ARRL Centennial — Advancing the Art and Science of Radio Since 1914

QST

DEVOTED ENTIRELY TO AMATEUR RADIO

October 2014 WWW.ARRL.ORG

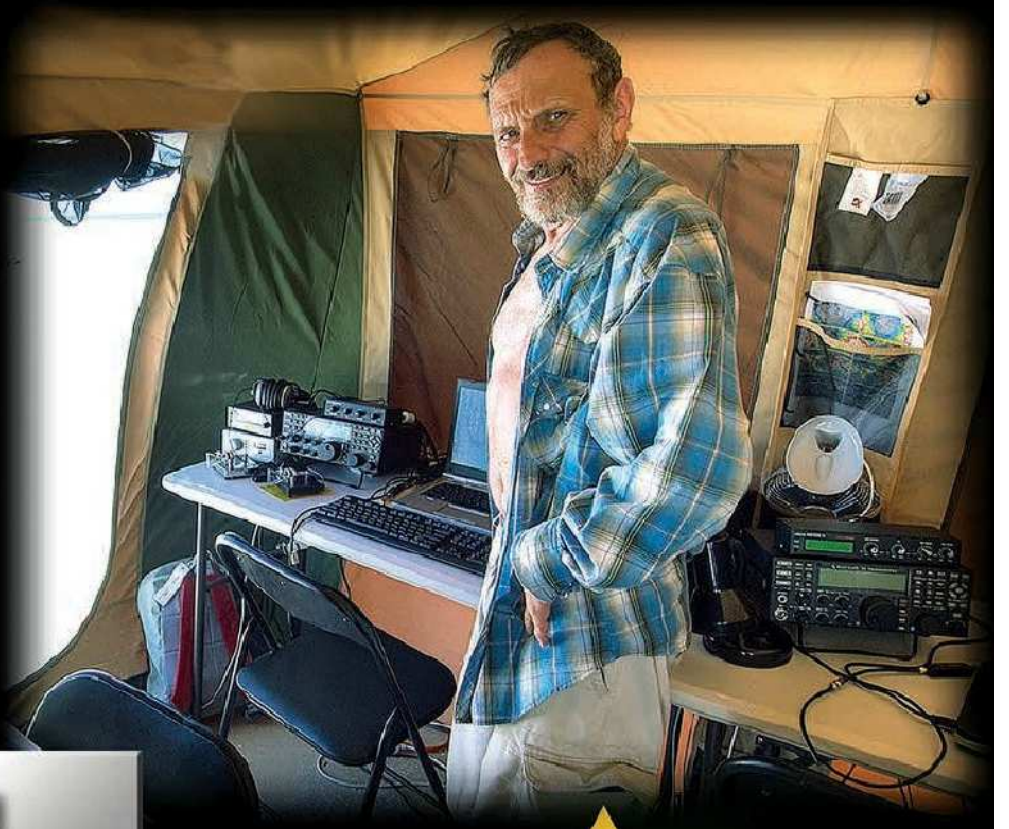
DIGITAL EDITION

Annual DXing Issue!

QST reviews:

- **Alinco DX-SR9T** HF Transceiver
- **Elecraft KXPA100** Amplifier and **KXAT100** Automatic Antenna Tuner
- **WebDX** Remote Station System

ARRL National Centennial Convention Photos!



DIGITAL FEATURE

48 | See a Video Overview of the Alinco DX-SR9T HF Transceiver

ARRL 100 YEARS

The Answer ...

Equipped with Extra Sharp 6-pole Crystal Roofing Filters

The Premium HF / 50 MHz Transceiver FT DX 5000

The Newly designed 9 MHz 1st IF of the FT DX 5000 main receiver implements sharp 6-pole* crystal roofing filters. *8-pole / 3 kHz
Superior close-in dynamic range affords the serious DX'er the best performance possible.

HF/50 MHz 200 W Transceiver

FT DX 5000MP *Limited*

200 W / Class-A 75 W

±0.05 ppm OCXO included
300 Hz, 600 Hz, and 3 kHz Crystal Roofing Filters included
※Station Monitor SM-5000 is optional accessory for the FTDX5000MP Limited.

YAESU
The radio

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

The radio... YAESU

HF/50MHz 100W Transceiver

FT DX 1200

This medium-price HF Transceiver Excels on all fronts. The High Frequency Design Technology it has inherited, ensures "Best in Class Performance". The Outstanding Operability is Perfect for the DX Scene.

Superior triple conversion receiver, and optimum gain distribution at each IF stage will eliminate out of band unwanted signals.

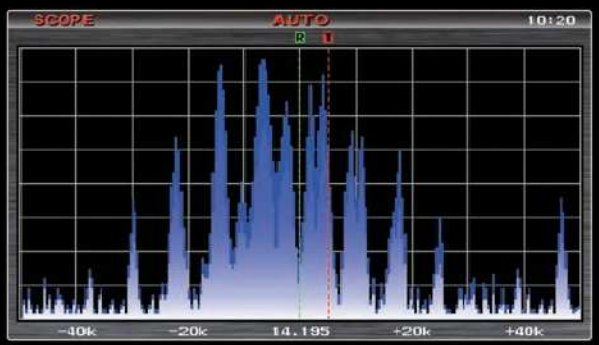
The 1st IF frequency is set at 40 MHz and is protected by selectable 3 kHz, 6 kHz and 15 kHz roofing filters, which effectively attenuate interfering signals.

Similar to the high end series Yaesu transceivers, it uses the 32-bit high speed floating point DSP, TMS320C6727B by Texas Instruments, for its IF DSP.
The acclaimed superior Yaesu DSP algorithm is highly effective in weak signal processing and enhancement.

The Full Color, 4.3 inch TFT display on the left side of the front panel, has a wide viewing angle and provides excellent visibility. It beautifully displays the various functions unique to this high class HF transceiver.

An optional built-in FFT-UNIT supports advanced functionality, including the AF-FFT Scope, RTTY/PSK31 Encode/Decode, CW Decode and CW Auto Zero-in.

The Full Color 4.3 inch TFT display



Spectrum-Scope (Full Screen display)

For latest Yaesu news, visit us on the Internet:
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New! Cushcraft R9 . . . *80-6 Meters*

80 Meters . . . No Radials . . . 1500W

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

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

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

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

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

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

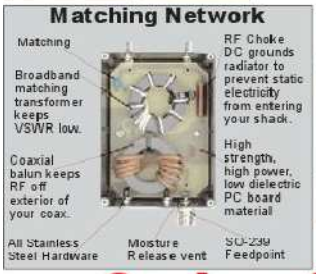
Rugged Construction: Thick fiberglass insulators, all-stainless steel hardware and 6063 aircraft-aluminum tubing is double or triple walled at key stress points to handle anything Mother Nature can dish out.

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

R8, $539.95. Like R9 antenna but less 75/80 Meters.

R-8TB, $79.95. Tilt-base lets you tilt your antenna up/down easily by yourself to work on.

R-8GK, $59.95. Three-point guy kit for high winds.



MA-5B *5-Band* Beam

Small Footprint -- Big Signal

The MA-5B is one of Cushcraft's most popular HF antennas, delivering solid *signal-boosting directivity* in a bantam-weight package. Mounts on roof using standard TV hardware. Perfect for exploring exciting DX without the high cost and heavy lifting of installing a large tower and full-sized array. Its 7 foot 3-inch boom has less than 9 feet of turning radius. Contest tough -- handles 1500 Watts.

The unique MA-5B gives you 5-bands, automatic band switching and easy installation in a compact 26-pound package. On 10, 15 and 20 Meters the end elements become a two-element Yagi that delivers solid power-multiplying gain over a dipole on all three bands. On 12 and 17 Meters, the middle element is a highly efficient trap dipole. When working DX, what really matters are the interfering signals and noise you *don't hear*. That's where the MA-5B's impressive side rejection and front-to-back ratio really shines. *See* ***cushcraftamateur.com*** *for gain figures.*

Cushcraft 10, 15 & 20 Meter Tribander Beams

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

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

The 3-element A3S/A3WS and 4-element A4S are world-famous for powerhouse gain and super performance. **A-3WS, $499.95,** 12/17 M. **30/40 Meter** *add-on kits* available.

Cushcraft Dual Band Yagis

One Yagi for Dual-Band FM Radios

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

Cushcraft Famous *Ringos* Compact FM Verticals

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

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Base Antennas

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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 Maldol HVU-8 ULTRA-COMPACT 8 BAND HF/VHF/UHF VERTICAL ANTENNA
80/40/20/15/10/6/2M/70cm Only 1/2 the traditional size and weight of vertical HF antennas, and it includes 2M/70cm! Unique radial system rotates for balcony installations, the radials can all be rotated to one side. • Wavelength: HF and 6M: 1/4 wave • 2M: 1/2 wave • 70cm: Two 5/8 waves in phase • Impedance: 50 Ohm • Max Power: HF 200W SSB • 6M–70cm: 150W FM• Conn: SO-239 • Height: Only 8'6" • Weight: 5lbs. 7ozs.

❸ 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

❹ 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

❺ 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

❻ 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

❼ 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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1.8-500MHz SWR/Impedance analyzer
Simple to use and accurate, the CAA-500 displays antenna system SWR and total impedance while turning the thumb wheel to sweep though the selected frequency range.

SO-239 connector for the low range.

N-female provides stable impedance in the high range

Install 6 AA batteries or use the 12VDC jack.

The primary tool for any antenna adjustment, trouble-shooting or installation project!

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Protect your CAA-500 from moisture, shock, dents and dings!

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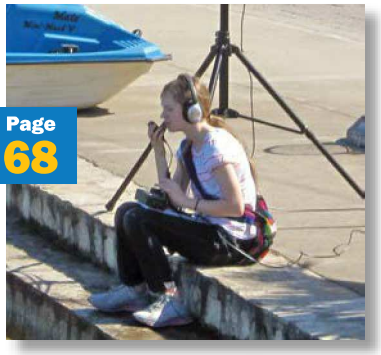
Technical

News and Features



Columns

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October 2014
Volume 98 Number 10

QST (ISSN:0033-4812) is published monthly as its official journal by the American Radio Relay League, Inc, 225 Main Street, Newington, CT 06111-1494, USA. Periodicals postage paid at Hartford, CT, USA and at additional mailing offices.

POSTMASTER: Send address changes to: *QST*, 225 Main St, Newington, CT 06111-1494, USA. Canada Post: Publications Mail Agreement #40612608. Canada returns to be sent to Bleuchip International, PO Box 25542, London, ON N6C 6B2.

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

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ARRL National Centennial Convention

1. ARRL volunteer Michael Bower helps Marco Hardmeier, HB9OCR, select an ARRL logo shirt. Marco was visiting from Switzerland. [Bob Inderbitzen, NQ1R, photo]

2. ARRL MVP Manager Dave Patton, NN1N, with Barb, K6BL, and Dave, W6NL, Leeson of California, who were technical advisors for WRTC2014. Dave is the author of the ARRL book *Physical Design of Yagi Antennas*. [Bob Inderbitzen, NQ1R, photo]

3. Greg Zenger, N2GZ, is pleased with his flea market purchase. [LJB Special Photography photo]

4. Frank Donovan, W3LPL, and Kan Mizoguchi, JA1BK, enjoy a quiet chat away from the bustle of the convention crowd. [LJB Special Photography photo]

5. Bettina Ludwig and Wolfgang Heinz, OE1WEU, proudly display the certificates that identify them as members of the Royal Order of the Wouff Hong. The top-secret Wouff Hong ceremony that was held at the convention on the evening of Friday, July 18, drew nearly 600 attendees. [Bob Inderbitzen, NQ1R, photo]

6. More than 500 people from all over the world operated W1AW during the Centennial Convention. [Bob Inderbitzen, NQ1R, photo]

7. ARRL Contest Branch Manager Matt Wilhelm, W1MSW, greets Bill Ralston, N7VM. [Bob Inderbitzen, NQ1R, photo]

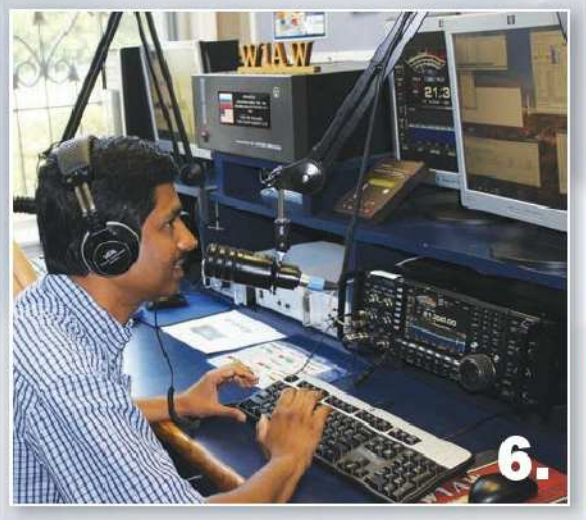

Photo Album

The ARRL was pleased to host 3300 visitors at the July 17 – 19 convention that celebrated the end of ham radio's first 100 years and the beginning of its second century. Thank you to everyone who attended!

8. Tom Davis, W1TFD, talks shop with Lou Lebron, WA2COP, and Mike Lebron, KD2CJJ, on the show floor. [Bob Inderbitzen, NQ1R, photo]

9. Anne Manna, WB1ARU, the current Secretary (and a former president) of the Young Ladies Radio League, signs a letter to her congressional representative in support of H.R. 4969. [LJB Special Photography photo]

10. Hams came from near and far — and really far — to be at the convention. Here are Robert, W9EWW, and Janis, N9LWJ, Garske from Wisconsin; Yamini Sadineni, VU2YAM, from Hyderabad, India, and Peggy Lang, N4PEG, and Rich Kennedy, N4ESS, from Florida. [LJB Special Photography photo]

11. The convention forums covered a variety of topics — from QRP and lightweight DXpeditioning, to ham radio history; from tower safety, to PIC programming — there was truly something for everyone. [LJB Special Photography photo]

12. Eight-year-old Marit Clifford, KF5ZVY, and her dad David, WA6CCB, check out the offerings on the show floor. The Cliffords traveled to the convention from New Mexico, where Marit is net control for the newly formed Bosque Youth Amateur Radio Club net. [LJB Special Photography photo]

13. Friends enjoy a low-key evening on the grounds of ARRL Headquarters at the Donor Reception, held on Thursday, July 17. From left to right, Jay Holladay, W6EJJ; Vieve Metcalfe, KD6YLI; Alice "Sam" Bell, W6QLT, and Dave Bell, W6AQ. [LJB Special Photography photo]

Photo Album

14. Just a few of the 900 people who attended the banquet held on the evening of Friday, July 18. The event featured a "My First Station" slideshow, for which hams sent in pictures of themselves (often as children or teenagers) with their first radios. The photos elicited smiles, "oohs" and "ahhs," and even laughter from the nostalgic audience. [Bob Inderbitzen, NQ1R, photo]

15. Five hundred hams from all over the world greeted one another at the International Guests "Welcome" Reception, held on Thursday evening. [Bob Inderbitzen, NQ1R, photo]

16. DXCC Card Checkers Jim Zimmerman, N6KZ, and Ron Cade, W6ZQ, enjoy some off-duty time at the convention. [Bob Inderbitzen, NQ1R, photo]

17. The Centennial Convention provided an opportunity for old and new friends from all over the country to meet up. Four states are represented here: (front, L-R) Roger Oppenheimer, W2REO, Connecticut; Harry Bates, KX3M, Pennsylvania; Pat Johnson, KJ4AVE, Florida; (back, L-R) Rick Cooper, KR3LC, Maryland; Don McGonigle, KK3G, Pennsylvania. [LJB Special Photography photo]

18. Frank, N6SNO, and Ruthann Reshke; Bill Marchand, W1WAM, and Matt Tyszka, WA1HRE, go in search of their next Centennial Convention activity. [LJB Special Photography photo]

David Sumner, K1ZZ — dsumner@arrl.org
ARRL Chief Executive Officer

A Week to Remember

"If you were in Hartford for the ARRL National Centennial Convention, July 17 – 19, you were part of a once-in-a-lifetime event."

The week of July 14, 2014 is now a permanent part of ARRL history. It began right on the heels of a successful World Radiosport Team Championship held in Massachusetts that brought several hundred participants from 40 countries to New England, many of whom made the 90-minute trek to the Hartford area for the ARRL Centennial festivities at the Connecticut Convention Center and at ARRL Headquarters, about 10 minutes away. The International Amateur Radio Union Region 2 Executive Committee held its annual meeting in Hartford on July 15 – 16, adding even more of an international flavor.

At Headquarters, visitors began to arrive early in the week. By Sunday at least 1000 had toured the office and many had had the very special opportunity to operate with the call sign W100AW from the iconic W1AW building.

At the Convention Center, once the initial crush of preregistered attendees was taken care of on Thursday morning, it was smooth sailing from that point on; 728 took advantage of the multiple Training Tracks that occupied the day. They were joined by others at lunch, bringing the audience for an inspiring talk by First Vice President Rick Roderick, K5UR, to a total of 900. Rick challenged us to think about the memorable moments we could have experienced only through Amateur Radio, all that we owe to those who came before us, and why we must leave a legacy so future generations can enjoy the same opportunities. Toward the end of the day, about 500 stayed for a reception to welcome our international guests from all continents.

The convention got underway officially on Friday morning with a ceremonial ribbon-cutting. In the exhibition hall more than 100 vendors and exhibitors were kept busy all day on both Friday and Saturday. On another level of the clean, modern facility, dozens of forums and presentations on a wide range of subjects drew large crowds on both days.

For each of the 3300 attendees, there were so many highlights of the event that it would be an injustice to single one out. Here are a few more:

On Friday afternoon a Memorandum of Agreement was signed by Federal Emergency Management Agency Administrator Craig Fugate, KK4INZ, and ARRL President Kay Craigie, N3KN, with Hartford Mayor Pedro Segarra looking on. The MOA strengthens the cooperative relationship between the two organizations so that Amateur Radio's emergency communications capabilities can be utilized even more effectively by the nation's emergency management system.

Addressing more than 900 banquet attendees Friday evening, FEMA Administrator Fugate earned a heartfelt standing ovation with a description of his own journey of discovery of the magic of shortwave radio communication and his experience with radio amateurs as an emergency manager in Florida. None of his listeners could have questioned Craig's sincerity, but any possible doubts would have been dispelled by observing him in the role of enthusiastic shopper in the exhibition hall!

After the banquet, a mass initiation into the Royal Order of the Wouff Hong, the whimsical "secret society" that seeks to uphold the finest traditions of "The Old Man" himself, Hiram Percy Maxim, was attended by nearly 600 members both new and old.

Saturday began with a well-attended Presidents Breakfast to honor the ARRL's volunteer leaders, past and present. The surviving Past Presidents who were able to come to Hartford were Harry Dannals, W2HD (1972 – 1982); Larry Price, W4RA (1984 – 1992); Rod Stafford, W6ROD (1995 – 2000); and Joel Harrison, W5ZN (2006 – 2010). Jim Haynie, W5JBP (2000 – 2006) was unable to attend. The awards they received symbolize the debt we all owe to the countless ARRL volunteers and officers of affiliated clubs who have contributed their time and talent over the past century.

Congressman Joe Courtney from Connecticut's 2nd District, the original cosponsor of H.R. 4969, addressed the breakfast gathering and spent an hour touring the exhibits to see how Amateur Radio is contributing to the development of American technology and emergency preparedness.

At midday on Saturday Joe Taylor, K1JT, related to a rapt audience of 800 how his early interest in Amateur Radio led to an academic career that earned him, among other honors, a Nobel Prize in Physics. Joe has come full circle, giving back to Amateur Radio by applying knowledge gained in the field of radio astronomy to the challenge of communicating with weak digital radio signals.

Joe Taylor observed that in Amateur Radio's infancy, scientists of the day did not believe the short waves could support useful communication and "truly were astonished" when amateurs proved them wrong. "It's a great story and it couldn't have happened the same way without the ARRL," he said.

Looking to the future — one in which good radio engineering will involve both hardware and software — Joe encouraged us all to not overlook any opportunity to contribute to the art and science of radio and to the public good. "Let us also work to keep our League a strong and effective voice on our behalf," he said. "I'd like to think that someone will be here 100 years from now looking back fondly on all the good things accomplished by Amateur Radio during ARRL's second century."

And that century has just begun. Let's make the most of it.

David Sumner, K1ZZ

hy-gain HF BEAMS...

. . . are stronger, lighter, 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 -- virtually no failures!

TH-11DX, $1199.95. 11-element, 4.0 kW PEP, 10,12,15,17,20M

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!*

Handles 2000 Watts continuous, 4000 Watts PEP.

Every part is selected for durability and ruggedness for years of trouble-free service.

Features a low loss log-periodic driven array on all bands with monoband reflectors, BN-4000 high power balun, corrosion resistant wire boom support, hot dipped galvanized and stainless steel parts.

Stainless steel hardware and clamps are used on all electrical connections.

TH-7DX, $899.95. 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.

Uniquely combining monoband and trapped parasitic elements give you an excellent F/B ratio.

Includes *Hy-Gain's* diecast aluminum, rugged boom-to-mast clamp, heavy gauge element-to-boom brackets, BN-86 balun. For high power, upgrade to BN-4000.

TH-5MK2, $789.95. 5-element, 1.5 kW PEP, 10,15,20 Meters

The broadband *five element* TH5-MK2 gives you outstanding gain.

Separate air dielectric *Hy-Q* traps let you adjust for maximum F/B ratio on each band.

Also standard is *Hy-Gain's* exclusive *BetaMATCH™*, stainless steel hardware and compression clamps and BN-86 balun.

TH-3MK4, $499.95. 3-element, 1.5 kW PEP, 10,15,20 Meters

The super popular TH-3MK4 gives you the *most gain for your money* in a full-power, full-size durable Hy-Gain tri-bander!

You get an impressive average gain and a whopping average front-to-back ratio. Handles a full 1500 Watts PEP. 95 MPH wind survival.

Fits on average size lot with room to spare -- turning radius is just 15.3 feet. Four piece boom is ideal for DXpeditions. Rotates with CD-45II or HAM-IV rotator.

Features *Hy-Gain BetaMatch™* for DC ground, full power *Hy-Q™* traps, rugged boom-to-mast bracket and mounts on standard 2"O.D. mast. Stainless steel hardware. BN-86 balun recommended.

TH-2MK3, $389.95. 2-element, 1.5 kW PEP, 10,15,20 Meters

The 2-element TH-2MK3 is Hy-Gain's *most economical* full power (1.5kW PEP) full size tri-bander.

For just $339.95 you can greatly increase your effective radiated power and hear far better!

Ruggedly constructed, top-performing, compact 6 foot boom, tight 14.3 foot turning radius. Installs almost anywhere. Rotate with CD-45II or HAM-IV. BN-86 balun recommened.

EXP-14, $629.95. 4-element, 1.5 kW PEP, 10,15,20 Meters

Revolutionary 4-element compact tri-bander *lets you add 40 or 30 Meters!* Has 14 foot boom and tight 17.25 feet turning radius. Fits on roof tri-pod, mast or medium duty tower.

Hy-Gain's *patented* broadbanding *Para Sleeve* gives you less than 2:1 VSWR. 1.5kW PEP.

BetaMATCH™ provides DC ground to eliminate static. Includes BN-86 balun. Easily assembled.

Truly *competitive against giant tri-banders at half the cost!*

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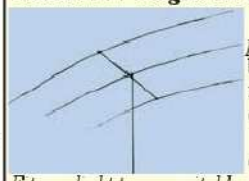

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TH-11DX	11	*For Gain and F/B ratio--See...*		4000	10,12,15,17,20	12.5	100	24	37	22	88	1.9-2.5	T2X	$1199.95
TH-7DX	7			1500	10, 15, 20	9.4	100	24	31	20	75	1.5-2.5	HAM-IV	$899.95
TH-5MK2	5	• www.hy-gain.com		1500	10, 15, 20	7.4	100	19	31.5	18.42	57	1.5-2.5	HAM-IV	$789.95
TH-3MK4	3	• Hy-Gain catalog		1500	10, 15, 20	4.6	95	14	27.42	15.33	35	1.9-2.5	CD-45II	$499.95
TH-3JRS	3	• Call toll-free		600	10, 15, 20	3.35	80	12	27.25	14.75	21	1.25-2.0	CD-45II	$379.95
TH-2MK3	2	800-973-6572		1500	10, 15, 20	3.25	80	6	27.3	14.25	20	1.9-2.5	CD-45II	$389.95
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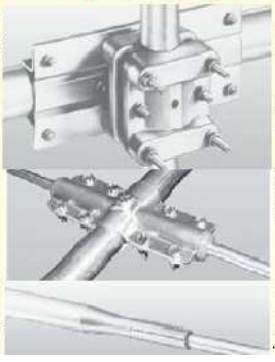

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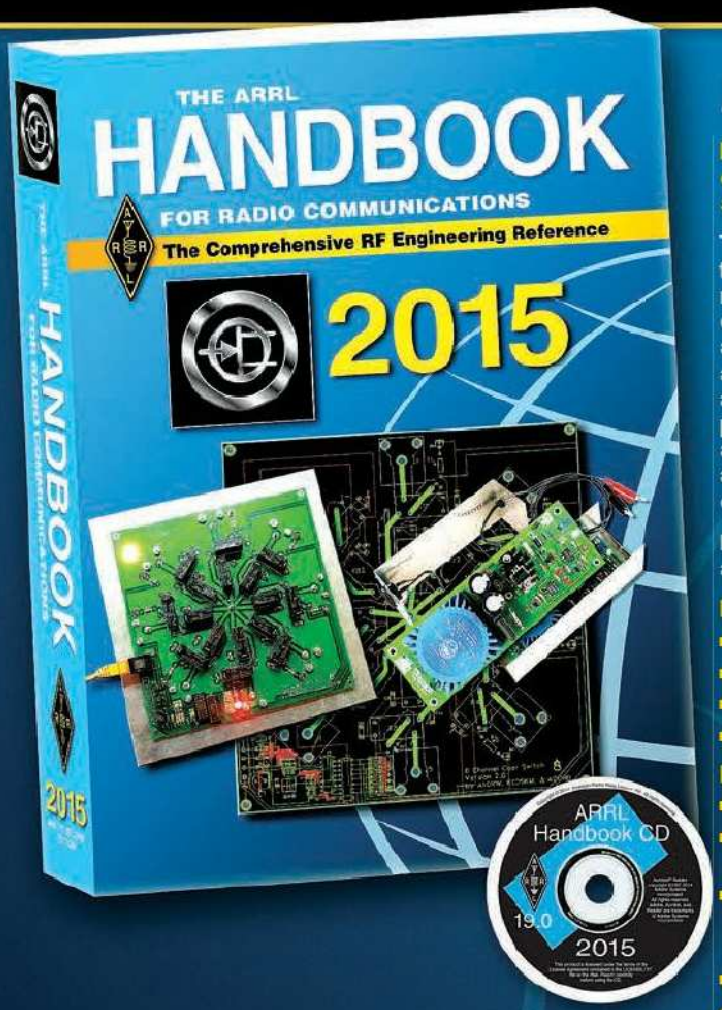

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QST 10/2014

Inside HQ

Harold Kramer, WJ1B – hkramer@arrl.org, ARRL Chief Operating Officer/*QST* Publisher

The ARRL Laboratory Part 1 — Test Equipment

Testing *QST* Product Review equipment; providing regulatory and legislative technical support; solving members' technical problems; resolving radio frequency interference issues; representing Amateur Radio to industry groups; and preserving historic equipment are but a few of the many functions performed by the ARRL Lab.

The Lab staff consists of Ed Hare, W1RFI, Lab Manager; Bob Allison, WB1GCM, Product Review Test Engineer; RFI Expert Mike Gruber, W1MG; Technical Information Service Support Engineer Zack Lau, W1VT and the Lab Support Assistant Tony Nesta, AA1RZ. A dedicated group of volunteers also assists in the Lab.

Improved Product Review Testing

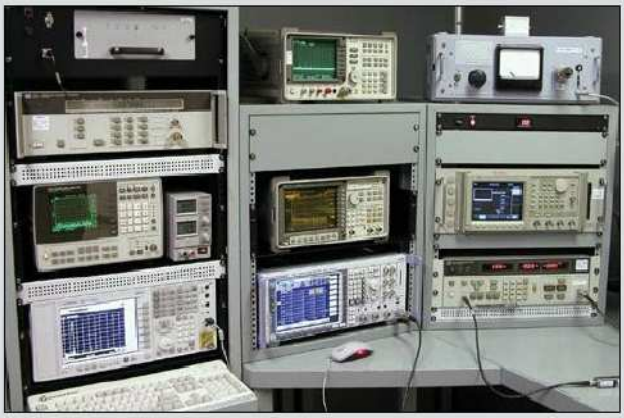
This month I want to focus on the Lab's Product Review testing function. The ARRL Lab tests about 35 to 40 products a year. Product Review is one of the most popular features in *QST* and we will be adding more Product Review items in upcoming issues.

We conduct Product Review equipment tests within a ten-foot-by-ten-foot "screen room" located inside the Lab. The room's walls, floor, and ceiling are shielded with steel and copper, effectively creating a Faraday Cage to isolate the interior from external RF sources, such as W1AW transmissions. This ensures that we are only measuring the RF behavior of the products under test, and not extraneous signals.

Three New Devices

The technical performance of Amateur Radio gear continues to evolve, which means that the Lab must keep pace with constantly changing measurement requirements. With that in mind, we recently upgraded much of our Product Review test equipment. Along with greater accuracy, the new test instruments have more capabilities than their predecessors.

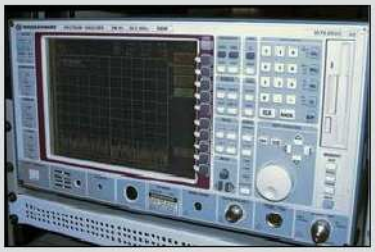
The upgrade was accomplished with the assistance of Dr Ulrich Rohde, N1UL. Dr Rohde is a well-known scientist and businessman (Rohde & Schwarz and Synergy Microwave Corp).



A view inside the screen room. The new Agilent MXA-9020A spectrum analyzer is visible at the lower left and the new Rohde & Schwarz FSUP 26 signal analyzer is at the bottom of the center rack.

Thanks to Dr Rohde's help, the Lab was able to acquire…

- A Rohde & Schwarz FSUP 26 signal analyzer. This instrument measures the phase noise of oscillators and transmitters. We perform this test because phase noise generated by a transmitter can increase the background noise level near the transmitted frequency, which can in turn mask nearby weak signals. The FSUP 26 measures phase noise on all amateur bands below 26 GHz. Previously, the Lab could only measure phase noise on 20 meters. According to Dr Rohde, this instrument "is amongst the best phase noise measurement instruments in the world."
- A Rohde & Schwarz FSEM spectrum analyzer. This device can measure radio frequencies from 20 Hz to 26.5 GHz. The analyzer includes a tracking generator as well. This instrument is used for a variety of frequency domain measurements, including extremely accurate measurements of a transmitter's radio frequency emissions across the spectrum.



This Rohde & Schwarz FSEM spectrum analyzer can measure radio frequencies from 20 Hz to 26.5 GHz.

The Lab also added an Agilent MXA-9020A spectrum analyzer. Its frequency ranges span from 10 Hz to 26.5 GHz. It can precisely measure harmonics and spurious emissions levels to determine if an amateur transmitter or power amplifier complies with FCC Part 97 regulations. This instrument also measures transmitted IMD (Intermodulation Distortion). Poor IMD performance can result in poor transmitted audio quality and RF splatter.

The benefit this new equipment will bring to ARRL members of will be more comprehensive and accurate Product Review testing. Today, Amateur Radio gear encompasses a wide variety of equipment, including both analog and digital radios. The Lab is tasked with testing radios that range from QRP to full power, and everything in between, at frequencies from LF to UHF. These new test instruments will allow the ARRL Laboratory to develop improved test methods to adapt to changing technology. Better Product Review test measurements and data gives you, our members, more information to make better decisions about which transceivers to purchase in a market with filled with many fine choices.

If you are curious about our test procedures, The *ARRL Test Procedures Manual* is published on our website at **www.arrl.org/procedure-manual**. The *Test Procedures Manual* will be revised in the near future to reflect our new test instruments and methods.

My thanks to Product Review Test Engineer, Bob Allison, WB1GCM, for his assistance with this column. Next month, I'll be discussing some of the other functions of the ARRL Lab.

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233 N Columbus St, Arlington, VA 22203
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Brian Mileshosky, N5ZGT
PO Box 20186, Albuquerque, NM 87154-0186
(505-463-9468); **n5zgt@arrl.org**

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PO Box 1482, Sundance, WY 82729-1482
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Southeastern Division
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18848 US Highway 441, Mount Dora, FL 32757
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Vice Director: **Michael Lee, AA6ML**
PO Box 354645, Palm Coast, FL 32135
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Southwestern Division
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Richard J. Norton, N6AA
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www.arrl.org/sections

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

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Delaware: Bill Duveneck, KB3KYH, 18682 Sunny Sky Blvd, Milton, DE 19968-2486 (302-537-4755); **kb3kyh@arrl.org**

Eastern Pennsylvania: Robert B. Famiglio, K3RF, PO Box 9, Media, PA 19063-0009 (610-359-7300); **k3rf@arrl.org**

Maryland-DC: James E. Cross III, WI3N, 16013 Dorset Rd, Laurel, MD 20707-5314 (301-725-6829); **wi3n@arrl.org**

Northern New York: Thomas Dick, KF2GC, 11 Jenkins St, Saranac Lake, NY 12983 (518-891-0508); **kf2gc@arrl.org**

Southern New Jersey: George Strayline, W2GSS, 10 E Pacific Ave, Villas, NJ 08251-2630 (609-741-8322); **w2gss@arrl.org**

Western New York: Laura Peters-Mueller, N2LJM, 2011 E Main St, Falconer, NY 14733 (716-338-3122); **n2ljm@arrl.org**

Western Pennsylvania: John Rodgers, N3MSE, 803 S Main St, Butler, PA 16001 (724-287-0424); **n3mse@arrl.org**

Central Division (IL, IN, WI)

Illinois: Tom Ciciora, KA9QPN, 1887 Irene Rd, Sandwich, IL 60548 (815-498-4929); **ka9qpn@arrl.org**

Indiana: Joseph D. Lawrence, K9RFZ, 4624 Willard Dr, Fort Wayne, IN 46815-6759 (260-373-1986); **k9rfz@arrl.org**

Wisconsin: Gary Sorensen, W9ULK, PO Box 212, Oxford, WI 53952 (608-697-2652); **w9ulk@arrl.org**

Dakota Division (MN, ND, SD)

Minnesota: Richard H. "Skip" Jackson, KS0J, 1835-63rd St E, Inver Grove Heights, MN 55077 (651-260-4330); **ks0j@arrl.org**

North Dakota: Lynn A. Nelson, W0ND, 6940 4th St SW, Minot, ND 58701 (701-839-8200); **w0nd@arrl.org**

South Dakota: Chris Stallkamp, W0ADZ, PO Box 271, Selby, SD 57472-0271 (605-870-1784); **w0adz@arrl.org**

Delta Division (AR, LA, MS, TN)

Arkansas: Dale Temple, W5RXU, 5200 Timber Creek Circle, North Little Rock, AR 72116 (501-771-1111); **w5rxu@arrl.org**

Louisiana: Jim Molan, KD5IGG, 311 N Matthews St, Bunkie, LA 71322-1536 (318-452-5686); **kd5igg@arrl.org**

Mississippi: Malcolm Keown, W5XX, 64 Lake Circle Dr, Vicksburg, MS 39180 (601-636-0827); **w5xx@arrl.org**

Tennessee: Keith E. Miller Sr, N9DGK, 1635 Jarratt Dr, Rockvale, TN 37135 (615-631-9952); **n9dgk@arrl.org**

Great Lakes Division (KY, MI, OH)

Kentucky: Jim Brooks, KY4Z, 7099 Louisville Rd, Cox's Creek, KY 40013 (502-349-2099); **ky4z@arrl.org**

Michigan: Larry Camp, WB8R, 71 Oakdale Lane, Coldwater, MI 49036 (517-278-0406); **wb8r@arrl.org**

Ohio: Scott D. Yonally, N8SY, 258 Valley Hi Dr, Mansfield, OH 44904-9792 (419-512-4445); **n8sy@arrl.org**

Hudson Division (ENY, NLI, NNJ)

Eastern New York: Pete Cecere, N2YJZ, 329 W Saugerties Rd, Woodstock, NY 12498 (845-246-4359); **n2yjz@arrl.org**

NYC-Long Island: Jim Mezey, W2KFV, 38 Appletree Ln, Carle Place, NY 11514-1336 (516-315-8608); **w2kfv@arrl.org**

Northern New Jersey: Richard Krohn, N2SMV, 23 Sweetmans Ln, Manalapan, NJ 07726; **n2smv@arrl.org**

Midwest Division (IA, KS, MO, NE)

Iowa: Robert McCaffrey, K0CY, 1210 Noble Hills Pl, Boone, IA 50036 (515-432-2512); **k0cy@arrl.org**

Kansas: Ronald D. Cowan, KB0DTI, PO Box 36, LaCygne, KS 66040 (913-757-3758); **kb0dti@arrl.org**

Missouri: Dale C. Bagley, K0KY, PO Box 13, Macon, MO 63552-1822 (660-385-3629); **k0ky@arrl.org**

Nebraska: Matthew N. Anderson, KA0BOJ, 2342 Clay St, Ashland, NE 68003 (402-480-5515); **ka0boj@arrl.org**

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Connecticut: Betsey Doane, K1EIC, 92 Mohegan Rd, Shelton, CT 06484-2448 (203-929-7759); **k1eic@arrl.org**

Eastern Massachusetts: Phil Temples, K9HI, 125 Coolidge Ave, Apt 803, Watertown, MA 02472-2875 (617-331-0183); **k9hi@arrl.org**

Maine: Bill Crowley, K1NIT, 150 Maple St, Farmingdale, ME 04344-4809 (207-623-9075); **k1nit@arrl.org**

New Hampshire: Peter Stohrer, K1PJS, 9 Gladstone St, Concord, NH 03301 (603-715-9299); **k1pjs@arrl.org**

Rhode Island: Bob Beaudet, W1YRC, 30 Rocky Crest Rd, Cumberland, RI 02864 (401-333-2129); **w1yrc@arrl.org**

Vermont: Paul N. Gayet, AA1SU, 11 Cherry St, Essex Junction, VT 05452 (802-878-2215); **aa1su@arrl.org**

Western Massachusetts: Ed Emco, W1KT, 37 Bullard Ave, Worcester, MA 01605 (508-853-3333); **w1kt@arrl.org**

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

Alaska: Jim Larsen, AL7FS, 3445 Spinnaker Dr, Anchorage, AK 99516-3424 (907-345-3190); **al7fs@arrl.org**

Eastern Washington: Mark Tharp, KB7HDX, PO Box 2222, Yakima, WA 98907-2222 (509-965-3379); **kb7hdx@arrl.org**

Idaho: Edward Stuckey, AI7H, 2300 W Polo Green Ave, Post Falls, ID 83854-9680 (208-457-0354); **ai7h@arrl.org**

Montana: George Forsyth, AA7GS, 212 Skyline Dr NE, Great Falls, MT 59404 (406-868-2212); **aa7gs@arrl.org**

Oregon: Everett Curry, W6ABM, 1546 NE Greensword Dr, Hillsboro, OR 97124-6139 (503-522-7142); **w6abm@arrl.org**

Western Washington: Monte L. Simpson, K2MLS, 2523 N Wycoff Ave, Bremerton, WA 98312-2711 (360-373-3095); **k2mls@arrl.org**

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

East Bay: James Latham, AF6AQ, 1798 Warsaw Ave, Livermore, CA 94550-6140; (925-447-6136); **af6aq@arrl.org**

Nevada: Gary Grant, K7VY, 11040 Broken Hill Rd, Reno, NV 89511 (775-851-7840); **k7vy@arrl.org**

Pacific: Bob Schneider, AH6J, PO Box 131, Keaau, HI 96749-0131 (808-966-8146); **ah6j@arrl.org**

Sacramento Valley: Ronald D. Murdock, W6KJ, 998 Bogue Rd, Yuba City, CA 95991-9221 (530-674-8533); **w6kj@arrl.org**

San Francisco: Bill Hillendahl, KH6GJV, PO Box 4151, Santa Rosa, CA 95402-4151 (707-544-4944); **kh6gjv@arrl.org**

San Joaquin Valley: Dan Pruitt, AE6SX, 4834 N Diana St, Fresno, CA 93726 (559-779-2974); **ae6sx@arrl.org**

Santa Clara Valley: Brandon Bianchi, NI6C, 1154 Trivoli Way, Salinas, CA 93905 (559-313-3373); **ni6c@arrl.org**

Roanoke Division (NC, SC, VA, WV)

North Carolina: Karl Bowman, W4CHX, 5509 Shimer Farm Ln, Raleigh, NC 27614-6301 (919-669-6068); **w4chx@arrl.org**

South Carolina: Marc Tarplee, N4UFP, 4406 Deer Run, Rock Hill, SC 29732-9258 (803-327-4978); **n4ufp@arrl.org**

Virginia: Carl Clements, W4CAC, 4500 Wake Forest Rd, Portsmouth, VA 23703 (757-484-0569); **w4cac@arrl.org**

West Virginia: Charles L. Hardy Jr, WV8CH, 1203 Bachman Rd, Fayetteville, WV 25840 (304-640-4630); **wv8ch@arrl.org**

Rocky Mountain Division (CO, NM, UT, WY)

Colorado: Jack Ciaccia, WM0G, PO Box 21362, Boulder, CO 80308-4362 (303-587-0993); **wm0g@arrl.org**

New Mexico: Bill Kauffman, W5YEJ, 1625 36th St SE, Rio Rancho, NM 87124-1719 (505-349-0460); **w5yej@arrl.org**

Utah: Mel Parkes, NM7P, 2166 E 2100 North, Layton, UT 84040 (801-547-1753); **nm7p@arrl.org**

Wyoming: Garth Crowe, WY7GC, 1206 Avalon Ct, Gillette, WY 82716-5202 (307-686-9165); **wy7gc@arrl.org**

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

Alabama: David Drummond, W4MD, 5001 Lakehurst Dr, Northport, AL 35473 (205-339-7915); **w4md@arrl.org**

Georgia: Gene Clark, W4AYK, 1604 Lynwood Lane, Albany, GA 31707 (229-888-1090); **w4ayk@arrl.org**

Northern Florida: Steve Szabo, WB4OMM, 536 Central Park Blvd, Port Orange, FL 32127-1136 (386-566-2085); **wb4omm@arrl.org**

Puerto Rico: Rene Fonseca, NP3O, HC 67 Box 15593, Fajardo, PR 00738 (939-579-4134); **np3o@arrl.org**

Southern Florida: Jeff Beals, WA4AW, PO Box 1584, Loxahatchee, FL 33470-1584 (561-252-6707); **wa4aw@arrl.org**

Virgin Islands: Fred Kleber, K9VV, PO Box 24275, Christiansted, VI 00824-0275; **k9vv@arrl.org**

West Central Florida: Dee Turner, N4GD, 10132 64th St N, Pinellas Park, FL 33782 (727-548-7474); **n4gd@arrl.org**

Southwestern Division (AZ, LAX, ORG, SDG, SB)

Arizona: Robert J. Spencer, KE8DM, 1831 S McKinley Ave, Yuma, AZ 85364-5114 (928-941-7069); **ke8dm@arrl.org**

Los Angeles: David Greenhut, N6HD, 5260 Darro Rd, Woodland Hills, CA 91364-1933 (818-992-5507); **n6hd@arrl.org**

Orange: Carl Gardenias, WU6D, 20902 Gardenias St, Perris, CA 92570 (951-490-2270); **wu6d@arrl.org**

San Diego: Stephen M. Early, AD6VI, 4724 Maple Ave, La Mesa, CA 91941 (619-461-2818); **ad6vi@arrl.org**

Santa Barbara: Robert Griffin, K6YR, 1436 Johnson Ave, San Luis Obispo, CA 93401-3734 (805-801-7292); **k6yr@arrl.org**

West Gulf Division (NTX, OK, STX, WTX)

North Texas: Chris Brewer, N5GMJ, 8308 N Water Tower Rd, Saginaw, TX 76179-5169 (817-939-3128); **n5gmj@arrl.org**

Oklahoma: Lloyd Colston, KC5FM, 813 Canterbury Blvd, Altus, OK 73521-4903 (234-564-2775); **kc5fm@arrl.org**

South Texas: Lee H. Cooper, W5LHC, 2507 Autrey Dr, Leander, TX 78641 (512-260-7757); **w5lhc@arrl.org**

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Ameritron 160-6M 1.2kW FET Amplifier

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

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

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

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

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

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

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

This compact operator-friendly and attractive desk-top amplifier fits neatly into any station. Just 10Wx6½Hx18½D 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-1306 automatic bandswitching reads band data from your transceiver and automatically changes bands as you change bands. An optional interface cable is required for your particular radio.

Clean, Modular Construction

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

ALS-1306 Power Supply

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

This *hash-free* fully regulated swtiching power supply is only 12 lbs. and measures a compact 10Wx6½Hx9½D 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.

New! ALS-1306 **$3299** Suggested Retail

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Peek Inside and see Ameritron's beautiful craftsmanship!

ALS-600
600 Watt FET Fixed Station Amp

ALS-600 **$1599** Suggested Retail

No tuning*, no fuss, no worries -- just turn on and operate*. 600 Watts PEP/500W CW, instant bandswitching, SWR protected, extremely quiet, SWR/Wattmeter, ALC control. 1.5-22 MHz (10/12 Meters with MOD-10MB, $29.95). 120/220 VAC. Inrush protected. 9½Wx6Hx12D inches.

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ALS-500M
500 Watt Mobile Amplifier

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"I now have two OM Power amps in my shack, they are built with quality and perform flawlessly. OM Power has become my amp of choice." **Andy - UA3AB**

"I liked the reliability & ruggedness of the FT5ZM OM Power amps so much that I purchased a one new from Array Solutions when I got home."
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"A large DXpedition can be a true torture test for equipment. The OM Power Amplifiers we used on Amsterdam Island ran flawlessly from setup to teardown. I was very impressed."
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FT5ZM
AMSTERDAM ISLAND 2014

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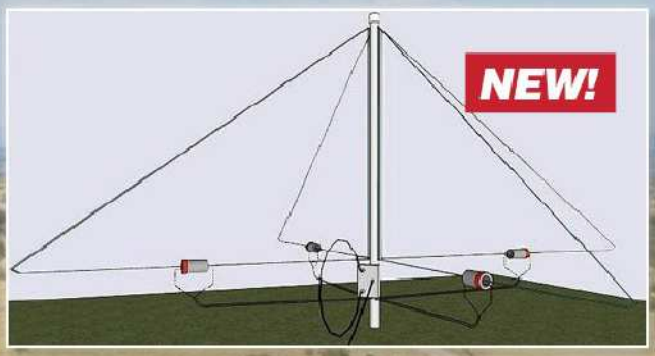

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PX3 Panadapter adds a visual dimension to signal hunting

The PX3 provides fast, real-time spectrum and waterfall displays, plus one-click QSY. Its small size and low current drain make it ideal for travel use. Features 2 to 200 kHz span, noise blanker, USB interface, and full integration with the KX3.

KX3-2M/4M module adds 2 or 4 meter capability

Intended for both local emergency communications and casual all-mode use, the KX3-2M and -4M modules provide power output of 2.5 – 3 W typical at 13.8V and excellent receive sensitivity. Includes full FM/repeater support including CTCSS tones and DTMF.

KX3 Transceiver Specifications

- 160-6 m (2 m or 4 m with optional module)
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- World-class receive performance
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- Supports PC-based remote control and logging; SDR applications via RX I/Q outputs; simple firmware updates
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- 1.7" x 3.5" x 7.4" (4.3 cm x 8.9 cm x 18.8 cm) 1.5 pounds (less options and 8-AA cell battery pack)
- Current drain as low as 150 mA; 9-15 V DC

KXPA 100 Amplifier Specifications

- 100 W output on 160-6 m with 5 W input typical
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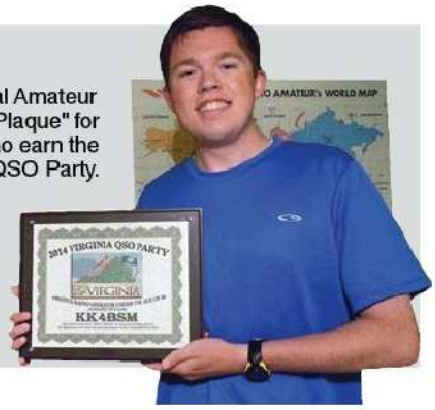
Steve Ford, WB8IMY, upfront@arrl.org

Morse Code Jack O' Lantern

Halloween visitors to the home of James Kern, KB2FCV, may be perplexed by this jack-o'-lantern creation — unless they are CW ops!

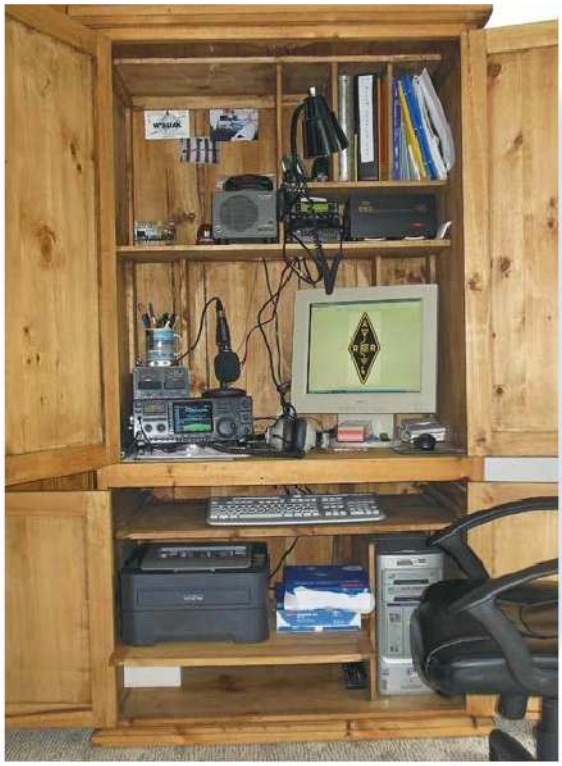
High-Scoring Ham

Each year the K4AMG Memorial Amateur Radio Club sponsors a "Youth Plaque" for amateurs age 18 and under who earn the highest scores in the Virginia QSO Party. This year the plaque went to John Herrick, KK4BSM. John bagged the prize with an HF station consisting of an Icom IC-706MKIIG transceiver and a ladder line-fed 40 meter dipole antenna.



The 51J Lives Again

Grant Guthrie, W4BVT, lovingly restored this 1951 Collins 51J receiver and integrated it into his station console.



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When Grady McCright, W5GEM, and his wife moved into their new home, Grady chose to completely hide his station when not in use. He discovered this handsome cabinet at a local furniture store and knew it held the answer. The cabinet easily houses his entire station, including two transceivers, a computer, a monitor, and much more. When he isn't operating, Grady just closes the doors and everything blends into the room's decor.

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Elecraft's world-class trio is now complete. It all started with the K3 transceiver, which tops the charts in nearly every receive category. Then we added an exciting visual dimension with the versatile P3, our fast, full-color panadapter. And now, we're proud to introduce the KPA500: a 500-watt solid-state amp that's so well-integrated you'll think it's reading your mind.

The KPA500 features 160-6 m coverage, instant RF-based band switching with any radio, alphanumeric status display, bright LED bar graphs, and a rugged, built-in linear supply. The amp's manual band switches can be used to change bands on the K3. The K3 can even select per-band amplifier drive levels automatically when the amp is placed into operate mode, so you'll rarely need to adjust power output.

The K3 already gives you the competitive edge, with its optional high-performance sub receiver, roofing filters as narrow as 200 Hz, new audio peaking filter (APF), and one of the cleanest SSB signals around. Adding the P3 and KPA500 will take you, and your station, to the next level.

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Output voltage	9~15VDC variable
Output voltage variation	Less than 3%
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Output current	30 A (max), 25 A (continuous)
Ripple	Less than 50mVp-p at rated load
Fuse	4A (FXE), 8A (FXT)
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Size	190(W)×69(H)×181(D)mm (Projections not included)
Weight	Approx. 2.5 kgs with detachable AC cord

Specifications subject to change without notice or obligation.

* USB ports may not work for charging cell-phones/mobile phones due to special charging circuits of those devices.

This "Breakthrough" switching power supply packs a lot of features into a compact, lightweight design that features 9-15VDC variable output and delivers up to 25 amps, 30 peak. Unlike other "switchers", it's electrically quiet. But if you should find noise, don't worry! The patented Noise Offset Circuit lets you move the switching noise you might find to another frequency. Other features include a large illuminated "instrument-class" Volt/Amp meter, rear panel binding posts (30A peak), front panel cigar outlet (10A), two pairs of snap-in terminals (5A max.) and USB ports (2A max.), front panel voltage adjust, customer-defined output voltage "memory", ripple less than 50mV p-p and triple circuit protection for short-circuit, over temperature, and current limiting!

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- Internal VOX and Wire cloning capability

SPECIFICATIONS

T-version : RX Freq.	136-174MHz / 400-480MHz (76-108MHz WFM)
TX Freq.	144-148MHz / 420-450MHz
E-version : TX/RX	144-146MHz / 430-440MHz (RX 76-108MHz WFM)
Modulation	F3E (FM)
Power output	Approx. 5, 2.5, 1W
Receiver system	Direct-conversion
Sensitivity	Wide -12dBu , Narrow -9dBu
AF output	1W (10% distortion)
Frequency stability	± 2.5ppm
Dimensions	59.0W×98.0H×35.0D mm or 2.32W×3.86H×1.38D inches w/o projection
Weight	Approx. 227g or 8.01 oz; includes antenna and battery pack
Temp. range	-20°C~+55°C (-4F°~+131F°)

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Letters from Our Members

During 2014, in honor of the ARRL Centennial year, each "Letters from Our Members" column will feature a letter from a past issue of QST.

The New Regs, 1973

In 1972, Novice licensees were finally allowed to use VFOs rather than crystals to determine their transmitting frequencies. The FCC decision was not without controversy, however, since some amateurs felt that Novices would not be able to use VFOs properly. This letter, published in the January 1973 issue of QST, *is a reaction to that sentiment. — Ed.*

Though I am a relatively new ham, I have been impressed with the fairness and impartiality of the rulings of the FCC for a long time. This observation is borne out, it seems to me, in the recent rules of the Commission concerning the new regulations.

I am overjoyed to be able to use a VFO, and I have provided means to check its frequency. I hope that the adverse comments I have heard on the air to the effect that they cannot properly operate a VFO will not be taken too seriously by other Novices. That is silly. What a General can learn, so can a Novice. It will, however, require new skill and knowledge, and I think it would behoove the higher class licensees to help the Novice acquire those skills he needs, rather than berate him. Let us all help one another.

Jim Gunn, WN1QNK, Ossipee, New Hampshire

Centennial Convention Congratulations

I just wanted to send a quick note of congratulations. The Centennial celebration, from all I could see, was a complete success! My friend Greg, AG5W, and I thoroughly enjoyed it. We spent an extra day in town going to some of the must-see spots (Mark Twain house, etc.) and caught the Vintage Radio and Communications Museum of Connecticut over in Windsor on our last afternoon there. It was a lot of fun, and the airport Marriott even had a Nash Rambler (the car, not the music group!) meetup in their lot that weekend, so there was lots of nostalgia on that front!

So, congrats to the League on a well-planned and executed event. As a board member and officer of a small non-profit here in Austin, I know how difficult that can be.

Duane Calvin, AC5AA
Life Member
Austin, Texas

■ Thank you to Lisa Kustosik, KA1UFZ, and all of the Headquarters staff for the warmth and hospitality that ARRL President Emeritus Harry Dannals, W2HD (ARRL President from 1972 – 1982), and I received during the ARRL Centennial Convention. Harry told me that it was the most fun he had ever had at a hamfest or convention. From my perspective, it was an honor to be able to make the visit a reality for my friend W2HD. It brought joy to my heart to see his face light up as he encountered old friends and people he had not seen for 25 years.

It is clear to me that the League is in good hands. What is most evident is that all in Newington truly care about this hobby and cherish the mission of moving us forward into the next century.

Robert E. Pattison, K4DU
Ruckersville, Virginia

Stumping for the Soapbox

Subsequent to participating in the June VHF contest as well as Field Day this past June and submitting some brief comments and pictures related to my experiences via the Soapbox section of the ARRL website (**www.arrl.org/soapbox**), it dawned on me that this is an underutilized part of the website. When I returned to the Soapbox to read about other hams' experiences in these events, a disappointingly small number of submissions were displayed.

I encourage others to submit stories and photos to the Soapbox, especially for Field Day, in order to display your activity and possibly educate others about innovative, new, and beneficial techniques you or your group employed to be successful in a particular event. What better way to show your activity and perhaps encourage others to participate in a contest-related event that otherwise they might not consider.

Hank Hanburger, K3YDX
Gambrills, Maryland

Tube-Based Power Supply and "Jig" Versus "Fixture"

Thanks for Bryant Julstrom's, KC0ZNG, project article "A Tube-Based Bench Supply for Tube Projects" in the August 2014 issue. Although I would not have use for such a thing at present, an adjustable high voltage supply is a handy thing to have, and certainly not something one sees often anywhere in the ham press!

The last time I saw such a thing professionally was in my USAF career a very long time ago. Actually, it was not a standalone unit but an integral part of a tube-based communications system. The main output used several high power beam tetrodes, intended for audio amplifier service, in parallel.

Having been a ham since age 14 in 1964 and growing up with plenty of vacuum tubes, I was well aware of the dangers. Unfortunately, not all of the folks in the career field had the same respect for high voltages, because most of the equipment had been solid state for quite some time, but incidents were still rare. (Or rather, admitted incidents were rare! I suspect that many were too embarrassed to mention it to anyone.)

And while I'm at it, KC0ZNG's "Hints & Kinks" item in the August issue ("A Part-Cleaning Jig") is a great idea! I'd never call it a jig myself, though, but rather a "fixture." I made that mistake *once* at my last job. I referred to something used to hold things during production as a "jig" in the presence of the head machinist, who quickly set me straight — for the next 20 years, I never used the term "jig" again! (Because he allowed me full and free access to the machine shop, I wasn't about to cross him.) In metalworking and woodworking, at least, a "fixture" is something used to hold something in position, while a "jig" is used to control the path of a cutting tool (and could also hold a work piece in position at the same time).

Mike Czuhajewski, WA8MCQ
Severn, Maryland

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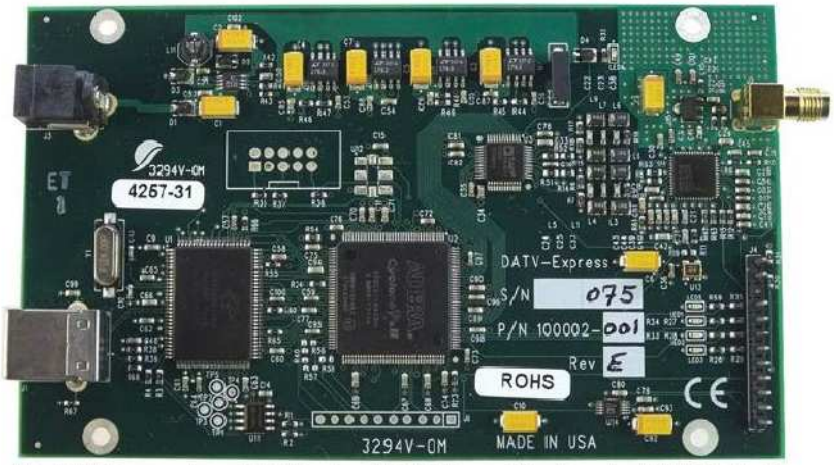
DATV-Express — A New Low-Cost Digital TV Transmitter

Digital ATV just became a whole lot easier.

Art Towslee, WA8RMC

DATV (Digital Amateur Television) is the transmission and reception of digital live video by radio amateurs within allocated amateur bands. Our not-for-profit company, DATV-Express, progressed from concept to a finished product that you can obtain from us to accomplish this. Here are some details of our circuit board, along with optional features, and a look at what we're working on for the near future.



The DATV-Express board. [Art Towslee, WA8RMC, and Ken Konechy, W6HHC, photo]

History of ATV

Modern fast-scan Amateur Television (ATV) dates to the early 1950s and until recently has been entirely analog. I became interested in ATV in 1965, using a Sylvania vidicon camera and a modified General Electric 450 MHz 10 W two-way radio. I started DXing with a 96-element collinear antenna on a 70-foot tower. It was a lot of fun for many years.

DATV Beginnings

US broadcasters had adopted digital television by the end of the first decade of 2000, but there was no migration into US amateur gear. That heightened interest within the Amateur Television in Central Ohio (ATCO) club. Many European amateurs were transmitting DATV, and we found commercially available European DATV boards. The boards were expensive, but we acquired a set of them in 2004, making ATCO the first in the US to have a DATV repeater. That generated much interest, and many amateurs purchased inexpensive

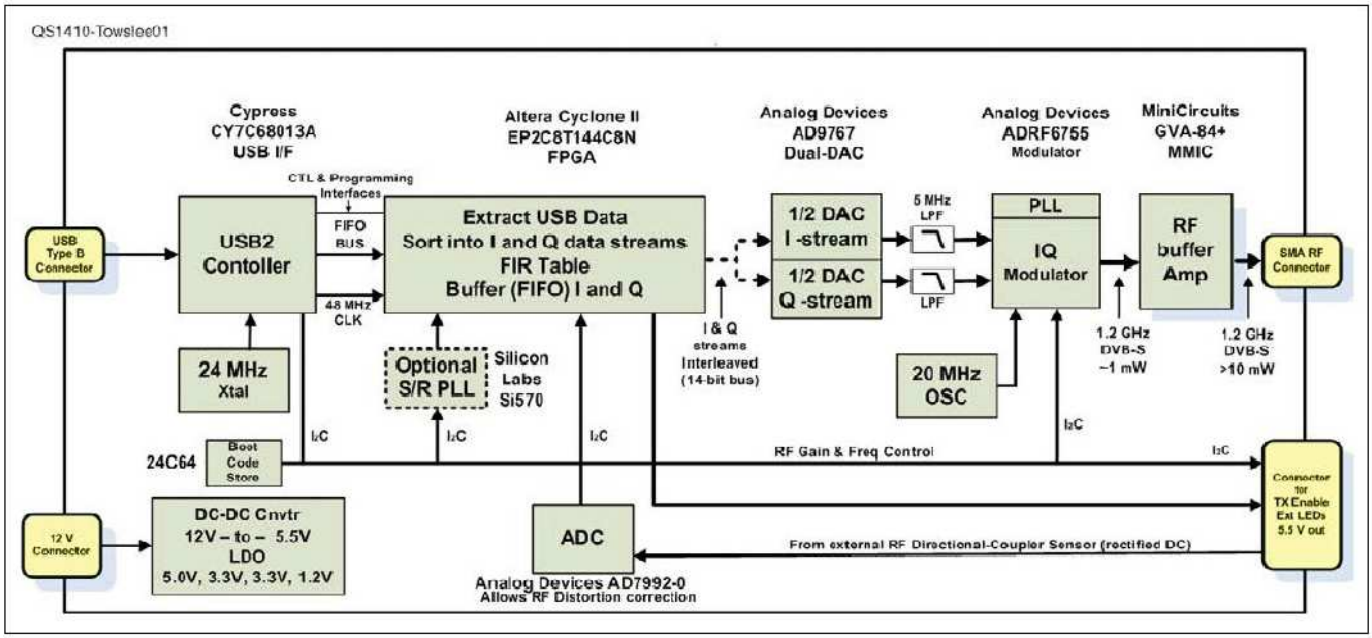


Figure 1 — Block diagram of the DATV-Express board.

"Free to Air" digital receivers to receive the DVB-S "satellite type" digital transmission. Snow-free and ghost-free digital video signals received with simple antennas are crystal clear. What a difference! However, there are drawbacks. Because digital pictures are either 100% snow-free or a blank screen, finding the strongest signal by rotating the antenna doesn't work well. The most significant problem was, and still is, the cost of the transmitting equipment. Digital TV transmitting equipment requires very linear transmitters, and there are few companies producing equipment.

Forming our DATV Group

After we installed our ATCO digital transmitter repeater, I often asked for volunteers who could help develop a low-cost amateur television digital equipment. During my DATV presentation at the Dayton Hamvention ATV forum in 2009, a representative from Tucson Amateur Packet Radio (TAPR) asked if I would present something at their TAPR DCC Chicago Conference in the fall of 2009. In that talk I again asked for volunteers who could assist in the design of a low-cost DATV transmitter. Ken Konechy, W6HHC, had a similar presentation about digital television at that conference, and he also asked for volunteers to help develop DATV equipment.

Meanwhile in the UK, Charles Brain, G4GUO, was experimenting with DATV software on an expensive commercial IQ modulator. Independently, Charles contacted TAPR and suggested that he could write DATV software if TAPR knew anyone who could design a concept hardware board. TAPR then contacted Ken about Charles' proposal, and Ken contacted me. I agreed to design the hardware, Charles would write the software, and Ken would manage and document the project. We also enlisted Tom Gould, WB6P, for his circuit board layout expertise, PADS software PCB (printed circuit board) layout tools, and willingness to help where he could. By the end of 2011, DATV-Express had produced the first working prototype board.

PCB Iterations

Our first PCB layout taught us that 1280 MHz circuit board traces must be short and direct. On the second prototype we fixed some of the RF issues, improved power supply bypassing, and added circuitry enhancements, but the modulator IC ran too hot. On our third prototype we added more ground plane around the modulator IC and shortened the signal bus.

That prototype proved to be production ready; we wanted to eliminate *all* known bugs before release. We felt that we wouldn't be able to properly support the product if there were numerous problems coming in from customers. Although we originally wanted to stimulate DATV interest in the USA, most sales were in Europe, Australia, and other countries. As we develop more applications, I'm sure that interest will increase.

The DATV-Express Board

The DATV-Express board (see Figure 1), is a modulator/transmitter board that processes video and audio into an amateur band digital television RF signal. It can operate over the frequency range 100 MHz to 2450 MHz without any hardware changes. Check your local area for actual frequencies in use. You can use this board in the 420 – 450 MHz, 902 – 925 MHz, 1240 – 1300 MHz, and 2390 – 2450 MHz amateur bands by selecting the proper frequency in the software menu.

The Express board (see specifications in Table 1), operates with a video capture card (see Figure 2), that has a hardware MPEG2 encoder (to minimize PC overhead), and a standard PC running the Linux (Ubuntu) operating system. Composite video and audio feeds into the video capture card where it is converted into an MPEG2 data stream. That module, in turn, feeds the data to the computer via a USB cable connection. The computer processes the MPEG2 data and sends it to the Express board as a transport stream via a second USB cable connection. The board further processes the data and converts it into an RF signal, which is software adjustable from about –35 to +10 dBm.

DATV Modulation

The Express board is a software defined radio (SDR) product capable of almost any modulation scheme, limited by the software driving it. We have basic SDR software in the works, but for now, basic DVB-S (worldwide Satellite format, spectrum shown in Figure 3) and DVB-T (European broadcast terrestrial format, spectrum shown in Figure 4) are the only ones available. The DVB-S format is QPSK (Quadrature Phase Shift Keying), the same as that used by commercial broadcast satellites worldwide. That signal can be received without modification on standard "Free To Air" satellite set top boxes. Suitable boxes are available new at satellite stores for under $125 or used on eBay for $20 to $50. The DVB-T format is the terrestrial format used in Europe and some other countries. You can select either the

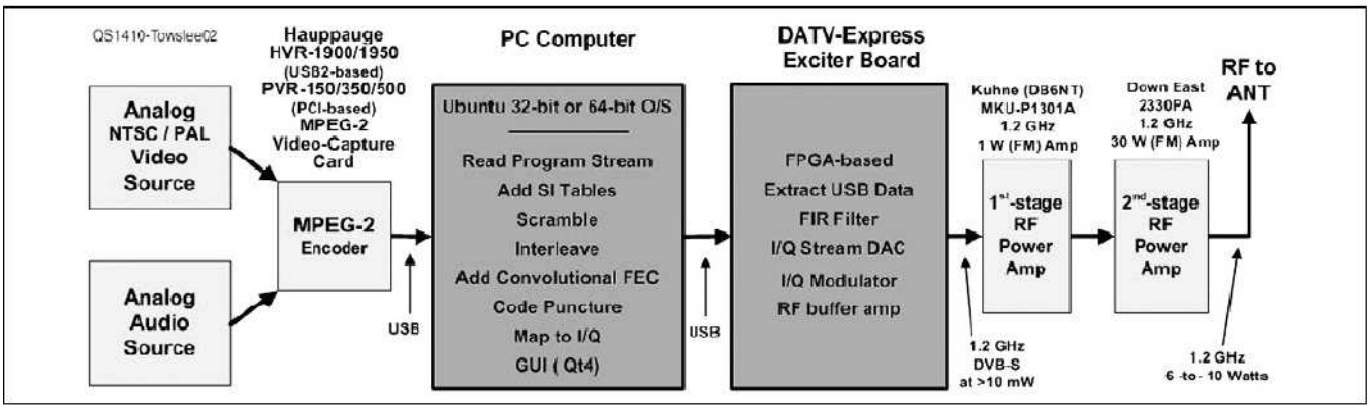


Figure 2 — Block diagram showing the transmitter signal path from video to RF.

DVB-S or DVB-T modulation format in the software menu. Small "USB dongles" for receiving DVB-T can be ordered online for less than $25. A number of US hams have had success experimenting with this format for DX operations. They have claimed distances of over 150 miles with transmitters operating at around 1 W output power.

The DATV Transmitter

The overall transmitter block diagram is shown in Figure 2, and the details of the Express board are in Figure 1. The Express board receives MPEG2 transport stream data from the video capture card in the computer through a USB2 controller. The data is processed and converted to a parallel data bus and passed on to a Field Programmable Gate Array (FPGA) where error correction and further encoding take place. The FPGA does most of the data processing, thereby relieving the computer of many high speed operations. Although it is possible to run the board from a Raspberry Pi, tests have proven that it is pressed beyond its limit. However, the MK802 IV[1] and ODROID quad-core boards are a better solution. Software is being finalized to support these boards.

The FPGA 14 bit 100 MHz data bus connects to a dual digital-to-analog converter (DAC), which converts the signal to an I/Q signal pair. These two signals pass through identical low-pass filters to remove the DAC sampling artifacts, and are then input to the I/Q modulator IC. A MMIC RF buffer amplifier then amplifies the modulated RF signal and passes it through a 3 dB attenuator to isolate the output. That +10 dBm (10 mW) signal appears at the output SMA connector of the Express board. Figure 2 identifies some possible commercial amplifier combinations for the 1240 – 1300 MHz band that bring the RF power up to 1 W and then up to 6 – 10 W.

More Features

The Express board has a software selectable signal generator feature that can output a single frequency unmodulated CW signal. You can select any frequency between 100 and 2450 MHz with output from –35 dBm to +10 dBm.

We also provide a "Transport Stream" file recording feature. Enabling the TS software button causes the computer to create a transport stream (.ts file) in the computer root directory. It records at about 2 MB/s for as long as the software button is enabled. The stored file in the PC can then be played back with video viewing programs such the VLC media player.

Table 1
DATV-Express board specifications

Environmental Details	
Temperature	0 to +30°C (32-86°F)
Humidity	+10 to 95% non-condensing
Electrical Details	
Required computer components	Host computer with at least two USB2 ports or one port and a USB hub.
USB interface cable	USB type A connector at computer end, USB type B connector at DATV Express end.
Software support requirements	Pentium 4 or better, 2 GB available hard drive memory.
Operating system	32 bit or 64 bit Ubuntu (Linux) — Version 12.04LTS or newer.
Video capture card, external	Hauppauge USB models HVR-1950, HVR1900, PVR USB2.
Video capture card, internal	Hauppauge card models PVR-150, PVR-250, PVR-350.
Input voltage	+9 to +15 V dc (400 mA @ 12 V dc). Input polarity protected. External 1 A slo-blo fuse.
Frequency range	100 MHz to 2450 MHz
Symbol Rate (MS/s)	1.00 – 9.99 in 0.01 steps. (Design optimized for 2 – 6 MS/s).
FEC combinations ½, ⅔, ¾ ⅝, ⅞ for DVB-S and DVB-T protocol.	
EVM (Error Vector Magnitude) 2.4%. (Measured with Agilent EXA N9010A Signal analyzer).	
MER (Modulation Error Ratio) 32 dB.	
Video	Determined by capture card specs. Hauppauge model HVR1950 accepts 1V P-P 75 Ω NTSC or PAL video.
Audio	Determined by capture card selection; audio compression: MPEG1.
LED identification	
LED1	I2C activity — BLINK, Blinks quickly during I2C communication. It's a very short blink and hard to see.
LED2	SR counter — FLASH, Higher symbol rates = faster flashing.
LED3	FX2 OK, ON if the USB controller is OK.
LED4	+5 V power, ON when +5.5 V dc is present.
LED5	PLL locked: ON for all normal operation, OFF for setup malfunction.
Connector details	
USB	USB2 type "B" connector (J1), standard USB2 connections to/from host computer.
RF output connector (J2)	SMA female.
DC power connector (J3)	Female DC 2.54 mm center pin. Mates to Switchcraft #760 or equal plug.

Future of DATV-Express

The International Space Station (ISS)[2] is now sending DVB-S video to communicate with students at schools worldwide. ISS can transmit DATV on 2422, 2369, and 2395 MHz at 2.0 and 1.3 MS/s. A proposal is being prepared to permit transmissions of DVB-S video signals *to* the ISS. Stay tuned!

We are working hard adding features to the Express board, including SDR applications, and incorporation with the MK802 IV, ODROID, and and other computer boards. The MK802 IV or ODROID board with the video capture module and the Express board form a truly portable DATV application that is practical for remote or emergency operation. We are planning a

[1]Notes appear on page 33.

Data I/O connector (J4) pins	
1	+5.2 V dc thru 50 Ω ¼ W resistor
2	Tx disable input (Gnd to turn Tx OFF) (Floats to +3.3 V through 100 Ω for Tx ON)
3	Key (no pin)
4	PLL locked output (LED5)*
5	I2C activity output (LED1)*
6	Symbol Rate output (LED2)*
7	FX2 OK output (LED3)*
8	I2C buss SDA Reserved for future data communication/ expansion and testing analysis
9	I2C buss SCL Reserved for future data communication/ expansion and testing analysis
10	Ground
11	Analog input 1**
12	Analog input 2**

*This data is + true to 3.3 V for function indicated. The outputs are in parallel with LEDs thru a 100 Ω resistor.
**These inputs are reserved for forward and reverse power output signals through an external dual directional coupler.

Expansion connector (J6)	
1	Ground
2	Key (no pin)
3	FPGA I/O pin 97
4	FPGA I/O pin 96
5	FPGA I/O pin 95
6	FPGA differential – output pin 72
7	FPGA differential + output pin 71
8	FPGA differential – input pin 70
9	FPGA differential + input pin 69
10	FPGA I/O pin 67

Signals	
Transport Stream	A "transport stream" feature is incorporated in the software to enable signal analysis. When the "TS log to file" button is checked, the computer will collect the active signal in a continuous *datvexpress.ts* data stream in the default Home directory.
RF output	Freq. range: 100 MHz to 2450 MHz
Resolution	100 Hz. Accuracy: ±2 kHz
Frequency stability	±100 ppm
Output Impedance	50 Ω
Level (100 MHz)	–34 dBm to +13 dBm in 1dB steps
Level (1280 MHz)	–35 dBm to +12 dBm in 1dB steps (1280 MHz)
Level (2450 MHz)	–39 dBm to +8 dBm in 1 dB steps (2450 MHz)
Spectral regrowth	–60 dBc (RF level setting 00 to 35) –50 dBc (RF level setting 36 to 47)

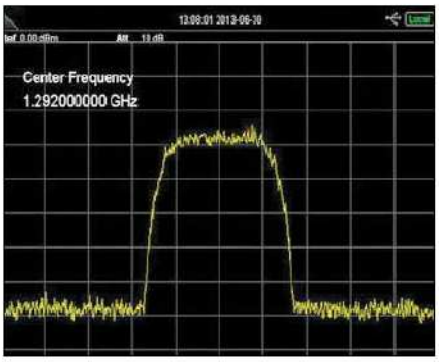


Figure 3 — DVB-S spectrum analyzer waveform. The scale is 10 dB per vertical division and 1 MHz per horizontal division.

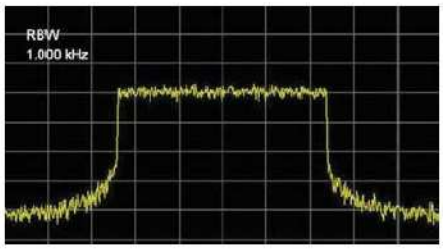


Figure 4 — DVB-T spectrum analyzer waveform. The scale is 10 dB per vertical division and 1 MHz per horizontal division.

QAM modulation feature for USA CATV compatibility. Standard USA broadcast 8VSB (ATSC) format is also possible. Are there any experienced Digital TV software engineers out there willing to help us?

This project is a labor of love. We are selling the completely assembled and tested boards for US $300 on a *not-for-profit basis* via DATV-Express LLC, a non-profit company. We formed the company specifically for furthering the development and popularity of DATV. We are all volunteers and our selling price covers the cost of development and parts. When the development costs are repaid, we will open up the design for the circuit board layout, the schematic, and software to others. The assembled and tested board, operating software, and complete manual are available from our web page, **www.DATV-Express.com**.

Notes
[1]MK802 IV — Rikomagic RKM MK802 IV available at **www.amazon.com**. ODROID — ODROID U3 available at **www.hardkernel.com**.
[2]**www.arlss.org/hamtv-on-the-iss.html**

ARRL member and General class licensee Art Towslee, WA8RMC, was first licensed in 1965. Art has an Electrical Engineering degree from the University of Toledo in Toledo, OH. He worked for Mettler Toledo, Inc designing industrial scale equipment, and retired in 2007 after 44 years of service. He has been active almost exclusively with VHF, UHF, and microwave ham radio communications. He designed and built most of his ATV gear including collinear antennas. Art authored articles in *Ham Radio Magazine* in 1980 about his television camera design. Later he authored an ATV chapter in the *ARRL Operating Manual*. He enjoys Digital ATV and ATV repeater design projects for the local ATCO ATV club in Columbus, Ohio. He is the club president and ATCO Newsletter author/publisher. You can contact Art at **towslee1@ee.net**.

DATV-Express is a team effort of Art Towslee, WA8RMC, hardware design; Charles Brain, G4GUO, software design; Ken Konechy, W6HHC, project manager and documentation; and Tom Gould, WB6P, PCB layout design.

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

Extended Double Zepp Yagi Antenna

Add some DX punch with this modification of a classic antenna.

William Alsup, N6XMW

The Extended Double Zepp favors two opposite directions. The basic Extended Double Zepp center-fed antenna consists of two 0.62 wavelength sections placed end to end (1.24 wavelengths total) and fed in the middle.[1] The antenna has a pattern broadside to the wire with one major forward and one major backward lobe, each having about 3 dBd gain at the cost of narrow beamwidths in the main lobes. That specific length maximizes the gain and has a feed point impedance that is easily transformed to 50 Ω by a well-chosen segment of ladder line.

But, if you want only *one* direction, consider my Extended Double Zepp Yagi. I decided to add the reflectors to concentrate the pattern from my San Francisco, California location toward Alabama, the location of my childhood friend Junior, N4CLT, with whom I enjoy chats every Saturday morning, and toward the Caribbean and South Africa.

Turning the Zepp into a Yagi

Before building the reflectors, I modeled the proposed antenna using *EZNEC*.[2] After some trial and error, *EZNEC* modeling showed that there should be two collinear standalone reflectors rather than a single reflector, each a little longer than ½ wavelength, connected in the center by non-conductive cord, as in Figure 1.

All of the wires (black lines) are #18 AWG "silky" wire.[3] The colored lines indicate UV-resistant cord. Six insulators can be seen in appropriate locations. Each of my antenna driven elements is an uncut continuation of the homemade ladder line. This avoids the need to solder the ladder line to the antenna. Each starting wire length must be long enough to include one side of the radiating element as well as one side of the ladder line (plus a little extra for trimming in the tuning process). Ladder line is lightweight, which reduces sagging, and can be low loss. My ladder line terminates 3 feet above the ground (see Figure 2), in a Budwig antenna connector (**www.budwig.com**). The 5-inch gap between the two radiating sides at the top of the ladder line is maintained by thick monofilament or weed-eater cord or PVC pipe. The ladder line spacing is not critical. I used 3-inch spacing, using thin-walled irrigation tubing for spacers. The length of the ladder line, however, is critical. It needs to be a multiple of ½ wave at the center design frequency *plus* an additional matching length to compensate for the high-impedance feed point of the antenna. The exact length of the ladder line needs to be adjusted by trial and error for best match.

Antenna Dimensions

As seen in Figure 1, each side of the driven element is 44 feet, 11 inches long, separated by a 5-inch gap, so the total Double

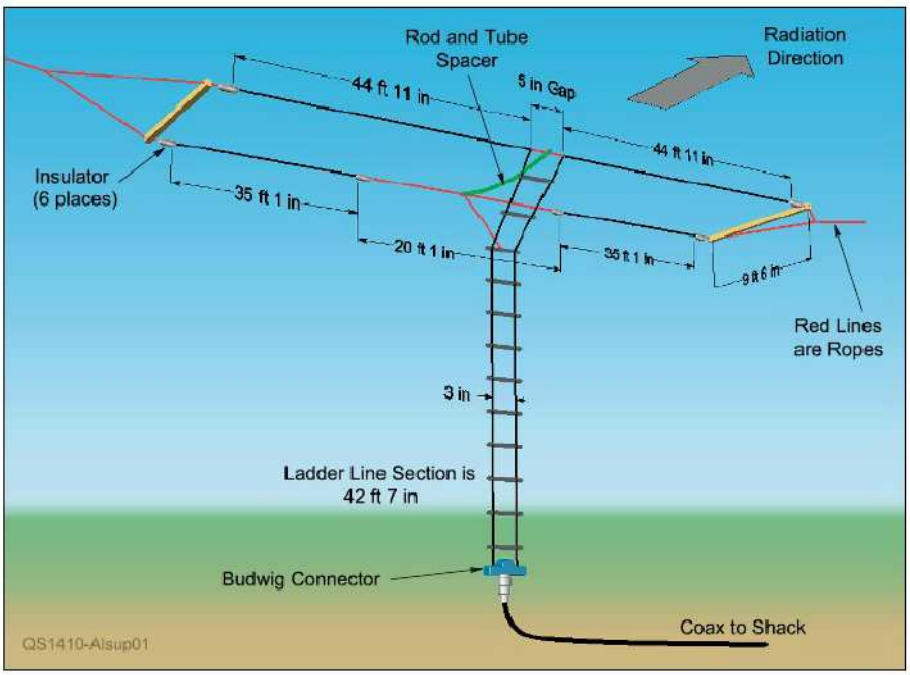


Figure 1 — Extended Double Zepp Yagi dimensions.

[1]Notes appear on page 35.

Figure 2 — Detail of the ladder line transition to coax.

Zepp length is 90 feet, 3 inches. Each side of the ladder line and each driven element are made from a continuous 87 foot, 6 inch length of #18 AWG "silky" wire (plus some extra for trimming). The reflectors are 35 feet, 1 inch each, with a cord in the 20 foot, 1 inch gap between elements. Spars maintain a 9.5 foot separation between the driven and reflecting elements. The 42 foot, 7 inch long ladder line terminates in a Budwig connector (see Figure 2), then to 50 Ω coax cable. You can insert a balun between the ladder line and the coax. My antenna is about 47 feet above the ground.

EZNEC modeling showed that there should be two collinear standalone reflectors rather than a single reflector.

The two spacers at each end of the antenna are lightweight wooden 10 foot long, 1.5 inch × 1.5 inch spars. The middle spacer needs to be light to reduce sag. I used two 6-foot long, ¼-inch diameter plastic rods slipped (for better stiffness) into a 6-foot long aluminum, ⅜ inch outside diameter tube for a total 12 foot length. Taking into account the tendency to bow, this maintains the needed 9.5 foot spacing.

Hanging the Wires

I ran a line from the two tips of each wooden end spar, forming a triangle. At the apex I connected a hoist line, which then runs through pulleys suspended from trees. Instead of allowing the ladder line to hang directly down from the driven element, it should be drawn rearward slightly so as to hang down from the centerline of the overall ensemble. Connect a drawstring from the ladder line about 12 feet below the feed point to the center spar at the two reflectors, as shown in Figure 1. This also helps keep the antenna level.

Suspend the antenna ensemble from lines through hoist pulleys at each end. The entire antenna can be raised or lowered by pulling or releasing the hoist lines, and should remain level and reasonably flat with minimum sag.

I used an EZ Hang slingshot to launch a monofilament line over a limb high in a tree. I then pulled a stronger string over the limb, which pulled a stronger rope that drew an even stronger steel cable over the limb. Steel cable will resist abrasion in windstorms, giving a long life to the pulleys. The pulley is connected to the end of the cable, taking care to keep the hoist line through the pulley as the steel cable is pulled high into place. When the antenna is pulled tight, it and the pulley should clear the foliage of the tree. Use the same procedure at a second tall tree about 110 feet away.

Performance

EZNEC modeling shows a strong forward lobe with modest rearward and side lobes. The forward lobe gain is 6 dBd, which is about 3 dB more than the Extended Double Zepp. The front-to-back and front-to-side ratios are about 12 dB. On-air reports put the antenna on par with my rotatable Cushcraft A4S Yagi on a 50 foot tower. My Extended Zepp Yagi is inexpensive, performs reliably, is easy to maintain, and has suitable gain in the favored direction. It does, however, take up a lot of space in the long direction, and needs two tall trees or masts.

Notes

[1] *The ARRL Antenna Book*, 22nd Edition. Available from your ARRL dealer or the ARRL Bookstore, ARRL order no. 6948. Telephone 860-594-0355, or toll-free in the US 888-277-5289; **www.arrl.org/shop**; **pubsales@arrl.org**.

[2] Several versions of *EZNEC* antenna modeling software are available from developer Roy Lewallen, W7EL, at **www.eznec.com**.

[3] Part #532 from **www.thewireman.com**.

Photos by the author.

William Alsup, N6XMW, is an Amateur Extra class operator who first became an amateur in 1962 as WA5EGI. He became very active in the last 25 years in DXing and studying propagation, and enjoys on-air chats with his childhood pal. Bill operates SSB and CW and has close to 300 countries confirmed. He and his wife Suzan raised a family in Oakland, California, but he does most of his operating and antenna construction near Yosemite National Park in California. Bill went to college at Mississippi State, then Harvard Law School, and was a trial lawyer for 25 years. In 1999, Bill was appointed by President Bill Clinton to the Federal District Court in San Francisco, where he continues to serve. You can reach Bill at 450 Golden Gate Ave, Rm 16-5240, San Francisco, CA 94102-3489 USA or **william_alsup@cand.uscourts.gov**.

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

New Products

End-Fed Antennas and Tuner from SOTAbeams

The Peak Tuner from SOTAbeams is designed to match end-fed half wave antennas on the 20 through 10 meter bands. The tuner is adjusted with a single tuning knob. It does not include an SWR indicator, but in most cases it is easily adjusted by listening for maximum band noise or by using the SWR indicator included in many QRP radios. SOTAbeams has also introduced a series of half wave end-fed antennas for 80 through 10 meters. Price: Peak Tuner, about $39; half wave end-fed antenna, about $21 to $26 depending on band (prices shown without tax for US/Canada). For more information and ordering details, visit **www.sotabeams.co.uk**.

A CW Adapter for the Collins KWM-2A Transceiver

Add a CW filter, RIT, and fix the transmitter CW frequency shift with these modifications.

The new RIT function control is stacked with the RF Gain control.

Georges Ringotte, F6DFZ

The Collins KWM-2A is legendary. About 30,000 of them were placed into service between their debut in the October 1959 issue of *QST* and the early 1980s. During this time, the Collins KWM-2A was the absolute standard for ham SSB transceivers. The radio participated in wars, space conquests, and expeditions. It used the best components available to cover the spectrum from 3.3 to 30 MHz in SSB/CW modes with exceptional stability and outstanding receive and transmit quality.

Even by today's standards, the KWM-2A is very usable. Its only issue lies with the CW mode. A survey in the March 1981 issue of *Ham Radio Magazine* listed its "worst features" as relays (solved with plug-in relays), heat (solved with small fans), lack of a CW filter, RIT, and transmit CW shift. The last three issues can be resolved using this CW adapter.

Objectives

I wanted to add an IF CW filter and a RIT with ±2 kHz shift, and to correct the 1 kHz CW shift between receive and transmit modes. The KWM-2A generates CW by injecting an audio tone (1550 Hz on mine) into the SSB transmit chain. The SSB 2.1 kHz Collins mechanical filter rejects harmonics of this tone. The method is fine and as long as you keep a low drive level with little or no ALC, the signal is clean both on the air and as seen on a spectrum scope. That same tone triggers the VOX for semi break-in keying, and generates the sidetone. Yes, the frequency of the sidetone is quite high, but you are monitoring your keying in a silent background, so there is nothing wrong about this high pitched tone. The downside of the KMW-2A mode of CW generation lies in the shift between receive and transmit frequencies. If you prefer to receive a CW tone around 550 Hz for example, your transmission will be offset by 1 kHz, the difference between the 1550 Hz generated tone and your preferred 550 Hz pitch.

I also wanted to make only slight modifications to the wiring, no modification to the Collins permeability tuned oscillator (PTO), absolutely no holes and no modifications to other oscillators. I wanted no degradation of the radio's appearance outside or inside, good ergonomics, and readily available components. My solution is a plug-in CW adapter on a single PC board, seen in Figure 1, which can be unplugged to operate the radio as before.

This adapter is also compatible with the Collins 312B-5 VFO station console and will correct its CW shift, allowing you to easily use split operation while working a DXpedition. The only incompatibility is with the noise blanker accessory, because the CW adapter uses the plugs and switch position intended for that accessory.

Figure 1 — The CW adapter plugs into the KWM-2A.

Description of the CW Adapter

The CW adapter comprises a power supply, a CW IF amplifier and filter, RIT and TX CW shift circuits, and control circuits.

Power Supply

The power supply requires care to make it work correctly. Referring to the schematic in Figure 2, the 6.3 V ac filament voltage from J24 Pin 8 connects to a voltage rectifier-doubler, then to a 9 V regulator. R1 isolates the rectifier from the tube filaments. If too small, some hum is induced into V16, the audio amplifier. If too high, U1 does not regulate properly and a different kind of hum is induced in the RIT and IF CW filter amplifier. That's why I used the lowest possible voltage compatible with the low current relays K1 – K5, and low voltage drop Schottky rectifiers diodes.

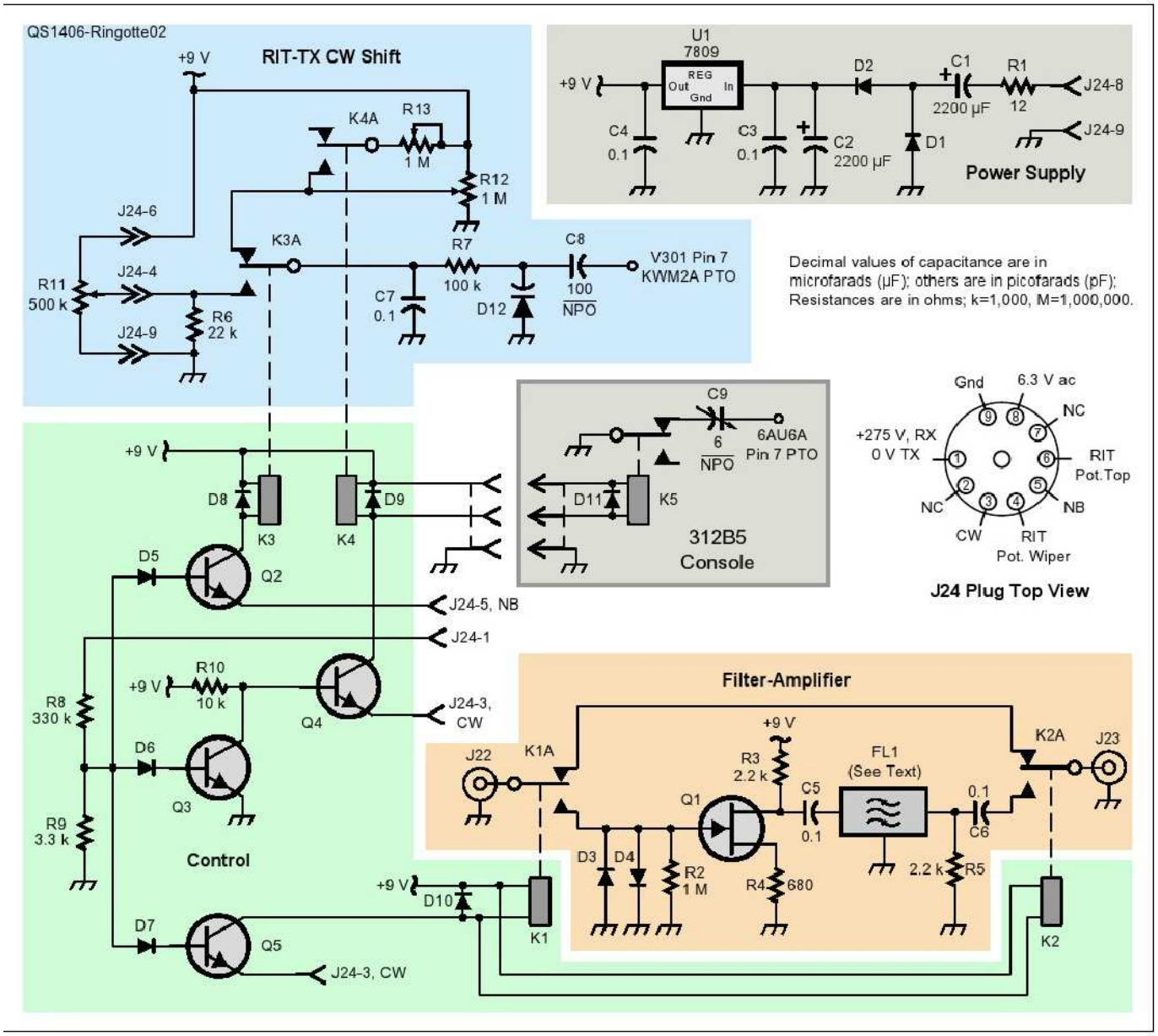


Figure 2 — The CW adapter comprises a power supply, filter amplifier, RIT/TX shift, and control circuitry.

C1, C2 — 2200 µF 25 V
C3 – C7 — 100 nF 63 V
C8 — 100 pF 500 V NPO
C9 — 6 pF air trimmer
D1, D2 — 1N5818 low voltage drop Schottky rectifier diodes
D3 – D11 — 1N4148 diode
FL1 — CW filter, 455.8 kHz center frequency, Z_{in} and Z_{out} 2 kΩ (see text)
J22, J23 — RCA male assembly to fit J22 and J23 on KWM-2A chassis
J24 — nine-pin plug assembly to fit J24 on KWM-2A chassis
K1 – K5 — Relays, Omron G5V1 or equivalent SPDT 12 V, 960 Ω coil
R11 — Part of stacked potentiometer 500 k Ω log taper (see text)
R12, R13 — 1 M Ω 10-turn potentiometer, tuning on side
Q1 — J310N JFET
Q2 – Q5 — 2N2222A
R1 — 12 Ω ¼ W (see text)
R2 — 1 MΩ ¼ W
R3, R5 — 2.2 kΩ ¼ W
R4 — 680 Ω ¼ W
R6 — 22 kΩ ¼ W (see text)
R7 — 100 kΩ ¼ W
R8 — 330 kΩ ½ W
R9 — 3.3 kΩ ¼ W
R10 — 10 kΩ ¼ W
U1 — 7809 9 V regulator
D12 — BB139 varicap diode

IF CW Amplifier and Filter

The KWM-2A 455 kHz IF signal is picked off in the receiver path immediately after the Collins mechanical filter. Relays K1 and K2 switch in the CW filter in CW mode and bypass it in other modes (USB, LSB, TUNE, LOCK) and during transmit. In CW mode, the radio uses the USB BFO on 456.350 kHz, so if you want to listen to CW signals with a pleasant tone near 500 Hz, you need a CW filter with a 455.8 kHz center frequency. Suitable filters are available from Yaesu and Kenwood (the used market), or new from INRAD. You can choose 250, 400, 500, or 600 Hz bandwidths.

I used a Yaesu XF 455.8 MC (600 Hz bandwidth and 2000 Ω impedance) designed for the FT-1000 auxiliary receiver, the FT-726, and the FT-736. Diodes D3 and D4 protect Q1 from switching transients. Q1 (J310) uses a 1 MΩ gate resistor to keep the same load on the Collins mechanical filter. A 2.2 kΩ is used in Q1's drain to adapt the input of the filter, and the same value is used at the output of the filter. Adapt these resistances to your filter requirements. The net gain of this stage is 0 dB, so you will get the same S-meter readings on SSB and CW. Because the Collins mechanical filter and the CW filter are cascaded, the overall selectivity is extremely good. As long as the cabling around the mechanical filter is unaltered, the outstanding ultimate rejection is preserved. This circuit is switched off during transmit to prevent D3 and D4 from severely limiting the CW power.

RIT and TX CW Shift Circuits

Varicap diode D12 connects through C8 directly to Pin 7 (cathode) of V301 (see Figure 3), so there's no need to dig inside the PTO. It shifts the PTO frequency about ±2 kHz without impairing stability, precision or linearity. When the RIT is not used, and during transmit, relay K3 connects the varicap circuit to R12, a 10-turn potentiometer (RIT zero set). In receive with RIT on, relay K3 connects the varicap circuit to the RIT potentiometer located on the front panel of the radio. During transmit, and in CW mode, relay K4 connects R13, another 10-turn potentiometer, shifting the transmit frequency to correspond with the receiving frequency.

R6 tends to linearize the RIT log potentiometer so that the RIT shift is the same on both sides of its travel. You might have to experiment with the value of R6 for your specific potentiometer.

I stacked the RIT potentiometer in the location of the RF gain control, with RIT as the inner knob, and RF GAIN at the outer knob, as seen in the lead figure, in place of the stacked RF gain/noise blanker potentiometers. I used an AF/RF stacked potentiometer set from a Collins 75S3B/C receiver. It has a 10 kΩ outer knob section, and a 500 kΩ log inner knob section. The potentiometer set is available from Surplus Sales of Nebraska. Another solution uses a guitar CTS stacked potentiometer. You will have to experiment with parallel resistors to emulate the 10 kΩ RF gain value.

I used a set of concentric knobs from a Fender "Jazz Bass" guitar for the stacked potentiometers, available new from guitar shops. I slightly enlarged the inner knob to fit the Collins AF/RF gain potentiometer. As seen in the lead photo, I added + and – signs with dry transfers to indicate the zero and the direction of RIT shift. The RIT circuit is switched in by the NB position of the transceiver power switch. Now, NB can be interpreted as "No Bound," indicating that receive and transmit frequencies can be offset using the RIT knob.

Control Circuit

In The KWM-2A, J24 plug Pin 1 carries +275 V in receive, and 0 V in transmit. [Use extreme caution; these high voltages can be lethal. — *Ed.*] I use this voltage to control the various relays. With +275 V on and the NB (now RIT) on, Q2 conducts and switches in the RIT circuit with K3.

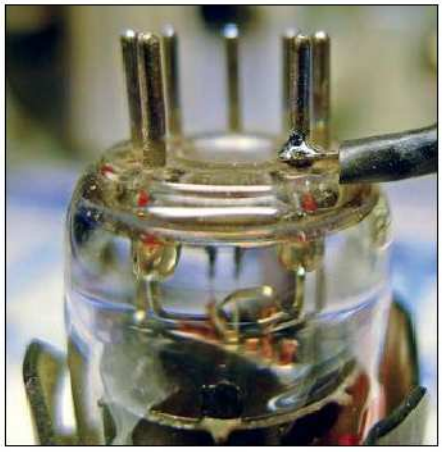


Figure 3 — Connect the varicap diode through C8 directly to Pin 7 (cathode) of V301.

During transmit, and in the ON and CAL positions, the RIT circuit is off.

With +275 V on, and the mode switch in the CW position, Q3 conducts and switches in the CW filter with relays K1 and K2. The CW filter is out of circuit in other modes or during transmit. During transmit (0 V on J24 plug Pin 1), Q4 is off and Q5 conducts in CW mode, allowing K4 to shift the PTO frequency to the correct CW transmit frequency. During receive, and on other modes, the PTO frequency is not shifted.

A three-pin plug on the printed circuit board (top left in Figure 1) can be used to command a relay installed inside the 312-B5 console. A small 6 pF air trimmer, C9 in Figure 2, is switched in during transmit in CW mode. Its value is adjusted to correct the CW transmit frequency shift in the same manner as the KWM-2A PTO.

Installing the CW Adapter

You will need the KWM-2A manual and schematic diagrams to safely perform the modifications. You should have a good understanding of what has to be done. The CW adapter uses J22, J23, and J24 (see Figure 4), originally intended for the noise blanker accessory.

IF Circuits

Cut the jumper wire between J22 and J23. Cut the shielded cables originally connected to J22 and J23 (coming from T2 and Z5), and solder them together, center to center and shield to shield. Use heat shrink tubing to insulate and protect them. Next, cut the lead from C83 (1000 pF 500 V) going to first IF amplifier V1B Pin 6. Using two shielded Teflon insulated cables, connect C83 to J22, and V1B Pin 6 to J23. Be careful to not reverse them, as there is 275 V present during transmit on C83. Connect a temporary jumper cable with two RCA plugs between J22 and J23. Now, test to make sure your KWM-2A works as before.

Control Circuit

Next we install the stacked potentiometers. Mark the positions of, and cut the three wires connected to RF gain potentiometer R84. Identify the two unconnected spare wires near R84. They were wired by Collins to install the noise blanker and are generally located under the mode switch S9. One wire goes to J24 Pin 3; connect it to the free CW contact switch S9G. Using

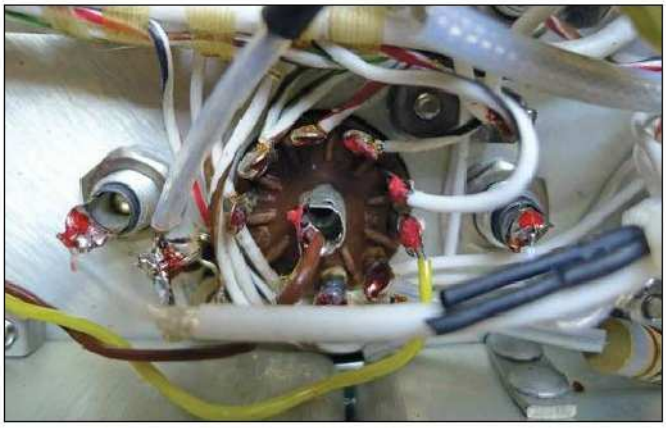


Figure 4 — The CW adapter uses (left to right): J22, J24 (nine pins), and J23 (originally intended for the noise blanker accessory).

an ohmmeter, verify continuity to ground when switch S9 is in the CW position.

Remove RF gain potentiometer R84 and replace it with the new stacked potentiometers. The RF gain control is the lower of the installed stacked controls, the one nearest the front panel. Reconnect the three RF gain control wires to the 10 kΩ potentiometer section. Connect the last unconnected spare wire to the wiper arm terminal of the 500 kΩ control. Connect two Teflon insulated wires to the two other terminals of the 500 kΩ control and route them near J24.

Cut the two wires connected to J24 Pins 5 and 6 and cover them with heat shrink tubing. Connect J24 as shown on the schematic diagram. Carefully verify the connections to J24 Pin 4, because two wires are connected. One is connected to the wiper arm terminal of the new RIT potentiometer, the other to S11 and sees a ground in the NB position. You may need to cut one of them and check that it connects to the potentiometer cursor or to S11, and adjust the wiring accordingly.

With the temporary jumper between J22 and J23, check your transceiver. It should work as before. Measure ac and dc voltages, resistances, and grounds on the J24 pins, comparing values with those on the transceiver schematic diagram for the NB and CW positions of the mode switch.

Building the CW Adapter Board

Construction is not at all critical. First, gather components and lay them out starting with the biggest item parts (the CW filter and the electrolytic capacitors). Then decide the dimensions available for your board and the way you will connect it to J22, J23, and J24. I used PCB RCA sockets and male/male RCA adapters to connect the board to J22 and J23. For J24 I used a nine-pin plug, which I attached directly to the board.

I used free PCB design software and sent the files to a small PCB manufacturer. The Gerber files for my design are available on the *QST* in Depth web page.[1] PCB design is not difficult. The board is in proximity to the PTO, which facilitates the connection to V301 and reduces stray capacitance and inductance. If your KWM-2A has fans, make sure that there is clearance for components, specifically for the CW filter and the electrolytic capacitors.

Adjustments

Plug in the CW adapter. Switch ON the transceiver in USB mode. It should work as before. Test the RF gain control. Switch to CW mode. You should hear the clicking of relays and the CW filter should engage, reducing background noise. Switch to CAL position and tune in a signal. The S meter's readings should be roughly the same in CW and USB. Switch to NB and move the RIT control. The receiving frequency should vary.

Connect a frequency meter to the VFO plug on the back of the transceiver. Center the RIT control and note the frequency. Switch the RIT off by switching to ON or CAL. Adjust the 10-turn RIT zero potentiometer to read the same frequency. If you do not have a frequency meter, use the calibrator to zero-beat its signal with RIT on and off. Use another correctly calibrated transceiver to tune the CW shift.

Transmitting into a dummy load, send a string of dots using another transceiver. In CW mode with RIT off, tune this signal to the center of the Collins CW filter bandwidth. Now transmit a string of dots with the KWM-2A, and tune the CW shift 10 turns potentiometer to center this signal on the other transceiver. A spectrum scope or a CW zero indicator on your other transceiver will help with the process.

You must also adjust the PTO, capacitor C54, T2, and L4 of your transceiver as directed in the Collins manual. The RIT circuit shifts the frequency of the PTO about 4 kHz; but has no effect on stability.

Conclusion

You can operate the transceiver without the adapter by unplugging it and plugging a jumper between J22 and J23. The KWM-2A is a joy to use on CW with this adapter. When you switch from USB to CW in a crowded CW portion of band, the noise is drastically reduced and much interference is eliminated. You will appreciate the clarity of CW signals. At last, what a pleasure to call CQ with RIT off and to hear stations replying right in the CW passband. It's an outstanding half-century old transceiver, usable on all HF bands, and now in CW mode too. *Well done, Monsieur Art Collins!*

[1]www.arrl.org/qst-in-depth

Photos by the author.

Georges Ringotte, F6DFZ, is a retired Colonel of the French Firemen in Provence, which is known for stunning landscapes, but also for wildfires and floods. His expertise was the design of computer-aided dispatch systems, control rooms, and command cars. Licensed in 1974, and an ARRL member since 1976, his main interests in ham radio are vintage American radios, homebrewing, QRP, and DXing. George can be reached at 180 rue du Château 07120 Saint Alban-Auriolles, France, or **f6dfz@sfr.fr**.

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

Add 40 Meters to a 24-Foot Boom Yagi

Add this hot DX band to an existing Hy-Gain beam.

Michael Foerster, W0IH

My Hy-Gain TH11DX beam on a 50-foot tower is very effective on five bands, 10 through 20 meters. I wanted to add a sixth band, 40 meters. The TH11DX beam includes truss wires that keep the boom from sagging from the weight of the beam antenna elements. I tried feeding the truss wire, but couldn't get a resonable match, so I needed another approach. Taking a hint from a TowerTalk post written by Tom Russell, N4KG, I insulated the truss wires at the tower mast and added a matching network so I could use one of the truss wires and the boom as an antenna for 40 meters.

The Matching Network

I constructed an omega match with two variable capacitors, each covering up to around 200 to 250 µF, and with plate spacing sufficient for adequate RF power. As seen in Figure 1, the first capacitor is in series with the coax center conductor feed line and the boom shunt feed line. The second capacitor is a shunted to ground along with the coax shield at the mast. I mounted the two variable capacitors in a plastic housing with the tuning shafts sticking out the side to allow for easy tuning access. I used two ¼-inch rubber grommets to seal the shafts to the plastic housing. I drilled the shaft holes in the housing to ensure a snug fit around the shaft, and then sealed the housing cover with silicone seal and a layer of black tape to keep the box weathertight, as seen in Figure 2. The tuning box has survived for more than 10 years on my tower with no problems and no need to readjust the match.

The Shunt Feed

My solution for an adjustable shunt feed allows me to tune the antenna while standing on the tower. As seen in Figure 3, I cut a slot an ⅛ of an inch larger than the boom diameter in a piece of aluminum plate that would be fitted over the boom. I then attached a wire (the shunt feed) to the top of the plate going back to the mast and connected it to the series capacitor of the omega match. The spring, seen at the bottom of Figure 2, attaches the shunt feed to the vertical

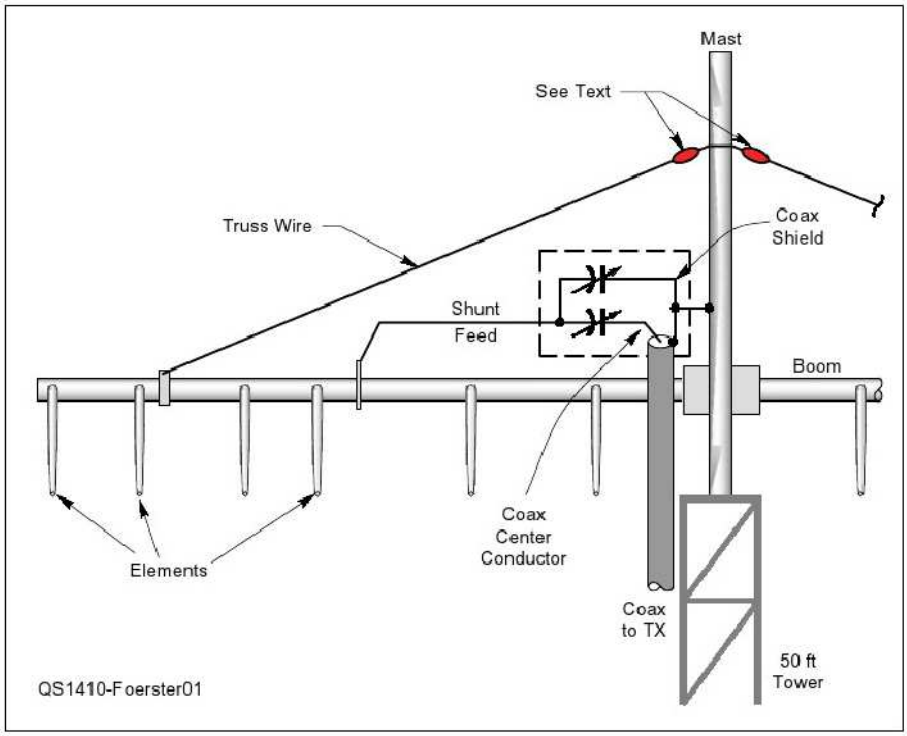


Figure 1 — This schematic representation of the 40 meter antenna shows the tuning capacitors, the shunt feed, and the existing truss wires and boom.

Figure 2 — The omega match housing attaches to the mast.

Figure 3 — An aluminum plate is tensioned by a shunt feed wire and the spring attached through an insulator to the mast. The PVC clamp structure on the right helps to adjust the location of the aluminum plate on the boom.

Figure 4 — Completed shunt assembly mounted above the boom and attached to the tower.

mast above the boom through an insulating strap, and applies tension to the shunt.

Not knowing the exact position of the tap point on the boom, I didn't want to lean out over the boom to set the plate, so I fastened a common paper clamp to the end of a piece of plastic PVC pipe and tied a string to the clamp to allow opening the jaws of the clamp, as shown on the right side of Figure 3. The clamp lets me move the plate back and forth along the length of the boom to search for the correct tuning position while standing on the tower at the center of the antenna. I simply set the tap point along the boom and then connect the shunt wire to the omega match and adjust the capacitors for the best match. The spring, pictured in Figure 3, attaches to the mast with an insulated plastic strap, and keeps the shunt feed wire tensioned so that the boom tap plate will not fall off. You can see the completed shunt assembly in Figure 4. You can use plastic tie wraps for the insulated strap, but be sure to protect them from the Sun and the elements by wrapping the tie wraps in plastic tape.

Tuning the Antenna

With the boom shunt tap in place, I used an antenna analyzer to find the best tuning for 40 meters while adjusting the two capacitors. If the match was not good, I just moved the shunt tap back and forth on the boom until I found a suitable impedance. The final position for the shunt tap on the boom of my antenna was 70 inches from the mast. The VSWR is 1:1 at 7.1 MHzand below 1.5:1 at the band edges.

This 40 meter modification in no way affects the match on any of the other five bands for my TH11DX Yagi antenna. The 40 meter antenna also exhibits directionality similar to a dipole aligned with the boom. The rotor for the beam sure comes in handy!

Other Beams and Bands

Although I insulated the truss wires at the mast, I also tested a configuration with the truss wires connected to the mast (see Figure 1). The tuning point shifts up in frequency, but there is sufficient adjustment capability in the capacitors and the shunt feed to bring that configuration to a suitable match.

You can apply this method of using the boom and a truss wire to other bands and to other beams including ones with different boom lengths. You can also consider using the other side of the boom and the other truss wire to match to 30 meters with another shunt feed and feed line. The shunt tap point along the boom would need adjustment and a little experimentation. An advantage is that this solution can be adapted to almost any antenna without any major modifications.

Photos by the author.

ARRL member Michael Foerster, W0IH, holds an Amateur Extra class license. He's been continuously licensed since his first license, WN0VNH, in 1968, then several months later as WA0VNH. He has worked as an electronics technician, and moved into software testing about 25 years ago, which he continues today. His station includes the Elecraft K-Line, the K3, P3 and KPA500, along with a KX3 portable radio and vintage Heathkit SB101, HW101 and SB221 equipment. You can reach Michael at **w0ih@arrl.net**.

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

Steve Ford, WB8IMY, wb8imy@arrl.org

BeagleBone Black does ALE

A typical BeagleBone Black microcomputer.

The BeagleBone Black is a popular microcomputer and this new application for its talents has nothing to do with beer. Instead, ALE is an acronym for Automatic Link Establishment.

One of the attractions of ALE technology is its ability to automatically select optimum frequencies for point-to-point communication on the HF bands. The military was the first to exploit ALE and it spread to Amateur Radio with the personal computer revolution in the '80s and '90s.

Among the most popular ALE software is *PC-ALE* (**hflink.com/pcale/**), originally developed by Charles Brain, G4GUO. Thanks to *PC-ALE*, an ordinary station computer can function as an ALE transceiver controller and modem.

In a simplified example, let's say an ALE user wishes to contact an ALE-equipped friend on the other side of the continent. The operator enters the friend's call sign and sets the software to work. As soon as *PC-ALE* detects that the frequency is clear, it triggers the transceiver, sends a brief digital call and then waits for a response. Hearing nothing, it switches the radio to a different frequency, usually on a different band, and tries again. It repeats this process on a string of predetermined frequencies for a certain amount of time.

At the other end of the path, the friend's computer is continuously scanning the same frequencies, "listening" for possible calls. When it finally decodes the transmission, it transmits a response, establishes the link and alerts the human operator.

Once the link is established, the operators can communicate with SSB or even conduct a digital exchange. This extraordinary flexibility makes ALE a valuable tool for public service activities.

The only weakness of ALE in a public service role is that it requires a computer. That means a sizable desktop machine, or at least a laptop.

Steve Hajducek, N2CKH, has announced the debut of a second-generation ALE modem/controller project known as BeagleBone Black-ALE (or simply BBB-ALE). Instead of a desktop or laptop computer, the ALE controller is reduced to a hunk of hardware that you can hold in your hand. BBB-ALE is a complete, standalone HF-ALE embedded controller with optional remote control interfacing based on the original *PC-ALE* project code.

Steve has created a Yahoo! forum to encourage discussion as the project develops. You'll find it at **https://groups.yahoo.com/neo/groups/BeagleBoneBlack-ALE/info**. The "Files" section of the forum is taking shape and by the time you read this, a preliminary draft design specification will be posted. Joining a Yahoo! group is free of charge, of course.

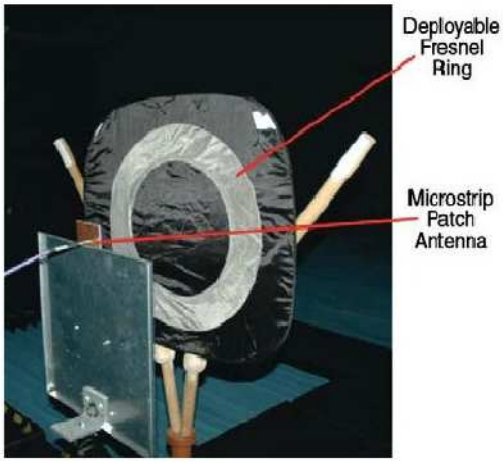
Portable Fresnel Rings

Pete Friedrichs, AC7ZL, passed along an interesting bit of research about the possibility of using portable Fresnel rings to boost the gain of microwave antennas in the field. This is of particular interest to the military, but it may have amateur applications as well.

The Fresnel lens was created by Augustin-Jean Fresnel specifically for use in lighthouses as a means to generate a focused beam of light in a relatively small space. A Fresnel lens is divided into angled concentric sections. Each angled section is somewhat thinner than its neighbor. In total, the angled sections act like one very large lens, but with less physical volume and a significantly shorter focal length.

At the Johnson Space Center, Timothy Kennedy, Patrick Fink, Andrew Chu, and Gregory Lin have developed what they call a "deployable" Fresnel ring that uses a similar technique to focus radio waves rather than visible light. The rings are built with conductive and non-conductive fabric so they can be folded and unfolded with ease.

They work by canceling the out-of-phase radiation along a designated plane, according to the size of the ring and where you place it relative to the antenna (in the "Fresnel" zones). So far they have managed to achieve about 8.6 dB of added gain at 2.4 GHz when placing a Fresnel ring in front of a patch antenna.



A Fresnel ring positioned in front of a microwave patch antenna. [Photo courtesy of the Johnson Space Center.]

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

Alinco DX-SR9T HF Transceiver

This entry-level transceiver also includes some SDR features.

Reviewed by Bob Allison, WB1GCM
ARRL Senior Test Engineer
wb1gcm@arrl.org

The Alinco DX-SR9 is a "bare bones" HF transceiver, designed as a commercial-use radio that is simple to operate. There are many places around the world without telephone infrastructure. Indonesia is a good example. It is composed of more than 13,000 islands, where inhabitants rely on HF to conduct business within a range of a few hundred miles. These are mostly untrained operators who need simplicity when it counts, especially while at sea in transit from island to island. Our review transceiver, made for the Amateur Service, is the DX-SR9T model and is identical to the commercial version, except it transmits on the amateur bands only.

The DX-SR9T is very similar to the DX-SR8T reviewed in the June 2011 issue of *QST*.[1] There is one added feature: SDR (software defined radio) mode, making this a transceiver a "hybrid." With a PC that has two sound cards, the user can operate the DX-SR9T using only a mouse with scrolling ability (more on that later). In this review I will share my experience operating the transceiver as a conventional radio and as an SDR.

The Bones

The DX-SR9T is a basic 160 through 10 meter HF transceiver (including 60 meters), providing 100 W RF output on CW, SSB, and FM, and 40 W output on AM. Power output is not continuously variable between 0 and 100 W as it is with most radios. In addition to HIGH (100 W), there is a LOW setting at about 10 W output, and S-LOW at about 1 W output. A 135 kHz through 30 MHz general coverage receiver in the above modes is included.

The DX-SR9T is a good candidate for mobile operation, mostly for its ability to detach the front panel from the main body of the transceiver using an optional cable and hardware. It also has a large frequency and menu display with ⅝ inch tall alphanumeric characters. The front-facing speaker is a bit small, but audio is loud enough to overcome road noise inside a truck or the din of a motorboat engine.

Though basic, the DX-SR9T is flexible. It has two VFOs (A and B), with "split" operation for working DX. Its CW features include an internal iambic keyer, selectable sidetone pitch, and full break-in, semi break-in and auto break-in modes.

Bottom Line

The Alinco DX-SR9T is an easy-to-use, basic 100 W transceiver for 160 to 10 meters. It can also perform as an SDR when connected to a PC, but with limited performance and functionality.

The auto mode automatically adjusts the delay time with keying speed. The transceiver's memory storage capability is far from basic, with a total of 600 channels registered in three banks of 200 channels per bank. Each channel stores mode, filter, AGC, receiver gain, and noise blanker settings, along with split VFO frequencies and more. The transceiver also has tone encoding, useful for accessing 10 meter FM repeaters.

Out of the Box

The DX-SR9T comes with the EMS-64 hand microphone, the EBC-7 mic hanger with self-tapping screws, a fused 9-foot copper power cord, and a printed instruction manual. An optional EDX-2 external automatic antenna tuner is available for home, automobile, or maritime operation. The optional EDS-17 front control remote kit, with its 16-foot cable, front panel bracket, unit cover, and hardware is also needed for the optional auto tuner. Alinco also offers regulated power supplies and a number of other accessories. A mobile mounting bracket is not an option and must be purchased through a third-party vendor.

User Interface

After briefly reading the basic instructions, I provided 13.8 V dc to the power cord, plugged in the microphone, attached a 40 meter dipole antenna, pressed the power switch, and was ready to start talking. Well, *not really*. I did have to read the instruction manual, which saved some head scratching. The manual is well written and the learning process was nearly painless.

There are a total of five knobs and 23 pushbuttons, and almost every pushbutton has two or three functions. The most prominent control is the rubber-surfaced 1¾ inch

[1] M. Corey, W5MPC, "Alinco DX-SR8T HF Transceiver" Product Review, *QST*, Jun 2011, pp 51-55.

diameter tuning knob. The other knobs are VOLUME, SQUELCH, RIT, and IF SHIFT.

The 12 pushbuttons located at the top right of the front panel are used primarily for changing bands or directly entering the operating frequency. Momentarily pressing the 1 button places the transceiver in the 160 meter band, 2 is for 80 meters, and so on. Momentarily pressing the ENTER button allows direct frequency entry. Buttons 0 through 9 each have a third function, accessed by momentarily pressing the FUNCTION button, then the desired pushbutton. A second function of the . (decimal point) pushbutton is TUNE, used for initiating the tuning process of the optional automatic antenna tuner.

Pressing and holding FUNCTION for one second enables the display menu. There are 27 menus. A shortcut to one of the 27 menu options can be accessed using the MF (multifunction) pushbutton, located just to the right of the display. I found this feature to be handy after setting it up as a shortcut to Menu 13 (CW keyer speed). Though I could adjust many features using the menu system, I found no menu setting for adjusting the microphone level.

At the very top right of the front panel is the power on/off pushbutton. Below it are dual function pushbuttons for mode, VFO/memory toggle, MHz or kHz tuning step, and RF gain selection (+10 dB, normal, –10 dB, –20 dB). An RIT enable, lock and up/down pushbuttons complete the transceiver panel controls.

The large trapezoidal blue-background LCD is easy on the eyes. The background lights are dimmable and can also be turned off. I found dimmer setting 30 out of 64 works the best for indoor stationary use, though mobile operators may prefer a brighter display for daytime use. All of the icons, when present, are large enough to be easily read. The 1½ inch segmented LCD S meter, located along the bottom of the display, is stretched out enough to give critical reports. While transmitting, this part of the display acts as a relative power meter. There is no power indicated while in the S-LOW power setting, other than an LED indicator, located just to the left of the display, that shines red while transmitting (it's green while receiving).

Rounding out the front panel is an external speaker jack (also used for cloning),

Table 1
Alinco DX-SR9T, serial number M000507

Manufacturer's Specifications	Measured in the ARRL Lab
Frequency coverage: Receive, 0.135 – 30 MHz transmit, 1.8 – 29.7 MHz (amateur bands only).	Receive and transmit, as specified.
Power consumption: Receive, 1 A; transmit, 20 A at 13.8 V dc ±15%.	At 13.8 V dc: Receive, 652 mA (max brightness, max volume, no signal), 600 mA (min brightness). Transmit, typically 2 A (s-low), 4.1 A (low), 15 A (full power). Operation confirmed at 11.7 V (65 W output).
Modes of operation: SSB, CW, AM, FM.	As specified.

Receiver	Receiver Dynamic Testing
SSB/CW sensitivity: 1 µV (0.15-1.8 MHz), 0.25 µV (1.8-30 MHz).	Noise floor (MDS), 500 Hz bandwidth:
Noise figure: Not specified.	14 MHz, preamp off/on 13/10 dB.
AM sensitivity: 10 µV (0.15 – 1.8 MHz), 0.25 µV (1.8-30 MHz).	10 dB (S+N)/N, 1-kHz, 30% modulation, 9 kHz bandwidth:
FM sensitivity: 0.5 µV (28-30) MHz.	For 12 dB SINAD, 9 kHz bandwidth: 29 MHz, preamp off/on: 0.7/0.19 µV.
Spectral display sensitivity: Not specified.	Preamp off/on: –129/–134 dBm.
Blocking gain compression dynamic range: Not specified.	Gain compression, 500 Hz bandwidth:
Reciprocal mixing dynamic range: Not specified.	20/5/2 kHz offset: 88/76/72 dB.

	Preamp off	*Preamp on*
0.137 MHz	–119 dBm	–114 dBm
0.475 MHz	–130 dBm	–132 dBm
1.0 MHz	–129 dBm	–135 dBm
3.5 MHz	–136 dBm	–141 dBm
14 MHz	–134 dBm	–137 dBm
28 MHz	–130 dBm	–140 dBm

	Preamp off	*Preamp on*
1.0 MHz	1.57 µV	0.91 µV
3.8 MHz	0.82 µV	0.44 µV
29 MHz	1.78 µV	0.51 µV

	20 kHz offset *Preamp off/on*	*5/2 kHz offset* *Preamp off*
3.5 MHz	118/103 dB	97/94 dB
14 MHz	114/104 dB	96/91 dB

ARRL Lab Two-Tone IMD Testing (500 Hz bandwidth)*

Band/Preamp	*Spacing*	*Input Level*	*Measured IMD Level*	*Measured IMD DR*	*Calculated IP3*
3.5 MHz/off	20 kHz	–47 dBm	–136 dBm	89 dB	–2 dBm
		–22 dBm	–97 dBm		+16 dBm
14 MHz/off	20 kHz	–47 dBm	–134 dBm	87 dB	–3 dBm
		–21 dBm	–97 dBm		+17 dBm
		–27 dBm	0 dBm		+14 dBm
14 MHz/on	20 kHz	–55 dBm	–137 dBm	82 dB	–14 dBm
		–26 dBm	–97 dBm		+10 dBm
14 MHz/off	5 kHz	–74 dBm	–134 dBm	60 dB	–44 dBm
		–46 dBm	–97 dBm		–25 dBm
		–10 dBm	0 dBm		+5 dBm
14 MHz/off	2 kHz	–74 dBm	–134 dBm	60 dB	–44 dBm
		–49 dBm	–97 dBm		–25 dBm
		–10 dBm	0 dBm		+5 dBm

Manufacturer's Specifications	Measured in the ARRL Lab
Second-order intercept point: Not specified.	14 MHz, preamp off/on, +59/+53 dBm; 21 MHz, +75/+61 dBm.
FM adjacent channel selectivity: Not specified.	29 MHz, 65 dB.
FM two-tone, third-order IMD dynamic range: Not specified.	29 MHz, preamp on: 20 kHz offset, 65 dB;** 10 MHz offset, 108 dB.
S-meter sensitivity: Not specified.	S-9 signal at 14.2 MHz: preamp off/on 43.6/17.8 µV.
Squelch sensitivity: Not specified.	At threshold: SSB, preamp off, 5 µV; FM, preamp on, 29 MHz, 0.1 µV (min), 1.5 mV (max).
Receiver audio output: >2 W into 8 Ω at 10% THD.	1.5 W at 8% THD into 8 Ω (max audio). THD at 1 V RMS, 0.55%.
IF/audio response: Not specified.	Range at –6 dB points, (bandwidth):† CW (500 Hz): 485 – 1175 Hz (690 Hz); Equivalent Rectangular BW: 701 Hz; USB (2.4 kHz): 186 – 2990 Hz (2804 Hz); LSB (2.4 kHz): 185 – 2986 Hz (2801 Hz); AM (2.4 kHz): 163 – 1197 Hz (2068 Hz); AM (9.0 kHz): 159 – 1686 Hz (3054 Hz).
Spurious and image rejection: >70 dB.	First IF rejection, 14 MHz, 114 dB; image rejection, 100 dB (36 dB in SDR mode).
Transmitter	**Transmitter Dynamic Testing**
Power output: 100 W (hi), ~10 W (low), ~1 W(s-low); AM, 40 W (hi), ~4 W (low), ~0.4 W (s-low).	At 13.8 V dc, typical: CW, SSB, FM — (hi) 100 W, except 90 W at 1.8 MHz; (low) 11 W, except 9 W at 1.8 MHz; (s-low) 0.8 W except 0.27 W at 1.8 MHz; AM, 37 W (hi), 4.5 W (low), 0.25 W (s-low)
Harmonic suppression: >50 dB (1.8-29.7 MHz), except >45 dB at 10.1 MHz.	56 dB (worst case, 10 meters), 62 dB typical, 64 dB at 10.1 MHz. Meets FCC requirements.
SSB carrier suppression: >40 dB.	68 dB.
Undesired sideband suppression: >50 dB.	>70 dB.
Third-order intermodulation distortion (IMD) products: –31 dB @ 14 MHz, 100 W PEP.	HF, 100 W PEP, 3rd/5th/7th/9th order: –28/–36/–38/–47 dBc (worst case, 28 MHz); –32/–35/–42/–51 dBc (typical); –28/–39/–43/–51 dBc (SDR, typical).
CW keyer speed range: Not specified.	6 to 40 WPM, iambic mode B.
CW keying characteristics: Not specified.	See Figures 1 and 2.
Transmit-receive turnaround time (PTT release to 50% audio output): Not specified.	S9 signal, AGC fast: SSB, 96 ms; CW (full break-in), 82 ms.‡
Receive-transmit turnaround time (tx delay): Not specified.	SSB, 60 ms; FM, 64 ms.
Composite transmitted noise: Not specified.	See Figure 3.

Size (height, width, depth): 3.8 × 9.5 × 11.5 inches (including protrusions); weight, 9 lbs.

Price: $795.

*ARRL Product Review testing includes Two-Tone IMD results at several signal levels. Two-Tone, Third-Order Dynamic Range figures comparable to previous reviews are shown on the first line in each group. The "IP3" column is the calculated Third-Order Intercept Point. Second-order intercept points were determined using –97 dBm reference.
**Measurement was noise-limited at the value indicated.
†Default values; bandwidth adjustable via DSP.
‡Turnaround time in SDR mode is longer and varies with PC processor rate.

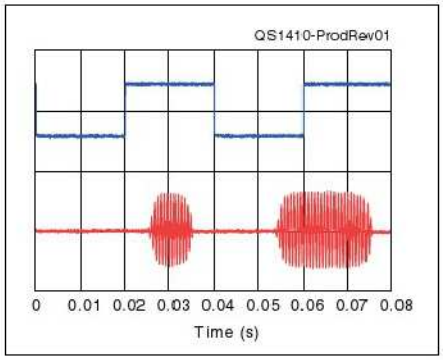


Figure 1 — CW keying waveform for the Alinco DX-SR9T showing the first two dits in full break-in (QSK) mode using external keying. Equivalent keying speed is 60 WPM. The upper trace is the actual key closure; the lower trace is the RF envelope. (Note that the first key closure starts at the left edge of the figure.) Horizontal divisions are 10 ms. The transceiver was being operated at 100 W output on the 14 MHz band.

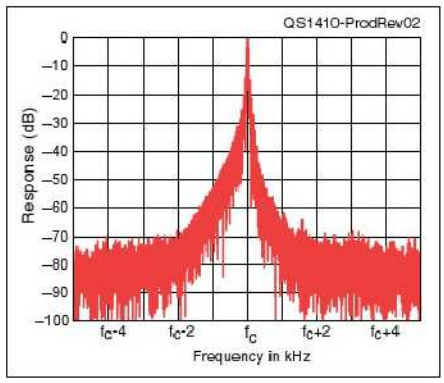


Figure 2 — Spectral display of the Alinco DX-SR9T transmitter during keying sideband testing. Equivalent keying speed is 60 WPM using external keying. Spectrum analyzer resolution bandwidth is 10 Hz, and the sweep time is 30 seconds. The transmitter was being operated at 100 W PEP output on the 14 MHz band, and this plot shows the transmitter output ±5 kHz from the carrier. The reference level is 0 dBc, and the vertical scale is in dB.

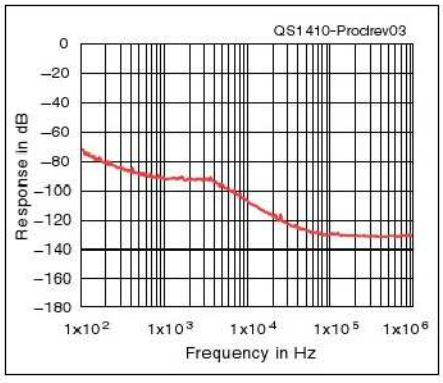


Figure 3 — Spectral display of the Alinco DX-SR9T transmitter output during composite-noise testing. Power output is 100 W on the 14 MHz band. The carrier, off the left edge of the plot, is not shown. This plot shows composite transmitted noise 100 Hz to 1 MHz from the carrier. The reference level is 0 dBc, and the vertical scale is in dB.

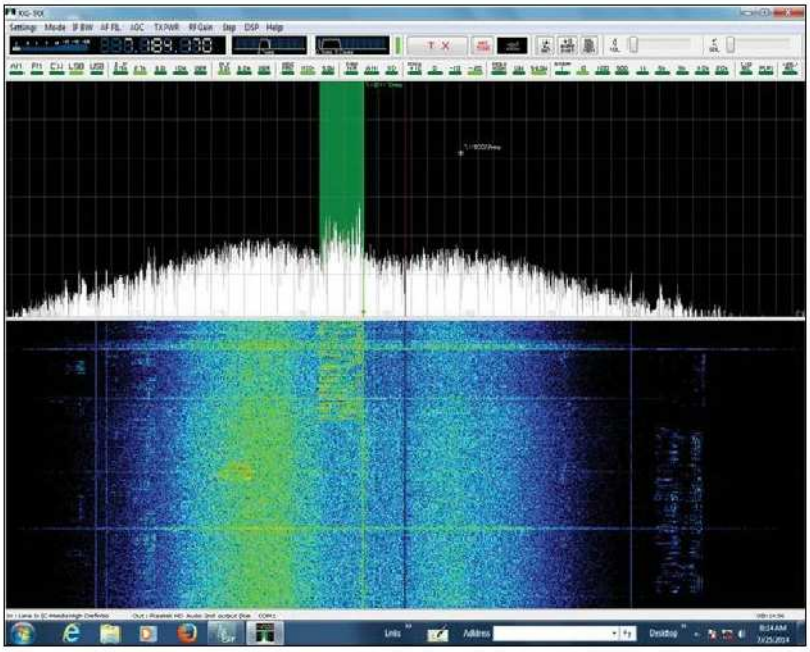


Figure 4 — Here are both panoramic and waterfall displays while receiving an SSB signal on 40 meters. The green column represents the IF filter window, with SSB transmission inside, rising above the background noise level.

a headphone jack, and a typical eight-pin microphone jack. Around the back of the DX-SR9T are connections for the antenna (SO-239), an amplifier key jack (phono), external ALC jack (phono), CW key or paddle jack, the five-pin accessory jack used for the optional auto tuner, another clone jack (also used for SDR control with optional ERW-7 USB cable), and a modulation input jack and I/Q signal output jack, both for SDR control. Only a small Phillips head screw and washer is present for a station ground connection, something I found inadequate.

SDR Operation

For SDR mode operation, Alinco provides only I/Q output, modulation input and control jacks. The user must supply a PC and all hookup cables, along with third-party *Windows* software called *KG-TRX*. The software is free and can be downloaded from the Internet.[2] To use the SDR mode, your computer must have two separate sound cards. One is used for the I/Q interface and the other for the speaker and the microphone audio. Note that Alinco does not support the *KG-TRX* software.

The software is easy to download, but I found the hookup a bit confusing and the adjustments of the levels of each sound card are time consuming. However, with patience, the software works. As mentioned at the beginning of this article, this transceiver is a basic HF transceiver and the *KG-TRX* software provides *basic* SDR operation. To enter this mode, the transceiver must be in the FM mode first. By pressing the FUNCTION pushbutton, then the MODE button, the label SDR appears in the display, and all control is done with a scrolling mouse. In this mode, the microphone connected to the front panel is disabled and another microphone must be plugged into the PC for phone operation.

Figure 4 shows a screenshot of the DX-SR9T in SDR mode. The panoramic part of the display shows 48 kHz of spectrum at a time horizontally, in 1 kHz increments. The relative received signal strength is shown, vertically, with no indication of received signal strength other than the S meter at the top left of the screen. As you can see, there is no "grass" protruding from the bottom of the screen to show the noise floor, as normally seen with other SDRs. To me it's more like "hay," which can be made taller or shorter by adjusting sound card levels. The hump in the middle of the panoramic display is from the high frequency roll off of the sound card (shown at each side of the hump) that accepts I and Q outputs from the transceiver. Another sound card, with equalization, could be tried to reduce the hump in the middle of the display.

The SDR controls are basic. Tuning steps per scroll wheel detent can be set from 1 to 20 kHz. My software did not allow for direct frequency entry with a keyboard. One feature that got better when using the SDR mode is the IF filter bandwidth control. When the DX-SR9T is operated as a conventional transceiver, either a 1000 or 500 Hz IF bandwidth DSP filter can be selected in CW mode, a 2.4 or 1 kHz filter bandwidth in SSB mode, and a 9 or 2.4 kHz filter bandwidth in AM mode. In SDR mode the filter is variable, from 100 Hz to 10 kHz, by selecting USER in the IF bandwidth selection window near the top center of the screen. A window then pops up and the bandwidth can be adjusted as needed. There is also an audio filter selection window near the top of the screen, with options of 3 kHz, 6 kHz or USER. Unfortunately, in this case the USER function did not work.

The transmitter power output is selectable onscreen with the same choices offered by the front panel buttons. Other controls mimic the front panel buttons as well, and some controls, such as the I/Q recorder/playback, do not work at all.

For SDR CW operation, the CW jack on the transceiver's rear panel is disabled. The only way to key the transmitter in SDR mode is to click on CW, click on TX (to send), and then use the right click button on the mouse to send Morse code while being careful to keep the mouse pointer within the straight key icon box. No sidetone is present while sending. I quickly grew tired of making contacts this way.

The software does control the important functions, but it still needs work and perhaps down the road, this will be improved, or other SDR software will be written for the Alinco DX-SR9T. It is important to remember this basic software gives an introduction to the world of SDR while the transceiver, by itself, retains traditional operating controls.

Testing at the ARRL Laboratory

There were no real surprises while testing the Alinco DX-SR9T. The receiver is sensitive enough for weak signal work on the 10 meter band, but the dynamic ranges show that this is a basic radio, designed for simple antennas such as a single wire

[2]The software is available from **www2.plala.or.jp/hlkokiblyorl/soft/kgtrx/index_e.html**.

antenna, dipole, vertical, or perhaps a small Yagi. Its most limiting dynamic range at 2 kHz spacing is two-tone, third-order dynamic range. This means with multiple adjacent very strong signals at the transceiver antenna jack, false signals will appear on the desired receive frequency. However, most operators with simple antennas will never experience this effect since signal voltages are low enough. If an operator does experience unwanted effects they have a 10 or 20 dB attenuator to place in line to straighten things out. Still, I wouldn't attempt to win a contest with this transceiver using a big antenna farm.

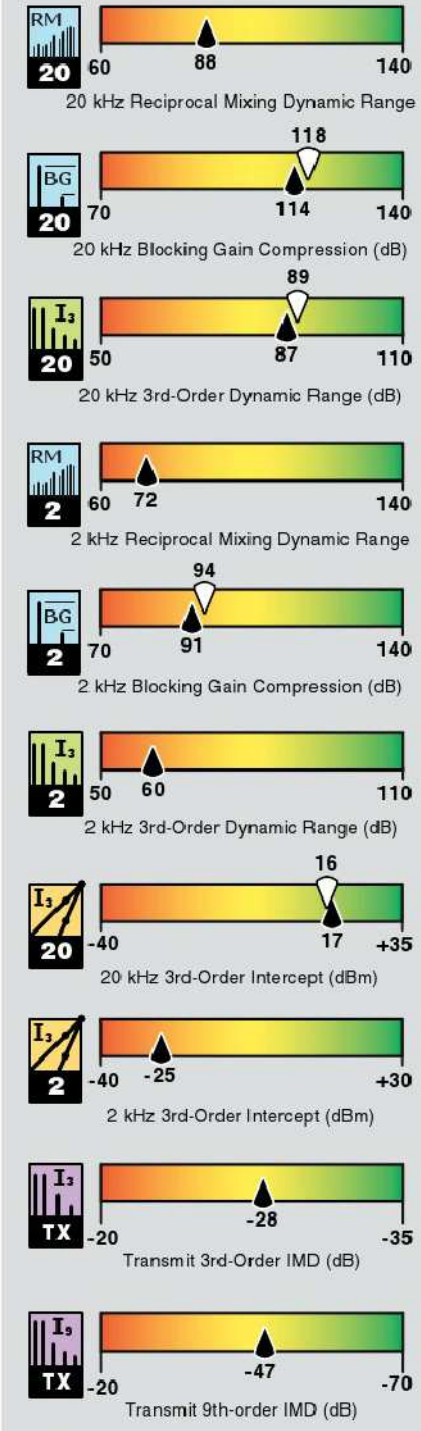
One major performance improvement over the DX-SR8T model is frequency stability. The previous model experienced frequency flutter due to air from the cooling fan blowing across the PLL circuit. This flutter is absent with the DX-SR9T. The stability was good enough (within 1 Hz) for the long CW transmission needed for our composite noise test set. Figure 3 shows the composite noise from 100 Hz to 1 MHz. The chart shows one of the highest phase noise curves ever recorded at the ARRL Lab. If the transceiver is attached to a low gain antenna and operated without an amplifier, this will not likely be a problem for other operators listening near the transmitted frequency. Nearby operators may hear an increased background noise when this transmitter is producing power. As in most cases, transmit IMD will override transmit phase noise close to the transmitted signal.

The CW keying waveform plot shows soft keying at 60 WPM. At much slower speeds, the soft keying isn't noticeable. I did notice significant overshoot (a momentary power spike) each time the key was pressed while in the LOW power position. This overshoot will cause key clicks to be transmitted. A spokesman from Alinco told me this overshoot would be very difficult to fix at this time. No overshoot was observed in the HIGH or S-LOW power setting. Little to no overshoot was observed during voice tests.

On the Air

Though lacking a microphone gain control and ALC indicator to reassure me that the transmitter was properly adjusted, reports of good transmitted audio were the norm when operating the DX-SR9T as a traditional transceiver using the supplied hand microphone. I found the DX-SR9T to be

Key Measurements Summary



one of the easiest transceivers I've operated. Audio from the speaker is average quality, but is clear and provides plenty of volume in the right direction. It is also perfectly adequate for casual CW operating. I enjoyed several nights of operating inside my garden shed (no more room in the house ham shack), using an elevated 20, 15, and 10 meter vertical antenna with many radials. I was even able to make a few contacts using the S-LOW setting at 1 W RF output on 20 meters on both CW and SSB. I have a neighbor who has a jalopy truck with notoriously noisy ignition components. Each time he passed by, I engaged the noise blanker, which removed the crackle effectively.

The manual covers PSK31 operation, using the front panel speaker jack and the rear modulation input jack for audio going to and from a PC sound card. I strongly suggest careful adjustment of the PC sound card audio output level. A high audio level into the modulation jack may cause overmodulation of the transmitter. With no ALC indication to go by, caution must be taken by observing the off-air audio tones on a waterfall display to avoid a wide and distorted signal. A local radio amateur with a waterfall display is helpful for such adjustments.

RTTY, packet, and SSTV operation use the microphone jack and external speaker jack. There are written steps in the manual for setup and optimum performance. Sound card audio levels must be carefully adjusted using these modes as well.

In SDR mode, I managed to make an SSB contact on 40 meters with Charles Woodside, N1LU, about 50 miles away. He reported the DX-SR9T's transmitted audio sounded muddy and mechanical, and then helped me further by sending a video of his side of the contact. Clearly, I was doing something wrong!

After studying the manual, I found that Menu 24 differed from what was printed. A big hint for me was the last menu setting on the display is 26, not 25 as shown in the manual. I determined that Menu 24 was inserted into the menu list after the manual went to the print. Menu 24 must be selected to "S-RT-IF" for the transmitted audio to be intelligible. Further tests with Product Review Editor Mark Wilson, K1RO, proved this to be the correct adjustment, although my audio still sounded noticeably better when operating the DX-SR9T as a conven-

tional transceiver rather than an SDR. Listening off-air, there was about a 2-second delay from when I spoke into the microphone to when speech came out intelligibly in a nearby receiver's speaker. Clearly, this delay is not good for rapid-fire transmissions, but it's fine for casual operating.

Conclusion

The Alinco DX-SR9T is a basic HF transceiver, suitable for casual operating on the amateur bands. It is also suitable for operators who wish to try SDR technology with a little patience and experimenting. SDR operation could use improvement, but look at it as a bonus and consider whether or not the traditional aspects of this radio meet your needs.

Manufacturer: Alinco, Inc, Yodoyabashi Dai-Bldg 13F, 4-4-9 Koraibashi, Chuo-ku, Osaka 541-0043 Japan; **www.alinco.com**. Distributed in the US by Remtronix (**www.remtronix.com**) and available at many Amateur Radio dealers.

Click here for a video overview of the Alinco sDX-SR9T HF Transceiver.

Elecraft KXPA100 Amplifier and KXAT100 Automatic Antenna Tuner

Reviewed by Phil Salas, AD5X
QST *Contributing Editor*
ad5x@arrl.net

In addition to my main station, I own an Elecraft KX3 transceiver that I use primarily for portable operation. Therefore I was very interested in testing the KXPA100, a 100 W linear amplifier that covers 160 to 6 meters and is designed to interface seamlessly with the KX3. The amplifier also includes provisions to work with any QRP transceiver that provides about 5 W drive. An optional KXAT100 automatic antenna tuner provides antenna system flexibility when necessary.

The KXPA100 is available factory built and tested, or as a no-solder kit. The unit reviewed here is the KXPA100 amplifier with KXAT100 auto tuner kit.

First—The Build!

The KXPA100 and KXAT100 arrived in a small shipping carton. Inside were two boxes containing the fully assembled and tested main RF assembly and the KXAT100 tuner assembly, and a box with the cabinet and associated hardware. See Figure 5.

Figure 6 shows the completed amplifier just before attaching the cover. The bottom two PC board assemblies (amplifier and filter) come pre-mounted to the heatsink. Assembly consists of mounting the UHF connectors and serial port jack to the back panel, and then installing the front panel and full cover. If you have the KXAT100 auto tuner (the top pc board assembly), you simply remove four mounting screws on

Bottom Line

The KXPA100 is a compact 100 W amplifier that is designed to work with any QRP transceiver. Silent QSK operation and an optional internal wide-range auto tuner add capabilities not found in many other QRP amplifiers.

Figure 5 — Unpacking the boxes.

Figure 6 — Ready for the cover.

the amplifier, install four standoffs, plug in the KXAT100, and re-install the four mounting screws on the tuner assembly. Assembly requires basic mechanical skills. Just follow the excellent instruction manual (available on the Elecraft website at **www.elecraft.com**), check off each step as you complete it, and before you know it you'll be finished! In my case, this was about 1.5 hours from the time I opened the main box until I was ready to apply power.

Technical Details

The KXPA100 is powered directly from a 13.8 V dc power supply capable of at least 20 A continuous current (the specification calls for 24 A peak). There is no fan; a large heatsink provides the necessary thermal protection. A handle on the left side provides ease of transport, and special rubber feet permit the amplifier to be mounted vertically (front panel down) or in its normal horizontal upright position.

Output power is 100 W from 160 to 6 meters with about 5 W of drive, although Elecraft recommends limiting output power to 80 W on 6 meters for best linearity. The amplifier is rated for 100 W continuous transmission on CW/SSB with a 50% duty cycle keying/modulation waveform. It's rated for 60 seconds of continuous carrier at 100 W output for high duty cycle modes such as RTTY, digital or FM.

PIN diode TR switching provides silent full break-in (QSK) operation. The TR switch is designed to handle switching even with RF applied should a fault cause the amplifier to be bypassed.

There is no amplifier bypass switch. A relay bypasses the KXPA100 when it is powered off, when the relay is commanded OFF by the *KXPA Utility* software, or when a KX3 transceiver interfaced with the optional KXPACBL cable is set to 10 W or less (or has its PA MODE menu setting OFF). This eliminates PIN diode switch loss (less than 1 dB) when operating QRP "barefoot."

However, with radios other than a KX3, the amplifier should be turned off when QRP operation is desired. If a radio other than a KX3 transmits when the KXPA100 is powered on but not keyed, transmit RF passes through the receive path. While there will be no damage with transmit power up to 15 W, the PIN diode receive biasing is such that significant out-of-spec harmonics will be generated. This was not clear in the Revision A KXPA100 user manual, and so we thought there was a problem with the amplifier during testing in the ARRL Lab. Our KXPA100 was returned to Elecraft for analysis, which resulted in a user manual revision for clarification.

Our returned KXPA100 did benefit from two Elecraft hardware updates. The first was a digital noise reduction improvement, and the second was the addition of diode isolation of the TR control line to prevent an external amplifier control line from back-feeding into the KXPA100 internal switching. A KXPA100 returned for any reason will receive these updates at no charge.

The KXPA100 includes frequency sensed automatic band switching that is always active. That feature allows automatic band changes with all transceivers. When a band change occurs, amplification is disabled, the correct low-pass filter and input network are selected, there is a delay while the relays settle, and then amplification is re-enabled — all occurring within 20 ms. With the optional KXPACBL connected, the amplifier will follow band changes from the KX3 without transmitting, but frequency sensing always takes precedence.

Display and Fault System

There is significant control, monitoring and display information available on the

KXPA100's front panel. The bottom row of controls and indicators for SWR, mode, antenna selection, and auto tuner functions are present only if the optional KXAT100 antenna tuning unit is installed.

The dc power to the KXPA100 is controlled by the OFF/ON switch on the amplifier, or by the power switch on a KX3 if connected with the KXPACBL. LED amplifier status indicators show output power in watts, whether or not the rear panel input attenuator is switched in, and whether or not the amplifier is being keyed.

Faults are displayed with the amplifier LEDs and on a KXPACBL-connected KX3 display. Faults include high SWR, excessive drive, excessive output power, high current, and a system fault. System fault details are available via a connected KX3 display or the *KXPA Utility* software. A fault condition suspends normal operation, usually by bypassing the amplifier. The exception occurs when more than 8 W drive causes the 3 dB input attenuator to switch in. Faults clear automatically after a delay of about 8 seconds when the condition causing it is corrected. After clearing, the fault message remains on the KX3 display until any key is pressed.

Setting Up the Amplifier

Begin by installing 25 A fuses in the supplied dc cable fuse holders if they are not pre-installed. Then connect 13.8 V dc and turn on the amplifier. Connect a PC via the USB or RS-232 interface and download and install the *KXPA Utility*. Update the firmware to the latest version if necessary.

Figure 7 shows the rear panel. Connect a ground wire, RF IN/OUT, and PA KEY cables to your transceiver. The PA KEY interface is compatible with all transceivers. The optional KXPACBL cable package provides the KX3 data interface and amp keying connections. The 3 dB ATTEN switch is for the input attenuator if you have between about 8 and 15 W drive.

Performance Measurements

Table 2 summarizes KXPA100 performance measured in the ARRL Lab. The only issue noted was poor two-tone IMD performance when the amplifier was driven with the Lab's standard two-tone IMD test setup. Performance was fine when the KXPA100 was driven with a KX3 connected with its amplifier interface cables.

Table 2
Elecraft, KXPA100, serial number 0555

Manufacturer's Specifications	Measured in ARRL Lab
Frequency range: All amateur frequencies in the range of 1.8 – 29.7 and 50 – 54 MHz.	160, 80, 40, 30, 20, 17, 15, 12, 10, 6 meters.
Power supply and current: 12 – 15 V dc (13.8 V dc nominal) at 24 A peak capacity.	At 13.8 V dc, 19 A maximum, 17 A typical (HF, 100 W output); 11 A (50 MHz, 80 W output).
Power output: 100 W continuous HF, 80 W at 50 MHz (CW/SSB).	As specified at 13.8 V dc (see text). At 12 V dc, 88 W (HF), 65 W (50 MHz).
Driving power required: 5 – 7 W.	4 – 6 W (typical).
Input SWR: 1.5:1 or less.	See Table 2.
Spurious and harmonic suppression: Not specified.	Typically 52 – 64 dB, except 44 dB at 1.8 MHz.* Meets FCC requirements.
Third-order intermodulation distortion (IMD): Not specified.	3rd/5th/7th/9th: 32/34/42/52 dB below PEP (14 MHz); 31/35/40/51 dB below PEP (50 MHz).
TR switching time: Not specified.	Amplifier key to RF output: 3 ms; amplifier un-key to RF power off: 8 ms.
TR keying input: Receive +5 V dc open circuit, ground to transmit (1 mA maximum).	As specified.
Size (height, width, depth): 4.6 x 5.3 x 9.8 inches (including protrusions); weight, 5.3 lbs (including KXAT100 autotuner).	
Price: KXPA100 amplifier: $699.95 (kit), $749.95 (assembled). KXAT100 tuner: $299.95 (kit), $349.95 (assembled). KXPACBL KX3-to-KXPA100 cable $29.95.	

*The second harmonic amplitude is reduced as frequency increases on the 1.8 MHz band.

Table 3
KXPA100 Operating Parameters

Band (meters)	Drive (W)	Input SWR	P_{actual} (W)	$P_{bargraph}$ (W)	$P_{utility}$ (W)	DC Current (A)
160	4.50	1.52:1	100	100	99	17.1
80	4.90	1.49:1	100	100	98	17.8
40	4.90	1.44:1	100	100	97	15.4
30	5.20	1.33:1	100	100	97	13.6
20	3.30	1.56:1	100	100	96	13.1
17	4.00	1.53:1	100	90	95	17.4
15	4.60	1.35:1	100	90	94	17.2
12	3.60	1.29:1	100	90	92	13.2
10	4.40	1.40:1	100	90	92	17.2
6*	3.20	1.27:1	80	70	70	12.5

Notes: Measured by the author. 13.9 V dc key-down voltage, unkey 0.28 A, keyed with no drive 1.15 A. P_{actual} measured with the author's MiniCircuits PWR-6GHS+ sensor and calibrated attenuators. $P_{bargraph}$ is output power indicated on the KXPA100 bar graph and $P_{utility}$ is indicated by the *KXPA Utility* software.
*The 6 meter output power specification is 80 W. See text.

Elecraft investigated this and determined that the KXPA100 was automatically selecting the wrong band when driven with a low power two-tone signal. The KXPA100 defaults to 6 meters on power-up unless it is tracking an attached KX3. It then uses frequency sensing to select the correct band. Below about 0.5 W drive, however, the KXPA100 frequency counter becomes unreliable. With the Lab's low-level two-tone signal at the input, the counter was getting confused. This resulted in either no band change or a change to the wrong band. In normal operation, even with SSB, low-level counter operation was reliable. However, because of this particular issue Elecraft changed the firmware to more reliably select the correct low-pass filter at very low power levels. The new firmware should be released by the time this review is published.

Table 3 details the author's measurements of amplifier input SWR and required drive for 100 W output. The KXPA100 bar graph display and *KXPA100 Utility* power readings are pre-calibrated at the factory. The bar graph readings are fairly coarse as

Figure 7 — Elecraft KXPA100/KXAT100 rear view.

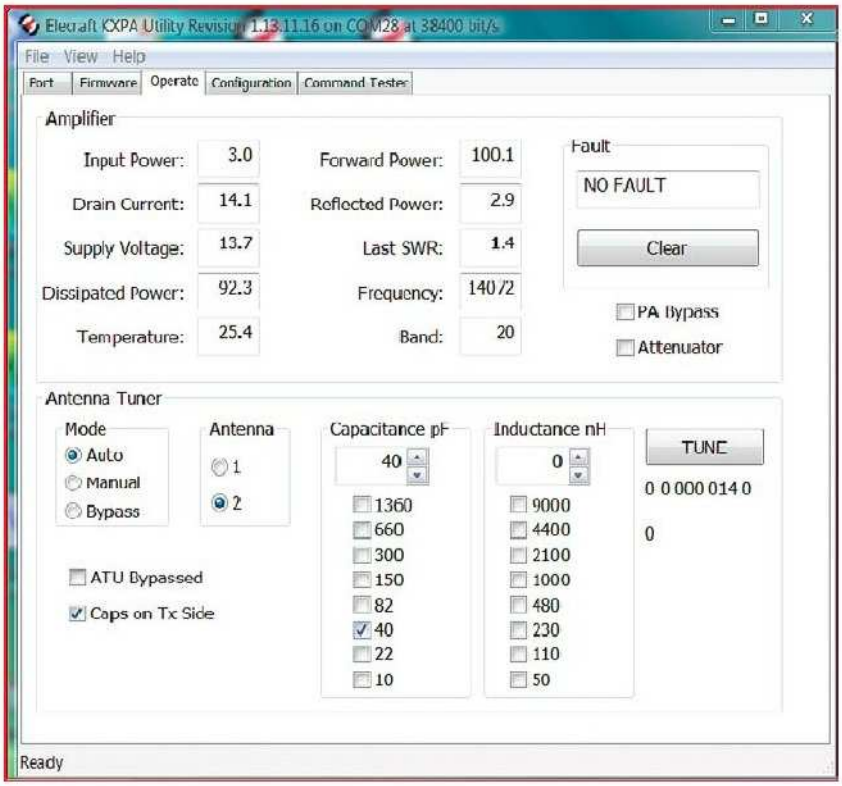


Figure 8 — *KXPA Utility* operation page.

power is indicated in 10 W increments. I did find some discrepancies — particularly on the higher bands — between the bar graph display and *Utility* readings when compared to my NIST-traceable MiniCircuits PWR-6GHS+ sensor and calibrated attenuators.

KXAT100 Automatic Antenna Tuner

Unless you have an almost perfect antenna system, the optional internal KXAT100 antenna tuner is worth considering. Table 4 lists the KXAT100 specifications.

The KXAT100 provides automatic or manual (user initiated) tuning, as well as a bypass mode if no tuning is required. Bypass is a tuning solution if it results in a SWR of ≤1.2:1. In AUTO, tuning begins when the SWR exceeds 1.8:1. In MAN, tuning is initiated when the TUNE button is pressed and 3 to 5 W of RF carrier is applied. Even in the manual mode, however, previously memorized tuner settings and antenna information is automatically selected once the frequency is determined. The KXAT100 modes (AUTO, MAN, and BYP) are not remembered on a per-band basis — when you select a specific mode, that mode will be used on all bands until you change it.

Like the amplifier, the KXAT100 auto tuner uses RF sensing (first priority) or KX3 data to switch bands automatically. The KXAT100 interrupts the KXPA100 during a band change, when tuning, or upon encountering a sudden high SWR condition.

The "start-tuning" SWR threshold (1.8:1) and the bypass tuning solution (1.2:1) default settings are currently not adjustable, but these values are quite appropriate for normal operation. Figure 8 shows the *KXPA Utility* operating page.

The KXAT100 has two antenna switch ports that can be memorized, along with tuning data, on a per-band basis. I measured the non-selected-to-selected port isolation with an Array Solutions VNA2180 and found isolation to be 48 dB at 14 MHz, 43 dB at 28 MHz and 40 dB at 50 MHz.

While this test is for a 50 Ω system, actual antennas may result in much better isolation depending on the bands the antennas are designed for, antenna directivity, and differences in antenna polarization. The measured isolation indicates that the

Table 4
KXAT100 Automatic Antenna Tuner

Manufacturer Specifications

Frequency range:	1.8 to 54 MHz, continuous.
Auto tune power:	3 W minimum, 5 W typical.
Tuner configuration:	Series-L/shunt-C, reversible-L.
L/C tuning ranges:	8 capacitors (2624 pF max) and 8 inductors (17370 nH max), relay switched.
Matching range:	Up to 10:1 SWR at 100 W; up to 20:1 SWR at 10 W.
Antenna interfaces:	Two SO-239 jacks, rear panel.
Tuning memory segments:	10 kHz wide below 3 MHz; 20 kHz wide, 3 – 26 MHz; 100 kHz wide, 26 – 38 MHz; 200 kHz wide, 38 – 60 MHz. Also stores selected antenna connector for each band.

Resistive Load and Loss Testing

SWR	Load		160 m	80 m	40 m	20 m	10 m	6 m
10:1	5 Ω	Loss (%)	36	2	6	8	10	16
		SWR	2.8	1.18	1.26	1.44	1.08	1.15
8:1	6.25 Ω	Loss (%)	27	0	0	6	8	12
		SWR	2.67	1.07	1.07	1.43	1.17	1.18
4:1	12.5 Ω	Loss (%)	8	0	0	5	6	9
		SWR	1.71	1.12	1.22	1.34	1.21	1.16
3:1	16.7 Ω	Loss (%)	8	0	0	2	4	8
		SWR	1.67	1.15	1.34	1.32	1.12	1.44
2:1	25 Ω	Loss (%)	6	0	0	0	3	8
		SWR	1.80	1.08	1.45	1.28	1.23	1.32
1:1	50 Ω	Bypass Loss	0	0	0	0	0	0
		Bypass SWR	1.1	1.11	1.05	1.02	1.17	1.34
2:1	100 Ω	Loss (%)	0	0	0	0	1	2
		SWR	1.16	1.09	1.16	1.15	1.05	1.28
3:1	150 Ω	Loss (%)	0	0	0	2	2	3
		SWR	1.11	1.30	1.68	1.29	1.12	1.48
4:1	200 Ω	Loss (%)	6	0	0	2	3	4
		SWR	1.48	1.39	1.12	1.15	1.25	1.83
8:1	400 Ω	Loss (%)	5	1	1	3	7	20
		SWR	1.40	1.41	1.22	1.08	1.26	1.14
10:1	500 Ω	Loss (%)	4	0	0	4	6	31
		SWR	1.23	1.26	1.09	1.28	1.50	1.24

KXAT100 antenna switch will be adequate for most installations.

Tuner Measurements

Resistive matching range and loss testing was performed with the precision setup described in the August 2012 issue of *QST*.[2] The test results are given in Table 4. Tuning power was set at 5 W, per Elecraft's recommendations. My test equipment is specified to ±3% accuracy therefore all measured losses are subject to the ±3% accuracy. As you can see, the KXAT100 achieved its 1.8:1 or better SWR target except for low impedance 8:1 and 10:1 SWR matching on 160 meters.

Most wide-range antenna tuners — both manual and automatic — can find a match on one or more frequencies when connected to an open or a short. This is due to finite-Q components, resulting in the tuner actually tuning into its own internal losses. As it may be possible to tune into an open or short (perhaps caused by a bad feed line or operator error), I memorize my tuning solutions on each band and leave the antenna tuner in manual mode. The antenna tuner still selects the memorized tuning values in manual mode, so if something causes the SWR to change, the KXPA100/KXAT100 will indicate a high SWR and bypass itself if necessary. Therefore you'll know to check your antenna system, rather than have the KXAT100 automatically try to tune into the changed load.

[2]P. Salas, AD5X, "MFJ-994BRT and MFJ-998RT Remote Automatic Antenna Tuners," Product Review, *QST*, Aug 2012, pp 47-50. See the digital edition of that issue or **www.arrl.org/qst-in-depth** for details.

Operating

Because I have a KX3, I used the Elecraft KXPACBL interface cable. This permits the auto tuner's TUNE switch, ANT switch, amplifier and auto tuner settings to be displayed on and controlled from the KX3, along with faults and performance information. Further, changing bands on the KX3 band results in automatic band change and antenna selection within the KXAT100 and KXPA100. And the KX3 even switches on the KXPA100/KXAT100 when the KX3 is turned on.

My antenna system consists of a 43-foot vertical with remote 160/80 meter matching and a four-element 6 meter beam — perfect for the KXAT100's two antenna ports. Using the *KXPA Utility*, I selected ANT1 for the vertical and ANT2 for the 6 meter beam. Then I configured the memories for the vertical on all HF bands. Once everything is set up, operation is a breeze. The KXPA100/KXAT100 picks the right antenna and tuning solution as it follows my KX3. Operating the KX3 with the KXPA100/KXAT100 is almost exactly the same as operating with my K3 transceiver — including the perfectly silent full break-in operation. A very pleasant experience indeed! Operation will be almost as seamless with non-Elecraft transceivers, as a short RF signal will result in the appropriate band, antenna and tuning memory selection. All your custom preferences can be saved if you lose or corrupt the KXAT100's memory.

Conclusion

The KXPA100 is a compact, well-protected amplifier that integrates perfectly with the KX3 transceiver — and to a slightly lesser extent with other QRP transceivers. The optional internal KXAT100 antenna tuner provides all the antenna system flexibility most hams will ever need. The no-solder kit is quite easy to build, but you can opt for an assembled and tested unit as well. If you occasionally need to boost your QRP signal by a couple of S units, the KXPA100 is certainly worthy of your consideration.

Manufacturer: Elecraft, PO Box 69, Aptos, CA 95001-0069; tel 831-763-4211; fax 831-763-4218; **www.elecraft.com**.

WebDX Remote Station System

Reviewed by Tom Loughney, AJ4XM
aj4xm@arrl.net

Over the years we have seen many innovations change Amateur Radio. Think about moving from spark to CW to AM, FM, and SSB — or the introduction of amateur satellites, packet radio, PSK31, or WSJT, to name a few. For me, the WebDX remote station system from RemoteHamRadio is one such innovation. WebDX allows any amateur with even a modest amount of computer skill (enough to say, send e-mail or search the Internet) to operate a remotely located, fully equipped station from the comfort of home or from anywhere he or she can get online. Hams who live in apartments or who are limited by homeowner's associations or deed restrictions can use this system to remotely operate a station with large towers and multiple antennas and make worldwide contacts.

The original RemoteHamRadio system, reviewed in the May 2013 issue of *QST*, required the use of an Elecraft K3 or K3/0 transceiver (essentially a K3 without RF components) and a RemoteRig interface, and charged an annual subscription fee.[3] This system is now called PremiumDX and starts at $4999 for the first year, including the lease of a K3/0 for your station. It offers access to some truly spectacular stations in the US and elsewhere.

The new WebDX system brings two major changes. First is the introduction of WebDX technology that does away with the K3 and RemoteRig hardware on the user end, replacing it with a web browser interface for controlling and using the remote station. Second, the WebDX service requires no annual subscription (you simply pay as you go after a $99 initial fee), and offers access to more "modest" stations. (Modest compared to the PremiumDX superstations, anyway. They are still very nice. Figure 9 shows one of the available antenna installations.) If you have a K3 or K3/0 and RemoteRig, you can use the WebDX service with that hardware if you like. This review will focus on the WebDX service and browser interface.

[3]S. Ford, WB8IMY, "RemoteHamRadio Station Network," Short Takes, *QST*, May 2013, p 59.

Figure 9 — RemoteHamRadio cofounder Ray Higgins, W2RE, works on the antennas at WebDX station in Monticello, New York. The antenna farm available to remote users includes monoband Yagis for 40 through 6 meters, a full size vertical for 80 meters and a 160 meter inverted V. [Photo courtesy Lee Imber, WW2DX]

Using the WebDX browser technology, you sit in the comfort of your home and control a remote station equipped with an Elecraft K3 transceiver. The WebDX network currently includes stations in New York and California. Some of the remote stations also include a fully automatic RF power amplifier, and available antennas range from wires to multiband Yagis to monoband Yagis. You can operate CW and SSB from 6 meters through 160 meters, although not all stations have all bands. You can rotate Yagis, adjust power output, adjust bandwidth and other radio settings, and of course see real time S-meter readings. You can see the antenna pattern on screen, displayed on a world map that also shows the real-time greyline.

Bottom Line

The WebDX service from RemoteHamRadio offers a way for amateurs to get on the air by remotely controlling one of several equipped stations. With the WebDX browser interface, users just need a fast Internet connection, a PC or other device running *Chrome*, and a suitable headset and microphone.

WebDX Browser Technology Requirements

At your end of the system, you need a desktop or laptop computer, or a Google Chromebook or tablet running any operating system that supports Google's *Chrome* web browser. (That includes *Windows*, Mac *OS X*, or *Linux*.) You do need a broadband Internet connection, so it would not work in real time over dialup or even with 4G-LTE phones.

WebDX does not use *Skype* or anything else complicated to set up. All you have to do is install Google's *Chrome* browser with just a couple of clicks at **www.google.com**. You connect whatever microphone and speakers or headphones you want to use with your device, or use the ones built in if your device has them, and you are ready to go. (I usually use my Heil ProSet headset with adapters as needed.)

The browser on your end is running a program on the other end that controls everything. Other online users can see that the remote station is in use, but not by whom. They can't hear anything unless they have a receiver to pick it up off the air. In essence, you have a really long microphone cord, speaker cables and set of radio control buttons.

Using the System

I think I have tried all of the available remote control services, combined some of them in ways not designed for, and improved a few. WebDX is far ahead of others systems I've used. Remember, this system is letting you use a high-end radio and amplifier and often a tower and beam from an ideal location. Of course you can run barefoot with 100 W or QRP at 5 W into a dipole if you want, but you still have an ideal location with little or no RF noise around. (My suburban location has a S-2 to S-3 noise floor all the time on my physical radios.)

As you can see from Figure 10, the browser interface is really clean. Across the top it shows current remote stations and if they

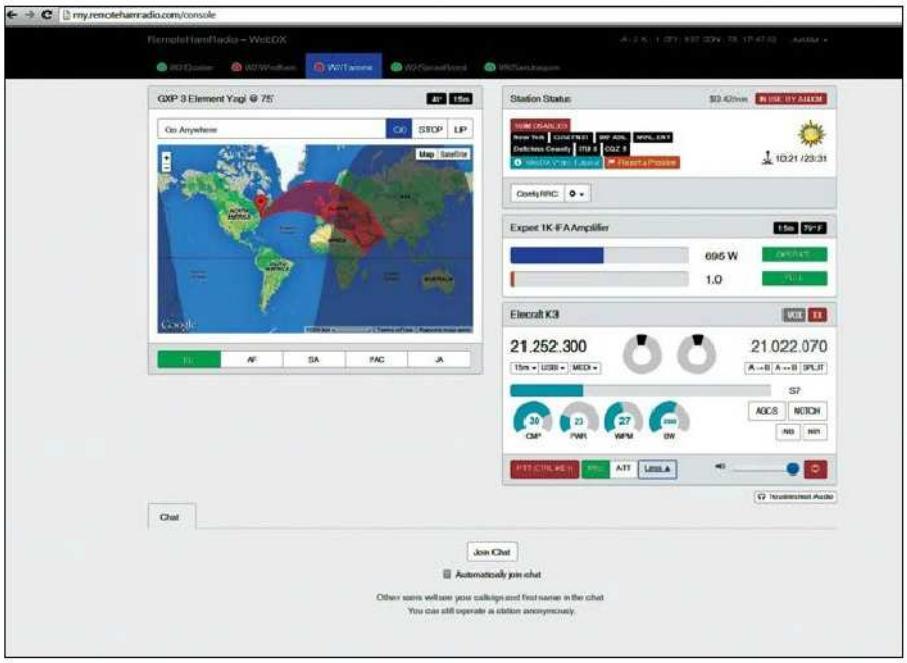


Figure 10 — A view of the WebDX screen while the author operates SSB on 15 meters using a remote station in Dutchess County, New York.

are in use or available. When I started using WebDX in March 2014, there were only two remote stations active. As of late July there were five, with more planned. The sponsors say they will keep adding locations as long as the demand is there.

There is an optional "text chat" area if you want to type real-time messages to other people using the RemoteHamRadio system. For example, you might tell others how long you expect to be using the radio, as each station in the network can have only one user at a time. After all, it's a real physical radio and antenna you are using. Or maybe you want to let others know that 10 meters is very hot to Europe or that it is "radio day" in some other country, so there are a lot of stations on the air from there.

To operate CW, you type the text you want to send into an onscreen text box and it's sent on the other end. Macros are available to store often-used information such as a CQ message (think memory keyer). Keyer speed is adjustable.

Digital mode operation with the WebDX browser software is not yet available. If you use the WebDX service with K3/RemoteRig hardware at your end, you can use any digital mode supported by the K3.

Even if you have some antennas and a good radio, there are reasons to use WebDX. My home station antennas are all in my attic about 16 feet above ground level and 20 feet above sea level. This allows me to spend hours on the air for ragchewing and working stations across the country, and I get a fair share of contacts in Europe and Africa. Often I can hear stations that I need in my log for DXCC and other awards or really nice QSL cards (I still put them up on the wall), but they do not hear me. If only I could put up a high outdoor antenna or turn that 6 meter beam that is between the rafters in my attic...well, with WebDX I can work those stations.

About the Cost

To join the WebDX service there is a one-time signup fee of $99 and there is a per minute fee for using the equipment. Depending on location and equipment, that fee varies from 15 to 49 cents per minute at this time.

Here's how I use the system to keep things affordable. I keep WebDX open in *Chrome* and minimized. You only pay when you click the onscreen POWER button to turn on a remote station and use it. So if I can hear a station I need but can't get through, or barely hear it at my station, or see something I want to work on the DX spotting network, I can just expand the *Chrome* browser and pick a WebDX station that is available. I turn on the station, swing the beam to the right heading, input the desired frequency and mode, and try to work the station I need. I have not found a station yet that I could not work, and often on the first call. Then I turn off the remote station and go back to what I was doing with my own radio. So I've spent a few minutes (and a few dollars) on WebDX and put a new country in the logbook. That's well worth it to me.

If I did not have any radios or antennas at home, I might block out an hour here and there and have some fun tuning the bands and working stations as I go. Maybe it would cost me $10 or $25, but it sure beats not getting on the air at all. I have done that on some occasions and really enjoyed it.

You can use WebDX from just about anywhere you can get a fast Internet connection. Imagine taking take your laptop into a hotspot such as Starbucks or Panera Bread, slipping on your Heil ProSet with the right adapters and working DX. You will have a crowd surrounding you in minutes. Welcome to ham radio in the 21st century.

Manufacturer: RemoteHamRadio, tel 888-528-6937; **www.remotehamradio.com**.

Feedback

■ On page 52 of the August 2014 issue of *QST* (our review of the DX Engineering AAPS3-1P Receiving Array), there are two errors in the text that appears in the 3rd column, 2nd paragraph. The first is that 75 W should have been 75 Ω. The second is that "0.000831 long" should have been "0.00083 wavelengths long."

■ In the article "Antenna Masts: Safety and Selection" by Don Daso, K4ZA, in the September 2014 *QST* (page 30), there is a statement that DX Engineering offers software to calculate stress on masts. This is inaccurate. The *DX Engineering Mast Load Estimator* is an on-line calculator that allows the user to model an installation to determine which of the two mast sizes sold by DX Engineering is adequate for the proposed installation. It is specific to only those two masts. There is also DX Engineering mechanical calculation software (*YagiMechanical*) available, but it does not calculate mass stress.

Joel R. Hallas, W1ZR, w1zr@arrl.org

Fences Make (and Hide) Good Neighbors

Q Ken, K0KS, asks: One of the new hams in our club has been bitten by the contesting bug but, like many, he lives in a deed-restricted neighborhood. He had resigned himself to stealth antennas for 40 meters and higher frequencies. We suggested that he string as much wire around as possible and try to tune it on the lower frequency bands. What he managed is interesting and I've worked a number of stations using similar arrangements on both 75 and 160 meters.

His antennas is #22 AWG wire strung around the top of a 6 foot high board fence and the arrangement looks like a big question mark. He put a counterpoise ground wire around the bottom of the fence and managed to find a resonance on 75 meters, and it drives with a low enough SWR that his tuner can handle it. He thought it would be a high angle (NVIS) antenna but, to his surprise, his first contacts were to Canada and New England states, indicating lower angle radiation.

This configuration reminds me of the direction discontinuity ring radiator (DDDR) antenna that received a lot of attention in the 1970s.[1] I wonder if this arrangement should be included in the tool box of those with antenna restrictions?

[1]W. English, W6WYQ, "Beginner and Novice — A 40-Meter DDDR Antenna," *QST*, Dec 1971, pp 28-32.

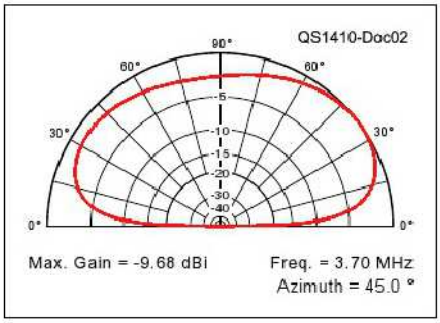


Figure 2 — The *EZNEC* elevation pattern of the antenna of Figure 1, in the peak of the main beam — toward the far end of the fence above typical ground (conductivity 0.005 S/m, dielectric constant 13).

A Ken, this is indeed an interesting idea, a potential candidate not only for those interested in stealth antennas, but also for anyone who wants to make long-range contacts on the lower frequency HF bands without the need for high supports.

As you noted, after intensive investigation and propositions to the contrary, the DDDR turned out to be a top-loaded short vertical. As a result it faded from view, but the configuration, if not the name, should remain in our tool kit for appropriate occasions. The wooden "privacy" fences that seem to be cropping up do work both ways. Thus if you stay on your side, as this antenna approach allows, no one from the other side can tell what you're doing either. So the question comes down to how well the resulting antenna is likely to work.

I modeled a number of DDDR-like configurations using *EZNEC*, starting with a square.[2] I found it was resonant on 3.7 MHz, with a Z of about 10 Ω that should work with most wide-range antenna tuners. It could also be fed, gamma-match style, further up on the vertical portion to obtain a better match. For this model, the counterpoise was a complete square and the fed wire had a gap of 1 foot at the end. I used #12 AWG copper wire in my model for both wires to minimize loss, but thinner wire could be used with a small penalty, if stealthiness is needed on both sides of the fence.

The resulting intensity was about –9 dBi at a peak elevation angle of 30°. For comparison, a full-size 80 meter ground plane over resonant elevated radials has a predicted intensity of –0.7 dBi at 24°, a difference of about 1.4 S-units, but a lot less noticeable than a 70-foot pole. Unfortunately, in common with the full-size vertical, the antenna

[2]Several versions of *EZNEC* antenna modeling software are available from developer Roy Lewallen, W7EL, at **www.eznec.com**.

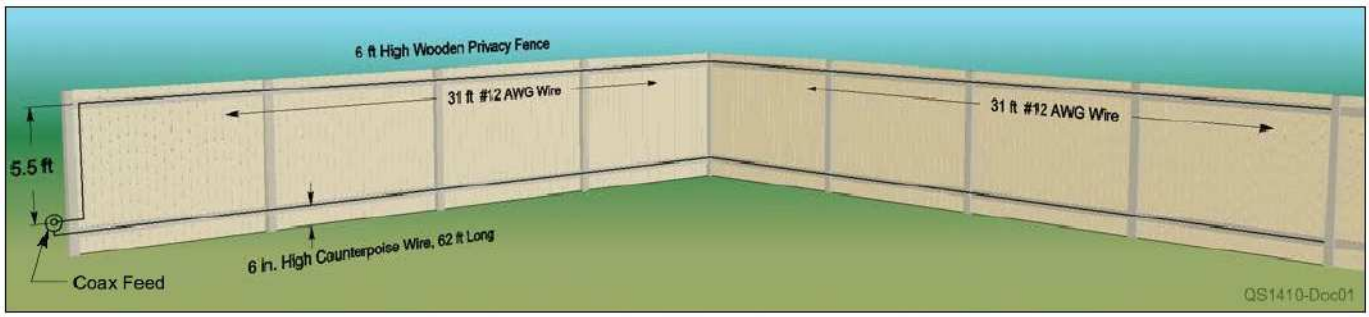


Figure 1 — Sketch of an 80-meter DDDR-like top-wire loaded vertical monopole mounted on a privacy fence. As noted, it can give a good account of itself, considering its visual impact and cost.

has a higher SWR than most tuners could handle on other bands, although a series variable capacitor of about 20 pF should get it to a 4:1 SWR on 20 meters, for example.

Not everyone has a square fence of that size, in fact it seems rather unlikely. Two sides could be open, with the wires on the open sides. I also looked at some other configurations. If there are just two sides of a 6 foot high fence, and there's space for 31 feet of wire on each, the resulting L configuration fed from one end will have an intensity within a dB of the first (see Figures 1 through 4). Of course, the higher the top wire can be, the better it will work (with some trimming of the horizontal wire length). If the fence is longer, so that there can be about 56 feet of wire on each side, the vertical wire can be in the apex of the V with an increase in intensity of almost 2 dB over the square.

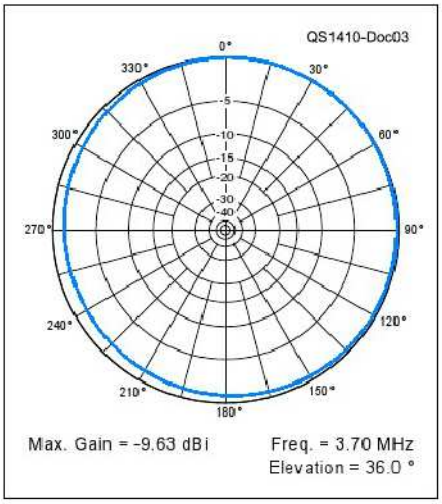


Figure 3 — The *EZNEC* azimuth pattern of the antenna of Figure 1, in the peak of the main beam at 36° elevation. Note that the total field is within 1 dB of being omnidirectional, with the peak toward the open end.

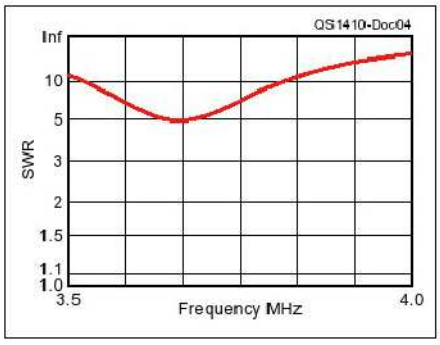


Figure 4 — 50 Ω *EZNEC* SWR plot of the privacy fence monopole. In common with other loaded monopoles, the impedance is low, but the SWR is low enough to be matched by a wide range tuner, particularly near the resonant frequency. While a remote tuner at the antenna base is the preferred configuration to minimize coax loss, even 100 feet of LMR-400 will have a loss of less than 0.5 dB with a 10 Ω load on 3.7 MHz, so an in-shack tuner should not be ruled out.

As with other vertical monopoles, the ground is very important, and the single wire "counterpoise" is not the best. If stealth digging is in your future, putting in a multi-radial buried ground system around the base of the feed point can make a big difference. I modeled 28 buried radials, each 68 feet long, and the resulting intensity of the V configuration increased to –4 dBi.

It is particularly important to evaluate the RF exposure levels in this kind of situation in which you are up against a property boundary. While not likely an issue on the lower HF bands, it certainly can be on higher frequencies. Have your calculations available for official inspection, or in case a neighbor asks.

Q Dave, KG4BZW, asks: What is the difference between a 50 Ω dummy load and 50 Ω terminator? I want to use my dual-channel oscilloscope to make measurements of 50 Ω systems. The oscilloscope I have does not include a 50 Ω input port, only 1 MΩ ports. I understand that a 50 Ω terminator on the oscilloscope will be required to do this. I have a small 50 Ω dummy load. Can this be used for the terminator?

A Yes, within its specifications, a dummy load will do a fine job as a line terminator. Generally, a 50 Ω terminator is simply a device that provides a 50 Ω load to the signal being measured. Those that are on oscilloscopes, or other test equipment, are generally useful at low levels. One can easily be made by putting a 50 (or 51 Ω) non-reactive ½ W resistor (such as the older carbon composition types) inside a coax plug with one end soldered to the center pin and the other to the shield barrel using as short leads as possible.

If your scope VERTICAL INPUT port connects via a coax jack, a typical arrangement is to use a coaxial T adapter on the VERTICAL INPUT port with the terminator on one side of the T and the signal input on the other. This makes for a compact and flexible arrangement that is easy to change back to a high impedance input port by just removing the terminator.

Commercial terminators are often made in a similar way, often within a BNC plug with a cap over the rear of the resistor to complete the shielding. Such terminators can terminate no more than ½ W, and generally somewhat less, because they are encased in the connector body they don't provide the air flow necessary to dissipate the heat that a resistor in free space could.

Your dummy load is just a termination that is designed to dissipate more power — often as high as 1.5 kW, for example. Over its rated frequency range, it also can serve as a scope terminator, even if connected via a length of 50 Ω cable, since that will preserve the impedance and avoid tying up lab bench space. But note that while the small terminator can provide a 50 Ω resistive impedance load well into the VHF range, the typical high-power dummy load, because of the size of the components and the internal connecting wires, often provides a poor impedance match at frequencies above 30 or 50 MHz.

If you do need to obtain a matched termination into the VHF range, a good termination can also be made from a coil of coax cable, the lossier the better. For example, a 200 foot length of open (or short) circuited regular (non-foam dielectric) RG-58 will provide a 50 Ω SWR of 1.07 at 2 meters and 1.00:1 at 70 centimeters because of the loss in the cable at those frequencies.

Do you have a question or a problem? Ask the Doctor! Send your questions (no telephone calls, please) to "The Doctor," ARRL, 225 Main St, Newington, CT 06111; for fastest response, e-mail **doctor@arrl.org**.

H. Ward Silver, N0AX, n0ax@arrl.org

Experiment #141

Window Comparators and Null Detectors

In the early days of Hands-On Radio, one of the first experiments (#11) described comparator circuits.[1] These are pretty handy for detecting when the voltage at one of their inputs is greater or less than at the other input. I'm finally getting around to describing two variations of the comparator — the *window comparator* and the *null detector*. There are plenty of applications for these circuits in radio and for test circuits.

The Window Comparator

Figure 1 shows a comparator circuit that incorporates hysteresis to shift the setpoint "a little bit" when the output changes state. That helps prevent "chatter" — rapid on-off switching of the output due to noise on the input signal or voltage reference. This comparator-with-hysteresis is known as a *Schmitt trigger*. Schmitt triggers are so useful that logic ICs intended for interfacing to switch and analog signals use them at gate inputs. Typical parts are the CD4093 and CD40106, along with variations of the 7414.

The comparator provides information about a single level — is the input voltage higher or lower than the setpoint? It is often more useful to know if an input voltage is between an upper and lower limit. This type of comparator is a *window comparator*, sometimes called a *range detector*.

The window comparator in Figure 2 is simply a pair of comparator circuits — one detects whether the input is below the lower limit and the other detects when it is higher than the upper limit. Hysteresis is not included in order to keep the circuit simple. (Power and ground for the LM393 are on Pins 8 and 4 in the DIP and SOIC packages.)

The comparator setpoint voltages (labeled Upper Limit and Lower Limit) are easy to calculate: Upper Limit = V+ × (R1+R2)/(R1+R2+R3) = 2/3 V+ and Lower Limit = ⅓ V+. If V+ is 12 V, then the two limits are 8 V and 4 V, creating a 4 V window from 4 to 8 V.

Remember that the output of the comparator is an open-collector transistor acting as a switch that can be open or closed. By connecting the output to a pull-up resistor (R4 in Figure 2) the output voltage is HIGH when the transistor is off (approximately V+) and LOW (at the transistor's collector-emitter saturation voltage) when the transistor is on. When the comparator's non-inverting (+) input is at a higher voltage than the non-inverting (–) input, the output is HIGH. When the opposite is true (non-inverting input lower than the inverting input) then the open-collector transistor output is LOW.

Connecting both comparator outputs together creates a *wired-AND* gate in which *both* output transistors must be HIGH to allow the voltage at R4 to rise and turn on Q1, lighting the LED. If either comparator output is LOW, Q1 remains off. For the window comparator, if the input voltage is higher than Upper Limit, the output of U1A is LOW and Q1 is off. If the input voltage is lower than Lower Limit, the output of U1B is LOW and Q1 is off. The only condition in which both comparator outputs are HIGH occurs when the input voltage is between Upper Limit and Lower Limit.

Look In the Window

Build the circuit, using either a variable power supply or adjustable resistor to create the input voltage. Vary the input voltage from below 4 V to above 8 V, while watching the LED. It will turn on when the input voltage is in the target window.

[1] All previous Hands-On Radio experiments are available to ARRL members at **www.arrl.org/hands-on-radio**.

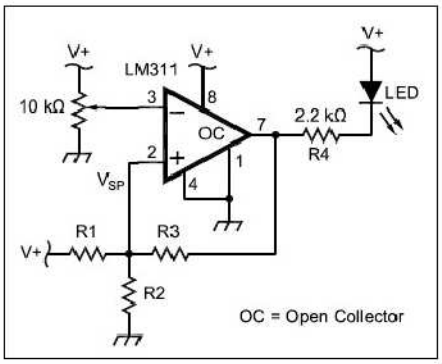


Figure 1 — The Schmitt trigger circuit is a comparator with hysteresis added to its switching setpoint through the addition of R3. See Hands-On Radio Experiment #11 for information on calculating the value of R3.

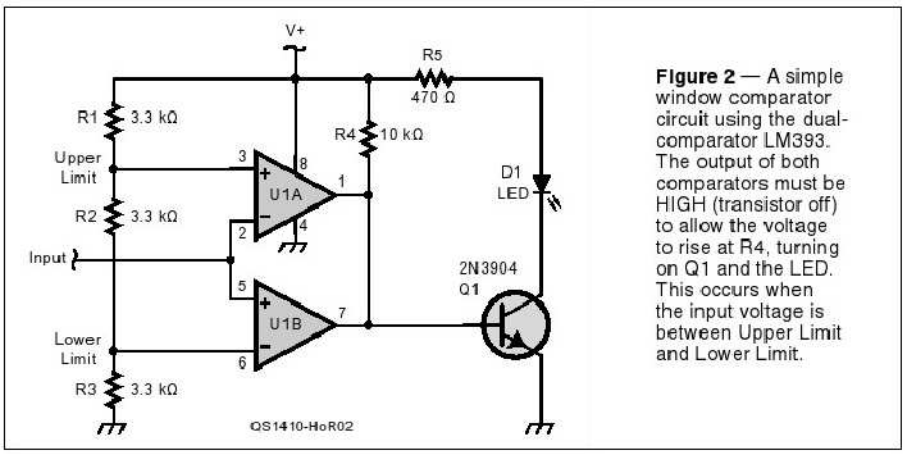


Figure 2 — A simple window comparator circuit using the dual-comparator LM393. The output of both comparators must be HIGH (transistor off) to allow the voltage to rise at R4, turning on Q1 and the LED. This occurs when the input voltage is between Upper Limit and Lower Limit.

Now experiment with the value of R2 by substituting fixed-value resistors or using an adjustable resistor. What happens to the window range as R2 is increased? (The window range increases.) Why? (A higher value for R2 lowers Lower Limit and increases Upper Limit.) Decrease R2 and verify that the opposite effect occurs. Return R2 to 3.3 kΩ and increase the value of R3 — what happens to the window? (The window shifts higher.) Return R3 to 3.3 kΩ and increase the value of R1 to observe the effect on the window. (It shifts lower.)

If you used a different voltage for V+ the values of Upper Limit and Lower Limit would change right along with it. What if there was noise on the power supply output? Or if you were using a battery supply — what would happen as the battery discharged? Obviously, it's not a good idea to use an unregulated voltage source for your setpoints. Some kind of regulated voltage is necessary. (Note that if you use a bipolar supply with Pin 4 of U1 and the negative end of R3 connected to the negative supply voltage, the window limits can be made positive or negative.)

This is such a common circuit that many manufacturers offer single and dual comparator ICs with a voltage reference built in. One such IC is the Linear Technology LTC1442.[2] You can also use a Zener diode or voltage reference IC. Regardless, for consistent and reliable operation, the voltage source to which the voltage divider string of R1, R2, and R3 must be clean and stable. It is good practice, particularly around RF sources like transmitters, to include small-value capacitors (such as 0.01 µF) from each setpoint to ground.

Window comparators are useful for lots of radio-related chores: making sure your power supply or battery voltage is in the right range, for example. If you sample some RF power and use a peak detector as described in the previous column, a window comparator can be used to make sure the power is within a desired range. Another use is for decoding the Icom transceiver BAND data output that changes from 0 to 7 V with the band selected. K6XX has designed a circuit that uses an LED meter driver IC with many window comparators built in to sort the voltage levels into digital-compatible outputs.[3]

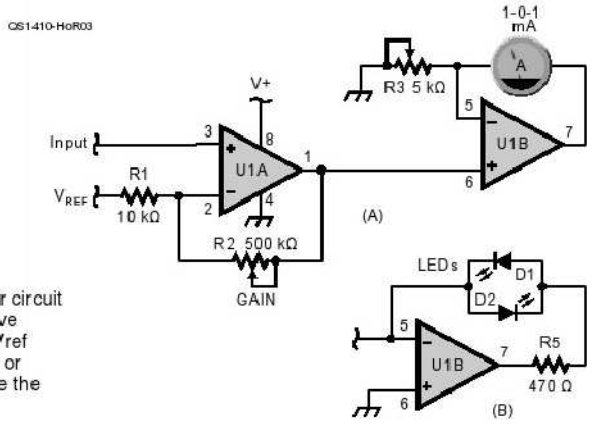


Figure 3 — The null detector circuit converts a positive or negative voltage difference between Vref and Input into a current (3A) or lights an LED (3B) to indicate the polarity of the difference.

Null Detector

There are many instances in which it's useful to adjust a circuit or system to produce a voltage exactly equal to some reference level, such as when balancing a bridge circuit or trying to adjust dc offset in an amplifier or demodulator circuit. A special type of window detector called a *null detector* responds to a narrow range right around a 0 V difference between its two inputs. "Null" in this case means "no difference between" the voltage being measured and a reference voltage.

Figure 3A shows a null detector circuit that uses an analog center-zero meter to allow fine adjustments to obtain the null. The input section consisting of U1A, R1, and R2 sets the gain of the detector equal to R2 / R1. The higher the gain, the more sensitive the detector. Note that U1 is a dual op-amp and not a dual comparator! A bipolar power supply of at least ±6V should be used.

U1B converts the voltage at the non-inverting input into current through the meter. R3 calibrates the voltage-to-current ratio: I = V / R3. If R3 is 1kΩ, then 1 V at the non-inverting input to U1B is converted to 1 mA of current through the meter. (1-0-1 mA center-zero meters are often used with a shunt for battery charging systems.)

To calibrate the meter; set R2 to 10 kΩ so that gain equals 1, ground V_{REF}, then connect a voltage of 0 to 1 V to the input. Measure the voltage at the output of U1A and adjust R3 so that the meter shows the same number of mA. i.e. – for a voltage of +0.5 V, the meter should indicate 0.5 mA in the positive direction.

To use the null detector, connect V_{REF} to the reference voltage desired, whether 0 V or some other value, and adjust input gain (R2) to the desired sensitivity. For initial adjustments of the external circuit being measured, keep gain low. As the null is reached, increase input gain for more and more sensitive adjustments.

An alternative to the analog meter is shown in Figure 3B, a pair of LEDs connected back-to-back. The calibration pot, R3, is adjusted with V_{REF} and Input shorted so that both LEDs are dark. (Noise, hum, or ripple on either signal may cause the LEDs to light dimly. A 0.1 µF capacitor across R2 creates a low-pass filter to avoid responding to ac components.) If the input voltage is higher than V_{REF}, then the bottom LED will be dark and the top LED will be lit. This is often sufficient to adjust a circuit or balance a bridge without requiring a high-precision display.

Parts List

LM393 dual comparator (or equivalent)

TL082 dual op-amp (or equivalent)

2N3904 NPN transistor

Standard LED (2)

470 Ω, 3.3 kΩ (3 ea.), 10 kΩ (2 ea.) ¼-watt, 5% resistors

5 kΩ, 10 kΩ trimpot

1-0-1 mA center-zero dc milliammeter (optional)

[2]LTC dual-comparator with reference data sheet available at **www.linear.com/product/LTC1442**.

[3]B. Wolbert, K6XX, "Automatic Band Select and Serial Interface for Icom HF Radios," **www.k6xx.com/radio/icbsciv.pdf**.

Paul Wade, W1GHZ, w1ghz@arrl.org

The Decibel

An understanding of the dB is the basis for understanding all microwave systems.

I have had several requests for a column about dynamic range. When I began to dig deeper, I found that too many hams do not really understand the decibel (dB) concept. Since it would be hard to discuss dynamic range without using dB, I decided to address dB first and then dynamic range in the next "Microwavelengths."

Decibels

A dB, or decibel, is a logarithmic representation of a power ratio. A power ratio is the ratio of one power level to another, for instance, output power divided by input power. You may recall logarithms from school — they were commonly used to simplify calculations before calculators and computers. Multiplication may be performed by addition of logarithms, and division by subtraction, saving the tedious work of multiplication or long division. Decibels, being logarithmic, allow power ratios, like gain and loss, to be calculated quickly and easily by addition and subtraction.

The decibel is a tenth of a *bel*, a measurement unit invented by Bell Labs. A bel is a power ratio of 10, that is, if the output is 10 W and the input 1 W, the ratio is 10:1 or 1 bel. While useful for early telephones, the bel was too large for any accurate work, so it was divided logarithmically into tenths of a bel or decibels. To convert a power ratio to dB, the formula is:

$$dB = 10 \times \log(\text{power ratio}) = 10 \times \log(P2/P1).$$

P2 equals the output power and P1 the input power; use the log or $\log_{10}$ button on your calculator to complete the calculation.

To convert dB to a power ratio, do the opposite:

$$\text{power ratio} = 10^{(dB/10)}$$

A review of Table 1, which lists some common values, should provide more insight.

Any other ratio can be found by adding dB — for example, 3 dB + 3 dB = 6 dB, which is the same as 2 × 2 = 4 times larger. Similarly, 6 dB + 3 dB + 1 dB = 10 dB, which is the same as 4 × 2 × 1.25 = 10 times larger.

Those of you checking my arithmetic with your calculator will find that the numbers aren't exact; for instance, a power ratio of 2 is actually 3.0103 dB. The values shown in the table are the reasonable approximations used by hams with real test equipment. A good industrial lab might be able to make most measurements to 1% accuracy, but most hams are lucky if they can measure to 10% accuracy — which is fine for most things. For a power gain of 24 times, 13.8 dB is more than precise enough; 14 dB is good enough.

Table 1
dB Equivalents for Common Power Ratios

dB	Power Ratio
–10	0.1:1
–3	0.5:1
0	1:1
1	1.25:1
3	2:1
6	4:1
10	10:1
20	100:1
30	1000:1

Old-fashioned analog instruments, like the HP 432A power meter scale shown in Figure 1, often have both power and dB scales on the meter. It is easy to read the power to within about 1% or within 0.1 dB, which is more than adequate. If the instrument has been recently calibrated, it might be accurate to 1% of the full scale reading. Notice also how the dB scale becomes more compact at the low end of the scale. To keep the reading on the upper part of the scale with the better resolution, the range switch has seven dB ranges available.

Figure 1 — Analog power meter with both power and dB scales. [Paul Wade, W1GHZ, photo]

The real advantage of the dB is when you're making system calculations, since the gain or loss of all the pieces can simply be added to get a total. Suppose we have a microwave transverter, with an antenna preamplifier having a 16 dB gain, a cable with 2.4 dB of loss, another amplifier with a 12 dB gain, a filter with a 1.8 dB loss, and a mixer with an 8.5 dB loss. To find the total gain of the system we simply add the dB to get 16 – 2.4 + 12 – 1.8 – 8.5 = 15.3 dB of system gain.

The answer is available in seconds with no effort, while multiplying and dividing power ratios would be very complicated. We can also quickly estimate the effect of changes to the system. This may not seem important

with simple examples, but when we look at a whole system, from antenna to headphones, the total change may be more than 100 dB.

Voltage dB

Frequently, one sees a statement like "this op-amp has a voltage gain of 60 dB." While voltage dB measurements are very useful, errors may arise when connecting components with mismatched impedances.

The correct definition for the power ratio of V2 (output) toV1 (input) includes the impedance for each voltage, Z1 for V1 and Z2 for V2, and is:

$$dB = 20 \times \log(V2/V1) + 10 \times \log(Z1/Z2)$$

A bit of algebraic manipulation will show that this is still a power ratio. If the impedances are equal, the second term is zero, and we may use the simple form:

$$db = 20 \times \log(V2/V1).$$

dBm

A common power measurement for RF and microwaves is dBm, decibels compared to 1 milliwatt. The advantage of this form is that the effects of gain and loss may be easily calculated — an amplifier with 14 dB gain will amplify an input signal of +7 dBm to an output power of +21 dBm. If it then passes through a filter with 1.5 dB of loss, or −1.5 dB gain, the signal level out is +19.5 dBm. Table 2 shows some common values.

Other measurements that may be found are:

- dBW — dB compared to 1 W
- dBuV — dB compared to one microvolt in a 75 Ω system (impedance must be specified)
- dBV — dB compared to 1 V (often in a 600 Ω system, impedance must be specified)
- dBc — dB compared to carrier level; used for sidebands and intermodulation or other spurious outputs

Antenna Gain

Antenna gain is another area with many misleading and confusing statements. An antenna is passive, so it cannot increase power. However, it can be directive, so that more power is radiated in one direction than in other directions; of course, this results in less power radiated in other directions, so that the total radiated power is always slightly less than the input power because of resistive losses and reflections back to the transmitter.

Table 2
dBm Equivalents for a Range of Powers

dBm	Power
-30	1 microwatt
0	1 mW
10	10 mW
30	1 Watt
60	1 KW

Antenna gain is relative to some reference antenna, the power radiated in a desired direction compared to the power radiated in that direction by the reference antenna. The standard reference antennas are either a (half-wave) dipole or an isotropic antenna, a hypothetical antenna that radiates equally in all directions. The gain is designated dBd for the dipole reference or dBi for the isotropic.

Advertising gains can be very misleading. Sometimes no reference is designated, just dB. Others are referenced to a ¼ wave whip — a case where the local ground plane can make a big difference in perceived gain.

The gain of a microwave antenna may be estimated from the aperture, the area of a dish, or the mouth of a horn. The maximum aperture gain (dBi) available from an aperture with area A is:

$$10 \times \log((4\pi/\lambda^2)A)$$

Actual gain is the aperture gain multiplied by the aperture efficiency, which is rarely more than 50%, so a good estimate for gain is about 3 dB less than maximum gain available for the aperture.

Noise Figure

The noise figure of an amplifier is the ratio of the total noise output of an amplifier with an input temperature of 290K (the Kelvin temperature scale starts at absolute zero or 0K and its units are the same as Celsius) to the noise output of an equivalent noise-free amplifier, expressed in dB. This definition isn't particularly useful, but most instrumentation measures noise figure in dB, and equipment specifications for noise figure are in dB. A useful thing to remember is that any loss in front of a receiver, feed-line loss for instance, adds directly to noise figure. One dB of feed-line loss increases the system noise figure by 1 dB, making system calculations easy.

Table 3
Equivalent Noise Temperatures for Various Noise Figures

NF	Trx
0 dB	0K
0.2 dB	13.7K
0.4 dB	28.0K
0.5 dB	35.4K
0.6 dB	43.0K
0.8 dB	58.7K
1 dB	75.1K
2 dB	169.6K
3 dB	288.6K
10 dB	2610K

Noise figures (NF) were useful for radar receivers and tube amplifiers with NF typically 3 – 10 dB or more, but modern preamps have noise figures well under 1 dB, so noise temperature is more meaningful. We can calculate noise temperature T_r from noise figure as:

$$T_r = 290 \times (10^{(NF/10)} - 1)$$

Table 3 may give a better insight into how very low noise figures hide large changes in temperature.

The effect of feed-line loss mentioned previously can also be seen in Table 3 — even a small amount of feed-line loss can turn a good preamplifier into a mediocre performer. At microwave frequencies, feed lines tend to be rather lossy, so the preamp should be as close to the antenna as possible.

Bandwidth and MDS

A resistor at a temperature T (in Kelvin) generates a noise power (P_n) = kTB where B is the bandwidth in Hertz and k is Boltzmann's constant, 1.38×10^{-23} joules/Kelvin. Since the noise power is proportional to bandwidth, we may also express bandwidth in dB as:

$$\text{Bandwidth (dB)} = 10 \times \log(\text{Bandwidth}/1\ \text{Hz})$$

At room temperature, 290K, $P_n = -174$ dBm/Hz. In a 2.5 kHz SSB bandwidth, $P_n = -140$ dBm, plus the noise figure. For a 3 dB noise figure, to be detectable signal power must be greater than −137 dBm to be larger than the noise power. Reducing the bandwidth to 500 Hz for CW reduces the noise power by 7 dB, enabling us to detect signals 7 dB weaker.

Digital communications modes such as JT65 use digital signal processing to detect signals in very small bandwidths, just a few Hertz, so that usable signal levels may be as much as 30 dB weaker than possible in an SSB bandwidth. Thus, when JT65 gives a

signal report of −22 dB, it is compared with the noise power of a 2.5 kHz bandwidth.

The noise power is also proportional to temperature T (in Kelvin), so we can express a temperature difference in dB as:

Temperature difference (dB) =
10 × log(T2/T1)

The Minimum Detectable Signal (MDS) of a receiver is limited by the system temperature, T_{sys}, made up of the antenna temperature and the receiver noise temperature. An antenna pointed along the ground receives the noise power of the ground, perhaps 300K in summer. With a 3 dB noise figure, T_{sys} = 300 + 289 = 589K. But when a microwave antenna is pointed at the sky rather than at the warm ground, the received noise power from the microwave background radiation of the universe is only a few K. If we also use a modern preamplifier with T_r < 35K, we can reduce the system temperature T_{sys} to well under 100K. So the improvement in T_{sys} is at least 7.6 dB, and even more as we lower T_r and T_{sys}.

The combination of digital communication modes and preamplifiers with extremely low noise temperatures is the magic that has made EME possible for modest stations.

Summary

Anything that can be expressed as a ratio of powers may be converted to dB, allowing quick and easy calculation. When we can combine gain, bandwidth, and noise power in dB, system calculations become much more straightforward.

When you understand dB and become comfortable working with them, many RF and electronic calculations become easy and more intuitive. This may help you to understand how to improve your system performance — finding the changes that give the most bang for the buck.

If you're still a little unclear about the dB, try reading Bob DeVarney's *QST* article "Decibels and dBm Demystified" for a further discussion of this topic.[1]

MUD

Microwave Update 2014 will be held in Rochester, NY, on October 24 – 26. Don't miss this chance to catch up on the latest in microwaves and to test and show off your latest project. See **www.microwaveupdate.org** for details.

[1]B. DeVarney, W1ICW, "Decibels and dBm Demystified," *QST*, Sep 2013, pp 46 – 47

New Products

bhi Dual In-Line Noise Reduction Module

The bhi DSP Dual In-Line noise reduction module provides stereo noise cancellation and may be used with any transceiver. It is designed for use with radios having stereo or two channel output options, but it can also be used with a standard mono speaker input signal. The module offers high and medium level audio inputs and has stereo line out, stereo headphone and mono speaker output sockets. You can listen with headphones and a mono speaker at the same time, and you can also connect a pair of stereo computer speakers to the line output socket. The module uses bhi DSP noise canceling technology and noise reduction is said to be 9 to 35 dB. Audio output with 8 Ω loads is specified at 0.5 W per channel for headphones and >6 W for a speaker. The module requires 10 – 16 V dc (2.5 A maximum). For more, visit **www.bhi-ltd.com** or US distributors **www.gapantenna.com** or **www.w4rt.com**.

Passive Audio CW Filter Kit from the Xtal Set Society

The Passive Audio CW Filter Kit from the Xtal Set Society requires no batteries or power supply. The kit features a 250 Hz bandwidth, 700 Hz center frequency audio filter designed for 8 Ω systems. The unit installs between your receiver's headphone jack and headphones or speaker, and a bypass switch allows for bypass and in-line reception comparison. Assembly for experienced kit builders is less than an hour. The kit consists of eleven parts, including three high-mu ferrites, quality PCB and black plastic case. Instructions are included for changing the filter bandwidth to 500 Hz for CW or 1500 Hz for SSB; for either of these frequency bandwidths the number of winding per core must be changed and a different set of capacitors purchased. Price: filter with case $36.95; filter without case $29.95. For more information, or to order, visit **www.midnightscience.com**.

Amateur Television Application Notes from KH6HTV

KH6HTV Video offers application notes and other technical articles — all on the subject of amateur television (ATV, both analog and digital, no slow-scan) — for free download. A recently added article is "AN-17: DVB-T the solution for Ham Digital Television" which documents recent research on high-definition digital TV. KH6HTV Video also offers a variety of ATV transmitters for the 70 cm and higher frequency bands, as well as other products for the ATV station. For more information, visit **www.kh6htv.com**.

Steve Sant Andrea, AG1YK, hk@arrl.org

LED RFI, Power Pack Adapter, and a Vehicle Vertical Beam

Light Emitting Noisemaker

I am interested in LED lighting. The technology has grown by leaps and bounds, with today's lights requiring half — or less — of the power of an incandescent lamp to generate an equivalent number of lumens.

I wanted to replace the lights in my radio room and adjacent areas with LED lighting. The radio room was previously equipped with two dual-bulb fluorescent fixtures. Each bulb was rated at 40 W and it is not unusual for these lights to stay on 12 or more hours a day. Another room, about 20 feet away, has a single-bulb fixture that is on all the time and there is also a two-bulb 24-inch fixture in the area just outside the radio room.

I purchased five 48-inch LED replacement tubes for the radio room and the single tube fixture (see Figure 1). I also purchased two 24-inch tubes for the smaller fixture.

While the LED tubes are smaller in diameter than the original T12 bulbs, the conversion to LED from fluorescent tubes is not a simple plug and play. It is necessary to remove the fluorescent ballast completely from the circuit. It is not a problem to leave it physically in the fixture, but the connecting wiring to the ac input and the "tombstones" (the fluorescent tube sockets) must be removed or the LED tube will be damaged. Once the ballast is removed, simply run an ac lead to each tombstone to complete the installation.

[Safety First! AC line voltages can be *lethal*. Before modifying any light fixture as described here, turn off the main circuit breaker supplying power to it and use a voltmeter to verify that the power is off. If you are unsure about working with high-voltage electrical wiring, seek help from an electrician. — *Ed.*]

Once I made the conversion in each fixture I was fairly pleased with the result. The light was whiter than the fluorescent tubes, was dispersed in a more downward direction than before, and seemed brighter.

Shortly after the install, however, I turned on my Icom 756 Pro II and discovered a tremendous noise level and regularly spaced spikes on the rig's spectrum display. The S meter was reading 10 dB over S-9.

When I turned off the LED lights, the noise level returned to a more normal S-2. Even the LED fixture in the room 20 feet away caused unacceptable levels of noise on my receiver. The affected bands were 20 and 15 meters and, to a lesser extent, 10 meters.

I do not know the manufacturer of the lights. I purchased them through eBay and am in the process of returning them to the seller with an explanation of the problem. It is interesting to note that the smaller 24-inch LED tube is not causing interference. It was obtained through a different source and is manufactured by Exetik Systems, Cambridge, Massachusetts.

If you are considering converting fluorescent fixtures to use LED replacements, I would advise you to shop around carefully and buy lamps with the option to return them should they prove incompatible with your radio equipment. [You might also like to read Mike Gruber's, W1MG, article on light bulb RFI in the October 2013 issue. — *Ed.*[1]] — *73, Andy Corbin, W4KDN, 1210 Mountain View Rd, Vinton, VA 24179*, **nitespark@cox.net**

Figure 1 — The product label for one of the noisy lamps. [Andy Corbin, W4KDN, photo]

Ryobi Power Adapter

As the ARES® Director of the Foothills Amateur Radio Society, I have long advocated for better battery packs to keep a handheld running in a pinch. These can be AA- or D-cell belt packs, Anderson Powerpole outlets, or cigarette lighter plug adapters for vehicles.

Professionally, I'm in the construction industry and I use Ryobi 18 V drills and impact drivers. I upgraded to the new lithium batteries, which, according to the label, have 48 Wh of power. Also the lithium batteries retain their charge at low temperatures and for long periods. With my handheld transceiver connected to my four-element Yagi, it takes ½ W to hit the local repeater. If we don't consider conversion losses, that's 96 hours of transmit power! Doing the math, the drill battery pack would outperform the AA batteries, hands down.

The problem is how to convert the typical 18 V tool battery to 12 V. Ryobi integrated a voltage tester into their new line of batteries, leaving the older battery tester on the sale table for $10. This provided the solution for connecting to the battery pack. With a little modification, a voltage regulator was mounted, two Anderson Powerpoles attached (see Figure 2), and my venerable IC-02AT handheld transceiver was operational on the local High River 146.7 MHz repeater.

For the voltage regulator, I used the new 78H12, which, according to specs, has a continuous current output of 5 A with a 7 A peak current output. You could, in theory,

[1]M. Gruber, W1MG, "Light Bulbs and RFI — A Closer Look," *QST*, Oct 2013, pp 42 – 45.

Figure 2 — An accessory battery tester is modified with the addition of a regulator and Powerpole connectors to convert electric tool battery packs for use with portable radios. [Wally Gardiner, VE6BGL, photo]

run your 25 W mobile, but the heat sink on the 78H12 gets pretty warm at 5 W.

I left the factory voltage indicator circuit in place and added a 100 pF capacitor to filter any induced RF on the power leads. There are several circuit variations available on the Internet. A fuse or two and possibly a crowbar circuit could also be added depending on the size of the enclosure. The hardest part of the project is finding a connector for your brand of power tool battery. A little ingenuity may be required, but the concept seems to work just fine. — *73, Wally Gardiner, VE6BGL, 390 Ellis Crescent, High River, AB Canada T1V 1J1*, **gardinercomputer@shaw.ca**

2 Meter Vehicle Vertical Beam

Two easily made and quickly attached magnetic whips instantly turn a 19-inch rooftop vehicle whip into a high-gain three-element beam. Use it as a simple foxhunting antenna or to reach a distant repeater in an emergency situation. Keep these add-on whips in your vehicle, and when needed, place the longer (20-inch) whip behind your 19-inch whip as a reflector and the shorter (18-inch) whip in front as a director, spaced 16 inches element-to-element. Voila, a low-profile vertical Yagi for your mobile.

Small, round ¾ × ⅛ inch neodymium super magnets, with countersunk holes for flathead screws, are the secret to easy construction. Use ½ inch 10-24 stainless or brass screws and nuts together with a #10 crimp-on screw-eye lug to attach the whip to the magnet (see Figure 3). I obtained the magnets from eBay, but there are other Internet sources. The whips do not need to be physically attached to the vehicle's body; capacitive coupling makes the connection.

Figure 3 — The whip bases are made from neodymium magnets, 10-24 screws and nuts, a crimp lug, and the whip element itself. [Ernie Sloan, W6ND, photo]

I used 1/16 inch stainless steel whips. With flux and adequate heat, stainless can be soldered. Steel piano wire is also satisfactory and solders more easily. Solid soft copper wire will bend in the wind.

The whip dimensions are from the tip of the whip to the surface of the vehicle. The recommended spacing of 16 inches yields a 0.2 λ spacing, which is a near-optimum Yagi design. I modeled it in *EZNEC* for a front-to-back ratio of 19 dBi for foxhunting. Forward gain is 11 dBi. Horizontal beamwidth is 98°. Adding these new elements will introduce some mismatch, but at this spacing the loss is small and the SWR adequate for modern transceivers. As a final touch, I added a single layer of electrical tape to the bottom of each magnet to preserve the vehicle's finish.

With the vehicle parked and pointed at a distant repeater, these simple accessory whips could someday be a lifesaver. For a little extra fun, I can add an attenuator and join a local 2 meter foxhunt. — *73, Ernie Sloan, W6ND, 5032 Michael St, Santa Maria, CA 93455*, **w6nd@arrl.net**

KX3 Mounting Bracket

The KX3 was designed as an ultra-portable transceiver. However, many hams purchased it as a base station or a backup base station. The transceiver normally sits at a low angle on the desktop, which many hams find inconvenient. Several manufacturers offer Plexiglas and wooden stands, which are great if you use the accessory paddles. I don't use the paddles and, because space is at a premium, I wanted the KX3 up off of the desktop.

My solution was to design and make a simple, yet sturdy, under-shelf mounting bracket. The bracket consists of three pieces of wood cut from a 1 × 6 inch pine board (see Figure 4). Two of the pieces are cut to a size of 3 × 5 inches and then layered to form the horizontal board that attaches to the shelf. This layering lowers the KX3 enough to clear the shelf. One edge of the lower board in the sandwich is beveled to angle the KX3 for proper viewing of the display. The angle will vary depending on the specifics of your setup, so some trial and error is needed here.

The third piece is 3½ × 8 inches and forms the transceiver back support. It is mounted to the beveled edge of the lower board once the appropriate angle for comfortable viewing and operation has been established. With the mounting board centered against the shelf boards, the mounting board will extend about 1½ inches on either side of the shelf board. The extended back legs of the KX3 go over these extended sides and hold it to the shelf by gravity. [The use of some mounting putty or notches in the mounting board for the legs should be considered for a more solid installation. — *Ed.*]

I used short drywall screws to join the boards and also to fasten them to the underside of the shelf (see Figure 5). Finally, an application of flat black paint will help the mount blend in with the KX3. — *73, Mike Lichtman, KF6KXG, 1717 El Rito Ave, Glendale, CA 91208*, **kf6kxg@arrl.net**

Figure 4 — Three pieces of pine board will turn the KX3 into a space-saving base station. [Mike Lichtman, KF6KXG, photo]

Figure 5 — The KX3, mounted to an under-shelf bracket, makes an excellent backup transceiver or primary rig for a "space challenged" shack. [Mike Lichtman, KF6KXG, photo]

Coax Connector Plate

While assembling a tower and antenna system for our new radio club, John, W8QN, suggested that we should install a plate at the top of the tower where we could terminate our LMR-600 and LMR-400 coax runs. This would allow us to run more flexible coax to the antennas. The loss in short runs of Flex LMR-400 would be acceptable at UHF and VHF and would prevent damage to the stiffer LMR-600 from rotator motion. This setup would also permit us to ground the shield of the coax to the top of the tower.

We planned five runs of coax to the top of the tower, two LMR-600 and three LMR-400. With that in mind, I designed the plate shown in Figure 6. I made the plate from ⅛ inch aluminum and MIG welded them together with an internal angle of 60°. The plate is mounted to the tower with ¼ inch stainless steel U-bolts that are attached to the horizontal portion of the Z-brace on the tower (see Figure 7).

The ½ inch diameter, N-type, chassis mounted barrel connectors have two flat sides so that they will not twist when you are tightening your coax connector. The holes for the connectors were drilled slightly undersized and then filed to enlarge them, leaving corresponding flat sides in the holes. Finally I added a couple of stainless steel eye bolts to which I could attach pulleys in case we wanted to add some wire antennas to the tower at a later date. — *73, Dennis Klipa, N8ERF, 644 E Whitethorn Dr, Midland, MI 48640*, **n8erf@arrl.net**

More on the Switchover Relay

The switchover relay hint in the August issue sparked (!) a number of replies.[2] Their essence being that before using a power supply to charge a battery by connecting the supply directly to the battery, you need to examine the power supply's schematic carefully to see if it can safely be put in parallel with another voltage source. New or surplus power supplies come in a very wide variety of designs. Some can be used in a parallel arrangement as in Phil's, KE3FL, case, many others cannot. The issue isn't just one of slowly discharging the battery, but some significant safety issues have been reported.

Carl Hayes, NN5I, related an unpleasant experience he had with a power supply that had an internal "crowbar circuit." When the power supply was turned off, the battery voltage triggered the crowbar, shorting the battery. "It immediately destroyed itself thoroughly, making spectacular smoke and fire that could easily have caused my house to go up in flames." Instead of a relay, Keith Mitchell, NS3B, recommends using a "Schottky diode placed inside the power supply before the voltage reference divider. Wire the fans before the diode."

If you are considering a new supply for battery charging, contact the manufacturer to verify that their supply will work in the configuration you want to use. With older or surplus supplies, carefully trace out the schematic for the components connected to the output terminals and look for any circuit elements that could cause a hazard if a "backward" voltage is applied. All in all, it's probably best to use a charge controller between the power supply and the battery. Finally, remember that a high capacity battery is capable of delivering *several hundred amperes — instantly* — when shorted; always fuse both sides of all battery lines to limit such currents.

[2]P. Karras, KE3FL, "Emergency Power Switchover Relay," *QST*, Aug 2014, pp 60 – 61.

Figure 6 — The coax connector plate made from aluminum plates welded together at a 60° angle. [Dennis Klipa, N8ERF, photo]

Figure 7 — Mounted just below the top of the tower with U-bolts, the coax connector plate provides a convenient transition place to change from stiff to flexible types of coax. [Dennis Klipa, N8ERF, photo]

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

QST invites you to share your hints with fellow hams. Send them to "Attn: Hints and Kinks" at ARRL Headquarters, 225 Main St, Newington, CT 06111, or via e-mail to **hk@arrl.org**. Please include your name, call sign, complete mailing address, daytime telephone number and e-mail address on all correspondence. Whether you are praising or criticizing an item, please send the author(s) a copy of your comments.

Reaffirming Our Commitment to Service

One of the primary reasons for the existence of Amateur Radio is emergency communications support.

David Johnston, KD8BQN, provided communications support during the 2012 Colorado wildfires. [Robert Strieby, W0PT, photo]

Doug Rehman, K4AC
ARRL Southeastern Division Director
k4ac@arrl.org

The first statement of the fundamental purpose of our service, as listed in the Federal Communication Commission rules that govern Amateur Radio, reads: *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.*[1]

As a Special Agent with the Florida Department of Law Enforcement, I spent many hours performing tasks not specifically involved in enforcing Florida law. This included administrative paperwork, meetings, training, and firearms qualification. All of those tasks, however, are integral parts of law enforcement.

As amateurs, we routinely provide communications for a variety of non-emergency events. In addition, we routinely check into nets, handle message traffic, and much more. Just as the administrative and training tasks that police officers perform are essential to the process of law enforcement, so too are these amateur activities an essential component of our emergency communications capability. In effect, they are all preparations for actual events.

The countless hours spent participating in nets and other events train amateurs to efficiently communicate. As a result, we have a distinguished history of providing emergency communications support in incidents as small as those involving a single person and disasters as widespread as Hurricane Katrina.

Our Mission is Clear

On July 18, Federal Emergency Management Agency (FEMA) Administrator Craig Fugate was the keynote speaker at the League's Centennial Convention in Hartford, Connecticut. During his speech he recounted his outstanding experiences with Amateur Radio when he served as the head of Emergency Management for Marion County, Florida. Mr Fugate's experiences with Amateur Radio have been so positive that he joined our ranks as KK4INZ, recently upgraded to General, and now checks into nets when his schedule permits.

Earlier that same day, Mr Fugate and ARRL President Kay Craigie, N3KN, signed a Memorandum of Agreement that will enhance our relationship with FEMA. You can read more about this historic agreement elsewhere in this issue and online at **www.arrl.org/news/fema-and-arrl-sign-agreement-fema-administrator-calls-ham-radio-resilient**.

To make the ARRL's position on emergency communications unequivocally clear, at our July Board of Directors meeting we unanimously passed a Resolution reaffirming our commitment to emergency communications. The Resolution recognizes the countless number of hours donated by amateurs through the ARES® program, and through assistance to our partners.

Our challenge moving forward is to identify roles where we can provide beneficial services. Direction is found in another fundamental purpose stated in the FCC rules: *Expansion of the existing reservoir within the amateur radio service of trained operators, technicians, and electronics experts.*[2] As society becomes increasingly less "hands-on," the need for our technical skills and knowledge, especially in emergencies, is growing. Amateurs know far more than how to talk via radio; the technical aspects of our hobby allow us to solve communications problems and improvise solutions. We need to look for opportunities to utilize these skills and knowledge to benefit our communities

Equally important is that while our service is named "Amateur Radio," we continue to present ourselves with a professional demeanor — both in person and on the air.

Please join with us in reaffirming our commitment to serving our communities. If you aren't already involved, contact your local club or your Section Manager to find out how you can participate.

[1]Part 97.1(a)
[2]Part 97.1(d)

Signals From Paradise

A brief history of ham radio in the Virgin Islands.

Malcolm Preston, NP2L

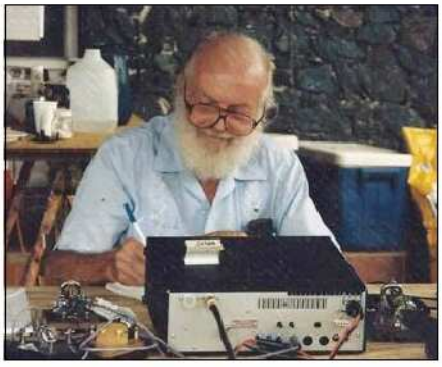
The origins of ham radio in the Virgin Islands can be attributed to Dick Spenceley, who was a Navy radio man stationed at the St Thomas Coast Guard station in 1921, and who later settled on the island. In 1928, *QST* reported that the United States Supervisor of Radio in the Fourth District issued the call 4AAN to Dick in 1928. His call was later changed to KV4AA. His many years of activity were recognized by the US Army and the Territorial Governor in 1968. For a number of years, Dick was active on the HF bands. He was recognized in the *Guinness Book of World Records* for making 48,100 QSOs in 376 days in 1978. Many of us have his cards in our archives.

The Virgin Islands remained sparsely populated until the 1950s, when air service improved and a boom in tourism started. Caneel Bay, the first Caribbean Resort, was opened by Nelson Rockefeller, who also purchased and donated land on St John for a national park. A large oil refinery was built on St Croix. Amateur activity started to grow along with these developments. Hams started coming to participate in contests and operate casually during their vacations. Some even ultimately settled on the island.

Always recognized by the ARRL, the US Virgin Islands, along with Puerto Rico, were part of the West Indies Section until 1982 when Ron Hall, KP2N, was elected first Section Manager. Ron served until 1996, followed by John Ellis, NP2B, until 2012 when Fred Kleber, NP2X/K9VV, was elected.

The British Islands, centered around Tortola, also experienced growth and actually became the birthplace of the Virgin Islands Radio Club. Bob Denniston, WØDX, a former president of the ARRL, had settled on that island and built a small resort on Belmont Bay called Smugglers Cove. The seed for starting a radio club was planted during a discussion between Bob, also VP2VI, and Ron Hall, W8OFG, now KP2N, a designer for Heathkit in Benton Harbor who was visiting the islands. They realized that the ham population on Tortola (at that time Bob and Arthur Swain, VP2VA) wouldn't support a club they named the club the Virgin Islands Radio Club. Instead, they combined forces with St Thomas hams Aubrey Nelthropp, KV4BT, Clark Edson, KV4EN (later KP2B), and Anglican Bishop Edward Turner, KV4BQ, to start an informal club. Initially the club was based on the premise that there would be no formalities, no business, and no officers. That philosophy still exists today — when the annual business meeting is timed, it may not take longer than one minute. Formal recognition waited until 1978 when officers were elected and the club became affiliated with the ARRL.

At the Orlando HamCation®, Greg Sarratt, W4OZK (left), who was Southeastern Division Director at the time, posed for a photo with three US Virgin Islands Section Managers. From left to right: current Section Manager Fred Kleber, K9VV, former Section Managers John Ellis, NP2B, and Ron Hall, KP2N. [Harold Kramer, WJ1B, photo]



Bob Denniston, VP2VI/WØDX (SK), operating Field Day on St Thomas in 1996.

A radio club was established on St Croix around 1975 by Lou, KV4JC, with Dick, WV4II, and Jerry, WB6RCN. Dick Moffit and his brother Vern, WV5IJ, had a ham shack and tower at an old sugar mill. In 1993, a discussion between Bob Kallaway, KP2AV, and Mal Preston, NP2L, led to the organization of the St John Radio Club, with an initial group of 12 members.

One of the first activities engaged in by all of the clubs was the establishment of 2 meter repeaters. Three repeaters were established on St Thomas, but at that time all were owned by individual members, not the club. In 1978, W4UWH set up the first one in 1985, WP2ACW set up the second; shortly thereafter W2IBJ set up the third. The WP2ACW repeater was later purchased by Klaus, KP2O, and is still in operation at its commanding location atop of Crown Mountain. A repeater consisting of a couple of reconfigured mobile rigs was installed on St Croix in 1985. It was later replaced by a repeater originally built in 1979 by W4MRJ as a RTTY repeater in Atlanta. John, W4MRJ, now with the call NP2B, brought it down and rebuilt it as a voice repeater, and it is still in use today as NP2VI. The St Croix club gave the St John club a repeater, which they renovated and

put into service on Bordeaux Mountain as KP2SJ in 1993.

Communication During Disasters

Emergency communication has always been a priority in the Virgin Islands. Phone and power lines, satellite dishes, and microwave antennas tend to be attractive targets for storms, particularly during the hurricane season. Significant storms were experienced in 1928, 1931, and 1932, then Donna in 1960, Klaus in 1984, Hugo in 1989, Bertha in 1998, and Marilyn in 1995. Ham radio always played a significant role in preparation before, during, and after the storms.

During the 1928 hurricane, two early Army Amateur Radio Systems (a predecessor of MARS) members, Forrest Dana, 4AGR, and Ralph Hollis, 4AFC, maintained a critical communications link with the US War Department. They provided information that brought help from both the Army and the Red Cross.

In 1995, John Ellis, NP2B, was in contact with the NHC net on 20 meters during Hurricane Marilyn. From his shack on St Croix he corrected information on the center of Marilyn. He was in an ideal position to do so, being directly under the eye. In the early hours and days after the storm, ham radio was the only working means for inter-island and off-island communication. The repeater on St Croix remained the only operational one in the Virgin Islands. Traffic was passed for the Governor and Lt Governor, National Guard, Red Cross, and FEMA, among others. Stations on St Thomas and St Croix reported the condition of airport runways, arranged for helicopter air evacuations, arranged for deployment of gas generators and other needed assistance principally over 20 meter SSB nets. On St John, hams provided equipment to open communications between the clinic, EOC, and Coral Bay, which was completely cut off by road. Hams manned EOC equipment on all three islands. In the aftermath of all of these events, Virgin Islands hams from all three islands handled health and welfare traffic with several disaster nets on the mainland.

DX and Contests

Because both the US Virgin Islands and the British Virgin Islands are recognized as countries for DXCC credit, DXing and contests have always been popular. Bob

Frank Butler, W4RE, and Ron Hall, KP2N.

Denniston, WØDX/VP2VI, has been recognized by Martti Laine, OH2BH, as the pioneer of the DXpedition for organizing the "Gone Wacki" trip to the Bahamas in 1948. Bob joined John Ackley, KP2A, on Clipperton Island in 1954 and earned a world record in the ARRL DX contest for the 1960 performance at VP1JH from Belize. Bob and John planted the seed that brought visiting hams from all over the world to operate in the Virgin Islands. Jon Pomfrett, W2AAF, was a regular summer resident and a DXer on St John. One can still create a pileup by calling CQ.

Contest stations also have origins in the Virgin Islands. For years, KP2A was active with John or visiting operators at the controls. WP2Z was probably the first rental ham shack in the Virgin Islands. It was on top of an 850 foot hill overlooking St Croix's north shore. NP2B's location was the perennial base for visiting competitors on St Croix. The St Thomas club station, KP2D, has thrived in both ARRL and CQ contests, principally in RTTY events. Around 1997, a group from the US Virgin Islands and the British Virgin Islands entered VP2VE in ARRL SSB DX contest from the Big Bamboo beach bar on the north coast of Anegada.

Several well-known nets sprung up in the Virgin Islands. While he was there, Bob, VP2VI, held a nightly CW training net on 160 meters. Other notable long-lived nets include the 40 meter Caribbean Maritime Mobile Weather Net (7250 kHz, 1100Z). Lou Bean, KV4JC, served as net control for 20 years before being relieved by George Cline, KP2G. Aubrey Nelthropp, KV4BT, was a cofounder of Friendly Net (7188 kHz, 1200Z). George, KP2G, started the Virgin Islands weather net on the St John repeater (146.63, 1040Z) in 1994. The St Croix ARES net meets Monday evenings on their repeater (147.250, 2300Z).

Bring Your Rig

Ham radio doesn't recognize national borders, as the connection between US and British Virgin Island amateurs attests to. In 1985 the UN donated several battery-powered HF rigs to the British Virgin Islands to provide emergency communications between Tortola, Virgin Gorda, Jost VanDyke, and Anegada. Installation was accomplished by hams from both countries making eight trips to those islands. VP2VI along with longtime British Virgin Islands Telecom administrator Arthur Swain, VP2VA, developed a British Virgin Islands testing and licensing system based on those in the US. After Bob and Arthur passed away, US Virgin Islands VEC teams tested British Virgin Islands candidates (who all have US postal addresses) and qualified them for US licenses. The telecom office on Tortola was then able to license them based on reciprocity.

Hams, sailors, and others seeking a warm clime are always welcome in the Virgin Islands. Rent a boat, condo, house, or hotel room. Bring the family, bring your rig, and come on down!

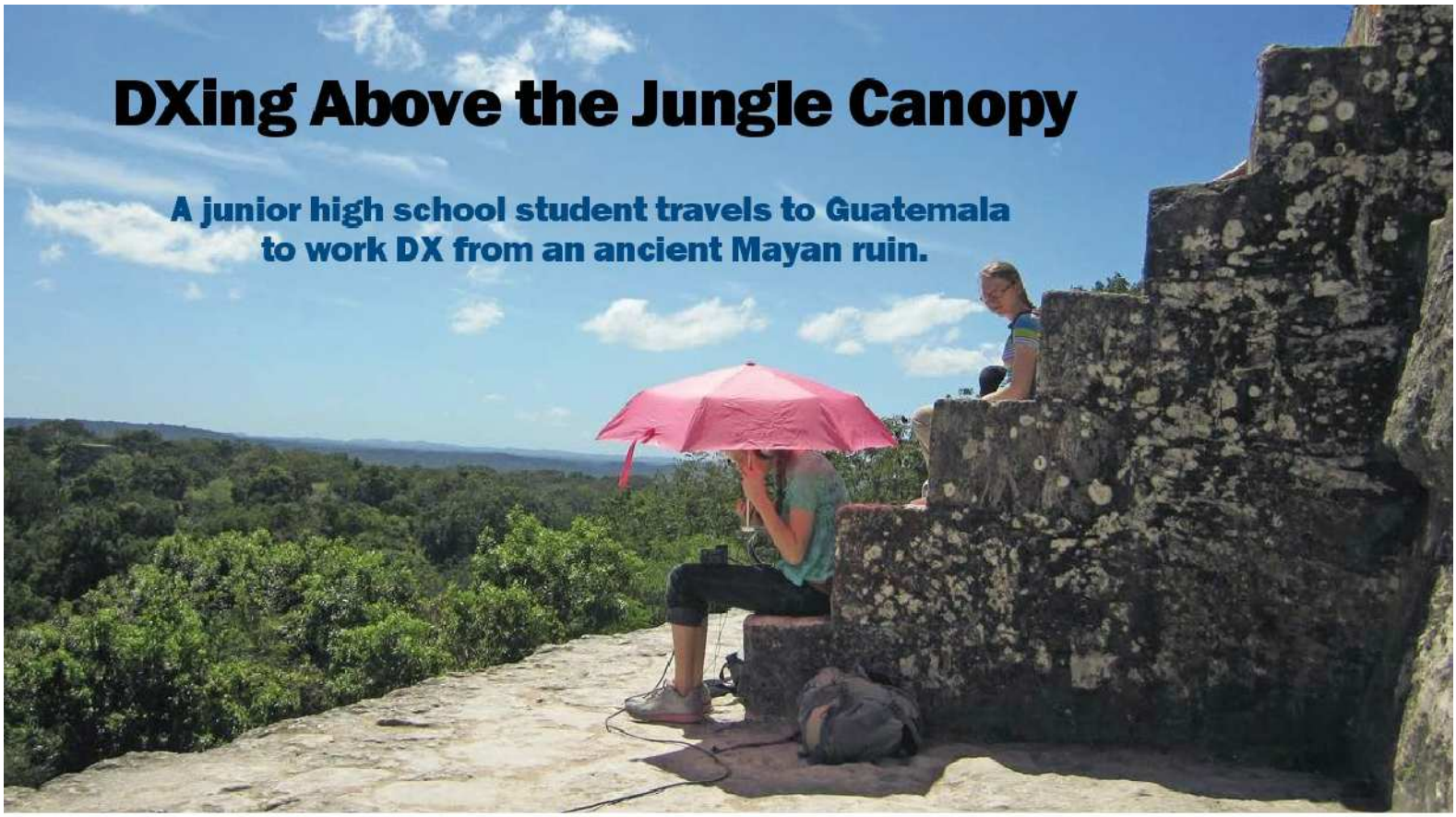
Malcolm "Mal" Preston, NP2L, attained a Class B license in 1949 and upgraded to Class A in 1950. He had the calls W9JQY and W2IRZ prior to his current one. He now holds an Amateur Extra class license and is a Life Member of the ARRL. He is a graduate of Denison University, has an MBA from Northwestern, and is a CPA. His work career included service with Auditor General, USAF, several years in public accounting before financial management positions in the paper manufacturing industry. In the 1980s, he pursued a parallel career renovating hydro-electric facilities in New York state. He was a cofounder of the New York Alliance for Hydro-Electric Energy.

Mal moved to St John in 1990 and has been active in ham satellites, DXing, contesting, ARES activities, and both the St John and Virgin Islands Amateur Radio clubs. He currently serves as Assistant Virgin Islands Section Manager.

He can be contacted at PO Box 1318, St John, Virgin Islands 00831 or by e-mail at **np2l@arrl.net**.

DXing Above the Jungle Canopy

A junior high school student travels to Guatemala to work DX from an ancient Mayan ruin.



Adrianne Morrill, KG7HYD, and Aaron Morrill, NA7AM

Every year since 2005, my family and I have been traveling to Guatemala to do mission work. In February of this year, I returned with my dad David, AE7DM, for a 15-day trip. This trip was unlike all the others because I had just passed my Technician class license test the month before. My dad and I brought along his Elecraft KX3 HF transceiver and Buddipole antenna. I was excited to see who I could talk to from Guatemala and, of course, I looked forward to talking to my family and friends back home in Spokane, Washington.

I knew this was going to be a great trip. Mission work and playing on the radio — my two favorite things! My dad had scheduled times and frequencies for talking with my brother Aaron, NA7AM, who attends a boarding school in Canada. There were also some members of the ARES / RACES group that my family is a part of, who wanted to talk to me while I was there. I am the youngest member in the group at age 13, but I really like the excitement of helping with RACES and community events.

Why Ham Radio?

I started learning about Amateur Radio 3 years ago, when everyone in my family was working toward their licenses. My interest increased when Aaron went away to a high school in Canada. The best way to talk to Aaron was over the radio. So if I wanted to talk to him, I had to use my dad's call sign. Now I have my own license, KG7HYD, and I can talk to Aaron any time. We are now a "ham family" with my mom, N7MOM, and sister, KF7WZA, also having gotten their tickets.

Studying for my ham radio license was very hard for me. In the summer of 2013, I went to a Technician license class at a club. To help me study, Aaron put Gordon West's Technician CDs on my iPod. Finally, over Christmas break I passed my first practice exam. One week later, after passing many more practice tests, I went to take my Technician exam. On my first try I missed it by two questions. So I took it again right then and there — and passed!

The Long Trip Down

My dad and I left home on February 12. My dad had packed all the radio gear in a Pelican case, making sure each piece fit perfectly in the foam insert. I was scared every time we went through security because it was a big box with a lot of electronics in it, but everything went okay. On the plane we put the case under my seat, which worked out well because I could rest my feet on it during the flight.

We had an overnight layover in Guatemala City and arrived late that evening. The next morning, February 13, we had one more early flight to our destination — the island of Flores, where we would be staying for the next week.

The little island of Flores is on Lake Petén Itzá. Petén is one of the states in Guatemala (known as "departments") and Itzá is the Mayan tribe it is named for. The Spanish word "flores" means "flowers," and the island is very flowery with old, brightly colored buildings. The city of Santa Elena is on the adjacent shore with a land bridge running to the island.

Radio Red Tape

In order to get permission to operate in Guatemala, we sent a PDF of both our licenses to the International Amateur Radio Union (IARU) member society in Guatemala, Club de Radioaficionados de Guatemala (CRAG). It was sent about a month before we left, with the dates we would be in Guatemala. We included our call signs and what our locations would be. We sent the information to an e-mail

address we got from the ARRL® website, which said that Guatemala holds a reciprocal operating agreement with the US and there is no fee.

"Perfect," we thought, "but what about prefixes to use before our call signs?" We still hadn't received a reply from CRAG, so we found a woman at the mission who spoke Spanish and asked her to call. She explained to my dad that she had talked to the secretary at CRAG. The president of CRAG who deals with foreign licensing was away. She gave us his personal e-mail address and my dad re-sent our information to him.

Finally we received a reply from Jorge Abed, TG9AAJ, who said we needed to fill out an online form, and he provided the link: **www.radioaficionados.ws/visitantes.html**. My dad filled it out and submitted it the same day; but in Guatemala, nothing gets done in a hurry. On Wednesday, a week into our trip, my dad sent another e-mail to Jorge saying, "I filled out the online form, when can I start to use my radio and what prefix do I use?" His reply came back right away — which was kind of funny. Jorge's entire e-mail reply was "is TG7AE7DM." We took that as a "yes" and set up the radio that afternoon.

Time vs Airtime

My dad and I had fun setting up the radio on the shore of the island (see Figure 1). I tried to contact a few stations, but the combination of low power and low elevation on the sidewalk did not help my signal. On Thursday we set up the radio on the other side of the island, but bad propagation left 10 meters dead.

Finally, on Friday, we set everything up on the hotel balcony. My dad had packed a Powerwerx switching power supply and a 100 W Elecraft amplifier to boost our signal. We operated off of the hotel's power, but the antenna situation was not the best (see Figure 2). My dad said he could hear a few people on 10 meters. Unfortunately, that was the last day of my mission work with the local kids and I had no time for playing radio.

Saturday afternoon we packed everything up for our drive to Tikal, which is an ancient Mayan city northeast of Lake Petén Itzá. It is part of the Tikal National Park and the location of many Mayan ruins.

After a day and a night in the park DXing and enjoying the ruins, we drove south for Poptún, a small town in the northeastern part of Guatemala near the Belize border. Poptún has a larger mission and is also the headquarters for the organization "Water for Life." We stayed in an apartment there for 3 days and set the radio up with the 100 W amplifier and the Buddipole on the roof.

Figure 1 — Adrianne, KG7HYD, operating from the flooded shore on the island of Flores.

This was the downtime of the trip and the radio was set up permanently. I had as much time as I wanted to operate for 2 days. With 100 W and the Buddipole on top of the apartment's tin roof, I was able to reach Canada to talk to my brother both days with a 55 signal report. Even my friends from the ARES / RACES group in Spokane gave me a good signal report, and I talked to many other stations. I really liked putting on headphones and entering the radio world, where everyone wants to talk to a TG7 station.

The Misty Morning

At 4:00 in the morning on Sunday, February 23, the air was saturated with water and I had to use a flashlight to climb the 180 wooden steps to the tallest pyramid in the ancient Mayan city of Tikal. I was only up that early because our tour guide was taking us to see the sunrise from Temple IV. The view was supposed to be spectacular and he told us we could see for miles above the jungle canopy. He also said we should be able to see the other temples poking up out of the jungle like little mushrooms.

When we made it to the top of Temple IV,

Figure 2 — The KX3 and amplifier set up on the balcony at the hotel on the island of Flores. Luckily the hotel had power available.

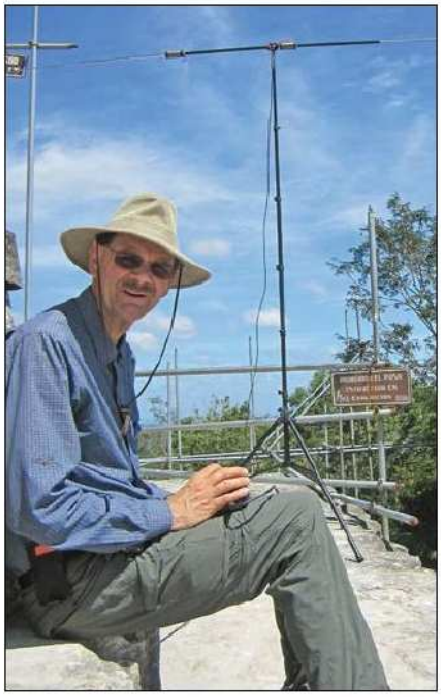


Figure 3 — David, AE7DM, checking the SWR on the Buddipole, Sunday afternoon on Temple IV. [Adrianne Morrill, KG7HYD, photo]

we waited half an hour for sunrise. When it started to get light, there was a thick fog that covered the top of the jungle canopy. I couldn't even tell I was above the jungle, except my legs told me I was — from climbing up the 180 wooden steps! The fog was a little disappointing, but I found the perfect spot to set up our KX3 and Buddipole later in the day when it was warmer.

Breakfast at the Lodge

The hike down was fast and the trail through the jungle did not seem as creepy in the morning light. We had breakfast waiting for us back at the lodge where there were lots of little souvenir shops. After a breakfast of black beans and tortillas (classic Guatemalan food), we were free to roam around. I had fun looking at the scale model of all the ruins and I could see the one I would be calling CQ from later in the day — I couldn't wait!

Packing for the Pyramid

My dad packed 25 feet of coax, the Buddipole antenna, the Elecraft microphone, the Bose headphones, and the KX3. We made the trek up the wooden stairs again, this time with the sun shining and the temperatures warming up. At the top I help my dad set up the Buddipole (see Figure 3). He used a compass to find north and oriented the antenna for a clear shot to the US.

There wasn't any power on top of the temple, so we left behind the power supply, 100 W amplifier, and the extra coax. I ran the radio at 5 W using its internal AA batteries, which worked just fine.

I started calling CQ as TG7/KG7HYD, low power portable on top of the jungle in Guatemala (see Figure 4). Soon I made a contact in Georgia and another in Rhode Island. The sun was shining right down on me and the radio was getting quite hot from the sun and from me using it. I used an umbrella for shade and kept making contacts (see the lead photo).

Lots of the English-speaking tourists talked to my dad and couldn't believe that I had a license at my age. Even the local Guatemalan tour guides asked if this was radio equipment similar to that from World War II. I informed them this was state-of-the-art Amateur Radio equipment.

After an hour of listening and making contacts on 10 meters, I was starting to get sunburned through my shirt and the batteries we getting low. I made a few more contacts to the East Coast and closed down. I would really miss that spot — the beautiful view and the good propagation.

Adios, Amigos

Our last day was mostly filled with goodbyes and not a lot of radio. We took the antenna off the roof and put the amplifier and radio back in the box for the trip to Flores. On Wednesday, February 26, my dad booked our last night in the hotel in Flores. Our plane left early the next day.

Our room was on the fourth floor of the hotel and had a balcony. My dad was dying to set up the radio to see if having the amplifier would get our signal out from the island. When he had everything set up and plugged in, he turned on the radio but the batteries were too low from our day at Tikal. What did it matter? We had power — at least we thought we did! I tried every plug in the room, but none of them worked. By that time the radio was dead. We sadly packed up the radio and went to bed.

We boarded a plane early the next morning and started the long trip home. When we entered the states, I caught myself saying, "TG7" in front of my call sign on a handheld, while talking to my dad in the airport. I'm really going to miss the good food, good weather, good friends, and great operating locations in Guatemala. I definitely have to go back!

Figure 4 — Adrianne, KG7HYD, making contacts from the top of Tikal Temple IV with other Mayan temple ruins in the background.

All photos by David Morrill, AE7DM, except where noted.

Adrianne, KG7HYD, received her Technician license earlier this year. She comes from a ham family, which is what sparked her interest in obtaining her license. Adrianne's main motivation was that she enjoys talking to new people and thought that through ham radio she could get to know people around the world. Adrianne is already working toward her General class license so she can get into DXing.

Aaron Morrill, NA7AM, an ARRL member, started out in ham radio when he was a sophomore in high school. He is a Volunteer Examiner, a member of his local ARES® group, and also of RACES. Aaron went to high school in Canada and while there obtained his Canadian Basic class license with Morse code and operates as VA7AMO. Aaron's interest in radio and wireless technology has him working toward an Electrical Engineering degree. His main radio activities are digital modes and activating SOTA peaks.

Aaron can be reached at 14103 West Coulee Hite Rd, Spokane, WA 99224, **na7am@icloud.com**.

Cuban Contest Station Achieves Top Ten

T48K breaks into the top ten of the ARRL DX Phone contest with operating skill and ham ingenuity.

Douglas Ruz, CO8DM

On the morning of Wednesday, February 26, 2014, my friend Raul, CO8ZZ, arrived at my house. He had traveled from Las Tunas, Cuba, the capital city of our province, with antennas and other equipment. I loaded my equipment into his truck and we continued the trip to Chaparra, a small town about 8 miles away. In Chaparra we met up with the other members of the Radio Club Las Tunas team, T48K — Alejandro, CM8AKY, and Alex, CO8KA.

We continued our trip to La Herradura beach, located in the northern part of Las Tunas province. It's a good site for a station because antennas can be installed a few feet from the Atlantic Ocean, which does much to improve the station's performance.

The T48K verticals arranged along the shore of the Atlantic.

T48K was first activated in February 2001, during the ARRL® International DX CW Contest. The founders were Raul, CO8ZZ; Josue, CO8JY (now CO7RR), and me. We have participated frequently in most of the ARRL and CQ contests held over the years, but this would be our first time competing in the ARRL DX Phone contest.

Planting Antennas

When we arrived at La Herradura, our friend Hector was waiting. He owns the house we used for our contest operation. It was already afternoon and we only had time to install the two-element vertical for 10 meters. After the sun faded, we moved inside and installed our stations. We had a Yaesu FT-857 transceiver as the running station, a Yaesu FT-757GXII transceiver as the multiplier station, and a Kenwood TS-130S transceiver as a backup. We also had two amplifiers, a Collins 30L-1 and a Yaesu FL2100Z. To round it all off we had a computer network with two PCs running *NIMM* contest software.

The Las Tunas Contest Crew, T48K. From the left: Alejandro, CM8AKY; Raul, CO8ZZ; Alex, CO8KA, and Doug, CO8DM. [Hector Font, photo]

Just after sunrise on Thursday we started installing the rest of the antennas — the two-element 15 meter vertical, the 20 meter vertical dipole, and my 40 meter quarter-wave vertical. Then we had to deal with the problem of the 80 and 160 meter antennas. In previous contests we had used a pine tree to support the low-band antennas. Unfortunately, somebody had cut the pine tree down.

We were up early on Friday to resume work on the antenna farm. We ended up raising two inverted V antennas for 80 and 160 meters. We were a little apprehensive because we had to feed both antennas with one piece of coax and had neither the time nor the equipment to run any meaningful tests.

Zero Hour

At March 1, 0000Z the contest began. Alejandro, CM8AKY, started calling on the 20 meter band beginning the first of our 2-hour shifts. The deepening nighttime brought with it a storm. Our portable antennas were not the sturdiest but, luckily, all survived except the 15 meter antenna, and our contest operation continued through the night on the lower bands. The inverted Vs for 80 and 160 seemed to be performing well and overall our operators spent the night working pileups of 120 – 150 contacts per hour.

A new day dawned and we took a break to fix the 15 meter antenna that was knocked down in the storm. One of the 15 meter vertical's two elements was damaged so we raised the remaining element as a vertical dipole. It performed well mounted next to the ocean water.

Alejandro, CM8AKY (left), and Doug, CO8DM, work on the radial system.

Propagation returned with the sun and the high bands opened up. The weather was calm and we seemed to be in for good weather and good luck. As the middle of the contest arrived, we had over 3000 contacts and more than 200 multipliers.

Sunday, March 2

Ours was a modest station and because this was our first DX Phone contest, we didn't have previous results for comparison. Our goal was to achieve a good showing with respect to other Cuban stations in our class.

The high bands stayed open and we kept piling up contacts. Twenty meters was jumping until almost midnight. At that point, we decided to switch to 40 meters to improve our contact count on that band, but we found a problem. The tide seemed to affect the 40 meter antenna's resonant frequency. We went out in the dark to raise the antenna's radials off the beach. This brought the antenna's resonant frequency back to the center of 40 where it was supposed to be.

More Multipliers

For the first time we began receiving cluster spots, thanks to our friend Pavel, CO7WT, who installed a spider cluster in Camagüey City. His system receives spots via e-mail every 2 minutes, a unique method for obtaining spots. I installed a packet cluster system at my home location in Puerto Padre, about 10 miles from the contest station.

My cluster system uses *UiDxLink*, a program written by Roland, SM6EAT. It sent us spots on VHF at 1200 baud. This was very helpful because in La Herradura there is no Internet access, so packet radio was our only choice. The only glitch was that the telephone connection at my shack dropped out every 25 minutes and the system needed to redial. Once we had the cluster information, we were able to add more multipliers. At night, activity on the low bands increased while the higher bands continued to yield a steady stream of contacts.

As the contest came to a close, we had operated for the full 48 hours. After all our weeks of preparations, we found we had 6094 contacts and 328 multipliers for an unofficial score of 5,996,496 points. If that score was correct, it would put us in second place just behind the superb station PJ2T in Curaçao. We checked our log for errors and submitted it.

Doug, CO8DM, runs the pileup, which at times reached 150 contacts an hour.

Our official score was 5,862,672 points, with 6018 contacts and 328 multipliers. This put us in the number eight spot for the Multioperator Single Transmitter, High Power category. Not a bad showing for a first attempt. Operating the DX contest was a great time and we enjoyed the adventure and challenge of the event. Thanks to all the stations who contacted us and we hope to see you in our next contest.

All photos by Raul Verdecie, CO8ZZ, except where noted.

Douglas Ruz, CO8DM, passed his first Amateur Radio exam in September 1989 to become CM8DM. Currently he has first class license CO8DM. A year after being licensed, he built his own 40 meter double sideband rig, which he still uses. He has almost completed DXCC on 40 meters, mainly using phone.

Doug won Third Place World in the 1999 CQ World Wide CW contest and Fourth Place World in the 2000 ARRL International DX CW, both times operating 80 meter low power.

Doug was chosen to participate in the first multi-multi operation from Cuba; the T49C DXpedition of the SK0UX radio club in the 1997 CQ World Wide CW contest.

He is a member of the Las Tunas Contest Crew, T48K. The team has participated in many ARRL and CQ World Wide contests, mainly as a multi-single team with wire antennas and old radios operating from Punta de Corella, a beautiful beach near his home.

Doug has completed basic DXCC #37,409 and 50 MHz VUCC #1387, and is a member of the Cuba DX Group. He has more than 200 countries worked on HF and 88 worked on 6 meters. Doug can be reached at Jesus Menendez 216, Puerto Padre, LT 77210, Cuba, **co8dm@frcuba.co.cu**.

The T48K shack — you don't have to be pretty to make the top 10.

ARRL Board of Directors Meets in Hartford, Following Convention

ARRL Board lauds "unforgettable milestone," formalizes LoTW policy, and honors award recipients.

Reflecting the afterglow of the ARRL National Centennial Convention that had concluded a couple of days earlier, the ARRL Board of Directors commended and thanked the ARRL staff and volunteers for "their devotion and service, contributing to a truly memorable celebration of this unforgettable milestone in the life of the ARRL." The resolution, offered during the Board's July meeting in Hartford and adopted with applause, noted the "countless" hours staffers spent, in addition to their routine responsibilities, preparing for and running the convention. The Board also cited the essential role of "many dedicated volunteers" before, during and after the convention.

The Board dealt with a variety of matters during the two-day gathering on July 21 and 22, and bestowed several awards and honors. ARRL President Kay Craigie, N3KN, chaired the session.

Emergency Communications Role Reaffirmed

Citing the inspiring speech delivered by Federal Emergency Management Agency Administrator Craig Fugate, KK4INZ, at the National Centennial Convention banquet, the Board resolved to reaffirm its "commitment and desire to further improve and enhance Amateur Radio's participation and standing in emergency communications for the benefit of the nation's emergency response agencies and the American public."

At the convention, the ARRL and FEMA signed a *Memorandum of Agreement* that, the resolution said, would "strengthen FEMA's partnership with ARRL and build upon our work to expand emergency communications capabilities and the use of Amateur Radio in emergency management."

ARRL President Kay Craigie, N3KN, presided at the July 2014 Board meeting. [Harold Kramer, WJ1B, photo]

The resolution also cited the FCC's recognition of the value of the Amateur Radio Service. In an August 2012 document, "Uses and Capabilities of Amateur Radio Service Communications in Emergencies and Disaster Relief," the FCC summarized Amateur Radio's contribution by saying, "the emergency response and disaster communications communities all agree that Amateur Radio can be of great value in emergency response situations. Amateur radio carries with it a wide range of advantages that allow it to supplement other emergency communications activities during disasters. This has been demonstrated time and again in a wide variety of emergency and disaster situations."

Logbook of The World

The Board adopted an updated policy for the League's popular Logbook of the World (LoTW) service. The new statement largely formalizes long-standing and existing policies and procedures. To maintain LoTW's security, the policy

ARRL Rocky Mountain Division Director Brian Mileshosky, N5ZGT (left), and ARRL Southeastern Division Director Doug Rehman, K4AC. [Harold Kramer, WJ1B, photo]

states that in the event that a call sign certificate is shown to have been compromised, "all contacts submitted with that call sign certificate will be removed from LoTW, all confirmations generated by those contacts will be invalidated, and all award credit generated by those confirmations will be revoked." LoTW users who allow their certificates to be compromised or who "knowingly exploit" compromised certificates may lose the privilege of using LoTW and participating in ARRL awards programs.

"The integrity of LoTW must support the prestige of those awards that depend on it, such as DXCC," the policy states. "The goals of 'ease of enrollment' and 'ease of use' must be balanced against the requirement of maintaining an extremely high level of integrity."

Committee Referrals

The Board referred several matter to committees for study.

- The Programs and Services Committee (P&SC) is to closely examine the issue of remotely controlled stations, noting that these "pose both opportunities and challenges." The P&SC would "consider the possible advantages, disadvantages, and any potential ethical issues as they relate strictly to the DXCC program" and report its findings by the Board's January 2015 Annual Meeting.
- The Administration and Finance Committee is to study the establishment of a three-person Information Technology Strategic Planning Committee to examine existing IT op-

Board Honors

The Board elected Bruce J. Frahm, K0BJ, an Honorary Vice President. Frahm served a total of 20 years as Midwest Division Vice Director, Director, and ARRL Second Vice President. The Board cited his diligent service on Board committees as well as his leadership and "extraordinary generosity" as an ARRL Maxim Society member and his regular on-the-air activity, which included stints from some 30 countries, promoting international goodwill.

The Board granted the title of "ARRL Receptionist Emerita" to Penny Harts, N1NAG, who retired on July 31 following 46 years of service at ARRL Headquarters — the longest tenure of any current Headquarters staff member. The Board's resolution recounted that after joining the staff in 1968, "Penny quickly established herself as the friendly voice and face of the ARRL to countless callers and visitors to Newington." She also earned her Amateur Radio license — eventually upgrading to Amateur Extra class — became active in local radio club affairs, and served as an ARRL Volunteer Examiner at more than 100 exam sessions. She "capped her career by providing invaluable assistance at the ARRL National Centennial Convention," the Board said, and, over the years, has been "an inspiring friend to her colleagues" as well as to volunteers and Board members.

The Board extended its very best wishes to ARRL Chief Development Officer Mary M. Hobart, K1MMH, who also retired on July 31, after 13 years of "outstanding service, above and beyond the call to the members of the ARRL, present and future," the Board resolution said. Among her other accomplishments, Hobart was credited with developing the Second Century Campaign, "to insure the fiscal well being of the ARRL for years to come" and for being "directly responsible for raising millions of dollars in cash, endowments, and bequests" for the League.

Honorary Vice President, Bruce Frahm, K0BJ. [Rick Lindquist, WW1ME, photo]

Mary Hobart, K1MMH, and Penny Harts, N1NAG, at their retirement party at ARRL HQ.

erations and create a strategic plan that maximizes the IT services provided to ARRL members and staff now and in the future.

- The Executive Committee is to study the possibility of seeking limited RTTY/data privileges for Technician licensees on 80, 40, and 15 meters.

Other Business

In other business, the ARRL Board of Directors:

- voted, without offering specifics, to support "a significant increase in the resources directed to generating new amateurs, with particular emphasis on increasing diversity." The ARRL staff was directed to propose a course of action to meet that goal, with initial steps to be taken during formulation of the Board's 2015-16 Plan.
- voted to have ARRL staff work with the Programs & Services Committee to design and implement a web-based reporting system to gather information on activities performed by Field Organization volunteers. The first phase of the reporting system should be implemented during 2015.

Reports

- ARRL Chief Financial Officer Barry Shelley, N1VXY, reported that the first-half operating loss was a bit less than the budget plan allowed for. Cash flow for the year will be negative, he said, mainly due to the cost of upgrading the HVAC system in the older part of ARRL Headquarters.
- ARRL Chief Development Officer Mary Hobart, K1MMH, reported that Second Century Campaign pledges and gifts now total about $7.2 million toward the goal of $10 million. The Spectrum Defense Fund is ahead of its 2013 pace, she said.
- ARRL General Counsel Chris Imlay, W3KD, reported that a revised policy statement on mobile Amateur Radio operation is being readied for Executive Committee consideration. The policy will offer appropriate wording for distracted driving legislation aimed at avoiding unintended consequences for mobile operators.
- New England Division Director Tom Frenaye, K1KI, chairman of the Ethics & Elections Committee, reported that voter participation in division elections was below expectations in 2012 and 2013, the first years during which electronic voting was the principal means for casting ballots. The Board was told that steps would be taken to raise the visibility of the balloting process for the fall elections.

Awards

The Board named several award winners.

The 2014 Hiram Percy Maxim Award — the League's top youth honor — went to Padraig Lysandrou, KC9UUS, of Bloomington, Indiana. The recipient of a Goldfarb Scholarship, Lysandrou was cited for his demonstrated passion for HF DXing, his high school Amateur Radio club activity, his service as Indiana Assistant Section Manager for Youth Activities, and for actively sharing his love of Amateur Radio by being a presenter Dayton Hamvention and other venues. Lysandrou was the recipient of the *QST* Cover Plaque Award in May 2013 for his article "A Crazy Idea: DXpedition to Cyprus."

The 2014 ARRL Technical Innovation Award went to Warren C. Pratt, NR0V, of Santa Cruz, California. He was cited for his research leading to the development of *PureSignal*, "an adaptive baseband pre-distortion algorithm used to improve the linearity of amplifiers and reduce intermodulation distortion products emitted by software-defined transmitters."

The joint recipients of the 2014 Herb S. Brier Instructor of the Year Award were Brad Amacker, N5MZ, of Petal, Mississippi, and Bill Finnegan, NR8I, of Marion, Ohio. Amacker has taught at 16 Amateur Radio license instruction classes that resulted in some 100 students becoming Amateur Radio licensees, and he's been active in mentoring new licensees. Finnegan, who has taught 21 Amateur Radio license instruction classes in the past decade resulting in 60 new ham radio licensees, was cited for "his patience with students, especially those struggling with comprehension of more difficult radio theory."

The joint recipients of the 2013 Doug DeMaw, W1FB, Technical Excellence Award were Kai Siwiak, KE4PT, of Coral Springs, Florida, and Bruce Pontius, N0ADL, of Scottsdale, Arizona. Both were credited with "distinguished lifelong Amateur Radio careers, both on the air and in test and measurement respects." They were specifically cited for their December 2013 *QST* article, "How Much 'Punch' Can You Get from Different Modes?" The article characterized and quantified the typical performance of various analog and digital modes to shed light on their performance and limitations.

Welcome!

Northwestern Division Director Jim Pace, K7CEX, and Great Lakes Division Director Dale Williams, WA8EFK, attended their first ARRL Board meeting as directors. Delta Division Vice Director Ed Hudgens, WB4RHQ, Northwestern Division Vice Director Bonnie Altus, AB7ZQ, and Great Lakes Division Vice Director W. Thomas "Tom" Delaney, W8WTD, attended their first Board meeting ever. President Craigie welcomed Honorary ARRL Vice Presidents Fried Heyn, WA6WZO, and Jay Holladay, W6EJJ, and IARU Vice President Ole Garpestad, LA2RR, as guests.

Strays

National Wildlife Refuge Week

The KP1-5 Project wants to remind amateurs that this year's National Wildlife Refuge Week will be October 12 – 18, 2014. We encourage you to visit a refuge near you and operate a special event station from that refuge in conjunction with this year's event. More information on where and how to operate from one of our nation's National Wildlife Refuges can be found at **http://kp1-5.com/new/nwrweek.htm**. Please e-mail information about your operation to the KP1-5 Project (**kp1-5project@att.net**) so it can be added to the website. Contact Mike Thomas, NA5U, at **na5u@arrl.net** with any questions.

I Would Like to Get in Touch With...

Anyone who has a copy of a manual or schematic for the Regency HR-220 transceiver. Contact Mac Campbell, K9KZX, at **k9zkxmac@att.net**.

ARRL's Second Century Has Begun!

With the help of thousands of members and friends, the ARRL in July bade farewell to its first 100 years during its National Centennial Convention, and hailed the start of its second century.

Rick Lindquist, WW1ME

The ARRL's National Centennial Convention, held at the Connecticut Convention Center in Hartford on July 17 – 19, was highlighted by the signing of a Memorandum of Agreement between the Federal Emergency Management Agency (FEMA) and the ARRL; remarks by Nobel Laureate Joe Taylor, K1JT, who revealed what his crystal ball has foretold about the next century of ham radio; the official dedication of the ARRL Centennial Terrace at League Headquarters, and the enthusiasm of some 3300 conventioneers. The event also provided some impetus for legislation, H.R. 4969, that could change the landscape for those affected by private land-use restrictions on antennas.

Visitors queued up early on the convention's opening day. [LJB Special Photography photo]

ARRL President Kay Craigie, N3KN, called the convention "a truly memorable and meaningful celebration of the centennial, in the city where it all began 100 years ago."

Visitors arrived from all 50 US states and some 3 dozen countries, including official delegations from Japan, England, Germany, Australia, and elsewhere.

We offer a glimpse of the convention activities and personalities as they welcomed ARRL's next 100 years of serving and supporting Amateur Radio.

ARRL Second Century Campaign major donor and committee member Mike Valentine, W8MM (left), and SCC Chairman David Brandenburg, K5RQ, shake hands on the just-dedicated ARRL Centennial Terrace. Brandenburg said he stepped up to chair the committee, because he wanted to help those coming into the hobby in the same way he was helped when he got into Amateur Radio at age 14. "For everybody here," he told the dedication audience, "ham radio is a big deal to us, and it's very important to us that we keep it going." [LJB Special Photography photo]

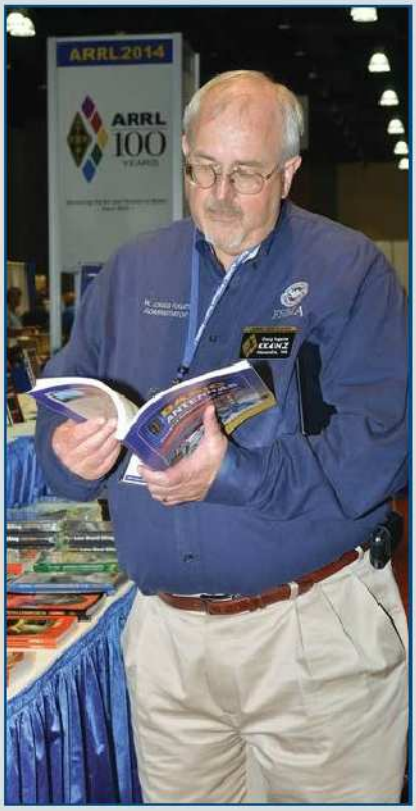
And we're off! (L-R) ARRL New England Vice Director and Convention Co-Chair Mike Raisbeck, K1TWF, ARRL President Kay Craigie, N3KN, and Convention Co-Chair and ARRL COO Harold Kramer, WJ1B, officially open the ARRL National Centennial Convention.

More than 100 vendors and exhibitors set up in the ARRL National Centennial Convention Exhibition Hall. [LJB Special Photography photo]

Yamini Sadineni, VU2YAM, journeyed from Hyderabad, India, to join the ARRL's Centennial celebration. She was on the TI9KK DXpedition team and has been active in responding to weather emergencies. [LJB Special Photography photo]

ARRL Rocky Mountain Division Director Brian Mileshosky, N5ZGT, was among the Convention's forum presenters. [LJB Special Photography photo]

Guest of honor and featured banquet speaker FEMA Administrator Craig Fugate, KK4INZ, perhaps thinking about his newly gained General privileges, checks out the ARRL's *Basic Antennas* during his convention visit. At the Friday evening banquet, Fugate told some 900 guests, "Radio is one of the most resilient communications technologies we have. When the power is out and telecommunications are down, the Amateur Radio community can serve as a vital resource in support of emergency responders and survivors during a disaster." [LJB Special Photography photo]



Devlin Murray, KC2PIX, was a presenter at one of the convention's two youth forums. [LJB Special Photography photo]

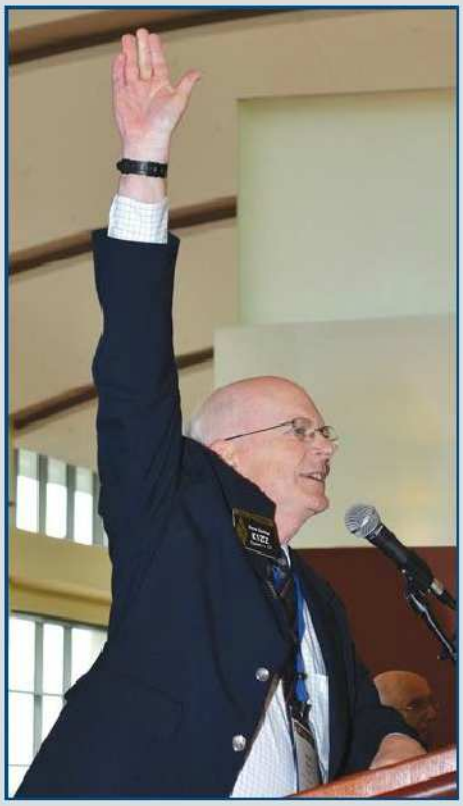
An estimated 900 guests were on hand as ARRL First Vice President Rick Roderick, K5UR, addressed an opening-day lunch at the Connecticut Convention Center. [LJB Special Photography photo]

FEMA Administrator Craig Fugate, KK4INZ, and ARRL President Kay Craigie, N3KN, join at the convention in signing a Memorandum of Agreement between FEMA and the ARRL. [Rick Lindquist, WW1ME, photo]

His "Get Behind HR 4969" sticker on display, ARRL General Counsel Chris Imlay, W3KD, explains to a packed forum what the League-initiated legislation would and would not do. [Rick Lindquist, WW1ME, photo]

Outside the Convention Center, satellite enthusiast Patrick Stoddard, WD9EWK, successfully makes contact with NASA Astronaut Reid Wiseman, KF5LKT, at NA1SS on board the International Space Station. [Rick Lindquist, WW1ME, photo]

"My own boyhood fascination with the art and science of radio got me into this hobby," Nobel Laureate Joe Taylor, K1JT, told a rapt convention audience, "and, from there, it launched me on a path leading to advance degrees in physics, to teaching university physics, to making fundamental research contributions to mankind's knowledge of the laws of nature." He predicted continued digitalization of Amateur Radio electronics. [Rick Lindquist, WW1ME, photo]



An exuberant ARRL CEO David Sumner, K1ZZ, addresses a convention gathering. Later, at the closing ceremony, Sumner said, "With this moment, we say good-bye to ARRL's first century. With fondness [and] great memories, you're all part of that history. And now, we're all part of the ARRL's second century." [LJB Special Photography photo]

Young Lily Lemken of New Jersey may become part of Amateur Radio's next century. "Our job now is to do our part to make sure that Amateur Radio and the ARRL are strong for them, when it's their turn to celebrate the next milestone in the history of our League," ARRL President Kay Craigie, N3KN, said of the stroller set. Lily is the daughter of Chuck, KC2SST, and Monica Lemken. [LJB Special Photography photo]

Well-dressed men: The Radio Society of Great Britain's Mark Allgar, M1MPA, and Chris Danby, G0DWV, creatively display their national colors for the convention banquet. [Bob Inderbitzen, NQ1R, photo]

ARRL's Role in Canada

Radio amateurs on both sides of our northern border have a shared history.

David Sumner, K1ZZ

It is often observed that radio waves do not respect international borders, but in the early days of Amateur Radio it wasn't all that easy to send a message between the United States and Canada. Communication between Canadian and American amateur stations predated the founding of the ARRL in 1914, but it was not until well after World War I that regular relay routes were established within Canada and to points south.

The war itself was the principal cause of the delay. Britain's declaration of war in August 1914 put amateur stations in Canada off the air. The ban was lifted on May 1, 1919, five months ahead of the United States.

The Operating Department in the March 1920 issue of *QST* carried the first monthly report of the Ontario Division which was joined the following month by the St Lawrence Division. The Division Managers were located in Toronto and Montreal, respectively.

By the August 1921 issue of *QST* the Operating Department found it necessary to reassure Canadian amateurs that the ARRL had no desire to stand in the way of progress toward a Canadian organization. Noting that it had "expanded to take in Canadian work in cooperation with our own at the earnest request of some well-informed Canadian amateurs," the column observed: "Whenever it is apparent that Canada needs a separate organization and a promising framework and supporting stations for that organization come into existence, the A.R.R.L. will be ready to recognize it and co-operate fully."

In the meantime the development of a Canadian organizational structure continued. In 1923 a Canadian General Manager was placed in charge of a field organization structure more or less parallel to that of the United States and also represented Canada on the ARRL Board of Directors. A. H. Keith Russell, c9AL served in that post until 1930 and was succeeded by Alex Reid, VE2BE, who went on to represent Canada on the ARRL Board for the next 30 years.

The Canadian Division Director participated fully in the work of the ARRL Board

A. H. Keith Russell, VE9AL

A.H. Keith Russell was a prominent figure in the early years of Amateur Radio in Canada. March 1923 *QST* reported that he had become interested in radio as a teenager in 1908 and used the call sign XRE. During World War I he served in the Royal Naval Air Service. After returning to Toronto he became a barrister and solicitor in the spring of 1920 and Manager of the ARRL Ontario Division in November of that year while also serving as President of the Wireless Association of Ontario, an ARRL affiliate. He operated under the call signs 9AL and 3AL before country identifiers were added, and VE9AL later on.

In 1923 Russell was named Canadian General Manager, a position that he held until the end of 1929 when he decided not to stand for re-election. Before and during the International Radiotelegraph Conference held in Washington in 1927 he rallied Canadian support that proved to be essential to an acceptable outcome for Amateur Radio. Russell went on to organize Canadian Flying Clubs and re-emerged on the pages of *QST* in September 1943 as Group Captain Russell, director of technical training of the Royal Canadian Air Force.

Noel B. Eaton, VE3CJ

Noel B. Eaton, VE3CJ, was elected Vice Director of the Canadian Division and took office in January 1960. Attending his first Board Meeting in May of that year Noel found himself elevated to the position of Director when the Board elected long-serving Canadian Director Alex Reid, VE2BE, as a Vice President.

Noel was well prepared for the task. Recently retired from running his family business, The Eaton Knitting Company, Ltd. and a former Wing Commander in the telecommunications branch of the Royal Canadian Air Force, he was first licensed in 1937 and was well known to active amateurs throughout the world as a result of operating frequently as VP5BP from the Cayman Islands. In 1962 Noel was elected to serve on the ARRL Executive Committee by his fellow ARRL Directors and in 1964 he helped organize IARU Region 2 and became its first Treasurer.

In 1974 the ARRL Board elected Noel as a Vice President and nominated him to serve as the first President of the International Amateur Radio Union from outside of the United States. This was an important step in the implementation of a plan to mount the most effective possible campaign on behalf of Amateur Radio at the 1979 World Administrative Radio Conference. Noel led the successful effort to bring Amateur Radio's goals into global alignment and to assemble the team, mostly of volunteers, that defended our allocations and gained new bands at 10, 18, and 24 MHz.

Before retiring from ARRL and IARU involvement in 1982, Noel set the wheels in motion for a major revision of the IARU Constitution to recognize the growing importance of the IARU regional organizations. The new Constitution was adopted in 1984 and with minor revision has guided the IARU ever since. He died on September 28, 1996.

except with regard to FCC rulemaking proceedings. In addition he had to ensure that Amateur Radio's interests were properly looked after in Ottawa. While Canadians were fully integrated into the ARRL field organization and operating activities and a Canadian Counsel could be called upon for legal matters, the services provided to members from Newington tended to be geared toward the United States despite our best efforts to be binational in word and deed. It is worth noting that two ARRL National Conventions (in reality, binational conventions) were held in Canada: June 30 – July 2, 1967 in Montreal during the Centennial celebration of Canadian Confederation and a decade later, June 3 – 5, 1977 in Toronto.

An Independent Canadian Association

As Amateur Radio grew it was inevitable that support would develop within Canada for an independent national association. In 1967 the Canadian Amateur Radio Federation was formed and gained some measure of success. Some Canadian amateurs viewed CARF as a desirable alternative to the ARRL, others regarded it as an unnecessary duplication of effort, still others saw it as a useful complement, and – just as in the United States – some simply didn't recognize the need for a national organization to safeguard their interests.

In July 1979 the ARRL Board authorized an application for incorporation of the Canadian Radio Relay League, Inc. in Canada. CRRL thus became a self-governing and self-administering division of the ARRL. This led in turn, after several years of study and preparation, to a decision at the July 1987 ARRL Board meeting that the time had come for CRRL to become a completely separate entity. On January 1, 1988 amendments to the ARRL Articles of Association and Bylaws took effect that set CRRL on its own course. Amateurs in Canada continued to be eligible for ARRL membership, to receive *QST*, and to participate in ARRL contests and awards. However, they no longer would elect ARRL officials and would look to CRRL for representation.

In 1993 CRRL and CARF merged to form Radio Amateurs of/du Canada. While it took some time for the cultures of the two organizations to be melded together, today RAC stands tall as Canada's National Amateur Radio Society with the slogan "We're ALL about Amateur Radio!"

The ARRL and RAC continue to cooperate closely for the betterment of Amateur Radio on both sides of the border and internationally. May it always be so.

David Sumner, K1ZZ, is the Chief Executive Officer of the ARRL. You can contact him at **k1zz@arrl.org**.

Canada in the IARU

ARRL Maritime Division Manager Major Bill Borrett, c1DD, represented Canada at the organizational meeting of the International Amateur Radio Union held in Paris in April 1925. The initial structure of the IARU was based on individual membership and called for a Section of the IARU to be organized in each country with at least 25 members. The Canadian Section was one of the first four to qualify with ARRL Canadian General Manager Russell at its head.

IARU Region 2 was established in 1964. Canadian Division Director Noel B. Eaton, VE3CJ, was elected Treasurer, a position that he held until he was elected IARU President in 1974. Noel led the IARU team at the all-important World Administrative Radio Conference in 1979.

Canada's leadership in the IARU has continued right up to the present day. Tim Ellam, VE6SH, was elected IARU Vice President in 2004 and President in 2009, and is now serving his second 5-year term as President. Other Canadian amateurs have served, and continue to serve, as IARU representatives at ITU meetings and conferences and on the IARU Region 2 Executive Committee.

ARRL Canadian Directors

A. H. Keith Russell, c9AL, 1923-1930
Alex Reid, VE2BE, 1930-1960
Noel B. Eaton, VE3CJ, 1960-1974
George Spencer, VE2MS/VE4IM, 1974-1976
Ron J. Hesler, VE1SH, 1976-1980
Mitchell Powell, VE3OT, 1980-1982
Thomas B. J. Atkins, VE3CDM, 1982-1988

Fall 2014 Director and Vice Director Elections

Every year, elections of ARRL Directors and Vice Directors are held in five of the 15 ARRL Divisions for 3-year terms beginning at noon on January 1 of the following year. A solicitation of nominations appears in the July and August issues of *QST*.

The following candidates have been nominated this year and have been found to be eligible:

Atlantic Division for Director:
Tom Abernethy, W3TOM
Phil Theis, K3TUF

Atlantic Division for Vice Director:
Scott Bauer, W2LC
Bob Famiglio, K3RF
John Mueller, K2BT

Dakota Division for Director:
Greg Widin, K0GW

Dakota Division for Vice Director:
Kent Olson, KA0LDG

Delta Division for Director:
David Norris, K5UZ

Delta Division for Vice Director:
Ed Hudgens, WB4RHQ

Great Lakes Division for Director:
Dale Williams, WA8EFK

Great Lakes Division for Vice Director:
Tom Delaney, W8WTD
Steve Putman, N8ZR

Midwest Division for Director:
Rod Blocksome, K0DAS

For the offices for which there was only one candidate, that candidate has been declared elected. Balloting will take place in the Atlantic Division for Director and Vice Director and in the Great Lakes Division for Vice Director.

There was no nominee for Midwest Division Vice Director. The position is currently held by Director-elect Blocksome. When the position becomes vacant it will be filled by appointment by ARRL President Kay Craigie, N3KN.

Rick Lindquist, WW1ME, ww1me@arrl.org

ARRL National Centennial Convention Honors the Past, Bullish on the Future

Thousands gather in the city where the League was founded.

The ARRL National Centennial Convention is now a part of Amateur Radio history, and the League's second century has arrived! The 3-day event at the Connecticut Convention Center in Hartford went smoothly, ARRL President Kay Craigie, N3KN, observed, pointing out that many of the estimated 3300 conventioneers remained for the Saturday closing ceremony — and beyond. "Even as late as Sunday, people were shaking my hand at the convention hotel and saying how much they enjoyed the convention," Craigie said.

On hand were all but one of the living past ARRL presidents: Harry Dannals, W2HD (1972 – 1982); Larry Price, W4RA (1984 – 1992); Rod Stafford, W6ROD (1995 – 2000), and Joel Harrison, W5ZN (2006 – 2010). Jim Haynie, W5JBP (2000 – 2005), was unable to attend. Craigie hosted a Presidents Breakfast to honor them and Richard Crouch, N6RC, grandson of ARRL President George Bailey W1KH/W2KH (1940 – 1952).

A convention highlight was the signing of a *Memorandum of Agreement* (*MOA*) between the ARRL and the Federal Emergency Management Agency (FEMA), aimed at enhancing cooperation between the League and FEMA in disaster communication. FEMA Administrator Craig Fugate, KK4INZ, and President Craigie inked the pact on July 18.

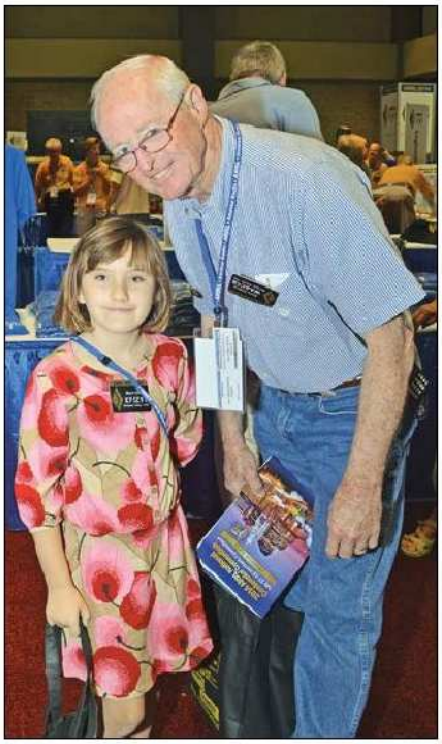
"This MOA will strengthen FEMA's partnership with ARRL and build upon our work to expand emergency communications capabilities and the use of Amateur Radio in emergency management," Fugate said at the signing, calling Amateur Radio "resilient." The new agreement will allow FEMA and ARRL to work together to provide resources, services and personnel, as available, in order to strengthen capacity in areas of emergency communications, mass care and emergency assistance, disaster preparedness, response and recovery, while also raising public awareness about the use of Amateur Radio as a public safety resource.

"We look forward to working with FEMA to further develop opportunities for trained, equipped and prepared Amateur Radio operators to serve the public interest whenever and wherever disasters affect our country and its communities," Craigie said.

The convention also energized efforts to line up co-sponsors for "The Amateur Radio Parity Act of 2014" — H.R. 4969 — which calls on the FCC to apply the "reasonable accommodation" three-part test of the PRB-1 federal pre-emption policy to private land-use restrictions regarding antennas. The bill's primary sponsor is Rep Adam Kinzinger (R-IL). It received initial co-sponsorship from Rep Joe Courtney (D-CT), who visited the convention on July 19 to speak with League officials and visitors. PRB-1 now only applies to state and municipal land-use ordinances, and the FCC has indicated that it will not act to provide the same legal protections from private land-use agreements — often called covenants, conditions, and restrictions (or CC&Rs) — without direction from Congress.

The effort at the convention to entice visitors to sign letters to lawmakers yielded some 1400 constituent letters, which were hand-delivered to members of Congress.

ARRL General Counsel Chris Imlay, W3KD, told an H.R. 4969 forum that the Commission's Over-the-Air Receiving Device (OTARD) rules already preempt private land-use agreements to permit the installation of television antennas and satellite dishes. Making the leap to reasonably accommodating outdoor Amateur Radio antennas is within the FCC's regulatory scope, he suggested, given the established strong federal interest in effective Amateur Radio



Conventioneers Marit Clifford, KF5ZVY, with her dad Dave Clifford, WA6CCB (right), both of New Mexico. [LJB Special Photography, photo]

At ARRL's "Discovery Station" in the Convention's Exhibit hall, presenter Larry Kendall, K6NDL, demonstrates basic electricity and electronic principles for Shannon Fitzgerald. [Debra Johnson, K1DMJ, photo]

(L-R) National Hurricane Center Amateur Radio Coordinator John McHugh, K4AG; FEMA Administrator Craig Fugate, KK4INZ, and NHC Assistant Amateur Radio Coordinator Julio Ripoll, WD4R. [Rick Lindquist, WW1ME, photo]

All smiles. (L-R) Otis Vicens, NP4G; John Bigley, N7UR; Rafael Velazquez, NP4VO; Carlos Colon, WP4U, and Carlos Osorio, WP4N. [Rick Lindquist, WW1ME, photo]

communication. The goal, he explained, would be to compel homeowner's associations to negotiate "reasonable accommodation" with an affected radio amateur. "We need to get a lot of co-sponsors for this bill," Imlay stressed. (The League's H.R. 4969 web page, **www.arrl.org/hr-4969**, contains more information and resources.)

In a keynote convention address, Nobel Laureate Joe Taylor, K1JT, told a packed auditorium that Amateur Radio will continue to thrive and serve the public interest. While the primary topic at his standing-room-only presentation on July 19 was "DXing with Weak Signals and Beyond," Taylor — who detailed the development of his *WSJT* suite of "weak-signal" DSP software — also took time to prognosticate.

In the future, he said, digital technology will become the rule, and good engineering will be a combination of hardware and software. Beyond that, he said, science, technology, and Amateur Radio will continue to benefit from a healthy cross-fertilization between amateurs and professionals.

Craigie said she saw some youngsters at the convention who likely will be around for the League's 150th anniversary in 2064. "Our job now is to do our part to make sure that Amateur Radio and the ARRL are strong for them, when it's their turn to celebrate the next milestone in the history of our League," she said.

ARRL Dedicates Centennial Terrace to Honor Major Donors

The new Centennial Terrace, dedicated on July 17 at a ribbon-cutting and reception held in conjunction with the ARRL National Centennial Convention, now graces the area to the right of the ARRL Headquarters main entrance. It complements the terrace of memorial bricks and benches on the opposite side. The Centennial Terrace features an impressive central granite pillar bearing the visage of ARRL Co-Founder Hiram Percy Maxim, W1AW, and the names of the ARRL Second Century Campaign (SCC) Committee, chaired by David Brandenburg, K5RQ. Flanking the central pillar are two granite panels engraved with the names of major contributors to the Second Century Campaign.

ARRL President Kay Craigie, N3KN, told a dedication gathering of about 250 that contributing to the Second Century Campaign "is not so much a donation to the ARRL as an investment in the future of Amateur Radio."

"We are the conduit. We are the means. Amateur Radio is the end," she added in thanking all contributors.

The permanent installation is a means to "make sure that future generations remember your generosity," ARRL CEO David Sumner, K1ZZ, said. ARRL Chief Development Officer Mary Hobart, K1MMH, hosted the gathering, which Sumner called "bittersweet," since Hobart was retiring at the end of July.

Sumner said the Centennial Terrace dedication and the convention are "a part of the history of Amateur Radio," which, he continued, would have ended long ago had it not been for "the vision of the founders of this organization."

ARRL Chief Development Officer Mary Hobart, K1MMH (left), chats with Second Century Campaign Chairman David Brandenburg, K5RQ, on the Centennial Terrace. [Rick Lindquist, WW1ME, photo]

"The only way we have to repay that debt is to pay it forward to the future to make sure that Amateur Radio and the ARRL as the defender and supporter of Amateur Radio, are here long after we're gone." Donors to the campaign "now are a part of the ARRL's history and of Amateur Radio's history," he concluded.

FCC News

FCC Proposes Substantial Fines for Two Radio Amateurs Alleging Deliberate Interference, Failure to ID

The FCC Enforcement Bureau came down hard on two radio amateurs in July, proposing substantial fines for alleged deliberate interference with other Amateur Radio communications — in one case by transmitting music and animal noises — and failure to properly identify. In similar *Notices of Apparent Liability for Forfeiture* (*NALs*) released July 22, the Commission proposed fining Michael Guernsey, KZ8O (ex-ND8V), of Parchment, Michigan, $22,000, and Brian Crow, K3VR, of North Huntingdon, Pennsylvania, $11,500. In both cases, the FCC said the evidence indicated that the transmissions at issue were aimed at interfering with other radio amateurs with whom each "has had a long-standing and well-documented dispute" that had spilled out onto the air.

The FCC in both instances responded last March to "several complaints of intentional interference" on 14.313 MHz. Commission agents used radio direction-finding techniques to pin down the source of the transmissions. According to the *NAL* issued to Guernsey, the FCC agents monitored transmissions from his station for approximately 40 minutes on March 7, 2014, "and heard him transmit a pre-recorded song and various animal noises on the frequency."

According to the *NAL issued to Crow*, FCC agents monitored transmissions from his station for approximately 3 hours on the morning of March 14, 2014, and heard him transmit slow-scan television (SSTV) signals and "a pre-recorded voice transmission of another amateur station on the frequency."

"These transmissions prevented other amateur licensees from communicating over the frequency," the *NALs* said, adding that neither Guernsey or Crow transmitted their assigned call signs while the agents were listening.

The FCC agents later the same day visited Crow's residence and asked to inspect his station, which they confirmed was capable of operating on 14.313 MHz. Crow denied operating his station that morning, however, and claimed that he was not at home when the interfering transmissions occurred.

The Enforcement Bureau has warned both Guernsey and Crow in the past regarding interference to other Amateur Radio operators. In Crow's case, the FCC said the fact that he subsequently interfered with other amateur operators "demonstrates a deliberate disregard for the Commission's authority," and warranted an upward adjustment of $3500 to his proposed base forfeiture. Guernsey first came to the Enforcement Bureau's attention in the late 1990s and, the FCC said in the *NAL*, "has a history of causing interference to the communications of other Amateur Radio operators and has been warned repeatedly in writing." Guernsey's lengthy history with the Commission warranted an upward adjustment of $14,000 to his proposed base forfeiture.

The Commission gave both licensees 30 days to pay their fines or to file written statements "seeking reduction or cancellation of the proposed forfeiture."

The *NALs* to Guernsey and Crow came in the wake of a June 5 *Notice of Violation* alleging that Thomas Ryan Price, W7WL, of Sweet Home, Oregon, caused malicious interference to other radio communications on 3908 kHz, transmitted music on the same frequency, and failed to properly identify.verbal and written on-scene warnings of the consequences of refusing to allow an inspection of a radio station.

Section Manager Nomination Notice

To all ARRL members in Arizona, Arkansas, Iowa, Kentucky, Mississippi, Montana, North Texas, Orange and Wyoming. You are hereby solicited for nominating petitions pursuant to an election for Section Manager (SM). Incumbents are listed on page 16 of this issue.

To be valid, a petition must contain the signatures of five or more full ARRL members residing in the sections concerned. It is advisable to have a few more than five signatures on each petition. A sample nomination form is available on the ARRL website at **www.arrl.org/section-terms-nomination-information**. Nominating petitions may be made by facsimile or electronic transmission of images, provided that upon request by the Membership and Volunteer Programs Manager, the original documents are received by the Manager within seven days of the request.

We suggest the following format:

(Place and Date)

Membership and Volunteer Programs 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 two-year term of office.

(Signature____Call Sign____City___ZIP____)

Any candidate for the office of Section Manager must be a resident of the Section, an Amateur Radio licensee of Technician class or higher and a full member of the League for a continuous term of at least two years immediately preceding receipt of a nominating petition. Petitions must be received at Headquarters by 4 PM Eastern Time on December 5, 2014. If more than one member is nominated in a single section, ballots will be mailed from Headquarters on or before January 2, 2015, to full members of record as December 5, 2014, which is the closing date for nominations. Returns will be counted February 24, 2015. Section Managers elected as a result of the above procedure will take office April 1, 2015.

If only one valid petition is received from a section, that nominee shall be declared elected without opposition for a two-year term beginning April 1, 2015. If no petitions are received from a section by the specified closing date, such section will be resolicited in the April 2015 *QST*. A Section Manager elected through the resolicitation will serve a term of 18 months. Vacancies in any Section Manager's office between elections are filled by the Membership and Volunteer Programs Manager. — *David Patton, NN1N, Membership and Volunteer Programs Manager*

Rick Palm, K1CE, k1ce@arrl.org

National Public Safety Telecommunications Council

The ARRL joins with government and industry to improve public safety communications.

This month, Ralph Haller, N4RH, Chairman of the National Public Safety Telecommunications Council, gives us an overview of the council's activities and how Amateur Radio operators can help set public safety communications policy.

Amateur Radio has long been a service that has launched people onto a career path. An early interest in radio has prompted many to pursue careers in technology, engineering, physics, and, more recently, software and computer sciences. These careers have also been the catalyst to bring many into Amateur Radio. When profession and hobby meet, both benefit. Amateur Radio provides a means to experiment, operate, design, network, and give back to the community in a way not provided by other hobbies.

Over the last couple of decades, the fields of public safety, emergency management, and disaster response have brought many into the Amateur Radio service out of a concern for community safety and resilience in times of emergency and disaster. These professionals have brought to the Amateur Radio service new ideas in training and exercise, network design, and resource management. Amateur Radio programs such as ARES®, MARS, SATERN, and SKYWARN have allowed radio amateurs to learn the principles of emergency and disaster communications while honing their radio operating skills.

The ARRL® has for many years maintained relationships with organizations dedicated to public safety, emergency communications, and disaster response. The ARRL is a member of the Governing Board of National Public Safety Telecommunications Council (NPSTC). This relationship allows the ARRL to represent the Amateur Radio service to the public safety communications community. These two communities have large stakes in technology, spectrum, and protection of life and property.

NPSTC — Goals and Organization

NPSTC provides a forum for all phases of the public safety community to come together and develop policies and procedures to enhance public safety communications. NPSTC has 15 Governing Board members.[1] All of these members are associations involved with different segments of public safety. These organizations direct the work efforts of NPSTC and approve all final policy recommendations. NPSTC also has three Associate Organizations and four Affiliate Organizations.[2] The organizations in these categories cannot vote, but can bring their expertise to NPSTC decisions, often positively affecting the outcome of difficult issues. Finally, NPSTC has nine Liaison Organizations. These are generally federal agencies involved in public safety.[3] These agencies bring the perspective of the federal government to NPSTC deliberations. The Department of Homeland Security also provides a support office for NPSTC. The above organizations, working together, allow for unified public safety positions on important communications issues. NPSTC also welcomes participation of any interested party. Governing Board meetings are open to the public, as are all of the working groups.

NPSTC's goals are:

- Create a vision for the future of public safety communications
- Develop common policy perspectives through collaborative forums
- Educate governmental bodies concerning public safety communications issues
- Influence future technologies and develop public safety requirements where necessary
- Advocate for the interests of public safety
- Facilitate coordination, dispute resolution, and the exchange of effective practices, tools, and information.

NPSTC is divided into three major committees: the Interoperability Committee, the Spectrum Management Committee, and the Technology Committee. Working groups are formed under the guidance of the appropriate committee to work on specific issues. NPSTC has over 1500 active volunteers involved with these groups, and over 3000 individuals receive NPSTC reports, notices, and information briefs.

Interoperability Committee

The Interoperability Committee works on issues related to improving the ability of different public safety organizations to communicate. For example, NPSTC recently developed a common channel naming plan that assures all public safety radios will identify interoperability channels in the same way. Before this plan, radios from different organizations might be programmed to the same channels but, because they were named differently in each radio, it was difficult to know if common channels existed. Now, every interoperability channel has a unique name that is pro-

[1]Notes appear on page 86.

grammed into each public safety radio. Different organizations responding to emergencies can talk to each other by simply tuning each radio to a known interoperability channel.

The Interoperability Committee has also worked to improve interoperability along the Canadian and Mexican borders. Through the work of the Border Issues Working Group, emergency responders can now operate their radios on either side of the border without further authority and soon will be able to have fixed infrastructure across the border. The developments in this working group will significantly enhance the ability of first responders on each side of the border to communicate during major border events.

Spectrum Management Committee

The Spectrum Management Committee deals with issues related to spectrum allocations and use. One major issue recently tackled was revision of the rules for use of the 4.9 GHz band. This is a band dedicated for public safety use for Wi-Fi and fixed links. The band lacked a comprehensive plan for its use and only a very limited database of licensed stations was maintained by the FCC. NPSTC developed a national band plan that included all existing uses plus a dedicated channel to transmit video from helicopters and robots. NPSTC also proposed that critical infrastructure be allowed to share the band (for example, power utilities). NPSTC's plan is now at the FCC, which is considering rule changes for the band.

NPSTC developed a national band plan that included all existing uses plus a dedicated channel to transmit video from helicopters and robots.

This committee was also very active in the recent FCC narrowbanding mandate to reduce the authorized bandwidth from 25 kHz to 12.5 kHz in the VHF and UHF bands. NPSTC provided education to communities about the FCC requirements and ways to meet those requirements. Due in large part to NPSTC's efforts, nearly all public safety agencies were compliant with the narrowbanding rule by the required date. This committee also has primary responsibility for preparing documents to be filed with the FCC.

Technology Committee

The Technology Committee reviews technical requirements for emerging radio technologies and assures that the needs of public safety are met. The committee has been and is very active in developing requirements for deployment of the new nationwide public safety broadband system. While the system will be built by FirstNet, an organization under the Department of Commerce, FirstNet is relying heavily on input from NPSTC for design criteria for the network. NPSTC is providing input on reliability requirements, site hardening, coverage areas, voice over Long Term Evolution (LTE), and several other launch requirements for the network. To date, 487 requirements have been identified.

NPSTC would welcome more members of the amateur community to become involved.

The Technology Committee also recently finished work on a tool to help the end user community to program radios from different manufacturers to work together (the Programming And Management "PAM" tool). Every manufacturer has its own programming methods, so making radios work together presented a significant challenge. The tool provides a spreadsheet that identifies each programming element and what it is called by each of the participating manufacturers. With the tool, a radio programmer has the ability to identify common elements desired in each radio and program them regardless of the brand of radio.

Public Resources

NPSTC also maintains a treasure chest of documents relating to public safety. These documents are stored on the NPSTC server and are available to any interested party. The NPSTC website at **www.npstc.org** provides a starting point to research nearly any public safety communications issue.

The above examples are but a few of the issues tackled by NPSTC. Each committee and working group relies on volunteers to donate their time, talents, and knowledge to solve problems and develop recommendations. The Amateur Radio community is rich in talent and experience. NPSTC would welcome more members of the amateur community to become involved. Most of the committee and working group meetings are by conference call, so travel is generally not required. Anyone desiring to participate can review current issues under consideration on the website and fill out a volunteer form online. Participating in NPSTC provides an opportunity to network with others, keep current with public safety communications activities, and contribute to the advancement of public safety communications.

[1]American Association of State Highway and Transportation Officials (AASHTO), American Radio Relay League (ARRL), Association of Fish and Wildlife Agencies (AFWA), Association of Public-Safety Communications Officials (APCO), Forestry Conservation Communications Association (FCCA), International Association of Chiefs of Police (IACP), International Association of Emergency Managers (IAEM), International Association of Fire Chiefs (IAFC), International Municipal Signal Association (IMSA), National Association of State Chief Information Officers (NASCIO), National Association of State Emergency Medical Services Officials (NASEMSO), National Association of State Foresters (NASF), National Association of State Technology Directors (NASTD), National Emergency Number Association (NENA), and National Sheriffs' Association (NSA).

[2]National Council of Statewide Interoperability Coordinators (NCSWIC), Canadian Interoperability Technology Interest Group (CITIG), Utilities Telecommunications Council (UTC), Alliance for Telecommunications Industry Solutions (ATIS), Telecommunications Industry Association (TIA), Open Mobile Alliance (OMA), and Critical Communications Association (TCCA).

[3]Federal Communications Commission (FCC), Federal Emergency Management Agency (FEMA), National Telecommunications and Information Agency (NTIA), Office of Emergency Communications (DHS-OEC), Office for Interoperability and Compatibility (DHS-OIC), Public Safety Communications Europe (PSCE), SAFECOM Program, US Department of the Interior (US DOI), and US Department of Justice (US DOJ). (OEC and OIC are part of the Department of Homeland Security [DHS]).

Ralph Haller, N4RH, an ARRL member, has been licensed for over 50 years and currently holds an Amateur Extra class license. He has 40 years of experience in the communications industry, 25 with the Federal Communications Commission (FCC). Ralph was chief of the FCC's Private Radio Bureau for several years. He wrote the charter for the Public Safety Wireless Advisory Committee (PSWAC) and initiated the meetings. Ralph's areas of expertise include broadcasting, cable television, human radio frequency exposure, and land mobile communications systems. He is an electronics engineer and a Fellow in the Radio Club of America. He can be reached at 122 Baltimore St, Gettysburg, PA 17325, **ed@fcca-usa.org**.

Contest Corral — October 2014

Check for updates and a downloadable PDF version online at www.arrl.org/contests.

Refer to the contest websites for full rules, scoring information, operating periods or time limits, and log submission information.

Start - Finish Date-Time				Bands HF / VHF+	Contest Title	Mode	Exchange	Sponsor's Website
1	1300Z	2	See website	1.8-28 / -	CWOps Weekly Mini-CWT Tests	CW	Name and member number or S/P/C	www.cwops.org/cwt.html
3	0230Z	3	0300Z	1.8-14 / -	NS Weekly Sprint	CW	Serial, name, and S/P/C	www.ncccsprint.com
3	1400Z	5	0200Z	1.8-28 / -	DX/NA YLRL Anniversary Party	Ph CW Dig	Serial, RS(T), and S/P/C	www.ylrl.org
4	0000Z	4	2400Z	1.8-28 / 50	TARA PSK Rumble	Dig	Name and call area (see website)	www.n2ty.org
4	0800Z	5	0800Z	1.8-28 / -	Oceania DX Phone Contest	Ph	RS and serial	www.oceaniadxcontest.com
4	1200Z	5	1159Z	1.8-28 / -	Russian WW Digital Contest	Dig	RST and 2-char oblast code or serial	www.rdrclub.ru
4	1200Z	5	1200Z	14-28 / -	Worked All Britain HF Contest	Ph	RS, serial, DXCC entity or WAB area	wab.intermip.net
4	1600Z	5	See website	3.5-28 / 144	New Jersey QSO Party	Ph CW	RS(T) and NJ county or S/P or "DX"	www.k2td-bcrc.org
4	1600Z	5	2200Z	1.8-28 / 50,144	California QSO Party	Ph CW	Serial and state/prov/"DX" or CA county	www.cqp.org
5	0700Z	5	1900Z	21,28 / -	RSGB 21/28 MHz Contest	Ph CW	Serial and UK district	www.rsgbcc.org
6	1600Z	6	1959Z	3.5-14 / -	EU Autumn Phone Sprint	Ph	Both call signs, serial, name	www.eu-sprint.com
6	1630Z	6	1730Z	3.5, 7 / -	OK1WC Memorial Contest	Ph CW	RS(T) and serial	www.memorial-ok1wc.cz
7	0200Z	7	0400Z	3.5-28 / -	ARS Spartan Sprint	CW	RST, S/P/C, and power	www.arsqrp.blogspot.com
8	7 PM	8	11 PM	- / 432	432 MHz Fall VHF Sprint	Ph CW Dig	4-char grid square	www.svhfs.org
9	0001Z	9	2359Z	28 / -	10-10 Sprint	Ph CW Dig	Call, name, 10-10 number, S/P/C	www.ten-ten.org
11	8 PM	12	2 AM	1.8 / -	Great Pumpkin Sprint	Dig	RST and S/P/C	www.podxs070.com
11	**0000Z**	**12**	**2359Z**	**- / 2.3G+**	**ARRL EME Contest**	**Ph CW Dig**	**Call signs, sig rpt, acknowledgement**	www.arrl.org/contests
11	0000Z	12	1600Z	3.5-28 / -	Makrothen RTTY Contest	Dig	4-char grid square	home.arcor.de/waldemar.kebsch
11	0800Z	12	0800Z	1.8-28 / -	Oceania DX CW Contest	CW	RST and serial	www.oceaniadxcontest.com
11	1200Z	12	1200Z	3.5-28 / -	Scandinavian Activity Contest	Ph	RS and serial	www.sactest.net
11	1200Z	12	2359Z	1.8-28 / -	QRP ARCI Fall QSO Party	CW	RS(T), S/P/C, QRP ARCI number or pwr	www.qrparci.org/contests
11	1200Z	12	2359Z	1.8-28 / 50	FISTS/SKCC QSO Party	CW	RST, name, S/P/C, and mbr nr(s) or power	www.skccgroup.com, www.fistsna.org
11	1600Z	12	See website	1.8-28 / 50,144	Arizona QSO Party	Ph CW Dig	Serial and S/P/C	www.azqsoparty.org
11	1600Z	12	See website	1.8-28 / 50,144	Pennsylvania QSO Party	Ph CW Dig	Serial and PA county or ARRL/RAC section	www.nittany-arc.net
12	**0000Z**	**12**	**0359Z**	**3.5-14 / -**	**North American RTTY Sprint**	**Dig**	**Both call signs, serial, QTH, name**	www.ncjweb.com
13	1600Z	13	1959Z	3.5-14 / -	EU Autumn CW Sprint	CW	Both call signs, serial, name	www.eu-sprint.com
15	0030Z	15	0230Z	3.5-14 / -	NAQCC Monthly QRP Sprint	CW	RST, S/P/C, and NAQCC mbr nr or power	naqcc.info
18	6 AM	18	1 PM	- / 902+	902+ MHz Fall VHF Sprint	Ph CW Dig	6-char grid locator	www.svhfs.org
18	0000Z	19	2400Z	3.5-28 / -	JARTS WW RTTY Contest	Dig	RST and age (YL may send '00')	www.jarts.jp
18	0000Z	18	0200Z	14-21 / -	Asia-Pacific Sprint	CW	RST and serial	jsfc.org/apsprint/aprule.txt
18	0001Z	19	2359Z	28 / -	10-10 Fall CW QSO Party	CW	Call, name, 10-10 number, S/P/C	www.ten-ten.org
18	1400Z	19	2300Z	1.8-28 / 50+	Iowa QSO Party	Ph CW Dig	RS(T) and IA county, state/prov, or "DX"	www.wa0dx.org
18	1400Z	19	0200Z	1.8-28 / 50+	New York QSO Party	Ph CW Dig	RS(T), NY county, state/prov, or "DX"	www.nyqp.org
18	1500Z	19	1459Z	3.5-28 / -	Worked All Germany	Ph CW	RS(T) and serial or DOK code	www.darc.de/referate/dx/contest/wag/en
18	1500Z	19	1500Z	1.8 / -	Stew Perry Warmup Contest	CW	4-char grid square	www.kkn.net/stew
18	1600Z	19	2359Z	1.8-28 / 50	W/VE Islands QSO Party	Ph CW Dig	RS(T) and S/P/C or island designator	www.usislands.org
18	1800Z	19	1800Z	1.8-28 / -	South Dakota QSO Party	Ph CW Dig	RS(T) and SD county or S/P/C	www.kb0wsw.com/SDQP/page_home.html
18	1900Z	19	See website	1.8-28 / 50-432	Telephone Pioneer QSO Party	Ph CW Dig	Year of membership and chapter	www.tpqso.com
18	2000Z	19	2200Z	3.5-7, 21-28 / -	Spooky Feld-Hell Sprint	Dig	RST, S/P/C, Feld-Hell member nr	www.feldhellclub.org
19	1700Z	20	0100Z	1.8-28 / 50,144	Illinois QSO Party	Ph CW	RS(T) and IL county or S/P/C	www.w9awe.org/ILQP.html
20	0200Z	20	0400Z	1.8-28 / -	Run For the Bacon	CW	RST, S/P/C, Flying Pig nr or power	www.fpqrp.org
20	**1300Z**	**24**	**2359Z**	**1.8-28 / 50+**	**School Club Roundup**	**Ph CW Dig**	**RST, category, and S/P/C**	www.arrl.org/school-club-roundup
22	0000Z	22	0200Z	1.8-28 / 50	SKCC Straight Key Sprint	CW	RST, S/P/C, name, SKCC number	www.skccgroup.com
25	0000Z	26	2359Z	1.8-28 / -	CQ World Wide SSB Contest	Ph	RS and CQ zone	www.cqww.com
31	0000Z	Nov 2	2359Z	1.8-28 / 50,144	Haunted Lighthouse QSO Party	Ph CW Dig	Serial or ARLHS number	arlhs.com

2014 School Club Roundup Results

The joy, wonder, and magic of ham radio is alive and well. — WD1W

Lew Malchick, N2RQ, n2rq@arrl.net

The good band conditions of the 2013 – 2014 School Club Roundup's first session on October 21 – 25 brought out quite a few more operators, just as they did for most ham radio events! As for many other activities throughout the country, however, the snow and ice storms during the February 10 – 14 session made operating a lot more challenging. Nevertheless, the Roundup rules! (For the full results including all scores and many comments from the participating clubs and operators, see **www.arrl.org/contest-results-articles**.)

Entries from October were up from 48 to 54, with QSOs increasing from about 7600 to more than 8200, and operators up more than 20% to 551. KB3BRT at Cowanesque Valley School repeated a leading performance in the Elementary School category. The Middle School category was again led by KF5CRF (Viking Radio Club, Eisenhower Middle School) with a 50-state sweep and more than a 50% increase in school contacts. K9SOU (Bloomington High School South ARC) increased their previous score by 68% to lead the Senior High School group. University of Florida club W4DFU repeated as the leader in the College/University category. Retired teacher Marvin, N4NY, once again had the Individual top score with 43 school contacts.

In February 2014, entries were impacted by the winter weather, with schools reporting closings or reduced hours. Total entries were down by three from 70 last year and QSOs were down almost 800 to 10,088. The number of operators increased to more than 930, thanks to 300 reported by W3NCS (North Clarion County Elementary School ARC). KD8NOM (Dresden Elementary Amateur Radio Station), W3NCS, and KB3BRT continued to lead the Elementary School category with KD8NOM passing W3NCS. The top four schools in the Middle/Intermediate schools were K5LMS (Lampasas Middle School Youth ARC), KF5CRF, K7BZN (Chief Joseph Middle School), and K4WBM (William Byrd Middle School). K5LMS and KF5CRF swapped places from the October session.

Stations in the High School category were led by K1BBS (Burr and Burton Amateur Radio Club). All four leading stations repeated from October, with three of the four increasing their scores. The College/University category had a new leader (W9NAA, Rose Tech Radio Club) and many new entries.

Non-school clubs also surged from one to four entries. We always like to recognize and thank all who sent in scores — thank you! There were 17 out of 118 with fewer than 10 QSOs.

Category Winners

	Call	Club or School	Location	Score
Elementary/Primary School — W/VE				
Oct 2013	KB3BRT	Cowanesque Valley School ARC	PA	31,080
Feb 2014	KD8NOM	DEARS / Dresden Elementary ARS	OH	61,773
Middle/Intermed/JR High School — W/VE				
Oct 2013	KF5CRF	Viking Radio Club, Eisenhower MS	OK	213,556
Feb 2014	K5LMS	Lampasas Middle School Youth ARC	TX	220,458
Senior High School — W/VE				
Oct 2013	K9SOU	Bloomington High School South ARC	IN	194,142
Feb 2014	K1BBS	Burr and Burton Amateur Radio Club	VT	237,084
College/University — W/VE				
Oct 2013	W4DFU	Uniersity of Florida	FL	260,640
Feb 2014	W9NAA	Rose Tech Radio Club	IN	132,435
College/University — DX				
Oct 2013	ON4HTI	STARCom/Vives	DX	28,800
Feb 2014	ON4HTI	STARCom/Vives	DX	46,041
Club/Multi-Op — W/VE				
Oct 2013	WM3PEN	Holmesburg Amateur Radio Club	PA	704
Feb 2014	W5KS	Lawton Fort Sill ARC	OK	16,445
Individual — W/VE				
Oct 2013	N4NY		SC	16,860
Feb 2014	N4NY		SC	23,240

Improved Reporting

After a most challenging 2012 – 2013, the School Club Roundup has experienced significant changes in support. Bruce Horn, WA7BNM, has provided an online reporting utility at **www.b4h.net/arrlscr** so entries and comments can be uploaded and posted or corrected immediately. Thank you, Bruce!

In order to help process results quickly, be sure your log is in Cabrillo format. A list of logging programs that produce the correct format as well as a sample log are provided on the ARRL's School Club Roundup web page at **www.arrl.org/school-club-roundup**.

Maintaining a Club

There is a persistent problem to deal with, not only for the SCR, but for school-based Amateur Radio activities overall. What happens when a teacher or club advisor leaves? Too often it means the end of the club. A number of teachers/mentors we have known for years are nearing retirement. We need to find ways to keep their successful programs going. If you have ideas, share them with us.

School Club Roundup — 2014/2015

During the 2014 – 2015 school year, the School Club Roundup sessions will be held on the third full school week of October and the second full school week of February. Those dates are Monday, October 20 at 1300Z through Friday, October 24 at 2359Z and February 9 – 13, 2015. Students may also be interested in other winter contests: ARRL November Sweepstakes Phone (Nov 15 – 17), the ARRL 10 Meter Contest (Dec 13 – 14), and the SSB edition of the North American QSO Party (Jan 17 – 18). These are great ways to foster student interest. See you on the air!

School Club Roundup — Faster Results!

In order to quickly publish final results, the log submission deadline is changing to 15 days. For the October session (Oct 20 – 24), entries must be submitted by November 8. The February session (Feb 9 – 13) log deadline is February 28th.

The 2014 ARRL November Sweepstakes

CW: 2100 UTC Saturday November 1 – 0300 UTC Monday, November 3
Phone: 2100 UTC Saturday, November 15 – 0300 UTC Monday, November 17

- Amateur Radio's longest-running domestic contest returns for its 81st year in 2014.
- Join thousands of other operators as they attempt to beat personal records, win categories, and achieve the coveted Clean Sweep by working all 83 ARRL sections in a single weekend.
- Entrants may operate for a maximum of 24 of the 36 hours during the contest period. Off-times must be a minimum of 30 consecutive minutes without listening or transmitting.
- SS CW logs must be e-mailed or postmarked by 0300 UTC Tuesday, November 18; phone logs must be e-mailed or postmarked by 0300 UTC Tuesday, December 2. E-mail Cabrillo-formatted logs to **sscw@arrl.org** or **ssphone@arrl.org**. Paper logs can be sent to ARRL November Sweepstakes, 225 Main St, Newington, CT 06111.

Complete rules and entry forms can be found at
www.arrl.org/sweepstakes

Lu Romero, W4LT, wearing his lucky shirt as he prepares to pilot his station in the November Sweepstakes [Linda Romero, photo]

Strays

Celebrating the Anniversary of a Globe-Spanning Contact

Amateurs spanned the Atlantic Ocean in the early 1920s, but the next challenge was to span the entire globe by radio. On October 18, 1924, two-way communication was finally established between Frank Bell, call sign 4AA, a sheep farmer in South Island New Zealand, and Cecil Goyder, call sign 2SZ, a former pupil of Mill Hill School, operating from the school in North London, United Kingdom.

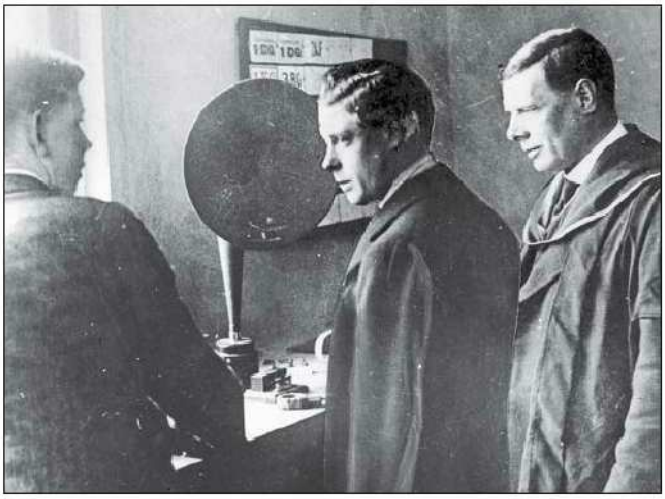
To commemorate the 90th anniversary of this historic contact, radio amateurs at stations in Mill Hill School and Shag Valley, New Zealand, will recreate the first Goyder/Bell contact, hopefully on a frequency close to that used in 1924.

The unique call sign 2SZ will be on the air from October 11 – 18 from Mill Hill School. Pupils will be able to visit the radio station, speak to the operators, and even speak over the air. During the same week, a special station using the call sign ZL4AA will be operating from Shag Valley in South Island, New Zealand.

In addition, other events in both countries will be taking place to celebrate this special anniversary. GB2NZ will be on the air from September 20 to October 18 from a number of UK locations and on all bands from 160 through 10 meters. Radio amateurs in New Zealand will continue to operate ZM90DX on all bands.

Members of the Radio Society of Great Britain (RSGB), which is the national society for Amateur Radio in the UK, will be providing the station at Mill Hill School along with much of the supporting documentation. The school will be using the facility provided by the RSGB as an interactive learning tool for students.

Don Beattie, G3BJ, RSGB Vice President, commented: "This was a significant milestone in the development of global communications. I am delighted that the RSGB is able to help Mill Hill School celebrate this anniversary, and share with its pupils and the amateur radio world the historic nature of this event."



Cecil Goyder (left) meeting the Prince of Wales (center) a few days after the historic contact.

Bernie McClenny, W3UR, w3ur@arrl.org

October Is DX Month

With great contests and typically good propagation, October is the month to add some new countries to your log.

October is usually one of the best months for DX, and that's the theme for this month's issue of *QST*. Traditionally, the March/April and September/October equinox periods provide some of the best DX conditions, on both the high and low bands. This, along with the running of the best DX contest of the year, the CQ World Wide DX SSB Contest on October 25 and 26, will have the bands full of all kinds of DX during October.

Even if you aren't a contester, you can take advantage of these great conditions and the sheer amount of DX that is active in the week leading up to the CQ WW DX Phone contest. Before the contest, many of the Contest DXpedition participants set up their antennas and stations and will run tests to make sure everything is running correctly. This is a great time for DXers to pick up new countries, including new band and mode fills.

LZ1GC Heading to Nauru Island

After many months of planning, Stan, LZ1GC (3D2GC), will be doing a solo DXpedition to Nauru Island as C21GC September 28 through October 14. He has secured flights from Sofia, Bulgaria to Brisbane, Australia and then on to Nauru Island, staying at the Menen Hotel. Stan says this is not a vacation or holiday and is looking for financial support for this DXpedition. He expects to be many kilograms over the baggage allotment. Stan has contacted the Nauru Director of Telecommunications, who has received all of the needed documents for the C21GC license.

Stan plans to be QRV on 1.8 – 50 MHz on CW, SSB, and probably on RTTY. He'll be taking Kenwood TS-480SAT and TS-480HX transceivers and an ACOM 1011 amplifier, thanks to the support of Lydia and Vasko, LZ1JK, from ACOM LTD. Antennas will include a ground plane on 160, 80, 60, and 40 meters; an EXP GP 40-10 meters — which will include the 12, 17, and 30 meter bands — and a four-element Yagi for 50 MHz (RI39ii). The C21GC website is now up and running at **www.c21gc.com** and includes his complete plans, latest news, biographical information, a list of sponsors, QSL information, and contact details.

His suggested transmit frequencies will be as follows:

CW — 1822.5; 3507; 5371; 7007; 10,116; 14,010; 18,070; 21,015; 24,895, and 28,010 kHz.

SSB — 5401; 7164; 14,190; 18,140; 21,275; 24,940, and 28,480 kHz

RTTY — 7038; 10,140; 14,088; 18,100; 21,088; 24,922, and 28,088 kHz

Remember, these are the frequencies he will be transmitting on, and he will be listening up or down (split) and *not* on his transmit frequency. QSL via PayPal, direct, bureau, and DX Service for sponsors. Plans are to upload logs to Club Log during the DXpedition and he'll "try fast LoTW."

Locations of Nauru and Lord Howe Islands.

VK9L — Lord Howe Island

The Lagunaria DX Group, which consists of 15 German operators and one operator from Poland, are heading to Lord Howe Island in mid-October. Team members for this one include: Joerg, DF6JC; Joerg, DF7TH; Mathias, DJ2HD; Gerd, DJ5IW; Markus, DJ7EO; Heye, DJ9RR; Chris, DL1MGB; Dietmar, DL3DXX; Paul, DL5CW; Tom, DL5LYM; Ben, DL6FBL; Micha, DL6MHW; Dieter, DL8OH; Joerg, DL8WPX; Robert, SP5XVY, and Bernd, VK2IA (DL1VJ). The team plans to arrive on Lord Howe Island on October 12 and operate VK9DLX until October 29, departing the following day. During the CQ World Wide SSB DX Contest, they will use the call VK9LM, in memory of Rudi, DJ5CQ, who passed away in 1995. He operated with that call several times during the '80s and '90s. In fact, two of the team (DL3DXX and DL8WPX) operated with Rudi using this call.

The team will have 10 "fully operational HF stations," including amplifiers, for activity on 1.8 – 50 MHz on CW, SSB, and RTTY. One will be a dedicated 6 meter station. Rigs will include 11 Elecraft K3 transceivers, 10 amplifiers (two OM Power 2500HF, three OM Power 2000HF, two OM Power 2000+, and three ACOM 1000). They will be operating from "two separate houses" using Wi-Fi to connect all the computers to a network for logging and "communicating between the stations."

Those 10 stations will have plenty of antennas, including a Titanex V160E 27 meter high vertical for Top Band; a full-size Four-Square on 80 meters; another full-size Four-Square on 40 meters and a four-element vertical dipole array; a full-size Four Square on 30 meters and a four-element vertical dipole array; two three-element monoband Yagis on 20 meters as well a four-element vertical dipole array. On 17,

15, and 12 meters they will have three-element monoband Yagis and four-element vertical dipole arrays. For 10 meters they will have a five-element Yagi and another four-element vertical dipole array. For the Magic Band it will be a five-element Yagi.

As of press time the team had not announced their target transmit frequencies. They plan to have them on their website, **www.lordhowe2014.org**, but rest assured, they will be operating split (listening up or down from their transmit frequencies). Each of the DXpedition team members are "paying 100% of their own travel costs, hotel accommodation, and food, together with their own contribution toward logistics." However, with this in mind they are seeking financial support to help with the costs of shipping equipment, antennas, and other needed supplies. Please visit **www.lordhowe2014.org/sponsoring/howtohelp.php** to help out.

QSL information will be posted on the VK9DLX/VK9LM website. If you need Lord Howe Island either for an all-time new one or if you need it on a specific band or mode, this will be your opportunity with a huge team effort aimed at working as many stations as possible.

DX News From Around the Globe

5V — Togo. The dates for the Czech DXpedition to Togo, mentioned in last month's column, will be September 25 to October 3. The operators will be OK6DJ, OK1FPS, and OK1FCJ operating as 5V7DB, 5V7PS, and 5V7ST respectively on 1.8 – 28 MHz with the focus on the CQ World Wide RTTY Contest. Their website is **www.cdxp.cz**.

FO/A — Austral Islands. Rob, N7QT, has announced the dates of his October TX5D holiday-style DXpedition to the Austral Islands: October 3 – 13. As a reminder, the Austral Islands are an ARRL® DXCC separate entity. Activity will be focused on 80 and 40 meters using CW, SSB, and digital modes. QSL via N7QT either direct (with SASE or SAE and $2 or 1 IRC), via the bureau, LoTW, and eQSL.

S7 — Seychelles. Kasimir, DL2SBY, is heading to the Seychelles Islands for a holiday-style operation as S79KB. His first stop will be from Mahe Island from October 4 – 9 followed by Praslin Island until October 18. Listen for him on 10 – 28 MHZ on SSB, CW, and RTTY using his FT900AT transceiver, Icom 1010 and verticals. QSL via DL2SBY.

T30 — Western Kiribati. A German team has announced plans to activate T30D from Southern Tarawa Atoll from October 2 – 15. Team members will include DJ9HX, DK3CG, DM2AYO, DL2HWA, DL4SVA, DL2RNS, DL1RTL, DF7TT, DL7JOM, DL2AWG, DL6JGNA, and DL7VEE. They are planning operations on 1.8 – 50 MHz on CW, SSB, and RTTY using four or more stations, each with 500 W amplifiers. They have announced the following target frequencies:

CW: 1814.5; 3526; 7026; 10,119; 14,026; 18,086; 21,026; 24,906; 28,026, and 50,120 kHz

SSB: 1849; 3805; 7095; 7182; 14,210; 18,120; 21,255; 24,955; 28,455, and 50,120 kHz.

RTTY: 3595; 7046; 10,137; 14,090; 18,099; 21,090; 24,918, and 28,090 kHz.

The T30D team has a website at **t30d.mydx.de**. QSL via DL4SVA, plus OQRS. You can QSL direct or via the DL QSL bureau. The T30D log will go on LoTW later.

YJ — Vanuatu. YJ0X, Vanuatu, is the expedition destination for team leader ZL3PAH and fellow operators ZL4PW, ZL3GA, and G3USR, October 3 – 14. The flights are booked and a seaside villa is secured. They will have a pair of K3 transceivers with amplifiers, a K2 transceiver in reserve. They will be operating CW, RTTY, and SSB. For antennas they have HEX-BEAMs, a six-element 6 meter Yagi, and verticals for 30, 40, and 80 at the edge of the sea. See **foldingantennas.com** for more on the antennas they are taking along. Updated information from ZL3GA says that 160 meters is definitely being planned.

On 6 meters they will have a breakable beacon with a K3/KPA500 ready to switch to 6 if the band opens. [A breakable beacon is a regular transceiver set up to operate as a beacon. With the K3 transceiver, a beacon message is recorded in one of the K3's message memories. A time delay is set and the message repeat function engaged. The K3 transmits the message and then switches to receive for the delay period, during which a calling station can be heard. If a calling station is heard, the operator disengages or "breaks" the beacon message repeat, completes the contact, and restarts the message beacon. — *Ed.*] Luc, PT7WA, has joined the team as pilot for Spanish speakers. The organizers say YJ is highly sought after in Latin America. Luc will handle requests from South and Central America and the Caribbean only. They will have a Club Log online log and OQRS. The logs will go on LoTW within 3 months. ZL3PAH will be the QSL manager. Follow them on **yj2014.wordpress.com**.

Dr Glenn Johnson, W0GJ (VU3RYJ); Yamini Sadinei, VU2YAM, and Mr Suri, VU2MY, took a moment for a photo op while attending the ARRL Centennial Convention. Suri is planning another International DXpedition from Port Blair, Andaman Islands (VU4) in December. [Bernie McClenny, W3UR, photo]

ZK3 — Tokelau. SP5EAQ and SP5ES will be going to Tokelau to be QRV October 8 – 31 or so on 80 – 10 meters. Entry approvals for the Nukunonu Atoll and Tokelau visas have been received; the preliminary ship booking is done and the local accommodation has been secured. ZK3Q and the ZK3E call signs will be confirmed on arrival. There is also some activity from 5W planned on the way back home, in early November. They have a website at **zk3.sp5drh.com**.

Wrap Up

That's it for this month, with thanks to KE3Q and *The Daily DX* for helping to make this month's column possible. Next month we will report on another VU4 DXpedition by an all Indian team going to both Nicobar and Andaman Islands. Don't forget to send your DX news, photos, and club newsletters to **w3ur@arrl.org**. Until next month, see you in the pileups! — *Bernie, W3UR*

Jon Jones, N0JK, n0jk@arrl.org

Spectacular Propagation Adds Radio Fireworks to the 4th of July

Record-breaking propagation makes 6 meter history.

The 2014 July 4 holiday weekend may go down as one of the best ever on 6 meters. Some rare, remarkable, and very strong openings provided fireworks day after day. David, N1ZHE, says "In my opinion, they were EPIC!" Alex, EA8DBM, was so loud on the 5th and 6th many thought it must be F2.

The holiday festivities started early on July 3 when Li, BA4SI, worked many in Europe around 0950Z. Later, stations along the East Coast had a strong opening to Europe for hours. Lauren, W0LD (FM05), worked CT1, EA, and SM at 2100Z. Around 2310Z (July 4 JST) Han, JE1BMJ, heard loud Russian TV signals. Bo, OX3LX, was active and Han asked him to listen for him. Bo immediately heard JE1BMJ with a 599 signal and they worked at 2313Z. After this contact, Bo worked 49 stations in Japan including "JA1, JA2 – 6, JA9, and JA0" (see Figure 1). These are the first terrestrial JA – OX 6 meter contacts known. From the ON4KST chat page July 4 UTC:

> 00:19:20; OX3LX Bo – JE1BMJ; 40 to 50 JAs in log
> 00:19:04; JE1BMJ Han, Great BO! How many JAs about? Zone 40 very rare for JAs.
> 00:18:35; OX3LX Bo – JE1BMJ; What a pile up wow

Han notes "the bearing to OX is only 4° from the North Pole. On HF the signals usually have a polar FAI flutter. Bo's signal did not have a flutter tone." Han notes this path is similar to JA – VY0HL (June 15, 2013) and JA – VY2ZM (June 12, 2012). It goes through the aurora zone.

Propagation expert Jim Kennedy, K6MIO, reviewed this opening:

> Back in 2012, near the end of June, there was a rather spectacular series of E_s openings on a worldwide basis. In particular, on June 29, 2012, these included over-the-North-Polar-region paths from northwestern W7 on into northern and eastern Europe (green). Analysis strongly suggested that these paths were the result of a combination of auroral E_s, polar E_s, and mid latitude E_s, all linked together. [1] Starting from the W7 side, these 2012 contacts were consistent with an auroral E_s hop, linked to a polar E_s hop, linked to one or two mid latitude E_s on the European side. (JW7QIA was worked in the Midwest the same day).

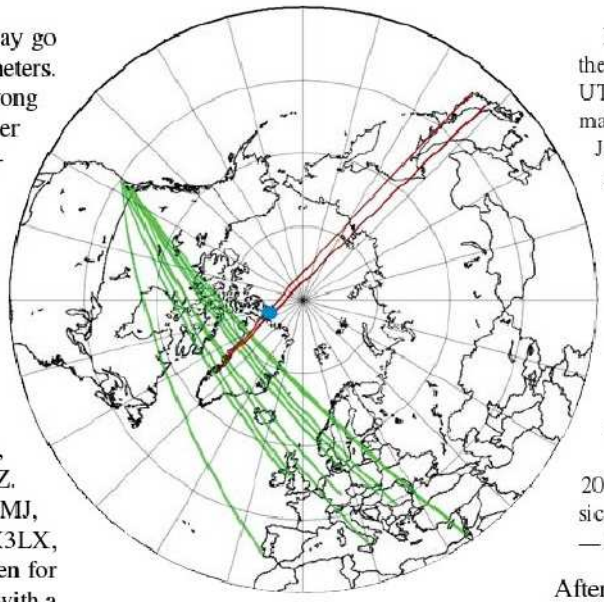


Figure 1 — Comparison of the June 29, 2012 and July 3, 2014 openings. The 2012 opening included over-the-North-Polar-region paths from northwestern W7 into and eastern Europe (green). In 2014, just a few days later in the year, OX3LX in Greenland began making contacts over the North Pole into Japan (red). The blue dot, near is the approximate position of the Magnetic Dip North Pole. [Jim, K6MIO/KH6, map]

Now, this year, just a few days later in the year, on July 3, starting shortly before UTC 00:00, OX3LX in Greenland began making contacts over the North Pole into Japan. Figure 1 shows some of these contacts in red. The blue dot, near the geographic North Pole, is the approximate position of the Magnetic Dip North Pole. A preliminary review suggests that, starting from the Greenland side, this is consistent with one hop of polar E_s (always daylight in the summer North Polar region), to an auroral E_s hop, and finally to an evening-peak mid latitude E_s hop.

It would appear that the two 2012 and 2014 openings were both the result of basically the same set of propagation links. —*Jim*

After the polar opening to Japan faded, Bo had a strong opening into the Midwestern states and Canada for a couple of hours. NW0W (EM47) said Bo was 599. The VY0SNO/b (FP53) was also heard across the heartland including N0JK (EM28) at 0220Z. The DX continued on the 4th. NW0W had D44TS "599 in for 1.5 hours." Dennis, K7BV (FM04), worked A45XR at 1420Z. At the same time, Dave, N9HF (EL99), worked Ami, 4X4DK, for Dave's country # 99 on 6 meters. Alex, EA8DBM (IL18oh), worked west to Texas and Colorado (K0YW (DM67), 1429Z; K0GU (DN70), 1652Z) and was spotted by K6QXY (CM88) and W6TOD (DM15).

July 5 started out with Alex, EA8DBM, working east to Japan around 1000Z. Alex began working stateside around 1320Z. The opening progressed west. At 1520Z N0JK (EM28) worked EA8DBM on CW at 1520Z fixed mobile with 100 W and a whip. WB8VLC (CN84) heard me calling Alex. WW0E worked Alex, then NW0W (EM47) spotted him "40 over S-9 calling for west coast" at 1805Z. Many western stations went into Alex's log such as Ray, W2RS (DM41), who worked him using

[1] Kennedy, 2013 "Proceedings of the 47th Conference of the Central States VHF Society," p 109; also Kennedy, 2014, DUBUS 2/2014, p 40.

150 W to a Hy-Gain AV-620 vertical from Arizona at 1747Z. "I gave him a 55 report, but his signal later built up to S8. That seems awfully strong for 4 – 5 hop E_s (the distance is 5456 miles)."

The strong signals were likely due to chordal E_s hops. Six meters remained open to North America from the Canary Islands until after 2250Z. That is over 9 hours! CN8KD gave many a new country including K0YW (DM67) at 1333Z. Bruce heard Mohammed work many on the West Coast. Jay, K0GU (DN70), made 22 JA contacts.

As the sun rose over the East Coast Sunday July 6, EA8DBM spotted the WA1OJB/b (FN54) at 1021Z. By 1115Z, K0HA (EN10) in Nebraska heard him 599. Rick, W0RT (EM27), logged EA8JL at 1353Z and EA8DBM 59 at 1402Z. Kirk, K4RO (EM66), at 1616Z had YO4ATW answer his CQ on 50.093 MHz CW. "I was running 100 W to an HF antenna without any 6 meter elements." Alex was in to the Pacific Northwest by 1626Z when K7CW (CN87) logged EA8DBM for his country # 105. John, KF7PCL (CN76), had EA8DBM "rise out of the noise" at 1706Z and "worked with a 559 signal."

Multihop E_s to Europe and Africa continued for hours. Mike, WB8VLC (CN84), reports that he worked EA8DBM on at

> 1954Z with honest 599 for reports on 6 meters, 50.081 MHz CW at both ends. Alex is still in now over 2 hours later. Using 4 1/2 elements, broken 5 element, on 13 foot boom Yagi at 30 feet and 100 W. I used a broken beam to work EA8DBM in the Canary Islands for WAC.

At 2115Z the band suddenly opened from Alaska to the Midwest and southeast states. W0WOI (EN22) had KL7RA in with a "bone crushing signal" and KL7KY 559. Many stations in the southeastern states were able to work Alaska for their WAS. Other Alaskans spotted were WL7N, KL7NO, and KL7HBK. That evening another opening for OX3LX south to W4ETN (EM83) and on west.

July 7 FP/KV1J caught a great opening and worked K0YW at 0007Z. Bruce notes

> FP is always tough due to the geography of Miquelon Island forcing the operators to operate on the east side of the island's spine. The relatively high takeoff angle is very tough to overcome.

The July 7 opening continued as W7EW (CN84) worked EA7KW at 1708Z.

July 8 UTC arrived with a huge opening between Japan and the west coast states. KF7PCL worked JE1BMJ (QM05) at 0519Z. Bill, K2PO (CN85), worked 26 JAs with a K3 transceiver and two-element SteppIR. Jim, W7OUU (DN22), Idaho worked 22. Paul, K7CW, and Johnny, KE7V (CN88), said it was open to Japan from 0118 to 0400Z, dropped out then back stronger than ever 0500 to after 1000Z! Johnny worked 300 JAs, "DS5ACV at 0832Z, BA4SI at 0836Z, and DS4OTV at 0850Z. Worked many JA6s. Biggest thrill was hearing Li, BA4SI, S9 plus call over a huge pileup of JAs." This and other JA – West Coast openings this summer took place later than the summer solstice short path (SSSP) contacts between Japan and North America the last couple of seasons. The SSSP contacts peak around 2300Z. Diurnal E_s peaks tend to support E_s propagation from the western states to Japan on 6 meters around 0500Z and later.

Transpacific Tropo Duct Analysis

Tropospheric ducts seem to form between the mainland and Hawaii almost every summer and this year was no exception. But the KH6 — W6 tropospheric opening in early July, 2014 was one of the longest yet observed, lasting for 8 days.

There have been other openings that were more widespread. One in 1995 extended all the way to the Canadian border, allowing several stations in Washington state to work KH6HME. During that opening W7FI was credited with setting a new land-to-land 144 MHz DX record when he worked KH6HME over a distance of 4333 kilometers (KH6HME had worked W1LP/MM over a greater distance). There were also earlier openings that resulted in contacts all the way into the microwave region.

The early July 2014 opening produced no microwave contacts, but for sheer longevity it was one of the best. The opening began on Wednesday afternoon, July 2 when WB6NOA and perhaps others first heard the KH6HME beacon. On Friday night (July 4), I posted a video on YouTube illustrating how the 144 and 432 MHz beacons sounded by then in DM13cs (the Orange County foothills): **youtu.be/Uucyw8YO9s0**.

On Saturday (July 5), Fred Honnold, KH7Y, made the 5-hour round trip drive from his home to the beacon site at 8000 feet elevation on Mauna Loa. He worked a number of California stations on 144, 223.5, and 432 MHz with excellent signals. Meanwhile, three other Hawaiian stations worked the mainland from much lower elevations: KH6/K6MIO, KH6SX, and WH6XM.

This duct proved to be much like earlier ones. On the California end the duct was low, perhaps as low as 1000 feet asl at times. But on the Hawaiian end, the duct was centered somewhere near the beacon site at 8000 feet. Stations at low elevations near Hilo were not nearly as loud as Fred, who was signing KH6HME in honor of the late Paul Lieb, who made this path famous.

To illustrate just how good the path was, I made and posted a video of part of a contact with KH6HME (KH7Y, operator) on 223.5 MHz FM, where Fred was running all of 15 W. Was he loud on FM 2505 miles away? Judge for yourself: **youtu.be/XOyaUNMYIGg**.

This was all happening Saturday. On Sunday afternoon (July 6), the beacons were still loud in Orange County. At the same time, K6FV (400 miles to the north) was hearing a 599 signal from the 144 MHz beacon on a handheld IC-202 in the hills above San Mateo at 1700 feet asl overlooking Half Moon Bay. Fred had gone home Saturday night. but I worked KH6/K6MIO and KH6SX again Sunday afternoon. Here's how the KH6HME beacons sounded by Sunday afternoon, 4 days into the opening: **youtu.be/iQiTW8U_qD8**.

Early the following Thursday morning (July 10) the KH6HME beacons were still rolling in to southern California on the eighth day of this duct. This had become one of the longest KH6 tropo openings in memory. Personally, I thought the 1973 duct was pretty impressive, but it only lasted for 5 days. The beacons finally faded out for the last time during this opening sometime on the eighth day.

Here's how KH6HME/B sounded at N6NB a few hours before the opening ended Thursday, July 10: **youtu.be/WXBkvM8WxG8** — *Wayne Overbeck, N6NB*

On the Bands

50 MHz. W5KI (EM36) worked JE1BMJ (QM05) 2328Z July 2. K0YW (DN67) logged K6CS/p (CN71) for a new grid

July 4. Charlie, K6CS, gave many contacts with the rare CN71 grid (see Figure 2). On the 11th, Leo, KJ6HI (DM03), worked 27 JA stations around 0600Z. Paul, K7CW, worked KH8/W7GJ on EME the 14th. July 20 K7ULS (DN41) heard F8BUI on JT65 at 2150Z. The CQ VHF contest was slow, but just before the end, stations in Texas had an opening to Europe. Matt, W3UUM (EL29), worked DL8YHR, HA8FK, and DJ6YX just before 2100Z. NW0W (EM47) worked rare NU6O (CN70) for a new grid.

On July 21, G8BCG (IO70) had a strong E_s opening to North America. Peter made over 200 North American contacts. "Grid fields worked were DM, DN, EM, EN, FM, FN, and GN." N0JK (EM28), using an M^2 HO loop with 100 W; N0CWR (EM29), and N0LL (EM09) all worked Peter around 1700Z. Peter was solid copy on the loop. Tim, NW0W (EM47), did well with 22 European stations logged including SV8CS from 1406–1646Z and a "second round" from 1738–1907Z when he worked another 38.

> G(6), OZ(3), SM7GVF, ON(5), LA5UF, PA(3), DL(8), OE9ICI, and OE3XMA, LX1JX, OK2POI, IK0FTA, HA5JI, SP3RNZ and a host of others. Signals where *true* 599 for at least 80% of them. The piles were huge. Conditions were the best of this season bar-none for me into Europe.

VE1SKY (FN74) had a strong opening to Europe from 1200–1400Z July 22. On the 23rd Rich, K1HTV, reports:

> there was an E_s opening from the mid-Atlantic area to northern Europe this morning. I was a bit too far west (FM18ap) to work very much with only a G and an EI station making it into the K1HTV log. I heard SP and OZ stations weakly. However, K2PLF in FM19sp (northern MD) was heard running dozens of stations (DL, SP, G, GM, F, EI, SM, etc), most of them in northern Europe. He is only 105 miles northeast of my QTH but enough of a distance to have a major effect on working the DX on this opening. These QSO occurred between 1300 and 1430Z.

A second "late" European opening took place from July 23 1900 – 2100Z, which favored W9 and W0. Craig, K9CT (EN50), ran many Europeans including UX0UN. NW0W did great again working "MM0AMW, OE (1), GM (4), PA (2), G (8), DL (9), LX (1), F (5), EI (1), IK (1), S5 (1), ON (1), and SM7FJE = 36 Total." This opening did not go much west of the EN40, EN50, and EM47 grids. W0WOI (EN22) managed a marginal contact with G8BCG.

Sunday July 26 TF3SG (HP94) Iceland spotted the K1MS/b (FN42) and was worked by K2MUB (FN21) at 2243Z. Later OX3KQ and MM0AMW worked west to Minnesota, Missouri, and Nebraska. K1TOL found OH6DD at 0037Z July 27 "for a new grid." KU9C/VP9 was active from VP9GE's home working many.

On July 31, UTC E_s linked with Aurora E_s to the Arctic. The VY0SNO/b (FP53) was spotted from W1 west to W7 and many heard the VY0YHK/b (EP28). Here in Kansas, the VY0SNO/b was in almost 2 hours (N0JK EM28) and audible on a whip antenna. This is the loudest I heard this beacon since December, 2001. Many Canadians were active from rare grids. I worked VE2IR (FN45) at 0145Z. Larry, N0LL (EM09), worked VE2CSI and VE2TKH (FO60) at 0230Z and VE7DAY (DO70) at 0549Z. The month ended with a rare summer time E_s – TEP opening between PY1RO (GG87) to Europe ~ 1800Z. DK2EA had Rolf "599" to JO50 at 1814Z. Thanks to WA1RKS, WA3IUH, N1ZHE, N0KE, ND0B, VP9GE, and WA2GFN for their reports.

144 MHz. Bill, W8QZA, San Diego worked KH6HME on tropo July 5 using a FT-817 and a four-element Yagi. John, KF0M (EM17), worked VE3KKL (FN25) on E_s July 11 at 0017Z. On July 22, KF0M worked KE5JXC (EL39). July 25 K5SW (EM25) worked WD0BQM (DN81) at 1300Z. Alan, KA0JGH (EN10), worked WD0BQM 1441Z and WA7KYM (DN71) Wyoming at 1454Z. July 26, KA0JGH spotted W0ANH (EN47) and K0SIX (EN35) at 1304Z. KF0M and N0IRS (EM29) worked KX4R (EM73) on tropo at 1230Z. July 27 KF0M worked WB4JGG (EM75) at 0355Z. N0IRS (EM29) and KF0M spotted the WD9BGA/b (EN53) at 1153Z the 27th. W8PAT received 2 meter DXCC # 127.

222 MHz. N0IRS (EM29) worked KN4OK (EM64) July 25 at 1152Z on tropo.

80 GHz. On June 23, Ron, K6GZA, and Bob, KF6KVG, on Mt Diablo (CM97av) worked Goran, AD6IW, on Mt Lassen (CN90fl) for a new world distance record of 289 kilometers.

Figure 2 — Charlie's, K6CS, portable location in rare grid CN71, California. [Charlie Swim, K6CS, photo]

Here and There

KH9/WA2YUN/B is off the air. Colin left Wake Island July 11 and relates "It has been a lot of fun working 6 meters. The beacon has been heard in some surprising places. There will be no one to keep the beacon going when I leave." Courtesy of Fred, KH7Y.

Jim, K6MIO/KH6, notes a recent prediction by the Royal Observatory of Belgium for Solar Cycle 24 suggests the second peak will be near the end of 2014.

Brian, WA1ZMS, received the Brendan Medal from the Irish Transmitting Society at the ARRL® Centennial Convention.

Special Event Stations

Maty Weinberg, KB1EIB, events@arrl.org; www.arrl.org/special-event-stations

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

Sep 6 – Sep 14, 0000Z – 2359Z, W6Q, Brookfield, IL. Six Meter Club of Chicago, K9ONA. **Route 66 On The Air**. 18.160 14.266 7.266 3.866. QSL. Michael Huedepohl, 3532 Raymond Ave, Brookfield, IL 60513. **www.k9ona.com**

Sep 10 – Sep 21, 0000Z – 2359Z, K4MIA, Loxahatchee, FL. PBSE Radio Society. **National POW MIA Recognition Day Special Event Station**. 21.300 18.150 14.265 7.185. QSL. Michael Bald, 6758 Hall Blvd, Loxahatchee, FL 33470. *Sister station K4MIA/7 in operation some days. Please take time to remember our POWs and MIAs as well as their families.* **www.qrz.com/db/k4mia**

Sep 20, 1400Z – 2100Z, N2R, Englishtown, NJ. Royal Rangers NJ District. **2014 Powwow Amateur Radio Event.** 21.310 14.250 7.230 3.850. Certificate & QSL. Lawrence Stewart, O'Hensyn Village 4A, Budd Lake, NJ 07828. *We will be operating HF 80 to 15 meters on phone, CW, and PSK. We will also attempt to use FM satellite S050 and possibly the ISS.* **ka2hjh@optonline.net**

Sep 27, 1400Z – 1930Z, NC4AR, Thomasville, NC. Tri-County Amateur Radio Club. **Everybody's Day**. 7.210. Certificate. NC4AR, PO Box 747, Trinity, NC 27370. Certificate instructions at URL. **www.qrz.com/db/nc4ar** *or* **www.nc4ar.org**

Sep 27, 1500Z – 2200Z, W9PVR, Spring Green, WI. Pine Valley Repeater Club. **Long Island East Qualification for US Islands Program**. 14.275 14.070 7.255. QSL. Ralph Hendrickson, S 6509 Cty Rd J, Viroqua, WI 54665. **www.w9pvr.com**

Sep 27 – Sep 28, 1900Z – 0400Z, WE7GV, Sahuarita, AZ. Green Valley Amateur Radio Club. **20th Annual Fiesta Sahuarita**. 14.246 14.244 14.242. Certificate & QSL. Green Valley Amateur Radio Club, 601 N La Canada Dr (SAV), Green Valley, AZ 85614. **www.gvarc.us**

Oct 2 – Oct 5, 1400Z – 2000Z, W8R, Beckley, WV. Black Diamond Amateur Radio Club. **Rocket Boys Festival — October Sky**. 14.280 7.280. Certificate, Rocket Boys Special Event Station, John Hyme, W8HY, PO Box 472, Beaver, WV 25801. **www.qsl.net/wv8bd/rbf**

Oct 3 – Oct 6, 0000Z – 2359Z, N1FD, Nashua, NH. Nashua Area Radio Club. **35th Anniversary**. SSB 28.400 21.300 14.285 7.200 3.900; CW 30 kHz from band edge. QSL. Nashua Area Radio Club 35th Anniversary, PO Box 248, Nashua, NH 03061. **www.n1fd.org**

Oct 4, 1400Z – 2000Z, W4CAR, Chesapeake, VA. Chesapeake Amateur Radio Service. **5th Annual Waterways Heritage Festival**. 21.340 14.240 7.240. Certificate. Chesapeake Amateur Radio Service, 116 Reservation Rd, Chesapeake, VA 23322. *Certificate sent via e-mail; see website for details.* **www.w4car.org**

Oct 4, 1400Z – 2100Z, N9BAT, Berwyn, IL. Chicago Suburban Radio Association. **90th Anniversary**. 7.245. QSL. Ed Schumacher, 3011 Becket Ave, Westchester, IL 60154. *Celebrating from our birthplace, Berwyn, IL. Setup will be at the Berwyn Historical Society during the 45th Houby Days Festival. Check website for developing details on times, call signs, and other frequencies.* **www.csraham.com**

Oct 4 – Oct 5, 1200Z – 0000Z, K4C, Dawsonville, GA. Toccoa-Stephens Chamber of Commerce. **Currahee Military Weekend, Band of Brothers, Camp Toccoa**. 14.308 7.256 147.330 3.875. QSL. Bruce Perry, 102 Clearwater Dr, Dawsonville, GA 30534. **kk4rwj@arrl.net** *or* **www.qrz.com/db/kk4rwj**

Oct 4 – Oct 5, 1321Z – 1321Z, K3NQT, Bedford, PA. Bedford County Amateur Radio Society. **50th Fall Foliage Festival**. 28.450 14.250 7.260 7.050. Certificate & QSL. See URL, or direct to SE Fall Foliage, 300 Cumberland Rd, Bedford, PA 15522. *Promoting Amateur Radio and its role in public service. Amateurs will be providing communications for the transportation services during the event.* **www.bcars.org**

Oct 4 – Oct 5, 1600Z – 0400Z, K4C, Toccoa, GA. **Currahee Military Weekend**. 14.308 14.070 7.256. QSL. Bruce Perry, 102 Clearwater Dr, Dawsonville, GA 30534. *Operating from "3 miles up" on Currahee Mountain for the Toccoa-Stephens Military weekend. For QSL card, e-mail* **n4stg@arrl.net**. **www.qrz.com/db/k4c**

Oct 4 – Oct 8, 0001Z – 1200Z, K0L, Emporia, KS. Emporia State University Amateur Radio Club. **Lunar Eclipse**. 14.270 21.310 7.230. QSL. Dwight Moore, Campus Box 4050, 1 Kellog Cir, Emporia, KS 66801.

Oct 10 – Nov 10, 1010Z – 1212Z, W7TA, Reno, NV. Sierra Nevada Amateur Radio Society. **Nevada Sesquicentennial Celebration**. 20 meters. QSL. SNARS, PO Box 7727, Reno, NV 89510. *No specific freqs at this time. We are planning to replicate the sending of the Nevada state constitution to Washington DC via Morse code, where it was signed by President Lincoln, declaring Nevada as a state. This was the longest code message ever sent (at that time) and it took several days and numerous relays across the country.* **www.snars.org**

Oct 11, 1300Z – 2200Z, NE0QP, Various locations, NE. Lincoln NE Chapter of Quarter Century Wireless Association. **Nebraska Rare County Activation**. See URL for frequencies. QSL. QCWA Chapter 025, Reynolds Davis, K0GND, 3901 S 42nd, Lincoln, NE 68506. **qcwa.org/chapter025.htm**

Oct 11, 1400Z – 1800Z, NC4MC, Troy, NC. Montgomery Amateur Radio Society. **Uwharrie Mountain Festival**. 14.250 14.030 7.250. Certificate. Donald L. Grady, KG4ZRH, 120 Woodline Dr, Troy, NC 27371.

Oct 11, 1400Z – 2000Z, W5QX, San Angelo, TX. San Angelo Amateur Radio Club. **90th Anniversary Celebration**. 14.230 7.230 146.94 – PL 103.5. Certificate. SAARC, PO Box 4002, San Angelo, TX 76902. **www.w5qx.org**

Oct 11, 1400Z – 2100Z, W5I, Denison, TX. Grayson County Amateur Radio Club. **Eisenhower Birthday Celebration**. PSK31 14.070 7.070; SSB 14.250 7.250. QSL. K5GCC, 718 E Hwy 82 #198, Sherman, TX 75090. *We will be operating SSB and PSK31 on 20 and 40 meters, depending on band conditions.* **www.k5gcc.org**

Oct 11, 1500Z – 2200Z, K9HAM, Godfrey, IL. Lewis & Clark Radio Club Inc. **30th Anniversary**. 21.320 21.250 18.150 18.130 14.250 14.225 7.250 7.230; 10 meters if open. Certificate & QSL. Lewis & Clark Radio Club Inc, K9HAM, PO Box 553, Godfrey, IL 62035. *We have been an ARRL Affiliated Club for 30 years.* **www.k9ham.org**

Oct 11, 1600Z – 2000Z, N4W, Athens, TN. McMinn County Amateur Radio Club. **USS *Charles R. Ware* Reunion Special Event.** 14.340 14.225 7.290 7.175. Certificate. McMinn County Amateur Radio Club, 206 Woodman St, Athens, TN 37303. *Email or SASE certificate available, see instructions on event website. Contacts will be made in the General portion of the 20 and 40 meter bands.* **www.mcminnarc.com/N4Wweb/N4W.html**

Oct 11, 1600Z – 2300Z, NI6IW, San Diego, CA. USS *Midway* (CV-41) Museum Ship. **US Navy Birthday Special Event.** 14.320 7.250; PSK31 14.070; D-STAR REF1C. QSL. USS *Midway* (CV-41) Museum Radio Room, 910 N Harbor Dr, San Diego, CA 92101.

Oct 11 – Oct 12, 1321Z – 1321Z, K3NQT, Bedford, PA. Bedford County Amateur Radio Society. **50th Fall Foliage Festival**. 28.450 14.250 7.260 7.050. Certificate & QSL. See URL or direct to SE Fall Foliage, 300 Cumberland Rd, Bedford, PA 15522. *See Oct 4 – 5 listing.* **www.bcars.org**

Oct 11 – Oct 12, 1422Z – 1421Z, W0D, Macon, MO. Macon County Amateur Radio Club. **Lester Dent — Doc Savage Special Event**. 14.270 14.070 7.270 3.970. Certificate. Macon County ARC, PO Box 13, Macon, MO 63552. **www.maconcountyarc.net**

Oct 11 – Oct 12, 1500Z – 2100Z, W1W, New Milford, CT. Northville Amateur Radio Association. **Warren Fall Festival**. 14.200. QSL. NA1RA, PO Box 354, New Milford, CT 06776. QSL will be via LoTW by NA1RA using W1W. **www.na1ra.org**

Oct 11 – Nov 11, 0000Z – 0500Z, CK3Q, Mississauga, ON, Canada. Robert Emerson. **150th Anniversary of the Quebec Conference**. 28.525 14.270 21.295 24.940. QSL. Robert Emerson, VE3RHE/CK3Q, 6950 Summer Heights Dr, Mississauga, ON L5N 7E9, Canada. *VE3RHE will be operating as CK3Q to celebrate the 150th Anniversary of the Quebec Conference.* **canada-150th.ca**

Oct 12 – Oct 20, 0000Z – 2359Z, W6Q, Healdsburg, CA. Will Pattullo. **25th Anniversary San Francisco Great Quake of '89**. 28.465 21.265 14.265 7.265. QSL. W6Q — Will Pattullo, 161 Presidential Cir, Healdsburg, CA 95448. **www.qrz.com/db/ae6yb** or **ae6yb.jigsy.com**

Oct 16 – Nov 15, 0900Z – 2359Z, OO4CLM, Knokke, Belguim. **Club Station ONZ. SES OO4CLM**. 21.245 21.020 14.145 14.020. Certificate & QSL. Ivo Maertens, Ruitingen 2, Knokke-Heist 8301, Belguim. *To commemorate the liberation of our town Knokke in 1944; a free-of-charge award is available as a PDF; see website for information. QSL goes 100% via the bureau for each contact made.* **www.oo4clm.be**

Oct 17 – Oct 18, 1800Z – 2100Z, W5B, Plano, TX. USCG Auxiliary. **75 USCG Auxiliary Anniversary**. 14.230 7.220. QSL. Walt Evanyk, 3200 Sherrye Dr, Plano, TX 75074. **shaneford@aol.com**

Oct 18, 0800Z – 1700Z, K4B, Naples, FL. Boy Scouts of America, Southwest Florida Coun-

cil, Alligator District. **57th Annual Jamboree on the Air**. 28.360 21.370 14.280 7.192. QSL. BSA JOTA c/o ARASWF, Naples American Red Cross, 2610 Northbrooke Plaza Dr, Naples, FL 34119. **bsaswfl52@gmail.com**

Oct 18, 0900Z – 1500Z, W1L, Fall River, MA. USCG Auxiliary. **USCG Auxiliary 75th Anniversary Radio Day**. 28.400 21.300 14.250 7.200. QSL. Larry L. Beavers, 297 Clarkson St, Fall River, MA 02724.

Oct 18, 1300Z – 1800Z, W4M, Milledgeville, GA. Milledgeville Amateur Radio Club. **Deep Roots Festival**. 21.300 14.240 7.220. QSL. Otis Murphy, W4OY, PO Box 144, Sandersville, GA 31082.

Oct 18, 1300Z – 2000Z, K2G, Babylon, NY. US Coast Guard Auxiliary D1 – SR. US **Coast Guard Auxiliary 75th Anniversary**. General portion of the 20 and 40 meter bands. QSL. KA2HHO/K2G, 59 Roosevelt St, Babylon, NY 11702.

Oct 18, 1300Z – 2300Z, W8E, Loveland, OH. United States Coast Guard Auxiliary. **75th Anniversary of the United States Coast Guard Auxiliary**. 7.234. QSL. Dave Stroup, 6138 Misty Creek Dr, Loveland, OH 45140. **cgaux8@yahoo.com**

Oct 18, 1400Z – 2100Z, W1H, Owls Head, ME. US Coast Guard Auxiliary. **75th Anniversary of the Coast Guard Auxiliary**. 28.425 21.325 14.275 7.185. QSL. Bill Hopwood, PO Box 272, Elkins, NH 03233.

Oct 18, 1400Z – 2200Z, K3G, Media, PA. US Coast Guard Auxiliary. **75th Anniversary**. 28.330 21.330 14.270 7.270. QSL. Dan Amoroso, 196 Dam View Dr, W3DI, Media, PA 19063. **wow.uscgaux.info/content.php?unit=053 – 04 – 07&category=1338125685**

Oct 18, 1400Z – 2300Z, N7Z, Apache Junction, AZ. USCG Aux Flotilla 114-10-8. **US Coast Guard Auxiliary 75th Anniversary**. 21.310 14.310 14.070. QSL. Paul Swietek, 5427 E Broadway Ave, Apache Junction, AZ 85119. **www.qrz.com/db/n7z**

Oct 18, 1400Z – 2300Z, K5I, Blackwell, OK. US Coast Guard Auxiliary. **Coast Guard Auxiliary 75th Anniversary**. VHF 146.970 145.190; digital 3.590; 3.900. QSL. Mike Baker, AE5US, 911 Robin Rd, Blackwell, OK 74631. *Special event stations will be on the air to explain the duties of the Coast Guard Auxiliary.*

Oct 18, 1400Z – 2300Z, W1Z, East Freetown, MA. US Coast Guard Auxiliary. **USCG Auxiliary 75th Anniversary**. 18.130 14.280 7.280. QSL. Paul G. Sadeck, 90 Doctor Braley Rd, East Freetown, MA 02717.

Oct 18, 1500Z – 2200Z, N4M, Mount Dora, FL. US Coast Guard Auxiliary, District 7, Flotilla 43. **US Coast Guard Auxiliary 75th Anniversary**. 14.280. QSL. David A. Pennell, NP2MR, 2031 Bayside Ave, Mount Dora, FL 32757.

Oct 18, 1600Z – 2100Z, WE7GV, Tubac, AZ. Green Valley Amateur Radio Club. **39th Juan Bautista de Anza Special Event**. 14.246 14.244 14.242. Certificate & QSL. Green Valley Amateur Radio Club, 601 N La Canada Dr (SAV), Green Valley, AZ 85614. **www.gvarc.us/**

Oct 18, 1600Z – 2300Z, K6A, Borrego Springs, CA. US Coast Guard Auxiliary, San Diego. **US Coast Guard Auxiliary 75th Anniversary Special Event**. 14.230 7.225 3.855. QSL. US Coast Guard Auxiliary, 2765 Borrego Air Ranch Rd, Borrego Springs, CA 92004. **wm1h@arrl.net**

Oct 18 – Oct 19, 1320Z – 1320Z, W2K, New York, NY. USCG Auxiliary Flotilla 014-05-11. **US Coast Guard Auxiliary 75 Anniversary**. 14.280 7.280. QSL. John Kiernan, KE2UN, 110 Cabrini Blvd, Apt A, New York, NY 10033. QSL Direct, EQSL, LoTW, **ke2un@msn.com**

Oct 18 – Oct 19, 1500Z – 2359Z, WC5C, Azle, TX. Tri-County Amateur Radio Club of North Texas. **Pelican Island Activation TX0050L**. 28.360 21.360 14.260 7.260. QSL. Michael Burns, KE5NCS, 128 Denver Tr, Azle, TX 76020. **www.wc5c.org**

Oct 18 – Oct 21, 1600Z – 0201Z, W0W, Alexandria, MN. Runestone Amateur Radio Club. **Discovery of Kensington Runestone**. 21.070 14.255 7.235 3.925. Certificate & QSL. Bill Klundt, KG0DX, 509 Pine St S, Sauk Centre, MN 56378.

Oct 19 – Oct 22, 1800Z – 2359Z, W9IMH, Franklin, IN. Indiana Masonic Home Amateur Radio Club. **Indiana Masonic Home 98th Anniversary**. 146.460 28.420 14.240 7.240. QSL. Brenda (Fran) Carter, 916 Solomon Dr, Franklin, IN 46131.

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 to the address listed in the announcement. To receive a special event QSL card (when offered), be sure to include a self-addressed, stamped business envelope along with your QSL card and QSO information. *Note: Some clubs may ask for a nominal fee to cover the cost of the certificate or QSL. Request will be made on air during the event or on the club's website.

Special Events Announcements: For items to be listed in this column, use the ARRL Special Events Listing Form at **www.arrl.org/special-events-application**. A plain text version of the form is available at that site. You may also request a copy by mail or e-mail. Offline completed forms can be mailed, faxed (Attn: Special Events) or e-mailed.

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 **Dec** *QST* would have to be received by **Oct 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.

Special Events listed in this issue include current events received through July 10. You can view all received Special Events at **www.arrl.org/special-event-stations**.

October 2014 W1AW Qualifying Runs

Earn your Code Proficiency certificate or endorsements by listening to W1AW Qualifying Runs. Legibly copy at least one minute of text by hand and mail the sheet to:

W1AW Qualifying Run, 225 Main St, Newington, CT USA 06111

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

October Qualifying Runs will be transmitted by W1AW in Newington, Connecticut at 10 PM EDST on Monday, October 6 (0200 UTC, October 7) and at 4 PM EDST on Wednesday, October 22, (2000 UTC) at 1.8025, 3.5815, 7.0475, 14.0475, 18.0975, 21.0675, 28.0675 and 147.555 MHz. The West Coast Qualifying Runs will be transmitted by K9JM on Wednesday, October 15, at 9 PM PDST (0400 UTC October 16) at 3590 and 7047.5 kHz. Unless indicated otherwise, sending speeds are from 10 to 40 WPM.

Listen for W1AW Portable Centennial QSO Party Operations in September!

October 1 – October 7	W1AW/3	Washington DC
	W1AW/6	California
	W1AW/KL7	Alaska
October 8 – October 14	W1AW/4	Virginia
	W1AW/0	Missouri
	W1AW/KH0	Tinian CNMI
October 15 – October 21	W1AW/4	Alabama
	W1AW/8	Michigan
	W1AW/KH0	Tinian CNMI
October 22 – October 28	W1AW/7	Nevada
	W1AW/8	West Virginia

The Future of DX and DXpeditioning

DXing is as popular as ever, but there are some worrisome trends.

Bob Allphin, K4UEE

I have no idea what Amateur Radio will look like in the future, but I can confidently predict that there will continue to be young and old people alike who believe that radio is magic. Among the believers will be those who want to make contacts with others in faraway places, as well as those who want to go to those places and hand out those contacts. However, there are some trends in the world of DX and DXpeditioning that could have a negative impact on the enjoyment of DXing in the future, unless we can take steps in a positive direction.

Throughout the ARRL Centennial Year, *QST* is sharing the thoughts of selected members as they consider the current state of Amateur Radio and the future of our avocation at the dawn of its second century.

Trend 1: Escalating Costs

Rare locations around the world, most often referred to as the DXCC "most wanted," are rare because they are usually uninhabited and a long way from anywhere. Usually a chartered vessel is required, and the cost is very high. On the recent FT5ZM DXpedition, the vessel's cost was $320,000.

My hope is that DXers will begin to understand the extreme costs involved in activating rare locations and will become more willing to help with the expenses. Too many DXers, including those who make multiple QSOs with the DXpedition, do not contribute. And approximately 65% of all support coming from the DX community comes from North America. This must change!

To open new sources of funding I imagine that future DXpeditions will ask for contributions from DXers for a quick upload to Logbook of The World (LoTW). I also expect that DXers using a DXpedition's Online QSL Request System (OQRS) to request QSL cards will be asked to contribute on a sliding scale for multiple QSOs.

Trend 2: Deteriorating On-Air Techniques Among DXers

Another troublesome trend is the poor operating techniques exhibited by many DXers in pileups. Among the reasons for this is the extreme competition for multiple band/mode contacts spurred by new awards, annual competitions as well as the ClubLog leaderboard. This exacerbates the intensity of the pileups, often for the duration of the DXpedition.

The relative ease of licensing has a role to play, too. In lieu of in-depth training, one can simply attend a 6-to-8-hour "hamcram" course that culminates in a license exam. I am not against these types of courses, but what happens after the students graduate? Without a follow-up mentoring program, these new hams merely add to the mess on the bands. So part of the answer is good old-fashioned Elmering. It needs to come from individuals and our clubs.

My vision is that individual DXers and clubs will take their mentoring or Elmering responsibilities seriously and help our new licensees become productive, serious, and skilled operators.

Trend 3: Sloppy DXpedition Practices

I believe DXpedition operators have the primary responsibility for the conduct and character of their pileups. The DXpedition must try to be loud and easily heard and the DXpedition operator must take charge.

My vision is that DXpedition operators will read, understand, and adhere to the "Best Practices for DXpedition Operating," found on the DX University website at **www.dxuniversity.com**. Furthermore, they will put into practice the suggestions and techniques explained in "DXpeditioning Basics," by Wayne Mills, N7NG, which can be found at **www.dxpeditioningbasics.com**.

Lastly, the DXpedition leaders must play an active role in training the new or less experienced operators.

Trend 4: Deliberate Interference

Deliberate interference (DQRM) appears to be on the rise. Some DQRM is generated by to those who gain pleasure by spoiling the enjoyment of others. Some DQRM results from DXers who have no confidence in the pileup operator and take the attitude that if they aren't going to get through, then no one else will, either.

But I believe the major source of DQRM comes from amateurs who've had their QSOs interfered with by the pileup. When faced with a pileup, they are unwilling to move their operating frequencies and instead choose to fight.

My vision is that DXpeditions will limit their pileups to a maximum of 8 – 10 kHz for CW and 15 – 20 kHz for SSB. Once again, responsibility rests with the DXpedition operator.

Trend 5: Barriers to Accessing Rare Entities

Lastly, I'd like to comment on the difficulties some government agencies place in the path of those who wish to journey to far-flung locations. Many of the rare DXCC entities are Antarctic or Pacific Islands that are usually the homes of protected species of flora and fauna.

My vision is that the government agencies that control access to these protected islands will see the benefit of allowing Amateur Radio operations periodically. Often, joint multi-disciplinary projects can be mutually beneficial. I am hopeful that Amateur Radio operators will eventually be viewed as partners and not adversaries.

The FM Revolution

How unwanted commercial transceivers sparked a massive change in Amateur Radio.

Bill Pasternak, WA6ITF
newsline@ix.netcom.com

As I look around my shack, I must have almost a dozen FM rigs of varying age, from the latest $30 dual-band handheld to the first synthesized rig made specifically for the Amateur Radio market. Before that, I had a plethora of crystal-controlled FM radios, some of which date back to the 1960s or earlier.

What unites them all is the history of FM in the Amateur Radio Service. Although FM had been available to hams for many years prior to its burst of popularity, it took an action by the FCC to light the fuse. Obviously, in an article of this length, there isn't room to cover all the radio gear involved in the FM revolution, but here are some of the highlights.

The Beginning: Land Mobile

Ever hear of a Motorola P33BAM or an RCA Carfone? Maybe you have heard the terms "Pre-Prog," "Prog Line," or "T-Power" uttered by veteran hams who joined the FM boom in those early days.

These were names of commercial FM "land mobile" transceivers that suddenly appeared on the surplus market in the late 1960s when the FCC made rule changes that effectively mandated new rigs for commercial users. As a result, commercial operators — everyone from police departments to taxi companies — were forced to abandon their old radios and adopt newer technology. The result was a flood of surplus FM gear.

Savvy hams, many of them working in the land mobile industry, snapped up the old radios for pennies on the dollar and converted them to the Amateur Radio bands, primarily 2 meters. Suddenly amateurs had ridiculously cheap access to two-way FM technology, with its clear signals and robust hardware.

Some amateurs installed these rigs in their homes and cars as a means to talk to one another point-to-point. Others, who had learned of the technology developed by the late Arthur M. Gentry, W6MEP, made them into repeaters to extend the range of mobile operations (see "Once Upon a California Hilltop," in the March 2004 issue of *QST*; **www.arrl.org/files/file/Technology/tis/info/pdf/pasterna.pdf**).

Amateur FM Attracts Attention

It only took a couple of years before ham manufacturers recognized the burgeoning trend and decided to capitalize on it. Among the first FM transceivers specifically designed for hams was the FDFM-2 from a Japanese company known as Inoue Communications, soon to be better known as Icom.

The success of the FDFM-2 led Icom to follow up with the model IC-2F (not to be confused with the later IC-2AT handheld of the 1980s). Like its predecessor, the IC-2F had six channel pairs, but featured a more sensitive receiver and a 10 W transmitter. This radio's success quickly led other manufacturers in both the US and Japan to join what became a frenzy among radio amateurs to get on 2 meters and operate what publisher Wayne Green, W2NSD (SK), christened the "Fun Mode."

By the late 1960s into the early 1970s, just about everyone was scrambling for a piece of the FM market. There were well-known names from the established ham radio industry such as R.L. Drake, Galaxy Electronics, and even Heathkit. Several commercial two-way manufacturers such as Regency Electronics, SONAR Radio, and General Aviation Electronics (Genave) jumped in. There were immediately challenged by numerous pieces of gear coming from the Pacific Rim by the now firmly established United States subsidiary distributors of Icom, Kenwood, and Yaesu. There were also a plethora of companies that sounded like domestic US outfits that were actually second sourcing OEM radios built in Japan, but selling them under private label.

These early rigs were all crystal controlled with six to 12 channels (requiring separate transmit and receive crystals to fill up each pair of slots) and a sparse number of controls. A typical front panel of an early 2 meter FM transceiver such as the Regency HR-2 had a channel selector knob, a volume control with a power off position, and a squelch control. Most ran 10 to 12 W, so installing one in a vehicle simply meant mounting the radio (which in many cases was no larger than the remote control head of a surplus land mobile unit), plugging it into the vehicle's cigarette lighter, and attaching an appropriate external antenna. Add crystals for repeaters in your geographic area, and you were an "instant FMer."

Knowledgeable hams turned surplus FM rigs like these into amateur FM transceivers.

The Growth of Repeaters

As interest in FM grew, so did the number of repeaters. More repeaters meant more channel pairs and very soon owning a six or 12 channel mobile radio was not enough. This was especially

true if you lived a more densely populated area. Manufacturers, especially those from Japan, were the quickest to respond to this need with radios that doubled the channel capacity. Of course, you also had to invest substantially in crystals to fill these channels. At close to $30 a pair in early 1970s dollars, filling up all the slots in an FM transceiver could cost more than the radio itself.

By the mid-1970s there was hardly a city or town that did not have at least one repeater on 2 meters, and larger municipalities had repeaters occupying almost every available channel pair between 146 and 148 MHz. There was some expansion onto the 70 centimeter band, and in California experimentation had begun with repeaters on the 1.3 meter band, thanks to a simple 12-channel radio brought to US shores by Midland. Hams soon found that the Midland 13-509 could be split in two and wired to a controller, thereby making a simple, yet very effective, 10 W repeater.

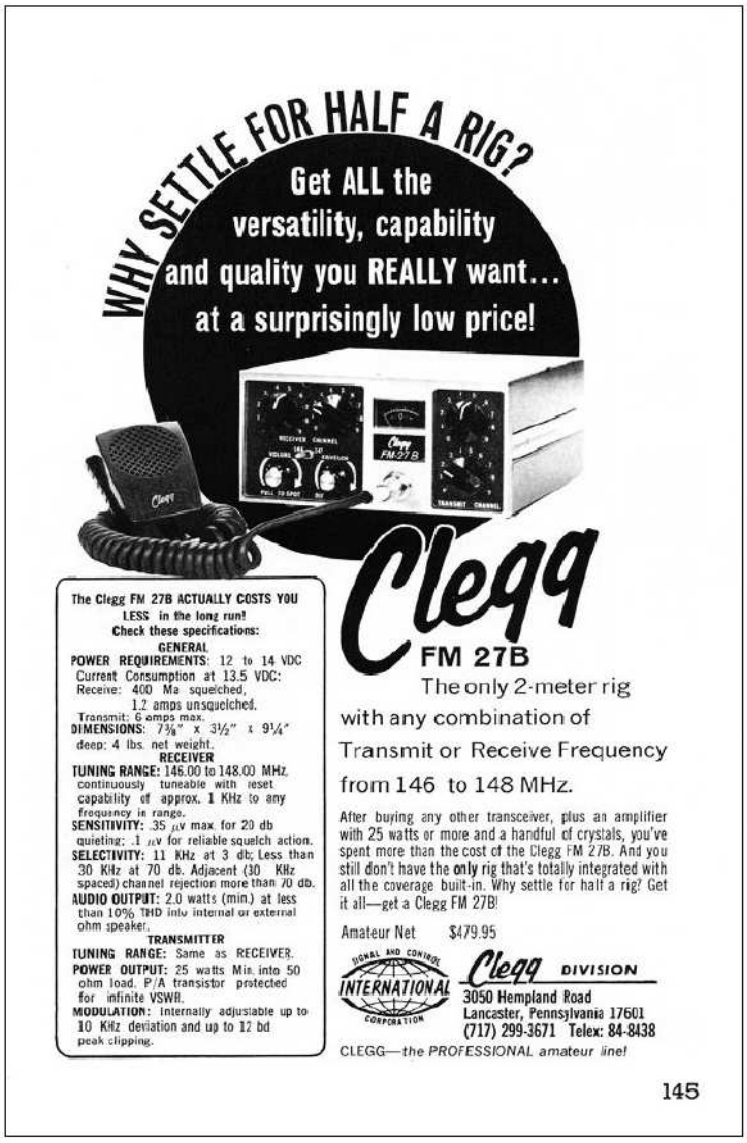
With all this FM activity, the cost of crystals was becoming a serious burden for many hams. A better way had to be found, and it was, but by following two different paths.

The Rise of the Synthesizers

The first solution was an add-on frequency synthesizer such the GLB Channelizer designed by the late Gilbert Boelke, W2EUP, and sold by his company GLB Electronics. This unit permitted most radios of the era to replace or augment crystal pairs with an early external synthesizer that covered the entire 144 to 148 MHz band in 10 kHz steps (later mods provided 5 kHz steps) and a switch to permit simplex or ± 600 kHz offset for repeater operation. The unit was available factory built and ready for installation, or as a build-it-yourself kit. Boelke's success led to others producing their own versions, but by then W2EUP's design had become standard fare.

Not every ham wanted to add another box to his home or mobile installation, though. What was needed was a completely crystalless radio. It wasn't long before two rigs showed up to answer the call.

One was the brainchild of the late American ham radio equipment developer Edward T. Clegg, W2LOY/W3LOY, the owner of Clegg Labs. The revolutionary transceiver was called the model the FM-27B and covered the 146 to 148 MHz FM subband using an early frequency synthesis system that required no external crystals. You just tuned



The Clegg FM 27B was one of the first full synthesized FM transceivers for the Amateur Radio market. This advertisement appeared in the May 1973 issue of *QST*.

in your receive frequency, zero-centered the transmit frequency, and away you went with 25 W of power. At $479 ($2500 in today's dollars!) the Clegg FM-27B was still considered a bargain compared to the cost of purchasing numerous sets of crystals.

The FM-27B was soon challenged by Inoue Communications, which by this time had re-branded itself as Icom. Its entry into the synthesized 2 meter FM radio arena came in 1973 with the model IC-230. While it did have a few drawbacks in comparison to the Clegg radio, such as not having complete coverage of simplex channels and operating only 30 kHz inter channel spacing, it also had several advantages. Perhaps the most important of these was that it was roughly the same size as almost all of the crystal controlled transceivers of the era with frequency selection requiring only one toggle switch and two knobs. The latter feature made it a bit safer to set operating frequency while running mobile.

With the entry of the GLB synthesizer to modify existing crystal controlled radios, and the Clegg and Icom gear that did away with crystal control entirely, the era of the trunk-mounted surplus land mobile transceivers had come to an end. By the early 1980s, as the FM revolution peaked, almost every FM transceiver was using frequency synthesis and the first microprocessors were showing up as well. There was no going back.

Convention and Hamfest Calendar

Gail Iannone, giannone@arrl.org; www.arrl.org/hamfests-and-conventions-calendar

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

Alabama (Headland) — Oct 25 D H R T V
8 AM – noon. *Spr:* Wiregrass ARC. Headland Town Square, 9 Park St. *Tl:* 145.43 (186.2 Hz). *Adm:* Donations accepted. Densie Williams, KJ4VDE, 334-726-4126; **KJ4VDE@aol.com**; **wb4zpi.org**.

Alabama (Helena) — Oct 11 D F H R T V
9 AM – 1 PM. *Spr:* Shelby County ARC. Helena Amphitheater, 4151 Helena Rd. *Tl:* 146.98 (88.5 Hz), 147.32 (88.5 Hz). *Adm:* $5. Bob Thomas, KC4AF, 205-426-2000; **robert@tks-inc.com**; **www.w4shl.com/hamfest**.

ALABAMA STATE CONVENTION
November 8, Montgomery, AL
D F H R S T V
9 AM – 3 PM. *Spr:* Montgomery ARC. Alcazar Shrine Center, 555 Eastern Blvd. *Tl:* 146.84. *Adm:* $7. Fred Beatty, K8AJX, 334-270-0909; **hamfest@w4ap.org**; **http://www.w4ap.org/news/Hamfest.htm**.

Arizona (Marana) — Nov 8 D F H Q R S T V
7 AM – 1 PM. *Spr:* Oro Valley ARC. Marana Middle School, 11279 W Grier Rd. *Tl:* 146.62, 444.1, 145.19, 440.4 (all 156.7 Hz). *Adm:* $5 (free with student ID or under 12). Steve Wood, W1SR, 520-906-1204; **nauset2222@yahoo.com**; **tucsonhamfest.com**.

ARKANSAS STATE CONVENTION
October 18, Batesville, AR
D F H R S T V
8 AM – 2 PM. *Spr:* Batesville Area RC. Southside Middle School, 70 Scott Dr. *Tl:* 147.27 (94.8 Hz). *Adm:* Free. Cindy Smith, KF5ANG, 870-793-6479; **sunbeamsmama@gmail.com**; **barchams.org**.

Arkansas (Morrilton) — Oct 11 F T
8 AM – 2 PM. *Spr:* Randy Griffin Memorial RC. Petit Jean State Park (Rec Hall), 1285 Petit Jean Mountain Rd. *Tl:* 146.52. *Adm:* Free. Dale Temple, W5RXU, 501-771-1111; **w5rxu@att.net**; **k5boc.org**.

TECHFEST CONVENTION
November 1, Lakewood, CO
H R S
8 AM – 4 PM. *Spr:* 285 TechConnect RC. Lakewood Elks Lodge, 1455 Newland St. *Tl:* 147.225 (107.2 Hz). *Adm:* $10. Nancy Stitt, K0NNC, 303-838-6427; **techfest@centurylink.net**; **na0tc.org**.

CONNECTICUT STATE CONVENTION
October 12, Meriden, CT
D F H R S T V
8 AM – 1 PM. *Spr:* Nutmeg Hamfest Alliance. Four Points By Sheraton Meriden, 275 Research Pkwy. Nutmeg Hamfest. *Tl:* 147.36. *Adm:* $7. John Bee, N1GNV, 203-440-4973; **info@nutmeghamfest.com**; **nutmeghamfest.com**.

Florida (Leesburg) — Nov 1 D F T
8 AM – noon. *Spr:* Lake ARA. LARA Clubhouse, 11146 Springdale Ave. *Tl:* 147.0 (103.5 Hz). *Adm:* Free. Frank Anders, KK4MBX, 484-794-5828; **twfrank111@aol.com**; **www.k4fc.org**.

Florida (Odessa) — Sep 27 D F H R T
8 AM – 1 PM. *Spr:* Suncoast ARC. Gunn Hwy Flea Market, 2317 Gunn Hwy. Pasco Cty Hamfest. *Tl:* 145.35. *Adm:* $5. Ron Wright, N9EE, 352-683-4476; **mccrpt@tampabay.rr.com**; **sarcfl.com**.

Florida (Pinellas Park) — Nov 8 F H R T V
8 AM – noon. *Spr:* St. Petersburg ARC. Freedom Lake Park, 9990 46th St. *Tl:* 147.06. *Adm:* Free. Clayton Parrott, KJ4RUS, 727-215-8140; **clayton_parrott@yahoo.com**; **www.sparc-club.org**.

Florida (West Palm Beach) — Nov 1 F H T
7 AM – noon. *Spr:* Palms West ARC. AJFCS, 5841 Corporate Way, Ste 200. Link McGarity WV4I Memorial Free Flea. *Tl:* 147.045 (110.9 Hz). *Adm:* Free. Robert Pease, KS4EC, 561-358-9999; **ks4ec@att.net**; **www.palmswestradio.org/**.

Georgia (Blythe) — Oct 11 D H R T V
9 AM – 1 PM. *Spr:* ARC of Augusta. Blythe Area Community Center, 3129 Hwy 88. *Tl:* 145.49. *Adm:* $6. Doug Pugh, KE4JSJ, 803-279-6725; **doug9933@gmail.com**; **www.theamateurradioclubofaugusta.org**.

Georgia (LaGrange) — Oct 11 D F H R S T V
9 AM – 1 PM. *Spr:* LaGrange ARC. Oakside Baptist Church, 1921 Hamilton Rd. Buzzard Nest, Special Event Station, Youth Program. *Tl:* 146.7 (141.3 Hz). *Adm:* Free. Anna Pike, KD4PCU, 334-521-2662; **lagrangehamfest@yahoo.com**; **www.lagrangeradioclub.org**.

GEORGIA STATE CONVENTION
November 1 – 2, Lawrenceville, GA
D F H R S T V
Saturday 8 AM – 4 PM, Sunday 8 AM – 2 PM. *Spr:* Alford Memorial RC. Gwinnett County Fairgrounds, 2405 Sugarloaf Pkwy. Stone Mountain Hamfest. *Tl:* 146.76, (107.2 Hz). *Adm:* adv $6, door $8. Chris Balch, KS4MM, 855-786-8643; **hamfest@stonemountainhamfest.com**; **www.stonemountainhamfest.com**.

Georgia (Rome) — Oct 18 F H R T V
8 AM – 1 PM. *Spr:* Northwest Georgia ARC. Rome Senior Center, 406 Riverside Pkwy NE. Al Brock Memorial Hamfest/Tailgate. *Tl:* 146.94 (88.5 Hz), 443.2 (100 Hz). *Adm:* Free. Grover Keith, KA5QFI, 706-766-1118; **ka5qfikeith@aol.com**; **w4vo.org**.

Iowa (Davenport) — Nov 2 D F H R S
8 AM – 2 PM. *Spr:* Davenport RAC. Clarion Hotel, 5202 N Brady St. 43rd Annual Hamfest. *Tl:* 146.88 (77 Hz). *Adm:* advance $7, door $8. Kelly Lovely, W1HAM, 563-321-7559; **w1ham@arrl.net**; **arcsupport.com/drac**.

Kentucky (Hazard) — Oct 25 D F H R V
8 AM – 1 PM. *Spr:* Kentucky Mountains ARC. Hazard Disabled American Veterans #64, 165 Industrial Dr. *Tl:* 146.67 (103.5 Hz). *Adm:* $5. Johnnie Brashear, KY4JLB, 606-438-5557; **jlb741@yahoo.com**; **kmarc.net**.

Maryland (Hollywood) — Oct 25 D F H R T V
8 AM – 3 PM. *Spr:* St Mary's County ARA. Hollywood Volunteer Fire Department, 24801 Three Notch Rd. *Tl:* 146.64 (-146.2 Hz). *Adm:* Free. Ken McNeely, KB3YPY, 301-862-4105; **ken.mcneely@yahoo.com**; **www.k3nhk.org**.

Maryland (West Friendship) — Oct 5
D H Q R S T V
8 AM – 4 PM. *Spr:* Columbia ARA. Howard County Fairgrounds, 2210 Fairgrounds Rd. *Tl:* 147.135 (156.7 Hz). *Adm:* $6. David Parkison, KB3VDY, 410-977-1249; **trainman195@gmail.com**; **carafest.org**.

Regional ARRL Centennial Events
October 10 – 12
Pacificon, Santa Clara, CA

Coming ARRL Conventions
September 5 – 7
ARRL/TAPR Digital Communications Conference, Austin, TX*

September 12 – 14
Southwestern Division Convention, San Diego, CA*

September 19 – 20
W9DXCC Convention, Schaumburg, IL*

September 26 – 27
W4DXCC/SEDCO Convention, Pigeon Forge, TN*

September 26 – 28
Mid-Atlantic States VHF Conference, Bensalem, PA*

September 27
North Dakota State Convention, West Fargo, ND*
Washington State Convention, Spokane Valley, WA*

October 4
Delaware State Convention, Georgetown, DE*

October 5
Iowa Section Convention, West Liberty, IA*

October 10 – 11
Florida State Convention, Melbourne, FL*

October 10 – 12
Pacific Division Convention, Santa Clara, CA*

October 11
Pacific Northwest VHF Conference, Seaside, OR

October 12
Connecticut State Convention, Meriden, CT

October 18
Arkansas State Convention, Batesville, AR
Wisconsin ARES/RACES Conference, Wisconsin Rapids, WI

October 24 – 25
Oklahoma Section Convention, Ardmore, OK

November 1
TechFest Convention, Lakewood, CO

November 1 – 2
Georgia State Convention, Lawrenceville, GA

November 8
Alabama State Convention, Montgomery, AL

November 15 – 16
Indiana State Convention, Fort Wayne, IN

*See September *QST* for details.

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

Maryland (Westminster) — Oct 26 D F H R T
8 AM – noon. *Spr:* Carroll County ARC. Carroll County Agricultural Center, 706 Agriculture Center Dr. Mason-Dixon Hamfest. *Tl:* 145.41 (114.8 Hz). *Adm:* $6. Steve Beckman, N3SB, 410-876-1482; **n3sb@qis.net**; **www.qis.net/~k3pzn**.

Massachusetts (Cambridge) — Oct 19. Mitch Berger, N2YIC, 617-253-3776 (9 AM – 5 PM); **w1gsl@mit.edu**; **www.swapfest.us**.

Michigan (Kalamazoo) — Oct 19
D F H Q R S T V
8 AM – 1 PM. *Sprs:* Kalamazoo ARC and Southwest Michigan AR Team. Kalamazoo County Expo Center, 2900 Lake St. *Tl:* 147.04 (94.8 Hz). *Adm:* $5. Jeff Belknap, N8RWS, 269-205-3560; **n8rws@w8vy.org**; **kalamazoohamfest.com**.

Michigan (Madison Heights) — Oct 26
D F H Q R V
8 AM – 2 PM. *Spr:* Utica Shelby Emergency Communication Assn. United Food and Commercial Workers Hall, 876 Horace Brown Dr. *Tl:* 147.18 (100 Hz). *Adm:* $5. Rosemary Anderson, WB8YAB, 586-382-0831; **rosemarya@gmail.com**; **www.usecaarc.com**.

Michigan (Muskegon) — Oct 18 D F H R S V
8 AM – noon. *Spr:* Muskegon County Emergency Communication Services. Fellowship Reformed Church, 4200 E Apple Ave. *Tl:* 146.82 (94.8 Hz). *Adm:* adv $5, door $6. James Duram, K8COP, 231-638-7010; **hamfest@mcecs.net**; **www.mcecs.net/Hamfest.htm**.

Missouri (Belton) — Oct 18 D H R S V
8 AM – 1 PM. *Spr:* SouthSide ARC. St Sabina Catholic Church, 700 Trevis Ave. *Tl:* 147.12 (151.4 Hz). *Adm:* adv 3 for $7, door $4 each. Forrest Creason, KD0RSX, 816-714-8647; **KD0RSX@gmail.com**; **southsidearc.net**.

Missouri (Kirkwood) — Oct 25 D F H R V
7:30 AM – 1 PM. *Spr:* St Louis ARC. Kirkwood Community Center, 111 S Geyer Rd. 23rd Annual Halloween Hamfest. Breakfast made to order. *Tl:* 147.15 (141.3 Hz). *Adm:* advance $3, door $5. Bob Sluder, N0IS, 636-285-7605; **bcsluder@msn.com**; **www.halloweenhamfest.org**.

Missouri (Nixa) — Nov 8 D F H R S V
8 AM – 2 PM. *Spr:* Nixa ARC. Nixa Event Center, 421 W South St. *Tl:* 147.015 (162.2 Hz). *Adm:* $5. Larry Grinstead, WA0JZK, 417-887-8517; **lgrinste@hotmail.com**; **www.nixahams.net/**.

New Jersey (Township of Washington) — Oct 11 D F H Q R T V
8 AM – 2 PM. *Spr:* Bergen ARA. Westwood Regional Junior/Senior High School, 701 Ridgewood Rd. *Tl:* 146.79 (141.3 Hz). *Adm:* $7. Jim Joyce, K2ZO, 201-664-6725; **k2zo@arrl.net**; **www.bara.org**.

New Mexico (Socorro) — Oct 18
D F H R S T V
8 AM – 2 PM. *Sprs:* Socorro ARA, Tech ARA, and the City of Socorro. NM Firefighters Training Academy, 600 Aspen St. *Tl:* 146.68 (100 Hz), D-STAR 444.5 link 055A. *Adm:* Free. Al Braun, AC5BX, 575-835-3370; **ac5bx@juno.com**; **socorroara.org/hamfest.html**.

New York (Fishkill) — Oct 12 D F R V
8 AM – 2 PM. *Spr:* Mt Beacon ARC. Downstate Correctional QWL, 121 Red Schoolhouse Rd. *Tl:* 146.97 (100 Hz). *Adm:* $5. Adam Nowik Jr, KC2DAA, 845-849-3666; **KC2DAA@aol.com**; **www.wr2abb.org**.

New York (Hicksville) — Oct 26 D F H Q R V
9 AM. *Spr:* Long Island Mobile ARC. Levittown Hall, 201 Levittown Pkwy. Free ham radio tune-up clinic. *Tl:* 146.85 (136.5 Hz). *Adm:* $6. Richard Cetron, K2KNB, 516-694-4937; **K2KNB@arrl.net**; **www.limarc.org**.

New York (Horseheads) — Sep 27
D F H R T V
6 AM – 2 PM. *Sprs:* ARA of the Southern Tier and Chemung County ARES. Chemung County Fairgrounds, Grand Central Ave. 39th Annual Elmira International Hamfest/Computerfest. *Tl:* 147.36. *Adm:* advance $6, door $8. Albert Comfort, KD2DGF, 607-301-0040; **2014Hamfest@ARAST.org**; **www.ARAST.org**.

New York (Queens) — Oct 5 D F H Q R T V
9 AM – 2 PM. *Spr:* Hall of Science ARC. NY Hall of Science Parking Lot (Flushing Meadows Corona Park), 47-01 111th St. Drop and Shop. *Tl:* 444.2 (136.5 Hz). *Adm:* $5. Stephen Greenbaum, WB2KDG, 718-898-5599; **WB2KDG@arrl.net**; **www.hosarc.org**.

North Carolina (Maysville) — Oct 12
D F H R T
8 AM – 2 PM. *Spr:* Maysville Hamfest Assn. Rotary Park Community Center, 704 8th St. *Tl:* 146.52. *Adm:* Free. Byron Highland, K4BMH, 252-347-1498; **bhighland@nc.rr.com**.

Ohio (Conneaut) — Oct 19 D F H R S V
7 AM – 3 PM. *Sprs:* Conneaut ARC and American Legion Ladies Auxiliary Cowle Unit 151. American Legion Hall Cowle Post 151, 272 Broad St. *Tl:* 147.39 (131.8 Hz). *Adm:* $5. J. Michael Pongrass, KD8OSJ, 814-440-6679; **kd8osj@yahoo.com**; **qsl.net/w8bhz/**.

Ohio (Massillon) — Nov 2 D F H Q R S V
8 AM – 2 PM. *Spr:* Massillon ARC. Massillon Boys and Girls Club, 730 Duncan St SW. 54th Annual Hamfest. *Tl:* 147.18 (110.9 Hz). *Adm:* $5. Terry Russ, N8ATZ, 330-837-3091; **truss@sssnet.com**; **www.w8np.org**.

OKLAHOMA SECTION CONVENTION
October 24 – 25, Ardmore, OK
D F H R S V
Friday 5 – 8 PM, Saturday 8 AM – 1 PM. *Spr:* Texoma Hamarama, Inc. Ardmore Convention Center, 2401 N Rockford Rd. *Tl:* 146.97. *Adm:* adv $8, door $10. Don Loving, KM5OX, 580-221-1894; **wallcloud2001@yahoo.com**; **www.texomahamarama.org**.

Oklahoma (Enid) — Nov 1 D F H R S V
8 AM – 2:30 PM. *Spr:* Enid ARC. Garfield County Fairgrounds Hoover Bldg, 302 E Oxford Ave. *Tl:* 145.29. *Adm:* $2. Lois Fox, KC5ZCK, 580-242-4800, **enidfoxes@hotmail.com**; **www.enidarc.org/ENIDHAMFEST**.

PACIFIC NORTHWEST VHF CONFERENCE
October 11, Seaside, OR
Q R S T
8 AM – 4 PM. *Spr:* Pacific Northwest VHF Society. Shilo Inn Suites Hotel Seaside Oceanfront, 30 N Prom. 20th Annual Conference. *Tl:* 144.2 USB. Registration: advance $40, door $50. Jim Christiansen, K7ND, 253-549-4062; **secretary@pnwvhfs.org**; **pnwvhfs.org**.

Pennsylvania (Sellersville) — Oct 19
D F H R T V
7 AM – 1 PM. *Spr:* RF Hill ARC. Sellersville Firehouse, 50 N Main St. *Tl:* 145.31 (131.8 Hz). *Adm:* $6, non-ham spouses and children free. Jim Soete, WA3YLQ, 215-723-7294; **wa3ylq@arrl.net**; **rfhillarc.org**.

Pennsylvania (Washington) — Nov 2
D H Q R S T V
8 AM – 3 PM. *Spr:* Washington Amateur Communications. Washington County Fairgrounds, 2151 N Main St. *Tl:* 146.79, 147.27. *Adm:* $5. Bud Plants, N3TIR, 724-350-6745; **bud@n3tir.com**; **www.wacomarc.org**.

South Carolina (Anderson) — Oct 18
F H R T V
9 AM. *Spr:* Anderson RC. Darwin Wright Municipal Park, 1002 Manse Jolly Rd. *Tl:* 146.79. *Adm:* Free. James Hampton, WA4JWS, 864-932-7478; **brookele@brookelect.com**; **www.andersonradioclub.com**.

South Carolina (Conway) — Nov 8
D F H R S T V
8 AM – 2 PM. *Spr:* Grand Strand ARC. Academy of Hope, 3521 Juniper Bay Rd. *Tl:* 145.11 (85.4 Hz). *Adm:* adv $6, door $7. Jim Wood, KF4CJE, 843-340-1132; **kf4cje@w4gs.org**; **www.w4gs.org**.

South Carolina (Sumter) — Oct 25
D F H R T V
8 AM – 4 PM. *Spr:* Sumter ARA. Bethel Baptist Church Community Center, 2401 Bethel Church Rd. *Tl:* 147.015 (156.7 Hz). *Adm:* $5. Thomas D'Anella, KC4ZTC, 803-661-9934; **tdanella@sc.rr.com**; **sumterhamradio.org/**.

Tennessee (Chattanooga) — Oct 25
D F H R S T V
8 AM – 3 PM. *Spr:* Chattanooga ARC. Alhambra Building, 1000 Alhambra Dr. 36th Annual Hamfest. *Tl:* 146.79. *Adm:* $5. Wayne James, WB4IEJ, 423-899-7970; **waynrdude@aol.com**; **www.Hamfest Chattanooga.org**.

Tennessee (Greeneville) — Oct 18 D F H T V
7 AM – 12:30 PM. *Spr:* Andrew Johnson ARC. Greene County Fairgrounds, 123 Fairgrounds Rd. *Tl:* 145.39 (186.2 Hz). *Adm:* $5. Bob Gass, N4FV, 423-707-7448; **n4fv@yahoo.com**; **www.greenevillehamfest.com**.

Texas (Aransas Pass) — Nov 8 D F H R S T V
8 AM – 2 PM. *Spr:* South Texas ARC. Aransas Pass Civic Center, 700 W Wheeler Ave. 16th Annual South Texas Hamfest, Silent Auction. *Tl:* 146.82 (107.2 Hz). *Adm:* advance $8 (by Oct 25), door $10. Albert DeMeulle, KF5ARJ, 361-633-9330; **info@southtexashamfest.org**; **www.southtexashamfest.org**.

Utah (Logan) — Oct 11 D F H R V
7 AM – 5 PM. *Spr:* Bridgerland ARC. Cache County Fairgrounds, 450 W 500 S. *Tl:* 146.72 (103.5 Hz); D-STAR NU7TS B. *Adm:* Free. Bill Neville, WA7KMF, 435-770-1087; **bill.neville@gmail.com**; **www.barconline.org**.

Washington (Silverdale) — Oct 25 F H R
9 AM – noon. *Spr:* Kitsap County ARC. Silverdale Community Center, 9729 Silverdale Way. *Tl:* 146.44. *Adm:* $3. Ron Sefton, N7EM, 360-779-5418; **rlsefton@comcast.net**; **www.kcarc.org**.

West Virginia (Mineral Wells) — Oct 11
D F H Q R T V
8 AM – 2 PM. *Spr:* Wood County Emergency Communications. Wood County 4-H Campground, Butcher Bend Rd. *Tl:* 147.255 (131.8 Hz). *Adm:* $5. Kenneth Harris, WA8LLM, 304-679-3470; **wa8llm@yahoo.com**; **wc8ec.com**.

Wisconsin (Colby) — Oct 11 D H R
8 AM – noon. *Spr:* Black River ARA. Colby Lions Pavilion, 103 W Adams St. 9th Annual Central Wisconsin Swapfest. *Tl:* 147.15 (114.8 Hz). *Adm:* $3. Bob Braun, KB9BLV, 715-654-5552; **kb9blv@yahoo.com; www.facebook.com/events/1450268595210397/**.

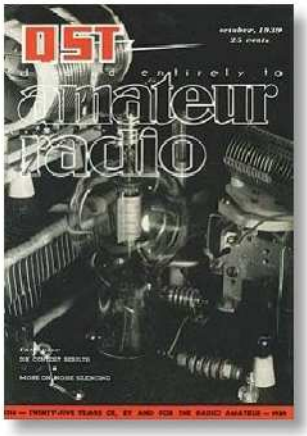
Wisconsin (Hubertus) — Oct 12 D F H R
8 AM – 1 PM. *Spr:* Southeastern Wisconsin FM Amateur Repeater Society. Sterling Chalet, 1271 Hwy 175. *Tl:* 146.82 (127.3 Hz). *Adm:* $5. Darrell Welch, K9ABC, 262-628-1700; **dw@charter.net**; **www.sewfars.com**.

WISCONSIN ARES/RACES CONFERENCE
October 18, Wisconsin Rapids, WI
S
9:30 AM – 4:30 PM. *Spr:* Wisconsin ARES/RACES. McMillan Memorial Library, 490 E Grand Ave. *Tl:* 146.97 (114.8 Hz). *Adm:* Free. Mark Rasmussen, N9MEA, 715-675-4872; **wi.sec@charter.net**; **www.wi-aresraces.org**.

75, 50, and 25 Years Ago

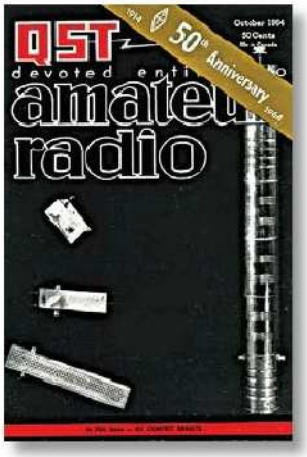
Al Brogdon, W1AB

October 1939



- The cover photo shows the innards of W1TS's new 250 W rig, described in this issue.
- The editorial discusses the war in Europe and looks at the possibilities that loom in the future for American hams. The USA had declared itself a "neutral nation" but, unlike other neutral nations, allowed its hams to stay on the air because of their trusted status by government agencies.
- Don Mix, W1TS, tells about "A Compact ¼-Kw Rig" that he built for all-band HF work, using a 6V6-807-75T tube lineup.
- In "The Series-Valve Noise Limiter," Dana Bacon, W1BZR, presents a new circuit for clipping noise peaks.
- Rex Purcell, VS6BF, spins a thrilling tale of adventure on the high seas. "The Cruise of the 'Pang Jin.'" The oral story was set down on paper by George Polk, XU8GP.
- Reginald Tibbetts, W6ITH, tells us about building "The Band-Edge Locator," a 100-kc crystal oscillator with multivibrator and amplifiers.
- Warren Andrew, W9IVT, reports on "An R.F. Matching Network for General Use" that will match feed lines of various impedances.
- In the compilation "How Would You Do It?," several hams show and tell how they home-brewed their QSL cards using photographic techniques.

October 1964



- The cover photo shows several coaxial tank v.h.f. filters built by Ed Tilton, W1HDQ, and described in this issue.
- The editorial discusses FCC Docket 9295 et seq., about the hoopla surrounding proposed expansion of the phone bands, license classes, incentive licensing, etc.
- Ed Tilton, W1HDQ, tells us how to build "Coaxial Tank V.H.F. Filters," as well as how and where to use them.
- James Hall, W4TVI, discusses "The Effect of Converter Gain on Receiver Noise Figure."
- James McMechan, W0PFP, and Clayton Clifford, K0KPG, present "A Different Satellite-Tracking Antenna System."
- Norman Foot, WA9HUV, tells about "A Lumped-Constant Converter Front End for 432 Mc."

October 1989

- The cover photo montage shows some highlights of "The '80s."
- The editorial discusses two timely subjects — the bioeffects of RF fields, and the WARC bands.
- Wallace Kaufman, KC4EBX, reports on the first joint US-Soviet Amateur Radio operation, in "US-Soviet Radio Relations Thaw in the Arctic."
- In "This Is Not a Drill!," Mike Nickolaus, NF0N, et al., report on hams helping with emergency communication for 5 days following the crash landing of AA flight 232 at the Sioux City Airport in Iowa.
- In "A Computer-Controlled Digitized-Speech System for SSB Contesting," Brian Bergeron, NU1N, tells us how he uses an Apple Macintosh computer to log contacts, check for dupes, time-stamp each contact, and do the speaking for the contest.
- HQ's Zack Lau, KH6CP, tells about designing and building "The QRP Three-Bander," with sidetone, spotting, and full break-in on 18, 21, and 24 MHz.
- "The Bardstown [Kentucky] Experiment," by David Greer, WE4K, reports how the local school system, the local radio club, and a ham newspaper editor put radio into the classroom. The results "surpassed [their] wildest expectations."
- In the "Public Service" column, Gurnee Bridgman, W9NT, writes about communication help furnished by hams, in "Red River of the North — Spring 1989 Flooding" — the worst flooding of the century for that river.

Field Organization Reports

July 2014

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**.

662 W5KAV
462 KI6LNB
440 WA4STO
382 KC8QWH
370 N1UMJ
355 KT2D
317 KD8HPG
265 WD8USA
260 N8FVM
285 K0IBS
282 KD8EBY
248 WB9FHP
243 WB8RCR
240 KW4EMG
233 W8QAS
231 KB8VXE
230 N7YRT KJ4JPE
220 W7GB
218 KK5NU
215 K7OAH
214 W4SEE
213 KC5ZGG
211 N8OSL
210 KB2RTZ
193 WB8YYS
190 W7FQQ
188 KF4DVF
187 WB8R
184 K8RDN
175 WB9WKO VE7GN
170 AG9G N5TMC WA3EZN W2OSR
165 KE5HYW
161 KK7DEB
160 KG0GG KD5RQB KE4CB N7CM K7EAJ WB9JSR
158 N2RDB
155 WB9QPM W9WXN W5DY W4VX W4DNA WB4ZIQ
150 K0VTT
149 KB8TTE
144 AL7N
142 N5TAA
140 K1PJS N8SY WE2G K4IWW K7BDU
135 WS6P WA1STU W0LAW W8DJG
130 W9BGJ K6JT N8IBR W8MAL K7BFL KB1NMO KW1U WB2FTX K2TV
129 N1ZIH
127 KA8ZGY
125 WV8CH WK4WC
121 KD2AKX
120 NN7H KF5TTN KB0DTI KA4FZI KB1RGQ NM1K KA1G NA7G KB8RCR N2WGF
117 W7JSW
116 W1INC
115 KF5IOU KF7PDV K0PTK
114 N1IQI
112 KC8YVF
110 N7EIE KA9QWC KC9UJP K9LGU N9VC NX9K N5NVP N2DW W1KX KC5OZT K6HTN WB6OTS W2EAG N7XG K1HEJ N9MN KB2QQ N1JX
109 NA9L
108 K7RDB
107 W9EEU
106 WB6UZX
105 KB8QKC KF7GC W4TTO N1TF WB8WKQ
103 W0PZD
102 K1MLG
101 KJ7NO
100 K9JM AB1AV AB9ZA K0PTK N0DUX WA0VKC K5KV K6FRG KJ6PCC WA0CGZ K4GK KC8WH KB5KKT N3SW NC3F WA4BAM NU8K NS7K KA2GQQ WB8TQZ
99 KK7TN
98 KE5YTA N3RB
97 N5MBQ
96 W4CPG
95 N9WLW KC0ZDA
94 KF4DAX KJ4HGH
92 KB9KEG K6JGL
91 NE8B
90 WA6IAF KT5SR N5RL K5RG N3KB W8IM KA5AZK WC0W WB4BIK WB8SIQ WG8Z KB8HJJ KZ8Q KC7ASA KD7OED AK4RJ
89 W2CC KC8BW
88 KJ6IJJ W8CPG
KJ4G
87 KU6J KR6LH W8ARR
85 AB1ST KB5SDU KD0NJK W8TBC NX8A
84 KB9PGY KC5TGF KA0DBK
83 WD0GUF AK1NS WB2ZEX
80 AJ7B WA9QIB K0DEU N0MHJ AF7FT KF4OCU KB1WXC WB4RJW K8ED K8KV
79 W5XX N2RTF
78 KC2EMW N1LKJ K2KNB
77 WB8QLT KC2UMX
76 W6KJ W0RJA
75 K4VWK
74 K9DUR
73 K6RAU
72 W8KWG
71 WA5LOU W8WDS
70 K0RXC KD0AYN KD0USN KD7ZUP N0DUW W0FUI N0YOL N2YJZ N2VC WD8DHC KM7N

The following stations qualified for PSHR in previous months but have not been recognized in this column yet: (June) K7GJT 152. (May) WA6IAF 90.

Section Traffic Manager Reports

The following Section Traffic Managers reported: AK, AL, AR, AZ, CT, EB, EMA, ENY, EPA, EWA, GA, IA, ID, IL, IN, KS, LA, LAX, ME, MI, NC, NE, NFL, NH, NLI, NNJ, NNY, NTX, MN, MS, OH, OK, OR, SD, SFL, SJV, SNJ, STX, SV, TN, UT, VA, WCF, WI, WMA, WPA, WV, WY.

Section Emergency Coordinator Reports

The following ARRL Section Emergency Coordinators reported: IA, ENY, EWA, GA, ID, IN, KS, LA, MDC, ME, MI, MN, MO, NC, NFL, NLI, NM, NTX, OH, OK, SNJ, SV, WV, WWA.

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.

K6HTN 1869, WB9FHP 1613, WB6OTS 1332, N1IQI 837, WA4STO 768, K7BDU 751, KW1U 734, K6FRG 733, KZ8Q 641, WA3EZN 588, NX9K 576, N9VC 569, WA1STU 501, W9WXN 500.

BPL with Originations + Deliveries: NM1K 105.

Silent Keys

Silent Keys Administrator, sk@arrl.org

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

K1ARN **Uttin**, Arnold, Barton, VT
W1BRP **Mc Kinney**, Theos D. Jr, Pomona, NJ
W1DDO **Ruplenas**, Robert J., Braintree, MA
W1DOR **Greene**, Warren P., Woonsocket, RI
KA1ETE **Kring**, Jeffery M., Akron, OH
W1FIF **Hunt**, Norman T., De Forest, WI
WA1GCY **Cromwell**, John R., Lunenburg, MA
K1HOF **Elwood**, John F. Jr, Beverly Hills, FL
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sunnyvale@hamradio.com

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• V+V/V+U/U+U operation • Built-in GPS • Built-in TNC for APRS & DX-Cluster operation • 50W 2M & UHF • 1,000 memories • Dual receive • Green or amber backlight colors • Latest APRS firmware w/ new features • Sky Command II remote functions

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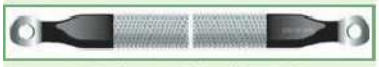
  - *Stranded Center Conductor.*
  - 95% TC Braid + bonded 100% Foil Shield.
  - *Very Flexible, Light Weight, and Smaller than RG8 sizes.*
  - Non-Contaminating-UV Resistant-Direct Burial-Black Jacket.



- ***235-5X-(length) 1" Wide Tin-Copper w/Ring Terminals Each End. Adhesive-Lined Heat Shrink Tubing.***
  - *Grounding Braid Heavy Grade.*
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Source Code: QST 2/2014

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New!

Receiver Guard 5000

Protect your sensitive receiver against high levels of RF from strong or nearby signals. DX Engineering's Receiver Guard 5000 is perfect if you have a receive antenna saturated with high RF levels. It is also useful for Field Day, SWL or if your neighbor generates a lot of RF.

The RG-5000's advanced design limits strong signals with minimal harmonic noise and is RF transparent at normal receiver signal levels. Designed for the world-class multi-transmitter contest station K3LR, it offers 100% protection to expensive transciever front-ends. The RG-5000 provides performance and frequency coverage superior to other devices. At a continuous input of 10 W maximum, output is only +10 dBm (83 dB over S-9), and insertion loss is under 0.15 dBm 0.5 to 50 MHz.

DXE-RG-5000 Receiver Guard 5000 ..... **$69.95**

New!

Copper Ground Rod Clamp

This clamp is the perfect mounting platform for up to six of the common coaxial protector models from PolyPhaser and Alpha Delta, sold separately. It secures to a 1/2"- 5/8" O.D. ground rod using the included stainless hardware. *The clamp is shown with optional parts.*

DXE-UCGC Copper Ground Rod Clamp **$48.95**

New!

Rotator Control Line Protector

This unit has eight individual terminals that will automatically shunt to ground when voltage spikes above 82 Vdc, in either polarity. It features a gasketed, weatherproof metal enclosure with an integrated stud for easy mounting.

DXE-IS-RCT Rotator Control Line Protector ... **$169.95**

New!

Dual Vertical Array

The Dual Vertical Array is an easy-to-install two-element vertical antenna phasing system that offers great HF performance. It uses a new design to increase array efficiency by eliminating the waste load port found on previous systems. The array can handle 2 kW, with a front-to-back over 20 dB and up to 3 dB of gain over a single vertical.

The DX Engineering Dual Vertical Array systems are available for the 160, 80 and 40 meter bands. More bands are coming soon.

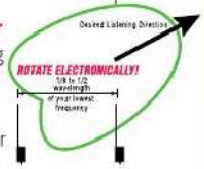
DXE-DVA-160-P Dual Vertical Array, 160M with controller **$469.90**

DXE-DVA-80-P Dual Vertical Array, 80M with controller **$454.90**

DXE-DVA-40-P Dual Vertical Array, 40M with controller **$439.90**

See the August 2014 issue of QST for the DXE-AAPS3-1P Review.

Receive Antenna and Noise Phasing Controller



Combine two identical receiving antennas to create a directional pattern. The controller lets you adjust the antenna pattern as if you were physically moving your antennas.

- Exceptional dynamic range—nearly 1,000 times (30 dB) better than nearest competitor
- Phasing rotates more than 360° with smooth control
- Low-noise, high dynamic range amplifiers
- Phases out noise from a single direction
- Works on all modes, 300 kHz to 30 MHz
- Provides power for external active antennas

DXE-NCC-1 Receive Antenna Variable Phasing Controller only **$599.95**

DXE-AAPS3-1P Active Antenna Phasing System with Controller **$1,133.95**

New!

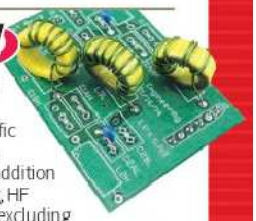
Cable Grippers

These grippers are the perfect complement to DX Engineering's Coaxial Cable Prep Tools. They help you securely hold your cable while you're doing the proper prep. They're also effective for holding the cable as you're pulling it off a spool or out of a box for a run.

DXE-CG-8U Cable Gripper for RG-8U Size Cable **$14.95**

DXE-CG-8X Cable Gripper for RG-8X Size Cable **$14.95**

NCC-1 Optional Receive Filters



New!

These filters are an upgrade to your NCC-1 Receive Array Phasing Unit, offering enhanced, frequency-specific directional noise and signal nulling performance. They're an excellent addition to your NCC-1 if you enjoy AM DXing, HF operation and SWL. By reducing or excluding frequency-specific signals that normally cause interference, these filters lower the noise floor of the desired pass-band to dramatically improve reception.

They have a nominal insertion loss of 1 dB. Purchase your filters in pairs, so you can match each receive antenna input to its corresponding pass-band slot on the NCC-1.

Part Number	Description	Band(s)
DXE-RXFL-LP160M	Low Pass	160M & below
DXE-RXFL-LP80M	Low Pass	80M & below
DXE-RXFL-LP40M	Low Pass	40M & below
DXE-RXFL-LP20M	Low Pass	20M & below
DXE-RXFL-LP15M	Low Pass	15M & below
DXE-RXFL-LP10M	Low Pass	10M & below
DXE-RXFL-HP160M	High Pass	160M & above
DXE-RXFL-HP80M	High Pass	80M & above
DXE-RXFL-HP40M	High Pass	40M & above
DXE-RXFL-HP20M	High Pass	20M & above
DXE-RXFL-HP15M	High Pass	15M & above
DXE-RXFL-HP10M	High Pass	10M & above
DXE-RXFL-BPF160M	Band Pass	160M
DXE-RXFL-BPF80M	Band Pass	80M
DXE-RXFL-BPF40M	Band Pass	40M
DXE-RXFL-BPF20M	Band Pass	20M
DXE-RXFL-BPF15M	Band Pass	15M
DXE-RXFL-BPF10M	Band Pass	10M

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Bulk Cable	Impedance	Length	Price
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DXE-8X	50 Ω	per foot	**$0.38**
DXE-8X-1000	50 Ω	1,000'	**$299.99**
Low-Loss Cable			
DXE-213U	50 Ω	per foot	**$0.89**
DXE-213U-500	50 Ω	500'	**$389.95**
DXE-11U	75 Ω	per foot	**$0.52**
Premium Low-Loss Cable			
DXE-400MAX	50 Ω	per foot	**$0.92**
DXE-400MAX-500	50 Ω	500'	**$399.95**
Low-Loss Foam Cable			
DXE-8U	50 Ω	per foot	**$0.84**
DXE-8U-500	50 Ω	500'	**$369.95**
Highly Flexible Cable			
DXE-58AU	50 Ω	per foot	**$0.29**
Flooded Jacket Cable			
DXE-F6-CTL	75 Ω	per foot	**$0.19**
DXE-F6-1000	75 Ω	1,000'	**$149.95**

New!

Made in USA

*DX Engineering's Revolutionary PL-259 Connector**

A "Better Mousetrap" Approach to Your Cable.

This brand new PL-259 design has a full-diameter, full-length soldered center pin, which means it will fit snugly into a well-worn SO-239. The large center pin also makes it easier to flow solder inside, further securing the conductor. The silver plated and deeply knurled shell has precise threads to promote a solid connection with the SO-239. Each of these PL-259 connectors is insulated with a PTFE dielectric for exceptional RF characteristics. You can only get this new connector design at DX Engineering.

***Patent Pending**

The New PL-259 is Used Exclusively on DX Engineering Cable Assemblies.

DX Engineering starts with the highest-performance, low-loss 8U, 213U and 400MAX coaxial cable, and then finishes each assembly with its revolutionary new PL-259 connectors. The connectors feature a machine-crimped shield that provides a 360° electro-mechanical connection. Every weather-shielded, hand-soldered assembly is hi-pot and continuity tested in the USA. They come in multiple lengths; custom lengths are also available.

DX Engineering is the Best Place to Get Coax, Here's Why:

- 100% High Voltage (Hi-Pot) Tested
- Weatherproof: Adhesive Shrink Tubing Seals Connections
- Silver-plated PTFE-insulated Connectors
- Hand Crafted by Top Techs
- See DXEngineering.com for more connector options

Black PVC Jacket

DXE-8U 50Ω Low-Loss Foam Dielectric Cable

- .405" high-flex PVC jacket

Attenuation per 100 feet	Power Rating	Efficiency
0.3 dB @ 5 MHz	5.4 kW	93%
0.5 dB @ 10 MHz	4.1 kW	90%
0.9 dB @ 30 MHZ	2.2 kW	81%
1.2 dB @ 50 MHz	1.8 kW	77%
2.2 dB @ 150 MHz	1.0 kW	60%

UV-Resistant, Non-Contaminating, Black PVC Jacket

DXE-213U 50Ω MIL-Spec Cable

- .405" Type II UV-resistant jacket is non-contaminating and suitable for outdoor use

Attenuation per 100 feet	Power Rating	Efficiency
0.4 dB @ 5 MHz	4.9 kW	90%
0.6 dB @ 10 MHz	3.4 kW	87%
1.0 dB @ 30 MHz	2.0 kW	79%
1.3 dB @ 50 MHz	1.5 kW	73%
2.4 dB @ 150 MHz	0.9 kW	57%

UV-Resistant, Non-Contaminating, Black PE Jacket

DXE-400MAX 50Ω Premium Low-Loss Cable

- Gas-injected foam, polyethylene dielectric bonded tape foil covered by a braided copper shield
- .405" low-density UV-resistant polyethylene jacket is ideal for outdoors
- Direct-bury

Attenuation per 100 feet	Power Rating	Efficiency
0.3 dB @ 5 MHz	6.9 kW	93%
0.5 dB @ 10 MHz	4.8 kW	90%
0.8 dB @ 30 MHz	2.8 kW	83%
1.1 dB @ 50 MHz	2.1 kW	79%
1.8 dB @ 150 MHz	1.2 kW	65%
3.3 dB @ 450 MHz	0.7kW	47%

UV-Resistant, Black PE Jacket

DXE-8X Low-Loss Foam Dielectric Cable

Known as RG-8X or Mini-8

- Very flexible; ideal for short, in-shack jumper cables
- .242" Type II jacket is non-contaminating and UV-resistant
- Direct-bury

Attenuation per 100 feet	Power Rating	Efficiency
0.6 dB @ 5 MHz	3.0 kW	86%
0.9 dB @ 10 MHz	2.2 kW	81%
1.4 dB @ 30 MHz	1.2 kW	69%
2.0 dB @ 50 MHz	0.9 kW	62%
3.8 dB @ 150 MHz	0.4 kW	42%

DX Engineering Cable is Available in Pre-Cut Assemblies with Connectors.

DX Engineering Cable Assemblies are built by our techs, right here in Ohio. They're fully tested and are ready for installation in your shack. For all lengths and connector options, visit DXEngineering.com.

Pre-cut Cable, PL-259 Connectors		
Part Number	Length	Price
DXE-8UDX002	2'	**19.95**
DXE-8UDX003	3'	**$20.95**
DXE-8UDX006	6'	**$23.95**
DXE-8UDX025	25'	**$43.95**
DXE-8UDX050	50'	**$68.95**
DXE-8UDX100	100'	**$118.95**

Pre-cut Cable, PL-259 Connectors		
Part Number	Length	Price
DXE-213UDX003	3'	**$20.45**
DXE-213UDX006	6'	**$22.45**
DXE-213UDX012	12'	**$26.45**
DXE-213UDX025	25'	**$43.45**
DXE-213UDX050	50'	**$68.45**
DXE-213UDX075	75'	**$96.45**
DXE-213UDX100	100'	**$118.45**
DXE-213UDX150	150'	**$178.45**

Pre-cut Cable, PL-259 Connectors		
Part Number	Length	Price
DXE-400MAXDX003	3'	**$21.45**
DXE-400MAXDX006	6'	**$24.45**
DXE-400MAXDX018	18'	**$31.45**
DXE-400MAXDX025	25'	**$44.45**
DXE-400MAXDX050	50'	**$69.45**
DXE-400MAXDX075	75'	**$97.45**
DXE-400MAXDX100	100'	**$119.45**
DXE-400MAXDX150	150'	**$179.45**

Pre-cut Cable, PL-259 Connectors		
Part Number	Length	Price
DXE-8XDU003	3'	**$18.45**
DXE-8XDU006	6'	**$19.45**
DXE-8XDU012	12'	**$24.45**
DXE-8XDU025	25'	**$29.45**
DXE-8XDU050	50'	**$37.45**
DXE-8XDU075	75'	**$44.45**
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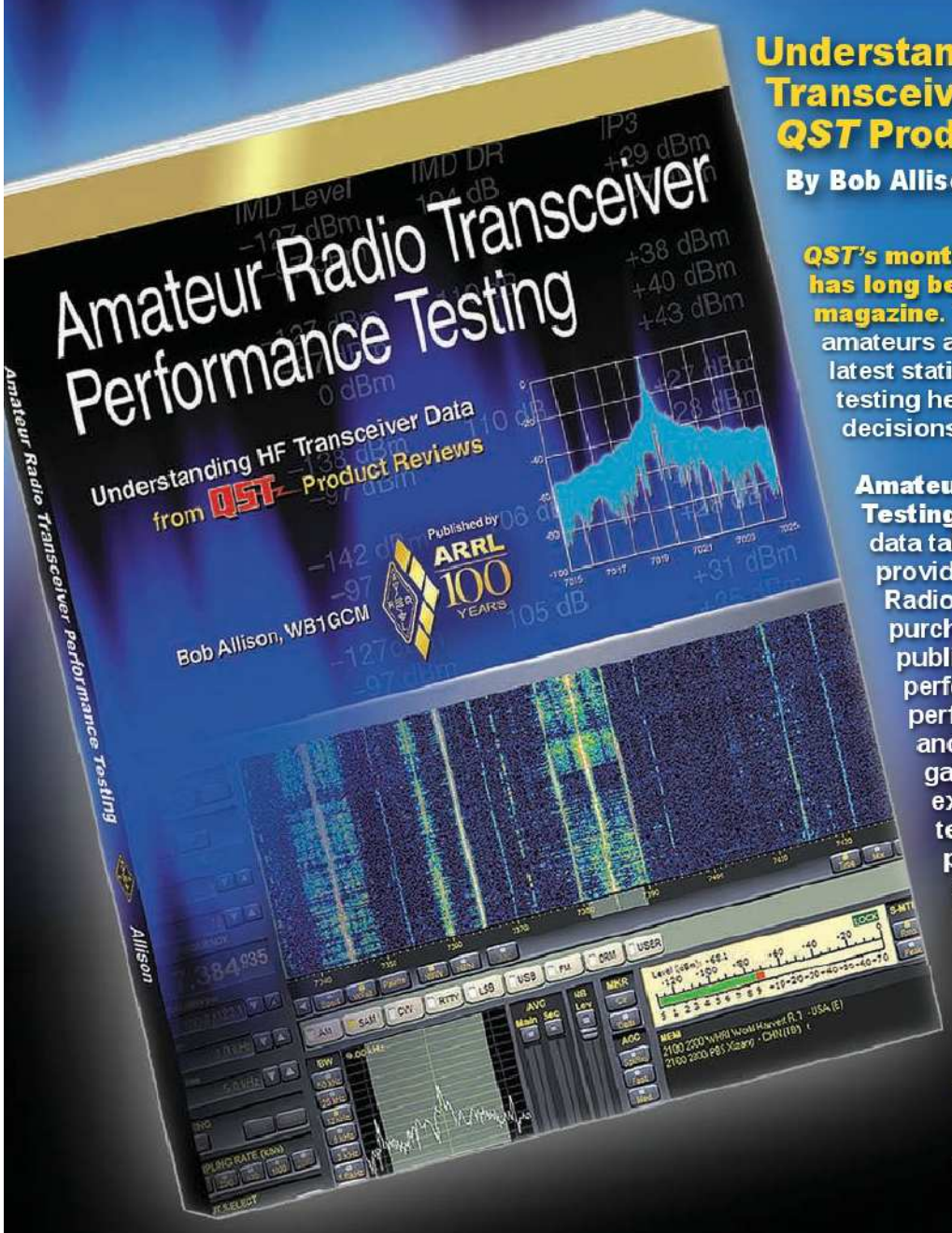
Amateur Radio Transceiver Performance Testing



Understanding HF Transceiver Data from *QST* Product Reviews

By Bob Allison, WB1GCM

***QST*'s monthly "Product Review" column has long been the most-read section of the magazine.** That's not surprising as most radio amateurs are interested in reading about the latest station equipment — and product review testing helps operators make informed decisions based on their needs.

Amateur Radio Transceiver Performance Testing explains in detail the performance data tables from *QST* Product Reviews, providing a valuable resource for Amateur Radio operators who are looking to purchase a transceiver. It discusses how published laboratory data relates to actual performance, how each major test is performed, the significance of each test, and what the numbers mean. You'll gain a better understanding of the extensive testing ARRL performs, technical terms and parameters presented in Product Review, and develop the capability to reach your own conclusion about which HF transceiver is best for you.

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- Certified yield stress rating over 100,000 psi
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This preamp could make the difference between barely hearing distant stations and actually working that rare DX. It features a BF981 FET ultra low-noise design. Gain is adjustable from 10 to 28 dB. The preamp is specifically tailored for monoband 160M operation. Visit DXEngineering.com for more options from KD9SV Products.

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DXE-AOK-DCF	SO-239 Add-On Kit to BTV Base	**$28.95**
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2X Arrays

Get on the 20/15/10 meter bands with an antenna that can withstand 100 mph winds. Its durability makes it ideal for permanent installations, but it's compact and light enough to be used during Field Day. The TX38 was also selected as the official tri-band antenna of WRTC 2014.

TXA-3B-8L-WRTC TX38 Yagi Antenna ..... was ~~$1,199.00~~
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Whether you are building a Yagi from scratch, refurbishing a well-used "old friend," or experimenting with a new antenna project, DX Engineering can supply the best hardware for your application. You can find useful tips and complete dimensions for each clamp and bracket type at DXEngineering.com.

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These stainless steel brackets have two holes for chassis- or bulkhead-mount connectors (not included). Each bracket comes with a stainless steel V-bolt and hardware.

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Use DX Engineering's Guy Rings to secure your rope guys and stabilize your aluminum vertical antenna. They work with three- and four-way guying systems and are a great complement to our tubing kits. These guy rings are super strong, virtually impervious to the elements and fit 0.75", 1.0", 1.25", 1.50" and 2.0" O.D. tubing.

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These kits contain seven sections of high quality smoothly telescoping tubing from 2" to 1/2" O.D. and new DX Engineering Compression Clamps for maximum tubing grip and strength. Perfect for portable operation, camping, Field Day or experimenting, these kits are an excellent way to get your antenna wire in the air quickly.

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The Best Aluminum Tubing Available

Just Add Clamps and Slide It Together for a Complete Antenna Element!

6063-T832 Aluminum Tubing

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3' lengths .058" wall - 3/8" to 2 1/8" O.D.

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Perfect for Most Elements

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When the band is open there's no time to lose!

YOU'RE GOOD TO

It was around eight in the evening and the house was pretty quiet. The kids were finally in bed, and the XYL was working on her dissertation. I tell you, when she gets that masters in psychology I'm gonna be in a world of trouble. Anyway, I retreated to the shack and turned on the HF rig to see if there was anything left of 20 meters this late. Mostly not, but as I got down toward the low end of the phone band I heard a whole bunch of faint stations calling a VP8S. I had to look it up; it's a rare DX island in the South Atlantic. I'm thinking "Yeah right, like I can bust through a pileup and work someplace like that with 100 watts and a dipole." Just then the DX station answered someone, and he nearly woke up my kids! He was booming in 10 over 9! It was one of those flukes of propagation, and I figured it might not last long; here was my chance to work some real DX. Down that low in the band my dipole gets pretty reactive, so I ran my transceiver's built-in tuner. It went something like this:

Me: Ok radio, tune me up.
Radio: Whirrr... whirrr... Uhh, no.
Me: No? What do you mean "No"?
Radio: Dude, have you seen the SWR down there? It's like 4:1!
Me: Yeah, so?
Radio: No can do, Boss. How about the top of the band again? I'm ok up there.
Me: Not good, radio... not good at all.

Well I'm paraphrasing of course, but that was pretty much it. Ok, no worries; I have an LDG tuner too – it's good to an SWR of 10:1. I took it out of bypass mode, tuned off frequency, changed to AM mode, reduced the power, keyed down and started the tuner. I waited until it finished, un-keyed, switched back to sideband mode, reset to full power, and tuned back to the DX frequency just in time to hear: "Sorry guys, but we have to QRT. 73s, and thanks... click!" And that was it; my VP8S was gone, probably forever.

Even if you have an automatic tuner, matching a modern radio to your antenna can be a lot like playing a concerto on the piano; you have to hit half a dozen keys in just the right sequence. And if you're still using a manual tuner, like one with two knobs and a roller inductor or something, well... fuggedaboutit. And, most radio's built-in tuners are limited an SWR of 3:1 at most; my droopy old dipole is lots worse than that down at the low end of the band.

Well, there's good news. Not only do LDG tuners work automatically, with thousands of memories for instant re-tuning on previously tuned frequencies, LDG makes special models specifically designed to seamlessly integrate with Kenwood, Yaesu, Icom and Alinco transceivers. You just press the Tune button and the tuner takes over, setting mode and power, tuning and returning to the previous mode and power in seconds. And if you're re-tuning on a frequency you've used before, the tuner reads the frequency digitally from the radio, and resets from memory almost instantly, with no tuning transmission at all. It's just what you need for pouncing on that rare DX or contest station before it's gone.

LDG brand-specific tuners include custom cables to connect to your transceiver, as well as a coax jumper for RF. Most are powered by the radio itself; just plug it in and you're good to go with an integrated tuner that will match just about any coax-fed antenna at SWRs up to 10:1. LDG also sells baluns so you can easily use longwires, or antennas fed with ladder line.

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ALL TUNERS 2000 MEMORIES

NEW YT-1200

Designed for Yaesu's FT-450, FT-450D, FT-950, FTDX-1200, FTDX-3000 and FT-2000 (non-D). Seamless integration similar to the popular YT-450. The tuner is powered by the transceiver (except the FT-2000). It has a CAT port pass-through so you can use computer control of the transceiver when using this tuner. Power and control through the provided interface cable.

Suggested Price $259.99

AT-897Plus

Mounts on the side of your FT-897 just like the original and takes power directly from the CAT port of the FT-897 and provides a second CAT port on the back of the tuner so hooking up another CAT device couldn't be easier.

Suggested Price $199.99

AL-100

Compatible with all Alinco radios including the new DX-SR8T (includes Alinco interface cable). The AL-100 is the definitive low cost automatic antenna tuner for the definitive low cost Amateur transceiver!

Suggested Price $149.99

IT-100

Matched in size to the Icom IC-7000 and IC-706. Control the IT-100 and its 2000 memories from either its own button or the Tune button on your IC-7000 or other Icom rigs. For your Icom radio that is AH3 or AH-4 compatible.

Suggested Price $179.99

YT-100

For Yaesu FT-857, FT-897 and FT-100 (and all D models) an integrated tuner, powered by the interface. Press the tune button on the tuner, and everything else happens automatically.

Suggested Price $199.99

radio not included

KT-100

For AT-300 compatible Kenwood transceivers (except TS-480HX). The KT-100 allows you to use the Tune button on the radio. 2,000 memories for instant recall of tuning parameters for favorite bands and frequencies.

Suggested Price $199.99

Z-817

The ultimate autotuner for QRP radios including the Yaesu FT-817(D). Tuning is simple; one button push on the tuner is all that is needed - the Z-817 takes care of the rest. 2000 memories cover 160 through 6 meters.

Suggested Price $129.99

Z-817H

The ultimate autotuner for QRP radios including the Yaesu FT-817(D) with addition of the Tokyo High Power HL-45B. Interfaces to the CAT port (ACC) on the back of the radio with the provided cable.

Suggested Price $159.99

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HAM-IV

HAM-IV **$649.95**

The most popular rotator in the world!

For medium communications arrays up to 15 square feet wind load area. *Has* 5-second brake delay, Test/Calibrate function. Low temperature grease permits normal operation down to -30 degrees F. Alloy ring gear gives extra strength up to 100,000 PSI for maximum reliability. *Precision* indicator potentiometer. Ferrite beads reduce RF susceptibility. Cinch plug plus 8-pin plug at control box. Dual 98 ball bearing race for load bearing strength and electric locking steel wedge brake prevents wind induced movement. North/South center of rotation scale on meter, low voltage control, max mast $2^{1}/_{16}$".

HAM-VI **$749.95** with DCU-2

HAM-VII **$799.95** *with DCU-3*

HAM IV and HAM V Rotator Specifications	
Wind Load capacity (inside tower)	15 square feet
Wind Load (w/mast adapter)	**7.5 square feet**
Turning Power	800 in.-lbs.
Brake Power	**5000 in.-lbs.**
Brake Construction	Electric Wedge
Bearing Assembly	**dual race/96 ball bearings**
Mounting Hardware	Clamp plate/steel U-bolts
Control Cable Conductors	**8**
Shipping Weight	26 lbs.
Effective Moment (in tower)	**2800 ft.-lbs.**

TAILTWISTER SERIES II

T-2X **$799.95**

T-2XD2 **$899.95** with DCU-2

T-2XD3 **$949.95** with DCU-3

For large medium antenna arrays up to 20 sq. ft. wind load. Has 5-second brake delay, Test/Calibrate functions. Low temp grease, tough alloy ring gear, indicator potentiometer, ferrite beads on potentiometer wires, weatherproof AMP connectors plus 8-pin plug at control box, triple bearing race with 138 ball bearings for large load bearing, electric locking steel wedge brake, North/South center of rotation scale meter, low voltage control, $2^{1}/_{16}$" max mast. **MSHD, $109.95.** Above tower heavy duty mast support. T2X, HAM-IV, HAM-V, HAM-VI. Accepts $1^{7}/_{8}$-$2^{5}/_{8}$" OD.

TAILTWISTER Rotator Specifications	
Wind load capacity (inside tower)	20 square feet
Wind Load (w/ mast adapter)	**10 square feet**
Turning Power	1000 in.-lbs.
Brake Power	**9000** in.-lbs.
Brake Construction	Electric Wedge
Bearing Assembly	**Triple race/138 ball brngs**
Mounting Hardware	Clamp plate/steel U-bolts
Control Cable Conductors	**8**
Shipping Weight	31 lbs.
Effective Moment (in tower)	**3400 ft.-lbs.**

CD-45II

CD-45II **$449.95**

For antenna arrays up to 8.5 sq. feet mounted inside tower or 5 sq. ft. with mast adapter. Low temperature grease good to -30 F degrees. *New* Test/Calibrate function. Bell rotator design gives total weather protection, dual 58 ball bearing race gives proven support. Die-cast ring gear, stamped steel gear drive, heavy duty, trouble free gear train, North center scale, lighted directional indicator, 8-pin plug/socket on control unit, snap-action control switches, low voltage control, safe operation, takes maximum mast size to $2^{1}/_{16}$ inches. MSLD light duty lower mast support included.

CD-45II Rotator Specifications	
Wind load capacity (inside tower)	8.5 square feet
Wind Load (w/ mast adapter)	**5.0 square feet**
Turning Power	600 in.-lbs.
Brake Power	**800 in.-lbs.**
Brake Construction	Disc Brake
Bearing Assembly	**Dual race/48 ball brings**
Mounting Hardware	Clamp plate/steel U-bolts
Control Cable Conductors	**8**
Shipping Weight	22 lbs.
Effective Moment (in tower)	**1200 ft.-lbs.**

hy-gain® *Programmable* DCU-3 Digital Rotator Controller

New!

DCU-3 **$449.95**

Hy-gain DCU-3 Digital Controller lets you program 6 beam headings! Gives you full automatic or manual control of your hy-gain HAM or Tailtwister Rotators.

Press a memory button or dial in your beam heading or let *Ham Radio Deluxe* (or other) take control. Your antenna auto rotates precisely and safely to your DX.

DCU-3 automatically jogs your antenna free and safely unlocks it before rotating begins *(great for older rotators with "sticky" brakes)* then turns off your motor before reaching its final heading. Your antenna *gently* coasts to a stop before the brake re-locks -- greatly reducing damaging overshoots and extending rotator life.

Simply press *Left* and *Right* buttons for *full* manual control and fine tuning.

Bright blue LCD shows current, dialed-in and computer controlled beam headings in one degree increments and your call.

Calibrate lets you accurately match your display to your *true* beam heading. Has USB/RS-232 ports for computer control. Adjustable LCD sleep time. Field upgradeable firmware. 8.5Wx4.3H x9D". 110 VAC. Order **DCU-3X** for 220 VAC.

DCU-2 Digital Rotator Controller

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AR-40

AR-40 **$349.95**

For compact antenna arrays and large FM/TV up to 3.0 square feet wind load area. Dual 12 ball bearing race. Automatic position sensor never needs resetting. Fully automatic control -- just dial and touch for any desired location. Solid state, low voltage control, safe and silent operation. $2^{1}/_{16}$ inch maximum mast size. MSLD light duty lower mast support included.

AR-40 Rotator Specifications	
Wind load capacity (inside tower)	3.0 square feet
Wind Load (w/ mast adapter)	**1.5 square feet**
Turning Power	350 in.-lbs.
Brake Power	**450 in.-lbs.**
Brake Construction	Disc Brake
Bearing Assembly	**Dual race/12 ball bearings**
Mounting Hardware	Clamp plate/steel bolts
Control Cable Conductors	**5**
Shipping Weight	14 lbs.
Effective Moment (in tower)	**300 ft.-lbs.**

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Variable DC motor speed for minimizing damaging antenna overshoot and fast operation. Intuitive menu for calibrating, offsetting, or changing parameters. Field upgradeable firmware. Use with Yaesu G-800/1000/2800/G450/650. For AC or DC motors.

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TH-D72A
2M/440 FM HT with Built in GPS

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• TX: 144-148, 430-450 MHz • RX: 118-524, 800-1300 MHz (cell blocked) • Power: 50/10/5W • Dual receive (V+V) (U+U) • Cross-band repeat • EchoLink® ready • Optional RC-D710 can replace the TM-V71A control panel to enable all the features of the original TM-D710A

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TS-480HX 200W HF/6M Mobile

• TX:HF/6M • RX: 0.5-60 MHz • Power: 10-200W (with two optional 22A PS's) • Memories: 99 • IF/stage DSP on main band, AF/stage DSP on sub-band

TS-480SAT 100W with auto antenna tuner.

TS-2000 HF/VHF/UHF Transceiver

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$40 MAIL-IN REBATE

FTM-400DR 2M/440FM Transceiver

TX: 2M/70cm RX: 108-470/800-999MHz (cell blkd) • Power: 50W FM • C4FM FDMA w/GPS for APRS (1200/9600bps) • Packet Ready Color display • Spectrum scope • ARTS • Bluetooth • Twin RX • MicroSD slot • 12/30kHz filters • 500 memories/band

$60 MAIL-IN REBATE

FT-270R 2M FM HT

• TX: 144-148 • RX: 136-174 • Power: 5/2/0.5W • 200 Memories • Extra large LCD display & speaker

VX-6R 2M/440 FM HT

•TX: 144-148, 222-225, 430-450 • RX: 0.5-999 (cell blkd) • Power: 5/2.5/1/0.3W (1.5W on 220) • 900 Memories

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• TX: 50-54, 144-148, 222-225, 430-450 MHz • RX: 0.5-999 MHz (cell blocked) • 1200+ Memories • Power: 5/2.5/1/0.05W (1.5W on 220 MHz) • Optional GPS Unit FGPS-2 with either CT-136 adapter or MH-74A7A hand microphone provides APRS® data

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$80 MAIL-IN REBATE

FT-450D HF/6M Transceiver

• TX: HF/6M • RX: 0.03-56 MHz • Power: 10-100W • Memories: 500 • Built-in Automatic Antenna Tuner • IF DSP • Same as the original FT-450AT with new features: Key illumination, Foot stand, Selectable 300 Hz/500 Hz/2.4 kHz CW IF Filters • Classically designed main dial and knobs • dynamic microphone

FTDX-1200 HF/6M Transceiver

• TX: HF/6M • RX: 0.03-56 MHz • Triple Conversion with 32-bit floating point DSP • Power: 100W • Built-in Automatic Antenna Tuner • 40 MHz IF with selectable 3 kHz, 6kHz & 15 kHz Roofing Filters • FM & AM Wide and Narrow modes included • Optional built-in FFT UNIT supports advanced functionality including AF-FFT Scope • RTTY/PSK31 Encode/Decode • CW Decode and CW Auto Zero-in • Full Color 4.3 in. TFT Color Display • USB port

FTDX-3000D HF/6M Transceiver

• TX: HF/6M • RX: 0.03-56 MHz • Power: 5-100W • Large TFT color display • High-speed spectrum scope • High end receiver based off of the FTDX-5000 • IPO • Built-in USB interface • Remote Control Capability • High-speed auto antenna tuner • RTTY/PSK31encode/decode included • 5 Digital voice messages

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• TX: 1.8-29.7, 50-54 MHz Power: 10-200W on CW, SSB, FM, RTTY & PKT and 5-50W on AM • RX: 0.03-60 MHz • 99 Memories • Agressive 112dB range • +40dBm IP3 or 3rd-order Intercept Range • High stability ±0.05ppm OCXO • 32-bit Floating Point DSP • Variable CW Audio Peak Filter, and High/Low-Cut DSP filtering • 300 Hz, 600Hz, 3 kHz, 6kHz and 15 kHz Roofing Filters

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HF/VHF/UHF All Mode Transceiver

• TX: HF/6M/2M/440MHz • RX: 0.03-199.999, 400-470 MHz MHz • Power: 2-100W/2-50W (2M)/2-35W (440) • Memories: 495, 900 D-Star Repeater Channels • Remote Head • Intuitive Touch Screen Interface • D-Star DV Mode • Detachable Angled Screen • SD Memory Card Slot • USB Port • Optional RS-BA1 Remote Control Software • Optional RC-28 USB Remote Encoder

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IC-7200 HF/6M Portable Transceiver

• TX: HF/6M • RX: 0.03-60 MHz • Power: 2-100W • Memories: 201 • Rugged design for outdoor use • 32-bit IF-DSPs + 24-bit AD/DA Converters • USB Port for CI-V Format PC Control and Audio In/Out

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IC-7410 HF/6M Transceiver

• TX: HF/6M • RX: 0.03-60 MHz • Power: 2-100W • 15kHz 1st IF Filter and optional 3kHz & 6kHz filters to proted against strong unwanted adjacent signals • Much faster DSP unit compared to the IC-746PRO • Automatic antenna tuner • USB connector for PC control

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IC-7600 HF/6M Transceiver

• TX: HF/6M • RX: 0.03-60 MHz • Power: 2-100W • Memories: 101 • 5.8 inch color screen • High-resolution real spectrum scope • Automatic antenna tuner

$100
INSTANT
COUPON

IC-9100 HF/6/2M/440 MHz All Mode

• TX: HF/6/2M/440 MHz • RX: 0.03-60, 136-174, 420-480 MHz • Optional 1.2 GHz, 1-10W Operation • Power: 2-100W HF/6/2M & 2-75W 440 MHz • Memories: 297 • Optional D-Star Board • Auto Tuner • +30dBm class third-order intercept point • Optional 3 kHz & 6 kHz Roofing Filters (first IF) • USB Port for PC Control • Optional Remote Control Software • Optional RC-28 USB Remote Encoder • Much More!

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800-321-3594
cleveland@aesham.com

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MFJ ANALYZERS

MFJ-269C . . . 530 KHz - 230 MHz plus 415-470 MHz, 12-bit A/D

New and improved. Now covers 530 KHz to 230 MHz and 415 to 470 MHz!

Instantly gives you a complete picture of your antenna.

Read SWR, return loss, reflection coefficient, match efficiency at any frequency simultaneously.

Read Complex Impedance (530 KHz to 230 MHz) as series equivalent resistance and reactance (Rs+jXs) or as magnitude (Z) and phase (degrees). Also reads parallel equivalent resistance and reactance (Rp+jXp).

Determine velocity factor, coax loss in dB, length of coax and *distance to short or open in feet (it's like a built-in TDR).*

Coax Calculator™ calculates coax line length in feet given degrees and vice versa for any frequency and velocity factor.

Measure SWR and loss of coax with *any* characteristic impedance (530 KHz to 230 MHz) from 10 to over 600 Ohms.

Measures inductance in uH and capacitance in pF at RF frequencies, 530 KHz to 230 MHz.

High contrast LCD gives precision readings and two side-by-side analog meters make antenna adjustments smooth and easy.

12-bit A/D converter gives much better accuracy and resolution than common 8-bit A/D converters -- *MFJ-269C exclusive!*

Built-in frequency counter, battery saver, low battery warning, Ni-Mh/NiCd charge circuit. 4Wx2Dx6¾ inches, 2 lbs. Use ten double A batteries or 110 VAC with MFJ-1312D, $15.95.

New! MFJ-269C **$399.95**

MFJ *No Matter What™* Warranty

Every MFJ analyzer is protected by MFJ's famous one year No Matter What™ limited warranty. We will repair or replace your MFJ analyzer (at our option) for a full year.

MFJ-269C *PRO™* Analyzer

MFJ-269CPro, $429.95. Like MFJ- 269C, but UHF range covers ***430 to 520 MHz*** to include commercial industrial frequencies. Rugged protective shell protects knobs, switches, meters, LCD for industrial/lab work.

More hams use MFJ analyzers than all others in the world!

MFJ-259C 530 KHz to 230 MHz

World's most popular analyzer

New!

MFJ-259C **$299.95**

World's most popular antenna analyzer is new and improved. Now covers 530 KHz to 230 MHz!.

Super easy-to-use -- Read antenna SWR, complex impedance, return loss, reflection coefficient. Determine velocity factor, coax cable loss in dB, length of coax and distance to short or open in feet. Read inductance in uH, capacitance in pF at RF frequencies. Large easy-to-see two line LCD screen and side-by-side meters clearly display your information. Built-in frequency counter, signal generator, Ni-Cad charger circuit, battery saver, low battery warning and smooth reduction drive tuning. *More!*

MFJ-266C 1.5-65, 105-230 300-490 MHz -- *all* Ham Bands

MFJ-266C **$359.95**

New! 220 MHz band!

MFJ-266C *new* compact *wide-range* analyzer covers HF (1.5-65 MHz), VHF (105-230 MHz, including 220 MHz band) and UHF (300-490 MHz). Antenna Analyzer mode reads frequency, SWR, complex impedance *simultaneously*. 500 MHz freq. counter mode has 100 Hz resolution, measures relative field strength/ frequency for tracking interference. Signal Generator mode, solid-state switching, and electronic tuning. Backlight, N-connector.

MFJ-225 1.5-180 MHz *continuous* Two-Port Graphic Analyzer

MFJ-225 **$399.95**

Out in the field, MFJ-225 is a compact completely *self-contained handheld graphing analyzer.* On the bench it becomes a full-fledged two-port (S21) desktop machine when teamed up with your PC. Using powerful IG-miniVNA freeware, you'll run detailed data analysis and print out stunning color-graphic plots to document your work! Built-in back-lighted *3-inch LCD graphic* display. Make fine adjustments using full-screen easy-to-view SWR bargraph, capture vivid swept displays for SWR, impedance, return loss, phase angle, more. DDS generator.

MFJ-249C *Analyzer*

MFJ-249C, $279.95.
If digital display is all you need MFJ-249C does everything MFJ-259C does without analog meters.

HF/VHF/UHF SWR Analyzer™ *CLOSEOUT!!!*

MFJ-266B, $299.95.
Has all the features of MFJ-266C but MFJ-266B covers 1.5-65 MHz, 85-185 MHz and 300-490 MHz. Does not cover 220 MHz band.

HF/6M SWR Analyzer, 1-60 MHz

MFJ-213, $199.95.
Reads SWR, complex impedance, impedance magnitude. Measures capacitance, inductance, field strength, frequency, generate test signals. Fine tune stubs, analyze coax, test baluns, RF transformers, plus other RF tasks.

MFJ SWR Analyzer Accessories

A. MFJ-29D/MFJ-39D, $24.95. Carry Pouch for MFJ-259C/269C.
B. MFJ-92AA10, $29.95. 10-Pack 2500 mAh Ni-MH Supercells.
C. MFJ-66, $24.95. Dip coils, set of two covers 1.8-230 MHz.
D. MFJ-731, $99.95. Tunable Analyzer Filter, 1.8-30 MHz, for strong RF fields.
E. MFJ-917, $29.95. 1:1 Current balun for SWR Analyzers to test balanced line antennas, other loads.
F. MFJ-5510, $9.95. 12VDC cigarette lighter adapter.
G. MFJ-7737, $5.95. PL-259 to BNC Female.
H. MFJ-7727, $5.95. PL-259 to SMA Female.
I. MFJ-633, $29.95. Ultra-fast intelligent charger.

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MFJ TUNERS

Ham Radio's *Most Popular* 300 Watt Antenna Tuner

More hams use MFJ-949s than any other antenna tuner in the world!

Why? Because the world's leading tuner has earned a world-wide reputation for being able to match just about anything.

Full 1.8-30 MHz Operation

Tune your antenna for minimum SWR! Works 1.8-30 MHz on dipoles, verticals, inverted vees, random wires, beams, mobile whips, shortwave receiving antennas . . . Use coax, random wire, balanced lines. Has heavy duty 4:1 balun for balanced lines.

Custom inductor switch

Custom designed inductor switch, 1000 volt tuning capacitors, *Teflon*® insulating washers and proper L/C ratio gives you *arc-free* no worries operation

MFJ-949E **$189.95**

up to 300 Watts PEP transceiver input power.

The MFJ-949E inductor switch was *custom* designed to withstand the extremely high RF voltages and currents that are developed in your tuner.

8-Position Antenna switch

Antenna switch lets you select two coax fed antennas, random wire/balanced line or dummy load through your MFJ-949E or direct to your transceiver.

Lighted Cross-Needle Meter

Full *size* 3-inch lighted Cross-Needle Meter. Lets you easily read SWR, *peak* or average forward and reflected power simultaneously. Has 300 Watt or 30 Watt ranges.

QRM-Free PreTune™

MFJ's *QRM-Free PreTune*™ lets you pre-tune your MFJ-949E *off-the-air* into its built-in dummy load! Makes tuning your actual antenna faster and easier.

Plus Much More!

Full *size* built-in non-inductive 50 Ohm dummy load, scratch-proof Lexan multi-colored front panel, $10^5/_8$x$3^1/_2$x7 inches. Superior cabinet construction and more!

MFJ-948, $169.95. Econo version MFJ-949E. Has all features except for dummy load.

***No Matter What™* Warranty**

Every MFJ tuner is protected by MFJ's famous one year *No Matter What*™ limited warranty. We will repair or replace your MFJ tuner (at our option) for a full year.

More hams use MFJ tuners than all other tuners in the world!

MFJ-989D *Legal Limit* Tuner

MFJ-989D **$409.95**

New, improved MFJ-989D *legal limit* antenna tuner gives you better efficiency, lower losses and a new *true* peak reading meter. Easily handles *full* 1500 Watts SSB/CW, 1.8-30 MHz, including MARS/WARC bands. Six position antenna switch, dummy load. *New* 500 pF air variable capacitors. *New* improved *AirCore*™ Roller Inductor. *New* high voltage current balun. *New* crank knob. $12^7/_8$Wx6Hx$11^5/_8$D".

MFJ-986 Two knob *Differential-T™*

MFJ-986 **$369.95**

Two knob tuning (differential capacitor and *AirCore*™ roller inductor) makes tuning foolproof and easier than ever. Gives minimum SWR at only one setting. Handles 3 KW PEP SSB amplifier input power (1.5 KW output). Gear-driven turns counter, lighted peak/average Cross-Needle SWR/Wattmeter, antenna switch, balun. 1.8 to 30 MHz. $10^3/_4$Wx$4^1/_2$Hx15 in.

MFJ-962D *compact* kW Tuner

MFJ-962D **$319.95**

A few more dollars steps you up to a KW tuner for an amp later. Handles 1.5 KW PEP SSB amplifier input power (800W output). Ideal for Ameritron's AL-811H! *AirCore*™ roller inductor, gear-driven turns counter, pk/avg lighted Cross-Needle SWR/Wattmeter, antenna switch, balun, Lexan front, 1.8-30MHz. $10^3/_4$x$4^1/_2$x$10^7/_8$ in.

MFJ-969 300W *Roller Inductor* Tuner

MFJ-969 **$229.95**

Superb *AirCore*™ Roller Inductor tuning. Covers *6 Meters* thru 160 Meters! 300 Watts PEP SSB. *Active* true peak reading lighted Cross-Needle SWR Wattmeter, *QRM-Free PreTune*™, antenna switch, dummy load, 4:1 balun, Lexan front panel. $10^1/_2$Wx$3^1/_2$Hx$9^1/_2$D inches.

MFJ-941E *super value* Tuner

MFJ-941E **$149.95**

The *most for your money!* Handles 300 Watts PEP, covers 1.8-30 MHz, *lighted* Cross-Needle SWR/Wattmeter, 8 position antenna switch, 4:1 balun, 1000 volt capacitors, Lexan front panel. Sleek $10^1/_2$Wx$2^1/_2$Hx7D in.

MFJ-945E HF/6M *mobile* Tuner

MFJ-945E **$129.95**

Extends your mobile antenna bandwidth so you don't have to stop, go outside and adjust your antenna. Tiny 8x2x6 in. *Lighted* Cross-Needle SWR/Wattmeter. Lamp and bypass switches. Covers 1.8-30 MHz *and* 6 Meters. 300 Watts PEP. **MFJ-20, $6.95,** mobile mount.

MFJ-971 *portable/QRP* Tuner

MFJ-971 **$129.95**

Tunes coax, balanced lines, random wire 1.8-30 MHz. Cross-Needle Meter. SWR, 30/300 or 6 Watt QRP ranges. Matches popular MFJ transceivers. Tiny 6x$6^1/_2$x$2^1/_2$ in.

MFJ-901B *smallest* Versa Tuner

MFJ-901B **$99.95**

MFJ's smallest (5x2x6 in.) and most affordable wide range 200 Watt PEP Versa tuner. Covers 1.8 to 30 MHz. Great for matching solid state rigs to linear amps.

MFJ-902B *Tiny Travel* Tuner

MFJ-902B **$99.95**

Tiny $4^1/_2$x$2^1/_4$x3 inches, full 150 Watts, 80-6 Meters, has tuner bypass switch, for coax/random wire.

MFJ-904H, $149.95. Same but adds Cross-needle SWR/Wattmeter and 4:1 balun for balanced lines. $7^1/_4$x$2^1/_4$x$2^3/_4$ inches.

MFJ-16010 *random wire* Tuner

MFJ-16010 **$69.95**

Operate all bands anywhere with MFJ's reversible L-network. Turns random wire into powerful transmitting antenna. 1.8-30 MHz. 200 Watts PEP. Tiny 2x3x4 in.

MFJ-906/903 *6 Meter* Tuners

MFJ-906 **$99.95**

MFJ-906 has lighted Cross-Needle SWR/Wattmeter, bypass switch. Handles 100 W FM, 200W SSB. **MFJ-903, $69.95,** Like MFJ-906, less SWR/Wattmeter, bypass switch.

MFJ-921/924 *VHF/UHF* Tuners

MFJ-921/924 **$89.95**

MFJ-921 covers 2 Meters/220 MHz. **MFJ-924** covers 440 MHz. SWR/Wattmeter. 8x$2^1/_2$x3 in.

MFJ-931 *artificial* RF Ground

MFJ-931 **$109.95**

Eliminates RF hot spots, RF feedback, TVI/RFI, weak signals caused by poor RF grounding. Creates artificial RF ground or electrically places far away RF ground directly at rig. **MFJ-934, $209.95,** Artificial ground/300 Watt Tuner/Cross-Needle SWR/Wattmeter.

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MFJ *IntelliTuner*™ Automatic Tuners

More hams use MFJ tuners than all other tuners in the world!

World's most advanced Automatic Antenna Tuners feature world renowned MFJ AdaptiveSearch™ and AutomaticRecall™ algorithms -- world's fastest ultra-wide range tuning. Nine World Class models! Choose your features: Digital/Analog/Audio SWR-Wattmeter, Antenna Switch, Balun, Radio Interface, Digital frequency readout, Remoteable, Coax/Balanced Lines/Wire Tuning, Field Upgradeable . . .

MFJ *IntelliTuner*™ Automatic Tuners

The MFJ-993B *IntelliTuner*™ lets you tune any antenna *automatically* -- *ultra fast.*

It's a comprehensive automatic *antenna tuning center* **complete** with SWR/Wattmeter, antenna switch for two antennas and 4:1 current balun for balanced lines.

MFJ's exclusive *IntelliTuner*™, *Adaptive Search*™ **and** *Instant Recall*™ **algorithms give you** *ultra fast* automatic tuning with over 20,000 *VirtualAntenna*™ Memories.

You get a highly efficient L-network, 6-1600 ohm matching at 300 Watts SSB/CW or *extra-wide* 6-3200 Ohm matching at 150 Watts SSB/CW, 1.8-30 MHz coverage, Cross-Needle *and* digital meters, audio SWR meter, *backlit* LCD, remote control port, radio interface, heavy-duty 16 amp/1000V relays.

MFJ-993B **$269.95**

The MFJ-993B automatically tunes for minimum SWR and remembers your frequency and tuner settings. The next time you operate on that frequency and antenna, these tuner settings are instantly restored and *you're ready to operate in milliseconds!* 10W x2¾ Hx9D". Use 12-15 VDC/1 amp or 110 VAC with **MFJ-1316, $21.95**. Radio interface cables, remote control available. See ***www.mfjenterprises.com***

600 Watt MFJ Automatic Tuner

Like MFJ-993B but handles 600 Watts SSB /CW, matches 12-800 Ohms. 10,000 memories. Does not have LCD display, antenna switch, 4:1 current balun, audio SWR meter/feedback. 10Wx2¾Hx9D in.

MFJ-994B **$359.95**

No Matter What™ Warranty

Every MFJ tuner is protected by MFJ's famous one year *No Matter What*™ limited warranty. We will repair or replace your MFJ tuner (at our option) for a full year.

1500 Watt *Legal Limit*

for Ameritron AL-1500/1200/82 amps

Roam the entire HF spectrum 1.8-30 MHz *hands-free* with full *1500 Watt* legal limit on SSB/CW and near-perfect SWR! Lighted LCD/Cross-Needle Meter.

MFJ-998 **$699.95**

300 Watt Extra Wide Range

SWR/Wattmeter, 10000 VA Memories

Extra *wide matching range at less cost.* Exclusive dual power level: 300 Watts/6-1600 Ohms; 150W/6-3200 Ohms. Cross-Needle SWR/Wattmeter.

MFJ-991B **$229.95**

200 Watt ... Compact

Digital Meter, Ant Switch, Wide Range

World's fastest compact auto tuner uses MFJ *Adaptive Search*™ **and** *InstantRecall*™ algorithms. 132,072 tuning solutions instantly match virtually any antenna with near perfect SWR.

MFJ-929 **$229.95**

200 Watt ... Econo

Small, Ant Switch, 20K VA Memories

High-speed, wide matching range and compactness at low cost! Leave in-line and forget it -- your antenna is *always* automatically tuned! 2-position antenna switch.

MFJ-928 **$199.95**

200 Watt *MightyMite*™

Matches IC-706, FT-857D, TS-50S

No *extra space needed!* Just set your IC-706/7000, FT-857D, TS-50S on top of this matching low-profile automatic tuner -- it's all you need for a completely automated station using *any* antenna! Just tune and talk!

MFJ-925 **$179.95**

G5RV Antenna

Covers all bands, 160-10 Meters with antenna tuner. 102 ft. long. Can use as inverted vee or sloper. Use on 160 Meters as Marconi.1500 Watts. Super-strong fiberglass center/feed-point insulators. *Glazed ceramic* end insulators. All hand-soldered connections. Add coax, some rope and you're *on the air!*

MFJ-1778M, $39.95. G5RV Junior. Half-size, 52 ft. 40-10M with tuner, 1500 Watts.

MFJ-1778 **$44.95**

200W...Weather-sealed

for Remote/Outdoor/Marine

Fully *weather-sealed for remote Outdoor/Marine use!* Tough, durable, built-to-last the elements for years.

MFJ-926B **$279.95**

200 Watt...Remote

Coax/Wire Ant, No pwr cable needed

Weather protected fully automatic *remote* auto tuner for wire ***and*** *coax* antennas -- an MFJ exclusive. Powers through coax -- No separate power cable needed.

MFJ-927 **$259.95**

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MFJ *Switching* Power Supplies

Power your HF transceiver, 2 meter/440 MHz mobile/base and accessories with these highly reliable 15, 22, 30, 40 or 75 Amp MFJ Switching Power Supplies!

No RF hash . . . Super lightweight . . . Super small . . . Volt/Amp Meters . . .

MFJ's adjustable voltage switching power supplies do it all! Power your HF or 2M/440 MHz radio and accessories.

MFJ's *MightyLites*™ are so light and small you can carry them with one hand! Take them with you anywhere.

No more picking up and hauling around heavy, bulky supplies that can give you a painful backache, pulled muscle or hernia.

These babies are clean . . . Your buddies won't hear *any* RF hash on your signal! *None* in your receiver either! These super clean *MightyLites*™ meet all FCC Class B regulations.

Less than 35 mV peak-to-peak ripple under 25 or 45 amp full load. Load regulation is better than 1.5% under full load.

You won't burn up our power supplies!

MFJ Power supplies are *fully protected* with Over Voltage, Over-temperature and Over Current protection circuits.

MFJ *MightyLites*™ can be used anywhere in the world! They have switchable AC input voltage and work from 85 to 135 VAC or 170 to 260 VAC. Replaceable fuse.

A whisper quiet internal fan efficiently cools your power supply for long life.

22 Amp Continuous

Ham Radio's smallest and lightest 22 Amp continuous power supply is also its best selling!

MFJ-4125 **$84.95**

22 Amps continuous/25 Amps max at 13.8VDC. 5-way binding posts on front, 5A quick connects on back. 85-135/170-260 VAC input. 2.9 lbs. 5¾Wx3Hx5¾D".

MFJ-4125P, $94.95. Adds 2-pairs *Anderson PowerPoles*™.

22 Amp Continuous

22 Amps continuous, 25 Amps maximum. Like MFJ-4125 but adds Volt/Amp meters, cigarette lighter plug. Adjustable 9-15 VDC Output. 5¾Wx 4½Hx6D in. Weighs 3.7 lbs. Use 85-135 VAC or 170-260 VAC input. Replaceable fuse.

MFJ-4225MV **$99.95**

40 Amp Continuous

40 Amps continuous, 45 Amps max. Adjustable 9-15 VDC output. Volt/Amp meters, cigarette lighter plug, front 5-way binding posts, two rear quick connects. 5.5 lbs. 7½Wx 4¾Hx9D inches. Use 85-135 VAC or 170-260 VAC input. Replaceable fuse.

MFJ-4245MV **$149.95**

70 Amp Continuous

75 Amps maximum and 70 Amps continuously. Adjustable voltage 4.0-16 VDC. Short circuit, overload and over-temperature protection, 10.5 lbs. 9¾Wx5½Hx9½D". Great for Ameritron's ALS-500M mobile amplifier!

MFJ-4275MV **$249.95**

High Current Multiple DC Power Outlets

Power multiple Transceivers/accessories from a single DC power supply . . . Keeps you neat, organized and safe . . .Prevents fire hazard . . . Keeps wires from tangling up and shorting . . . Fused and RF bypassed . . . 6 foot, 8 gauge color coded cable . . .

Versatile 5-Way Binding Posts

MFJ-1118, $84.95. Power two HF and/or VHF rigs and six accessories from your main 12 VDC supply. *Built-in 0-25 VDC voltmeter.* Two pairs 35 amp 5-way binding posts, fused and RF bypassed for transceivers. Six pairs RF bypassed binding posts provide 15 Amps for accessories. Master fuse, ON/OFF switch,"ON" LED. 12½x2¾x2½ in.

MFJ-1116, $59.95. 8 pairs binding posts, 15A total.Voltmeter, on/off switch.

MFJ-1112, $44.95. 6 pairs binding posts, 15 Amps total.

MFJ-1117, $64.95. Powers *four* transceivers simultaneously (two at 35 Amps each and two at 35 Amps combined). 8x2x3 inches.

All PowerPoles™

MFJ-1128, $104.95. 3 high-current outlets for transceivers. 9 *switched* outlets for accessories. Mix & match included fuses as needed (one-40A, one-25A, four-10A, four-5A, three-1A fuses installed). 0-25 VDC *Voltmeter.* *Extra* contacts, fuses. 12Wx1¼Hx2¾D".

MFJ-1126, $84.95. 8 outlets, each fused, 40 Amps total. Factory installed fuses: two 1A, three 5A, two 10A, one 25A, one 40A. *0-25 VDC Voltmeter.* Includes *extra PowerPoles®*, *extra* fuses -- *no extra cost.* 9Wx1¼Hx2¾ inches.

PowerPoles™ *AND 5-Way Binding Posts*

MFJ-1129, $114.95. 10 outlets each fused, 40 Amp total. 3 high-current outlets for rigs -- 2 *PowerPoles®* and one 5-way binding post. 7 *switched* outlets for accessories

MFJ-1118 **$84.95**

MFJ-1116 **$59.95**

MFJ-1112 **$44.95**

MFJ-1117 **$64.95**

MFJ-1128 **$104.95**

MFJ-1126 **$84.95**

MFJ-1129 **$114.95**

MFJ-1124 **$64.95**

(20A max) -- 5 *PowerPoles®* and 2 binding posts. Fuses include (1- 40A, 2-25A, 3-10A, 3-5A, 2-1A installed). *0-25 VDC Voltmeter.* Includes extra *PowerPoles®* and fuses, 12½Wx1¼Hx2¾D inches.

MFJ-1124, $64.95. 6 outlets each fused, 40 Amps total. 4 *PowerPoles®*, 2 high-current binding posts, Installed fuses: 1-40A, 2-25A, 2-10A, 1-5A, 1-1A. Includes extra *PowerPoles®* & fuses -- *no extra cost.*

15 Amp Continuous

15 Amps continuous, 17 Amps max at 13.8 VDC. Over-voltage, over-current protection. 5-way binding posts. Load fault indicator and automatic shutdown. 90-130 VAC input. 1½ lbs. Tiny 3¾Wx2¼Hx3¾D inches fits easily in an overnight bag.

MFJ-4115 **$59.95**

30 Amps Continuous

Linear with 19.2 lb.Transformer

This heavy-duty linearly regulated MFJ-4035MV has *abolutely no RF Hash.* It delivers 30 Amps continuous, 35 Amps maximum from its massive 19.2 lb. transformer. Front panel adjustable 1-14 VDC output with convenient detent at 13.8 VDC. Volt/Amp Meters. 1% load regulation, 30 mV ripple. Over-voltage/current/temperature protection, 5-way binding posts, 2 pairs of quick-connects and a covered cigarette lighter socket for mobile accessories. Front panel replaceable fuse. 110 VAC input. 9½Wx6Hx9¾D in.

MFJ-4035MV **$149.95**

Free MFJ Catalog

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MFJ *Speech Intelligibility* Enhancer

. . . makes barely understandable speech highly understandable!

MFJ-616
$189.95

"What did you say?" Can you hear but . . . just can't always understand everything people are saying?

As we get older, high frequency hearing loss reduces our ability to understand speech. Here's why . . .

Research shows that nearly *half* the speech intelligibility is contained in 1000 to 4000 Hz range, but contains a miniscule 4% of total speech energy.

On the other hand, the low frequencies, 125 to 500 Hz have most of the speech energy (55%) but contribute very little to intelligibility -- only 4%.

To dramatically improve your ability to understand speech, you must:

First, drastically increase the speech energy above 500 Hz, where 83% of the speech intelligibility is concentrated.

Second, drastically reduce speech energy below 500 Hz where only 4% of speech intelligibility lies.

The MFJ-616 splits the audio speech band into four overlapping octave ranges centered at 300, 600, 1200 and 2400 Hz. You can boost or cut each range by nearly 20 dB.

A balance control and separate 2½ Watt amplifiers let you equalize perceived loudness to each ear so both ears help.

By boosting high and cutting low frequencies and adjusting the balanced control, speech that you can barely understand become highly understandable!

Even if you *don't* have high frequency hearing loss, you'll dramatically improve your ability to understand speech. You'll get an edge in contesting and DXing and enjoy ragchewing more.

Here's what *QST* for April, 2001 said . . . *"I expected a subtle effect at best, but I was astonished . . . The result was remarkably clean, understandable speech without hissing, ringing or other strange effects . . . made a dramatic improvement . . ."*

Immuned to RFI. Has phone jack, on/off speaker switch, 2 inputs, bypass switch. 10Wx2½Hx6D". Needs 12 VDC.

MFJ-1316, $21.95. For 110 VAC operation. Provides 12 VDC/1.5 Amps.

MFJ-72, $69.80. *All-in-one MFJ-616 Accessory Pack.* **Includes** MFJ-392 headphones, two MFJ-281 speakers and MFJ-1316 power supply. ***Save $7!***

Try it for 30 Days

Order from MFJ and try it -- No obligation. If not delighted, return it within 30 days for refund less shipping.

MFJ Contest Voice Keyer

Transformer-coupled -- No RFI, hum or feedback . . . 75 seconds total, 5-messages . . . Records received audio . . .

MFJ-434B
$199.95

Let this *new* microprocessor controlled MFJ *Contest Voice Keyer*™ call CQ, send your call and do contest exchanges for you in your own natural voice!

Store frequently used phrases like "CQ Contest this is AA5MT", "You're 59" . . . "Qth is Mississippi" . . . Contest by pressing a few buttons and save your voice.

Record and playback 5 natural sounding messages in a total of 75 seconds. Uses *eeprom* -- no battery backup needed. Use your mic or its built-in mic for recording.

You can repeat messages continuously and vary the repeat delay from 3 to 500 seconds. Makes a great voice beacon and calling CQ is *so* easy.

You can also record and play back off-the-air signals -- great help if you didn't get it right the first time! No more "*Please repeat*".

A playing message can be halted by the *Stop Button*, your microphone's PTT/VOX, remote control or computer.

Has jack for remote or computer control (using CT, NA or other program). Lets you select, play and cancel messages.

Your mic's audio characteristics do not change when your MFJ-434B is installed.

All audio lines are RF filtered to eliminate RFI, audio feedback and distortion. An audio isolation transformer totally eliminates hum and distortion caused by ground loops.

New! **It's** easy to use -- just plug in your 8 pin round or modular mic plug, set the internal jumpers for your transceiver and plug in the appropriate (included) cable for your rig.

Built-in speaker-amplifier. Speaker/phone jack. Use 9 Volt battery, 9-15 VDC or 110 VAC with optional MFJ-1312D, $15.95. 6½Wx2½Hx6½D in.

MFJ-73, $34.95. MFJ-434B Remote Control with cable.

60 dB Null *wipes out* noise and interference

MFJ-1026
$199.95

Wipe out noise and interference *before* it gets into your receiver with a 60 dB null!

Eliminate all types of noise -- severe power line noise from arcing transformers and insulators, fluorescent lamps, light dimmers, touch controlled lamps, computers, TV birdies, lightning crashes from distant thunderstorms, electric drills, motors, industrial processes . . .

It's *more effective* than a noise blanker! Interference much stronger than your desired signal can be completely removed without affecting your signal.

It works on *all modes* -- SSB, AM, CW, FM -- and frequences from BCB to lower VHF.

You can null out strong QRM on top of weak rare DX and then work him! You can null out a strong local ham or AM broadcast station to prevent your receiver from overloading.

Use the MFJ-1026 as an *adjustable phasing network.* You can combine two antennas to give you various directional patterns. Null out a strong interfering signal or peak a weak signal at a push of a button.

Easy-to-use! Plugs between transmitting antenna and transceiver. To null, adjust amplitude and phase controls for minimum S-meter reading or lowest noise. To peak, push reverse button. Use built-in active antenna or an external one. MFJ's exclusive *Constant Amplitude Phase Control*™ makes nulling easy.

RF sense T/R switch automatically bypasses your transceiver when you transmit. Adjustable delay time. Uses 12 VDC or 110 VAC with MFJ-1312D, $15.95. 6½x1½x6¼ in.

MFJ-1025, $179.95. Like MFJ-1026 less built-in active antenna, use external noise antenna.

MFJ *tunable* Super DSP filter

MFJ-784B
$279.95

Only MFJ gives you *tunable* and *programmable* "brick wall" DSP filters.

You can continuously *tune* low pass, high pass, notch and bandpass filters and continuously *vary* bandwidth to pinpoint and eliminate interference.

Only MFJ gives you 5 factory pre-set and 10 programmable pre-set filters you can customize. **Automatic** notch filter searches for and eliminates multiple heterodynes. Advanced adaptive noise reduction silences background noise and QRM.

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http://www.mfjenterprises.com *for instruction manuals, catalog, info*

MFJ Dummy Load/Wattmeter

1.5 kW Dry Dummy Load has built-in precision, true peak-reading SWR/Wattmeter switchable to external antenna!

World's most versatile 1.5 kW dummy load has a *built-in* true peak reading SWR/Wattmeter that you can switch and use independently!

You'll find tons of uses!

Tune up your transceiver, linear amplifier or antenna tuner into a safe 50 Ohm dummy load at *full power*. Then instantly switch to your antenna and monitor SWR, forward and reflected power.

Use for testing/tuning transmitters, transceivers, amplifiers, antenna tuners, baluns, transformers, filters, matching networks, coax, stubs, transmission lines and antennas.

The 50-Ohm dry dummy load works DC to 60 MHz. SWR is below 1.3:1 at 30 MHz. Can handle 100 Watts for ten minutes or 1500 Watts for ten seconds. Comes with power derating curve.

MFJ-267 **$159.95**

Extra-large three-inch lighted Cross-Needle meter reads SWR (1:1 to 8:1), forward and reflected power *simultaneously*.

Reads *true peak* PEP or average power on 300/3000 Watts forward and 60/600 Watts reflected power ranges 1.8-54 MHz.

High accuracy comes from a carefully designed directional coupler, an accurate active-peak reading circuit and a precision d'Arsonval meter movement.

RF tight perforated aluminum cabinet. 4½Wx3½Hx10½D inches. Uses 12 VDC or 120 VAC with **MFJ-1312D, $15.95.**

MFJ HF/VHF/UHF Dummy Loads

Dry 300 Watt HF/VHF Dummy Load

MFJ-260C **$39.95**

Air-cooled, non-inductive resistor in a perforated metal housing; Has SO-239 connector. Full load for 30 seconds. Silk-screened derating curve to 5 minutes. Handles 300 Watts. SWR is below 1.1:1 to 30 MHz, 1.5:1 from 30 to 650 MHz. Compact 2¼x2¼x7 inches. **MFJ-260CN, $49.95.** With type "N" connector.

Dry 1.5 kW HF/VHF/UHF Dummy Load

MFJ-264 **$74.95**

Ham radio's most versatile 50 ohm *dry* dummy load. Works with all radios from 160 Meters through 650 MHz. SWR below 1.3 to 650 MHz and below 1.1 at 30 MHz. Handles 100 watts for ten minutes, 1500 Watts for 10 seconds. 3Wx3H x9D inches. Has SO-239 connector. **MFJ-264N, $84.95.** With type "N" connector.

Oil-Cooled 1 KW CW, 2 KW SSB VersaLoad™

MFJ-250X **$49.95**

Run 1KW CW or 2 KW PEP for 10 minutes. Run *continuous duty* with 200 Watts CW or 400 watts PEP. Transformer oil not included. Low VSWR to 400 MHz. Under 1.2:1 to 30 MHz. SO-239 connector. Safety vent with cap, carrying handle. 7½Hx6⅝D inches. **MFJ-250, $69.95.** Includes transformer oil (no PCB).

3 GHz, 300 Watts Dry Dummy Load

MFJ-263 **$99.95**

New high-tech metal film resistor gives low SWR up to 3 GHz at 300 Watts! Mounted on large heavy-duty air-cooled heatsink. SWR is less than 1.1 DC to 1 GHz, 1.2 at 1.5 GHz and 1.5 at 3 GHz. Handles 125 Watts *continuous* and 300 Watts for ten seconds. High quality *Teflon*® N connector. 10¾Wx2¼Hx5¼D in. **New!**

MFJ Frequency Counters

MFJ-886 **$129.95**

MFJ-886 covers 1 MHz to 3 GHz with 300 MHz direct count, 0.1 Hz resolution. 4 gate times. 10-digit high-contrast 3/4 inch LCD display. Lock display button. Bargraph shows RF field strength. Includes rechargeable Ni-Cad batteries, charger, telescopic antenna. Black anodized aluminum. 2¾x2¼x1¼ inches.

MFJ-888 **$199.95**

MFJ-888, like MFJ-886, but covers *10 Hz*-3 GHz. Measures frequency/ period, has 50/1M Ohm input, auto hold, LED backlight, beeper. 2¾x4¼x1¼ inches

Field Strength Meters

MFJ-802 **$49.95**

MFJ-802 shows relative antenna field strength. Use to determine radiation pattern. Has large 3 inch meter. Telescoping *dipole* reduces influence of surrounding objects and is more reliable and repeatable than monopole. Sensitivity control. Jack for remote sensor. **MFJ-802R, $34.95.**

MFJ-801 **$29.95**

MFJ-801 has 1¾ inch meter, sensitivity control, 20 inch extended telescoping monopole antenna.

Find Power Line Noise fast!

MFJ-852 **$119.95** with dipole

MFJ-856 **$159.95** with 3 el. Yagi

Choose 3 element Yagi or compact telescoping dipole to quickly pinpoint noise. Walk or drive with these handheld, directional noise finders to search out leaky insulators, loose hardware and corroded ground lines quickly. Track noise directly to pole, transformer, insulator or others. Has field-strength meter, headphone jack to listen or record. Operates in optimum 135 MHz region. Sensitive .3uV receiver, 70 dB AGC.

81 dB Step Attenuator

MFJ-762 **$89.95**

81 dB Attenuator in 1 dB steps. 50 Ohms. Usable to 500 MHz. 250 milliwatt maximum input. BNC connectors. Shielded stages. Connect between receiver and antenna and use S-meter as a precision calibrated field strength meter. Prevent receiver blocking, cross-modulation. Determine gain/loss, ideal for fox hunting. Evaluate linearity. Isolate circuits. Extend range of sensitive equipment. Measure input/output level differences.

Compact Cross-Needle SWR/Wattmeters

MFJ-822 **$59.95**

MFJ-822, $59.95. Large 3-inch *lighted* Cross-Needle meter covers 1.8-200 MHz in 2 power ranges: 30/300 Watts. Read forward, reflected power, SWR *simultaneously*. Compact 3¼Wx3¼Hx3¼D inches takes little space. Perfect for home, mobile or portable use. SO-239 connectors. Use 12 VDC for lamp (cable included). **MFJ-842, $59.95.** Like MFJ-822, but covers 140-525 MHz, 15/150 Watt ranges.

25-1300 MHz Discone Antenna

MFJ-1868 **$59.95**

Ultra wide-band antenna receives 25-1300 MHz. Perfect for scanners. Transmit 50-1300 MHz. Handles 200 Watts. Ideal for 6/2/1¼Meters, 70/33/23 CM ham bands. Excellent for testing various transmitters on single coax. SO-239, 50 feet coax, stainless steel elements.

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MFJ *giant* 6.5 inch SWR/Wattmeter

World's *largest HF SWR/Wattmeter has giant 6½ inch meter!*

This one you can SEE! Extra-long scales gives you highly accurate SWR and power measurements. Huge numbers makes reading easy across your shack.

Like your analog watch, one glance at the meter needle gives you fast and accurate readings without actually reading the scale.

MFJ's exclusive *TrueActive*™ peak reading circuit captures *true* peak or average forward and reflected power readings.

Has 20/200/2000 Watt ranges for accurate

MFJ-868
$149.95 QRP or QRO operation. **Exclusive** MFJ Wattmeter *Power Saver*™ circuit turns on meter only when RF power is being measured. **Covers** 1.8-30 MHz. Use 9 volt battery or 12 VDC or 110 VAC with MFJ-1312D, $15.95. 7Wx5½Hx5D in. SO-239 connectors.

Giant 144/220/440 MHz SWR/Wattmeter
MFJ-867, $159.95. Like MFJ-868 giant SWR/Wattmeter, but covers 144/220/440 MHz.

MFJ peak-reading *giant* 4.5 inch *Cross-Needle* SWR/Wattmeter

New!

See it all at once on giant Cross-Needle SWR/Wattmeter! MFJ-891 simultaneously displays forward/reflected power and SWR on easy-to-read three-color scale. 20, 200, 2000 Watt ranges have individual scales. *True*™*Active peak-reading circuit* reads forward and reverse *true peak* power in all modes. New directional coupler gives increased accuracy over entire 1.6 to 60 MHz frequency range. Low bias Schottky diode detectors increase linearity at low power -- great for QRP. Super-bright LED backlight with on/off switch provides smooth even illumination. DC grounded antenna connections prevent electrostatic build up. Quality SO-239 connectors. Designer-styled molded front panel and rugged metal housing looks great. 7¼Wx4½Hx4½D in.

MFJ-891
$109.95

MFJ *high-accuracy* Digital SWR/Wattmeter

MFJ-826B has a large high-contrast, high-accuracy *backlit* LCD display. Auto-ranging selects optimum full-scale range from 25W, 250W and 1500W ranges with full 10-bit resolution on each range. Covers entire amateur power spectrum. Built-in frequency counter selects frequency compensated data set to insure highest accuracy for each band. Displays frequency, provides digital readout for older rigs and QRP rigs. *True* peak/average and forward/reflected power, SWR and frequency are *simultaneously* displayed. Select bargraphs to display forward/reflected power *or* forward /SWR *or* SWR only. MFJ's *PeakHold*™ freezes highest forward power displayed 1, 2 or 3 seconds. When SWR is greater than 1.5 to 3 (selectable) an alarm LED lights and buzzer sounds. Use 12 VDC or 110 VAC with MFJ-1312D, $15.95. 6½Wx2⅝Hx6D inches.

MFJ-826B
$179.95

www.mfjenterprises.com . . . World's largest selection of HF/VHF/UHF SWR Wattmeters!

MFJ-822
$59.95
Lighted 3" Cross-Needle Meter, SWR/Watts, 1.8-200 MHz, Fwd/Ref pwr, 30/300W. Compact.

MFJ-862
$69.95
Lighted Cross-Needle Meter, SWR/Watts, 144/220/440 MHz, 30/300 Watts Fwd, 60/6 W Ref.

MFJ-864
$99.95
Lighted Cross-Needle,SWR/Watts, 1.8-60/144/440 MHz, 30/300W Fwd, 6/60W Ref. Hook up HF&VHF/UHF rigs.

MFJ-815C
$89.95
Lighted 3" C/N Meter, SWR/Watts, 1.8-30 MHz, 300/3000W Fwd, 60/600W Ref. True Peak.

MFJ-812B
$39.95
VHF SWR Wattmeter, 2M/220 MHz, built-in field strength meter, Fwd/Ref, Pwr in 2 30/300W ranges.

MFJ-4416B *Super* Battery Booster

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

MFJ-4416B
$149.95

Boost battery voltage as low as 9 Volts back up to 13.8 VDC! Keeps your transceiver at full power output, provides full performance/efficiency, prevents output signal distortion and transceiver shutdown. Compensates for run-down battery, wiring voltage drop or when car is off. Provides up to 25 Amps peak with 90% efficiency. Selectable 9/10/11 Volts minimum input voltage prevents battery damage from over-discharging. RF sense turns MFJ-4416B off during receive to save power and increase efficiency. Adjustable 12 to 13.8 VDC output pass-through voltage improves efficiency and lets transceiver run cooler. Has output over-voltage crowbar protection. *Anderson PowerPoles*® and high-current 5-way binding posts for DC input, regulated output. 7¾Wx4Hx2⅛D inches.

100 Watts SSB from cigarette lighter socket!

MFJ-4403
$119.95

4-Farad capacitors supply 25 Amps needed for 100 Watts SSB peaks and replenished by 10 Amps average from cigarette lighter socket. Protects against reverse/over voltage, voltage transients, short circuits. Provides super noise/ripple filtering.

MFJ AC Line RFI Filter

Eliminate obnoxious power line and computer hash and noise by 6 S-units!

Filters and reduces AC power line RFI, hash, noise, transients, surges generated by computers, motors, RF transmitters, static/lightning by 30 db and up to 60-80 dB with a good earth ground. Super fast, *nano-second* overvoltage protection. Four 3-wire 15A, 120VAC outlets.

MFJ-1164B
$79.95

Transceiver Surge Protector

MFJ-1163, $69.95. Protects your expensive transceiver from damaging power surges. Capacitive decoupling and *ultra-fast* MOVs protection. 4 AC outlets.

MFJ all-in-one *Transmit Audio Console*

MFJ all-in-one *Transmit Audio Console* gives you an *8-Band Equalizer* for full quality ragchewing audio *or* powerful, pileup penetrating speech . . . Adjustable *Noise Gate* gives you transparent, back-ground noise reduction . . . Clean low-distortion *Compressor* gives you more powerful, richer, fuller sounding speech and higher average power SSB . . . Smooth *Limiter* keeps audio peaks from over-driving your transmitter, prevents SSB distortion and splatter. *Universal Mic-Interface* lets you use any microphone with any transceiver. Has low-noise preamp, mic voltages, PTT jack, impedance matching, level controls, RF/audio isolation, VU meter, headphone monitor, auxiliary input.

MFJ-655B
$219.95

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Upgrade your station and hear clearly with a bhi DSP noise canceling product!

Our technology is designed to recognize speech and remove noise!

HEAR IT Speaker

- *"Quick Adjust"* DSP control
- 8 easy selectable filter levels 9 - 35dB
- 3.5mm mono headphone jack
- On/off audio bypass switch
- 2.7W Amplified DSP speaker

ANEM MKII compact in-line module

Easy to use pushbutton control of the DSP filter functions - Use in-line with your extension speaker or headphones

HEAR IT inline module

- 3W Amplified Noise Eliminating In line module with full user control
- Use with a loudspeaker or phones
- 20% more audio & new filter knob
- 8 filter levels and audio bypass

DSPKR

- 10 Watts audio - 7 filter levels 9-24dB
- Sleep mode
- Filter store
- Volume control
- Input overload
- Mono headphone skt - 10 to 16VDC (2A) - Manual & fused DC power lead supplied

DSP modules to retrofit in your radio or speaker...

NEDSP1061-KBD
- Low level audio module. Fits inside Yaesu FT-817, FT-847, FT-897D, Kenwood TS-50, TS440, Alinco DX-77, Icom 706MKIIG, 736/738, 765,etc

NEDSP1062-KBD speaker module - 3W audio output - 8 filter levels - Audio bypass 12 to 18VDC

Supplied with instructions

DESKTOP
DSP base station speaker

- 10 Watt audio
- Rotary volume and filter level controls
- 8 filter levels 9-35dB
- Speaker and line level audio inputs
- Audio overload LED
- Headphone socket
- Size 200(h)x150(d) x160(w)mm

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MFJ BigEAR™

8-Band Portable *Dipole*

34 feet Radiators
Covers 7-55 MHz

MFJ-2289
$179.95

Whether you're relaxing in the mountains or beach or at your antenna restricted neighborhood, MFJ's BigEAR™ portable HF dipole puts out a strong full-size dipole signal!

Full Size Performance

BigEAR's™ whopping 34-feet stainless steel radiator -- *twice the length* of other portables -- gives you *full-size dipole* performance on 20-6 Meters. New *ultra low loss*, wide-spaced adjustable *air-wound* loading coil gives you highly efficient loaded dipole performance on 30/40 Meters and when radiators are shortened.

Full-size and ultra low loss loading coil is a winning combination that stands head and shoulders above shorter backpack antennas. All your power is radiated, not wasted in loading coils.

Rotatable Dipole Directivity

BigEAR's™ dipole pattern lets you aim a strong main lobe toward your QSO or null out QRM by simply rotating your tripod or mount.

True General Coverage

You can tune it up with exceptionally low SWR on any frequency between 7.0 and 55 MHz. Handles QRP to a full killowatt PEP.

Element Tips High In-the-Air

Distinctive V-shaped elements are set 45 degrees from the horizon to keep element tips high in the air. This maximizes radiation, minimizes ground loss and prevents hazardous contact.

Built-in Guanella Current Balun

Current Balun gives you consistent high-performance. Kills feedline radiation, pattern distortion, SWR shifts, RFI, noise pickup.

True Backpack Portability

Antenna is over 34 feet long fully extended, but disassembles and collapses to 27 inches in seconds. Fits most backpacks or suitcases! Just 2 pounds -- you'll hardly know you are packing it!

Goes Up Fast

Fewer parts to assemble. Much faster tune-up procedure. Heavy-duty aluminum center block instantly mounts on any mast/tripod up to 7/8 inches with MFJ's heavy-duty *NoTool™* mast lock. SO-239. For confined spaces, shorten whips and use loading coil to resonate.

BigStick™ 18-foot Portable Vertical

For the Ham on-the-go!

Carry a BigStick™ for strongest, loudest portable signal on the band!

MFJ-2286
$99.95

MFJ's extra long 17 foot stainless-steel telescoping whip gives you *full-size antenna* for full size performance 20 to 6 Meters but collapses to just 28 inches.

An ultra low loss, high-Q adjustable *air-wound* loading coil gives you highly efficient operation on 30/40 Meters.

This extra long radiator and ultra low loss loading coil is a winning combination that stands head and shoulders above shorter backpack antennas.

Antenna is 18 ft. fully extended. Disassembles and collapses to 28" in seconds. Fits most packs or suitcases! Just 2 pounds, you'll hardly know you are packing it!

Tapped loading coil covers 7-55 MHz without gaps. Great for Ham Bands and outstanding for image-free shortwave broadcast!

Everything included for instant operation. Easily mounts to any mast up to 1/2 inch. SO-239 for coax. 3/8-24 antenna connector.

Counterpoise kit included. Ensures low SWR, high efficiency.

All aluminum, stainless steel construction ensures years of excellent performance. *One kilowatt rated.*

18 foot Telescopic Fiberglass Mast with Tripod

MFJ-1919EX, $159.95.

***Put your antennas anywhere and get them up high with this super-strong* 18 foot telescoping fiberglass mast and heavy-duty steel MFJ-1919 tripod.**

QuickClamps™ easily collapses mast to 5 feet. Mast has thick 1/8 inch wall, .75 inch diameter top, 1.5 inch bottom. 15 lbs.

All tripods are black heavy-duty steel with braced triangle base, non-skid feet and mast lock.

MFJ-1918EX, $89.95. MFJ-1918 *tripod with super strong 9.5 foot telescoping fiberglass mast.* Collapses to 3.8 feet. *QuickClamps™.* Mast has thick 1/8" wall, ¾ inch top, 1 inch bottom. Weighs 6.5 lbs.

Tripods Only

MFJ-1919, $89.95, *Large tripod.* Supports 100 lb. antenna. Built-in 1.4 inch diameter mast extends 7.8 feet. Collapses to 4.5Hx.5D feet. Triangle base spreads to 4.8 feet on a side. Weighs 9.75 lbs.

MFJ-1918, $49.95, *Smaller tripod.* Supports 66 lbs. 1 inch diameter mast extends 6 foot. Collapses to 3.2Hx.3D feet. Triangle base spreads to 2.75 feet. Weighs 6.75 lbs.

17 foot *Stainless Steel* Telescoping Whip

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Use these inexpensive, lightweight, *isolated* mini-dipoles when space is limited for temporary or permanent installations. Rotate to null QRM/noise and to focus your signal. Coax choke balun, mast not included. For 40/30/20/17/15/12/10/6 Meters. Order **MFJ-22XX** (insert band in "XX") **$44.95.** 75/60 Meters, $49.95 each. Total length 14 feet. For mounting masts up to 1.25" OD.

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IMPORTANT DATES:

Preview & Pre-registration Begins: October 20, 2014
Bidding Opens: October 23, 2014 at 1400 UTC (10 AM EDT)
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ARRL The national association for AMATEUR RADIO®

October 23-October 30, 2014

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Available at:
- Universal Radio
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The *Navigator* Sound Card Modem

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

- ■ *Quiet - hear what others miss!*
- ■ *Convenient - No annoying jumpers!*
- ■ *Precise - FSK & CW controllers on board*
- ■ *Complete - Six COM ports*

- ■ Single USB connection to computer
- ■ USB Sound Card built-in
- ■ USB Powered
- ■ Universal Rig Control built-in - logic level +/-, CI-V, CAT, & RS-232!
- ■ Software Configuration - *No jumpers!*
- ■ FSK Controller for Precise RTTY
- ■ K1EL Paddle & Keyboard Precise CW
- ■ Separate COM ports for PTT, FSK, CW, CI-V/CAT & RS-232 - *no port splitters!*

The *Navigator* is a complete USB sound card modem featuring a proven USB audio sound card chip, six FTDI USB serial COM ports, a K1EL WinKeyer, True FSK and rig control connections for every radio. It has a built-in USB sound card with isolated audio I/O to your radio to prevent ground loops. A second audio input lets you use both receivers in a dual receiver radio. The logic level and RS-232 rig control ports support your Icom CI-V, Yaesu CAT, Kenwood and other radios. Front panel controls set both RX audio levels, TX audio ouput level, audio monitor level and the CW speed. There are no annoying internal configuration jumpers - just conveniently set the software-controlled configuration settings from your PC.

Need Software? Check the Ham Radio Deluxe & Radio Operating Center bundle!
Optimized for the Navigator, PK-232SC+ and other Timewave/AEA TNCs www.ham-radio-deluxe.com

PK-232SC+ with New Dual Port Option!

PK-232SC+ Multimode Data Controller*

Sound Card, Rig Control, USB, Pactor, RTTY, CW Packet, Dual Port Option & more!

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

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

For the first time in 23 years, we tweaked the PK-232's main PC board! Now with a dual port option, the incredible PK-232SC+ again expands its role in your radio station. The new PK-232SC+ can operate legacy modes on one port and sound card modes on the other - simultaneously! The SC+ connects to your computer with a single USB cable - no audio cables, no RS-232 cables! It has a built-in USB sound card with isolated audio I/O to your radio to prevent ground loops. The logic level and RS-232 rig control is optically isolated for your Icom CI-V, Yaesu CAT, Kenwood and other radios. A new optically isolated DTR PTT option works with legacy sound card software and radios. We even added a pair of USB ports for that new radio with USB rig control and other accessories.

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WRTC 2014 winners were part of a group that included 59 competing teams from 29 qualifying regions, representing 38 different countries.

GOLD. SILVER. BRONZE.

Icom sweeps at WRTC 2014. Congratulations to the winning teams!*

WRTC World Radiosport Team Championship 2014

Gold: Daniel Craig, N6MJ – United States
Chris Hurlbut, KL9A – United States

Silver: Rastislav Hrnko, OM3BH – Slovakia
Jozef Lang, OM3GI – Slovakia

Bronze: Manfred Wolf DJ5MW – Germany
Stefan von Baltz DL1IAO – Germany

To review official contest results please visit or scan:
www.wrtc2014.org/results

Pictured from left to right: Rastislav Hrnko, Jozef Lang, Daniel Craig, Chris Hurlbut, Stefan von Baltz, Manfred Wolf





Participants and awards given at WRTC 2014.

Of the winning teams, 5 out of the 6 radios used were Icom. ©2014 Icom America Inc. The Icom logo is a registered trademark of Icom Inc. Photos courtesy of Nodir Tursun-Zade, EY8MM. 41728a

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*Frequency coverage may vary. Refer to owner's manual for exact frequency specs.

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QST QuickStats

sta·tis·tics (st-tstks) n.
1. (used with a sing. verb) The mathematics of the collection, organization, and interpretation of numerical data, especially the analysis of population characteristics by inference from sampling.
2. (used with a pl. verb) Numerical data.

www.arrl.org/QuickStats

Online QuickStats Poll Results for July 1, 2014 through August 5, 2014.
Get on the web and vote today at **www.arrl.org/quickstats**!

Do you use fixed or rotatable satellite antennas?

- Fixed 8%
- Rotatable 12%
- I don't own satellite antennas 80%

Do you plan to install an antenna support tower at your home within the next year?

- Yes 23%
- No 77%

Do you participate in any regular VHF or UHF SSB nets?

- Yes, VHF 15%
- Yes, UHF 1%
- Yes, both 7%
- No 77%

Have you ever operated as a "rover" in a VHF+ contest?

- Yes 10%
- No 51%
- I don't participate in VHF+ contests 27%
- I don't participate in contests at all 12%

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* For 1.8/3.5/7/14/21 MHz Amateur bands, when receiving in CW/FSK/SSB modes, down conversion is automatically selected if the final passband is 2.7KHz or less.

Celebrating 30 Years of the ARRL VEC

In addition to the ARRL Centennial, 2014 marks a special milestone for the ARRL VEC. On July 21, 2014, the ARRL VEC celebrated 30 years of outstanding service to the Amateur Radio Community.

ARRL VEC Program

The ARRL's VEC program has a long standing tradition of serving the Amateur Radio community and the FCC with integrity and expertise. As the largest VEC in the nation, we operate as a knowledgeable information source for a wide-range of licensing issues. The ARRL VEC has had a positive effect on our community's growth and has truly made a difference in the future of Amateur Radio.

Serving the Amateur Radio Community

ARRL accredited Volunteer Examiners (VEs) give so generously of their time, energy and skill. They support us around the country by offering exam opportunities in their local communities and helping exam candidates fulfill their Amateur Radio aspirations.

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ARRL VE's, Thank You for 30 Years of Service!

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QST 10/2014

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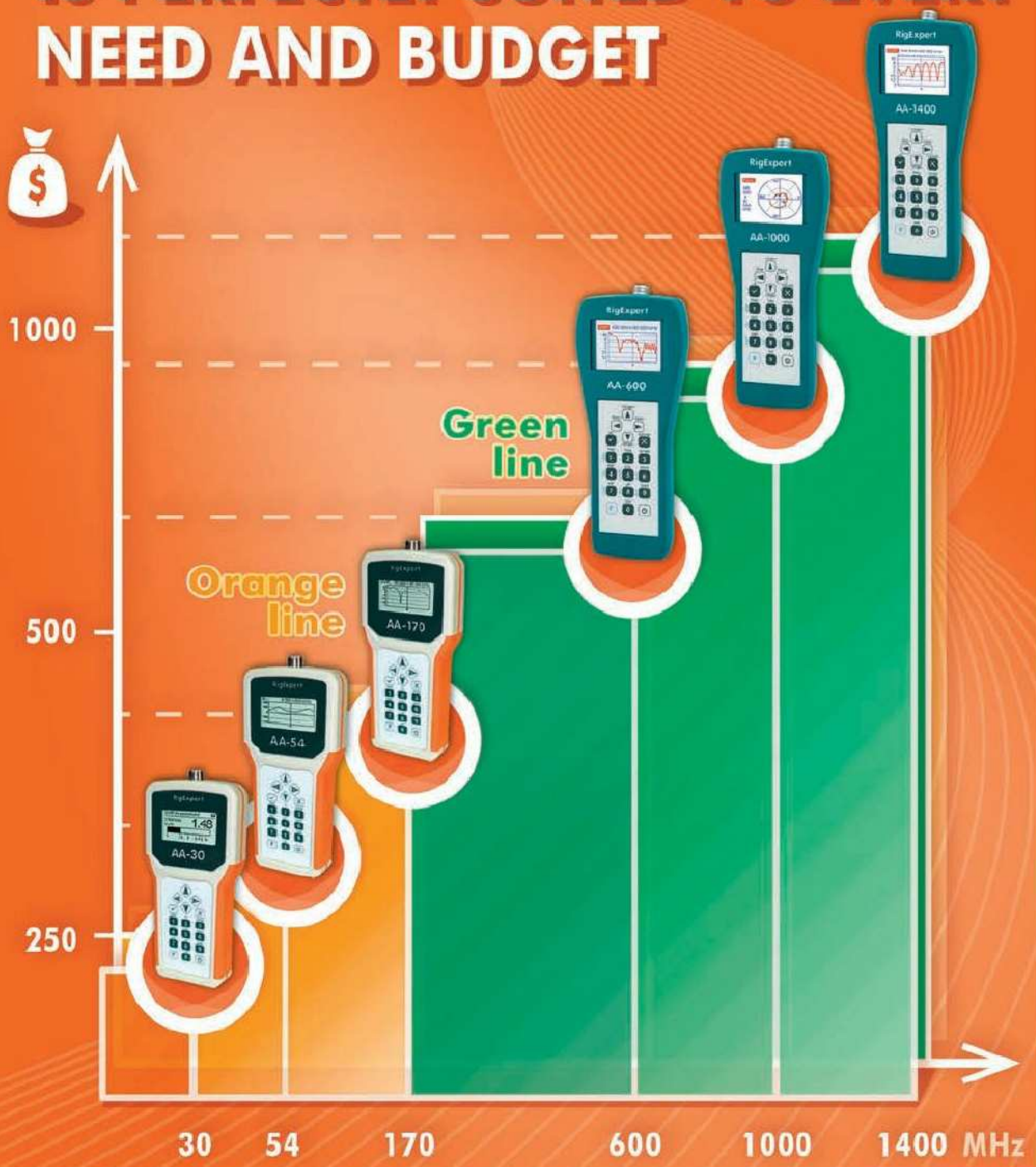

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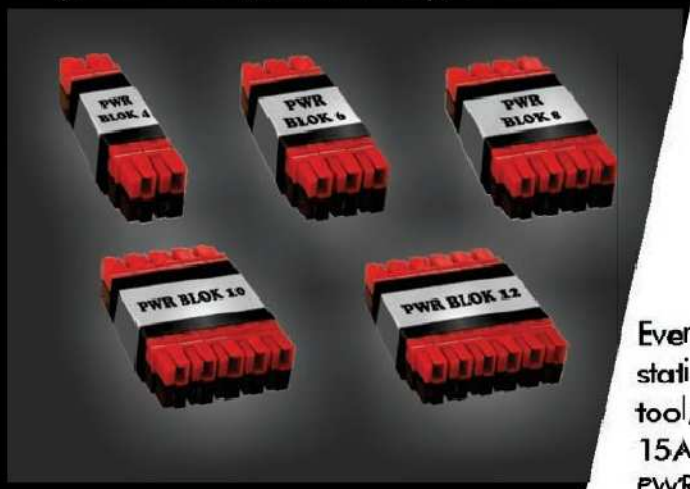

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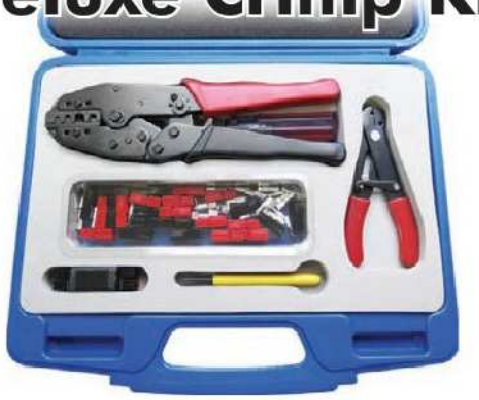

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4. Closing date for Ham-Ads is the 15th of the second month preceding publication date. No cancellations or changes will be accepted after this closing date. Please contact the Advertising Dept at 860-594-0209 or hamads@arrl.org.

5. No Ham-Ad may use more than 200 words. No advertiser may use more than two ads in one issue. A last name or call must appear in each ad. Mention of lotteries, prize drawings, games of chance etc is not permitted in *QST* advertising.

6. New firms or individuals offering products or services for sale must check with us to determine if a production sample (which will be returned) should be submitted for examination. Dealers are exempted, unless the product is unknown to us. Check with us if you are in doubt. You must stand by and support all claims and specifications mentioned in your advertising.

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