5UZG **Freeman**, Edmond O., Midlothian, TX
vW5WSF **Scheinuk**, Jack, Fuquay Varina, NC
♦KA6BQF **Jenkins**, Robert R., Berkeley, CA
KA6CYN **Mooneyham**, Maxine, Winton, CA
WD6DMK **Mote**, Angeline J., Oxnard, CA
vK6ETM **Sinclair**, George M., Annandale, VA
WD6EZY **English**, Phoebe, Albuquerque, NM
WB6LHL **Braden**, Glenn N., San Diego, CA
♦WB6PIH **Osterman**, Barbara L., Yorba Linda, CA
♦K6PPJ **Williams**, Don E., Bakersfield, CA
vK6TDE **Furon**, Leon D., Woodland Hills, CA
WA6YAO **Beck**, Robert E., Fullerton, CA
v•NC7C **Carter**, William C., Ellensburg, W
W7EJO **Andersen**, Dean E., Tumwater, WA
v♦W7EKV **O'Connor**, Roderick J., Phoenix, AZ
vN7GUO **Price**, Wilfred L., Tucson, AZ
KJ7HPC **Noble**, William G., Harrison, MT
vKG7HRR **Conklin**, Jerry Lee, Kenosha, WI
KI7HSX **Wilson**, Betty J., Grangeville, ID
vW7JY **Lillie**, Gerald L., Eugene, OR
♦KF7LGL **Brainerd**, Barbara, Kamiah, ID
K7LOG **Commo**, Norman F., Jr., Yakima, WA
N7OWV **Bennett**, June L., Carson City, NV
vN7RD **Smith**, Ron D., Sun City West, AZ
vKG7SPC **Anderson**, Robert A., Springville, UT
WA7TSP **Johnson**, Greg C., Jefferson, NC
W7WBZ **Anderson**, Avon K., Loveland, CO
vWD8BOB **Hamilton**, Robert J., Colfax, WV
N8DXD **Hindelang**, Robert L., Grosse Pointe, MI
KC8EEV **Mitchell**, George B., Ashland, OH
W8ILS **Savela**, Ronald M., Calumet, MI
NZ8J **Cook**, Timothy K., Fairborn, OH
vN8JGG **Eagan**, Dennis E., Sturgis, MI
W8QO **Arndt**, Melvin L., Toledo, OH
AC8RX **Knoll**, David, Holland, MI
WA8TCL **Staeger**, Steve, Southfield, MI
WA8Y **Linley**, Steven, Midland, MI
K9BIF **Short**, Charlie M., Goshen, IN
•K9BJM **Petry**, Lawrence W., Hoopeston, IL
KD9DBU **Glasgow**, Brian A., Sr., Shelburn, IN
♦♦K9EID **Heil**, Bob, Belleville, IL
N9EWO **Zantow**, David W., Janesville, WI
vKA9EXC **Farkas**, Richard C., South Bend, IN
W9GKS **Sepic**, Frank J., Mesa, AZ
KC9JII **Taylor**, Donald R., Loogootee, IN
K9JWZ **Switlick**, Robert, Milwaukee, WI
WA9OIG **Davis**, Alan L., Greenfield, IN
v♦N9SK **Kirtley**, Sidney L., Sharpsville, IN
N9TOD **Skogen**, Todd W., Yorkville, IL
•N9TVJ **Barnett**, Mitchell D., Greencastle, IN
vKC9UFR **Novak**, Robert J., Bowler, WI
vKBØAJ **Cox**, Daryl A., Corydon, IA
WØKIZ **Gold**, Robert E., Castle Rock, CO
KBØMJU **Ladewig**, Duane J., Littleton, CO
KØNX **Scovell**, Phil, Denver, CO
vKKØO **O'Brien**, Mark A., Rose Hill, KS
NIØQ **Berkey**, James N., Clinton, IA
♦KØUS **Gobel**, Richard, Ames, IA
•NØXOO **Krogstad**, Doris V., Fosston, MN
VE3IJE **Thomas**, Thomas T., Wallaceburg, ON, Canada

♦ Life Member, ARRL
♦ Maxim Society
♦ Current Diamond Club
v Veteran
• Former call sign

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

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

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IC-7100 | *All Mode Transceiver*

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• VHF/VHF, UHF/UHF simultaneous receive • 50 watts of output on VHF and UHF • Optional VS-3 Bluetooth® headset • Easy-to-See large white backlight LCD • Controller attachment to the main Unit

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• 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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• Unmatched SDR Receiving Performance • Band Pass Filters Dedicated for the Amateur Bands • High Res 4.3-inch TFT Color Touch Display • AESS: Acoustic Enhanced Speaker System with SP-40 For High-Fidelity Audio • Built-in High Speed Auto Antenna Tuner

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Automatically tunes un-balanced/balanced antennas, ultra-fast and has 20,000 virtual antenna memories. Has antenna switch, efficient L-network, select 300 Watts (6-1600 Ohms or 150W 6-3200 Ohms). 1.8-30 MHz, 4:1 balun, backlit LCD. 1.5 inch Cross-Needle SWR/Wattmeter and LCD. Handles full power SSB/CW and *Digital*.

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MFJ Legal Limit *IntelliTuner*™ tunes any antenna automatically, ultra-fast and handles a full 1500 Watts SSB/CW and Digital! It's a comprehensive automatic antenna tuning center complete with SWR/Wattmeter, antenna switch for two antennas, wire connection and a 4:1 current balun for balanced lines. MFJ's exclusive *AdaptiveSearch*™ and *InstantRecall*™ algorithms give you ultra-fast tuning with 20,000 virtual antenna memories. 12-1600 Ohm Impedance matching.

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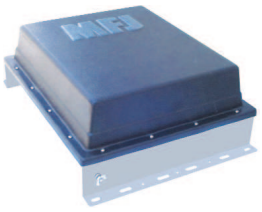

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It's the perfect match for Ameritron's ALS-1406, AL-80B, AL-82, AL-1200 and AL-1500 legal limit amplifiers! MFJ's 1500 Watt remote automatic antenna tuner is built into a weather-tight ABS plastic cabinet top with a stainless steel bottom. Includes MFJ-4117 BiasTee Power Injector to send DC/RF down the coaxial line. With a capability of 1500 Watts SSB/CW and *Digital*, coupled with automatic tuning, your high-power station can now operate essentially hands-free even when frequency and band changes are made.

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MFJ-259D 280 KHz - 230 MHz Antenna Analyzer

MFJ-259D
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World famous MFJ-259D gives you a complete picture of your antenna's SWR and complex impedance from 280 KHz to 230 MHz. MFJ-259D is a complete ham radio test station including frequency counter, RF signal generator, *SWR Analyzer*™, RF Resistance/Reactance Analyzer, Coax Analyzer, Capacitance/Inductance Meter and more! Large easy-to-read two line LCD screen and side-by-side meters. Super easy-to-use! Just set the bandswitch and tune the dial -- just like your transceiver.

MFJ-269D 280 KHz-230 MHz *plus* 415-470 MHz

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Instantly gives you a complete picture of your antenna. Read SWR, return loss, reflection coefficient, match efficiency at any frequency simultaneously. Read Complex Impedance (100 KHz to 230 MHz) as series equivalent resistance and reactance(Rs+jXs) or as magnitude (Z) and phase (degrees). *Coax Calculator*™, 12-bit A/D converter gives better accuracy/resolution.

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MFJ-223
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Pocket-sized Color VNA Analyzer has a vivid TFT multi-color display and covers 1-60 MHz. Get data for SWR, resistance, reactance, and impedance magnitude. Continuous DDS frequency coverage with 100 Hz resolution. Full selection of tuning steps and sweeps. Movable marker calls up alpha-numeric data for any point on any plot -- memory captures current data when analyzer is off. Single/Swept frequency modes, truly accurate SWR, R, X, Z measurements, seamless DDS coverage, smooth skip-free encoder, powerful +5-dBm stimulus generator, Built-in lithium battery.

MFJ Manual Antenna Tuners, 300 to 1500 Watts

MFJ-945E HF+6M Mobile Antenna Tuner

MFJ-945E
$189.95

Extends your mobile antenna bandwidth so you don't have to stop, go outside and adjust your antenna. It's a tiny 8Wx2Hx6D inches that will easily fit in your automobile console. Lighted Cross-Needle SWR/Wattmeter, Lamp and Bypass switches. Covers 1.8-30 MHz and 6-Meters. 300 Watts PEP. **MFJ-20, $14.95**, Handy mobile mount.

MFJ-949F Deluxe 300 Watt Antenna Tuner

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More hams use MFJ-949s than any other antenna tuner in the world! **Why?** Because it is the most versatile and economically priced. Handles 300 Watts, full 1.8-30 MHz plus 6-Meter coverage, custom inductor switch, 1000V tuning capacitors, full size peak/average lighted Cross-Needle SWR/Wattmeter, 8 position antenna switch, dummy load.

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MFJ-260C
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MFJ-260CN, $79.95. Type "N".

500 MHz, 100 Watt Dry Dummy Load

MFJ-261
$39.95
With PL-259
DC to 500 MHz

MFJ-261 connects directly with built-in PL-259. Finned aluminum heatsink, 15W continuous, 100W peak. SWR<1.5:1, DC-500 MHz.

MFJ-262B, $79.95. 35W continuous, 200W for 5 seconds. DC to 1 GHz.

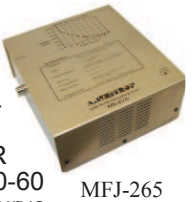
1.5 kW Dummy Load

Ham radio's most versatile 1.5 kW 50 ohm *dry* dummy load covers DC to 650 MHz. SWR 1.1:1 to 30 MHz, 1.3:1 to 650 MHz. Handles 1500W for ten secs, 100W for 10 mins. SO-239 connector.

MFJ-264
$129.95

MFJ-264N, $139.95. Type "N".

MFJ 2500W *fan-cooled* Dry Load



Handles legal limit amps, 2500W average one minute on, ten minutes off, 300W continuous. DC-6 Meters. SWR <1.25, 30 MHz; <1.4, 30-60 MHz. Detailed power curve. Use 12 VDC or 110 VAC.

MFJ-265
$299.95

Dummy Load/ SWR/Wattmeter Combo

Tune up your transceiver, linear amplifier or antenna tuner into a safe 50 Ohm dummy load at *full power*. Instantly switch to your antenna and monitor SWR, forward and reflected power on lighted cross-needle meter. 300/3000 Watt ranges. DC-60 MHz.Test/tune Xceivers, amps, tuners, baluns, filters, coax, stubs.

MFJ-267
$239.95

Oil-Cooled 50-Ohm VersaLoad™

Run 1KW CW or 2 KW PEP for 10 minutes. Run *continuous duty* 200W CW, 400W PEP. Transformer oil included. SWR 1.2:1@30 MHz.

MFJ-250
$119.95

MFJ-250X, $79.95. No transformer oil.

MFJ *GrandMaster™* SWR/Wattmeters

GrandMaster™ SWR/Power Meters are *the Cadillacs of ham radio!* Large 3¼x1¼ inch precision illuminated meter gives easy wide-angle viewing of SWR, forward or reflected power. Housed in an all metal cabinet with deluxe rubber feet and injection molded gray front panel, just 7½Wx3⅜Hx4¼D in. Air-dielectric SO-239 connectors with gold plated center pins gives superb performance. 3:1 SWR is centered at the mid-scale to give precision wide-range measurements. Selectable power ranges. Meter lamp requires 13.8 VDC or 110 VAC.

MFJ-870
$119.95

MFJ-870, $119.95. 1.6-60 MHz. 30/300/3000 Watt ranges.

MFJ-874, $179.95. 1.8-525 MHz. 5/20/200 Watt ranges.

MFJ Digital HF/VHF SWR/Wattmeter

Large 3.5 inch bright orange LCD display reads SWR, forward and reflected power simultaneously in one glance. Covers 1.5 to 525 MHz. Has HF/VHF switch. Handles 200 Watts.

MFJ-849
$229.95

1.8-60 MHz SWR Wattmeter

LED backlighted lamp, large 3" Cross-Needle SWR/Wattmeter with *TrueActive™* Peak Reading Circuit reads true-peak or average power. 3000/300 Watts forward and 600/60 Watts reflected power ranges. Read SWR from 1:1 to 8:1.

MFJ-815D
$129.95

MFJ giant 6.5 inch SWR/Wattmeter

World's *largest* HF+6M SWR/Wattmeter has *giant* 6½ inch meter! Extra-long scales gives highly accurate SWR/power 1.8-54 MHz. Huge numbers make reading easy. *True* peak or average forward and reflected power. 20/200/2000 Watt ranges. 9 Volt battery, 12 VDC or 110 VAC with MFJ-1312D, $34.95. 7Wx5½Hx5D in. SO-239s.

MFJ-868B
$199.95

MFJ-869, $299.95. Like MFJ-868B but is a fully-automatic auto ranging meter, amplifier bypass control and control relay for high SWR. High SWR Audio and Visual Alarms.

MFJ-867, $199.95. Like MFJ-868B but covers 144/220/440 MHz.

High-accuracy 1.8-60 MHz Digital Meter

Highly accurate! Auto-ranging select 25W, 250W, 1500W ranges with *full 10-bit* resolution. Frequency compensated data insures highest accuracy. *True* peak/average forward/reflected power, SWR and frequency are *simultaneously* displayed on backlit LCD and large 3-inch lighted cross needle meter. Peak hold. LED, buzzer, amplifier-bypass alerts.

MFJ-828
$299.95

MFJ-826B, $239.95. No analog meter, amplifier bypass, control relay.

Compact Digital SWR/Wattmeters

Displays forward, refelected power, SWR (1.6-60 MHz or 125-525 MHz) and battery *all in a single glance!* Large 1/2 inch forward power digits and 5/8" reflected/SWR digits are easy-to-see at night for mobile or base station use! 0-200W power handling. Power/backlight on/off. SO-239s.

MFJ-845
1.6-60 MHz
$139.95

MFJ-847
125-525 MHz

MFJ-847, $139.95. 125-525 MHz, 0-120W.

MFJ Compact Cross-Needle SWR/Wattmeters

Large 3-inch *lighted* Cross-Needle meter covers 1.8-200 MHz in 30/300 Watt power ranges or 140-525 MHz in 15/150 Watt power ranges. Read forward, reflected power, SWR *simultaneously*. Compact 3¼Wx3¼H x3¼D inches great for mobile or base. SO-239s.

MFJ-822
1.8-200 MHz
$79.95

MFJ-842
125-525 MHz

MFJ-842, $79.95. Like MFJ-822 but covers 140-525 MHz, 15/150 Watt ranges.

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

MFJ Transceiver Accessories

More hams use MFJ Accessories than all others in the world!

SDR T/R Protection Switch

MFJ-1708B-SDR
$139.95

An inexpensive wide-band SDR dongle receiver lets you see entire bands on frequency/waterfall computer displays! If you want to know where the activity is, who's generating splatter, what's in the DX window, how wide your audio is or what frequencies are clear, it's all right there! While receiving on your transceiver, MFJ switches your SDR to your antenna showing the entire band. On transmit SDR is switched out, grounded for protection. PTT and failsafe RF sense switches. HF/VHF/UHF. Monitor multiple bands with multiple SDRs and a multi-coupler. **MFJ-1708B-SDRS, $139.95.** SMA connector for your SDR.

Eliminate Noise, hear signals loud and clear

MFJ-1026
$259.95

Null out all types of noise!!! Severe power line noise from arcing transformers and insulators, fluorescent lamps, dimmers, touch controlled lamps, computers, TV birdies, lightning, garage door openers, electric drills, motors, industrial processes. A undesired signal can be completely removed without affecting the desired signal. All modes -- SSB, AM, CW, FM, frequences from BCB to lower VHF.

Prevent your expensive receiver from overloading. **Use** as an adjustable phasing network. Combine two antennas to give you a powerful receive station and have a variety of directional patterns. **RF-sense** T/R switch auto bypasses your rig when you transmit. Adjustable T/R delay time.

MFJ-1025, $239.95. Like MFJ-1026, less built-in antenna, use external.

ClearTone™ Communications Speaker

MFJ-281
$19.95

Bring out speech fidelity you never knew existed. Restore the smooth sound of CW. 3" speaker handles 8 Watts, 8 Ohms impedance, has six feet of cord terminated witha 3.5 mm mono plug. Tiny and compact but has a powerful booming sound. Mobile mounting bracket included.

Lightning Surge Protectors, 400/1500W

MFJ-270
$24.95

Safeguard your expensive electronic equipment from static electricity and lightning induced surges on your 50 Ohm coaxial line. Ultra-fast gas discharge tube safely shunts up to 5000 Amps of peak impulse current harmlessly to an independent ground. SWR is less than 1.1:1. Less than 0.1 dB loss. Use up to 1000 MHz. MFJ-270 handles 400 Watts PEP, SO-239 to SO-239.

MFJ-272, $37.95. 1500 Watts.

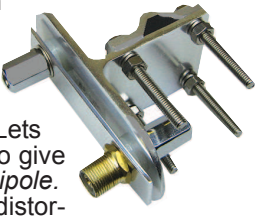
MFJ-270MF and MFJ-272MF are SO-239 - PL-259.

MFJ-270N and MFJ-272N are type N connectors.

MFJ-97, $19.95 and MFJ-97H, $24.95 are replacement gas tubes.

MFJ-270 and MFJ-272 do not protect against a direct lightning hit.

MFJ Dipole and Vertical Antenna Mounts



MFJ-347
$29.95

Build your own 80-6 Meter *mini*-dipole using two HF mobile whips! MFJ-347 *isolates* dipole elements. Lets you use a balun to give a *true balanced dipole.* Prevents pattern distortion, noise pickup and RFI radiation from RF on coax shield. Solid aluminum. Use masts up to 1¼" OD. Quickly change bands by simply unscrewing two hamsticks and replacing with a new pair at a different frequency. Great for POTA, HOA, home stations.

MFJ-342T
$19.95

3/8-24 Hamstick Mount

Mount 3/8-24 HF/VHF hamsticks vertically or horizontally on masts up to 1 inch OD. Built-in SO-239 for coax.

Deluxe Microphone Control Center

MFJ-1263
$169.95

MFJ's Microphone Control Center lets you mix and match any two microphones to any two transceivers with 8-pin round or 8-pin modular connectors. No changing connectors or rewiring; just push buttons. Your favorite mics will never become obsolete. Use your favorite microphone with your present or new rig by pushing a button. Instantly switch from a hi-fi ragchewing mic to a hard-hitting DX mic. Use a PTT foot switch (MFJ-1709) or let your computer or voice keyer (MFJ-434B) control your PTT line to free your hands for contests.

MFJ-392C, $59.95. Deluxe communication headphones work all modes -- SSB, FM, AM, data and CW. Superb padded headband and ear cushions. Adjustable. Signals never sounded so clear!

MFJ Station Clocks

MFJ-148RC
$79.95

Specially designed clock for amateur radio has two independent atomic 24/12 hour clocks with exclusive UTC time zone and a dedicated Station ten minute ID timer. Uses single time base to keep both clocks perfectly synchronized. Radio controlled for perfect time. Each clock can be independently set for 12/24 hour, time zone and DST on/off.

MFJ-108B, $29.95. Read both UTC and local time at a glance. 12/24 hour LCD has HUGE 5/8" digits. Long life battery.

Learn Morse Code

MFJ has all of the gear to help you learn Morse Code fast and easy!

MFJ-557, $69.95. Deluxe Code Oscillator and Telegraph Key is built on a sturdy non-skid base. Volume/tone adjustable.

MFJ-461, $119.95. Pocket code reader displays in English what you're hearing at the rig.

MFJ-418, $119.95. Pocket Morse Tutor has all the practice you need to be a CW Pro!

MFJ-419, $169.95. Multi-function CW-ElmerTM training tool lets you learn to receive and send Morse Code with a straight key.

MFJ CW Reader/Keyer

MFJ-464, $259.95. See what you are sending and receiving while learning Morse Code on-the-air! Use Iambic paddle or computer keyboard. Play like the CW Pros!

MFJ-407E, $129.95. Deluxe electronic keyer with memory. Dot-Dash memories, jam-proof spacing, weight control, sidetone, built-in speaker.

MFJ-564/B, $109.95. Choose chrome or black Iambic paddles from MFJ. Full range adjustment in tension/contact spacing. Self-adjusting nylon/steel bearings.

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MFJ Antenna Helpers

Multi-band G5RV Antenna

MFJ-1778 **$89.95** *The famous G5RV antenna is the most popular ham radio antenna in the world!* It's an efficient, *all band* 102 foot long antenna -- shorter than an 80M dipole. 32.5 foot ladder line matching section ends in an SO-239 connector for your coax feedline. Use horizontally or as Inverted Vee or Sloper with just one support. 1500W. Operate all bands 80-10M with an antenna tuner and even 160M with ground. Fully assembled with *ceramic* end and fiberglass center insulators. *Hang and Play™* -- add coax, rope to hang and you're on air!

MFJ-1778M, $79.95. 52' *JUNIOR for limited space.* 40-10M, 1.5 kW.

80-10M EFHW antenna

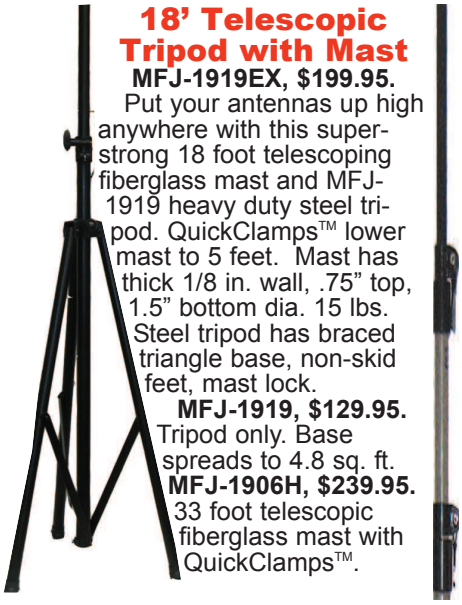
Get-on-the air on all bands 80-10 Meters with just one wire and one support (pole or tree) and no tuner or long counterpoise. Installs anywhere in minutes! Rugged *insulated-wire* radiator prevents detuning when contacting limbs/branches. *"No-snag"* end insulator slides over branches, leaves. Toss over a high limb for inverted-V or sloper or go vertical with an inverted-L. Great for emergencies. EFHWs naturally resonate on the 1/2-wave fundamental frequency and odd/even harmonics. No traps, stubs or resonators. Broad-band matching transformer at feed point gives SWR so low you may never need a tuner. 800W SSB/CW. 132 feet antenna wire.

MFJ Weather-Proof Window Feedthru Panels

Make antenna connections to your shack without drilling holes. Place in up to 48" windows. Cut to fit. Horizontal/vertical. Connections mounted on inside/outside stainless steel plates, attached to a 4', 3½" high, 3/4" thick pressure-treated real western red cedar. Resistant to rot/insects. Finish to your desire. Includes weather-stripping/lock stick.

MFJ-4601, $89.95. 6 coax connectors, ground post. 1500 Watts.
MFJ-4602, $104.95. 3 coax, balanced line feed-thru insulators, wire, ground.
MFJ-4603, $129.95. 4 coax, 1 N, 1 F type, pair ceramic feedthrus, 5-way posts, and adaptive cable feedthrough.

18' Telescopic Tripod with Mast



MFJ-1919EX, $199.95. Put your antennas up high anywhere with this super-strong 18 foot telescoping fiberglass mast and MFJ-1919 heavy duty steel tripod. QuickClamps™ lower mast to 5 feet. Mast has thick 1/8 in. wall, .75" top, 1.5" bottom dia. 15 lbs. Steel tripod has braced triangle base, non-skid feet, mast lock.

MFJ-1919, $129.95. Tripod only. Base spreads to 4.8 sq. ft.

MFJ-1906H, $239.95. 33 foot telescopic fiberglass mast with QuickClamps™.

9.5' Telescopic Tripod/Mast

MFJ-1918EX, $129.95. MFJ-1918 *tripod with 9.5 ft. telescoping fiberglass mast.* 3.8 feet collapsed. 6.5 lbs.

MFJ-1918, $84.95, *Smaller tripod* base spreads to 2.75 ft. Support 66 lbs. 6.75 lbs.

Giant Tripod

MFJ-1921, $219.95. *Giant tripod* base spreads to 8 feet! Supports massive antennas. Adjustable length non-skid legs accommodates uneven ground surfaces. Mast not included. Optional foot anchors, **MFJ-1905, $44.95.**

Portable, Telescopic Fiberglass Masts

High-strength fiberglass masts extend way up into the sky! Just pull out sections and lock. Choose Light-weight, Light-Duty or Super-Strong Thick-Wall models. Each collapses to an easy-to-carry size for true portablilty. Quick put-up and take-down. Use them for traveling, camping, at hotels, hamfests, field day, DX-peditions. Put up full size full performance inverted Vee, dipole or vertical antenna in minutes at heights that will snag you real DX. Use multiple telescoping masts to make loops, quads, rotatable dipoles even beams.

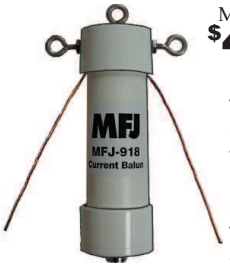
MFJ-1910, $119.95. 33 ft., light duty mast w/top tie ring.
MFJ-1917, $209.95. 43 ft., heavier duty thick-wall mast w/top tie ring.

RF Isolator

MFJ-915 **$49.95** **MFJ-915** *RF Isolator* prevents unwanted RF from traveling on the outside of your coax shield into your transceiver. This unwanted RF can cause painful RF "bites" when you touch your microphone or volume control, cause your display or settings to go crazy, lock up your transceiver or turn off your power supply. In mobile installations, stray RF could cause your car to do funny things even blow your car computer. Clear up these problems, plug an MFJ-915 between your antenna and transceiver. 1.8-30 MHz, 1500 Watts. 5x2 inches.

MFJ-919, $84.95.
4:1 current balun,1.5 kW.
MFJ-913, $49.95.
4:1 balun, 300 Watts.

True 1:1 Current Balun & Center Insulator

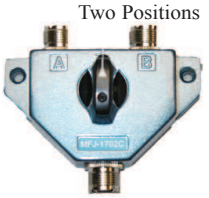


MFJ-918 **$49.95** **True** *1:1 Current Balun/ Center Insulator* forces equal radiator currents in dipoles for true dipole radiation pattern. Reduces coax radiation and field pattern distortion -- your signal goes where *you* want it. Reduces TVI, RFI and RF hot spots. *Don't build a dipole without one!* 50 hi-permeability ferrite beads on high quality RG-303 *Teflon*(R) coax and *Teflon*(R) SO-239. 1.5kW 1.8-30 MHz. Stainless steel hardware. 14 gauge stranded copper wire is *directly* connected to your antenna. 5x2 inches. Heavy duty weather housing.

4 and 2 Position Antenna Switches

MFJ-1704 **$129.95** Four Positions

MFJ-1702C **$69.95** Two Positions



MFJ gives you a center ground position, automatic grounding of unused positions, built-in lightning surge protection, handles 2.5 kW PEP and works to over 500 MHz. Extremely low SWR, isolation is rated from better than 60 dB at 30 MHz to better than 50 dB isolation at 500 MHz. Has negligible inertion loss. 50 Ohms.

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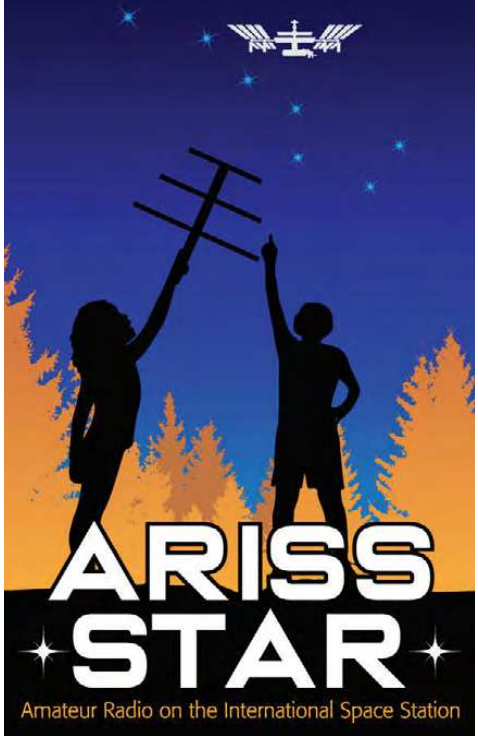
Phone: (662) 323-5869 • **Tech Help:** (662) 323-0549 • **FAX:** (662) 323-6551 8-4:30 CST, Mon.-Fri.

SUPPORT



The ARISS *STAR* *Keith Pugh Memoriam Project* honors ARISS Technical Mentor Keith Pugh, W5IU (SK), and seeks to improve ARISS US STEM education via robotics — with telerobotics adding a wireless accent.

Middle and high school-aged students will discover the benefits and excitement of ham radio while learning radio technology and communication.

Your support of this program is needed, please give directly to ARISS at

https://www.ariss.org/ariss-star.html

MFJ Antennas and Accessories

More hams use MFJ Antennas and Accessories than all others in the world!

Glazed Ceramic Center Insulators

The MFJ-16C01 is a dog bone ceramic glazed center or end insulator. It will not break with long antennas and will not arc over or melt even under full legal power. Molded ridges give an extra long path to prevent high voltage breakdown. Smooth wire holes prevent wire damage. The 16C01 can be used as a center or end insulator for dipoles, doublets, G5RV, vee antennas, vees, or use for guy wires.

MFJ-16C01
$5.95
Single

MFJ-16C06
$5.95
Six Pack

MFJ Cobweb Antenna 20/17/15/12/10/6 Meters

Restricted space spoiling your operating fun? MFJ Cobweb antenna puts your call back on the map! Sky-gray fiberglass spreaders and nearly invisible wire is a flat 9x9x½ foot square, just 8 lbs. Blends in your surroundings while standing tough against weather. Omni-directional. **MFJ-1838, $319.95.** Like MFJ-1836, adds 30/40M.

MFJ-1836
6-Bands
$299.95

MFJ-1838
$489.95
8-Bands

2-Position Remote Antenna Switch

Uses *single* coax feedline to feed two antennas, DC power and control signals. Remotely switch HF and/or VHF antennas, 1.8 MHz to 150 MHz. 1500 Watts. 50-75 Ohms. Outside Switch Box is fully enclosed and weather protected. SO-239s. 12 VDC or 110 VAC.

MFJ-4712
1.8-150 MHz
$109.95

6-Position Switches

MFJ-1700C, $179.95. Six position Antenna/Transmitter manual switch.

MFJ-1701, $139.95. Six position antenna manual switch.

MFJ *Apartment Antenna*

MFJ-1622
$139.95

MFJ-1622 Apartment Antenna covers 40-2 Meters, mounts outdoor to windows, balconies, railings, and works great indoors mounted to desks, tables, and bookshelves! Its universal mount/clamp lets you easily attach it to window frames, balconies, and railings. Its not a five element yagi, but you'll work your share of exciting DX!

40-6M Vertical

MFJ-2286
$149.95

Rugged 17' stainless-steel collapsible whip (Collapses to 28") is paired with an adjustable high-Q air-wound coil for 7.0-55.0 MHz coverage. 1 kW. Backpack portable. Just over 2 lbs. Includes MFJ-342T mount, counterpoise radials kit.

MFJ-2286PKG, $239.95. Adds tripod, 25 ft. coax, carrying case.

Tuned Indoor SDR Active Antenna

MFJ-1020C
$129.95

Make your SDR receiver come alive with HF signals, .3-40 MHz, while rejecting interference with MFJ-1020C *tuneable* indoor active antenna! Has gain control, telescoping whip antenna.

MFJ Low-Noise Receiving Mag Loop

Clearly hear signals 50 KHz to 30 MHz. Power line noise and static disappears. Excellent antenna/preamplifier balance gives deep null. Excellent strong and weak signal performance without overload.

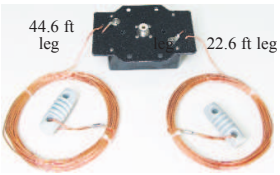
MFJ 36" Hi-Q Transmitting Loop

Work DX with low angle radiation and local close-in contacts with high angle radiation when mounted vertically. 150 watts. Super easy-to-use! Remote control auto tunes to desired band. Cross-Needle SWR/Wattmeter lets you quickly tune to your exact frequency. No control cable needed. All welded construction, welded butterfly capacitor with no rotating contacts, large 1.050 inch diameter aluminum radiator.

MFJ-1786
$659.95

MFJ-1788, $719.95. Like MFJ-1786 but covers 40-15 Meters. Includes control.
MFJ-9232, $69.95. QRP Loop Antenna Tuner with wire loop, 10-40 Meters. Handles 25 Watts. Backpack portable.

MFJ OCFD Dipoles



No tuner needed! MFJ ***Off-Center Fed Dipoles*** use MFJ's exclusive *ExactRatio*™ RF broadband transformer to give low SWR and maximum bandwidth on 40/20/10/6 Meters. A Guanella current balun kills feedline radiation, pattern distortion, SWR shifts, RFI and noise pickup. Install anywhere and get the same predictable performance regardless of feedline length. You get ground reinforced gain over verticals. Use horizontally, inverted vee, sloper. 98% efficient, 14 gauge, 7-strand copper wire, ceramic end insulators.

MFJ-2010
$89.95
300 Watts

MFJ-2012
$89.95
1500 Watts

Single Band Dipoles

Ultra high quality center fed dipoles give years of trouble-free service. Custom injection-molded UV-resistant center insulator has built-in SO-239 and hanging hole. *Glazed* ceramic end insulators. 7-strand, 14-gauge hard copper antenna wire. 1500 Watts. Use horizontally or as sloper or inverted vee. Simply cut to length with provided cutting chart.

MFJ-1779A
$99.95
160M, 265 ft.

MFJ-1779B
$79.95
80-40M, 135 ft.

MFJ-1779C
$59.95
20-6M, 35 ft.

MFJ-17758, $129.95. 80/40M trapped di-pole. 95'. Full size 40, end load 80M.
MFJ-17754, $$89.95. 40/20M trapped di-pole. 42'. Full size 20, end load 40M.

All Band Classic Doublet Antenna

MFJ 102 foot all band doublet covers 160-6 Meters with balanced line tuner. Super strong custom fiberglass center insulator relieves stress on 100 foot ladder line. Uses glazed ceramic end insulators. 1500 Watts.

MFJ-1777
$129.95

Deluxe Dipole Antenna Kit

MFJ-2774K
$99.95

Everything you need to build several antennas. Multi-purpose insulators, nylon rope, copper wire, PL-259s, RG-58 reducers, SO-239s, ceramic insulators, hardware.

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Phone: (662) 323-5869 • **Tech Help:** (662) 323-0549 • **FAX:** (662) 323-6551 8-4:30 CST, Mon.-Fri.

MFJ POTA/Mobile Accessories

80-10M EFHW antenna

Get-on-the air on all bands 80-10 Meters with just one wire and one support (pole or tree) and no tuner or long counterpoise. Installs anywhere in minutes! Rugged *insulated*-wire radiator prevents detuning when contacting limbs/branches. *"No-snag"* end insulator slides over branches, leaves. Toss over a high limb for inverted-V or sloper or go vertical with an inverted-L. Great for emergencies. EFHWs naturally resonate on the 1/2-wave fundamental frequency and odd/even harmonics. No traps, stubs or resonators. Broad-band matching transformer at feed point gives SWR so low you may never need a tuner. 800W SSB/CW. 132 feet antenna wire.

MFJ-1984HP, $109.95. 40-10 Meters, 800 Watts. 66 feet.

Portable/Collapsible 60-6 Meters Antenna

MFJ-1898 **$149.95** 60/40/30/20/17/15/12/10 and 6-Meters in one truly portable HF antenna!!! POTA, SOTA, DXPeditions. Collapses to 2 sections, just 1.25x11.5". It easily will fit with your radio, antenna tuner and other accessories into your backpack. Assembled it's 21.75". Fully telescoped it's a *whopping* 103". Easy to tune. Tapped tuning section base unscrews to reveal a nifty tuning chart (like a ruler). 125W PEP SSB. Quick, painless band changing. A 3/8-24 threaded connector lets you use it as a parked mobile or even as a quick base station antenna. The antenna has a reasonably low SWR so an antenna tuner may not be necessary on most bands. Stainless steel telescopic whip.

MFJ HF Hamsticks

MFJ-1675T - 75 Meters
MFJ-1660T - 60 Meters
MFJ-1640T - 40 Meters
MFJ-1630T - 30 Meters
MFJ-1620T - 20 Meters
MFJ-1617T - 17 Meters
MFJ-1615T - 15 Meters
MFJ-1612T - 12 Meters
MFJ-1610T - 10 Meters
MFJ-1606T - 6 Meters

$21.95 Each 6-30 Meters
40-60 Meters, **$22.95**
75 Meters, **$29.95**

Each is ruggedly constructed with a heavy duty 4', 3/8 inch dia. fiberglass rod and a nearly indestructible .125 inch dia. PH-17-7 stainless steel whip. Sleek, low profile, low wind loading. Semi-rigid fiberglass eliminates need for springs/guys. Whip adjusts for lowest SWR. 250W PEP. 7 feet fully extended, collapses to about 4'. Screws into any 3/8 x 24 female mount.

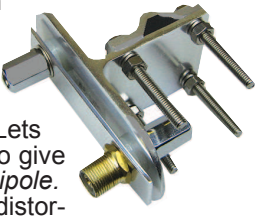
MFJ 4-Band Octopus Antenna

MFJ-2100, $129.95. Octopus Hub and four pair of your favorite hamsticks gives you a fully balanced multi-band dipole in minutes. Works at any height, low for local NVIS and high for DX. Use mast up to 1" OD.

17' Telescopic Whip

MFJ-1979 **$69.95** **MFJ's** premium stainless steel telescopic whips are the perfect choice for building collapsible multi-band dipoles, mobiles, portable and base antennas. They are great for traveling, mini DXpeditions, vacations, etc. They can also be used to replace your current automatic screwdriver whip for a more highly efficient fixed mobile operation. Rigidly collared at the base, stronger than plated brass, and impervious to rust and corrosion, they stand up to the forces of nature and the rigors of portable operation where others might fail. The base of each whip features a standard 3/8-24 mounting stud for installation on mobile or fixed antenna mounts like MFJ's lip mounts, magnet mounts, tripods and dipole mounts. For dipoles, use two MFJ-1979 whips.

MFJ Dipole and Vertical Antenna Mounts



Build your own 80-6 Meter *mini*-dipole using two HF mobile whips! MFJ-347 *isolates* dipole elements. Lets you use a balun to give a *true balanced dipole.* Prevents pattern distortion, noise pickup and RFI radiation from RF on coax shield. Solid aluminum. Use masts up to 1 1/4" OD. Quickly change bands by simply unscrewing two hamsticks and replacing with a new pair at a different frequency. Great for POTA, HOA, home stations.

MFJ-347 **$29.95**

3/8-24 Hamstick Mount

Mount 3/8-24 HF/VHF hamsticks vertically or horizontally on masts up to 1 inch OD. Built-in SO-239 for coax.

MFJ-342T **$19.95**

Work DX walking about!

MFJ-1899T **$99.95** **MFJ's** Walkabout antenna is designed for the FT-817, KX3 and other QRP transceivers. 80-6 Meters including WARC Bands. 10 section telescoping whip is 52" fully extended, just 7" collapsed. Whip unscrews from the 12" base loading coil. 25 Watts. Change bands by plugging the "wander lead" into appropriate socket. Fine tuning is done by adjusting the telescopic whip. BNC.

MFJ-1806T, $39.95. Single band walkabouts, 6/10/12/15/17/20 Meters 30/40/75 Meters, $49.95. BNC.

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MFJ-4230MVP, $159.95. World's most compact 30A switching power supply. V/A meter. 4-16 Volts, adjustable. 5Wx2 1/2H x6D inches, 3 pounds! Selectable input voltage 120/240 VAC.

MFJ *Super-Strong* Magnet Mounts with Coax/PL-259

MFJ 5-inch Magnet

MFJ-335BS SO-239
MFJ-335BM NMO
MFJ-335BT 3/8 - 24 For HF sticks
$29.95 Each

Best Seller!

These jet-black ***5-inch*** *super strong* magnet mounts have 17' coaxial line terminated with PL-259 connectors. SO-239 (BS) or NMO (BM) for your VHF/UHF antennas or 3/8-24 threaded (BT) for your HF hamstick antennas with a 3/8-24 threaded connector.

MFJ 3-inch Magnet

MFJ-333BS pictured

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3-inch black magnet antenna mounts. 17 foot coax is terminated with PL-259 connector. Choose SO-239 (**BS**) or NMO (**BM**). For VHF/UHF lightweight antennas.

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Release strain on your HT's antenna connector! 3 ft. flexible, mini coax with SO-239 connector.

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B.MFJ-5612SF SMA Female Wouxun/Baofeng.
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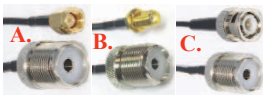

MFJ Triple 5" Magnets

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MFJ-336S SO-239
MFJ-336M NMO
MFJ-336T 3/8x24

Three super-strong 5-Inch Magnets make up this MFJ *Goliath*™ Tri-Magnet Mount. 1/4" thick steel triangle base. 17' coax. Select SO-239, NMO, 3/8-24 antennas. **Caution:** once on, it's difficult to get off!

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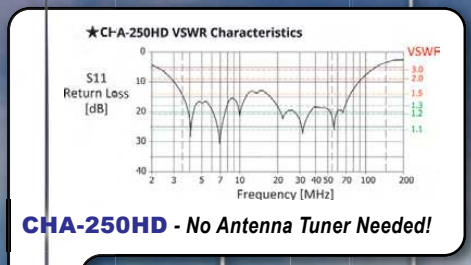

CHA-250HD - *No Antenna Tuner Needed!*

The Comet CHA-250HD is the updated version CHA-250B. The top aluminum section has been replaced with a solid whip for greater flexibility and less strain on the lower 4 aluminum sections in high winds.

❶ ❷ ❸ ❹ ❺ ❻

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

❼

Base Antennas

❶ COMET CHA-250HD BROADBAND 80M THROUGH 6M VERTICAL ANTENNA

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

❷ COMET GP-3 DUAL-BAND 146/446MHZ BASE REPEATER ANTENNA

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

❸ COMET GP-6 DUAL-BAND 146/446MHZ BASE REPEATER ANTENNA

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

❹ COMET GP-9 / GP-9N DUAL-BAND 146/446MHZ BASE REPEATER ANTENNA

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

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

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

❻ COMET GP-15 TRI-BAND 52/146/446MHZ BASE REPEATER ANTENNA

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

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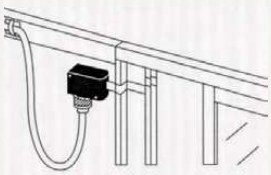

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Power Rating	1.5KW (1.8~60MHz) 1KW (144MHz)	2KW (1.8~60MHz) 1KW (144MHz)	200W (140~525MHz)
Tolerance	±10% at Full Scale	±10% at Full Scale	±10% at Full Scale
SWR Measurement	1:1~1:∞	1:1~1:∞	1:1~1:∞
SWR Detection Sensitivity	4W MIN	4W MIN	4W MIN
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Tolerance	±10% at Full Scale	±10% at Full Scale	±10% at Full Scale	±10% at Full Scale
SWR Measurement	1:1~1:∞	1:1~1:∞	1:1~1:∞	1:1~1:∞
SWR Detection Sensitivity	5W MIN	5W MIN	5W MIN	0.4W
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Input/Output Connectors	SO-239	SO-239	SO-239 or N-Type	N-Type

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Isolation: 60 dB 600 MHz
Connector: SO 239
Output Port: 2

CS-201GII

Frequency Range (up to): 2 GHz
Power Rating:
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250 W CW (up to 1 GHz)
150 W CW (up to 2 GHz)
VSWR: Below 1:1.3 at 1.3 GHz
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