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Official Journal of ARRL The national association for AMATEUR RADIO

The radio YAESU ...

The Dawn of a New Era
Dynamic Range 112 dB/IP3 +40 dBm

The New Premium HF/50 MHz Transceiver

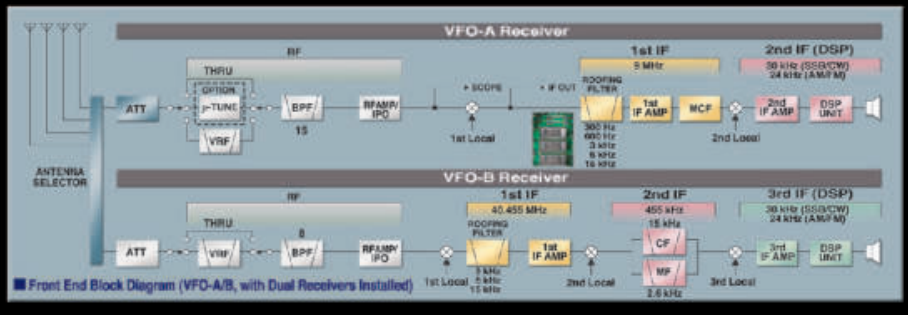
FT DX 5000

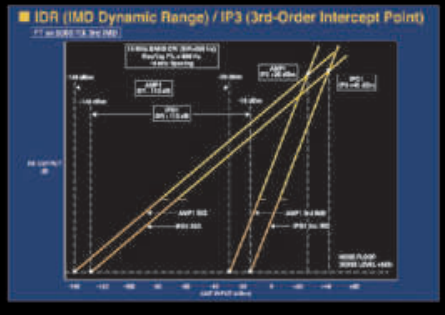
Two Totally Independent Receivers - The VFO-A/Main Receiver utilizes Super Sharp Roofing filters to give you the highest performance and best flexibility

The tight shape factor 6 pole crystal filters and D Quad Double Balanced Mixer design afford incredible improvement in 3rd – Order dynamic range and IP3 performance

Superb 3rd-Order Dynamic Range and 3rd-Order Intercept Point (IP3)

You will be pleased with the astounding 112 dB dynamic range and superb IP3 + 40 dBm at 10 kHz separation (CW/500 Hz BW). Experience the unmatched close-in dynamic range of 105 dB, IP3 +36 dBm at 2 kHz separation (CW/500 Hz BW)! (VFO-A/Main Receiver, 14 MHz, IPO-1)





HF/50 MHz 200 W Transceiver
FT DX 5000MP

Station Monitor SM-5000 included
± 0.05ppm OCXO included
300 Hz Roofing Filter included

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http://www.yaesu.com

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

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Reliable and Exciting, Superior Transceiver - the Real Deal
Indisputably, Best in Class Performance and Supreme Operability

HF/50 MHz 100 W 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-1 supports advanced functionality, including the AF-FFT Scope, RTTY/PSK31 Encode/Decode, CW Decode and CW Auto Zero-in.

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Cushcraft R9 . . . *80-6 Meters*

No Radials --1500 Watts

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.

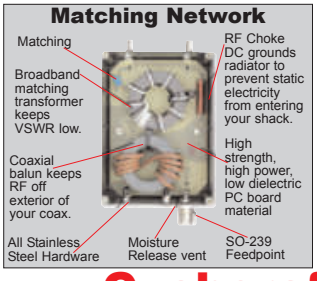
Rugged Construction: Thick fiberglass insulators, all-stainless steel hardware and 6063 aircraft-aluminum tubing is double or triple walled at key stress points to handle anything Mother Nature can dish out.

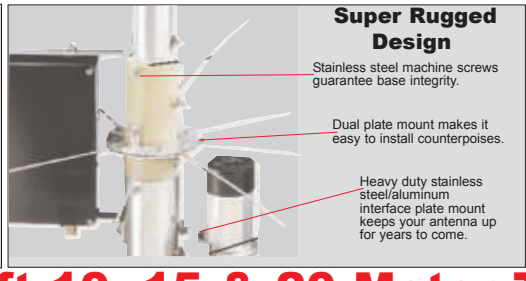
31.5 feet tall, 25 lbs. Mounting mast 1.25 to 2 inches. Wind surface area is 4 square feet.

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, $56.95. Three-point guy kit for high winds.





MA-5B *5-Band* Beam

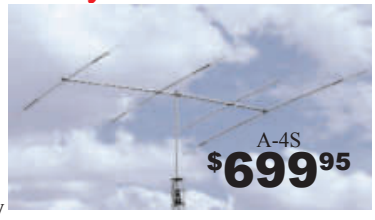
Small Footprint -- Big Signal

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!

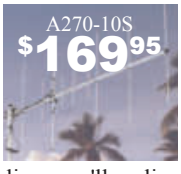


It goes without saying that the World-Ranger lineup is also famous for its rugged construction. In fact, the majority of these antennas sold years ago are still in service today! Conservative mechanical design, rugged over-sized components, stainless-steel hardware, and aircraft-grade 6063 make all the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

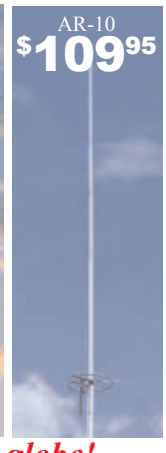
Cushcraft Dual Band Yagis

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 *Ringo* Compact FM Verticals



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

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Life is a JOURNEY. Enjoy the ride!

The engineering staff at COMET Antenna Company presents three new products!

CMX-2300 *TWIN Cross-Needle SWR/Power Meters*

Left Side Meter 1.8-200MHz: Max Power 3kW
Right Side Meter 140-525MHz: Max Power 200W

Average and PEP power selector switch
FWD, REF, SWR readings displayed simultaneously.
Separate ANT/TX connectors allow both meters
to be used at the same time - Low loss circuitry - Illuminated

CHV-5X *40/20/15/10/6M Rotatable Dipole*

HOA antenna restrictions? Limited space? Want to operate with a low profile? Need a small, multi-band HF/6M antenna for portable/ emergency use?... The CHV-5X is a great choice! Lightweight, compact, rotatable half-wave center fed dipole. Assembles in several configurations: “V”, “horizontal”, or as a “ground plane”. Each band tunes independently with sliding tuning stubs

Length: Approx 13 ft (assembled horizontally)

Weight: 5 lbs 14ozs (inc mounting plate and balun)

Max Power: 40/20M: 150W SSB 15/10/6M: 220W

CAA-500 *Cross Needle SWR and Impedance Analyzer*

Dual cross-meter real-time analog display of SWR and total impedance with high accuracy.

Seven frequency ranges (Including 222 MHz!) extending up to 500 MHz!

Thumb-wheel frequency adjustment for effortless sweeps of antenna operating range.

Two antenna jacks, "SO-239" and "N" (above 300 MHz).

Internal battery power or external DC (8 - 16 Volts).

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COMET™

Our mission: To promote and advance the art, science and enjoyment of Amateur Radio.

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News and Features

Our Cover
Give yourself room to roam by building an adapter that allows you to connect a Bluetooth headset to your radio, enabling you to make hands-free contacts whether you're at home, on the road — or off-roading. Allen Baker, KG4JJH, gives you all the details in his article, "A Bluetooth Radio Headset Adapter." [Equipment photos, Allen Baker, KG4JJH]

Radiosport

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August 2013
Volume 97 Number 8

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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- Wide Frequency Coverage
- 20-Watt Portable Operation Using Internal Batteries
- 100 Watts When Using an External 13.8-Volt DC Power Source

FT-817ND
The Ultimate Backpack, Multi-Mode Portable Transceiver
- Self-Contained
- Battery-Powered
- Covering the HF, VHF, and UHF Bands
- Provides up to Five Watts of Power Output
- SSB, CW, AM, FM, Packet, or SSB-based Digital Modes like PSK31

FT-857D
The World's Smallest HF/VHF/UHF Mobile Transceiver
- Ultra-Compact Package
- Ideal for Mobile or External Battery Portable Work
- Wide Frequency Coverage
- Optional Remote-Head
- High-Performance Mobile Operation

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HF/50 MHz 100 W Easy to Operate All Mode Transceiver
- Illuminated Key Buttons
- 300Hz / 500Hz / 2.4 kHz CW IF Filter
- Foot Stand
- Classically Designed Main Dial and Knobs
- Dynamic Microphone MH-31 A8J Included

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Reliable FM 5W Single Band Handheld Transceiver

FT-252

VHF FM TRANSCEIVER

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Compact and High Performance

FT-252

2 m Single BAND

NEW!

FT-257

70 cm Single BAND

- New Ergonomic design and Large Backlit LCD Display for better operation
- 5 Watts of Stable RF Power
- 800 mW of Loud Audio for noisy field operations
- ATS (Automatic Transponder System) "beeps" when moving out of communication range
- 200 Memory Channels for Serious users
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12.5 kHz Digital C4FM

144/430 MHz DUAL BAND DIGITAL TRANSCEIVER

FT1DR

Exciting new amateur digital transceiver

4 Communication Modes

The FT1DR operates in three digital modes and an analog mode. Enjoy communication in the mode that suits each purpose.

1. V/D Mode (Simultaneous Voice/Data Communication Mode)

Half of the bandwidth is used for voice signal with error correction. The very effective error correction code provides benefits such as minimal interruption of communication.

2. Voice FR Mode (Voice Full Rate Mode)

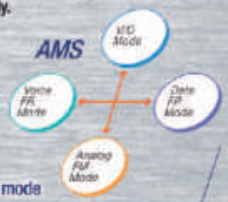
This mode uses the entire 12.5 kHz bandwidth to transmit digital voice data. The larger voice data size allows voice communication with high sound quality.

3. Data FR Mode (High-speed Data Communication Mode)

A high-speed data communication mode that uses the entire 12.5 kHz bandwidth for data communication. The FT1DR automatically switches to this mode when sending and receiving images, allowing a large amount of data to be transmitted quickly.

4. Analog FM Mode

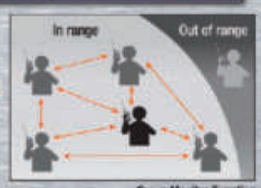
Analog FM is effective for communication with a weak signal that causes voices to break up in the digital modes. The analog mode allows communication even at distances where noise and weak signals make communication almost impossible.



■ AMS (Automatic Mode Select)
The function detects the receive signal mode

Digital Group Monitor (GM) Function

Automatically checks whether members registered in a group are within communication range. Displays information such as distance and direction for each call sign on the screen.



Group Monitor Function

Snapshot Function

When using the handy speaker microphone camera (optional MH-85A11U), press the shutter button to capture a snapshot, then press the image transmit button to easily transmit the image data.

MH-85A11U (Optional)

Smart Navigation Function

■ A real-time navigation function that records the location and direction of Group Monitor (GM) stations.

■ Backtrack Function to Return to Departure Point

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

Spectrum Pressure

"On June 14 the White House released a Presidential Memorandum that represents the next stage in making more radio spectrum available for commercial wireless broadband technologies. There are serious implications for incumbent users of spectrum between 400 MHz and 6 GHz — including radio amateurs."

Ensuring that every American has access to broadband capability is a longstanding objective of the federal government, and for good reason. Today, broadband access to the Internet is as essential to economic development as electricity. But unlike electricity, it can be — and increasingly is — delivered without wires.

Unless you're Rip Van Winkle you know there is a revolution underway in mobile wireless broadband. Most users of smartphones, tablets and other mobile devices that connect to the Internet don't think of them as radio transceivers, but in fact that's what they are — and they won't work without access to the radio spectrum.

Early projections of future spectrum needs for mobile services were based on the assumption that most of the traffic would be telephone calls. Today's reality is that mobile subscribers demand almost everything that can be communicated in digital form, regardless of how much bandwidth it takes. In a speech delivered on June 14 FCC Wireless Telecommunications Bureau Chief Ruth Milkman noted that US mobile data traffic grew by more than 1200% from 2009 to 2013 and that Cisco predicts it will grow nine-fold by 2017.

Even if the radio spectrum were devoid of existing users there would be limits to how much of it could be used effectively for mobile broadband. The lower frequency limit is determined by how small an efficient antenna can be made that will fit inside a mobile device, the upper limit by how much a signal at that frequency will be attenuated by walls, foliage and other obstacles. Depending on whom you talk to the lower limit is somewhere between 400 and 600 MHz and the upper limit is somewhere between 4 and 6 GHz.

But of course, this is not virgin spectrum. It has been fully allocated for decades, much of it to multiple radio services (including ours) that already share on a geographic or other basis. In addition, wireless broadband is not the only application for which more spectrum access is being sought in this frequency range.

The spectrum managers at the National Telecommunications and Information Administration (NTIA) and the FCC have been grappling all along with how to accommodate more users without imposing excessive costs and restrictions on the incumbents. (NTIA manages federal government use of the radio spectrum much as the FCC manages nonfederal use.) Congress gave them added impetus with a provision in the American Recovery and Reinvestment Act of 2009 that required the development of a National Broadband Plan. On June 28, 2010 President Obama followed up with a Presidential Memorandum directing NTIA and FCC to make 500 megahertz of spectrum available for wireless broadband use within 10 years. Later that year, as discussed on this page in the January 2011 issue of *QST*, NTIA released its initial plan for doing so.

The new Presidential Memorandum establishes a Spectrum Policy Team that is to work with NTIA to identify ways to give federal agencies "…greater incentive to share or relinquish spectrum, while protecting the mission capabilities of existing and future systems that rely on spectrum use." Among other things, NTIA is directed to take steps to minimize new frequency assignments for federal use between 400 MHz and 6 GHz and to conduct a pilot program for real-time monitoring of spectrum usage "…to determine whether a comprehensive monitoring program in major metropolitan areas could disclose opportunities for more efficient spectrum access, including via sharing."

While the executive branch cannot issue directives to an independent agency, the FCC is "strongly encouraged" to "enable innovative and flexible commercial uses of spectrum, including broadband, to be deployed as rapidly as possible" and to develop a program of performance criteria for radio receivers "such that emission levels resulting from reasonable use of adjacent spectrum will not endanger the functioning of the receiver." Among the steps toward rapid deployment that the FCC is urged to consider — and that could have implications for the Amateur Radio Service — are:

- identifying spectrum allocated for nonfederal uses that can be made available for licensed and unlicensed wireless broadband services and devices, and other innovative and flexible uses of spectrum, while fairly accommodating the rights and reasonable expectations of incumbent users; and
- identifying spectrum allocated for nonfederal uses that can be made available to agencies, on a shared or exclusive basis, particularly where necessary to accommodate agencies seeking to relocate systems out of bands that could be made available for licensed services or unlicensed devices.

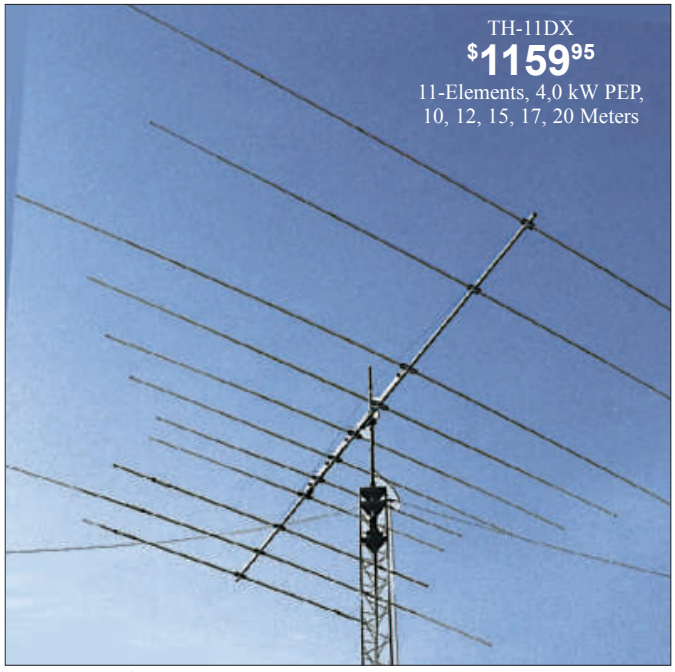
So, what does all this mean for us? Except for 2390-2417 MHz, all of our allocations between 400 MHz and 6 GHz are on a secondary basis — mostly to military radiolocation (radar) and other federal users. Pressure on them is pressure on us, either directly (because we're already sharing with them) or indirectly (as they are relocated out of a band and must be reaccommodated elsewhere). An FCC proceeding considering the expansion of unlicensed broadband use into the 5850-5925 MHz band is already underway.

The NTIA priority list of bands for possible "repurposing" for nonfederal/federal shared use shows 3100-3500 MHz, which includes our 3300-3500 MHz allocation, as the fifth of six bands — in other words, NTIA would prefer that four other bands be considered first. However, in its July 2012 report entitled "Realizing the Full Potential of Government-Held Spectrum to Spur Economic Growth" the President's Council of Advisors on Science and Technology strongly recommended that "spectrum from 2700 to 3700 MHz be prioritized as the basis for the Nation's first spectrum superhighway."

Given the great emphasis on sharing in the Presidential Memorandum we can expect this to be a major pressure point in the months ahead.

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, $1159.95. 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, $869.95. 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, $759.95. 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, $469.95. 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, $369.95. 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, $599.95. 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.

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Compact 3-element 10, 15, 20 Meter Tri-Bander
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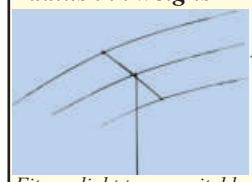

Fits on light tower, suitable guyed TV pole, roof tri-pod

TH-3JRS, $359.95. Hy-Gain's *most popular* 3-element 10, 15, 20 Meter tri-bander fits on most lots! Same top performance as the full power TH3MK4 in a compact 600 watt PEP design.

Excellent gain and F/B ratio let *you* compete with the "big guns".

Tooled manufacturing gives you *Hy-Gain* durability with 80 MPH wind survival.

Model No.	No. of elements	avg gain dBd	avg F/B dB	MaxPwr watts PEP	Bands Covered	Wind sq.ft. area	Wind (mph) Survival	boom feet	Longest Elem. (ft)	Turning radius(ft)	Weight (lbs.)	Mast dia O.D.(in.)	Recom. Rotator	Sugg. Retail
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	$1159.95
TH-7DX	**7**			**1500**	**10, 15, 20**	**9.4**	**100**	**24**	**31**	**20**	**75**	**1.5-2.5**	**HAM-IV**	**$869.95**
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	$759.95
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**	**$469.95**
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	$359.95
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**	**$369.95**
EXP-14	4			1500	10,15,20 opt. 30/40	7.5	100	14	31.5	17.25	45	1.9-2.5	HAM IV	$599.95

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2. ***Tooled*** *Boom-to-Element Clamp*

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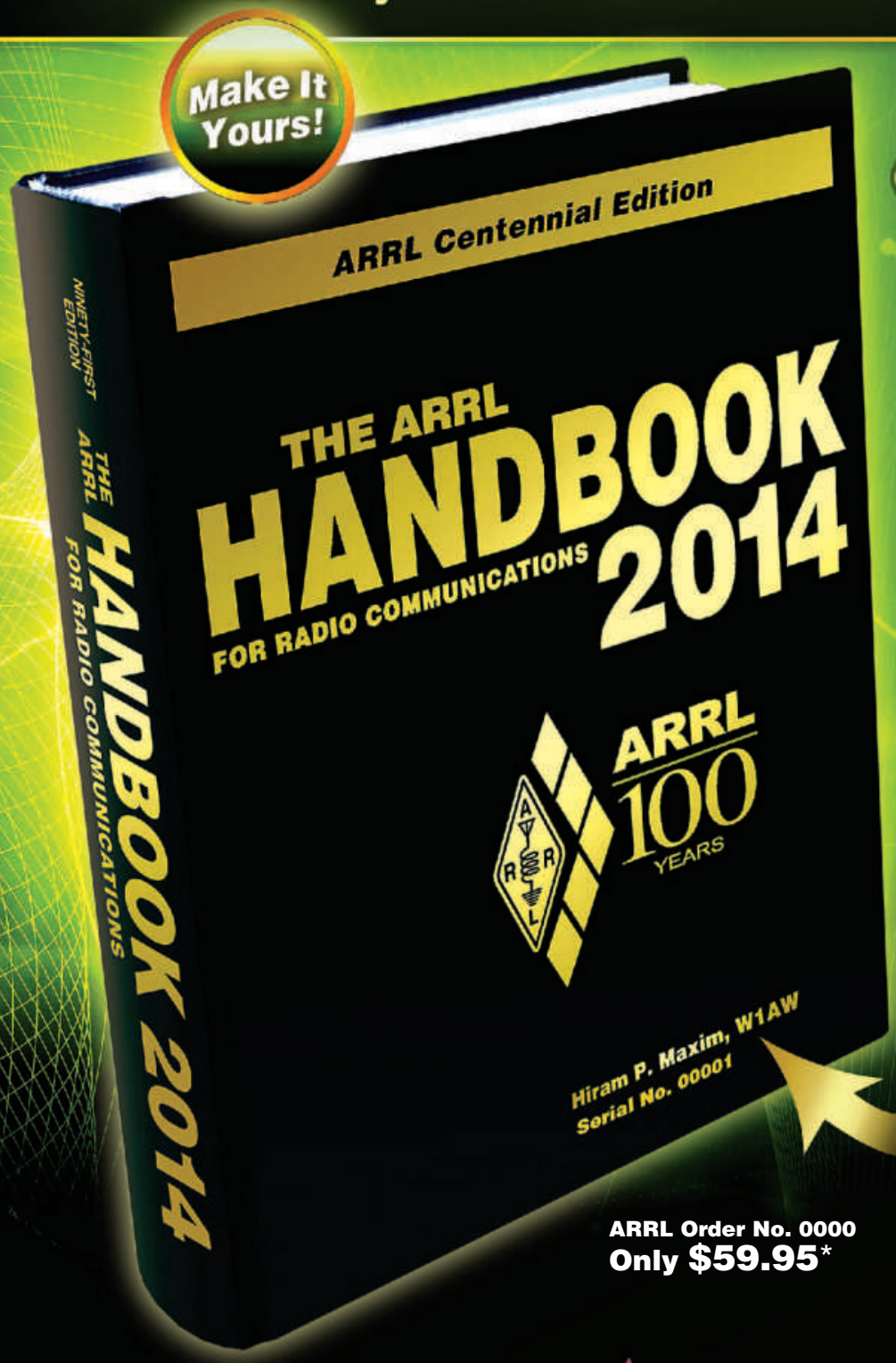

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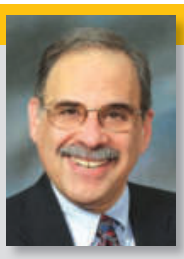

Harold Kramer, WJ1B – hkramer@arrl.org, ARRL Chief Operating Officer/*QST* Publisher

The ARRL Centennial Convention

The ARRL celebrates its 100th birthday next year. To observe this milestone, we will be holding the ARRL Centennial Convention in Hartford, Connecticut from July 17 to 20, 2014. This convention will be held in lieu of the New England Division Convention that is held in August in Boxboro, Massachusetts. The Boxboro folks have graciously put aside plans for their 2014 convention to work with us on the Centennial Convention.

Why Hartford? The ARRL began in Hartford in 1914. Our founders, Hiram Percy Maxim and Clarence Tuska, were from Hartford and our first office was located there. Today, ARRL Headquarters and W1AW are located in Newington, minutes from downtown Hartford. New England has many other places that are of historical significance to radio.

The ARRL Centennial Convention will be at the Connecticut Convention Center in downtown Hartford. It is easily accessed from major interstates and there's plenty of parking available. The Hartford Downtown Marriott is our Headquarters Hotel and it is attached to the Convention Center. We are working with other hotels that will be offering discounted rates to convention attendees. The Hartford region has a wealth of hotels, restaurants and other world-class attractions. Learn more about visiting Connecticut at **www.ctvisit.com**.

We are still in the planning stage, but we already have commitments from major exhibitors who will be displaying their latest products. You'll also be able to learn about the latest developments in Amateur Radio at the seminars we are planning. If you would like to be considered as a forum presenter visit **www.arrl.org/convention-presentations** and give us your ideas.

The Connecticut Convention Center.

Here is a list of some of the activities we've lined up so far:

- ARRL Headquarters and W1AW will be open for tours and W1AW will be open for guest operators for the entire week of the Convention.
- Free shuttle buses will be available between Headquarters and the Convention Center.
- On Thursday we are planning full day seminars including DX University and Contest University.
- On Thursday night, there will be a reception for international visitors.
- The exhibits will be open on Friday and Saturday at the Convention Center.
- ARRL EXPO, a showcase of ARRL exhibits, activities and programs, will be located in the exhibit hall.
- There will be an indoor flea market at the air conditioned Convention Center on Friday and Saturday.
- Friday and Saturday forum topics will include Technical Innovations and Advancements, On-The-Air Operating Activities, Public Service Communications, Education and Club Development and Support.
- License exams will be conducted during the entire convention.
- Culminating Friday's activities, we will hold a gala banquet at the Convention Center.

We expect many international visitors and exhibitors since we have planned the convention to occur the week after the World Radio Team Championship, WRTC 2014. This worldwide operating event runs from July 8 to July 15 and will be held in the Boston area. See **www.wrtc2014.org**.

As we launching ARRL's 100th birthday, we want everyone to enjoy themselves! We encourage you to bring your family and friends since there are many family activities in the Hartford area. There will be Hartford bus tours with on and off stops at various attractions and shopping areas.

We will be opening the Convention registration website sometime in August. In the meantime, visit **www.ARRL2014.org** for more information. We will be updating this site periodically.

During the past eight years, I have had the honor of attending many ARRL Division Conventions. They have all been outstanding events. I enjoy attending as ARRL's representative, which typically involves working at our booth, giving presentations and meeting with friends, ARRL members and other fellow radio amateurs. Like everyone else, I also enjoy attending as a ham who cruises the flea market, attends a forum and checks out the latest gear. However, this Convention will be different. Along with all the usual Convention activities, this will be a once in a lifetime opportunity to celebrate ARRL's 100th birthday with the worldwide Amateur Radio community. I hope to see you there.

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- **ARRL Member Directory**
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ARRL Technical Information Service — www.arrl.org/tis

Get answers on a variety of technical and operating topics through ARRL's Technical Information Service. ARRL Lab experts and technical volunteers can help you overcome hurdles and answer all your questions.

ARRL as an Advocate — www.arrl.org/regulatory-advocacy

ARRL supports legislation and regulatory measures that preserve and protect access to Amateur Radio Service frequencies. Members may contact the **ARRL Regulatory Information Branch** for information on FCC rules; problems with antenna, tower and zoning restrictions; and reciprocal licensing procedures for international travelers.

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Programs

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QEX – *A Forum for Communications Experimenters* – **www.arrl.org/qex**
NCJ – *National Contest Journal* – **www.arrl.org/ncj**
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ARRL is an incorporated association without capital stock chartered under the laws of the State of Connecticut, and is an exempt organization under Section 501(c)(3) of the Internal Revenue Code of 1986. Its affairs are governed by a Board of Directors, whose voting members are elected every three years by the general membership. The officers are elected or appointed by the directors. The League is noncommercial, and no one with a pervasive and continuing conflict of interest is eligible for membership on its Board.

"Of, by, and for the radio amateur," the ARRL numbers within its ranks the vast majority of active amateurs in the nation and has a proud history of achievement as the standard-bearer in amateur affairs.

A *bona fide* interest in Amateur Radio is the only essential qualification of membership; an Amateur Radio license is not a prerequisite, although full voting membership is granted only to licensed amateurs in the US.

Membership inquiries and general correspondence should be addressed to the administrative headquarters: ARRL, 225 Main Street, Newington, Connecticut 06111-1494.

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Can't find the department you're looking for? Call 860-594-0200 or e-mail **hq@arrl.org**. Sending e-mail to any ARRL Headquarters staff member is a snap. Just put his or her call sign (or first initial and last name) in front of **@arrl.org**. For example, to send to Hiram Maxim, First President of the ARRL, use **w1aw@arrl.org**, or **hmaxim@arrl.org**. If all else fails, send a message to **hq@arrl.org** and it will get routed to the right person or department.

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Four rugged MRF-150 FETs at 50 Volts give high efficiency . . . No deterioration with use

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Ameritron ALS-600 *Solid State FET* compact desktop station amplifier is only 4 dB below 1500 Watts -- less than an S-unit!

There are no tubes, no tube heat, no tuning, no worry rugged -- just turn on, select band and operate. 600 Watts PEP/500W CW -- lets you talk to anyone you can hear!

Covers 1.5-22 MHz, (10/12 Meters with $29.95 kit, requires FCC license), instant bandswitching, SWR/thermal protected, extremely quiet, lighted peak reading Cross-Needle SWR/Wattmeter, front panel ALC control, operate/standby switch. 12.5 lbs., 9½Wx7⅛Hx12D in.

Includes ALS-600PS transformer AC power supply for 120/220 VAC, inrush current protected. 32 lbs., 9½Wx6Hx12D inches.

ALS-600 Amp with Switching Power Supply
***New!* ALS-600S, $1599.** ALS-600 amplifier with 10 lb. ALS-600SPS switching power supply combo.

Switching Power Supply

ALS-600SPS **$699** suggested retail

Works with all ALS-600 amplifiers. Extremely lightweight, just 10 lbs. Superb regulation, very low radiated noise. 9Wx6Hx14½D in.

From QST Magazine, March, 2005

". . . the amplifier faulted only when it was supposed to. It protected itself from our boneheaded, sleep-deprived band changing manuevers . . . "

"I found myself not worrying about damaging this amplifier. It seems quite capable of looking out for itself. . . . Kudos to Ameritron."

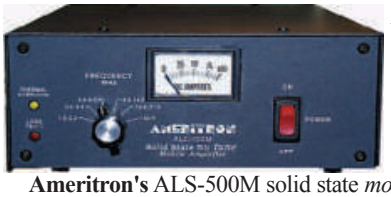
"I couldn't hear any noise at all from the SPS (*switching power supply*) on the vertical or quad…"

"I came to greatly appreciate the size, weight, reliability and simplicity of this amplifier."

"The ALS-600S makes it possible to pack a transceiver and a 600 Watt amplifier, that together weigh less than 30 pounds."

AMERITRON *mobile* 500 Watt *no tune* Solid State Amp

Instant bandswitching, no tuning, no warm-up, SWR protected, 1.5-22 MHz, quiet, compact



ALS-500M **$899** Suggested Retail

Ameritron's ALS-500M solid state *mobile* amp gives you 500 Watts PEP SSB or 400 Watts CW output! Just turn on and operate -- no warm-up, no tuning, instant bandswitching. Fits in very small spaces. ***New*** ALS-500RC, $49 *Remote Head* lets you mount ALS-500M amplifier *anywhere* and gives you full control. Select desired band, turn On/Off and monitor current draw on its DC Current Meter. Has power, transmit and overload LEDs. RJ-45 cables plug into Amplifier/Remote Head.

Covers 1.5-22 MHz, (10/12 Meters with $29.95 kit, requires FCC license).

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ALS-500M, $849, 500 Watt mobile amp.
ALS-500MR, $929, ALS-500M/Remote Head
ALS-500RC, $49, Remote head for ALS-500M (for serial # above 13049).
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Free online manuals! Ameritron brings you the finest high power accessories!

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Protects rig from damage by keying line transients and makes hook-up to your rig easy!

RCS-4 Remote Coax Switch . . . $159.95

Use 1 coax for **4** antennas. No control cable needed. SWR <1.25, 1.5 - 60 MHz. Useable to 100 MHz.

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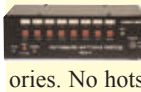
Replace **8** coax with 1! SWR<1.3 to 60 MHz.**RCS-10L, $219.95** with lightning arrestors.

New! RCS-12C Fully Automatic Remote Coax Switch Controller. . . $239.95



Band data from transceiver auto selects antennas. Antenna memories. No hotswitching. Rig-to-amp interface. For 3/4 BCD, 1 of 8 relay boxes. **RCS-12, $309.95**, auto controller with 8 coax relay box, to 60 MHz. **RCS-12L, $349.95**, with lightning arrestors.

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Steve Ford, WB8IMY, upfront@arrl.org

Being Section Manager is a Tough Job, but Someone Has to Do It!

Since ARRL Section Managers are busy running their sections, what do they do in their spare time when they get a moment to operate? Last February North Carolina Section Manager Bill Morine, N2COP, escaped to Bald Head Island, North Carolina to enjoy low power CW on the beach. It was a brisk 50 degrees with an imminent snowstorm when this photo was taken, but for Bill it was well worth it.

His antenna was an Outbacker with eight 33-foot radial wires. Bill reports good results with the 5 W supplied by his Yaesu FT-817ND transceiver, working throughout the US, Europe and South America. He even managed to check into the Ole Miss Net on 18.160 USB. [Pam Morine, photo]

A Work of Art in Metal

Being an avid CW operator, Dave Jones, NK1V, is always looking for new ways to pound brass — or in this case, steel!

A few months ago Dave decided to build his own semi-automatic "bug" key. He began with raw steel stock and went to work with just a hacksaw, an electric hand drill, a bench top drill press, a belt sander and various other hand tools. All the finishing was done using the belt sander and by hand using 320 and 600 grit sand paper. The result is the magnificent creation you see here.

Scouting Pride

Tom Fagan, K7DF, ARRL Arizona Section Manager, received the Boy Scouts of America Silver Beaver award earlier this year. The award is given to adults who have made an impact on the lives of youth through service to their local Boy Scout councils.

Tom has held numerous positions in his council. He gives his time as one of the radio merit badge counselors and has taught hundreds of merit badge classes to thousands of Boy Scouts. He has introduced Amateur Radio and the ARRL to many Cub Scout packs, Boy Scout troops, Girl Scout troops and Venturing crews throughout the southwest. From left to right: Tom's daughter Elizabeth, KE7ZPI; his wife Margie, KE7LHY; Tom Fagan, K7DF and his son Jim, KE7IDC.

Honoring the Memory

Eugene O. Sykes, second chairman of the Federal Radio Commission and first chairman of the Federal Communications Commission, was a native of Aberdeen, Mississippi and was buried there in June 1945. Over the years his memorial at Odd Fellows Rest Cemetery had turned black due to weathering and the lettering had become almost illegible. Members of the Monroe County Amateur Radio Club decided to clean the marker as a club project, restoring it to its former luster. From left: Leon Sharp, K5BUL; Rosie Sharp, KD5RRZ and Jim Buffington, K5JIM.

The memorial is not far from this historical marker at Sykes' boyhood home.

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Letters from Our Members

Changing Technology

At least once a week I visit the home of my grandfather, KE6F, and tinker with his radios and prepare them for sale (or disassemble them for parts). It always intrigues me that some of these pieces of equipment, which were previously tinkered with and modified in the garages and ham shacks of other operators, were once technologic milestones.

Comparing the old hardware with the new, however, I've noticed a number of advancements that we tend to take for granted today. First there is weight; a National NC-303 receiver weighs around 60 pounds while my modern transceiver weighs only 15. My 15-pound rig also has a built-in speaker (many "boat anchor" radios didn't). The NC-303 is no slouch when it comes to receive coverage, but my modern transceiver is almost "dc to daylight," as the saying goes. The NC-303 has a pleasant display, but frankly I prefer the digital display in my 21st century transceiver.

All that said, the old rigs have a certain *cache* that is unique. Perhaps it is just the fact that they are steeped in so much history. While I look forward to the latest advancements in transceiver technology, it is good to occasionally reflect on what brought us here.

Justin Ellis, KJ6PWP
Wilton, California

Swing Your Antennas South!

I am a contester living in South Africa, and I believe it is to the detriment of our hobby that during big contests, stations in the US, Europe, Russia and Japan are often only talking to each other. Their beams are rarely turned to those of us in the southern hemisphere.

Perhaps the ARRL can consider future contest rule enhancements from a southern hemisphere point of view. Perhaps contests could offer extra multipliers for contacts with southern hemisphere countries. It would give a greater incentive for those in the northern parts of the globe to look south!

Evan Seligmann, ZS6ELI
Pretoria, South Africa

Dumbing Down?

I could discuss the merits of code versus no code licensing, but that has already been beaten to death. However, I do believe the code requirement did make one actually learn something and not just memorize the answers to a string of readily accessible questions.

I am astonished when I see an Amateur Radio club advertise a licensing class and state that students are "guaranteed to get a license in one afternoon." How can they do that? It's easy; keep taking the test multiple times until you get lucky and pass.

To further prove my point, read the questions submitted to "The Doctor is In" column in *QST*. The answers to some of these questions should be obvious to anyone that has passed a seventh grade science course, let alone a licensed amateur. Many amateurs buy a pre-assembled half wave dipole for five times what it would cost to assemble one with some wire, a few insulators and a length of coax. Could it be they don't know how to calculate the proper length, or do they simply lack motivation?

Listen to just about any amateur frequency at any time of day; you will hear cursing, intentional interference, rudeness and lack of respect. Yes, I am aware that some of these rude operators were licensed before the days of "no code" and volunteer examiners, but I believe they are in the vast minority.

Should radio amateurs have the same level of competency as communications engineers? Of course not, but they should be at least be one notch above "appliance operators." I must conclude that today's Amateur Radio environment has become yet another facet of the dumbing down of America.

Joe Vik, W8DCQ
Oxford, Michigan

An Unexpected Inspiration

My local club, the Toledo Mobile Radio Association, allowed me to pursue an idea that I thought might give us the opportunity to publicize Amateur Radio to the public and possibly interest some youth as well.

The plan was to hold an operating event at the local library and call it "Wireless Day." It would be held in a side room with signage in the hallways to lure curious patrons to view modern ham radio equipment being used in conjunction with computers. Since the youth of today have known computers all their lives, this seemed a good opportunity to show them wireless in a different way.

We were granted use of the room for the entire time the library was open for the day in question. Sure enough, our event drew a number of visitors, but they weren't the ones we expected. No, the visitors we encountered were mostly hams!

Almost all of these amateurs were Technician class licensees who had been off the air for years. They were amazed at the new ham software and the way it interfaced with computers and radios. Our D-STAR demonstrations made particularly strong impressions. The visitors spent considerable time talking with the event operators and we gave them our club brochure, which had a lot of important information about the club and its activities.

I never realized there are so many inactive hams. I hope our event inspired them to think about getting on the air again.

Steve Bellner, W8TER
Maumee, Ohio

Kudos for Digital *QST*

Please pass on my heartiest congratulations and praise to the *QST* staff who design and produce the digital edition of *QST*.

The results are simply stunning! On my wide monitor at high resolution, the magazine is beautiful. The page turning feature on the bottom of each page is great fun, but the arrows are still there, too. Regardless, I have yet to have the bottom page turner fail.

I imagine that many people worked on this project, and it is certainly worth it. The ARRL has taken a major leap forward. If digital *QST* continues to work so well, I may yet give up my paper *QST* subscription in favor of digital only in the near future.

Mike Slate, N6TEA
Newbury Park, California

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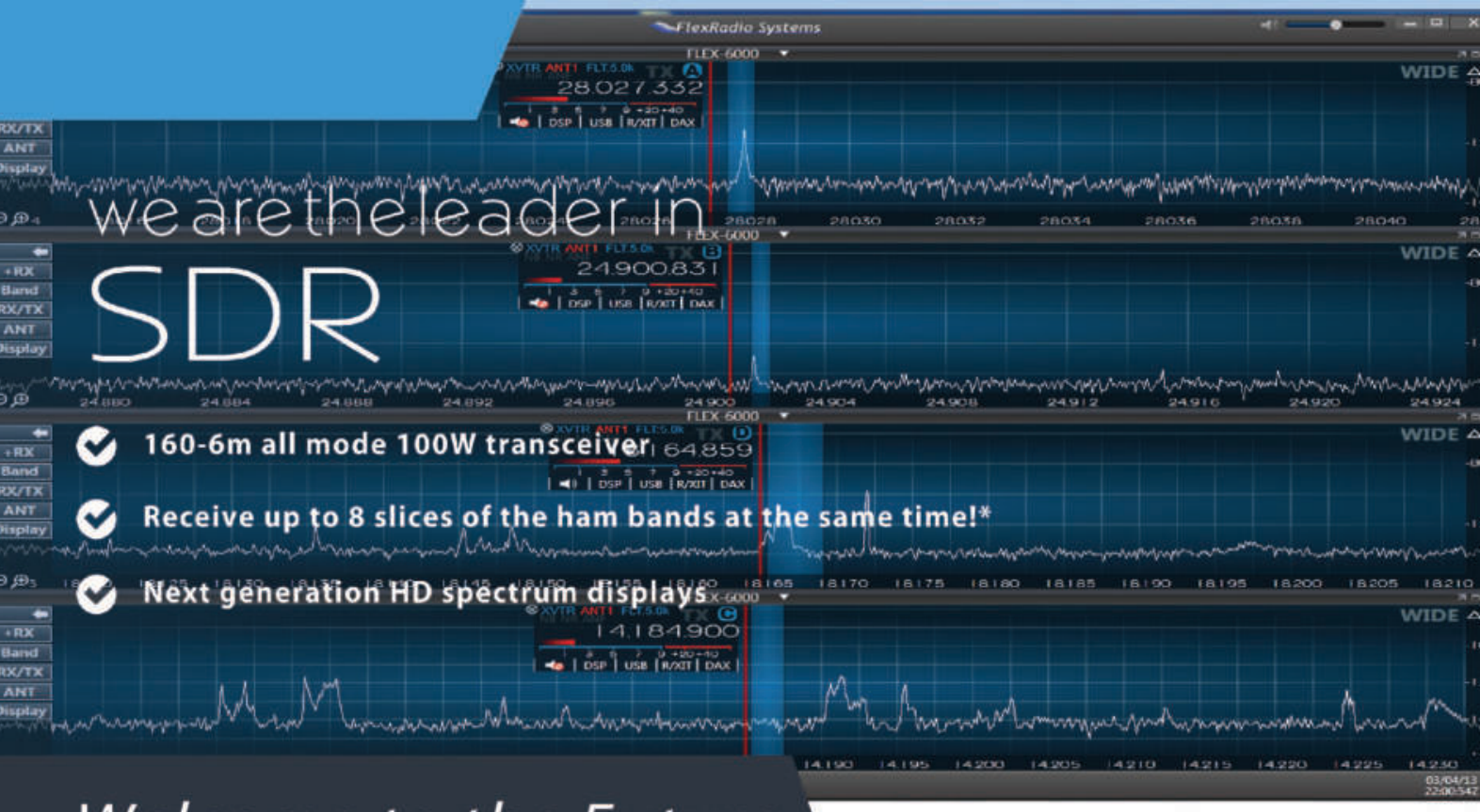

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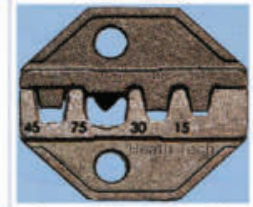

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Allen Baker, KG4JJH

In recent years Amateur Radio enthusiasts have connected cellular Bluetooth® headsets to transceivers using off the shelf hardware.[1] That hardware has been discontinued and is hard to find. Yet the idea of using a wireless headset is intriguing and useful on three levels. First, the capability to monitor the band or conduct contacts while away from the radio can come in handy during contests. Second, I can conduct a hands-free QSO while operating a vehicle. Third, adding another complete RF transmission link in the normal radio communications process appeals to me.

Audio Bluetooth modules from *kcWirefree* provide the final inspiration for this project.[2] The module loaded with *kcAudioGateway* firmware provides a two-way audio communications link to standard off the shelf Bluetooth mono headsets used with cell phones. The Bluetooth radio adapter resides at the transceiver with its audio input connected to the transceiver audio output, and its audio output connected to the transceiver microphone connector. Front panel pushbuttons control the Bluetooth connection and audio volume. A standard ham radio 12 V dc supply powers the adapter.

Circuit Description

The 0.59 × 1.17 inch 40 pin surface mount KC-6112-AG module M1 supports standard and custom Bluetooth profiles. At the recommended operating voltage of 3.3 V dc this class 2 Bluetooth module operates in the 2.4 GHz band and delivers up to 2.5 mW of RF to its built-in meander line antenna for a range of up to 25 meters. [These modules use the BlueCore 5 multimedia chip from Cambridge Silicon Radio, and are FCC and CE listed for embedded applications like this one. — *Ed.*] I added a USB software programming jack, mini connector J4 in the schematic of Figure 1 and to the circuit board layout allowing the user to update the module firmware.[3]

Table 1 lists the module states and LED events, and Table 2 lists the features and button actions. Pushbutton S1 BLUETOOTH enables the module and establishes the Bluetooth connection. Pushbuttons S2 VOL UP and S3 VOL DN shown in Figure 2 raise and lower the received volume. Double pressing S2 and S3 also raises and lowers audio input gain.

A 12 dB attenuator, R4 and R5, in Figure 1 lowers the transceiver audio speaker/headphone level to the maximum 0.4 V rms audio input level for M1. R1 and R6 attenuate the 0.75 V rms line output level from M1 by 30 dB to the typical transceiver microphone level. Two 3.5 mm phone jacks provide connections to the radio speaker/headphone output J1 and to the radio microphone J2.

Voltage regulator U1 accepts 12 V dc from power jack J3 shown in Figure 3, and supplies the 3.3 V dc to the circuit. The regulator features short-circuit protection and can source up to 500 mA of current. The circuit draws about 26 mA.

The Printed Circuit Board

The area 8 mm or more around module M1 should be free of any ground planes, power planes, trace routings or metal. I designed and ordered my printed circuit board (PCB) from ExpressPCB taking advantage of their MiniBoard service that provides three 3.8 ×

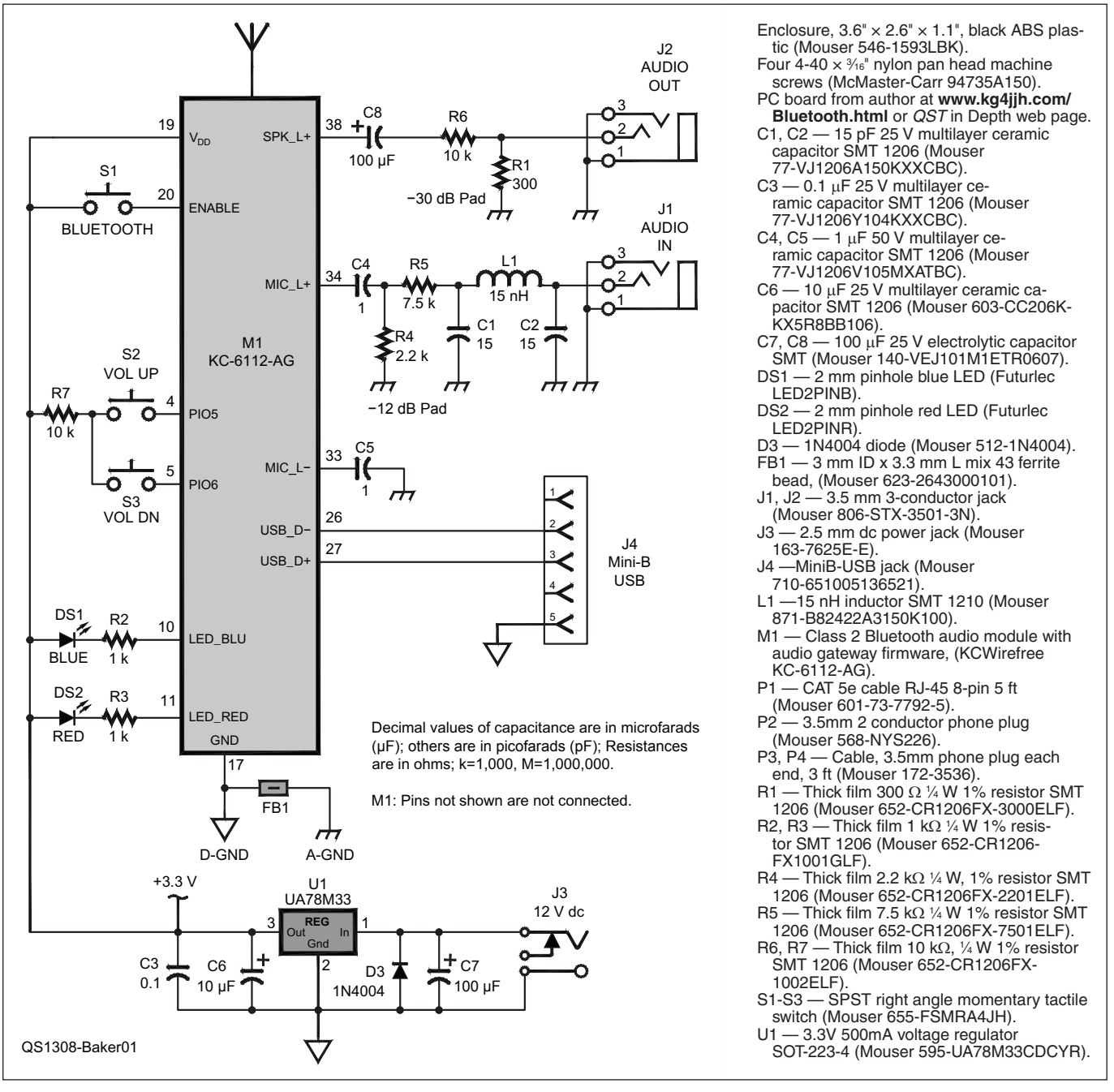
Table 1
Bluetooth LED Display Events

LED Action	State Indicator	Specific Timing
Powering On	Solid blue	1 s on
Powering Off	Solid red	1 s on
Discoverable	Fast alternate red/blue blink	60 ms on, 60 ms off
Connectable	Slow double blue blink	80 ms on/off/on, 1200 ms off
Connected	Blue blip	40 ms on, 2300 ms off
Connecting to Headset	Fast blue blink	–
Searching for New Headset	Blue/red/blue blink	–
Reset Pairing	Triple red + blue flash	–

Table 2
Bluetooth Button Features

Feature	Button Action
Power On	Hold BLUETOOTH button 2.5 s when off
Power Off	Hold BLUETOOTH button 2.5 s when on
Connect Last	Press BLUETOOTH button
Search & Connect	Hold BLUETOOTH button 1 s
Volume Up	Press VOL UP, hold for repeat
Volume Down	Press VOL DN, hold for repeat
Input Gain Up	Double press VOL UP
Input Gain Down	Double press VOL DN
Reset Pairing	Hold VOL UP and VOL DN 2 s

[1]Notes appear on page 33.



Enclosure, 3.6" × 2.6" × 1.1", black ABS plastic (Mouser 546-1593LBK).
Four 4-40 × 3⁄16" nylon pan head machine screws (McMaster-Carr 94735A150).
PC board from author at **www.kg4jjh.com/Bluetooth.html** or *QST* in Depth web page.
C1, C2 — 15 pF 25 V multilayer ceramic capacitor SMT 1206 (Mouser 77-VJ1206A150KXXCBC).
C3 — 0.1 µF 25 V multilayer ceramic capacitor SMT 1206 (Mouser 77-VJ1206Y104KXXCBC).
C4, C5 — 1 µF 50 V multilayer ceramic capacitor SMT 1206 (Mouser 77-VJ1206V105MXATBC).
C6 — 10 µF 25 V multilayer ceramic capacitor SMT 1206 (Mouser 603-CC206K-KX5R8BB106).
C7, C8 — 100 µF 25 V electrolytic capacitor SMT (Mouser 140-VEJ101M1ETR0607).
DS1 — 2 mm pinhole blue LED (Futurlec LED2PINB).
DS2 — 2 mm pinhole red LED (Futurlec LED2PINR).
D3 — 1N4004 diode (Mouser 512-1N4004).
FB1 — 3 mm ID x 3.3 mm L mix 43 ferrite bead, (Mouser 623-2643000101).
J1, J2 — 3.5 mm 3-conductor jack (Mouser 806-STX-3501-3N).
J3 — 2.5 mm dc power jack (Mouser 163-7625E-E).
J4 —MiniB-USB jack (Mouser 710-651005136521).
L1 —15 nH inductor SMT 1210 (Mouser 871-B82422A3150K100).
M1 — Class 2 Bluetooth audio module with audio gateway firmware, (KCWirefree KC-6112-AG).
P1 — CAT 5e cable RJ-45 8-pin 5 ft (Mouser 601-73-7792-5).
P2 — 3.5mm 2 conductor phone plug (Mouser 568-NYS226).
P3, P4 — Cable, 3.5mm phone plug each end, 3 ft (Mouser 172-3536).
R1 — Thick film 300 Ω ¼ W 1% resistor SMT 1206 (Mouser 652-CR1206FX-3000ELF).
R2, R3 — Thick film 1 kΩ ¼ W 1% resistor SMT 1206 (Mouser 652-CR1206-FX1001GLF).
R4 — Thick film 2.2 kΩ ¼ W, 1% resistor SMT 1206 (Mouser 652-CR1206FX-2201ELF).
R5 — Thick film 7.5 kΩ ¼ W 1% resistor SMT 1206 (Mouser 652-CR1206FX-7501ELF).
R6, R7 — Thick film 10 kΩ, ¼ W 1% resistor SMT 1206 (Mouser 652-CR1206FX-1002ELF).
S1-S3 — SPST right angle momentary tactile switch (Mouser 655-FSMRA4JH).
U1 — 3.3V 500mA voltage regulator SOT-223-4 (Mouser 595-UA78M33CDCYR).

Figure 1 — Schematic diagram of the Bluetooth radio adapter includes a 3.3 V dc power supply. Mouser parts available from **www.mouser.com**, KC Wirefree parts from **www.kcwirefree.com**, McMaster-Carr parts from **www.mcmaster.com**, Futurlec parts from **www.futurlec.com**.

2.5 inch PCBs for approximately $51.[4] You can obtain my PCB design from the *QST* in Depth web page.[5] My PCB adds a USB jack J4 and corrects some errors in the KC Wirefree documentation over the prototype board shown in Figure 4. The Bluetooth radio adapter PCB is smaller than the standard MiniBoard size so you must cut it to fit the enclosure. Trim the PCB to size by removing the solid copper areas. Cut inside the copper areas using a band saw or fine-toothed hack saw and finish removing the copper areas with a file.

Construction and Tools

All components are surface mount devices (SMDs) except J1-J4, S1-S3, D1-D3, and FB1. Since this was my first project using SMDs, I invested in a few tools and supplies which you may find handy as well. My list includes a magnifying lamp (3 diopter), temperature controlled soldering station (Hakko FX-888), soldering tips (Hakko T18-I, T18-C05, T18-B), tweezers (DigiKey EROP3CSA-ND), 0.020" diameter solder (Mouser 533-24-6337-9702) and de-soldering braid (Mouser 5878-60-1-5).

You might opt for a hot air rework SMD soldering station which uses hot air along with solder paste.[6] All components mount on the component side of the PCB as shown in Figure 4. Install all surface mount components first to allow room for the soldering iron. Inspect the PCB for correct components, component orientation, good solder joints and remove any solder bridges using de-soldering braid. Mount the two LEDs by bending the leads so that the LEDs match the openings in the front face of the 3.6 inch by 2.6 inch by 1.1 inch black ABS plastic enclosure

Figure 2 — Select the Bluetooth features using the three front panel pushbuttons and observe the Bluetooth state indications on the red and blue LEDs.

Figure 3 — Audio in and out, and 12 V dc connections are on the rear panel.

(Mouser 546-1593LBK). I show the LED bending dimensions and drawing on the *QST* in Depth web page. Also, be sure to remove the plastic tabs on the bottom of J1 and J2. Tap the PCB mounting holes with a 4-40 tap and install the PCB using four nylon 4-40 by 3/16 inch pan head machine screws (McMaster-Carr 94735A150). The nylon screws prevent shorting any PCB traces and reduce the amount of metal around the antenna. I provide a drill template for the enclosure front and rear panels to aid in hole cutting on the *QST* in Depth web page. Print the PDF template full size with no page scaling, align the template center lines with the panel center lines, and secure it to the panel using a temporary adhesive such as a glue stick. Add four sticky-back rubber feet on the bottom to complete the enclosure.

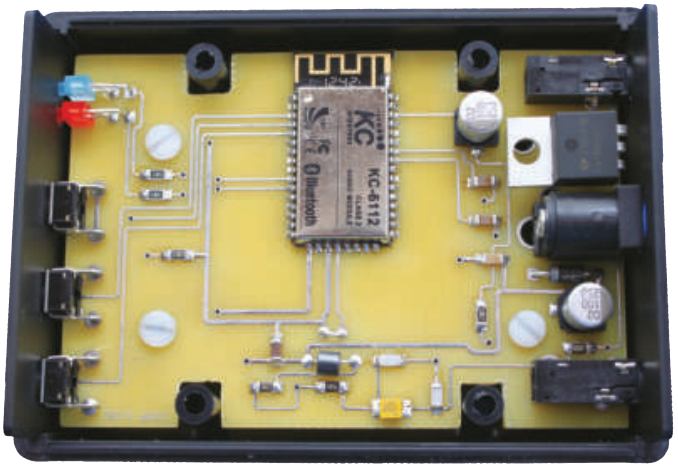


Figure 4 — The Bluetooth module in the top center of this prototype circuit board sports a folded "meander line" antenna.

Use a standard shielded cable with 3.5 mm mono phone plugs on each end to connect the Bluetooth radio adapter audio input to the transceiver speaker/headphone output. The cable for connecting the Bluetooth radio adapter microphone to the transceiver should have a 3.5 mm mono phone plug on one end and the appropriate microphone connector on the other end. I prepared one cable for use with my Yaesu FT-817/857 and one for my Kenwood TS-480SAT. Both of my radios use RJ-45 microphone connectors. J2 tip is audio out to the radio microphone, and J2 sleeve is microphone ground. Cut a five foot CAT-5e cable in half and solder a 3.5 mm mono phone plug on the cut end. Builders should consult their radio manual for microphone pin-outs. I've included some cable diagrams on the *QST* in Depth web page.

Bluetooth Headset

I chose the VXi BlueParrott® B250-XT shown in the article's lead photo to test my Bluetooth radio adapter as it has a boom that places the microphone near the mouth, increasing intelligibility.[7] This headset combines a high-performance noise-canceling microphone and noise suppression technology to eliminate ambient noise. It features 16 hours of talk time on a single charge and up to 150 hours standby time.

Powering up and Connecting

Refer to Table 1 for the LED event and state indicators and to Table 2 for the available button actions. Upon power up, the Bluetooth radio adapter will search for any previously paired Bluetooth headsets and attempt to connect with them. The adapter is discoverable and available for new pairings upon power up only if there are no previously paired devices in memory. Otherwise, the adapter can be put into discoverable pairing mode manually by pressing and holding the BLUETOOTH button through power up. After a 7 second hold the adapter will enter the discoverable mode, beep twice and flash an alternating red and blue light sequence. Press and hold the headset BLUETOOTH button for six or seven seconds and release. The headset will beep and the two units should connect in the next few seconds and display a slowly flashing blue LED. Once paired, the unit can be powered up using a 2.5 second press of the BLUETOOTH button for instant connection.

Once connection is established between the Bluetooth headset and Bluetooth radio adapter, adjust the output volume using the VOL UP and VOL DN buttons. Also, adjust the input gain input using a double press of the same buttons. The KC Wirefree modules support PTT functions, but since cell phones (and cell phone accessories) are full duplex there is no need for a PTT button. Therefore, when using the Bluetooth radio adapter with a standard Bluetooth headset configure your radio for VOX operation. As an aid to unwanted transmissions, the Blue Parrott Headset features a mute button. When transmitting from the Bluetooth headset there is an audio delay of about 45 ms that is not noticeable unless the transceiver transmit monitor is turned on. I recommend that you turn off the transmit monitor function to avoid the slight echo effect produced by the delay. You achieve the highest signal to noise ratio on

the Bluetooth headset by reducing the Bluetooth radio adapter input gain to minimum (double press the VOL DN button several times). Then adjust the transceiver output volume for maximum volume with minimum distortion.

Line of sight between the Bluetooth headset and Bluetooth radio adapter results in best range. Certain conditions and obstructions, such as other wireless devices, microwave ovens, walls or placing the device on a metal surface (such as your vehicle's hood) can inhibit radio wave transmission and reduce range.

Final Thoughts and Conclusion

I was pleasantly surprised at the ease of surface mount component soldering. The magnifying lamp and tweezers made component placement a snap. The high quality temperature controlled soldering iron and small diameter solder were instrumental in the completion of this project. My method was to lightly tin one pad with solder, place and align the component on the pads with tweezers, press down on the component, and heat the tinned pad. This levels and holds the component in place to allow soldering of the remaining pads. Finally, go back and resolder the first pad with additional solder. Place the solder wick over any solder bridge to clean it up and hold the tip of the soldering iron on top of the solder wick. The wick pulls in the excess solder, eliminating the bridge.

The outdoor range of my Blue Parrott headset and Bluetooth radio adapter is over 50 feet. You should be aware that Bluetooth transmissions do not always penetrate walls or ceilings and are limited to relatively short line of sight ranges. I found that the audio quality transmitted from the Bluetooth radio adapter to the Bluetooth headset is excellent, and the audio from the Bluetooth headset to the transceiver via the Bluetooth Radio Adapter easily meets the nominal 300-3 kHz communications bandwidth.

This project is among the most enjoyable and interesting Amateur Radio devices that I have developed. Because there are relatively few components, the project presents an ideal introduction to surface mount device soldering. The fun begins once the Bluetooth radio adapter has been paired with the headset and the levels set. Untethered from microphone and headset wires, you are now free to roam around. So, get out of your station chair, lace up your crosstrainers and turn your sedentary radio time into a workout!

Notes

[1]Bluetooth® is a trademark of the Bluetooth SIG, **www.bluetooth.com**.
[2]KC Wirefree Corporation, Bluetooth Wireless Audio Products, KC-6112 Datasheet, **kcwirefree.com/kc6112.html**.
[3]KC Wirefree Corporation, Firmware Update Tools, **kcwirefree.com/firmware.html**.
[4]ExpressPCB, **www.expresspcb.com/index.htm**.
[5]**www.arrl.org/qst-in-depth**.
[6]Hot Air Rework Station, **www.mcmelectronics.com/product/21-11425**.
[7]Blue Parrott B250-XT Headset, **www.vxicorp.com/products/blueparrott-bluetooth-mobile-solutions/bluetooth-headsets/b250-xt/**.

Allen Baker, KG4JJH, has been licensed since 2000 and loves to experiment with antennas and radio gear. He has authored numerous articles and maintains an Amateur Radio project website at **www.kg4jjh.com**. His other hobbies include fishing, camping and playing the guitar. You can reach him at 211 Brochardt Blvd, Knoxville, TN, 37934 or **kg4jjh@arrl.net**.

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

In The July/August 2013 Issue:

■ Gary Richardson, AA7VM, wanted a better frequency counter than a previous project had been, and decided that a complex programmable logic device (CPLD) would be well suited to the task. This project was an opportunity to learn about what was to him a new class of ICs. The resulting frequency counter is described in his article, "Another Frequency Counter for the Experimenter."

■ Hamish Kellock, OH2GAQ, describes a flexible, sophisticated way to control multiple transverters for use with a single transceiver in "A Microwave Transverter Controller."

■ James Lee, N1DDK, introduces us to micro-electrical-mechanical systems (MEMS) inertial sensors and describes some ways we might use these devices with our Amateur Radio stations in "Motion Based Electrical Power Control." While a MEMS device may look like a *normal* surface mount IC, and be soldered into a circuit like one, these little building blocks are anything but normal!

■ Ray Mack, W5IFS, takes a break from his "SDR: Simplified" column to explain "Using Time Domain Reflectometry for Transmission Line Impedance Measurement." Ray describes how a pulse generator and oscilloscope are used to make these measurements and reveal how the technique can reveal conditions on a remote piece of coaxial cable.

■ Bob Simmons, WB6EYV, presents "A Two Meter APRS Beacon Transmitter." With RS232 input from a GPS unit, this 2 W transmitter will have you beaconing your position into the APRS network.

■ Colin Horrabin, G3SBI, describes the design and construction of a receiver front end that could transform the state of art in receiver engineering. Colin used H-mode mixers and 4 × J310 transistor amplifiers for "The HF7070 Communications Receiver Prototype." While the HF7070 is not likely to become a commercial product, Colin's front end design gives the prototype receiver some outstanding performance. The measured IP3 dynamic range at 100 Hz signal spacing is 97 dB, and that measurement goes to 115 dB at 20 kHz spacing. If you are interested in receiver performance, you won't want to miss this article!

■ Nickolaus Leggett, N3NL, presents an idea for "Getting Students Excited About Technology and Engineering" with a brief Tech Notes article. A simple shielded metal box, with easy access door and a rack to hold standard sized circuit board cards would provide a convenient way to experiment with RF circuits without the need to fabricate a chassis or enclosure for each project.

QEX is edited by Larry Wolfgang, WR1B, (**lwolfgang@arrl.org**) and is published bimonthly. The subscription rate (6 issues) for ARRL members in the US is $24. First Class US delivery, $37; in Canada and internationally by airmail, $31. Nonmembers add $12 to these rates. Subscribe to *QEX* today at **www.arrl.org/qex**.

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There's a Ham Band at 900 MHz?

You bet, and you may find a lot to like on this shared band.

Johnny L. Knight, WB4U

The 33 centimeter amateur band covers 902 to 928 MHz. Hams are authorized to use this band on a secondary basis — meaning you can't cause harmful interference to users assigned on a primary basis and you must accept any interference caused by those primary users. There was one Alinco amateur handheld announced last year, and there are plenty of commercial radios for 900 MHz.[1]

What non-amateur users will you encounter on 900 MHz? Industrial, scientific and medical (ISM) equipment is permitted to operate under Part 18 of the FCC Rules for non-communications purposes in the entire band; this is how the amateur allocation came about in the first place since amateurs were willing to tolerate interference from this source. Military radar has the highest priority among communications users followed by other federal users; to protect these operations there are frequency limits on amateur operation in portions of Colorado, Wyoming, New Mexico and Texas. Next is the Location and Monitoring Service (LMS) including the new Progeny/NextNav deployment as reported in "Happenings" in this issue of *QST*. The amateur service comes next, with a myriad of unlicensed low-power devices operating under FCC Part 15 at the bottom of the pile.

Band Plans

Band plans for 900 MHz make room for all users and all modes. The original ARRL 900 MHz amateur band plan may have been designed without information about the practices of the primary users in the band, and without taking into account the capabilities of the available commercial equipment. That plan specified 12 MHz repeater offsets, an arrangement not supported by most of the commercial radios available for 900 MHz.

In July 2012, the ARRL Board of Directors approved a revised 33 centimeter plan. The new band plan (see Table 1) takes into account the primary users' operational preferences and suggests ham repeater inputs and outputs that are close to the band edges. This is similar to some regional plans as well. (See Tables 2 and 3.)

My primary interest in the band is FM and repeaters and there are more than most hams realize. In my area there are two 900 MHz repeaters and both offer good coverage out to about 50 miles for base stations and up to 30 miles for mobiles [This is mostly a function of repeater height and terrain — *Ed.*]. Handheld coverage varies, but often is usable out to about 10 miles. There is a lot of information about 900 MHz available on the Internet, which is the source of much of the in-

Figure 1 — The author's 900 MHz band Motorola GTX 900 scanning all channels.

Table 1
ARRL Band Plan for Amateur 33 Centimeter Band (902–928 MHz)

Frequency (MHz)	Mode	Function
902.000-902.075	FM, DV, CW/SSB,	Repeater inputs 25 MHz split paired with those in 927.000-927.075[2]
902.075-902.100	CW/SSB	Weak signal
902.100	CW/SSB	Weak signal calling; Regional option
902.100-902.125	CW/SSB	Weak signal
902.125-903.000	FM/other including DV	Repeater inputs 25 MHz split 12.5 kHz channel spacing paired with those in 927.1250-928.0000 MHz
903.000-903.100	CW/SSB	Beacons and weak signal
903.100	CW/SSB	Weak signal calling; Regional option
903.100-903.400	CW/SSB	Weak signal
903.400-909.000	Mixed modes	Mixed operations including control links
909.000-915.000	Analog/digital	Broadband multimedia including ATV, DATV and SS[3,4]
915.000-921.000	Analog/digital	Broadband multimedia including ATV, DATV and SS[3,4]
921.000-927.000	Analog/digital	Broadband multimedia including ATV, DATV and SS[3,4]
927.000-927.075	FM/other including DV	Repeater outputs 25 MHz split 12.5 kHz channel spacing paired with those in 902.0000-902.0750
927.075-927.125	FM/other	Simplex including DV
927.125-928.000	FM/other including DV	Repeater outputs 25 MHz split 12.5 kHz channel spacing paired with those in 902.125-903.000[5,6]

Notes to 33 centimeter band plan:
[1]Significant regional variations in both current band utilization and the intensity and frequency distribution of noise sources preclude one plan that is suitable for all parts of the country. These variations will require many regional frequency coordinators to maintain band plans that differ in some respects from any national plan. As with all band plans, locally coordinated plans always take precedence over any general recommendations such as a national band plan.
[2]May be used for either repeater inputs or weak signal as regional needs dictate.
[3]Division into channels and/or separation of uses within these segments may be done regionally based on needs and usage, such as for 2 MHz-wide digital TV.
[4]These segments may also be designated regionally to accommodate alternative repeater splits.
[5]Simplex FM calling frequency 927.500 or regionally selected alternative.
[6]Additional FM simplex frequencies may be designated regionally.

[1]Notes appear on page 36.

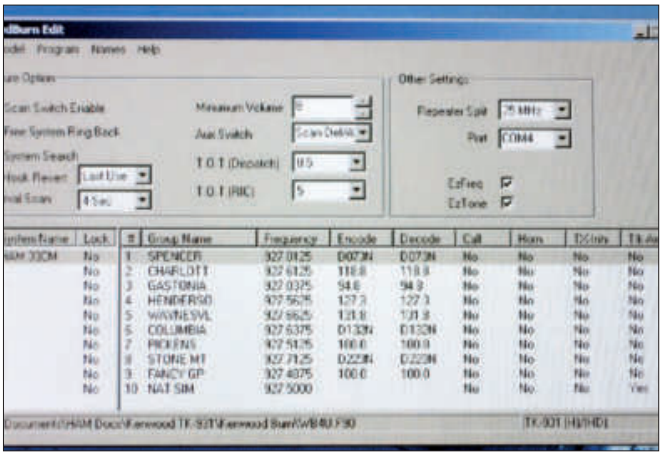


Figure 2 — Screen shot of the *Kenwood Burn* program used to set up the Kenwood TK-931 transceiver.

Figure 3 — The author's Kenwood TK931 monitoring the Spencer Mountain 900 MHz repeater.

formation in this article. Many hams have worked long and hard, experimented, learned and have shared what they learned with others via the Internet.[2]

Available Radios

In addition to the Alinco amateur handheld previously mentioned, there are both Motorola (see Figure 1) and Kenwood radios that need nothing more than programming to make them operational on 900 MHz. There are also many that require hardware modification to get them to work, so be very careful in deciding what you plan to purchase.

As outlined on the Batlabs site (**www.batlabs.com**), to modify a Motorola radio, you either need to find someone licensed to use the Motorola programming software, or you can buy a license yourself. Be aware too, that much of the Motorola software is *DOS* based and you will need an older computer with real COM (serial) ports. We are talking about an old 386, 486 or perhaps a Pentium 1 that runs at less than 800 MHz. You also need what is called a RIB (Radio Interface Box) and cable to go between it and the computer plus a cable to connect the RIB to the radio. Some of the newest software for Motorola radios will run on *Windows* but radios that use it cost much more than most hams want to pay for a radio.

For those looking at a Kenwood for use on 900 MHz, the news is better. In the beginning, hams had a lot of trouble programming a Kenwood for 900 MHz since Kenwood doesn't explicitly use frequencies in their programming. They use FCC channel numbers and it required a lot of time and effort to figure out the channel numbers needed for the desired frequencies. Thanks to the work of those pioneering hams there are now programs for Kenwood radios (*Kenwood Burn*) that do all the work for you (see Figure 2). In addition those programs work under *Windows*. Appro-

Table 2
Southern California Band Plan for 33 Centimeters (902–928 MHz)

Frequency Range (MHz)	Function
902.0125-902.0875	Group repeater input channels[2]
902.1000	Reserved for weak signal users
902.1125-902.9875	Offset A repeater and point-to-point link inputs[1]
902.7000	Offset A test pair input
903.0000-904.9875	Offset B repeater and point-to-point link inputs[1]
903.7000	Offset B test pair input
904.7000	Offset B test pair input
905.0000-905.9875	Digital[3]
906.0000-924.0000	Amateur television.
912.0000	Amateur television alternate FM[4]
913.2500	Amateur television simplex NTSC AM carrier
915.0000	Amateur television FM[4]
919.2500	Amateur television NTSC VSB repeater output carrier
924.0000-924.9875	Digital[5]
925.0000-926.9875	Offset B repeater and point-to-point link outputs[1]
925.7000	Offset B test pair output
926.7000	Offset B test pair output
927.0000-927.1000	Simplex point-to-point links[6]
927.1125-927.9875	Offset A repeater and point-to-point link outputs[1]
927.6000	Simplex
927.7000	Offset A test pair output
927.8000	Simplex

Notes for the above band plan table.
[1]Point-to-point links will be ground-to-communications site only. Communications-site-to-communications-site links will not be allowed.
Repeater and point-to-point links.
Emissions = 13K6F3E, ±2.5kHz maximum deviation.
3 kHz highest applied audio frequency.
Transmitter audio low-pass filter attenuation for 3 kHz to 20 kHz = 100 log(f/3) where f = frequency in kHz.
Channel spacing = 12.5 kHz (902.1125/927.1125 to 902.9875/927.9875 and so forth).
Repeater spacing (for offset A) = 25 MHz.
Repeater spacing (for offset B) = 22 MHz.
Frequency tolerance (fixed and mobile) = 1.5 ppm (0.00015%).
9xx.9000MHz repeater frequencies reserved for open repeater coordinations.
[2]Group repeater input channels for multiple system use; low noise channels, restricted to 5 W ERP. Multiple coordinees per channel. Never as a coordinee's primary input. Use limited to auxiliary repeater inputs only.
[3]Wideband digital ground transmit only.
[4]FM ATV: Ground simplex transmit only or repeater input paired with other band repeater output. No high-level site transmit permitted. 100 W ERP directional maximum. 10 W ERP omni-directional maximum. Video deviation 3 MHz. Occupied bandwidth 12 MHz (including all subcarriers). Overlap with an AM ATV repeater output on 919.25 MHz will be handled on case-by-case coordination. Use of optional 912 MHz carrier requires tight transmit bandwidth control. Digital TV allowed, but must conform to the current 6 MHz bandwidth usage.
[5]Wideband digital communications site transmit only. Horizontally polarized, directional, 2W ERP maximum.
[6]Simplex point-to-point links will be ground-to-ground or ground-to-communications-site only. Communication-site-to-communication-site links will not be allowed.
Last modified: May 17, 2010

priate cables with radio and USB terminations are available on Internet auction sites.

Both Motorola and Kenwood radios usable on 900 MHz can also be found on auction sites, but make sure you know exactly *what* you are buying.

Motorola GTX 900

The best choice from Motorola is the GTX 900 series. These will work on 900 MHz without modification — all they require is programming. They sell for about $100 to $150 depending on condition. There are two models of the GTX 900, a 30 W version and a 12 W version. The easy way to tell the difference is that the 30 W model has a power pigtail while the 12 W unit has a socket for the power cable.

The GTX is a spartan radio with only a channel number readout and 10 channels. You lose one channel because you *must* leave one channel as a *trunking* channel. That happens to be just one of the quirks of the GTX. The radio has robust receive audio from a front firing speaker and very good transmit audio. It can be programmed to scan. There are a number of accessories also out there for the GTX series. I use a 12 W version at home and have acquired a Motorola RMN-5068A desk microphone for it.

For 900 MHz operation the serial number of the radio you want begins with M11Wxxxxxx. The "W" specifies that that radio does cover 896 through 941 and the rest of the number gives details for that model such as power output and number of channels. For example, mine has a model number of M11WGD4CU1AN. It has 10 channels and is an LTR trunking model for 900 MHz. There is a more detailed explanation on the Batlabs web page.

Kenwood TK931 and TK981

On the other side there are the Kenwood models TK931 (see Figure 3) and TK981. Both of these can be programmed and operated without modification, however the 931 really needs the receive band-pass filters changed out for best performance (see the digital edition of *QST* for how to accomplish this).

Antennas

Antennas for 900 MHz are readily available. Both Larsen and Comet offer 902 to 928 antennas for both mobile and base use. There are also a multitude of commercial manufacturers that make antennas to cover 902 to 928 MHz. It's a nice thing that 900 MHz antennas are somewhat broad banded. I was lucky to snag a Decibel Products pager antenna on an Internet auction for a song. It is the model DB589Y, covers 890 to 960 MHz, is about 110 inches long, 2 inches in diameter and weighs 11.5 lbs and has 9 dBd gain. On the car I use a PCTEL (Maxrad) BMAX9105 that covers 870 to 950 MHz, is 23 inches long, NMO mount, black stainless steel and gives you 5 dB gain. It makes a major difference over a ¼ wave antenna on the car.

The Kenwood TK-931 I use in the car is the HD model and has a 30 W output. I was a little concerned about overheating while using this radio on the 900 MHz ham band, since most commercial radios are not designed for ragchewing. To be safe I added a small 40 × 10 mm fan to the back heat sink of my GTX 900 and to the top heat sink of the TK-931. The fan I chose runs all the time when I power up the radios and is very quiet. You have to really get close to the radio to even hear it, but it does move about 6 CFM and will cool the radios nicely if I get long winded!

So what are you waiting for? The 900 MHz ham band is there just waiting for you. All you need to do is check with some of your local hams or *The ARRL Repeater Directory* listings for your area to see if there are any repeaters close to you and get on the air.[3] If there are no repeaters close, build one!

Table 3
SERA (Southeastern Repeater Association) Frequency Utilizaation Plan for 902–928 MHz

Frequency Range (MHz)	Function
902.0000-902.2875	SSTV, FAX, ACSSB experimental
902.2125-902.4625	Auxiliary FM Duplex link input frequency pairs
902.4875-902.7250	FM repeater inputs and designated simplex (25 MHz split — 12.5 KHz spacing)
902.5000	FM simplex calling channel (1 of 2)
902.7375-903.0500	EME exclusive
903.0700-903.0800	CW beacons
903.1000	CW, SSB calling frequency
903.4000-903.6000	Cross band linear translator inputs
903.6000-903.8000	Cross band linear translator outputs
903.8000-904.0000	Experimental beacons exclusive
904.0000-906.0000	Digital communications
906.0000-907.0000	Narrow band FM simplex (grandfathered system — 25 KHz channels)
906.5000	Old national calling frequency (grandfathered)
907.0000-910.0000	FM repeater inputs (12 MHz split — 100 KHz spacing)
910.0000-916.0000	ATV
916.0000-918.0000	Digital communications
918.0000-919.0000	Narrow band FM control links and remote bases
919.0000-922.0000	FM repeater outputs (12 MHz split — 100 KHz spacing)
927.0125-927.9875	Auxiliary simplex and link frequencies
927.2125-927.4625	Auxiliary FM duplex link input frequency pairs
927.4875-927.7250	FM repeater outputs and designated simplex (25 MHz split — 12.5 KHz spacing)
927.5000	FM simplex calling channel (2 of 2)
927.7375-927.7875	Old SERA FM voice simplex channels (grandfathered)
922.0000-928.0000	Wideband experimental, ATV, simplex, spread spectrum

Notes

[1]B. Allison, WB1GCM, "Product Review — Alinco DJ-G29T Dual Band Handheld Transceiver," *QST*, Jul 2012, pp 44-47.

[2]See for example: **www.qsl.net/kb9mwr/projects/900mhz/plan.html**, **www.kw902.com**, **www.batlabs.com**, **www.ham-radio.com/wb6zsu/components/receiver/receiver_mods.html**. There are others but these are the pages I found most helpful to me. The Batlabs site is exclusively about Motorola radios that are usable on 900 MHz and the KW902 site provides just about anything you want to know about the Kenwood line of radios that can be used on 900 MHz.

[3]*The ARRL Repeater Directory*, 2012-2013 Edition. Available from your ARRL dealer or the ARRL Bookstore, ARRL in either desktop-sized edition, order no. 5485, or pocket-sized edition, order no. 5347. Telephone 860-594-0355, or toll-free in the US 888-277-5289; **www.arrl.org/shop/**; **pubsales@arrl.org**.

ARRL member Johnny L. Knight, WB4U, has been licensed since 1983 and currently holds an Amateur Extra class license. He is a certified teacher of electronics based on studies at North Carolina Agriculture and Technological University. In addition to working in public schools, his careers have spanned broadcasting and commercial communications and he now works for Union County Transportation in North Carolina. You can reach Johnny at 2104 Irby Rd, Monroe, NC 28112 or at **wb4u@wrknradio.com**. His web page can be found at **www.wrknradio.com**.

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

Build this Two Element 30 Meter Beam

Achieve 6.5 dBi gain with this Yagi antenna that uses full sized elements spaced 8 feet apart.

Tom Lindgren, WØWP and Rich Haendel, W3ACO

This two element Yagi antenna uses a full sized driven element spaced 8 feet from a director element to achieve 6.5 dBi gain and a front to back (F/B) ratio comparable to conventional three element designs. W3ACO did the modeling and antenna design and WØWP built and erected the antenna. Simulations showed that we could achieve 6.5 dBi forward gain and a 20 dB F/B ratio using a closely spaced driver-director (D-D) design. D-D Yagis are inherently narrower band than reflector-driven (R-D) element designs, but on the 30 meter band that is not a problem. The natural feed point impedance of a D-D Yagi is much lower than 50 Ω and the front to back ratio is significantly better than an R-D design. We developed a match to the 50 Ω coax, kept the antenna feed balanced and reduced the element spacing without compromising gain.

Modeling and Design Details

We used *EZNEC* 5.0 for all of the modeling.[1] The initial design used one inch constant diameter elements. We varied the spacing and element lengths to obtain good F/B ratio and a match to the desired 22 Ω impedance. The D-D Yagi that evolved from *EZNEC* modeling has 6.6 dBi gain, a F/B ratio of about 20 dB and a 22 Ω, 1.5 to 1 VSWR bandwidth of 100 kHz at an element spacing of 8 feet. Figure 1 shows the difference in front to back (F/B) ratio performance between a reference 18 foot spaced D-R version and the 8 foot spaced D-D antenna. Both models have a forward gain of 6.6 dBi. However the 8 foot spacing results in about 20 dB F/B ratio, 10 dB more than for the reference antenna with 18 foot spacing.

[1]Notes appear on page 38.

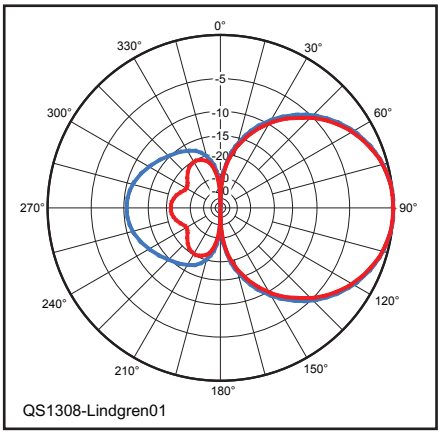


Figure 1 — Eight foot driver to director element spacing (red) performs 10 dB better in front to back ratio than (blue) 18 foot spacing.

Further reducing the spacing to 7 feet increases the gain to 6.75 dBi but reduces the resonant impedance to about 17 Ω and reduces the 1.5 to 1 VSWR bandwidth to 80 kHz. We decided that the 8 foot spacing and 6.6 dBi are a good compromise. We opted to insulate both elements from the boom as shown in Figure 2 for the director element and Figure 3 for the driven element. The grey colored balun box shown in Figure 3 houses the balun transformer.

We initiated the *EZNEC* based design by using constant one inch diameter elements. Then we tapered the antenna element diameters in *EZNEC* using a taper schedule from 1.5 inches at the center to one inch at the tips while checking performance against the one inch diameter reference design. *EZNEC* includes the Leeson corrections for tapered elements. The tapered model showed a gain of 6.67 dBi and a worst case F/B ratio of 20.7 dB. Computed VSWR referenced to 22 Ω was better than 1.5 to 1 from 10.06 to 10.16 MHz as seen in Figure 4.

Matching the Antenna

Six turns of trifilar wound #14 AWG enamel coated wire on an FT-240-61 toroid forms

Figure 2 — The director element is insulated from the boom.

Figure 3 — A balun transformer inside the grey box feeds the driven element.

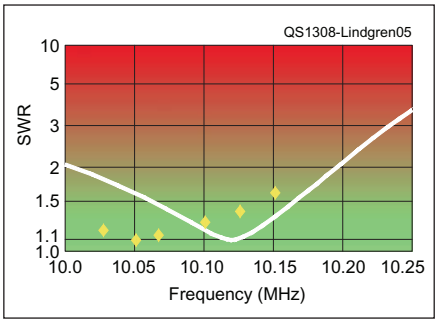


Figure 4 — The design VSWR (solid while line) remains well behaved across the 30 meter band. Measured points (♦) show that the antenna resonates 75 kHz below the design goal.

Figure 5 — The balun transformer, shown with a 22 Ω test load attached to 22 Ω coax cable winding input, is wound with trifilar #14 AWG enameled wire on an Amidon FT-240-61 core. Amidon part from **www.amidoncorp.com/ft-240-61**.

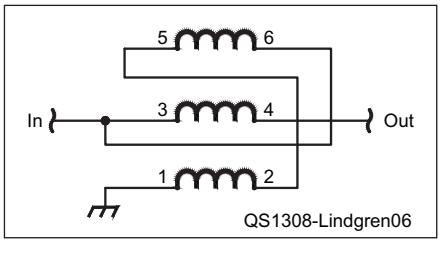


Figure 6 — Construct the balun from trifilar wound #14 AWG wire. In connects to the 22 Ω side and OUT connects to the 50 Ω side.

the 50 to 22 Ω impedance transformer (see Figure 5). According to Jerry Sevick, W2FMI, the insertion loss of a 50 to 22 Ω transformer at 10 MHz should be less than 0.04 dB.[2] Figure 6 shows the transformer schematic.

We fabricated a short length of 22 Ω coax cable using #12 AWG stranded Teflon® insulated wire and the shield from RG-58 coax cable. We covered the 22 Ω coax with black shrink tubing before winding 6 turns onto the same toroid as the transformer.

We measured the bandwidth and return loss of the transformer terminated by a 22 Ω resistor with an HP 8753E network analyzer. The return loss exceeded 30 dB (VSWR < 1.06 to 1) from 1.8 to 30 MHz.

Building the Antenna

We salvaged the center section of the boom and the boom to mast plate from a scrapped Telex/HyGain 402BA 2 element 40 meter beam. Figure 7 (on the facing page) shows the antenna construction dimensions along with the parts list. Slit each tubing section and overlap the different sized element tubing sections by six inches. Compress and hold the individual elements in place with hose clamps. The center insulating fiberglass rod is 0.125 inches thinner than the inner diameter of the 1.5" diameter tube, so we fitted pieces of 1.375" aluminum tubing as spacers over each end of the insulating fiberglass tube to make it fit properly inside the 1.5 inch diameter tubes.

The balun installs inside a weatherproof fiberglass box and has a female N connector [You can use a UHF connector instead — *Ed.*] to interface with the feed line. Cut a small drip hole on the bottom of the box. Use a coax seal to weatherproof the two 1.5 inch long wires and spade lugs going from the driven element to the balun box. A ⅜ inch lag bolt pins each element to the boom and keeps the elements from skewing in the wind. Attach the elements to the boom with half inch thick fiberglass plates. Use four U-bolts per element.

Finally, install the antenna on your tower. The short antenna boom keeps the balun box within reach for inspection of the coax connection and hardware tightening from the tower top. We don't recommend tuning the antenna on sawhorses near the ground because the proximity of the ground detunes the antenna significantly. Instead, we installed the antenna and found the VSWR and resonant frequency sufficiently close to the model.

Performance

The Yagi outperforms a Butternut vertical with raised radials previously used in the 30 meter band [The 48 foot tower height also helps. — *Ed.*] Tom, WØWP, logged more than 40 countries in the first two weeks of operating with this antenna. The F/B ratio seems to be about four S units and the side rejection is incredible due to the deep side nulls (see Figure 1). We measured VSWR using an MFJ 259 antenna analyzer at the bottom of the tower through 55 feet of RG-213 transmission line and later from the operating position in the shack. The antenna resonates near 10.05 MHz rather than at the design goal of 10.125 MHz shown in Figure 4. The measured VSWR are shown by the diamond symbols in Figure 4. Since the performance favors the desired lower portion of the 30 meter band, we opted to not re-tune the antenna. The modeled elevation pattern at a tower height of 50 feet shows a peak gain of 11.3 dBi at 26 degrees above the horizon, and a back lobe 15 dB below the peak gain at about 30 degrees elevation (see Figure 8). The *EZNEC* files are available from Rich, W3ACO, and the *QST* in Depth web page.[3] One *EZNEC* file describes the D-D Yagi that we built, the second file describes the D-R Yagi we used as a reference for comparison.

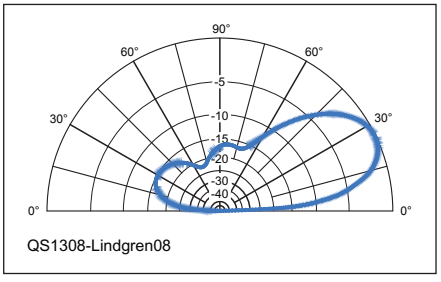


Figure 8 — The Yagi elevation pattern on a 50 foot tower peaks 26 degrees above the horizon with 11.3 dBi gain.

Notes

[1]Several versions of *EZNEC* antenna modeling software are available at **www.eznec.com**.

[2]J. Sevick, W2FMI (SK), *Transmission Line Transformers* Available from your ARRL dealer or the ARRL Bookstore, ARRL order no. TLT4. Telephone 860-594-0355, or toll-free in the US 888-277-5289; **www.arrl.org/shop**; **pubsales@arrl.org**.

[3]**www.arrl.org/qst-in-depth**

Tom Lindgren, WØWP, was first licensed in 1968. He enjoys DXing and CW and was a passionate contester in the '80s and '90s with many WØ land wins in the major DX contests. He has all DXCC entities confirmed except P5 on CW. Tom retired from Rockwell Collins in 2012 after 38 years as a design technician in the Advanced Technology Department. You can reach Tom at 9786 Blairs Ferry Rd NE, Cedar Rapids, IA 52411 or by e-mail at **wa0wcr@gmail.com**.

Rich Haendel, W3ACO, is an ARRL member and holds an Amateur Extra class license. He was first licensed in 1957. He spent his early years in ham radio working the 6 and 2 meter bands and built several transmitters during that period. He moved to Iowa to work at Rockwell Collins designing aircraft communications systems. Now retired, Rich spends his time chasing DX, and designing and building antennas. He is the President of the Iowa City Amateur Radio Club and the Secretary–Treasurer of the Eastern Iowa DX Association. You can reach him at 402 McLean St, Iowa City, IA 52246 or by e-mail at **rhaendel@q.com**.

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

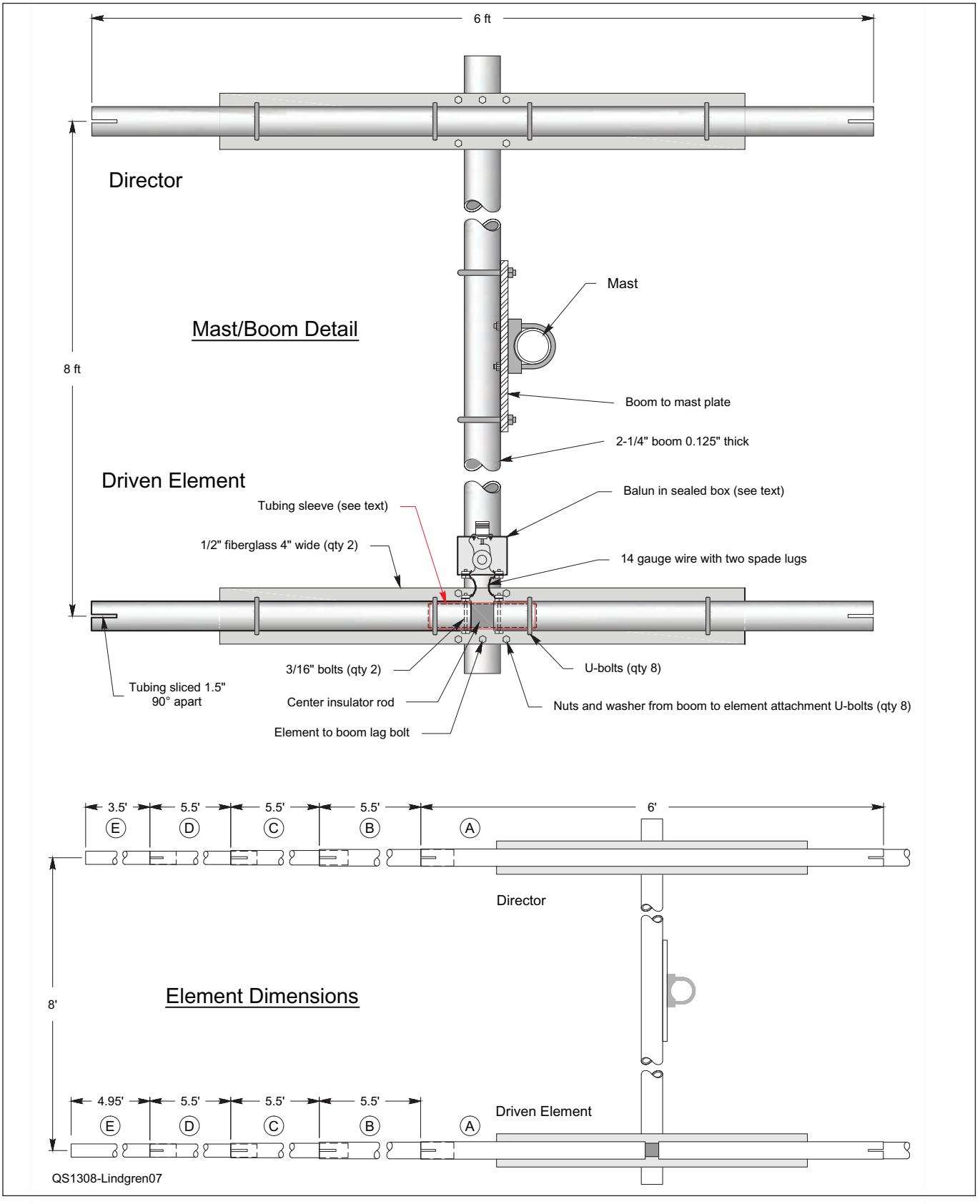


Figure 7 — Dimensions and assembly details of the 30 meter Yagi. Cycle 24 tubes from **www.cycle-24.com**, McMaster-Carr parts from **www.mcmaster.com**.

Structural fiberglass sheet, ½" Thick 4" × 96" (McMaster-Carr 7251K25)
Structural Fiberglass rod 1¼" diameter 5 foot length (McMaster-Carr 8543K11)

6063-T832 type tubing (Cycle 24 part numbers):
A — 1.5" diameter (p/n AL24-1500)
B — 1.375" diameter (p/n AL24-1375)
C — 1.25" diameter (p/n AL24-1250
D — 1.125" diameter (p/n AL24-1125)
E — 1.00" diameter (p/n AL24-1000)

Miscellaneous hardware store parts: U-bolts with boots, hose clams, nuts, bolts, and washers; stainless steel hardware preferred.

Don't Blame the Sun!

While the Sun is important to radio propagation, it's not the only game in town.

Eric P. Nichols, KL7AJ

The Sun is the prime mover in radio propagation. Without the Sun our enjoyment of HF would be greatly curtailed. In fact, without the Sun our enjoyment of just about anything would be greatly curtailed. If you're curious you will find that propagation forecasts are fascinating windows into our Universe. All that having been said, we need to keep things in perspective. Solar numbers indicate *trends*, and should be treated as such, just as stock market trends are.

The ionosphere, and hence HF propagation, is a function of two equally important factors: the Sun, which causes the ionization, and the atmosphere, which provides the ingredients to be ionized.

Here are a couple of things to keep in mind. The Sun is 93 million miles away; but the ionosphere is merely hundreds of miles away. While this is not an accurate measure of the relative importance of the two main components of propagation, it certainly is a good indicator of the relative immediacy of each factor.

Contrary to common belief, the Sun does not radiate isotropically. We see a lot of stuff on the Sun that will never affect us on Earth. The Earth receives a minuscule percentage of the Sun's output energy. The vast majority of what the Sun emits, for good or bad, isn't even aimed in our direction! For example, a solar observer may see a huge coronal mass ejection (CME). While we all might assume it's going to wipe out propagation for a few days or weeks, that will only happen if the CME is aimed at us. In terms of the total subtended angle of the Earth with respect to the Sun, we're a mere fleck on a flea. Our chances of being directly hit are next to nil.

Tanning the Hide without Roasting the Bones

There are two main ingredients that we get from the Sun that affect propagation — particles and radiation. Electromagnetic radiation traveling at the speed of light takes about 8 minutes to get here from the Sun. Obviously, since we can't observe anything faster than the speed of light (yet), we can have no early warning of electromagnetic radiation events. We can broadly categorize electromagnetic radiation events into two types — good and bad. Ultraviolet (UV) light is the main good ingredient.

CME Can Affect the Rhythm of Critical Frequencies

In Figure A, we show the nearly clockwork-like diurnal variations of the critical frequency in interior Alaska during late February and early March of 2013. Notice the hole in the graph on 3/02 that lasts nearly a full day. This is a typical outage caused by a major solar flare. Alas, it was during a recent ARRL DX contest. The smooth diurnal variations follow the expected pattern in accord with the local elevation angle of the Sun and its UV radiation, while the outage is caused by a coronal mass ejection from the Sun hitting the Earth.

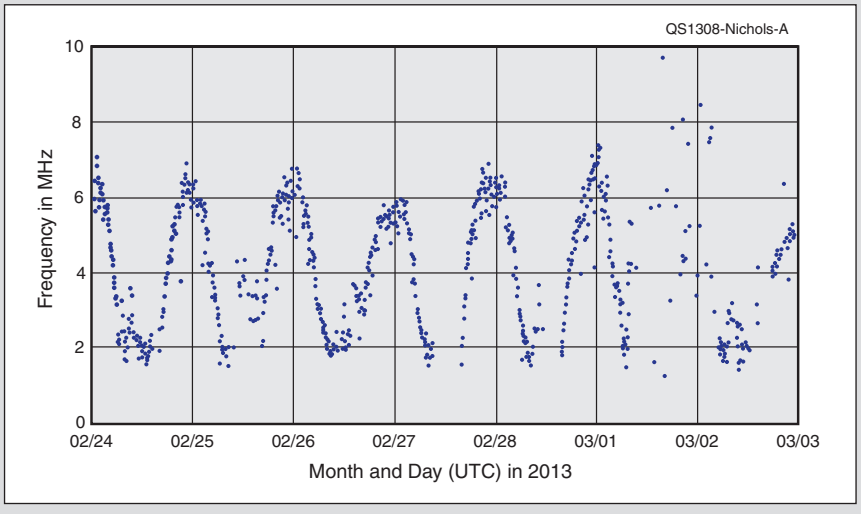


Figure A — Periodic behavior of the F2 layer critical frequency.

Ultraviolet activity from the Sun is quite closely related to sunspot activity. We are thus justified in having a healthy obsession with sunspots. The ionosphere needs a good even ultraviolet tan to free up all those radio friendly electrons from the atmospheric atoms, primarily from nitrogen and oxygen. Here we have an extremely delicate balancing act to perform if we want a useful ionosphere for radio. At very high altitudes the atmospheric pressure is low, and thus very easy to ionize for a given level of UV radiation. The problem is that there just aren't all that many atoms to ionize in the first place. At low altitudes there are lots more available atoms due to the higher atmospheric pressure. But they're much harder to ionize, plus the UV radiation has lost a lot of energy by the time it gets to the lower altitude atoms. As you might suspect, there must be some sort of optimum condition, a balance between ease of ionization and available ion ingredients, namely atoms. Indeed there is, and the electron density profile is a measure of this tension of conflicting interests. We have the highest concentration of free (or at least cheap) electrons at the peak of the electron density profile that occurs in the general vicinity of 200 to 250 kilometers in altitude.

The Big "But"

One might conclude that more radiation is better while looking at the electron density profile alone. This is not the case, however, since we have this persnickety little fly in the ointment — the absorptive D layer. Several solar conditions can cause large X-ray events that indeed are capable of ionizing atoms at levels that are well beyond what UV radiation can do. But they generally penetrate down into the D layer, thus activating that highly absorptive region, which doesn't do a lot for propagation. So for the most part, X-ray electromagnetic events generally fall into the "bad" category.

Duck!

Unlike electromagnetic radiation, it's unlikely that charged particles from the Sun can do

anything beneficial for radio propagation. In the worst case scenario, shotgun blasts of particles entering the ionosphere will simply punch the ionosphere so full of holes as to make it useless. At the very least, they will form wrinkles and ripples in the ionosphere, creating a very lumpy reflective surface. Fortunately most of those charged particles will follow the magnetic field lines of the Earth and spiral downward harmlessly into the Earth's surface, affecting mid-latitude propagation only very slightly. But they certainly wreak havoc in magnetic polar regions (including where I live). The main saving grace is that they create spectacular auroras.

Also, unlike electromagnetic radiation, particle blasts travel slowly, generally taking several days to reach us from the Sun, allowing us time to duck. Or at least allowing us to take advantage of a few days of undisturbed propagation before the dust hits the fan.

If we do see a large CME coming right at us, then the ionosphere is going to have a few bad days. Unfortunately the A and K solar indices don't really help much in telling us how bad a day (or week) we're going to have. Fortunately, such events don't last forever, and because of the extra ionospheric activity they generate, propagation can actually be much better than normal immediately afterwards, once the dust clears.

Wagging the Dog

Whenever I talk about radio propagation at a local radio club the question arises, "How much does the ionosphere affect the weather?" The simple answer is, "a lot less than the weather affects the ionosphere." In reality the troposphere (where weather and other human activity generally occur) is *trillions* of times more massive than the ionosphere. At the farthest detectable reaches of the ionosphere, the atmospheric density is about a *quadrillionth* of the density at ground level. So, when we ask the above question, we have a very small tail wagging a very big dog.

Since the ionosphere is made from the atmosphere, it would stand to reason that things like barometric pressure would affect the local character of the ionosphere, although perhaps with a bit of "rubber" between cause and effect. And, indeed they do. We know that the height of the electron density profile nearly exactly tracks the ion density profile. This suggests that the electrons don't stray very far from the positively ionized atoms from whence they were ripped. We know that those ions drift around relatively slowly, since they must have very nearly the same mass as non-ionized atoms.

Localized activities, such as thunderstorms, can have profound effects on the local ionosphere. Every lightning stroke has an accompanying upward lightning stroke that can reach into the upper regions of the ionosphere. Upward lightning manifests itself in jets and sprites. We are likely to discover many more such phenomena in the future, and we have yet to learn how large an area these phenomena affect. I suspect they are bigger (and more useful) events than we've commonly thought.

Hindcasting

I would have had a great career as a weather hindcaster — reporting the previous day's weather with nearly 100% accuracy. All kidding aside, ionospheric prognosticators have generally been more accurate than weather forecasters. This is quite remarkable, considering ionospheric science is so new compared to meteorology. One has only to look at a historical critical frequency chart such as the one found at **www.haarp.alaska.edu/cgi-bin/digisonde/scaled.cgi** to note the nearly clockwork precision with which the critical frequency follows the time of day, even up here in Alaska! Except when it doesn't.

By the judicious use of some ionospheric "hindcasting" we can determine that many unpredicted events (generally of the bad sort) are relatively local events that probably can't be blamed on solar activity at all! Evidence suggests that heavy particle "splashes" may cause localized ionization and thus some observed radio blackouts! These splashes may include hadron collisions with Earth's atmosphere, or perhaps more speculatively, collisions by the illusive magnetic monopole [Magnetic monopoles are theoretical and not known to exist in nature. — *Ed.*]. The phenomena are known among physicists as SIDS or sudden ionospheric disturbance sightings. While this is just educated speculation, radio amateurs may actually have an opportunity to make a real contribution to the radio art, or perhaps even win a Nobel Prize. In my ARRL book, *Radio Science for the Radio Amateur*, I suggest how to intentionally and deliberately look for SIDS with readily available amateur equipment.

The Right Hammer

There's an old adage that says, "To a man with a hammer, every problem looks like a nail." We radio amateurs have relied on solar numbers for so long that it's easy to forget that there are other equally useful tools. My tool of choice is the ionosonde [An upward directed, variable frequency, radar like system that determines the frequencies that are reflected by the ionosphere. — *Ed.*]. It's local, immediate and needs little interpretation. It tells me what the propagation *is*, not what it *might be*. But even better than that, every radio amateur's best tool is to be on the air often, and enjoy the propagation regardless of what the numbers say. It's the best antidote to the "paralysis of analysis."

Eric Nichols, KL7AJ, an ARRL member, has written numerous articles for many Amateur Radio and electronics experimenter publications over the past 30 years. He worked as a broadcast engineer for a quarter century. He applied his radio experience to experiments conducted at High Power Auroral Stimulation (HIPAS) Observatory and the High Frequency Active Auroral Research Program (HAARP), as well as to designing instrumentation for the UCLA Plasma Physics department.

Eric has published two books, *Plasma Dreams* and *The Opus of Amateur Radio Knowledge and Lore*. His latest book, *Radio Science for the Radio Amateur* is available at the ARRL bookstore (order no. 3381). Eric can be reached at PO Box 56235, North Pole, AK 99705 or at **kl7aj@arrl.net**.

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

Strays

For a Worthy Cause!

At their annual convention on April 20 in Cocoa Beach, Florida, Southeastern VHF Society President Charles Osborne, K4CSO (center), presented a check representing the society's donation to benefit the ARRL Spectrum Defense Fund. Accepting the check on behalf of the ARRL were Southern Florida Section Manager David Fowler, K4DLF (left), and Southern Florida Assistant Section Manager Jeff Beals, WA4AW (right). [Chuck Hoover, KØVXM, photo]

Steve Ford, WB8IMY, wb8imy@arrl.org

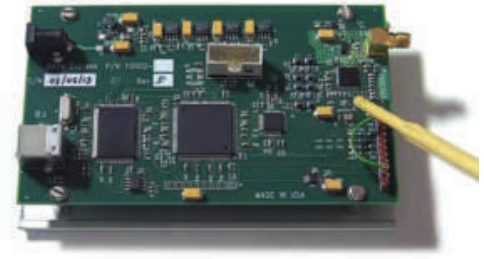
Smoothing the Road to Digital ATV

Hams have been enjoying analog television for decades. I dabbled in "fast scan" ATV on 432 MHz in the 1980s and thought it was a hoot. With an ancient black and white closed-circuit TV camera, a 10 W transmitter, a channel 4 receive downconverter and a little beam pointed out the window, I could hit the local ATV repeater with ease.

But as Stephen King's gunslinger in the *Dark Tower* novels would have said, that world has "moved on." Commercial TV has gone almost completely digital, but amateurs in the US have been slow to adapt. ATV enthusiasts are a tiny minority of the ham population and most are still using analog equipment. A large part of the reason for this is that digital TV transmitting gear is not readily available and what is available is expensive. The DATV-Express project hopes to change that!

If you attended the ARRL/TAPR Digital Communications Conference last year, you would have seen the presentation by Charles Brain, G4GUO and Ken Konechy, W6HHC, detailing the DATV-Express project. (See what you miss by not going to the DCC? There is still time to sign up for the September conference in Seattle. Go to **www.tapr.org/dcc**.) The DATV-Express team is designing a transmitter that will accept MPEG-2 encoded data from a video capture device or other MPEG-2 encoder and generate a DVB-S encoded 20 mW RF signal at 1.2 GHz. Feed that RF to a power amp and you'll have 7 to 10 W of digital ATV.

DVB-S is the standard used by satellite TV providers, so DATV signals can be received with modified or reprogrammed "free to air" satellite TV receivers you'll find for sale on eBay and elsewhere for about $80. With the DATV-Express transmitter anticipated to sell at about $300, a frugal ham could put together a complete DATV station for substantially less than $1000.



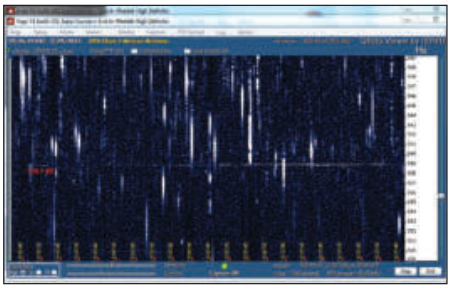
Watch the DATV-Express video on YouTube at **youtu.be/OXh-anABYaU.**

A typical free-to-air DVB-S receiver.

You can watch Charles Brain explain the latest version of the DATV-Express transmitter board at **youtu.be/OXh-anABYaU**. You can also download their Digital Communications Conference *PowerPoint* slides at **www.tapr.org/pdf/DCC2012-DATV-Express-ProjectTesting_G4GUO-W6HHC.pdf**.

More Meteors

After reading my February 2013 column in which I discussed monitoring digital TV pilot signals for meteor scatter returns, Denny Condron, KØLGI, wrote to tell me about a substantial subset of the ham community that monitors for meteors on a regular basis using everything from DTV pilot signals to Natural Resources Conservation Service SNOTEL telemetry beacons at 40.670 MHz. Stan Nelson, KB5VL, curates a website devoted to the subject at **www.roswellmeteor.com**. Stan's VHF meteor detection receiver can be heard on **www.spaceweather.com** receiving returns from an Air Force space tracking transmitter operating at 216.97927 MHz. If you're interested, join the RadioMeteors discussion group on Google Groups at **https://groups.google.com/forum/?fromgroups#!forum/radiometeors**.



Denny Condron, KØLGI, provided this impressive image that shows meteor scatter reflections of a DTV pilot signal.

The Twilight of the Personal Computer?

According to reports released by industry analysts IDC and Gartner a few months ago, PC sales have plummeted to levels not seen since 1994. What's going on?

Some blame the market's tepid response to *Windows 8*, but Apple desktops and laptops have also experienced sales declines. Others believe that people are simply holding onto their old computers because new machines don't offer dramatic improvements for the investment. Still others place responsibility on the rising popularity of smartphones and tablets.

My own crystal ball is foggy on the matter. Hams using station computers for digital modes and logging applications probably have little reason to upgrade. Processing power can become important when you're dealing with Software Defined Radios, but most computers made within the last few years should be adequate for the task. I believe we'll see more hams switching to tablets and smartphones at some point, but that transition will require more (and better) apps in the marketplace. There are some good Amateur Radio apps out there for Apple and Android devices, but nothing that comes even close to *N1MM Logger* or *WriteLog* for contesting, for example, or *Ham Radio Deluxe* or *Fldigi* for digital operating. Until that situation changes, I think you'll still see most amateurs hanging onto their laptops and desktops.

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

TEN-TEC 539 Argonaut VI HF QRP Transceiver

This transceiver offers a lot of features in a compact package.

Reviewed by Joel R. Hallas, W1ZR
QST *Contributing Editor*
w1zr@arrl.org

TEN-TEC's business started with low power (QRP) and portable equipment, including the original Argonaut transceiver introduced in 1971. Since then, they have continued to offer various models of low power gear, even though most attention has been focused on their high performance, full size transceivers. Thus, we should not be surprised to find that TEN-TEC has introduced a new QRP rig designed to work with the 100 W linear amplifier reviewed a few months back.[1]

What It Does

The Model 539 Argonaut VI is a very compact and lightweight eight band CW and voice transceiver that puts out 1 to 10 W on 160, 80, 40, 30, 20, 17, 15 and 10 meters. One of the design tradeoffs was to focus on the bands likely to be most interesting, most of the time, in order to maintain the small footprint. The limiting factor is reported to be the size of the separate high-Q front end parts used for each band. The result is that coverage of 12 and 6 meters is not provided, nor is operation on the 60 meter channels supported. This is not necessarily a problem — unless you are interested in those bands — but something to keep in mind.

Also be aware that this is essentially an amateur band-only radio — general coverage reception is not provided, except for extended tuning on either side of each ham band as shown in Table 1. The extra coverage includes National Institute of Standards and Technology (NIST) WWV standard frequency reception on 2.5 MHz (above 160 meters), 5 MHz (above 80/75 meters) and 10 MHz (below the 30 meter band). Also covered are two international shortwave bands: 120 meters (2.3 to 2.495 MHz) is included on the 160 position, and 60 meters (4.75 to 5.06 MHz — but not including the amateur channels) is almost entirely covered above 80 meters.

The Front Panel

Many traditionalists will be pleased to find that this radio has almost no menus. Instead, the small front panel provides all needed functionality though the use of just two concentric controls beneath the digital display panel, a TUNING knob, four multipurpose buttons and a toggle switch. One concentric knob combines RF gain (RF), AF gain (AF) and power on/off — the other sets the receive bandwidth (BW) and passband tuning (PBT). To the right of the concentric knobs is a larger finger dimple main TUNING knob that also can encode other information depending on the control mode.

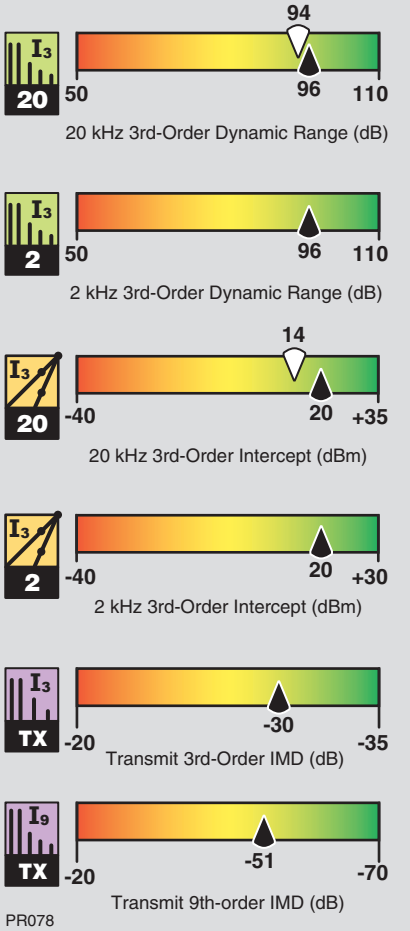
[1]J. Hallas, W1ZR, "TEN-TEC 418 100 W HF and 6 Meter Linear Amplifier," Product Review, *QST*, Feb 2013, pp 52-54.

Bottom Line

The TEN-TEC Model 539 Argonaut VI QRP transceiver is well suited to being a trail or travel companion. It could also serve as the center of a compact and competent 100 W home station, if appropriate ancillary equipment, such as their 418 linear amplifier, is nearby.

Figure 1 — The TEN-TEC 539 rear panel showing the available connections.

Key Measurements Summary



PR078

Key:

80 M

20 M

Dynamic range and intercept values with preamp off.

Intercept values were determined using -97 dBm reference

Blocking Gain Compression and Reciprocal Mixing Dynamic Range not tested; see text.

Table 1
TEN-TEC Model 539 Argonaut VI, serial number N/A

Manufacturer's Specifications	Measured in the ARRL Lab
Frequency coverage: Receive, 1.795-2.505, 3.495-5.005, 6.995-7.305, 9.995-10.155, 13.995-15.005, 18.063-18.173, 20.995-21.455, 27.995-29.705 MHz. Transmit, 1.795-2.005, 3.495-4.005, 6.995-7.305, 10.095-10.155, 13.995-14.355, 18.063-18.173, 20.995-21.455, 27.995-29.705 MHz.	Receive and transmit, as specified.
Power requirement: 9.5-14 V dc; receive, 0.55 A; transmit, 3 A at 10 W RF output.	At 13.8 V dc: receive 0.57 A (no signal, max audio); transmit, 3.38 A (max RF output). Operation confirmed at 9.5 V dc. (8.5 W output).
Modes of operation: SSB, CW, AM	As specified.
Receiver	**Receiver Dynamic Testing**
CW sensitivity, 500 Hz bandwidth: –138 dBm preamp on; –128 dBm preamp off.	Noise floor (MDS), 700 Hz roofing filter, 500 Hz bandwidth:*

	Preamp off	*Preamp on*
3.5 MHz	–125 dBm	–136 dBm
14 MHz	–125 dBm	–135 dBm
28 MHz	–125 dBm	–136 dBm

Noise figure: Not specified.	14 MHz, preamp off/on: 22/11 dB.
AM sensitivity: 6 kHz bandwidth, 10 dB SINAD, 30% modulation, preamp off: <4 µV.	10 dB (S+N)/N, 1 kHz, 30% modulation:

	Preamp off	*Preamp on*
3.8 MHz	2.88 µV	1.13 µV
29.0 MHz	3.01 µV	1.15 µV

Blocking gain compression dynamic range: 600 Hz BW, 138 dB at 20 kHz spacing, 140 dB at 2 kHz spacing.	Not tested.*
Reciprocal mixing dynamic range	Not tested.*

ARRL Lab Two-Tone IMD Testing (700 Hz roofing filter, 500 Hz bandwidth)**

Band/Preamp	*Spacing*	*Input Level*	*Measured IMD Level*	*Measured IMD DR*	*Calculated IP3*
3.5 MHz/off	20 kHz	–31 dBm	–125 dBm	94 dB	+16 dBm
		–23 dBm	–97 dBm		+14 dBm
14 MHz/off	20 kHz	–29 dBm	–125 dBm	96 dB	+19 dBm
		–19 dBm	–97 dBm		+20 dBm
		0 dBm	–52 dBm		+26 dBm
14 MHz/on	20 kHz	–41 dBm	–135 dBm	94 dB	+6 dBm
		–29 dBm	–97 dBm		+5 dBm
14 MHz/off	5 kHz	–29 dBm	–125 dBm	96 dB	+19 dBm
		–19 dBm	–97 dBm		+20 dBm
		0 dBm	–52 dBm		+26 dBm
14 MHz/off	2 kHz	–29 dBm	–125 dBm	96 dB	+19 dBm
		–19 dBm	–97 dBm		+20 dBm
		0 dBm	–52 dBm		+26 dBm

Setting Things Up

In place of the usual menus, there are four buttons above the TUNING knob that serve three or four functions each. The function that each provides is determined by a three position toggle switch marked T, M and B (for top, middle and bottom positions). These letters indicate which of the three primary functions each button provides — specified by the label above the button (T), on the button itself (M) or below the button (B). For example, the first button is primarily the band selector button and is labeled BAN on the button itself. Pressing that button cycles through the bands if the toggle switch is set to M or the *middle* position.

Above the button is a label PWR, so if the toggle switch is set to T for *top*, the TUNING knob is used to set the transmit power from 0 to 10 W. The label beneath the button is RIT, so if the switch is set to B, tapping the button turns the receive incremental tuning on and off. If RIT is on, the TUNING knob adjusts the receive offset frequency with the offset shown below the operating frequency in place of the VFO B frequency indication.

Some other button functions also work in two ways. A push toggles the function, while holding the button down allows the value to be adjusted using the TUNING knob. In addition, there are a number of special mode-dependent

Second-order intercept point: Not specified.	Preamp off/on, +65/+65 dBm.
DSP noise reduction: Not specified.	10 dB maximum.
Notch filter depth: Not specified.	Auto notch, >70 dB; attack time, 40 ms.
S-meter sensitivity: S9 = 50 µV RMS.	S9 signal at 14.2 MHz: preamp off, 32.7 µV; preamp on, 29.5 µV.
Receiver audio output: 1.3 W into 8 Ω at <3% THD.	1.57 W at 10% THD into 8 Ω; THD at 1 V RMS: 0.45%.
IF/audio response: Not specified.	Range at –6 dB points, (bandwidth):† CW (500 Hz): 444-952 Hz (508 Hz). Equivalent Rectangular BW: 335 Hz. USB: (2.4 kHz): 36-2370 Hz (2334 Hz). LSB: (2.4 kHz): 35-2370 Hz (2335 Hz). AM: (6 kHz): 11-2854 Hz (5686 Hz).
Spurious and image rejection: IF rejection, 74 dB (typical), image rejection, 59 dB typical (1st IF); 69 dB typical (2nd IF).	First IF rejection, 14 MHz, 90 dB; 28 MHz, 97 dB; image rejection, 14 MHz, 56 dB; 28 MHz, 91 dB.
Transmitter	**Transmitter Dynamic Testing**
Power output: 1-10 W.	SSB, CW, 0-12 W; AM, 3.75 W.
Spurious-signal and harmonic suppression: Not specified.	HF, 46 dB worst case (160 meters), 56 dB typical.
SSB carrier suppression: >60 dB.	62 dB.
Undesired sideband suppression: >60 dB.	54 dB.
Third-order intermodulation distortion (IMD) products: >30 dB below peak.	HF, 10 W PEP, 3rd/5th/7th/9th order: –30/–36/–47/–51 dB (worst case, 160 m) typically –37/–42/–58/–59 dB.
CW keyer speed range: 5-40 WPM	6.1 to 46.7 WPM; iambic mode A and B.
CW keying characteristics: 5 ms rise and fall time.	See Figures 2 and 3.
Transmit-receive turn-around time (PTT release to 50% audio output): Not specified.	S9 signal, 36 ms.
Receive-transmit turn-around time (tx delay): Not specified.	SSB, 20 ms.
Composite transmitted noise: Not specified.	See Figure 4

Size (height, width, depth): 3.0 × 6.5 × 8.7 inches; weight, 3.6 pounds.

Price: Model 539 Argonaut VI, $995; Model 712 sound card digital mode adapter, $79; 6 kHz AM filter, $125; 700 Hz CW filter, $35, hand mic, $39.95.

*Receiver measurements performed with DSP filter adjusted to 500 Hz and with the optional 700 Hz roofing filter. Blocking gain compression dynamic range and reciprocal mixing dynamic range were not measured. The Model 539's AGC cannot be turned off, and AGC must be turned off for these tests.

**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.

†Default settings; varies with PBT and pitch control settings.

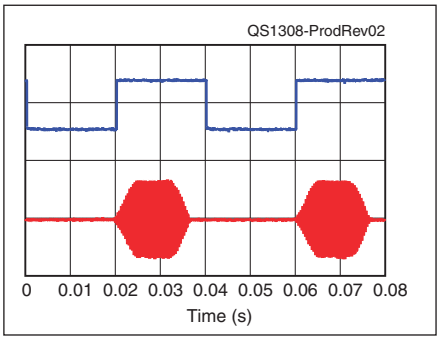


Figure 2 — CW keying waveform for the TEN-TEC 539 showing the first two dits in full-break-in (QSK) mode using external keying. Equivalent keying speed is 60 WPM. The upper trace is the actual key closure; the lower trace is the RF envelope. (Note that the first key closure starts at the left edge of the figure.) Horizontal divisions are 10 ms. The transceiver was being operated at 10 W output on the 14 MHz band.

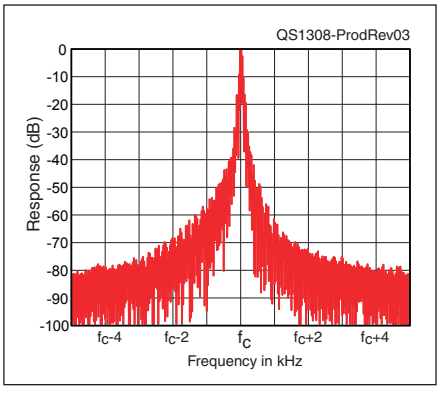


Figure 3 — Spectral display of the TEN-TEC 539 transmitter during keying sideband testing. Equivalent keying speed is 60 WPM using external keying. Spectrum analyzer resolution bandwidth is 10 Hz, and the sweep time is 30 seconds. The transmitter was being operated at 10 W PEP output on the 14 MHz band, 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.

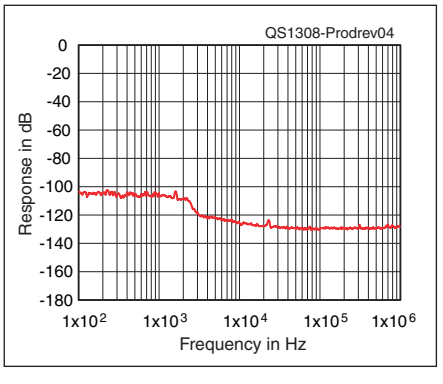


Figure 4 — Spectral display of the TEN-TEC 539 transmitter output during composite-noise testing. Power output is 10 W on the 14 MHz band. The carrier, off the left edge of the plot, is not shown. This plot shows composite transmitted noise 100 Hz to 1 MHz from the carrier. The reference level is 0 dBc, and the vertical scale is in dB.

functions such as monitor level adjustment or speech processor level available if the BW control is turned fully counterclockwise.

Yes, you can actually end up with some CONFIGURATION menu choices if you hold down the PWR button as you power up the unit. These are needed only if you add optional filters after you purchase the unit (filters ordered with the radio will be factory configured) or if you wish to update firmware.

Display Panel

The LCD display works quite well, conveys a lot of information and is crisp and easy to read. I found that even in direct sunlight I

could easily read the digits from any angle. I used the blue (default) backlight, although internal adjustments can change the background to any mix of blue, green and red depending on your preference, or perhaps to go with your shack decor.

The frequency display reads out to 1, 0.1 or 0.01 kHz depending on the tuning rate selected with the appropriate digits to the right of the decimal point displayed. These rates correspond to 400, 40 or 4 kHz per knob revolution.

A bar graph on the lower right serves multiple functions. On receive it works as an S meter, with a full increment for each S unit and two for S9 +10 dB, two more for S9 +30 dB. The normal mode on transmit is for the bar graph to indicate transmit power. If the MOD (mode) button is pressed while transmitting, the indication changes to a measurement of SWR with values shown through 3:1, a gap and then a HIGH reading.

A cute touch is the red circle in the midst of the TEN-TEC logo that is also a power out indicator. It should illuminate during code characters if POWER is set to 8 W or more, and will illuminate on voice peaks if the MIC GAIN and TRANSMIT COMPRESSION are properly adjusted. Also on the left side of the display is a function-dependent region that indicates the state of the preamp, the noise blanking or reduction and the transmit power level.

There is no TUNE function to provide a signal for measuring SWR or adjusting an antenna tuner. If the optional AM filter is installed, switching to AM will result in a 25% carrier when the mic PTT button is pressed. In CW mode, the key can be configured as if it is a straight key and the power can be turned down to 1 or 2 W for tuning functions. [At press time we were informed that the new version 1.03 firmware will add a manual TUNE function. — *Ed.*]

An eight pin MIC connector at the lower left provides connectivity for either a dynamic or electret microphone, along with an isolated pair of contacts for a PTT switch.

Rear Panel

The rear panel (see Figure 1) contains the bulk of the input/output connectivity. Along the top are an SO-239 UHF coax jack for connection to an antenna (ANT) or to the input of an amplifier such as the companion TEN-TEC 418, a hole plug that provides access to an internal IF port that can be used to provide an IF sample for a panadapter, and a socket for an automotive type 7.5 A fuse. Beneath the fuse is a nylon two-position polarized locking power connector.

The bottom row, from left to right, includes a handy dc output (DC OUT) jack that can provide 0.5 A at the supply voltage for accessories, a USB socket (see below), an eight pin DIN type accessory socket, an ⅛ inch "stereo" KEY jack for key or paddles and a ¼ inch mono socket for headphones (PHONES) that automatically disconnects the internal speaker. No external speaker jack is provided, although the headphone jack could likely drive an amplified speaker. I tried it with a small unamplified speaker and it didn't have sufficient output. The top firing internal speaker does sound good for its size, and should be satisfactory in most environments.

The connections on the rear panel minimize the need for front panel jacks, but it is a bit of a double edged sword in that installations will need easy rear panel access to change from headphone to speaker operation, or to disconnect the accessory USB sound card cable while operating voice modes, as recommended in the manual.

In the ARRL Lab

A summary of key test results from the ARRL lab is presented in the graphic on the second page with detailed results of all tests presented in Table 1 and Figures 2, 3 and 4. We could summarize by saying that this transceiver offers very good performance, on par with many full size desktop radios. CW operators will find the optional 700 Hz roofing filter well worth its $35 price tag for improved third order IMD dynamic range performance at close signal spacings.

We were unable to perform our usual receiver *blocking gain compression dynamic range* and *reciprocal mixing dynamic range* measurements because our protocol requires that the AGC be turned off — which is not a possibility with this radio.

On the Air at W1ZR

I had fun operating the latest Argonaut in voice and CW modes. While I mainly used it with the companion 418 amplifier tested previously, I made some QRP contacts as well. It's always a pleasant surprise to be reminded how well a low power radio can perform!

CW Operation

In the TEN-TEC tradition, CW received considerable attention — including provision for silent (no clacking) and smooth full break-in (QSK) operation. Semi break-in with an adjustable delay can also be selected, if that's your preference. The competent internal keyer can be set to support iambic modes A or B and has adjustable weight (relative dot length). The receiver is also nice to use on CW, especially the DSP filtering that can be set from 100 to 2500 Hz in 25 Hz steps with no apparent "ringing," even at the narrowest setting. The AGC can be set to one of three positions with the fast (F) about right for CW operation.

Voice Operation

Voice operation was not a stepchild either. I received reports of "great audio" using the optional model 702 dynamic PTT mic. Mic GAIN and COMPRESSION are adjustable from the front panel, and the red dot in the logo gives an indication of proper adjustment if it flashes on voice peak. An "auto notch" DSP heterodyne notch filter is provided for voice modes. As noted in Table 1, it reduces the level of such interference by 70 dB and does not introduce noticeable distortion. The DSP is equally effective in voice modes. In addition to the choices up to 2.5 kHz bandwidth described above, if the 6 kHz AM filter is installed, additional settings of 4, 5 and 6 kHz are available. While these are great for AM voice, the 4 kHz setting can be useful if listening to someone using extended bandwidth SSB (ESSB).

Two features of interest to many voice ops are not included: voice operated TR switching (VOX) or audio equalization. Both could be provided outside the unit, of course, if desired.

Digital Modes

Digital mode operation with the Argonaut VI is supported using the SSB mode in concert with a PC sound card. Traditional audio cable interconnections can be made using LINE IN and LINE OUT pins on the rear panel accessory (ACC 1) connector. The selection of LINE or MIC input is made on the front panel and each has separate gain settings, so the MIC GAIN need not be changed while optimizing digital mode settings. A DIN plug to fit the ACC 1 connector is provided with the radio, so the connections are easy to set up.

The only complication might be if you are also using the 418 amplifier, which includes a cable that is designed to fit in the same socket and doesn't offer those pins broken out. Fortunately, TEN-TEC now sells a Y cable that solves this problem.

An even simpler solution may be to obtain the optional TEN-TEC 712 USB/Soundcard Adapter Interface. This plugs into the ACC 1 socket on the rear of the radio, which also raises the same issue if you want to use the radio-to-amplifier cable at the same time.

The 712 device plugs into a USB port on your computer and acts like a sound card, with audio in and out coming in from the ACC 1 port. This may be particularly useful for those who want to dedicate their computer's sound card to another function, such as a panadapter. TEN-TEC does recommend disconnecting the USB port while using voice modes to avoid

Figure 5 — The TEN-TEC 539 fits well on my office desk, with power supply and Model 418 amplifier nearby, allowing me to have a radio at the ready while I work.

inadvertently inserting computer sounds onto the transmit audio.

I found that the 712 worked just fine on a PC running *Windows XP* with *MMTTY* for RTTY operation and *Digipan* for PSK31 operation. Both came up and worked well right out of the box. I even made a contact with Spain on 20 meter PSK31 running less than 10 W from the barefoot Argonaut VI!

Digital Connectivity

While the above arrangement can connect your transceiver's audio to the computer for digital modes, a separate USB connection is required to control or interface with the radio itself. This is important if you want to exchange radio data with any of the popular logging programs or if you wish to download and update the transceiver's firmware. This requires a USB accessory cable of the type that comes with many printers and other peripherals to allow operation via a USB port. My basement seems to come up with these whenever needed, but if yours doesn't, they are available at low cost from office supply stores.

The USB connection becomes a virtual PC COM port. As noted in the manual, a look at *Windows Device Manager* will provide the assigned COM port number. On my *Windows XP* machine, this installed itself without the need for the drivers that are available on the TEN-TEC web page. It assigned this port to COM 4, which worked with my logging program. If the assigned number is too high for your software, the manual describes how to change it.

I used the 539 with my *N1MM Logger* contest logging program and was able to exchange data in either direction with the radio at rates up to 256 kbps, the highest choice available in the program.

The only complication with this arrangement is if you want to run digital modes and a radio connected logging program at the same time. In that case the radio will take up two separate USB ports — probably not an issue for most current PCs. Alternately, an inexpensive USB hub can be used to break out multiple USB ports from a single computer connection.

Some General Observations

I found this radio a pleasure to use. At first I had it in the usual test location next to my regular basement station to allow easy access to antenna choices. When our four legged companion returned home from surgery at the vet, with the requirement that he (and therefore I) needed to avoid stairs, I set up the Argonaut VI on my upstairs office desk (see Figure 5) with the amplifier and power supply nearby.

I mention this because I think it indicates the flexibility of this radio. While it is designed to be a portable or trail radio, it can also serve as a handy small-footprint base station. This is made convenient by the automatic band switching provided by the companion linear amplifier. The amplifier thus doesn't need to be on the desktop to be easily controlled by the radio. I found it comforting, but not really necessary, to be able to see the amplifier to confirm proper operation.

The radio was easy to use in the desktop environment, and would be even easier if I had a compact keyer paddle. I did find the slowest tuning rate (4 kHz per turn) just a bit fast for my taste, especially with the DSP set to 100 Hz bandwidth. A useful feature is that if the TUNING knob is spun rapidly, the rate increases by a factor of 10 — handy for quickly moving up or down the band.

Documentation

The Argonaut VI comes with a 35 page instruction manual that does a good job describing setup and operation. There are clear illustrations of the controls, indicators and connection points along with a block diagram. A one page *Quick Start Guide* on heavy card stock is also provided, perfect to keep at hand for a reference for those times you forget how to do something.

TEN-TEC's website offers a nice 12 page schematic diagram package for those who would like that information; it's useful for troubleshooting, or just to better understand the transceiver functionality. The manual, *Quick Start Guide* and product brochure are also available online, so you can look them over to help you decide if it's the transceiver for you.

Manufacturer: TEN-TEC, Inc, 1185 Dolly Parton Parkway, Sevierville, TN 37862, tel 800-433-7373; **www.tentec.com**.

See the Digital Edition of *QST* for a video overview of the TEN-TEC 539 transceiver.

WF5Y Battery Booster

Reviewed by Phil Salas, AD5X
QST *Contributing Editor*
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Many HF, VHF or UHF transceivers are specified for 13.8 V dc, ±15%, or about 12 to 16 V. Below that range, power output usually drops off and the radio may not operate correctly or may even shut down. Low dc input voltage can be caused by voltage drop on the power cable from the high current drawn by a transceiver, or by the nominal 12 to 12.5 V (or lower) available from a lead acid battery that is removed from a charger as the battery discharges. "Battery boosters" are switching regulators designed to provide a steady output voltage (say, 13.8 V dc) over a range of input voltages as battery voltage decreases.

QST previously reviewed battery boosters from W4RRY, TG Electronics and MFJ.[2,3] An inexpensive new battery booster is the WF5Y Battery Booster available from **www.grumpyshop.net**. WF5Y also offers a wide range of dc power distribution products.

Overview

The Grumpy Shop website offers the following description: "This Battery Booster is rated at 150 watts continuous and will run a conventional 100 watt transceiver from a source as low as 8 volts, keeping the output voltage at a steady 13.8 volts. It has 3 power pole outputs for operating multiple transceivers and accessories. The output is internally set for 13.8 volts but can be adjusted to more than 35 volts by means of a pc mounted trimpot."

Let's take a more detailed look at the unit. The WF5Y Battery Booster is packaged in a plastic case. An Anderson Powerpole connector for the input is fused at 30 A and three Powerpole connectors at the output are fused at 25 A, 5 A and 3 A, respectively. The actual switching regulator module is epoxied to the plastic case as you can see in Figure 6. Surface mount components for the switching and control circuitry are mounted on the bottom side of the board. No additional heat sinking, air vents or fans are included.

The WF5Y Battery Booster is factory set for +13.8 V dc output. You can adjust the output voltage to compensate for dc cabling voltage drops using the adjustment potentiometer shown in the lower part of Figure 6.

[2]J. Hallas, W1ZR, "W4RRY Electronic Battery Booster," Product Review, *QST*, Oct 2005, pp 71-72.
[3]P. Salas, AD5X, "Battery Boost Regulators from TG Electronics and MFJ Enterprises," Product Review, *QST*, Nov 2008, pp 46-49.

Testing

The WF5Y Battery Booster is always on when dc voltage is applied to the input, as indicated by the green LED. When I first applied power, the output voltage immediately jumped to 18 V dc. As soon as I connected a 100 mA load (the fan in my power supply load box), the voltage dropped to the 13.8 V dc factory set value.

This 18 V initial value is a concern because many transceivers, even when turned off, have active components connected directly to the dc input. I attempted to determine the minimum current required for the unit to regulate to 13.8 V dc. However, while I was making measurements, the unit suddenly started working properly even when unloaded. Because of this, I would suggest connecting a 15 V transient voltage suppressor across the transceiver's dc input (for example, Mouser part number 625-1.5KE15A-E3). This inexpensive device will clamp voltage to 15 V maximum should it be necessary. Note that other WF5Y power distribution products feature overvoltage protection, and I think that would be a worthwhile addition to this product for use with 13.8 V electronics.

The description states that the WF5Y Battery Booster will operate with an input voltage as low as 8 V dc, but I found that the unit stopped regulating below 10 V dc. This isn't necessarily a problem, as a lead-acid battery is considered discharged at 10.5 V dc.

As heat sinking appeared minimal, I next measured the heat sink temperature with an IR (infrared) temperature sensor. For the first test, I set the output load current at 10.3 A to simulate a 142 W load. The input voltage to the WF5Y Battery Booster was set at 12 V dc, which is the nominal voltage of a lead acid battery. In less than 60 seconds, the heat sink went from room temperature to 70 °C (158 °F). I then set the output current to

Bottom Line

Although the WF5Y Battery Booster is inexpensive and will maintain 13.8 V dc output with inputs as low as 10 V, design limitations will probably relegate its use to lower powered VHF/UHF transceivers.

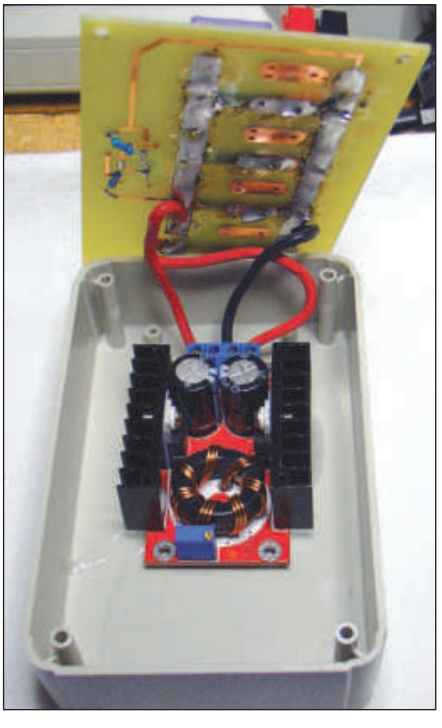


Figure 6 — Internal view of the WF5Y Battery Booster. The voltage adjust trimpot is the blue part on the lower edge of the PC board.

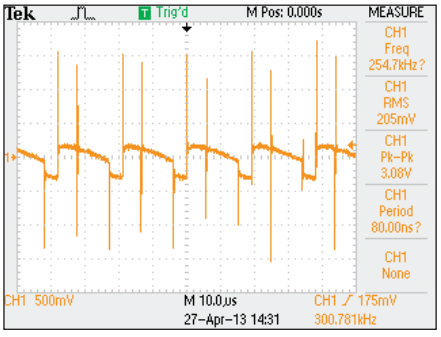


Figure 7 — AC-coupled switching noise on dc output at 13.3 A load.

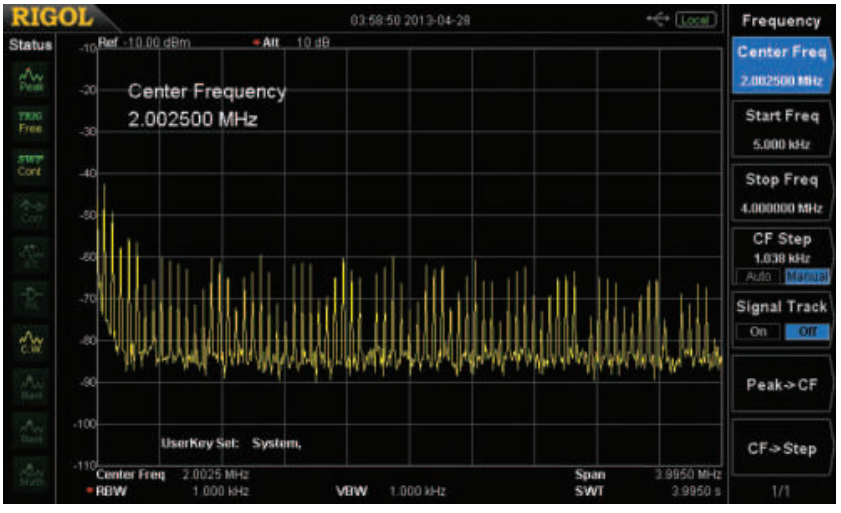


Figure 8 — Spectrum plot of switching noise at 13.3 A load.

13.3 A, simulating a 183 W load and the heat sink temperature went to 70 °C in less than 20 seconds. I stopped the tests at this point as 70 °C is very hot (the threshold of pain is approximately 45 °C) and I was concerned about damaging the regulator and/or the plastic box. Of course, these tests were run with the cover open. Under normal conditions the box will be closed so I'd guess the regulator would heat up faster.

Next I measured the switching regulator efficiency at 12 V dc (nominal lead acid battery voltage) and 10.5 V dc (lead acid discharge voltage) at several different loads. The results are shown in Table 2.

The last test was a measurement of output ripple and noise. I loaded the WF5Y Battery Booster output at 10.3, 13.3 and 16.3 A and found that the output ripple varied from about 2 to 3 V_{P-P}. Figure 7 shows the ripple at 13.3 A output, with the input voltage set at 12 V dc. Figure 8 shows the spectrum plot from 5 kHz to 4 MHz. As you can see, the switching noise is 20 to 30 dB above the spectrum analyzer noise floor over this range. Table 3 summarizes the specifications and my testing.

I also listened to the switching noise on a transceiver powered from a separate, clean voltage source. I connected a clip lead to the transceiver's antenna port, and draped the other end of the clip-lead across the WF5Y Battery Booster's output cable. I could hear very strong raspy tones every 100 kHz from 160 through 6 meters (typically S9 or greater), and there was a noticeable noise floor degradation between these 100 kHz noise peaks (typically S3 or greater). This was radiated energy, not conducted, as I was hesitant to connect the Battery Booster output to my transceiver because of the high power supply ripple.

Table 2
WF5Y Battery Booster Efficiency

V_{IN} (V)	I_{IN} (A)	P_{IN} (W)	V_{OUT} (V)	I_{OUT} (A)	P_{OUT} (W)	Eff (%)
12	13.5	162	13.8	10.3	142	88
12	17.3	208	13.8	13.3	183	88
12	21.9	263	13.8	16.3	225	86
10.5	16.4	172	13.8	10.3	142	83
10.5	20.9	219	13.8	13.3	183	84
10.5	25.8	271	13.8	16.3	225	83

Table 3
WF5Y Battery Booster

Feature	Specification	Measured
Minimum input voltage	8 V dc.	10 V dc.
Adjustable output voltage range	Up to 35 V dc.	34.6 V dc.
Continuous (150 W) output current at 13.8 V dc	10.9 A.	See text.
Intermittent (250 W) output current at 13.8 V dc	18.1 A.	See text.
Output ripple	Not specified.	2-3 V_{P-P}.
Efficiency	Not specified.	See Table 1.
Size (height, width, depth): 2.3 × 5 × 3 inches; weight, 7 oz.		
Price: $59.95.		

Some Final Thoughts

Battery boosters can be effective in compensating for low voltage power sources in mobile or portable environments. As discussed earlier, the WF5Y Battery Booster handles an input voltage as low as 10 V dc while maintaining 13.8 V dc output. However, I have several concerns with this unit. There is no output overvoltage protection, heat sinking is inadequate for the 20 A load presented by a typical 100 W HF transceiver, and there is no shielding or output filtering, so noise from the switching regulator is audible in a receiver throughout the HF spectrum. This is a very inexpensive battery booster, but you need to keep these limitations in mind. With added overvoltage protection, it would be suitable for short transmissions with a typical VHF/UHF FM transceiver.

Manufacturer: GrumpyShop, 2002 Cee Gee Ln, San Antonio, TX 78217; tel 210-264-9197; **www.grumpyshop.net**.

[At press time, the manufacturer indicated that he was working on upgrades to the basic model, including addition of a hash filter to reduce HF noise and a fan to improve the power output capability. — *Ed.*]

Feedback

- In "Up Front" [June 2013, page 20], the photo at the upper left corner of the page with the caption "On the road with the tower trailer" is actually a photo of different tower trailer that the author built in the 1970s and towed from California to Vermont. It is not the same trailer shown in the rest of the article.
- In "Forty-Three Million Miles per Watt" [June 2013, page 63], it is stated that the round trip distance to the Moon is 756,000. This is an error. The actual distance is about 477,714 miles.

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

Why do Mixers Need to be Nonlinear?

Q Philip, KK4SQ, notes that he has been trying to understand the operation of nonlinear amplifiers. He understands that with a linear amplifier, what goes in is the same signal that comes out, except for the amplitude. In a nonlinear amplifier, the output waveform is not the same shape as the input waveform. He asks "What I don't understand is how such a nonlinear amplifier can work as a mixer and why a mixer must be nonlinear — can you help?"

A Let's look at it in terms of algebra and a bit of trigonometry. A linear amplifier can be represented by a linear equation of the form $y = k \times x$, where x represents the input signal and y the output. Whatever x is, y is k times stronger. If we plot the equation (see Figure 1), we find we have a straight line with a slope of k.

To use use an audio amplifier as an analogy, if we put in the sound of a cello, we would get out the sound of a cello, only louder — we would not expect to hear a violin. If we put in the sounds of a cello and a bassoon, we would expect to only hear those tones, but louder.

If we represent the cello as a single tone sine wave, sin at, and the bassoon as sin bt, and we put them both in as inputs, at the output we would have $k \times (\sin at + \sin bt)$ or $k \times \sin at + k \times \sin bt$. Thus we would just have the same two tones at a higher level but we generate no new tones.

But recognize that there is no such thing as a perfectly linear amplifier, even though some come close over their operating range. When they aren't quite linear, instead of having the output/input relationship defined by a linear equation, as above, the curve will not be quite a straight line and can be defined by a polynomial of the following form:

$$y = k_0 + k_1x + k_2x^2 + k_3x^3 + k_4x^4 + \ldots k_nx^n$$

The weights (the k_n numbers) are adjusted to make the curve fit the response. If we focus on the k_2x^2, or second order term, recall that if we square the sum of two numbers, $x = (A + B)^2$, we get $A^2 + 2AB + B^2$. This is very significant, because if $A = \sin at$ and $B = \sin bt$, our two tones, in addition to the linear response we had before from the k_1x term, we get $(\sin^2 at) + 2\{(\sin at) \times (\sin bt)\} + (\sin^2 bt)$ all from the second order term.

Let's look at these components:

$(\sin^2 at) = \frac{1}{2}(1 - \cos 2at)$.

This is a dc component (not usually important) minus a phase shifted tone at twice the frequency. If $(\sin at)$ is our cello, we will also get a second harmonic — perhaps a violin tone at a level set by k_2, hopefully a much lower level than the cello. This is called *harmonic distortion*, and will usually be shown in amplifier specifications. In an RF power amplifier, we may need a low pass filter to get rid of this. Note that we will also get the second harmonic of the sin bt term.

$(\sin at) \times (\sin bt) = 1/2\{\cos(at - bt) - \cos(at + bt)\}$, or

$= 1/2\{\cos(a - b)t - \cos(a + b)t\}$

This is very interesting! Notice that we get two new tones, one the sum of the cello and the bassoon frequencies, the other their difference. We put two tones in our audio amplifier, and we get six out — the original pair, the second harmonics of both and the sum and differences, called the *intermodulation products*. (Note that if we continued to the higher order terms, we would also get

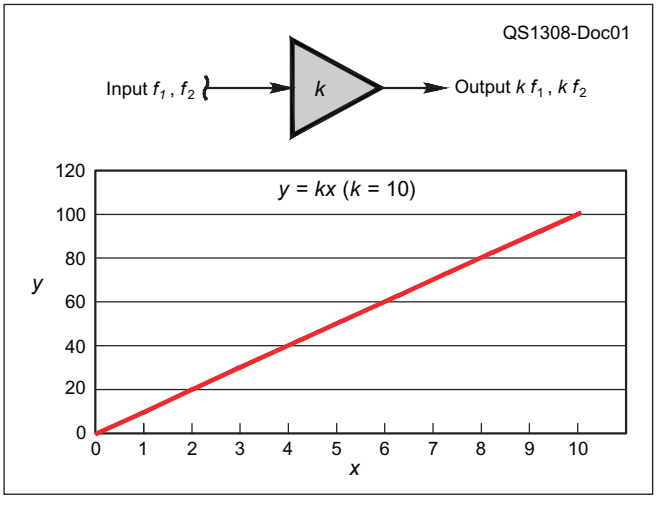


Figure 1 — Block diagram of an ideal linear amplifier along with its input output relationship. Put signals at two frequencies in, you'll only get signals at the same two frequency out — but they'll be louder.

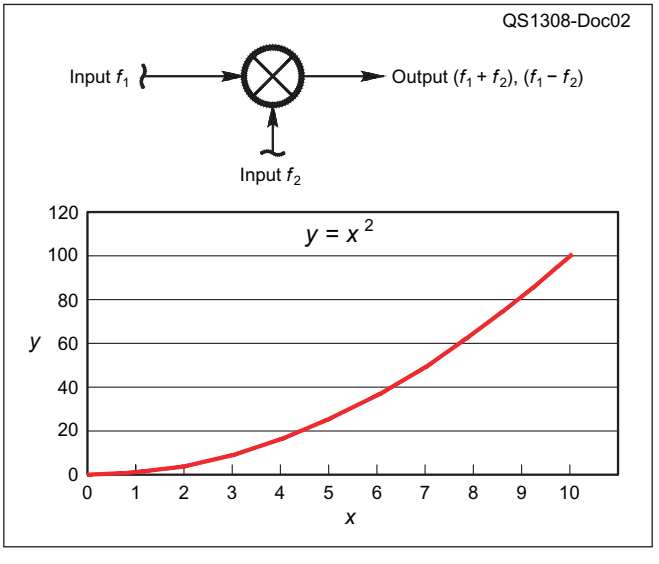


Figure 2 — Block diagram of an ideal mixer along with the input output relationship of a squarer. Put signals at two frequencies in, you'll get signals out at the sum and difference frequencies.

higher harmonics, as well as higher order intermodulation products, including the dreaded "third order IMD" response that often limits receiver performance).

Obviously, this is not what we want if we are looking for a linear audio amplifier. If we put on a recording of a duet, we would be disappointed if we heard an out of tune sextet instead!

Now, back to the mixer question. Notice that the nonlinear second order response has resulted in the generation of two new frequencies — the sum and the difference of the two inputs. While these frequencies would be unwanted distortion in a "linear" audio amplifier, it's exactly what we want from a mixer. We specifically want "modulation distortion" and we don't get that from a linear amplifier. Some components, diodes for example, have a characteristic curve with a knee, rather than a straight line, that has high second order response and they are often used as mixers for that reason. A second order response is shown in Figure 2. Circuits that look like they might be linear amplifiers become nonlinear if driven by a high amplitude local oscillator.

So by using an inherently nonlinear device, or driving a linear amplifier into a non-linear region, we can end up with a mixer that can heterodyne two signals to result in one at the sum or difference frequency. Note that the harmonics and dc terms may also be present at the output of the mixer, but they are often quite far from the desired output frequency so that they are easy to eliminate by filtering.

Q David, WB6WFV, asks: While driving by a ham's house, I noticed two apparently identical vertical antennas that appeared to be 10, 15 and 20 meter triband monopoles about a half wave apart on 20 meters. Is there some kind of directional gain to be had from this arrangement?

A It's hard to tell exactly what is happening without looking at the cabling, but monopoles can be phased to provide gain and directivity in a number of ways.

The most straightforward arrangement is to feed the two antennas in the same phase. This just takes equal lengths of coax from each antenna to a T connector and then any length of coax to the station. The resulting pattern has deep nulls along the line of the array and almost 4 dB gain broadside to the array, as shown in the *EZNEC* plot in Figure 3.[1]

Another easy possibility is to feed the two 180° out of phase. This switches the array from *broadside* to *end-fire* as shown in Figure 4. This is usually accomplished by feeding one of the antennas through an (electrical) half wave of coax. This is somewhat more complicated, since that coax will provide the correct phase shift on only one of the three bands. The 180° length of coax on 20 meters looks like 360° on 10, back to in-phase. In addition, even with 180° phase shift on 10 meters with a separate phasing line, the spacing will be one wave length and the pattern will look like that in Figure 5 — not your optimum end-fire pattern.

Other patterns can be generated including a unidirectional cardioid using ¼ wave spacing and feeding one antenna 90° out of phase. While easy to describe and model, the coupled impedances of this case make it tricky to achieve the needed phase and identical amplitudes to make this work well.

Another consideration is that if the antennas each provide a matched 50 Ω load, the two in parallel will look like 25 Ω, or a 2:1 SWR. Not usually a problem, especially if you have an antenna tuner.

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

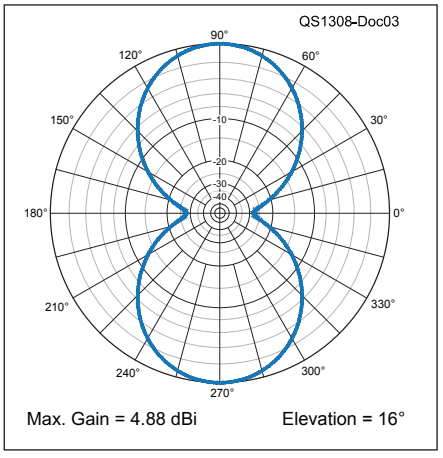


Figure 3 — *EZNEC* Azimuth plot of two 20 meter ¼ wave monopoles spaced ½ wave apart and fed in phase.

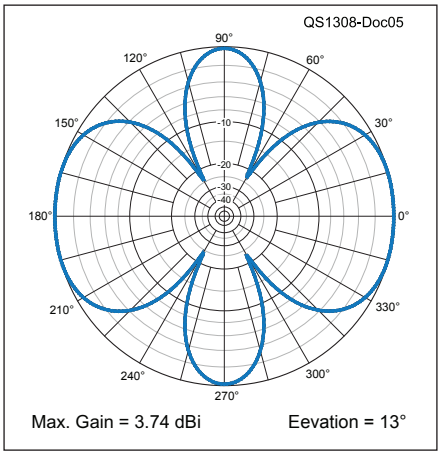


Figure 5 — *EZNEC* Azimuth plot of the two ¼ wave monopoles on 10 meters fed in phase. The pattern is different because the spacing on 10 meters is 1 wavelength.

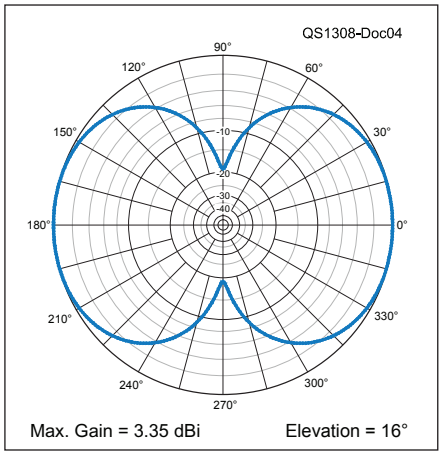


Figure 4 — *EZNEC* Azimuth plot of the two ¼ wave monopoles of Figure 3, but and fed out of phase (180°).

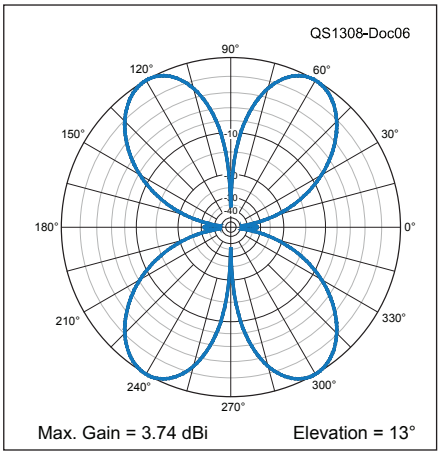


Figure 6 — *EZNEC* Azimuth plot of the two ¼ wave monopoles on 10 meters fed 180° out of phase. Again, the pattern is different from Figure 4 because the spacing on 10 meters is 1 wavelength.

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; **doctor@arrl.org**.

Steve Ford, WB8IMY, wb8imy@arrl.org

Ham Radio Deluxe Version 6.0

Ham Radio Deluxe ranks among the most popular *Windows* applications for everything from transceiver control, to logging, to satellite operation, to digital modes and more. Created by Simon Brown, HB9DRV, and the late Peter Halpin, PH1PH, the software suite has been a favorite for a more than 10 years.

In the April 2007 issue of *QST*, Richard Van Wyckhouse, KG4UHC, reviewed Version 3.4 and gave it considerable praise as a complex, yet highly versatile piece of software. However, the task of supporting *Ham Radio Deluxe* without financial compensation (the software was free of charge) soon became an intolerable burden for Simon. In late 2011, he sold the rights to Rick Ruhl, W4PC, Randy Gawtry, KØCBH, and Mike Carper, WA9PIE, who formed the company known as HRD Software LLC.

Their first task was to sift through all the bug reports that Simon had accumulated and tackle them one by one. The bugs numbered in the thousands, although not because *Ham Radio Deluxe* was a defective program. It was (and is) multidimensional with an extraordinary amount of code stringing everything together. In that environment a certain amount of buggi-ness is inevitable. Most problems were relatively minor, but they still needed to be tracked down and fixed.

In addition, HRD Software designed a support system to match the improved program. One of the frequent complaints about the "old" *Ham Radio Deluxe* had been that support was more or less "crowdsourced" and could be haphazard at best.

In time, HRD Software turned *Ham Radio Deluxe* into a genuine business product and began offering it for sale to the amateur community. While the price is no longer zero, the result is improved software that is professionally supported and continually enhanced. (Simon had many ideas for improvements, but he couldn't find time to implement them.) For the $99.95 purchase price you receive the software plus a year of guaranteed e-mail, telephone and even remote desktop-access support. At the end of the year, the decision to pay for a renewed support subscription is up to you; the fully functional software remains yours forever.

Figure 1 — The *Ham Radio Deluxe* main screen.

So How Is It Different?

If you're already familiar with *Ham Radio Deluxe*, a glance at the main screen in Figure 1 won't tell you much. In fact, it looks much the same. Dig deeper, though, and you'll uncover quite a few changes.

One difference that jumped out at me immediately was ARRL Logbook of The World integration. Uploading and downloading to LoTW was a breeze. From the Logbook screen I was able to input my user ID and password, after which *Ham Radio Deluxe* connected to the system and downloaded my most recent confirmed QSL data.

Speaking of awards and QSLs, the entire *Ham Radio Deluxe* award tracking and reporting scheme appears to have been revamped. The number of awards, for example, has more than doubled and the new reporting layout is very informative.

The DX spotting features, and the way in which the information is presented, have improved substantially. For amateurs on the go, *Ham Radio Deluxe* can now send "spot alerts" via e-mail (to your smartphone, for example).

Rig and rotator control options have expanded greatly compared to the Version 3.4 days. I noticed that Version 6.0 now "talks" to a longer list of gear, including newer rigs such as the Yaesu FT-3000 and the TEN-TEC Eagle.

Rotator control selections now include M^2 and Green Heron models.

Digital aficionados will recall that the multi-signal PSK decoder known as "Superbrowser" in the old *Ham Radio Deluxe* was a bit creaky and not as smooth as it could be. In *Ham Radio Deluxe* 6.0 it is now called "Super Sweeper" and the new incarnation includes RTTY.

As a RTTY enthusiast I was delighted to discover that *Ham Radio Deluxe* now supports FSK. That's my preferred method of enjoying RTTY with my Kenwood TS-2000 transceiver and it always irked me to be forced to use AFSK in the old version of *Ham Radio Deluxe*. It is important to note, however, that you must use a different COM port for FSK than you would for push-to-talk keying with PSK31, etc.

I had no problems using *Ham Radio Deluxe* 6.0 with my 64-bit *Windows 7* desktop computer as well as on my *Windows 8* laptop. If you're curious, the best approach may be to download the 30 day free trial version. That way, you can make sure *Ham Radio Deluxe* operates smoothly at your station before reaching for your credit card.

Manufacturer: HRD Software LLC, 12012 Fruitwood Dr, Riverview, FL 33569; tel 813-381-7714; **www.hrdsoftwarellc.com**. *$99.95.*

H. Ward Silver, NØAX, n0ax@arrl.org

Experiment #127

Phasors, Part Two

Last month, we introduced the phasor — a way of representing a sinusoid in terms of its amplitude and some value of phase compared to a reference. Phasor notation looks like $V\angle\phi$ where V is the amplitude and ϕ is the phase. Let's learn a few more things about phasors.

Basic Phasor Math

One of the nice things about phasors is that multiplying them is pretty easy. Multiplying phasor A by phasor B requires you to multiply the magnitudes and add the angles:

$$V_A\angle\phi_A \times V_B\angle\phi_B = V_AV_B\angle(\phi_A + \phi_B)$$

Similarly, to divide phasors, divide the magnitudes and subtract one angle from the other.

$$V_A\angle\phi_A \div V_B\angle\phi_B = (V_A / V_B)\angle(\phi_A - \phi_B)$$

Remember that to use phasor notation this way requires both signals to have exactly the same frequency so that ϕ_A and ϕ_B are constant. If that isn't true, the math gets a lot fancier.

How about adding phasors? Not quite as easy. Because we are operating in polar notation, you must break down each phasor into its X axis and Y axis components, add those components together and then change them back to phasors:

$$V_C\angle\phi_C = V_A\angle\phi_A + V_B\angle\phi_B$$

$$\text{X axis component} = [V_A \cos\phi_A + V_B \cos\phi_B]$$

$$\text{Y axis component} = [V_A \sin\phi_A + V_B \sin\phi_B]$$

$$V_C\angle\phi_C = X + jY = \sqrt{(X^2 + Y^2)} \angle (\tan^{-1} Y/X)$$

Bleh!

Fortunately, scientific calculators and software usually have routines to do this math automatically — look in the manual or Help file under *polar notation*. (Remember that online tutorials for this kind of math are listed on the ARRL website.[1])

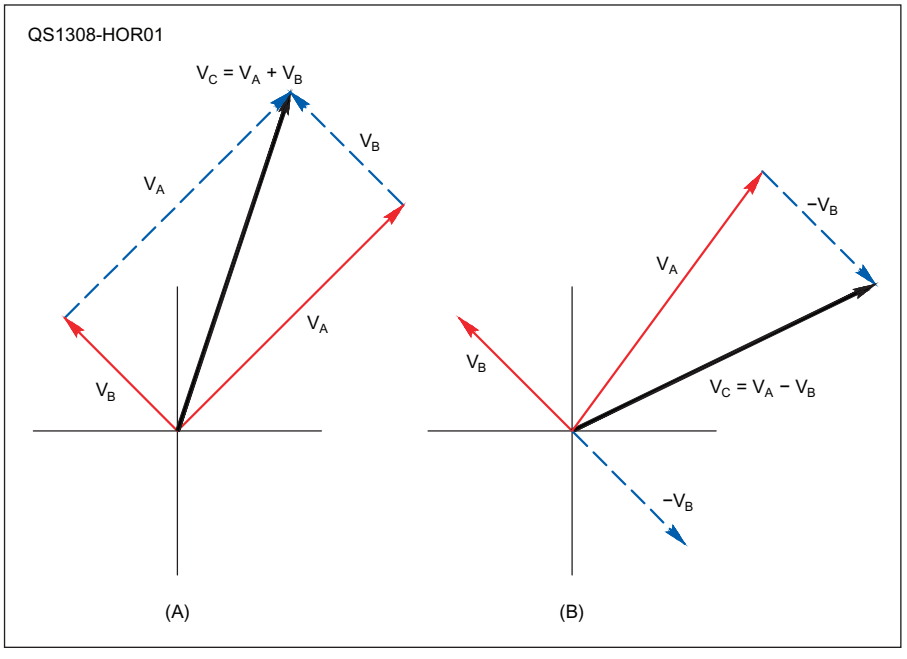


Figure 1 — Adding and subtracting phasors.

Graphically Adding and Subtracting

We have been drawing all of the phasors with

[1] **www.arrl.org/studying-for-the-general-license**, click on "Math Tutorials," then "Tutorials on Math for License Exams."

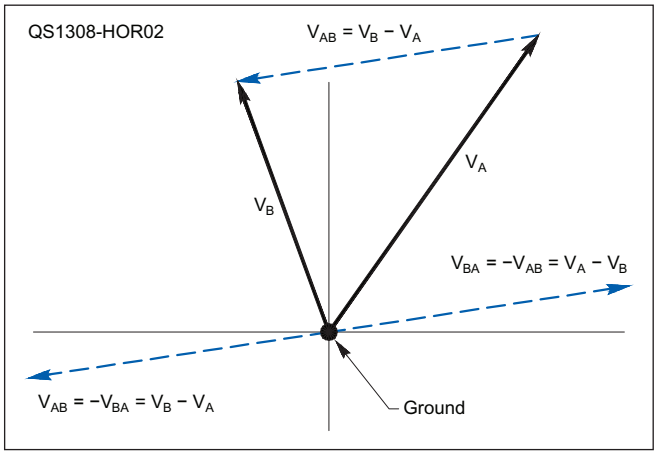


Figure 2 — Phasor-to-phasor voltages.

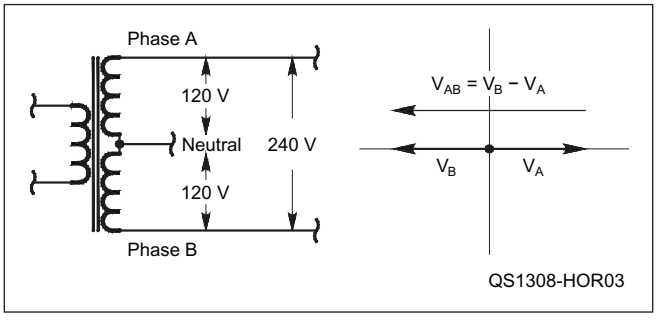


Figure 3 — Residential split-phase ac power.

their head at the origin and their tail (where the arrowhead is) at the point representing the magnitude and angle. Phasors can be drawn anywhere on the X-Y plane, though, as long as they have the same magnitude and angle! This makes adding them together graphically very simple, as shown in Figure 1A, by arranging the phasors "head to tail." The resulting phasor is drawn from the head of the first phasor to the tail of the last phasor.

Just like ordinary numbers, you can add phasors together in any order. What about subtraction? Turn the phasor to be subtracted 180° and add as in Figure 1B — just like subtracting an ordinary number by multiplying it by -1 and adding instead. Now you know how to add, subtract, multiply, and divide phasors all having a common frequency.

Let's learn another neat trick — if the phasors represent voltages, how do you find the difference in voltage between two phasors? When you measure voltage at a point in a circuit, you measure voltage "from" ground "to" the point. In effect you are measuring the voltage at the point and then subtracting the voltage at your ground reference, which is zero. If our phasor ground reference is at the origin as in Figure 2, the tail of the phasor (with the arrowhead) shows the voltage measurement with respect to ground.

When you measure voltage between two ungrounded points in a circuit, your meter's negative probe is the reference and you measure voltage "from" the reference point "to" the point where the positive probe is. Figure 2 shows how this works if the two voltages are phasors and our reference "ground" point is at the origin. The voltage "from" phasor A "to" phasor B is itself a phasor, written V_{AB} and calculated as $V_B - V_A$. We could also measure the voltage from phasor B to phasor A as $V_{BA} = V_A - V_B$. You can see that V_{BA} has exactly the same magnitude but the opposite angle to V_{AB}. Take a minute and sketch out the subtraction of the phasors to make sure you see how I came up with V_{AB} and V_{BA}.

Phasor-to-Phasor Voltages

This is all fine and dandy, but does it have any practical value? Would you ever encounter phasor-to-phasor voltages? Yes and closer to home than you imagined. Residential ac power electrical service supplies two phases to the main breaker box, each 120 V. The power comes from a transformer at the utility pole with a single primary winding and two secondary windings. Figure 3 shows the secondary windings each supplying one phase of your electrical service and connected together at one end as the neutral. The polarity of the windings is opposite so that the phasors representing their voltages point in opposite directions as shown in the phasor diagram. This is called *split-phase* power.

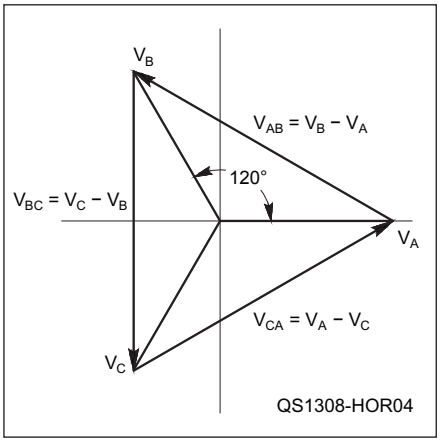


Figure 4 — Phasor diagram for three-phase power.

If you have two equal-and-opposite phasors, what is the magnitude of the voltage between them? (Answer: The sum of the phasor magnitudes.) If each phasor has a magnitude of 120 V, the magnitude of the voltage between them is 120 + 120 = 240 V. If you connect one hot wire to each phase and one to neutral, that's where the ac for your amplifier (or your clothes dryer) comes from!

Three-phase Power

Now let's take this one step further — three-phase power.[2] The ac coming from generating facilities like dams and power plants has three phases. That's why there are three wires (or pairs of wires) making up the high-voltage lines (not counting any protective ground wires). Large power consumers would unbalance the power grid if they used power from just one of the phases, so they are wired to use some power from each of the phases and the electricians are in charge of configuring things so each phase is loaded by about the same amount. That is why buildings and businesses of any size have ac service with three phases, not just two.

The phasors representing each of the three phases — A, B, and C — are shown in Figure 4. They are all spaced equally around the circle, ⅓ of the circumference or 120° apart. Let's say your apartment in a big building is supplied with two phases of power, just like residential split-phase ac power, and each phasor has an amplitude of 120 V. What happens when you try to run the drier by connecting it to the two phases (let's say phase A and B)? Why don't you get 240 V?

Look at Figure 4 and the phasor V_{BA}. The two phasors representing the phases of electrical service, V_A and V_B, are not pointing in opposite directions — they are only 120° apart — so their magnitudes don't add as in the split-phase situation. In fact, if you look up the trigonometry, the magnitude of phasor $V_{BA} = \sqrt{3}\ V_A = 1.866\ V_A$, not 2 V_A. If each phase is supplying 120 V, what voltage will your dryer see if it is connected across two phases? (120 × 1.866 = 224 V)

This dependence on how your electrical service is derived from the utility grid makes a big difference when running a heavy load — such as an amplifier. If your amplifier is designed to run from 240 V power and you connect it to 224 V instead, that is about 7% low. It's common for amplifiers not to supply their full rated output power when run at slightly lower input voltage. The opposite case — higher than expected input voltage — can stress high-voltage components, too.

If your equipment does not have a "universal" power rating of something like 90 to 260 V ac, determine how to configure it for the voltage you have available. Many appliances and amplifiers have selectable input voltage "taps" or connections on the primary winding of a power transformer that can accommodate 240, 220 or 208 V power. (Where does 208 come from? Two hundred and eight is approximately 1.866 × 112 V, at the low end of acceptable "120 volt" service.)

I said we'd have a two-part article, but it will take one more to get to some real radio meat-and-potatoes: AM and PM modulation from the perspective of phasors. That, in turn will usher you to the gates of modern data communication: I-Q modulation.

[2]A thorough treatment of three-phase power in both Y and delta connections is available online at **www.ece.msstate.edu/~donohoe/ece3414three_phase_power.pdf**.

Steve Sant Andrea, AG1YK, hk@arrl.org

Tuning Troubles, a Rescue Plug and Inverter Info

Curing Erratic Tuning

Most ham gear made in the past 15-20 years tunes use some sort of rotary encoder. These encoders generate digital pulses that are fed either directly or through some sort of buffer to the rig's microprocessor, telling it to tune up or down.

I purchased an Alinco DR-610T at a hamfest and found that the tuning via the main tuning knob was very erratic. I would try to increase (or decrease) the frequency (or memory channel) and it would bounce up, then right back to the same frequency or, in some cases, it would decrement instead of incrementing. Playing with the tuning knob repeatedly might finally get the frequency set where it was supposed to be. I decided to investigate the problem and see if a fix was possible.

The Alinco uses a common type of rotary encoder. More information on how these work can be found at **www.ubasics.com/adam/electronics/doc/rotryenc.shtml**. I am not sure what failure mode causes the erratic operation, but, instead of replacing the control, I was able to devise a fix. Through experimentation, I found that a couple of 0.1µF capacitors added across the rotary controller's terminals corrected the problem. Too large a capacitor stopped the tuning altogether and too small had no effect on the problem.

Figure 2 — This is a close-up view of the capacitors mounted to the back of the encoder. [Kirk Ellis, KI4RK, photo]

I soldered the two 0.1µF capacitors between each output terminal and ground (see Figures 1 and 2) on the opposite side of the PC board from where the encoder is located. The encoder has an "up" and a "down" terminal, and a common terminal, which in this radio was connected to ground.

On your rig, consult the schematic and service documentation to determine the best way to access the terminals and install the capacitors. You may need to experiment with different values of capacitors, though 0.1µF should be a good starting point. After soldering the capacitors in place, I reassembled the radio and it operated like new. — *73, Kirk Ellis, KI4RK, 203 Edgebrook Dr, Pikeville NC 27863*, **ki4rk@arrl.net**

Figure 1 — The capacitors, visible on the right, are mounted on the back of the control head circuit board, behind the rotary encoder. [Kirk Ellis, KI4RK, photo]

Rescue Plug Saves Battery

I pulled out my MFJ-259 antenna analyzer to do some testing only to discover the power switch had been left on, draining the batteries. In addition to the annoyance of finding a dead unit and the expense of new batteries, there is the danger that drained batteries may leak. This could potentially damage the unit.

A little investigation showed that switching between the batteries and an external power supply is managed by the 2.1 millimeter power jack. As with many similarly powered products, when a plug is inserted into the jack, the electrical path between the batteries and ground is interrupted. Knowing this, it is a simple matter to make a "dummy plug." Just dig a suitable plug out of your junk box or buy one through an electronics supplier. Insert the plug into the external dc socket before storage and you'll never have accidentally drained batteries again. I put the plug on a keeper string (using the plug ground/sleeve wire, not the power/tip wire) attached to one of the antenna jack screws as a simple reminder and to avoid losing the plug during use. Figure 3 shows the unit with the dummy plug inserted.

This workaround has also been verified on an MFJ-269 (with the J3 Jumper in the off, or non-rechargeable, position). It is possible that this technique might work with other MFJ

Figure 3 — By inserting the appropriate dc plug into the external dc jack, you can disable the internal batteries preventing accidental discharge and possible corrosion damage. [Mat Breton, AB8VJ, photo]

analyzers, but this hasn't been tested. I have also used this technique to protect the batteries of other products that use both internal and external power sources, although not all will work correctly (depending on how the power supplies are switched/controlled).
— 73, Mat Breton, AB8VJ, 35229 Rosslyn St, Westland, MI 48185, **ab8vj@arrl.net**

Small Antenna Mount

My friend, Bill, N9CHN, moved to a new condo in Arizona where rules do not permit antennas to be visible from the street. The building has a flat, rubberized-membrane roof so we needed a mounting solution that didn't require making holes in the building.

After some brainstorming, we constructed the light duty antenna mount shown in Figure 4. The materials required are:

1 10 foot length of 2 inch PVC pipe
3 PVC Ts
5 end caps
4 45° elbows
4 #6 × ¾ inch stainless steel wood screws
25 lbs pea gravel

Also required are PVC cleaner and glue. Painting is also required to protect the PVC pipe from UV radiation.

We assembled the mount on the ground, putting all the components together with the exception of two adjacent end caps. We then moved it to the roof, turned it on end, filled the tubes with pea gravel and placed the last two end caps. The pea gravel added about 20 pounds to the structure and made it quite stable. We used screws, not glue, to hold the end caps in place, so the gravel could be removed if necessary. Before installing the end caps, drill a 3/16 inch hole in each to allow for water drainage.

Any number of variations are possible. We chose the X configuration as it is stronger than an H and would also allow for the legs to be angled downwards in order to conform to a peaked roof. The legs could be fitted with threaded couplers for easy disassembly for portable use. The end caps could be glued in place and the unit filled with water instead of gravel for added weight, if freezing temperatures are not expected. It is possible that the vertical section could be made longer for some applications such as supporting the center of a dipole. [This design should only be used with small, low wind load antennas. Depending upon your situation, some form of guying may be prudent. — *Ed.*] *— 73, Ed Toal, N9MW, W8471 State Road 39, Blanchardville, WI 53516-9663*, **n9mw@tds.net**

Figure 4 — This PVC mount is simple and inexpensive to build. It is adequate for small, low wind-load antennas. [Ed Toal, N9MW, photo]

Mobile Pass-Through Panel

One challenge that every ham faces is how to get a signal from the antenna to the rig inside the house. A whole range of homebrewed and commercial solutions exists. The mobile ham faces the same issue. Drilling holes is the usual solution but that is always inconvenient and often not aesthetically pleasing. The popularity of VHF for repeaters, satellites and APRS has increased the use of multiple rooftop antennas creating the need to bring multiple signals into the vehicle.

The easiest way to do this is to leave a rear window open a crack and run the cable through. This option upsets the heating and air conditioning systems, admits rain and snow to the interior and runs the risk of the cables flopping around or being pinched by the window.

A better idea is to put a thin strip of wood at the top of the window with slots for the cables. Figure 5 shows one such installation. A piece of wood or other material the thickness of the glass (usually ⅛ inch) is cut about 2 inches wide and shaped to fit the particular window's profile. A slot about ¼ inch long is cut on the bottom for each cable entering the vehicle. *— 73, Alex Burr, K5XY, 695 Stone Canyon Dr, Las Cruces, NM 88011*, **k5xy@arrl.net**.

Figure 5 — A small piece of wood or rigid insulation is easily shaped and notched to make a feed line pass-through for your mobile installation. [Alex Burr, K5XY, photo]

Angle Bracket Panel Supports

I was having problems working on the control and metering panel for an amplifier. Every time I tried to do something to the panel, it was either in the wrong position or it fell over. I tried supporting it with wood blocks and with books, but those solutions either took up too much real estate on my bench or simply weren't stable enough.

I started looking for a solution and came across some right angle brackets left over from a shelving project. The brackets' holes were in the wrong places to fit the notches in the panel but a drill fixed that. I used 10-32 hardware, the same type I use to attach the panel to the rack, and now my rack panel stands upright (see Figure 6).

Note that metal bookends can be used for similar purposes, but they may not be as strong. In this case, I was mounting transformers and small Variacs to the panel and needed solid support. *— 73, Steve Gilbert, K1SG, 75 W Elm St, Hopkinton, MA 01748-2102*, **k1sg@arrl.net**

Improvised Radial Tie Point

I was installing a vertical antenna and needed a way to connect the radials. Looking for inspiration at my local home improvement

Figure 6 — Angle brackets make a solid and steady support when working on equipment panels. [Steve Gilbert, K1SG, photo]

center, I came upon equipment grounding bars in the electrical section. An equipment grounding bar is an aluminum bar with wire terminals and screws used in home power distribution panels. These grounding bars can be effective tie points for antenna radials. I chose the nine terminal version, which, when configured in a square, will hold up to 36 radials (see Figure 7). — *73, Richard Steck, W9RS*, **w9rs@arrl.net**

Figure 7 — A set of four equipment grounding bars can be bolted together to form a square around the base of your antenna and they will provide ample connection points for radials. [Richard Steck, W9RS, photo]

More On Battery B+

George Peters, K1EHW, contacted your editor with a concern regarding the dc to ac inverter in the May "Hints & Kinks" column.[1] George referred me to a 2012 *QST* article that concerned a trip problem when using an inverter with a Ground Fault Circuit Interrupter (GFCI).[2]

The 2012 article gives a detailed discussion of how inverters operate. In order to reduce cost, size and weight, inverters are designed without transformers (see Figure 8). In these designs the hot and neutral leads are not switched at the same time (see Figure 9). This can cause a situation where the neutral is approximately 85 Vrms *above* the case ground, which can cause a *shock hazard*. When using an inverter, review the manufacturer's instructions regarding how to safely connect the inverter to ground. — *73, Steve Sant Andrea, AG1YK*, **ag1yk@arrl.org**

[1]R. Richardson, K4AMN, "B+ From a Battery," *QST*, May 2013, pp 63-64.
[2]C. Wehner, W1FJW, "Ground Fault Circuit Interrupter (GFCI) Failure," *QST*, Nov 2012, pp 64-66.

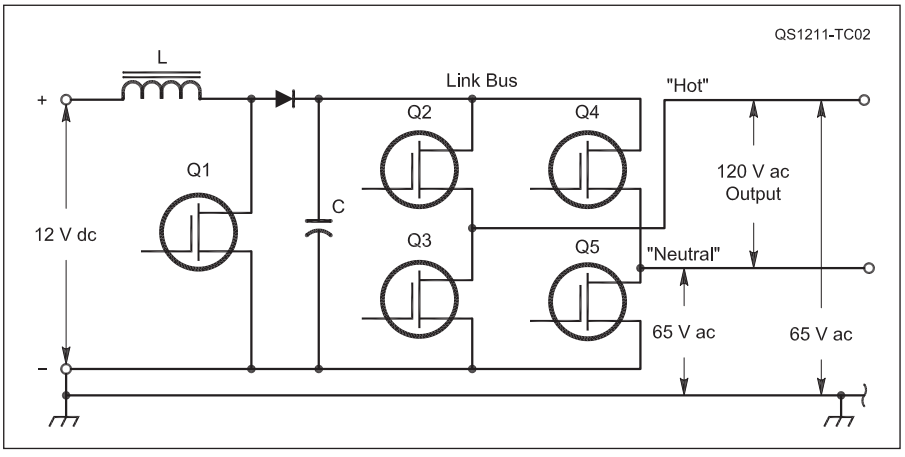


Figure 8 — This simplified diagram illustrates the operating principles of a typical 12 V dc to 120 V ac power inverter.

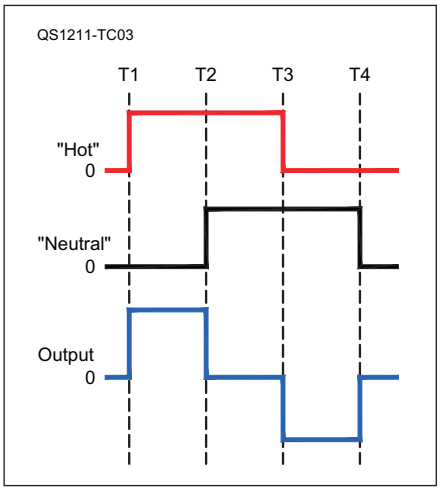


Figure 9 — As this diagram shows, for part of each cycle, a typical inverter will drive the neutral output line high to help simulate an ac waveform.

"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.

New Products

Lightweight HF Vertical Antennas from MFJ

The MFJ-2982 vertical antenna for 80-6 meters is 31 feet tall and requires no guys. Designed to set up quickly, the antenna collapses to 3.8 feet. Fiberglass sections twist to lock in place as the antenna is extended. It includes an adjustable base loading coil, balun and counterpoise. No antenna tuner is needed for 80/75, 60, 40 and 17 meter operation. The base loading network uses an air wound coil continuously tapped to provide full coverage of the 3.5 and 7 MHz bands. On 17 meters, the inductor configures the antenna as a ⅝ wave vertical. Operation on 30, 20, 15, 12, 10 and 6 meters requires an antenna tuner. The counterpoise consists of four insulated 12 foot radial wires that lie on the ground. Hardware is aluminum, stainless steel or corrosion protected. Power rating is 600 W PEP on SSB/CW. The MFJ-2980 is similar but works on 40-6 meters. Price: MFJ-2982 (80-6 meters), $149.95; MFJ-2980 (40-6 meters), $99.95; MFJ-1919 portable tripod, $89.95. For more information, to order, or for your nearest dealer, call 800-647-1800 or see **www.mfjenterprises.com**.

Hamvention™ 2013 Recap

This year's Dayton Hamvention featured many visitors and a ton of new toys.

Steve Ford, WB8IMY
***QST* Editor**

You could be forgiven for thinking you were in London, England when the doors to Hara Arena opened at 9 o'clock in the morning on Friday, May 17. The entire area was blanketed in a gray fog that shrouded the tops of the towers and antennas in the flea market.

The fog was of no concern to the thousands of amateurs streaming into the complex, however. As Hamvention veterans will tell you, even a monsoon would have amounted to little more than an annoyance. Hamvention devotees are well accustomed to inclement weather.

The Saturday flea market under overcast skies.

But what draws so many people to southwestern Ohio in the first place? The answer is the world's largest gathering of radio amateurs. With attendance pegged at more than 20,000, the Dayton Hamvention is a combination new product showcase, old and new equipment shopping spree, social event and educational camp. Here are some of the highlights from this year's gathering.

ARRL EXPO

The ARRL EXPO occupied a substantial chunk of real estate and drew a steady flow of visitors during all three days. This year marks the 75th anniversary of the founding of W1AW, the Hiram Percy Maxim Memorial Station, and that was a major EXPO theme. Many of the ARRL crew wore the new W1AW shirts on Sunday.

ARRL Laboratory Engineer Bob Allison, WB1GCM, and several volunteers set up a spectral purity testing station and offered free handheld transceiver evaluations. Most rigs passed without problems, but some presented unpleasant surprises to their owners!

Of course, it wouldn't be an ARRL EXPO booth without people standing in line for DXCC QSL checking, or queuing up to ask questions about Logbook of The World. The other EXPO areas such as the Youth Lounge, the Educational Services booth and the Public Service section were all well attended, as were the presentations on the EXPO "stage."

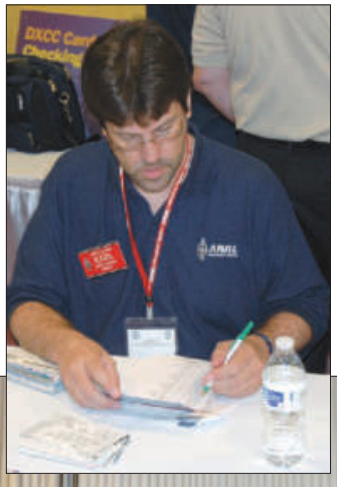
Visitors had the rare pleasure of meeting well-known writers including Leigh Klotz Jr, WA5ZNU (*Ham Radio for Arduino and PICAXE*); Eric Nichols, KL7AJ (*Radio Science for the Radio Amateur*) and Don Keith, N4KC (*Riding the Shortwaves*) at the author table.

One of the EXPO highlights was the presentation of the William R. Goldfarb Memorial Scholarship to Calvin Darula, KØDXC. The Goldfarb Scholarship is the result of a generous endowment from the late William Goldfarb, N2ITP. Before his death in 1997, Goldfarb set up a scholarship endowment of close to $1 million in memory of his parents, Albert and Dorothy Goldfarb. Awarded to one high school senior each year, the Goldfarb Scholarship assists the recipient in his or her pursuit of a four-year undergraduate degree in engineering or science or in the medical or business-related fields.

Thick fog enveloped the Hara Arena complex Friday morning as Hamvention 2013 was about to begin.

A different kind of pileup: hams crowding the aisles at Hamvention.

ARRL Contest Branch Manager Sean Kutzko, KX9X, checks DXCC QSLs in the ARRL EXPO area.



ARRL President Kay Craigie, N3KN, speaks at the Member forum.

In the ARRL Power Line Interference forum, Laboratory Supervisor Ed Hare, W1RFI (left), and Laboratory Engineer Mike Gruber, W1MG, demonstrate how an ultrasonic receiver can be used to pinpoint noise sources.

Calvin Darula, KØDXC, receives the 2013 William R. Goldfarb Memorial Scholarship from ARRL Central Division Director (and ARRL Foundation Vice President and Scholarship Chairman) Dick Isely, W9GIG. At left, Calvin's grandfather, Gary Hornbuckle, K9MMS and grandmother Betty Hornbuckle. At right, Martin Green, K2PLF, ARRL Foundation committee member and Jim Fenstermaker, K9JF, Foundation committee member and ARRL Northwestern Division Director.

Pat Bunsold, WA6MHZ (seated), and ARRL Laboratory Engineer Bob Allison, WB1GCM, prepare to test handhelds for spectral purity in the ARRL EXPO.

Calvin is a recent graduate of Waconia Senior High School in Waconia, Minnesota and plans to take his scholarship to St. John's University where he will study business management and economics. His passion is CW contesting. Calvin was recruited as a 2010 USA High Speed Telegraphy Team member and has served as an ARRL Youth Assistant Section Manager.

Forums

If you weren't roaming the flea market or the indoor exhibits, you were probably attending one of the many Hamvention forums.

The ARRL Power Line Interference forum was as informative as it was entertaining. ARRL Laboratory Supervisor Ed Hare, W1RFI, provided guidance and answered questions with assistance from Lab Engineer Mike Gruber, W1MG, and an arcing "Jacob's Ladder" noise source.

The Saturday morning ARRL Member forum was filled to capacity. After an introduction by Great Lakes Division Vice Director Dale Williams, WA8EFK, Ohio Section Manager Frank Piper, KI8GW, discussed several issues of local and statewide interest.

ARRL President Kay Craigie, N3KN, spoke on a number of topics, but in particular stressed the new ARRL Second Century Campaign and the need to ensure that our organization remains strong well into the future. To emphasize the point, and its relevance during the upcoming ARRL Centennial, she said, "While the past may excite us, it is the future that must inspire us."

ARRL Chief Executive Officer Dave Sumner, K1ZZ, brought the audience up to date on the status of ARRL involvement in national and international regulatory issues. While discussing a potential threat to our allocation at 76 GHz, he stressed the fact that even such sparsely used amateur spectrum deserved a vigorous defense. "The 76 GHz band may be of little interest to most hams today, but we need to preserve our microwave allocations for technologies we can't even imagine today and the future amateurs who will use them."

First Vice President Rick Roderick, K5UR, stepped to the podium and issued five challenges to the audience:

1. If you don't belong to a local club, join today. If you belong to a club already, actively support it.
2. Help inactive hams get on the air. Give assistance to new amateurs to help them use their privileges effectively. Volunteer time to help elderly hams who are no longer able to maintain their stations.
3. Recruit as many new amateurs as possible.
4. Recruit as many new ARRL members as possible.
5. Donate to the ARRL Second Century Campaign.

The excellent attendance at the ARRL Member forum was reflected in several other gatherings. The crowds at some forums, such as the "Advances in Software Defined Radio" presentation and the antenna forums, overflowed into the hallways!

Gear: Old and New

Indoor vendors appeared to be doing a great deal of business. At times the aisles were so choked with shoppers that movement was difficult. There seemed to be considerable interest in Software Defined Radio (SDR) products. To draw a crowd, a seller merely had to plug in a computer and fire up an SDR receiver or transceiver. As if to prove the point, the FlexRadio booth was frequently packed with curious hams. Even less well-known SDR manufacturers had little trouble attracting visitors to their booths. See the sidebar "New at Dayton 2013!" for a summary of many of the new products that debuted at the show.

It was interesting to note that there were fewer laptop computer vendors this year. The most prominent vendor had stacks of laptops for sale at well below $400, but there didn't seem to be many buyers. In contrast, another vendor who was proffering an array of tablet computers was doing a substantial amount of business. A sign of changing times, perhaps?

The Dayton Hamvention flea market has been in gradual decline due in large part to the influence of eBay and other online auction sites. Even so, it is still the world's largest Amateur Radio emporium. This year the emphasis seemed to be on component parts. For example, one fellow was selling vacuum variable capacitors on Saturday. Another was hawking Bird wattmeter elements and just about every transmission line connector and adapter imaginable — all at steep discounts.

It's a Wrap!

By noon on Sunday the big show was winding down. The remaining hams (vendors included) were weary, but happy. Shopping and haggling continued to the last minute. One gentleman was seen dashing through the flea market, trying to catch up with a seller who was about to leave with a pristine Drake TR-7 transceiver in tow. (He caught him just in time.)

By mid afternoon the asphalt expanse held only a few vehicles and Hara Arena crews had begun their cleanup. The Hamvention frenzy had finally come to an end…until next year.

Steve Ford is the Editor of *QST*. You can contact him at **sford@arrl.org**.

New at Dayton 2013!

Many new products debuted at the Dayton Hamvention — more than we could possibly show in a few pages. These are just some of the items that caught the eyes of our roving reporters. You'll find more in the digital edition of the August issue of *QST*.

The Icom IC-7100 HF transceiver features a removable control head with an innovative touch screen. It was awaiting FCC certification at press time, but should be available for sale this year. See **www.icomamerica.com/en/products/amateur/hf/7100/default.aspx**.

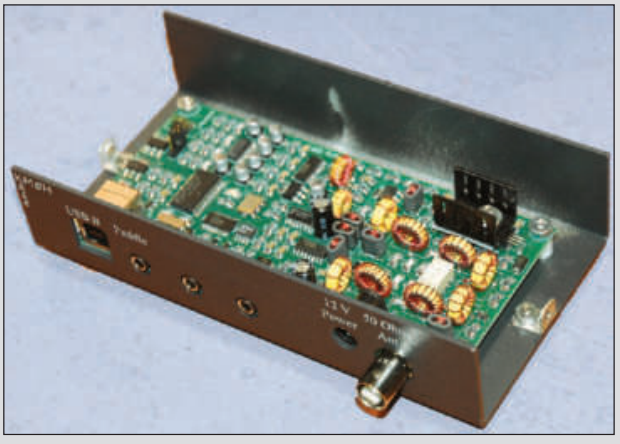
The Yaesu FTDX-1200 160 through 6 meter transceiver. It features a triple-conversion receiver with a 40 MHz first IF and 3/6/15 kHz roofing filters available. $2400. [Ward Silver, NØAX, photo]

The Yaesu FT-252 and FT-257 are simple, single-band 2 meter/70 centimeter FM transceivers. Each puts out 5 W. The user interface is greatly simplified, with common functions on dedicated buttons and everything else accessed through menus. $135. [Ward Silver, NØAX, photo]

The TEN-TEC Model 506 "Rebel" CW QRP transceiver with 4 W output. It is branded as an "open source" rig using Arduino compatible software and a Uno32 processor. According to TEN-TEC representatives, the Rebel is designed specifically to appeal to experimenters. $199.95.

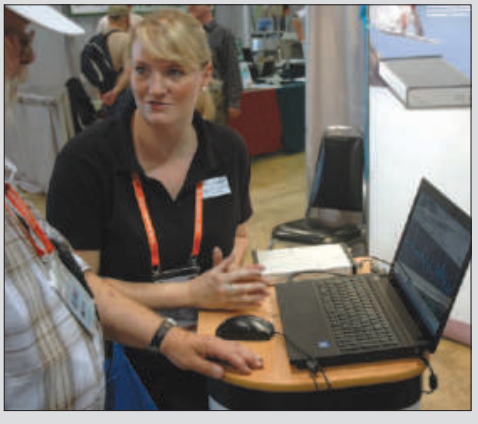
NCG/Comet unveiled a new dual-band VHF/UHF magnetic-mount mobile antenna. Available in black or white, the antennas are intended for low-profile mobile use. The antennas will be available later this year.

The NCG/Comet CMX-200 Wireless is a remote version of the popular CMX-200 SWR/power meter in a weatherproof enclosure that can be installed directly at the feed point of an antenna. It sends data to the station computer via a 2.4 GHz RF link. Note the miniature solar panel that charges the internal battery. The CMX-200 Wireless will be available later this year.



The Peaberry SDR V2 by AE9RB is a 1 W software defined transceiver kit with a built-in sound device. You can build your Peaberry for the 60/40/30/20 meter, 30/20/17/15 meter or 17/15/12/10 meter bands. The kit includes parts for all bands so you do not need to decide until you are ready to start building. $149. See **www.ae9rb.com**.

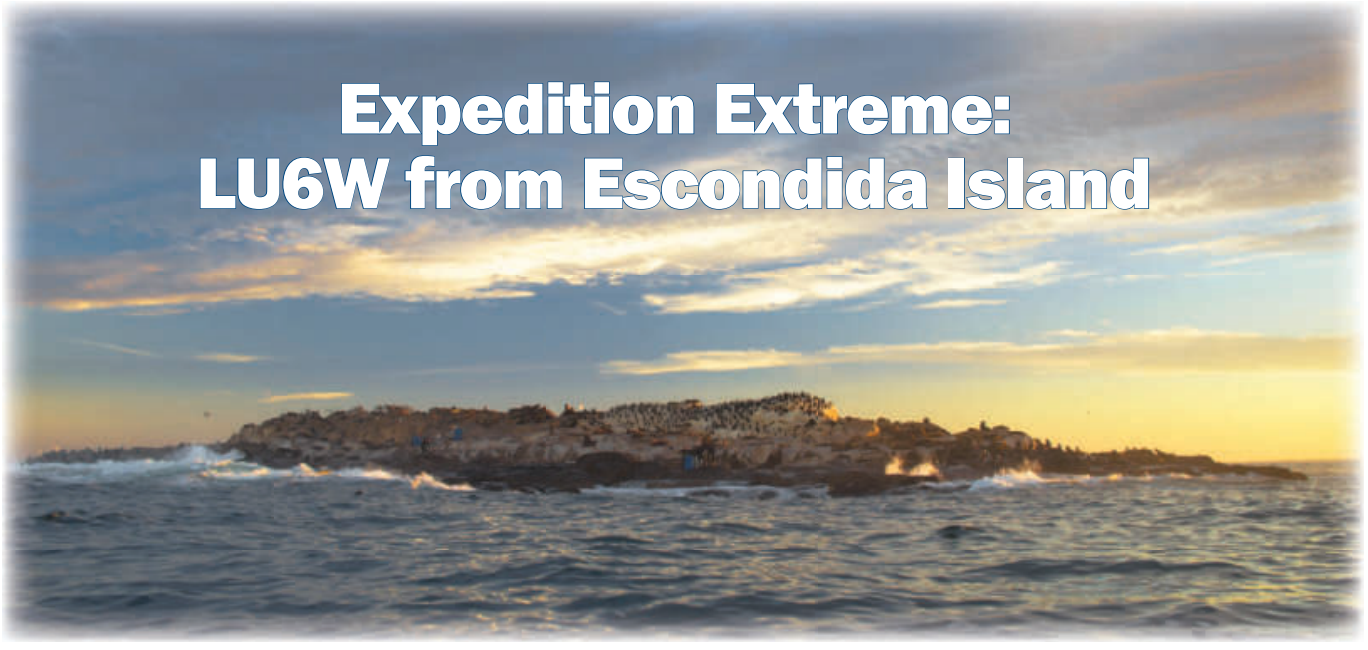
Reaching for the rafters in Hara Arena is the SteppIR CrankIR portable 40 through 2 meter antenna. SteppIR representatives were taking orders at Hamvention and stated that the antenna will begin shipping in September. See **www.steppir.com/wp-content/uploads/2013/05/CrankIR-Brochure-2013-with-boxes2.pdf**; $379.



Madeleine Greisenbrock, head of sales and marketing for SSB Electronic, demonstrates the new Zeus ZS-1 all-mode software defined transceiver. With 15 W output, the ZS-1 transmits on all amateur bands from 160 through 10 meters and receives from 300 kHz to 30 MHz. $1700. See **www.ssb.de/product_info/hp?language=en&info=p3407_Zeus-ZS-1-Transceiver.html**.

The Elecraft KXPA100 linear amplifier offers 100 W output on all bands, 160 to 6 meters, with just 4 W of drive power. Although designed to match the KX3 transceiver, it will work with any QRP rig. According to Elecraft, the KXPA100 will be available later this year.

Expedition Extreme: LU6W from Escondida Island



Activating the last IOTA group in South America meant fighting the odds and never giving up!

Cezar Trifu, VE3LYC

There are 99 island groups in South America that are eligible for the Islands On The Air (IOTA) program.[1] The last of them yet to be activated is located off the northern coast of Patagonia. The group includes only one island that meets the IOTA criteria: Escondida.

Located 5 km from the mainland, this rocky island 200 × 100 meters in size offers no landing place for a boat. Tidal and ocean currents push the water continuously over the rocks and there are deep crevasses where someone can easily drown. Wind and sea conditions are bad on a regular basis, can change rapidly and cannot be fully assessed from the mainland. In particular, the southeastern wind known as *Sudestada* may rise at any time, reaching up to 80 km/h with treacherous rapidity.

The island is home to a colony of sea lions several hundred strong, with massive 350 kg males defending their breeding territory very aggressively. Imperial cormorants, giant petrels and white terns also live there. The intense smell of ammonia generated by their excrement makes the place almost unbearable. An expedition to Escondida is nothing if not extreme, but the team that became LU6W was up to the challenge!

Putting the logistics in place for such an attempt wasn't easy. It took 15 months of sustained but fruitless negotiations through some of the local hams until, with the help of Javi, LU5FF, and Federico, LU6KK/W2NNN, I was able to contact José, LU2WAZ, president of the Radioclub Puerto Madryn. José and his group had considered an operation from Escondida for some time but lacked the necessary finances, radio equipment and operating experience. We quickly reached an agreement and drafted the activation plan. To maximize the number of contacts, we would attempt to operate two stations continuously. Johan, PA3EXX; Alex, LU5WW; Lucas, LU1FAM, and I formed the operating team while José and his group provided the necessary logistical support. The latter side carried out a reconnaissance mission on November 21, 2012 but the team was unable to land and investigate camping conditions.

QS1308-Trifu01

Despite the partial failure of the recon mission, we concluded that the best opportunity for landing was at low tide. As such, we decided to attempt a landing during the neap tide period January 1-9, 2013.

Heading South

I arrived in Buenos Aires on the morning of December 31, 2012, but my luggage with two Icom IC-7000 transceivers didn't make it. The airline assured me that my luggage would arrive the following day and be shipped to me. From Buenos Aires I flew with Johan to Puerto Madryn, about 1100 km away, where we were welcomed by José and his son Pablo, and then taken to the Radioclub Puerto Madryn shack, where we met with the rest of the team. Everyone was in high spirits as we prepared to celebrate New Year's Eve with José and his family.

The rigs arrived the next day in Trelew, which was an hour's drive away. We had already rented wetsuits for the operating team, but all the other stores were closed so we had to wait

[1]More information on the IOTA program can be found at **www.rsgbiota.org**.

until the day after to purchase food, batteries, gas for the generators and other supplies. At 5 AM on January 3 the team left for Escondida Beach, about 140 km south of Puerto Madryn, which is the nearest point of land to the island and was our departure point. It was a beautiful day but the wind and ocean current were pushing the water into high waves that broke loudly on the shore.

Waves, Rocks and Sea Lions

Once the wind died out, we went to inspect the island, checking for the best potential landing site. We realized that the only way to land was by swimming about 50 meters to the northwest corner of the island, which appeared to offer a little more protection against the ocean currents and swell. The 5-6 meter water level rise at high tide would cover many of the rocks making a landing attempt extremely dangerous. Also, the high tide would reduce the space the animals had, making our passing through their colony more difficult. Landing would have to be attempted at low tide.

Later that afternoon, swimming hard against the currents and pacing ourselves against the waves and swell, Alex and I succeeded in landing on the island. We had two long ropes strapped to us, each attached to a sealed drum filled with gear. Pablo, who had already swum ashore, helped us pull the heavy drums onto the rocks. We emptied them and then Pablo took them back to the boat and left with Chochi, the boatman, to bring the rest of the operating team and equipment.

Alex and I moved the unloaded equipment as far above the water as we could, but the huge male sea lions made any attempt to advance to higher ground futile. One hour later, without any transport in sight, I wondered if an accident might have occurred. At last, 2½ hours later we saw the small emergency boat approaching. Pablo swam across and told us sternly: "There was an accident! You must come to mainland; leave everything here!"

Equipment On the Rocks

I couldn't believe what I had just heard. How could we leave all the gear there unsecured? It would undoubtedly be washed away at high tide! I offered to stay on the island overnight, if I could get above the sea lions, but Pablo was very determined to leave. With time running out, we were left with no other option than to park the gear as high as we could, swim back to the boat and drive back to the mainland.

Once we were at sea, we learned that Chochi had overloaded the boat. As they were leaving the bay, the boat was hit by a huge wave and one of the heavy objects that was not well anchored was projected into the windshield, breaking it. Chochi ducked, but a broken piece of plastic sheared his earlobe, sending him to the hospital for stitches. Thankfully, no one else was injured.

In the rush of sending the emergency boat to us, the sump pump was left ashore. By the time Pablo and Andres were midway to us the boat had filled with water and they had to bail it with just a plastic bag! The ride back seemed to take forever as we all maintained a dejected silence for the trip.

We reached the mainland at sunset, physically exhausted and psychologically drained. Chochi returned very late to the camp. He insisted that he was fine but I knew he had to be in pain. As everyone prepared for the night, we all hoped the good weather would last, allowing us to return to the island the next day.

It was midmorning when the same group that landed once was ready for another attempt. Chochi slept only an hour and a half overnight since the analgesic he was prescribed wasn't strong enough for the pain, but he was brave about it. Midway to the island we found a bag of Johan's personal effects. It didn't look good. Once we approached the island, it was apparent that all the gear left behind had been washed away by the tide. The tide and ocean swell were too high and strong, so landing had to be aborted and we returned to the beach.

As the boatman pulled the boat out of the water with his truck, José's right foot got tangled in the rope, which formed a noose 4 inches above his ankle. The tight rope left José with a deep, severe bruise and he had to be taken to the hospital. Blood was dripping from Chochi's bandage so he accompanied José. I felt that it was important for us to post a message on our website, letting the DX community know what was going on. Johan set up his satellite phone and I called my friend George, VE3GHK, and read him a message he later sent to our webmaster: "We will try again…"

We spent the following hours thinking over the logistical plan. My two IC-7000 rigs, one antenna, an electronic key, a foot pedal, a set of headphones and Johan's waterproof laptop were gone. Chochi and José were injured and heading to Puerto Madryn to recuperate. However, I was determined to push through with another landing attempt. We had a spare rig, Johan's TS-50S transceiver, and another one of my multiband wire verticals.

Neither of the two original tents could be used, since they were too bulky to transport, first to the island, then atop the hill 30 meters above the ocean. They had to be replaced with Miguel's, LU4WMM, very light tent. I thought that we needed four people on the island, not only to make it easier to pass through the animals, but also to ensure we had

The team checking landing conditions on Escondida Island. From the left: Chochi, Cezar, José, Pablo and Johan.

With heavy weather approaching we hauled our gear down to the boat. Here Johan, PA3EXX (l), and Miguel, LU4WMM, are shown passing under the watchful eye of one of the big male sea lions.

Surrounded by sea lions, cormorants and guano, LU6W finally gets Escondida Island on the air.

one operator, two guards and one person at rest per shift. The rest of the team agreed.

By the time Chochi returned to the beach camp, the low tide had already passed. With no time to spare, we decided to make another attempt. Everything was ready, so the boat went into the water and we headed to sea again. Once again Alex and I reached the island, unloaded everything, and the boat went for a second load and returned after a short while. Johan and Miguel made it to the island too, bringing the rest of the supplies.

Setting Up Camp

It was sunset and we had only half an hour until darkness. We made it to the top just in time, carrying along the heavy drums with the batteries and the rest of the gear. Once we had passed the sea lions, the imperial cormorants moved away and let us take a position on the top. Using headband lights we installed the camp, we placed the rig on a small plastic table, and raised the antenna and the tent.

It was 0152 UTC, about 4 hours after we left the mainland, and LU6W was finally on the air. It didn't take long for an immense pileup to form. With one of us at the microphone and another one logging, entries added up quickly. Alex, an experienced contest operator, was genuinely surprised by the fierce pileup. "Welcome to IOTA!" I laughed. We operated under the open sky, switching everyone at 1½ hour intervals, thus keeping a good pace. Since the rig didn't have an electronic key interface, we were limited to SSB. It was 10 °C (50 °F) overnight but the log pages were damp from the humidity. Along with the equipment lost at sea, all my propagation charts were gone too. Fortunately the propagation conditions were fantastic as the 20 meter band remained wide open to all continents until after 1100 UTC, when we had to switch to 15 meters.

The weather continued to be very nice throughout the day, with virtually no wind. This is why I was surprised when Alex, pointing to the mast, told me that the wind must be picking up. It turned out to be a young male sea lion pushing hard on one of the radials in his effort to move around. We had to scare him off to avoid a temporary shutdown.

As the evening low tide approached, the logistics team informed us of a change in the wind direction, which signaled incoming stormy weather. They were in no mood to take any risks and requested we terminate the operation, as the boat was heading out to pick us up. While the rest of the guys moved everything down the hill and loaded the first boat, I continued operating for just a little longer. When we returned to the mainland everyone was rejoicing in the success and we gave each other "sea lion" hugs.

In 17 hours of operation we logged 1929 contacts with 1583 stations. About 53% of the contacts were on 20 meters, 42% on 15 meters and 5% on 10 meters. The continental and top DXCC statistics are shown in Table 1.

Besides those mentioned above, the logistics team included Lucas, LU1FAM; Jorge, LU4WG; Jorge, LU5WAG; Armando, LU8WAG, and Daniel, LU8WEA, who are deeply thanked for their contribution to the success of this project. I would also like to thank Carlos, LU1BCE; Miguel, LU1WKP, and Diego, LU8ADX, for their assistance in Puerto Madryn and Buenos Aires. Our thanks also to Maury, IZ1CRR, who maintained our website **lu6w.yolasite.com**.

We would also like to express our appreciation to Simon, IZ7ATN; Ezequiel, LU1EEZ, and Mark, LU7CAW, who had planned a similar project (independently of us) and who graciously stepped down when they became aware of our plans. Thank you, guys, for your great sportsmanship!

The support received from the German DX Foundation, International Radio Expedition Foundation, Swiss DX Foundation, Lake Wettern DX Group, Clipperton DX Club, DX Italia and LU Contest Group is graciously acknowledged. We are grateful to W5BXX and JM1PXG for their extraordinary financial support, as well as to HB9DKZ, Jan and Jannie Willemsen, and W5ZPA.

Special thanks to the top donors — AB6QM, DK8UH, DL1BDD, DL8FL, DL8MLD, I1SNW, I2YDX, IT9EJW, JA5IU, JF4VZT, OE3SGA, OE3WWB, PT7WA, RØFA, SM3NXS, VE7IG, VE7QCR, W3AWU, WD5JID; our large donors — CX6VM, DJ3XG, EA8AKN, F-59706, F5IL, F9GL, G3ZAY, G4VMX, GJ3LFJ, IK8TWV, JA8MS, JA9IFF, JRØDLU, KA1R, KD1CT, K5MT, K6VVA, KD6WW, N6AWD, N6NO, N6VR, ON4IZ, ON4XL, R6AF, SM3DMP, SM3EVR, UAØYAY, VE7DP, W1NG, WB2YQH, W5BOS, W5PF and many other generous donors.

Additional support toward the loss of the operating team's equipment was organized by Lutz, DK8UH, and the German DX Foundation, who are kindly thanked for their initiative. Thanks also to the Dewitt L. Jones, W4BAA, Trust for their extraordinary grant. Icom Canada and Radioworld in Toronto are thanked enthusiastically for their exceptional assistance. We value immensely the trust and encouragement received from many island chasers who offered overwhelming support.

Table 1

LU6W DXpedition Statistics by Continent

CONT	DXCC	QSO	STN	DUPE
AF	4	28	20	1
AS	6	272	261	10
EU	39	953	774	20
NA	9	408	315	11
OC	4	34	33	1
SA	9	234	180	9
Totals	71	1929	1583	52

LU6W DXpedition Statistics by DXCC

No	DXCC	QSO	STN	DUPE
1	K	337	256	8
2	JA	212	205	6
3	I	189	139	5
4	DL	150	121	1
5	LU	137	98	7
6	RA	94	81	2
7	PY	70	56	2
8	F	63	46	1
9	RA0	53	49	4
10	VE	49	39	3

Photos by the author.

Cezar Trifu, VE3LYC, is a member of the First Class CW Operators' Club (FOC) and the A-1 Operators Club. Cezar has earned many prestigious awards including the DXCC Honor Roll, IOTA Trophy and WAS Islands Award. He enjoys activating rare and new IOTA groups and can be reached at **ve3lyc@hotmail.com**.

Ragchewing 101

Get out of the "RST-73" rut and get to know your fellow hams.

Mike Pulley, WB4ZKA

Ragchewing is the ability to meet a stranger on the air, find common interests and linger a while in conversation. If you listen to the HF bands, you'll discover that, after the preliminaries, most hams struggle to find something worthwhile to say. Too often, it's a basic exchange and then someone finds an excuse to say 73. The station then closes with effusive best wishes and urgent hopes for another contact. This is a little hard to believe since they've just shown that they have nothing to talk about.

It's become a formula — a canned routine. But if you believe there should be more to Amateur Radio, you have the power to break out of the canned routine. Instead of the standard exchange of call signs, signal reports and 73s, start a conversation. As with all things, there's a better way and a worse way to do this.

Me, Myself and I

First, the worse way. Talk exclusively about yourself: How old you are, how young you were when you became a ham, how smart, accomplished and successful you are. Get on your soapbox about how everyone but you is stupid. It's not that these topics are forbidden, it's just that forcing the other person to endure a torrent of "me, myself and I" gets old quickly. This behavior tells the other ham that he's unimportant, that you can transmit but can't receive (especially telling on CW) or that you're so stuck in a radio rut that a pleasant give-and-take conversation is unlikely.

The Good Conversationalist

The better way is to show an interest in the other person. Ask questions. Don't wait for the other guy to take the lead. If you're interested enough in his age or how long he's been a ham, those details are being requested, not imposed. That difference changes the entire complexion of the contact.

Here are some questions I've found useful:

- *Where can I find your town on the map?* I like to have a road atlas handy to circle their town and see nearby features.
- *What caused a community to form there?* You might hear about a farming or ranching center, railroad or highway junction, historic trading post on a river, waterfall power for industry or other stories not commonly heard.

Escape the solitude of the canned contact. [Robert H. Brown Jr, KS4TD, photo]

- *What brought you to live there?*
- *What would I see standing in your front yard?* Neighborhoods in Texas ranch country look different than tree-arched South Carolina lanes and spruce-filled Pacific Northwest neighborhoods. Help him give you a verbal snapshot of his home.
- *How do you spend your time when not on this band and mode?* Hobbies, family activities, other radio interests and more, are all fodder for interesting discussion.
- *What is or was your work? Why did you choose that?*
- *Why did you become a ham? What attracted you to it?* These questions are especially relevant for new hams.
- *Tell me about your family.*

Of course, you need to be ready to answer when he asks the same questions of you.

Don't race through the questions. In fact, you may not get past the first one or two. They are the starter for your conversation engine. The fuel that keeps it running is your attention to the other guy's answers, making relevant comments and asking follow-up questions. Before you know it, your on-air conversation will be humming along, carrying you off the rutted path of formulaic exchanges.

Not everyone will respond, of course. The canned exchanges are enough for many hams and they aren't comfortable expanding beyond them. [Keep in mind that many DX stations may have only limited English skills. They might be able to have a "canned" contact but not a conversation. — *Ed.*]

On the other hand, you will find accomplished ragchewers on the air just waiting to visit with you on a wide spectrum of topics. Pay close attention when you find one of these gems because they'll teach — by example — how to make others feel comfortable being themselves on the air. They'll adjust their sending speed on CW, ask your thoughts on unusual topics and explore all sorts of interests with you.

Rag Chewers' Club

Becoming an interesting conversationalist should bring some tangible recognition and it does. Back in the days of yore, the ARRL® issued Rag Chewers' Club certificates to those who demonstrated a 30 minute on-air contact on any band or mode. Over time, costs grew, interest waned and, in 2004, the League stopped offering them. However, another group, the Society for the Preservation of Amateur Radio (SPAR) has taken up the baton. Go to their website (**www.spar-hams.org**) and click on "Rag Chewers' Club."

A radio and a license aren't much use — or much fun — until you talk with someone. Don't settle for the canned routine. With a little practice, you can become as proficient a conversationalist as you are a radio operator.

Mike Pulley, WB4ZKA, an ARRL Life Member, lives in suburban Phoenix, Arizona. His grass lawn and shade tree aren't uncommon, but many of his neighbors have landscaping featuring desert rocks and prickly plants. He can see desert mountains in the distance, which appear as "purple mountain majesties" at sunset. He'd much rather hear about you, though. Mike can be reached at 2708 N Pennington Dr, Chandler, AZ 85224-2252, **mike.j.pulley@cox.net**.

A Radio Voice in the Wilderness

After more than a century, the adventure continues for Arlene "Buddy" Clay, KL7OT.

Brenda Plessinger, AL7LX

"Good evening, this is KL7 Oscar Tango, net control for the Alaska Snipers Net."

That's the preamble Arlene "Buddy" Clay, KL7OT, uses each Thursday evening. That's not unusual — until you consider the fact that Buddy will be 101 years old in August!

Buddy's Alaskan adventure began on the East Coast of the US more than 70 years ago. Her husband Earl Clay — W1NOP at the time — was the conductor of the New Hampshire State Symphony. Buddy was a graduate of the New England Conservatory of Music, where she had played trumpet and piano.

Earl and Buddy moved to Alaska in 1944 after responding to a *QST* advertisement from the Civil Aeronautics Administration (predecessor to the Federal Aviation Administration). The CAA was recruiting husband-and-wife teams to serve as air traffic controllers in remote locations.

The Clays were accepted to the program and their first assignment was in Nome, Alaska. After two years in Nome, they accepted a new CAA assignment in Aniak, about 325 miles west of Anchorage, on the banks of the Kuskokwim River. Not long after their arrival, Buddy earned her license and the call sign KL7OT (today it is among few original two-letter call signs left in Alaska). Earl became KL7EM.

Life in Aniak

The Clays loved life on the Kuskokwim with the native Yup'ik people. The Yup'ik relied on hunting and fishing to feed their families and dog teams. The Clays followed their example and spent the next decade fishing for food in the summers and traveling by sled-dog team in the winter.

In those days the only telephone was at the airport office. Out where the Clays lived, communication was via Amateur Radio or nothing at all! The first transmitter Earl and Buddy owned was a homebrew rig built on an aluminum cake pan. It generated 10 W output and was powered by dry cell batteries. Their receiver was a Hallicrafters S-29.

When Earl passed away in 1956, Buddy decided to remain in Aniak. She worked half the day for the post office and the rest of the day at the airport. In winter she traveled to work by dog team and in the summer she used a 30-foot boat to make the journey. While at home Buddy maintained an active presence on the air.

When the Clays arrived in Aniak, their first station was comprised of a 10 W homebrew transmitter and a Hallicrafters S-29 receiver. [Photo courtesy of Tom Rutigliano, NL7TZ]

Buddy at her 100th birthday party. [Tom Rutigliano, NL7TZ, photo]

Buddy, KL7OT, calling the roll for the Alaska Snipers Net on 3920 kHz. [Tom Rutigliano, NL7TZ, photo]

In addition to all her other activities, Buddy served as Magistrate for Aniak and the 12 surrounding villages. The people were so grateful for her years of service that in June 2012 they dedicated an Aniak courtroom in her name.

Tragedy and Recovery

Tragedy struck in 1986 when a stove exploded in Buddy's cabin. Although she kept two large fire extinguishers nearby, she couldn't free the safety pins. By the time Buddy could use water to douse the flames, her feet had been severely burned.

Despite skin grafts, Buddy became wheelchair bound. Buddy moved into an assisted living facility in Wasilla in 2012. She requested and received permission to have an antenna installed and space provided for her station.

Even though Buddy misses Aniak, she has many radio friends who enjoy meeting her on the air every night. On Thursday nights at 6 o'clock (0200 Friday, UTC) it is Buddy you'll hear taking the roll on the Snipers Net at 3920 kHz. Whenever propagation favors the Lower 48, don't hesitate to join them!

Brenda Plessinger, AL7LX, an Amateur Extra licensee, became an amateur in 1989. She is the manager of the Alaska-Pacific Emergency Preparedness Net and a net control operator for the Alaska Snipers Net. She has also served as manager of the Alaska Bush Net and a net control operator for the Alaska Motley Group. You can contact Brenda at PO Box 6901, Nikiski, AK 99635; **brenda@acsalaska.net.**

Rick Lindquist, WW1ME, ww1me@arrl.org

Oklahoma Hams Respond Following Devastating Tornado

Amateur Radio response to the Oklahoma tornado; FCC news including a citation for a retailer selling unauthorized equipment, comments being accepted on the subject of RF exposure limits and news about the 33 centimeter band; IARU and Section Manager news.

Radio Amateurs in Oklahoma assisted the American Red Cross with communications after a powerful EF5 tornado swept parts of the state May 20. In the hardest-hit town of Moore the twister left behind a broad swath of destruction, killing some two dozen people — including nine children — injuring upward of 400 others.

"Amateur Radio operators were asked to support voice communications from the American Red Cross Oklahoma City Chapter Headquarters to their feeding station at the Incident Command Post located in Moore," explained ARRL Oklahoma Section Emergency Coordinator Mark Conklin, N7XYO. Amateur Radio operations in support of the ARC stood down a couple of days later.

In addition to the American Red Cross, members of the Salvation Army Team Emergency Radio Network (SATERN) were also in Moore, ready to support and assist with the Amateur Radio response. According to ARRL Oklahoma Section Manager Kevin O'Dell, NØIRW, the tornados disrupted cellular service in the affected areas. ARRL Emergency Preparedness Manager Mike Corey, KI1U, remained in contact with the Oklahoma ARRL Field Organization throughout the activation, sharing information on the Amateur Radio response through the ARRL EmComm Twitter feed and via regular communication with national partners. Corey said the hams in Oklahoma did "a great job" assisting the ARC and TSA.

Renowned Storm Chaser Tim Samaras, WJØG, Dies in Oklahoma Tornado

Carl Young (left) met Tim Samaras, WJØG (right), while attending a meteorological conference. [Photo courtesy of The Discovery Channel]

Professional storm chasers Tim Samaras, WJØG, his son Paul Samaras and fellow investigator Carl Young died May 31 near El Reno, Oklahoma, when an EF3 tornado suddenly changed paths and slammed into their vehicle, and they were unable to escape. According to ABC News, the body of Tim Samaras, an ARRL member, was found in his car, still in his seat belt; Paul Samaras and Young were pulled from the car by the tornado, and one of the men's bodies was found a half-mile away. In his biography on The Weather Channel website, Tim Samaras said that he always carried along Amateur Radio equipment when he chased storms.

"I chase the most powerful storms on the planet," Tim Samaras said in a video on his personal website. "At times I have mixed feelings about chasing these storms. On one hand they are incredibly beautiful; on the other hand, these powerful storms can create devastating damage that change people's lives forever."

The TWISTEX tornado research team that Tim Samaras founded has been featured on The Discovery Channel's "Storm Chasers."

ARRL Comments on Proposed 5 GHz Unlicensed Broadband Expansion

The ARRL has told the FCC that a near-term decision with respect to adding unlicensed National Information Infrastructure U-NII devices to the 5.85-5.925 GHz band "would be premature." The League commented in response to an FCC *Notice of Proposed Rule Making* (*NPRM*) in ET Docket No. 13-49 that aims to authorize U-NII use of an additional 195 MHz of spectrum in the 5.35-5.47 GHz and 5.85-5.925 GHz bands.

"[A] U-NII overlay at the present time requires a good deal of compatibility analysis, none of which has been completed to date," the League's comments assert.

The FCC was obligated by the Middle Class Tax Relief and Job Creation Act of 2012 (PL 112-96) to begin a proceeding to allow U-NII devices in the 5.35-5.47 GHz band. As the ARRL's comments point out, "There is no legislative obligation, however, to make available the 5.85-5.925 GHz band for U-NII use." Amateur Radio has a longstanding secondary allocation of 5.65-5.925 GHz, with an amateur-satellite uplink band at 5.65-5.67 GHz and a downlink at 5.83-5.85 GHz. In its 14-page filing, the ARRL traces the history of "a continuing series of overlays" to which the band has been subjected over the past 16 years, progressively reducing the utility of the amateur allocation.

IARU Helps Raise Ham Radio Visibility in Ghana

The West African nation of Ghana may become less of a "rare one" in the future, thanks to an Amateur Radio Administration Course (ARAC) held earlier this month by International Amateur Radio Union (IARU) representatives. The IARU offers ARACs in developing countries, primarily to train regulators or prospective regulators on the administration of the Amateur and Amateur-Satellite services.

"There were 28 students in total, 24 from the Ghana National Communications Authority (NCA), three from Kenya, and one from South Sudan," said ARRL Chief Technology Officer Brennan Price, N4QX, one of the course instructors. "All were attentive, engaged, and inquisitive." IARU Region 1 President Hans Blondeel Timmermann, PB2T, also was an instructor.

The NCA hosted the ARAC June 3-7 in the capital of Accra. Speaking at the opening of the five day session, NCA Director General Paarock Vanpercy stressed the need for Ghana to encourage Amateur Radio to develop an interest and awareness of technology among the country's youth.

Price said there are only 10 Ghanaian licensees on the books. Timmerman will continue working with the NCA as it publishes its Amateur Radio examination syllabus and conducts its first examinations in some time.

Price and Timmerman were granted licenses to operate from Ghana, and both did so "for instructional and recreational purposes," Price said. As 9G5AA, Timmerman logged more than 1000 QSOs (QSL via PB2T), while Price reported logging "dozens of contacts" as 9G5AB (QSL exclusively via Logbook of The World).

FCC News

FCC Citation Targets Online Retailer

The FCC in early June cited an Omaha, Nebraska-based online retailer for marketing unauthorized RF devices, including high-power 10 and 12 meter amplifiers, in violation of FCC rules. An FCC *Citation and Order* released June 6 orders Enterprise Group Inc, doing business as ePowerAmps, to immediately stop advertising, marketing and selling "all unauthorized radio frequency devices, specifically modified Citizens Band (CB) radios and non-certified radio frequency (RF) amplifiers for use in the 10 and 12 meter bands" or face possible fines and seizure of equipment.

ARRL CEO David Sumner, K1ZZ, said it was reassuring to see evidence of the FCC's continuing commitment to enforcement relating to Amateur Radio. "It is gratifying to see the Commission's Enforcement Bureau taking action against flagrant violators," he commented. The Amateur Radio community has long complained about interference, mainly on 10 meters, from unlicensed CBers and so-called "HFers." The FCC once banned the sale of amplifiers capable of operating above 24 MHz, a move that some considered misguided and punitive to Amateur Radio licensees.

Responding to a complaint, an agent from the Commission's Kansas City office observed on ePowerAmps' website "illegally modified CB radios being offered for sale in the United States." The FCC said the retailer also offered offer various modifications and upgrades for FCC-certified CB radios. These included swapping out the original final amplifier for a higher-powered replacement. Linear amplifiers offered for sale varied between 120 W and 8200 W, and the Commission said none of the 50 amplifiers offered for sale appeared to have FCC certification.

The FCC gave ePowerAmps 30 days to confirm "in writing" that it has stopped marketing unauthorized RF devices and to provide certain information to the Commission. The retailer also had 30 days to respond to the *C&O* and even to challenge the FCC's findings.

FCC Sets RF Exposure Reassessment Comments Deadlines

The Amateur Radio community and other interested parties have until September 3 to file comments on an FCC proceeding to reassess the limits and policies governing exposure to radio frequency electromagnetic fields. The FCC released a *First Report and Order*, *Further Notice of Proposed Rulemaking* and *Notice of Inquiry* in the proceeding (ET dockets 13-84 and 03-137) on March 27. The ARRL plans to submit comments this summer. The Commission will accept reply comments — ie, comments on the comments filed in the proceeding by September 3 — until November 1.

While the FCC proposals do *not* alter existing RF exposure limits, they do call for the elimination of existing special evaluation exemptions spelled out in Section 97.13(c) of the Commission's rules. Minor rules changes adopted in the *Report and Order* section of the document take effect August 5.

Nebraska, New Hampshire and Wisconsin Get New Section Managers

ARRL members in Nebraska have elected a new Section Manager, while members in Utah — faced with a three-way race — voted to keep their Section Manager. In addition, ARRL members in New Hampshire and Wisconsin each got new section managers. SMs in seven other sections ran unopposed and were declared elected for new two-year terms. Ballots in contested races were counted at ARRL Headquarters May 21. All newly elected candidates were scheduled to take office July 1.

In Nebraska, Matthew Anderson, KAØBOJ, of Ashland, outpolled Dan Steinhoff, W7UP, of Omaha, 184 to 123 votes. Outgoing SM Art Zygielbaum, KØAIZ, decided not to run for another term after serving since January 2009. Anderson previously served as SM from 2005 to 2008. His term is for 18 months, since nominations had to be re-solicited.

In Utah, Mel Parkes, NM7P, of Layton, was re-elected with 360 votes over two other candidates. Challengers Pat Malan, N7PAT, of South Jordan, received 197 votes, and Mickey Applebaum, KE7NZA, of Salt Lake City, got 82 votes. Parkes has served as the Utah's SM since 1999.

New Hampshire's new Section Manager is Peter Stohrer, K1PJS, of Concord — the only nominee to submit a petition by the deadline. Outgoing SM Al Shuman, K1AKS, of New Boston, decided not to run for another term of office after serving in various terms for 17 years.

In Wisconsin Gary Sorensen, W9ULK, of Oxford, was appointed Section Manager after Don Michalski, W9IXG, of Madison, stepped down and recommended Sorensen's appointment. Michalski had served as SM since July 1999. Sorensen will complete the current term of office that continues through June 30, 2014.

These incumbent ARRL SMs faced no opposition and were declared elected: Jim Cross, WI3N, Maryland-DC; Joe Giraudo, N7JEH, Nevada; Jim Mezey, W2KFV, New

York City-Long Island; Rich Krohn, N2SMV, Northern New Jersey; Bob Beaudet, W1YRC, Rhode Island; Dan Pruitt, AE6SX, San Joaquin Valley, and Bill Roberts, W5NPR, West Texas.

Location Service Deployment May Constrain 902-928 MHz Amateur Use

A portion of the 902-928 MHz (33 centimeter) band may become less useful to radio amateurs in urban areas as a result of an FCC *Order*. The FCC in June gave Progeny LMS, LLC consent to begin commercial operation of its multilateration location and monitoring service (M-LMS) in the upper portion of the band. Progeny's location service is designed to operate on 4 MHz of spectrum between 919.750 and 927.750 MHz.

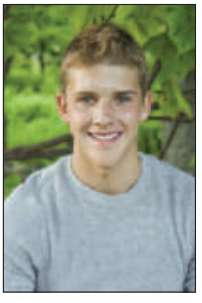
"Progeny is deploying a wide-area positioning system to provide more precise location services in areas where Global Positioning System (GPS) and other existing services may not work effectively, particularly indoors and in urban canyons," the FCC said in its *Order*.

The FCC opened the 33 centimeter band to hams on a secondary basis (Amateur Radio is secondary on all bands above 420 MHz) in 1985, provided hams did not interfere with the automatic vehicle monitoring (AVM) service, which the Commission subsequently expanded into the M-LMS. While M-LMS operations at least on paper have a higher priority than unlicensed Part 15 devices on the band, Progeny had to demonstrate through field testing that its network would not cause "unacceptable levels of interference" to such Part 15 devices as cordless telephones and baby monitors. This was a result of an FCC's policy to promote "co-existence" in the band, while not elevating Part 15 devices to co-equal status with M-LMS systems.

"Instead, the Commission sought to balance the equities and value of each use without undermining the established relationship between unlicensed operations and licensed services," the FCC said in its *Order*. The FCC asserted that Part 15 devices "will adapt to Progeny's operations because they are designed for operation in an interference environment."

In his June 2012 "It Seems to Us…" *QST* editorial, ARRL CEO David Sumner, K1ZZ, pointed out that effectively setting unlicensed services such as Part 15 at a higher priority than licensed services "is the reverse of the usual situation in which Part 15 devices are at the bottom of the pecking order." Federal (military) radiolocation and ISM Part 18 devices are at the top of the 902-928 MHz food chain. While operations such as Progeny's "will pose some new challenges for amateurs" in the 33 centimeter band, Sumner said, sharing bands with the military has helped Amateur Radio to stave off spectrum grabs from commercial interests.

Calvin Darula, KØDXC, Awarded 2013 Goldfarb Scholarship



2013 Goldfarb Scholarship Winner Cal Darula, KØDXC

The ARRL Foundation has awarded the 2013 William R. Goldfarb Memorial Scholarship to Calvin P. Darula, KØDXC, of St Bonifacius, Minnesota. He graduated from Waconia High School, and will attend St John's University to study business management and economics.

Darula is an avid and active Amateur Radio contester and a rising radiosport star. He was part of the K1LZ multioperator, two-transmitter teams that took top honors in the 2010 CQ World Wide WPX Contest (CW) and set the North American record in the 2011 CQ World Wide DX Contest (SSB). In 2008 he was voted the WØ Young Ham of the Year and has served as the ARRL Minnesota Youth Assistant Section Manager. In 2010, he was recruited as a team member to the USA High Speed Telegraphy Team. That year Darula spoke at the Dayton Hamvention® contest forum on the topic "How To Become A 50 WPM CW Wizard." He has written articles for *National Contest Journal* (*NCJ*), *CQ* and *Keynote*, the journal of FISTS CW Club.

The prestigious Goldfarb scholarship is the product of a generous endowment that William Goldfarb, N2ITP (SK), set up before his death in 1997 in memory of his parents, Albert and Dorothy Goldfarb. Awarded to one high school senior each year, the Goldfarb Scholarship assists the recipient to receive a four-year undergraduate degree in engineering, science, medical or business-related fields. In addition to outstanding academic performance, scholarship applicants must demonstrate financial need and be significantly involved with Amateur Radio.

The applications window for all 2014 ARRL Foundation Scholarships opens October 1, 2013, and closes at midnight on January 31, 2014. More information is available online, **www.arrl.org/scholarship-program**.

ARRL Names New ARRL Media & Public Relations, Contest Branch Managers

Sean Kutzko, KX9X, is the new ARRL Media and Public Relations Manager, succeeding Allen Pitts, W1AGP, who has retired. Kutzko has served as Contest Branch Manager since arriving at Headquarters in October 2007. An enthusiastic operator in contests and VHF weak-signal work as well as a backpack QRPer, Kutzko holds a BA in communications from the University of Illinois at Springfield and has worked at several National Public Radio affiliates in the Midwest.

"After spending the past six years promoting radiosport to the Amateur Radio community, I'm looking forward to helping promote all of Amateur Radio and what we have to offer, both within our community and to the rest of the world," Kutzko said. "Amateur Radio isn't just a resource to our communities in time of need, it's also a lot of fun."

Succeeding Kutzko as Contest Branch Manager is Mike DeChristopher, N1TA. DeChristopher started at ARRL last year as a Logbook of The World specialist and Awards and Programs Assistant.

Mike DeChristopher, N1TA, left, and Sean Kutzko, KX9X.

"I'm very excited to be taking over the Contest Branch and am looking forward to the new challenges this will bring," DeChristopher said. He is active in contesting from his home in Feeding Hills, Massachusetts. Kutzko and DeChristopher began their new positions June 17.

Call for Nominations for ARRL Director and Vice Director

Attention: Full ARRL members in the Pacific, Rocky Mountain, Southeastern, Southwestern and West Gulf divisions! You have the opportunity and duty to choose a Director and a Vice Director to represent you for three-year terms beginning January 1, 2014.

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

This year ARRL members in divisions where there are contested elections **will be able to vote electronically**. Members with valid e-mail addresses in their membership profiles will be sent instructions on how to vote by e-mail. Members without e-mail addresses or whose e-mails bounce, or who request a paper ballot, will be sent a ballot by postal mail as in the past.

Qualifications

The eligibility of nominees for the positions of ARRL Director and Vice Director will be reviewed by the Ethics and Elections Committee, composed of three Directors not subject to election this year: Greg Widin, KØGW (chair), Cliff Ahrens, KØCA, and Dennis Bodson, W4PWF. A nominee must be at least 21 years old and must have been licensed and a full member of the ARRL for a continuous term of at least four years immediately preceding nomination. Each nominee must provide information concerning his or her employment, ownership and investment interests, and other financial arrangements so the Committee can determine whether the nominee has a pervasive and continuing conflict of interest that would render him or her ineligible to serve (see Article 12 of the ARRL Articles of Association and Bylaw 45, available at **www.arrl.org/general-information**).

The qualifications for Director and Vice Director are identical. All the powers of the Director are transferred to the Vice Director in the event of the Director's death, resignation, recall, removal outside the division or inability to serve.

Nomination Procedure

Step 1: Obtain official nominating petition forms. Any full member residing in a division where there is an election may request an official nominating petition package. The request must reach the ARRL Secretary *no later than noon EDT on Friday, August 9, 2013.* If you are seriously considering running or nominating someone to run, don't wait until the last minute to request the forms; the deadline for submitting a completed petition form is just one week later.

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

Step 3: Submit petition form. The completed form must reach the Secretary *no later than noon EDT on Friday, August 16, 2013.* The submission may be made by facsimile or electronic transmission of images (i.e. a PDF or JPEG attachment to an e-mail) provided that upon request, the original documents are received by the Secretary within seven days of the request. A person who is nominated for both Director and Vice Director may choose to decline the nomination for Director; otherwise the nomination for Director will stand and that for Vice Director will be void.

On Monday, August 19, 2013, the Secretary will notify each candidate of the name and call sign of each other candidate for the same office. Candidates then will have until Friday, August 30, 2013 to submit 300-word statements and photographs, if they desire these to accompany the ballot, in accordance with instructions that will be supplied.

Balloting

If there is only one eligible candidate for an office, he or she will be declared elected by the Ethics and Elections Committee. If there is more than one eligible candidate for an office, the full members in that division who are in good standing as of September 10, 2013 will have the opportunity to cast ballots. Balloting will begin no later than October 1, 2013 and will conclude at noon Eastern Time Friday, November 15, 2013. The candidate receiving the most votes will be declared the winner.

Members who are eligible to vote and for whom the ARRL has a valid e-mail address will be sent instructions on how to vote electronically. All other members who are eligible to vote will receive ballots by USPS. The election will be conducted by Survey & Ballot Systems of Eden Prairie, Minnesota, which has more than 20 years of experience with association elections. Whether cast electronically or on paper, all votes will be by secret ballot. A representative of the Ethics and Elections Committee will be present to observe the tabulation of results.

Absentee Ballots

A full member who is residing temporarily outside his or her home division, including overseas, may arrange to vote in the home division by notifying the Secretary prior to September 10, 2013, giving their current mailing address as reflected in the ARRL membership records (i.e. *QST* mailing address) and the reason why another division is considered home. Members with overseas military addresses should take special note of this provision; in the absence of information received to the contrary, ballots will be sent to them based on their postal addresses.

The Incumbents

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

Pacific: Bob Vallio, W6RGG and Jim Tiemstra, K6JAT

Rocky Mountain: Brian Mileshosky, N5ZGT and Dwayne Allen, WY7FD

Southeastern: Greg Sarratt, W4OZK and Jim Millsap, WB4NWS

Southwestern: Richard Norton, N6AA and Marty Woll, N6VI

West Gulf: Dr David Woolweaver, K5RAV and John Robert Stratton, N5AUS

For the Board of Directors:
May 10, 2013
David Sumner, K1ZZ
Secretary

Rick Palm, K1CE, k1ce@arrl.org

HQ's Emergency Response Team

A look behind the scenes at the ARRL HQ incident management team and protocols.

While the "boots on the ground" for disaster response communications are the members of ARES® and the ARRL® Field Organization, the ARRL Headquarters staff in Newington, Connecticut, plays a key support role. This role has a long history and has experienced quantum leaps of evolution over the years. In the 1980s, disaster related communications was the responsibility of the Field Services Department. In 1989, the major catastrophe of Hurricane Hugo caused a re-examination of the entire system.

A panel of HQ staffers was tasked with drafting and implementing a response mechanism to support ARRL field organization leaders and operators with information gathering and dissemination, situation reports, communications among multiple ARRL sections for mutual assistance, media relations, and governmental and national served agency liaison, along with radios and other hard equipment. The field services manager managed the resulting protocol and team. A situation room was established on the second floor of W1AW.

As time went on we experienced 9/11 and Hurricane Katrina. The government responded by embracing the Incident Command System (ICS) as a standardized nationwide emergency response template. ARES and other groups rose to the challenge of bringing the amateur community's capabilities to the ICS level with the use of new data modes and more training. The ARRL HQ leadership recognized these trends and wisely decided to hire an experienced professional to manage the ARRL HQ field support function. ARRL Emergency Preparedness Manager Mike Corey, KI1U, implements the HQ emergency response protocol, assessing and effecting the correct level of response.

Corey worked closely with the field organization leadership during the horrific tornado disaster in Oklahoma at the end of May. From the *ARRL Letter* report:

> I have been in regular contact with Oklahoma Section officials since yesterday morning," said Corey. "Through the ARRL EmComm Twitter feed and regular communication with our national partners, the ARRL has been sharing information on the Amateur Radio response to the Moore tornado. Our folks in Oklahoma, who have been assisting the American Red Cross and the Salvation Army, have been doing a great job and they have my heartfelt thanks for the work they are doing for their community.

In 2011, Corey drove up I-91 — which was flooded in many sections — to Vermont in the immediate aftermath of Hurricane Irene to personally deliver radios and other equipment to radio amateurs devastated by the storm's unfathomable destruction. During this same activation, Sean Kutzko, KX9X; Steve Ewald, WV1X; Ken Bailey, K1FUG; Mike Corey, KI1U, and several others manned W1AW over the weekend to support response efforts to Hurricane Irene. Some operators put in a full 36 hours at the station!

HQ Emergency Response Plan

The ARRL recognized the need to coordinate a HQ response to emergency events that may involve multiple ARRL divisions/sections, the Connecticut section, the local community and the ARRL buildings and facilities in Newington. The response plan includes:

- *Resources* — Through their contacts, HQ helps locate additional resources — personnel and/or equipment — that are needed in the response effort.
- *Conference Calls* — Planning sessions may be needed by field organization volunteers. HQ helps by setting up conference calls so field officials can talk directly with one another.
- *PR and the Media* — HQ can help with public and media relations as well as provide background information to the press and public. HQ also relays national media inquiries to local contacts when appropriate.
- *Regulatory Service* — Occasionally, during major events, questions arise regarding regulatory matters (Part 97). HQ provides advice and guidance on such issues.
- *Interface with National Partners* — When a special line of communication needs to be opened with a served agency at the national level (Red Cross, FEMA, National Weather Service, etc), the ARRL can effect it through its existing set of liaisons.

Members of the St John ARES team demonstrating ham radio at the VITEMA Expo, from the left: Elton Lewis, VITEMA Director; Malcolm Preston, NP2L; George Cline, KP2G, and Paul Jordan, NP2JF. [VITEMA]

Occasionally, incidents occur locally within the Connecticut section and community affecting the operations of ARRL HQ. The Hurricane Sandy response is a perfect example of a situation in which the Connecticut section, the local community of Newington and the ARRL HQ physical plant were all impacted, necessitating a tailored response from Corey and his team.

To help coordinate the HQ response to events, the ARRL HQ Emergency Response Team (HQ-ERT) was established with two components: the *HQ-ERT Lead Team* and the *HQ-ERT Staff*. The Lead Team manages the overall response, while the Staff carries out critical tasks. The Lead Team may use as many or as few HQ-ERT staff members as needed based on the nature and scope of the emergency.

The Lead Team consists of Emergency Preparedness and Response Manager Corey; ARRL Chief Operations Officer Harold Kramer, WJ1B; the Media and Public Relations Manager Sean Kutzko, KX9X; the Membership and Volunteer Programs Manager Dave Patton, NN1N, and Assistant Manager Norm Fusaro, W3IZ. Each mem-

ber has completed ICS/NIMS courses, an ARRL public service communications course and SKYWARN training.

Corey, as Lead Team coordinator, monitors conditions that may require HQ-ERT activation and facilitates Lead Team meetings. Mike also serves as point of contact for local field appointees, particularly the Connecticut section emergency coordinator and section manager but also all section leaders. He activates the HQ-ERT and compiles the comprehensive after-action report.

Chief Operating Officer Kramer serves as finance/administrative section chief, following the ICS model. He is responsible for daily recording of personnel time; purchasing, renting and maintaining equipment and relations with ARRL vendors; injury compensation and claims, and cost analysis of event management.

Media and Public Relations Manager Sean Kutzko, KX9X, serves as information officer. Based on the NIMS model, a Joint Information System provides employees, stakeholders and the public with timely and accurate incident information and unified messages. The HQ-ERT plan creates a Joint Information Center (JIC) at ARRL HQ that brings incident communicators together during an event to develop a unified message. This ensures that all ARRL outlets are releasing the same information during an incident, minimizing rumors, so HQ is seen by other media as a primary source of correct and timely news.

The Membership and Volunteer Programs Manager Dave Patton, NN1N, serves as the logistics section chief under the ICS model and arranges the hardware for conference calls — their scheduling and authorization. Dave is also responsible for W1AW operations such as operator scheduling, operator training, on-air operations and ensuring generator operation. The Membership and Volunteer Programs Assistant Manager Norm Fusaro's, W3IZ, responsibility is to assess the equipment needs in the field and coordinate fulfillment and return of any equipment.

Activation

Once activation is made the Lead Team will notify the appropriate ARRL Section, Division and Executive personnel. They will then meet to determine an appropriate activation level, course of action and needed resources. Like the ICS, the HQ-ERT response can be scaled depending on the scope of the incident, from a local truck spill to a Category Five hurricane. The activation functions described above are instituted accordingly and, after stand-down, a comprehensive after-action report is compiled and submitted to the ARRL executive leadership.

In the situation room above W1AW, the message is clear and unified: ARRL HQ "has the back" of ARES field operators who are on the ground in difficult conditions and potentially in harm's way in any incident.

DHS' AUXCOMM Course Held at Dayton

In the February 2013 issue of the *ARES E-letter* and last month's column you were introduced to the Department of Homeland Security's Auxiliary Communications course.[1] I was fortunate to be one of 32 who completed the course held in conjunction with the Dayton Hamvention.

The purpose of the course is to train radio amateurs to serve in the communications unit (COMU) of an Incident Command System organization for an incident such as a wildfire, tornado, hurricane or a preplanned public event such as a parade or marathon. All of the instructors were experienced ICS communications leaders (COML) with Amateur Radio licenses, having trained 300 amateurs to date.

The non-negotiable prerequisites are the FEMA online IC-100, 200, 700 and 800 courses, and at least a General class license. At present, the Auxiliary Emergency Communicator is not a recognized incident management COMU position like the COML or COMT (Communications Technician), but may be in the future.

The course usually consists of 24 hours of training. The Hamvention class was spread out over 3 days and was still exhausting. The meat of the course is the use of frequently encountered ICS forms. There are multiple exercises involving the use of these forms and little use of radios in this course. Radio operators interested in the actual use of radios should consider the 5 day Communications Technician (COMT) course.

The three DHS-sponsored courses (COML, COMT and AEC) are not always easy to find and take as they are among the few DHS courses that are not under the FEMA umbrella. One communications official in each state and territory is the Office of Emergency Communications point of contact for requesting the course and/or getting invited to attend. — *Michael Schulsinger, N8QHV, Springfield, Ohio*, **n8qhv@arrl.net**

[1]R. Palm, K1CE, "ARES in the Classroom: DHS Auxiliary Communications Course," *QST*, July 2013, p 79.

St John, USVI ARES Demonstrates "When All Else Fails" Data Modes

VITEMA (Virgin Islands Territorial Emergency Management Agency) held an *All Hazards Preparedness Expo* on the island of St John (US Virgin Islands) on May 17, 2013. St John ARES group members demonstrated the ability to send e-mail messages to stations outside of the Virgin Islands in a simulation where all communications infrastructure was out of service, as was the case after Hurricanes Hugo in 1989 and Marilyn in 2005.

The demonstration took place at the club station, KP2SJ, which has emergency power but is in a poor location for HF propagation. To compensate, messages were relayed via 6 meters to Mal, NP2L, at a higher location about a mile away with an open path to the US. Messages were then forwarded to an off island station on HF. The Winlink 2000 (WL2K, **www.winlink.org**) WINMOR/RMS Express protocol was chosen because it could be used both in a P2P (peer-to-peer) mode for the relay link and in the WL2K mode for forwarding to a Winlink/WINMOR off shore hub station. An unexpected discovery was how much better 6 meter ground wave propagation was for traffic handling than experienced on 2 meters across the island's mountainous terrain.

Visitors to the table filled out ARRL Radiogram forms with the "To" field indicating the e-mail address. The message was then typed on the RMS message form, addressed and forwarded to the relay station NP2L and posted to its outgoing message file for transmission off island to stateside WINMOR stations Loren, NØIA, and Robert, WA6UVV. "We were pleased with the speed with which messages were exchanged over this automated system," said Mal, NP2L. Visitors and VITEMA staff received a live demonstration of how Amateur Radio could help them communicate in an emergency.

Lessons Learned

The demonstration was an effective way of informing officials and the public of the value of WINMOR and Amateur Radio for communication in a disaster. While perhaps not the most efficient way of handling tactical emergency traffic in the immediate aftermath of a disaster event, the use of WINMOR, both P2P and WL2K, can be an effective means of handling text message traffic and health and welfare messages. We judged the demonstration a success. — *George Cline, KP2G; Paul Jordan, NP2JF; Malcolm Preston, NP2L — St John USVI ARES and Amateur Radio Club*

Contest Corral – August 2013

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		Date-Time		Bands HF / VHF+	Contest Title	Mode	Exchange	Sponsor's Website
2	0230Z	2	0300Z	1.8-14 / -	NS Weekly Sprint	CW	Serial, name and S/P/C	www.ncccsprint.com
3	0000Z	5	2359Z	1.8-28 / -	Int'l Lighthouse-Lightship Contest	Ph CW Dig	Serial or ARLHS mbr/light nr and name, S/P/C	illw.org
3	0000Z	3	2359Z	1.8-28 / 50	TARA Grid Dip Shindig	Dig	Name and 4-char grid square	www.n2ty.org/seasons/tara_grid_rules.html
3	0001Z	4	2359Z	28 / -	10-10 Summer Phone QSO Party	Ph	Call, name, 10-10 number, S/P/C	www.ten-ten.org
3	1200Z	3	2359Z	1.8-28 / -	European HF Championship	Ph CW	RS(T), last two digits of 1st year licensed	lea.hamradio.si/~scc/euhf/euhfc.htm
3	**1800Z**	**4**	**1800Z**	**- / 222+**	**ARRL UHF Contest**	**Ph CW Dig**	**4-char grid square**	**arrl.org/contests**
3	**1800Z**	**4**	**0600Z**	**1.8-28 / -**	**North American QSO Party**	**CW**	**Name and state**	**ncjweb.com**
4	1300Z	4	1630Z	3.5-14 / -	South Africa DX SSB Contest	Ph	RS and serial	www.sarl.org.za
5	1600Z	5	See website	3.5 / 50, 144	OK1WC Memorial Contest	Ph CW	RS(T) and serial	www.hamradio.cz/ok1wc
10	0000Z	11	2359Z	3.5-28 / -	Worked All Europe	CW	RST and serial (see website for QTC rules)	www.waedc.de
10	1200Z	11	2359Z	1.8-28 / 50	Straight Key Weekend Sprintathon	CW	RST, QTH, name, member nr if member	www.skccgroup.com
10	1600Z	11	See website	1.8-28 / 50-440	Maryland-DC QSO Party	Ph CW Dig	Maryland county/city or S/P/C	mdcqsoparty.w3vpr.org
10	2000Z	10	2400Z	- / 50	Fall VHF Sprint — 50 MHz	Ph CW Dig	4-character grid square	www.svhfs.org
11	1700Z	11	2100Z	3.5-28 / -	NJQRP Skeeter Hunt	CW	RST, S/P/C, Skeeter number or power	www.qsl.net/w2lj
14	0030Z	15	0230Z	3.5-14 / -	NAQCC Monthly QRP Sprint	CW	RST, S/P/C, and NAQCC mbr nr or power	naqcc.info
14	1300Z	15	See website	1.8-28 / -	CWops Monthly Mini-CWT Test	CW	Name and member number or S/P/C	www.cwops.org/onair.html
17	**6 AM**	**18**	**12 AM**	**- / 10G+**	**ARRL 10 GHz and Up Contest**	**Ph CW Dig**	**6-character grid locator**	**arrl.org/contests**
17	0000Z	18	2359Z	3.5-7 / -	Dominican Republic Contest	Ph	RS and serial	www.hi8ud.org
17	0000Z	18	See website	3.5-28 / -	SARTG WW RTTY Contest	Dig	RST and serial	www.sartg.com/contest/wwrules.htm
17	0800Z	18	0800Z	1.8-28 / -	Russian District Award Contest	Ph CW	RS(T), serial or Russian district	rdaward.org/rdac1.htm
17	1200Z	18	1200Z	1.8-28 / 50	Keymen's Club of Japan Contest	CW	RST and JA pref/dist or continent	www.kcj-cw.com
17	**1800Z**	**18**	**0600Z**	**1.8-28 / -**	**North American QSO Party**	**Ph**	**Name and state**	**ncjweb.com**
17	2000Z	17	2200Z	1.8-28 / -	Feld-Hell Gridloc Sprint	Dig	RST, S/P/C, Feld-Hell nr, 4-char grid square	www.feldhellclub.org
18	1300Z	18	1630Z	3.5-14 / -	SARL Digital Contest	Dig	RST and serial	www.sarl.org.za
18	**1800Z**	**18**	**2359Z**	**3.5-28 / -**	**ARRL Rookie Roundup**	**Dig**	**Both calls, name, check, S/P/XE or "DX"**	**www.arrl.org/contests**
19	0100Z	19	0300Z	1.8-28 / -	Run For the Bacon	CW	RST, S/P/C, Flying Pig nr or power	www.fpqrp.org
24	0400Z	24	See website	3.5-28 / 144,440	ALARA Contest	Ph CW	RS(T), serial, ALARA nr, name	alara.org.au
24	0400Z	26	0400Z	1.8-28 / -	Hawaii QSO Party	Ph CW Dig	RS(T) and Hawaii multiplier or S/P	www.hawaiiqsoparty.org
24	1200Z	25	1159Z	3.5-28 / -	YO DX Contest	Ph CW	RS(T), serial or YO district	www.yodx.ro
24	1200Z	25	1159Z	3.5-28 / -	SCC RTTY Championship	Dig	RST, 4-char year first licensed	lea.hamradio.si/~scc/rtty/rtty.htm
24	1400Z	25	See website	3.5-28 / 50,144	Kansas QSO Party	Ph CW Dig	RS(T) and KS county or S/P/"DX"	www.ksqsoparty.org
24	1600Z	25	0400Z	3.5-28 / -	Ohio QSO Party	Ph CW	Serial and S/P or "DX"	www.ohqp.org
25	1300Z	25	1630Z	3.5-14 / -	South Africa DX CW Contest	CW	RST and serial	www.sarl.org.za

All dates refer to UTC and may be different from calendar dates in North America. Times given as AM or PM are local times and dates. No contest activity occurs on the 60, 30, 17 and 12 meter bands. Serial = Sequential number of the contact. S/P/C = State, Province, DXCC Entity. XE = Mexican state. Publication deadline for Contest Corral listings is the first day of the second month prior to publication date (June 1 for August *QST*) — send information to **contests@arrl.org**. Listings in blue indicate contests sponsored by ARRL or *NCJ*. The latest time to make a valid contest QSO is the minute listed in the "Finish Time" column.

The 2013 ARRL International DX Contest CW Results

This was an interesting year, starting with unfounded propagation concerns and ending with photo finishes and record scores.

Rick Lindquist, WW1ME, *NCJ* Managing Editor, ww1me@arrl.org

Just hours before the kickoff of the 2013 ARRL International DX Contest CW weekend, a large meteor blazed across the daytime sky over Russia's Ural Mountains and exploded. The shockwave broke windows, damaged buildings and injured hundreds. Not long after that incident and fewer than 5 hours before the contest starting bell, Asteroid 2012 DA14 streaked past Earth in a record-setting near-miss flyby. Rumors that these two events portended ominously for the contest turned out to be unfounded.

The *real* blast and record-setting began February 16 at 0000 UTC, when the bands exploded with the activity of thousands of hams around the globe, enjoying what turned out to be marvelous conditions. More than 4100 logs were submitted, scores by and large were substantially larger than last year's and participants set some new records.

Among the more thrilling results were the astonishing razor-thin margins between HK1NA and PJ4X for the top two spots in the DX Multioperator High Power category, and between TI5W and VP2ME in the DX Multioperator, Two Transmitter category. In addition, Scott, KØDQ, established yet another W/VE benchmark in the Single Operator, High Power category. The drama in most other entry categories on either side of the contest was greatly subdued, with clear winners claiming most top spots.

The Bands Are Open Online

The online extended version of WW1ME's write-up includes more details about the leaders in each category, many more photos, and sidebars about a remotely-operated multi-multi, how KØDQ pulled off his record-setting win, the inside story about those photo-finish DX multiops, operating from a kitchen in the South Pacific and more personal stories. See you there!

Propagation Worries

A day before the contest **spaceweather.com** reported that the Polar Light Center in Norway observed a magnetic storm that caused wild swings in the local magnetic field and "some fantastic auroras" overhead. As it turned out, *no* storms occurred during the contest.

With a sunspot number of 25, a solar flux around 100 and an A index of 10 as zero hour approached, conditions appeared favorable for 20, 40, 80 and 160, not so much for 15 and — even worse — 10 meters. As it turned out, operators on both sides of the competition often found 15 meters most productive. Stations in Asia and Oceania were scarce this year among the leaders.

Sponsored Plaque Winners

Thanks to the generous sponsorship of numerous clubs and individuals, we are pleased to announce the winners of a sponsored ARRL DX CW plaque. The ARRL wishes to thank the plaque sponsors for their continued commitment to the ARRL Plaque Program. Without their support and dedication, the Plaque Program would not be possible. Unsponsored plaques may be purchased by the plaque winner. If you wish to purchase an unsponsored plaque or order a duplicate plaque, contact ARRL Contest Branch Manager Mike DeChristopher, N1TA at (860) 594-0232 or by e-mail at n1ta@arrl.org. The cost for plaques is $75 (includes shipping).

Plaque Category	Plaque Sponsor	Mode	Winner
W/VE 1.8 MHz CW	Jerry Rosalius, WB9Z	CW	W4ZV
W/VE 21 MHz CW	Carl Luetzelschwab, K9LA	CW	K3RV
W/VE 28 MHz CW	Richard Bennett, KØXG	CW	K2SSS
W/VE Single Operator Low Power CW	Andy Faber, AE6Y	CW	N1UR
W/VE Single Operator QRP CW	Sean Kutzko, KX9X	CW	K3PH
W/VE Single Operator Assisted, High Power CW	Harold Ritchey, W3WPG Memorial	CW	K3WW
World Single Operator High Power CW	North Jersey DX Association	CW	6Y2T (VE3DZ, op)
Europe Single Operator High Power CW	Jim George, N3BB	CW	CR2X (OH2UA, op)
North America Single Operator High Power CW	Potomac Valley Radio Club	CW	6Y2T (VE3DZ, op)
World 1.8 MHz CW	Fred Race, W8FR, In Memory of DL1FF	CW	S59A
World 14 MHz CW	Jeff Hartley, N8II	CW	FY5KE (F6FVY, op)
World 21 MHz CW	Caribbean Contesting Consortium PJ2T	CW	J35X
World 28 MHz CW	W7EW / W7AT	CW	CR1Z (OH2BH, op)
World Single Operator QRP CW	Jerry Griffin, K6MD/DK6MX	CW	GJ2A (MJØASP, op)
World Single Operator Assisted, High Power CW	Southern California DX Club	CW	CE3CT (LU5DX, op)
World Multioperator Single Transmitter, High Power CW	John Patterson WCØW/V31TP	CW	CR3A
World Multioperator Unlimited CW	H Stephen Miller NØSM	CW	HK1NA
Great Lakes Division Single Operator CW	North Coast Contesters	CW	N8AA
Japan Single Operator Low Power CW	Western Washington DX Club	CW	JH4UYB
Seventh Call Area Single Operator High Power CW	Willamette Valley DX Club	CW	N9RV
Canada Single Operator Low Power CW	Contest Club Ontario	CW	VE1RGB
Pacific Division Single Operator Low Power CW	Central California DX Club, Inc. W6MEL	CW	K7ACZ
Central Division Single Operator High Power CW	Northern Illinois DX Association	CW	K9NW
Pacific Division Single Operator 20 Meters CW	Jim Davis, NN6EE	CW	N6LL
World Multioperator, Single Transmitter, Low Power CW	John Patterson WCØW/V31TP	CW	V31TP
Asia Single Operator QRP CW	Sean Kutzko, KX9X	CW	JQ1NGT

W/VE Single Operator

Scott, KØDQ, doesn't believe in "close enough." Far out in front in SOHP with 6.58 million points in 2012, he was still just shy of the 6.588 million point record. Once again operating SO2R from the WW1WW "Battleship New Hampshire" superstation, he soldiered on (or, in Scott's case, perhaps we should say "sailed on") to 5170 contacts with 524 multipliers for 8.08 million points. Forty meters was his money band with 20 and 15 not far behind.

His 2013 score not only breaks the previous W/VE SOHP record but sets an all-time record for a CW single operator for both W/VE and DX, topping PJ4A's 2011 score (RD3A, op) of 7.48 million points. From his perspective, the biggest difference was propagation.

Picking off the top spot in the SOLP category was Vermont's N1UR, who pulled way ahead in the crowd of 432 contestants, racking up 3224 contacts with 429 mults for 4.11 million points. Battling illness last year, Ed still managed a strong second place finish; this time he dominated once more, beating his old first district record of 3.47 million points, set in 2011, but still falling short of the overall 4.24 million point SOLP record that N2NL set from K4XS in 2001.

Once again leading the flea power (SOQRP) crowd was Bob, K3PH, in Eastern Pennsylvania, who edged out John, W2ID in Northern New Jersey for the top spot, 1.1 million to 1.09 million points. Bob logged 1168 contacts with 315 mults, while W2ID had 1159 contacts with 313 multipliers — close in anyone's book!

W/VE Single-Operator Unlimited

Going head to head for another year were Eastern Pennsylvanians (and fellow FRCers) Chas, K3WW and Bud, AA3B in the SOUHP category. K3WW prevailed once

Top Ten — DX

Single Operator, High Power

6Y2T (VE3DZ, op)	6,739,200
ZF2AM (K6AM, op)	6,379,800
TO5X (R5GA, op)	6,267,861
CR2X (OH2UA, op)	5,916,003
6V7S (RK4FF, op)	4,727,709
PY2NDX	3,965,826
NP2N (W2VJN, op)	3,846,456
G6PZ (GIØRTN, op)	3,620,295
DL6FBL	3,589,074
9A6XX	3,552,660

Single Operator, Low Power

P40W (W2GD, op)	5,223,456
VP9/W6PH	4,056,156
EF8R (EA8RM, op)	3,766,116
J88DR (G3TBK, op)	3,732,183
HQ2N (JA6WFM, op)	2,716,623
HC2/RC5A	2,589,120
MD2C (MDØCCE, op)	2,196,150
PY2YU	1,694,115
PY2NY	1,253,079
F6EYB	1,094,016

Single Operator QRP

GJ2A (MJØASP, op)	728,739
VQ5RP (KØUU, op)	479,220
HB9BMY	380,460
OK3C (OK2ZC, op)	360,570
HI/K8MR	302,940
YU0W	280,449
F/E73CQ	192,852
G4DBW	145,536
UU2CW	144,324
EA7AAW	127,368

Single Operator, 10 Meters

CR1Z (OH2BH, op)	314,529
EA8CN	251,871
XQ1KZ	241,164
CE3DNP	195,576
LU6UO	171,216
LW8DQ	169,455
PY2MTS	160,272
PS2R	120,726
LU5FR	114,345
CT1AOZ	89,964

Single Operator, 15 Meters

J35X	302,064
KL7RA	289,674
PX2C (PY2BK, op)	228,969
6W/HAØNAR	226,896
TF3Y	222,666
C6ASP (W6KW, op)	218,022
S50K	214,368
OT1A (ON4CCP, op)	202,188
TMØR (F5MNK, op)	188,271
EA8NC	187,758

Single Operator, 20 Meters

FY5KE (F6FVY, op)	394,887
CE1/K7CA	275,268
OH8X (OH6KZP, op)	239,058
C6AZZ (KQ8Z, op)	238,242
9A3TR	232,812
OK7K (OK1GK, op)	225,378
OH8R (OH8WW, op)	209,304
S53MM	205,542
5C5W (CN8KD, op)	201,666
OH8L (OH8LQ, op)	201,318

Single Operator, 40 Meters

C6AKQ (N4BP, op)	326,598
EA8CMX (OH2BYS, op)	288,840
CQ8X (OH2PM, op)	270,396
YU1LA	262,218
S57AL	229,158
E77W	227,430
S50C (S53RM, op)	219,066
S57Z	218,709
EF8N	199,056
SN3R (SP3HRN, op)	196,968

Single Operator, 80 Meters

C6APG (K4PG, op)	241,338
F5CQ	135,432
E71A	109,074
DM7C (DL6CX, op)	103,350
CO3IT	100,128
UU7J (UUØJM, op)	93,933
YUØT	92,448
HA8A (HA8DZ, op)	92,160
OK1IC	91,953
CO8ZZ	89,352

Single Operator, 160 Meters

S59A	56,304
YU7AV	34,770
SV3RF	33,720
DJØMDR	30,894
CO6LP	21,645
OK2W	19,530
LY7M	16,833
OK1AXB	15,456
UYØZG	9,144
EW1DO	5,874

Single Operator Unlimited, High Power

CE3CT (LU5DX, op)	3,424,065
SN7Q (SP7GIQ, op)	2,973,267
DL5AXX	2,863,950
IR2C (IK2JUB, op)	2,794,806
II9P (IT9GSF, op)	2,715,282
G9W (MØDXR, op)	2,576,286
HB9FAP	2,364,600
OQ5M (ON5ZO, op)	2,200,752
EA7TG	1,847,316
OL5Y	1,774,404

Multioperator, Single Transmitter, High Power

CR3A	6,551,010
P40L	6,511,512
KP2M	5,955,672
KP3Z	5,470,575
XE7S	5,384,610
VP5S	5,029,065
EF8USA	4,555,524
EI7M	4,287,825
LX7I	4,284,960
EA5RS	3,921,876

Multioperator Two Transmitters

TI5W	9,492,102
VP2ME	9,461,772
PJ2T	8,617,176
TM6M	7,053,984
KH7X	6,847,995
EF7X	5,878,152
M5E	5,522,457
OL7M	4,500,876
DL1A	3,996,342
DR4A	3,654,384

Multioperator, Unlimited Transmitters

HK1NA	10,696,152
PJ4X	10,638,459
KH6LC	7,194,795
9A1A	5,853,960
LZ9W	4,511,367
HA30S	3,665,310
JA3YBK	2,834,166
JE1ZWT	1,443,918
9A5CW	131,040

Multioperator, Single Transmitter, Low Power

V31TP	5,653,260
P49V	4,450,797
PY1SL	1,614,750
3D2RX	1,489,665
OL1C	1,024,632
S50XX	1,009,086
LZ9R	402,150
5C5T	367,200
YE1ZAT	153,780
DK5TX	89,544

Single Operator Assisted, Low Power

KP4EE	4,352,616
S53F	1,521,795
GIØRQK	1,432,458
EC4TA	1,306,818
DK5DQ	1,063,620
HI3TT	811,797
SP1NY	799,008
HA6NL	666,855
OK6Y (OK2PTZ, op)	605,655
LU7HZ	482,664

W/VE Single Operator Region Leaders

Boxes list call sign, score, and power (A = QRP, B = Low Power, C = High Power).

Northeast Region

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

KØDQ	8,084,796	C
K3CR (LZ4AX, op)	7,134,810	C
N2NT	6,906,060	C
VY2TT (K6LA, op)	6,722,772	C
NN3W	6,338,514	C
N1UR	4,110,678	B
K3AJ	1,618,650	B
K1VSJ	1,477,701	B
W1JQ	1,346,748	B
VE1RGB	1,153,848	B
K3PH	1,099,980	A
W2ID	1,080,789	A
N1IX	816,024	A
K8CN	772,200	A
N1TM	619,776	A

Southeast Region

(Delta, Roanoke and Southeastern Divisions)

AD4Z	4,196,760	C
K4RO	3,490,362	C
K1TO	3,440,625	C
KØZR	2,493,810	C
K4AB	2,493,210	C
N4YDU	2,111,910	B
N4UA	2,108,832	B
K5KU	1,145,238	B
W4AA	1,137,786	B
NN4X	1,120,278	B
W9WI	976,950	A
N4CW	759,600	A
AA4GA	207,060	A
N4AU	131,859	A
KS4X	125,202	A

Central Region

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

VB3E (VE3AT, op)	4,693,380	C
N8AA	3,963,360	C
K8GL	3,472,896	C
K9NW	3,351,765	C
K1LT	2,995,272	C
N4TZ	3,061,056	B
NA8V	2,382,615	B
N9CK	1,912,950	B
KV8Q	1,142,712	B
WB8JUI	754,728	B
VA3SB	790,938	A
KT8K	458,880	A
W8RTJ	365,484	A
WA8REI	214,230	A
VE3HG	160,272	A

Midwest Region

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

K5GN	5,579,925	C
N2IC	5,259,366	C
K5WA	3,928,905	C
WXØB (AD5Q, op)	3,699,810	C
KØRF (WØUA, op)	3,649,878	C
N5AW	3,024,120	B
WØUO	1,742,895	B
NAØN	1,021,293	B
WØETT	673,182	B
WD5K	661,200	B
KØOU	362,082	A
VE5VA	81,312	A
N8LA	30,240	A
NTØZ	22,515	A
WA5RML	20,520	A

West Coast Region

(Pacific, Northwestern and Southwestern Divisions; Alberta, British Columbia and NWT Sections)

N9RV	4,379,625	C
W6YI (N6MJ, op)	3,859,728	C
K6XX	2,756,073	C
K7RAT (N6TR, op)	1,054,920	C
K6NR	1,000,350	C
N7ZG	1,234,341	B
K7BG	1,225,269	B
WJ9B	857,805	B
N6RV	741,426	B
VE6EX	627,450	B
N7IR	577,404	A
W6JTI	464,928	A
W6QU (W8QZA, op)	217,752	A
KM6Z	149,985	A
WA6DBC	111,750	A

Top 10 — W/VE

Single Operator, High Power

KØDQ	8,084,796
K3CR (LZ4AX, op)	7,134,810
N2NT	6,906,060
VY2TT (K6LA, op)	6,722,772
NN3W	6,338,514
K1ZZ	6,332,172
K5GN	5,579,925
N2IC	5,259,366
AA1K	4,904,256
WC1M	4,755,195

Single Operator, Low Power

N1UR	4,110,678
N4TZ	3,061,056
N5AW	3,024,120
NA8V	2,382,615
N4YDU	2,111,910
N4UA	2,108,832
N9CK	1,912,950
WØUO	1,742,895
K3AJ	1,618,650
K1VSJ	1,477,701

USCW Single Operator, QRP

K3PH	1,099,980
W2ID	1,080,789
W9WI	976,950
N1IX	816,024
VA3SB	790,938
K8CN	772,200
N4CW	759,600
N1TM	619,776
N7IR	577,404
W6JTI	464,928

Single Operator Unlimited, High Power

K3WW	7,783,977
AA3B	7,204,194
K5ZD	6,693,312
K1AR	5,464,800
N3RR	4,293,168
N2MM	4,275,534
N8BJQ	3,502,680
W1GD	3,344,229
N2SR	3,339,708
KO7AA	3,225,150

Single Operator Unlimited, Low Power

K4XS	4,616,514
W3KB	2,373,030
WD4AHZ	2,116,500
WO1N	2,088,801
WW3S	1,940,400
W9XT	1,766,937
N5DO	1,674,090
WE9R	1,396,236
KE7X	1,349,400
K2ZC	1,284,981

Single Operator, 10 Meters

K2SSS	220,320
W3EP	166,725
WB9Z	136,890
K2PS	108,612
K6TA	104,640
VE3KZ	102,573
N4OX	88,740
K4WI	81,198
N2WN	67,392
K9WZB	59,976

Single Operator, 15 Meters

K3RV	643,926
KI1G	615,942
KD2RD	540,756
N4PN	531,573
K9OM	429,948
N7AT (K8IA, op)	397,872
NE8P	393,366
N2WQ/VE3	358,455
K4FJ	356,304
W5TM	280,692

Single Operator, 20 Meters

K2XA	656,544
N2PP	530,424
N4TB	470,322
N4ZZ	360,600
WØEWD	261,096
N8AGU	260,580
W9ILY	247,848
K9IL	138,699
K5UTD (HK1A, op)	132,066
WR2G	112,992

Single Operator, 40 Meters

W7WA	338,724
W3BGN	192,276
N6MA	191,808
K9NR	188,376
VE6WQ	179,118
N7WA	172,320
K7WP	163,116
WA1FCN	161,925
W8WA	88,800
K4VU	77,034

Single Operator, 80 Meters

W1MK	286,650
WX4G	166,608
N3IQ	154,704
KØKT	72,210
K3JGJ	65,268
W1MO	63,156
W1XX	56,628
N8II	49,536
VE3OSZ	49,446
K9KU	48,348

Single Operator, 160 Meters

W4ZV	83,808
W4SVO	40,635
N4XD	34,404
W8TOP (W8UVZ, op)	29,484
W2MF	16,995
W3GH	16,854
N7GP	11,070
NØTT	9,828
K4EJQ	8,103
N2GC	7,965

Multioperator, Single Transmitter, High Power

W2FU	9,055,458
W2RE	8,527,356
K2QMF	5,944,560
K8AZ	5,883,768
K5TR	4,648,518
K1HI	4,373,460
N3BNA	3,974,940
K5RX	3,580,962
KØTV	3,567,174
NØNI	3,130,116

Multioperator, Single Transmitter, Low Power

K2PO	1,966,536
VE9ML	1,862,574
W3YI	548,301
VA7DZ	450,177
KØUK	357,048
W3WN	180,297
WDØGTY	158,412
W1TM	54,693

Multioperator, Two Transmitters

N3RS	11,809,854
NY4A	10,990,662
K5GO	10,811,604
K9CT	9,855,360
VE3JM	9,612,504
W4RM	9,086,820
KB1H	8,933,604
K4TCG	7,215,831
K2AX	5,902,671
W7RN	5,162,289

Multioperator, Unlimited Transmitters

K3LR	18,046,977
W3LPL	17,296,773
K1LZ	15,810,600
NR4M	14,169,168
NQ4I	13,774,563
WK1Q	11,852,292
WØAIH	7,264,770
K1RX	6,021,432
N6RO	5,886,609
K1KI	5,755,263

Vassilis, SV1DPJ, was Single Operator Unlimited, High Power from the Radio Association of West Greece contest station SZ1A. Kostas, SV1DPI, reports that Vassilis had "a great time and made a great score," possibly a record from Greece. His official tally was 913,824 points (1354 contacts with 228 mults). [Kostas Stamatis, SV1DPI, photo]

again, racking up 7.8 million points to AA3B's 7.2 million. Chas made 4757 contacts with 551 mults, while Bud compiled 4510 contacts with 534 mults.

Only two of the top five finishers from 2012 showed up in the top five for SOULP this year, and neither managed to snag top honors. This time around Bill, K4XS, in Northern Florida, succeeded with 4.6 million points (2914 contacts with 531 mults).

W/VE Multioperator Roundup

In the Multioperator, Single Transmitter, High Power category, the operators at W2FU in Western New York pulled off the win with 9.06 million points. Repeating this year in second place, the W2RE team in Northern New York was not too far off the mark with 8.53 million points — the biggest deciding factor likely being the 20 additional mults the W2FU team logged (the two teams were just 110 contacts apart).

In the MS Low Power category, which attracted just eight entries, K2PO vanquished the field with an impressive 1.97 million points. That's nearly 1 million points ahead of the W1TM first place finish in 2012.

The Multioperator, Two Transmitter category saw the superb N3RS team in Eastern Pennsylvania repeat in the top spot with 11.81 million points. This was about 1 million ahead of last year's finish and bests the N3RS Third District record of 11.5 million set in 2001.

Within a shallow 15-entry field in the Multioperator, Multitransmitter category, the competition once again focused on the Battle of the Titans, pitting the team at K3LR in Western Pennsylvania against the equally talented W3LPL crew in the Maryland-DC Section. In a turnaround from 2012's MM battle, the K3LR team this time overtook the W3LPL ops by a healthy 750,000 point margin, setting a new world record in the process.

The K4VV team placed just 13th out of the pool of competitors this year, but its style of operation may set a new trend in MM contesting. K4VV consisted of three operators at four discrete locations in different states! Team member Mike, WØYR, reported that things went "very, very well." Read all about it in the online sidebar "K4VV Remote Contest Station Maiden Voyage."

W/VE and DX Single-Band Entries

To paraphrase Clint Eastwood's "Dirty Harry" character, contesters gotta know their limitations *and* those of their stations, but they have to know the *strengths* of both as well. Not everyone can field a bodacious DX contest signal on *every* band, but some otherwise modest setups do excel on one or two bands. Enter the Single-Banders! Each band's winning stations are listed in the Top 10 Single Operator, Single Band tables and, of course, the extended version of this article features much more about all single-band categories.

DX Single Operator

Stations in North America again took the top three places in the SOHP category from the DX side. The top two stations flipped positions from 2012. Jamaica's 6Y2T with Yuri, VE3DZ, at the helm, took the top spot this year in a close race, posting 6.74 million points, while ZF2AM, piloted by John, K6AM, was a close second from the Caymans with 6.38 million points. Yuri had 115 more contacts and one more multiplier, although the record of 6.8 million points that John set last year stands.

Dropping back by approximately 12 dB did not seem to hurt contesting pro John, W2GD, who ran up 5.2 million points at P4ØW to lead a crowded DX SOLP category, in the process topping his own South American record of 4.77 million points set in 2004.

Just two operators who were in last year's Top 10 in the challenging SOQRP category repeated this year, and only one was at the same station. Eight of the Top 10 stations were in Europe this year; the other two were in North America — quite a change from the geographical distribution in the other SOAB sub-categories. Well ahead of the pack in the top spot was GJ2A on Jersey (Island, not

Continental Leaders

Class	Call	Score
Africa		
Single Operator, High Power	6V7S (RK4FF, op)	4,727,709
Single Operator, Low Power	EF8R (EA8RM, op)	3,766,116
Single Operator Unlimited, High Power	CT3BD	4,320
Single Operator Unlimited, Low Power	CN8WW	277,140
Single Operator, 10 Meters	EA8CN	251,871
Single Operator, 15 Meters	6W/HA0NAR	226,896
Single Operator, 20 Meters	5C5W (CN8KD, op)	201,666
Single Operator, 40 Meters	EA8CMX (OH2BYS, op)	288,840
Multioperator, Single Transmitter, High Power	CR3A	6,551,010
Multioperator, Single Transmitter, Low Power	5C5T	367,200
Asia		
Single Operator, High Power	5B/UW2M (UR0MC, op)	2,763,996
Single Operator, Low Power	JH4UYB	706,848
Single Operator, QRP	JR4DAH	84,240
Single Operator Unlimited, High Power	JS3CTQ	1,108,530
Single Operator Unlimited, Low Power	UA0IT	139,590
Single Operator, 10 Meters	JA1BPA	46,956
Single Operator, 15 Meters	RU0FM	152,790
Single Operator, 20 Meters	JF1NHD	135,432
Single Operator, 40 Meters	JA1XMS	91,260
Single Operator, 80 Meters	JH1AEP	21,312
Single Operator, 160 Meters	JA8NFV	1,056
Multioperator, Single Transmitter, High Power	C4N	1,864,800
Multioperator, Two Transmitters	RT0C	1,659,792
Multioperator, Unlimited Transmitters	JA3YBK	2,834,166
Europe		
Single Operator, High Power	CR2X (OH2UA, op)	5,916,003
Single Operator, Low Power	MD2C (MD0CCE, op)	2,196,150
Single Operator, QRP	GJ2A (MJ0ASP, op)	728,739
Single Operator Unlimited, High Power	SN7Q (SP7GIQ, op)	2,973,267
Single Operator Unlimited, Low Power	S53F	1,521,795
Single Operator, 10 Meters	CR1Z (OH2BH, op)	314,529
Single Operator, 15 Meters	TF3Y	222,666
Single Operator, 20 Meters	OH8X (OH6KZP, op)	239,058
Single Operator, 40 Meters	CQ8X (OH2PM, op)	270,396
Single Operator, 80 Meters	F5CQ	135,432
Single Operator, 160 Meters	S59A	56,304
Multioperator, Single Transmitter, High Power	EI7M	4,287,825
Multioperator, Single Transmitter, Low Power	OL1C	1,024,632
Multioperator, Two Transmitters	TM6M	7,053,984
Multioperator, Unlimited Transmitters	9A1A	5,853,960

Class	Call	Score
North America		
Single Operator, High Power	6Y2T (VE3DZ, op)	6,739,200
Single Operator, Low Power	VP9/W6PH	4,056,156
Single Operator, QRP	VQ5RP (K0UU, op)	479,220
Single Operator Unlimited, High Power	KL2R (N1TX, op)	775,890
Single Operator, 10 Meters	V31YN (DJ4KW, op)	60,444
Single Operator, 15 Meters	J35X	302,064
Single Operator, 20 Meters	C6AZZ (KQ8Z, op)	238,242
Single Operator, 40 Meters	C6AKQ (N4BP, op)	326,598
Single Operator, 80 Meters	C6APG (K4PG, op)	241,338
Single Operator, 160 Meters	CO6LP	21,645
Multioperator, Single Transmitter, High Power	KP2M	5,955,672
Multioperator, Single Transmitter, Low Power	V31TP	5,653,260
Multioperator, Two Transmitters	TI5W	9,492,102
Oceania		
Single Operator, High Power	ZL3IO	2,295,657
Single Operator, Low Power	VK7CW	181,440
Single Operator, QRP	N7ET/DU7	9,135
Single Operator Unlimited, High Power	NH2T	1,259,298
Single Operator Unlimited, Low Power	KH6/W0ZT	83,385
Single Operator, 10 Meters	NH2DX (KG6DX, op)	85,104
Single Operator, 15 Meters	VK4TJF	19,224
Single Operator, 20 Meters	VK7GN	60,489
Single Operator, 40 Meters	KH7M (KH6ZM, op)	181,272
Single Operator, 80 Meters	WB4JTT/KH6	55,008
Multioperator, Single Transmitter, Low Power	3D2RX	1,489,665
Multioperator, Two Transmitters	KH7X	6,847,995
Multioperator, Unlimited Transmitters	KH6LC	7,194,795
South America		
Single Operator, Low Power	P40W (W2GD, op)	5,223,456
Single Operator, High Power	PY2NDX	3,965,826
Single Operator Unlimited, High Power	CE3CT (LU5DX, op)	3,424,065
Single Operator Unlimited, Low Power	LU7HZ	482,664
Single Operator, 10 Meters	XQ1KZ	241,164
Single Operator, 15 Meters	PX2C (PY2BK, op)	228,969
Single Operator, 20 Meters	FY5KE (F6FVY, op)	394,887
Single Operator, 40 Meters	YV5OIE	36,378
Multioperator, Single Transmitter, High Power	P40L	6,511,512
Multioperator, Single Transmitter, Low Power	P49V	4,450,797
Multioperator, Two Transmitters	PJ2T	8,617,176
Multioperator, Unlimited Transmitters	HK1NA	10,696,152

Shore), with Mathieu, MJØASP, in the chair, posting a very respectable 728,739 points. Over the course of his 34 hours on the air, Mathieu capitalized on good conditions on 20, 15 and 10, and eschewed 160 altogether.

DX Single-Operator Unlimited

In a SOUHP field of nearly 350 entrants, the leader was from South America. CE3CT in Chile, operated by Argentine Martin, LU5DX, took first place with 3.42 million points. The rest of the Top 10 was in Europe.

Single Operator Unlimited, Low Power competitors had almost as large a field as their high power competition. Joachim, KP4EE, was king of the hill with 4.35 million points.

DX Multioperator Roundup

In the DX Multioperator, Single Transmitter, High Power race, the CR3A team earned the trophy with 6.55 million points. It was a tight race, however, with runner-up P4ØL falling short with 6.51 million points. The major difference was in contacts; P4ØL worked one more mult.

In the Multioperator, Single Transmitter, Low Power competition, the V31TP team scrambled to the top of the heap with 5.65 million points. Last year, V31TP placed second in the MSHP category. P49V repeated in second place with 4.45 million points, well short of their 2012 score.

It was another tight race to the top between the teams at TI5W and VP2ME in the DX Multioperator, Two Transmitter category. Final scores put the three-operator TI5W team at 9.49 million points, a mere 30,330 points up on the five operators at VP2ME. TI5W snagged just 10 more contacts but harvested one additional — and crucial — multiplier.

The claim to the DX Multioperator, Multi-transmitter crown turned on error rate. *Claimed* scores had PJ4X edging out HK1NA by 16,299 points in a battle for top honors. After log checking, the official score revealed that HK1NA had topped PJ4X by a more generous margin of 57,693 points — still close. The final tally had HK1NA with 10.7 million points and PJ4X with 10.64 million points.

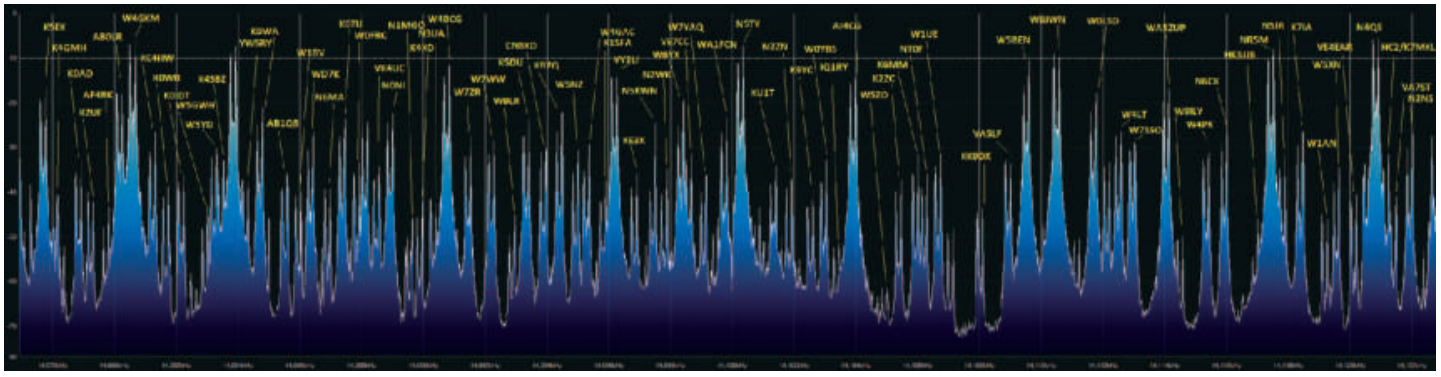
If ever there was a dramatic demonstration that careful logging counts, this is surely it. While the PJ4X team's error rate was a highly respectable 0.8 percent, the HK1NA group held theirs to just 0.5 percent, "and that made all the difference," to paraphrase Robert Frost (see the online "Accuracy Leaders" tables for a closer look at this factor).

Logging Accuracy

In a contest such as this one, accuracy is important. It's no surprise that the scoring leaders and the operators with the best logging accuracy coincide year after year. Scott, KØDQ, not only repeated as Single Operator, High Power leader this year, but he also had the highest accuracy (see the "Accuracy Leaders" tables online), according to our calculated Accuracy Index. This index measures the accuracy of a particular operator's log, taking log size into account. Error rate, while a useful individual benchmark, does not, and error rates for logs containing greater than 100 contacts ranged as high as 29.7 percent on the W/VE side to 17.4 percent on the DX side.

On the DX side, let's not forget that the MM battle for supremacy hinged on error rate. PJ4X's error rate has always been good, but HK1NA won the trophy as a result of superb accuracy. Ditto for the TI5W and PJ2T teams. Yuri, VE3DZ, led the Single Operator accuracy index list from 6Y2T this year just as he did last time, despite being "sleep deprived."

Meteors, asteroids and solar flares aside, for those who have never dipped a toe in the water for this event, the ARRL International DX Contest (CW or phone) is a terrific opportunity to log some new ones, since DX participants *only* work the US and Canada. Even with a modest setup and no special contesting skills it is feasible to attain DXCC in a weekend! Mark your calendars for February 15-16, 2014!



2013 ARRL RTTY Roundup Results

Record participation highlights the "RR's" silver anniversary.

Jay Townsend, WS7I, ws7i@arrl.net

This year we celebrate the Silver Anniversary of the ARRL RTTY Roundup — 25 years of fun and competition. In the eyes of many operators, the ARRL RTTY Roundup starts the radiosporting year. You know that activity will be wall-to-wall but you never know just what conditions might be and occasionally there is an odd twist of fate.

Everyone who enters the RTTY Roundup is a winner, because this event has something for everyone. Picture this: working new DX, getting another state for the Worked All States (WAS) award, trying out your new demodulator (hardware or software), a new antenna or a new computer. And don't forget helping out your club or just your team. But most of all there is a fast rate and loads of fun.

Propagation

Solar conditions improved over last year. With the flux in the 140s and nice A and K indices, things couldn't have been much better. Ten meters was open again this year but the big surprise was that 80 meters showed the better activity increase. With a record number of 1,922 logs submitted and a record number of QSOs, it was interesting to see who was operating where in the bands. Ten meter QSOs were actually down by 25,000 contacts while 40 and 80 saw big increases. The big deal this year on the low bands was the low noise level. Eighty meters was as full as I have seen it in a RTTY contest. Look for analysis throughout the online write-up of how different operators used differing strategies during the contest to take advantage of the propagation.

Unlike other recent RTTY contests with quiet bands during the entire contest, it was fairly difficult for operators to make poor choices in this event. The money band made 20 meters the band of choice. Fairly equal numbers of contacts were logged on 40 and 15 meters. No doubt the single operator, two radio (SO2R) guys placed a radio or a VFO on the band above or below 20 depending on their location. The single operator, multiple radio — up to 6 VFOs (three radios with dual receivers) — probably had something everywhere.

Lead image: This spectrum from 14.077 to 14.123 MHz shows why it was hard to get a character in edgewise. The band was captured and analyzed by Andy Flowers, KØSM/2, using a SoftRock Ensemble II and SDR# software on a low dipole in upstate New York.

Affiliated Club Competition

Since the Club Competition was added years ago it has added significantly to the RTTY Roundup. The Northern California Contest Club (NCCC) once again had over 70 participants and led the Unlimited category. The Potomac Valley Radio Club (PVRC) had 51 participants this year but trailed in scores submitted by their members, leading to a 2nd place finish in the Unlimited category.

The Minnesota Wireless Association (MWA) was 1st in the Medium Club ranks with 43 operators turning in 1.6 million points. Very close behind was the Yankee Clipper Contest Club (YCCC), less than 100,000 points off the winning pace. The Arizona Outlaws Contest Club was in the 3rd place spot this year.

Top Ten Scores

Single Operator

W/VE — Low Power

AA5AU	251,244
N2QT	209,592
VA2UP	201,125
NØAT	199,200
KC4HW	163,683
KØAD	162,108
W7YAQ	138,195
W7ZR	138,137
NT0F	137,007
KE5OG	136,141

W/VE — High Power

K4GMH	310,050
W7RN (WK6I, op)	309,248
W1UE	293,862
VE7CC	271,816
AA3B	268,288
N2WK	264,404
WK7S (K6LL, op)	238,497
ABØRX	233,100
WØLSD	229,068
AI9T	218,377

DX — Low Power

XE2K	160,608
VP9/WW3S	150,442
HI3TEJ	145,936
CN8KD	144,612
J35X	116,388
DL4MCF	116,263
ZZ2T (PY2MNL, op)	113,850
KH6ZM	108,388
HC2/K7MKL	97,545
F5BEG	97,114

DX — High Power

P49X (WØYK, op)	454,860
G6PZ (UT5UDX, op)	278,528
9A5W	213,237
SN7Q	198,072
IQ2CJ (IK2NCJ, op)	191,872
OL8M	173,118
KP4JRS	162,737
HI8PLE	147,828
EM2G (UR7GO, op)	146,133
KL7RA	137,970

Multioperator

W/VE — Low Power

K9OM	144,738
WB5TUF	124,928
K2EN	110,823
AA4NC	101,916
W4GAC	96,193
W9ILY	95,485
W1SLF	92,070
KA3QLF	87,516
WØRAA	81,696
KOØZ	74,235

W/VE — High Power

NØNI	265,950
WØSD	249,480
K1SFA	224,250
K9CT	218,115
WA5ZUP	204,120
KN5O	196,080
WW4LL	193,225
NR4M	192,570
KB7Q	186,147
W4RM	177,664

DX — Low Power

OQ6A	94,653
EA2RY	69,372
OH8KTN	65,208
IW1QN	63,838
UT8EL	57,252
UX4E	54,219
OM3KWZ	52,866
OK2RVM	44,469
KP2D	38,548
OE3RTB	32,760

DX — High Power

WP2NN	269,008
EI7M	219,604
EC4DX/1	189,924
OL7M	176,640
S53M	175,768
UW4I	175,763
IT9BLB	162,756
S5ØXX	157,374
MW2I	137,170
OH2HAN	125,512

Affiliated Club Competition

Club	Score	# of Logs
Unlimited Club		
Northern California Contest Club	4,044,558	71
Potomac Valley Radio Club	2,777,845	52
Medium Club		
Minnesota Wireless Assn	1,607,832	43
Yankee Clipper Contest Club	1,542,597	34
Arizona Outlaws Contest Club	1,332,572	22
Society of Midwest Contesters	1,216,348	21
Frankford Radio Club	1,006,537	17
Tennessee Contest Group	902,234	19
Contest Club Ontario	779,468	18
CTRI Contest Group	539,899	11
Alabama Contest Group	527,153	15
Western Washington DX Club	526,744	10
Florida Contest Group	499,691	16
Louisiana Contest Club	494,195	5
Grand Mesa Contesters of Colorado	491,525	8
DFW Contest Group	480,050	8
Southern California Contest Club	466,810	11
Contest Group Du Quebec	445,081	6
Willamette Valley DX Club	419,693	9
ORCA DX And Contest Club	331,332	6
Saskatchewan Contest Club	299,626	3
Maritime Contest Club	280,637	5
Mississippi Valley DX/Contest Club	262,766	4
Georgia Contest Group	250,069	3
Central Texas DX and Contest Club	240,119	3
North Coast Contesters	238,190	6
Carolina DX Association	222,783	4
Hudson Valley Contesters and DXers	217,228	5
Mad River Radio Club	202,850	5
Utah DX Assn	197,237	4
South East Contest Club	156,336	4
Kentucky Contest Group	142,942	5
Order of Boiled Owls of New York	106,387	3
Rochester (NY) DX Assn	83,335	4
Radio Club of Redmond	74,434	3
Local Club		
Orleans County Amateur Radio Club	1,065,283	10
Spokane DX Association	498,633	10
Iowa DX and Contest Club	273,864	3
Dominion DX Group	207,654	3
Metro DX Club	165,938	4
Midland ARC	154,782	5
Bergen ARA	152,017	3
Kansas City DX Club	146,876	3
Bristol (TN) ARC	114,182	5
Boeing Employees ARS — St. Louis	92,142	4
Low Country Contest Club	87,340	4
Sterling Park ARC	8,577	3

Sponsored Plaque Winners

Thanks to the generous sponsorship of numerous clubs and individuals, we are pleased to list the winners of the sponsored RTTY Roundup plaques below:

Plaque Category	Plaque Sponsor	Winner
W/VE Single Operator High Power — W7RM Award	Spokane DX Association	K4GMH
W/VE Single Operator Low Power — NM7M Memorial	Jim Reisert, AD1C	AA5AU
W/VE Multioperator High Power	John Lockhart, W0DC	N0NI
DX Single Operator High Power	The NN6NN RTTY Team	P49X (W0YK, op)
DX Multioperator High Power	Paolo Cortese, I2UIY, Memorial by W0YK	WP2NN
Pacific Division Single Operator High Power	Northern California Contest Club	W7RN (WK6I, op)
Dakota Division Single Operator Low Power	W2JGR Memorial by Don Hill, AA5AU	N0AT
Delta Division Single Operator Low Power	Roland Guidry, NA5Q	AA5AU
Midwest Division Single Operator Low Power	In Memoriam of Larry Lindblom, W0ETC, by Bob Ruvolo, KI6DY	NT0F
New England Division Single Operator Low Power	CTRI Contest Group	W1CCE
Roanoke Division Single Operator Low Power	Mike Sims, K4GMH	N2QT
Roanoke Division Multioperator Low Power	Sheila Blackley, K4WNW	AA4NC

To inquire about purchasing an unsponsored plaque, or for information on plaque sponsorship, please contact the ARRL Contest Branch at (860) 594-0232. Plaques cost $75 each, which includes all shipping and handling costs.

Jeff, WK6I, operated using *six* VFOs simultaneously but received no assistance from the rubber chicken in making a West Coast record score. [Tom Taormina, K5RC, photo]

On the Local Club level the Orleans County Amateur Radio Club showed just over a million points, with 10 radiosporting members submitting scores. They waxed the Spokane DX Association who also had 10 operators submitting but their score was 500,000 behind. The Iowa DX and Contest Club placed 3rd with only three operators submitting scores for a valiant effort.

DX Highlights

RTTY Roundup has grown from 295 logs submitted in 1989 to 1922 logs in 2013 — a major increase in participation. The most significant increase in participation has come from the DX side. From only 60 DX logs in 1989 it has grown to 936 logs in 2013. In fact, while US/VE logs decreased slightly this year DX logs showed a healthy increase of more than 15% over last year.

The 2013 RTTY Roundup had good balance with nearly equal log numbers coming from US/VE and the DX locations. The breakdown in increased operation is: Africa 1.4%, Asia 18.6%, Europe 70.2%, North America (outside W/VE) 3.2%, Oceania 2.8% and South America 3.8%. By entry category the logs were 511 SOLP, 203 SOHP, 97 MSLP, and 90 MSHP. This distribution is pretty much in line with the distribution in the US/VE logs as well.

RTTY Roundup — Past Years

RTTY Roundup was first held in1987 and it changed RTTY contesting forever, yet the current contest barely resembles the days of old. Hal, WA7EGA, stated in *QST* after the first event, "The popularity of the Roundup could have been predicted. Where else can you find a fast-paced, worldwide RTTY contest with a schedule that allows the contestant to take the XYL out to dinner Friday, have a leisurely breakfast the next morning, get six hours of sleep Saturday night and be finished in time to watch *60 Minutes* on Sunday?"

The Roundup was the first RTTY contest "for folks who do not heat their homes with their final tubes" and Low Power entries became the majority. "'Barefooters' competed in their own group in 1987 and 'peanut whistles' out-numbered 'barn-burners' by nearly three to one!" WA7EGA wrote. QSO totals were in excess of 700 the first year and now we exceed that in the first seven hours. Rates now average 100 contacts plus per hour for the entire RTTY Roundup.

Don, AA5AU, won the Single Operator, Low Power category in 1987. After the RTTY

Roundup Silver Anniversary we wondered where he was and what he was running back in 1987. Don was 30 years old back then and was very active in RTTY DXing. Along with many others Don could be found nearly every evening on 20 meters ragchewing with RTTY operators from around the world. He ran a ground-mounted five-band vertical from Louisiana back in 1987.

The rules that Hal and I wrote all those years ago have withstood the test of time. The intent was to equalize station advantages and disadvantages so that stations could win the contest from anywhere across Canada and the United States, as well as making DX an important part of the contest.

It seems to have worked. We have winners from the "Black Hole," the "West Coast" and all over the continent. Look at any Top Ten box and you will see W1, W3, W4, VE7, WØ, W9 and W5 all in the winner's circle. What other contest has NØNI and WØSD beating out K1SFA, W4RM or NR5M?

RTTY Roundup — Next Year

The great unknown next year will be the propagation and what it might bring to the table for the RTTY Roundup. In a recent webinar Carl, K9LA, presented his thoughts on what Cycle 24 might bring the rest of this year and of course the next Roundup — it looks like it might be a double peak cycle but we won't know for a while.

I think next year will bring another round of nice band conditions and yet another increase in participation. The 150 QSO per hour mark may well be beaten, as operators become more efficient with the use of multiple radios and VFOs.

Use the rest of this year to plan your strategy for the next Roundup, January 4-5, 2014.

More LTRS and FIGS Online

There is more — much more — in the online version of this write-up at **www.arrl.org/contest-results-articles**: new records, complete regional and continental listings, stories from participants, the origin of *2Tone* by its author and a review by Don, AA5AU. Shift online and check it out!

Sean's Picks

Sean Kutzko, KX9X, kx9x@arrl.org, ARRL Contest Branch Manager

State QSO Parties this month: Hawaii, Kansas, Maryland-DC, Ohio

- **QRP Contests this month:** NJQRP Skeeter Hunt (Aug 11), NAQCC Monthly QRP Sprint (Aug 15), Flying Pigs Run for the Bacon (Aug 19).
- **ARRL UHF Contest (Aug 3-4):** There's plenty of activity on 222 MHZ and up. Go set up on top of the tallest hill around and work some stations!
- **North American QSO Party — CW (Aug 3-4):** One of the friendliest CW contests around. Exchange is just your first name and state. A great CW event for beginners.
- **Worked All Europe, CW (Aug 10-11):** Sponsored by the Deutscher Amateur Radio Club (DARC), "WAE" is considered one of the most challenging on-air competitions out there. The addition of QTC — sending a station a portion of your log — makes this contest unique and intense. If you *really* love CW, this contest may be your cup of tea.
- **ARRL 10 GHz and Up Contest — Round 1 (Aug 17-18):** Ready for the challenge of the microwaves? Head for the hills and set up your dish; portable operating for this contest is encouraged!
- **North American QSO Party — Phone (Aug 17-18):** The Phone version of the NAQP CW, held two weeks earlier. All information is the same, only the mode has changed.

SARTG WW RTTY Contest (August 17-18): Three separate 8-hour operating periods (with two 8-hour mandatory rest periods) make this event easy on your weekend and easy on your sleep schedule. Everybody works everybody in this digi-fest! Exchange is a signal report and a sequential serial number, starting with 001.

August 2013 W1AW Qualifying Runs

W1AW Qualifying Runs are held at 10 PM EDST on Wednesday, August 7 (0200 Z, August 8) and at 4 PM EDST (2000Z) on Thursday, August 22. The West Coast Qualifying Runs will be transmitted by station K9JM at 3590 and 7047.5 kHz at 9 PM PDST on Wednesday, August 14 (0400Z August 15). Unless indicated otherwise, sending speeds are from 10 to 40 WPM.

Strays

***QST* Congratulates...**

Joe Lowenthal, WA4OVO, who received the Herb S. Brier Award for Amateur Radio Instructor of the Year at the December 2012 Holiday Meeting of the Delta Amateur Radio Club. Joe was selected by a motion of the ARRL Programs and Services Committee and a unanimous vote by the ARRL Board of Directors during the July 2012 meeting in Windsor, CT. In the photo, from left to right, Past Delta Division Director Henry Leggette, WD4Q; Delta Division Director David Norris, K5UZ and Joe Lowenthal, WA4OVO. [Ken Laseter, KI4AOH, photo]

The 2013 ARRL September VHF Contest

1800 UTC Saturday, September 14 — 0259 UTC Sunday, September 16

- VHFers around the country congregate on 6 meters and up for the ARRL September VHF QSO Party! The exchange is simply your Maidenhead grid square. Don't know your grid square? Visit **www.arrl.org/grid-squares**.
- Tropospheric ducting is the main form of propagation in the September contest, with maybe a little sporadic E, too. With good conditions, stations hundreds of miles away can be worked on the VHF, UHF and microwave bands.
- New categories for 2013: Single Operator, 3-Band (SO3B) and Single Operator, FM Only (SOFM)! See the rules for complete info on these two new categories.
- Operate from home, a hilltop or from several different grid squares as a Rover. The choice is yours!
- E-mail electronic Cabrillo-formatted logs to **septembervhf@arrl.org**; paper logs can be mailed to ARRL September VHF Contest, 225 Main Street, Newington, CT 06111. All logs must be submitted no later than 0300 UTC Wednesday, October 10.

Complete rules and entry forms can be found at
www.arrl.org/september-vhf

Scan this QR code with your smartphone to go directly to the September VHF Contest rules page.

"It's a rainbow full of sound!" John Kalenowsky, K9JK,enjoys some special propagation enhancement while on the rove in the 2012 ARRL September VHF Contest [John Kalenowsky, K9JK, photo]

The 2013 ARRL International EME Competition

Three weekends of activity!

Sept 8-29: 2.3+ GHz
Oct 26-27: 50-1296 MHz
Nov 16-17: 50-1296 MHz

0000 UTC Saturday – 2359 UTC Sunday each weekend

- Becoming active in EME has never been easier! Many stations are working DX on 2 meters and up with only 100 W and a single long-boom Yagi. Using CW or digital modes, you too can bounce your signal off the lunar surface and work DX! Certificates will be awarded to all stations that submit a log with at least one QSO!
- Complete rules may be found at **www.arrl.org/contests**.
- Logs must be received at ARRL HQ no later than 2359 UTC Wednesday, December 18, 2013. Send electronic logs to **emecontest@arrl.org**; paper logs can be mailed to EME Contest, ARRL, 225 Main St, Newington, CT 06111 USA.

The 20-foot dishes Jimmy Vitorakas, SV1BTR, uses on 432 MHz, 1.2 GHz and 2.4 GHz to place at the top of the All Band, CW Only category year after year. [Jimmy Vitorakas, SV1BTR, photo]

The 2013 ARRL 10 GHz and Up Contest

Round 1: August 17-18 Round 2: September 21-22 6AM Saturday — Midnight Sunday local time

■ One of the most challenging events on the contest calendar, the 10 GHz and Up Contest tests your ability to communicate over hundreds of miles on the microwave bands. Portable operation is not only allowed, it's encouraged. Find the right spot and you can make QSOs across many miles. If you're an experimenter, this event is definitely for you! If you're interested, hook up with one of the regional microwave clubs and ask to help out; there's a list of them at **www.arrl.org/v-u-shf-clubs**.

■ E-mail logs to **10ghz@arrl.org**, or send paper logs to: 10 GHz Contest, ARRL, 225 Main St, Newington, CT 06111. All logs must be received by 2359 UTC on Tuesday, October 15, 2013.

■ Be sure to post your 10 GHz stories, photos and other interesting information about your contest experience at **www.arrl.org/soapbox**; high resolution photos are encouraged!

Scan this QR code with your smartphone to go directly to the rules page.

Veteran VHF+ operator Tony Emanuele, WA8RJF, works from Perry Township Park, Ohio in EN91 during the 2012 ARRL 10 GHz and Up Contest. [Stephen Gocala, Jr, KB8VAO, photo]

The August 2013 Rookie Roundup – RTTY

1800 UTC -2359 UTC Sunday, August 18

Warren Richey, KK4EVI, and Douglas Meyer, KK4JRB, used the Rookie Roundup as an opportunity to learn RTTY operation by activating the Charleston (SC) ARC station in the club's EmComm trailer. [Roger Hawthorne, AJ4UB, photo]

Scan this QR code with your smartphone to go directly to the Rookie Roundup rules page.

■ Digital modes come to the August Rookie Roundup, the contest aimed at amateurs licensed for three years or less. Old-Timers work the Rookies and are encouraged to mentor Rookies in person as well.

■ It's easy to get on RTTY; all it takes is a PC, a rig and an interface to connect your PC's sound card to your favorite HF transceiver. If you are new to RTTY, champion RTTY contester Don Hill, AA5AU, has a great beginner's guide to RTTY at **aa5au.com/rtty**.

■ Rookies can compete as a Single Operator, or get a bunch of Rookies together at the same station to enter as Multioperator. Up to five Single Op entries can band together and participate in the Team Competition. See the rules for complete details.

■ Submit your score summary online using the Rookie Roundup Score submission form within 72 hours. All Rookie participants get a certificate via e-mail.

■ Tell us how you did! Submit your story and high resolution photos to the Rookie Roundup Soapbox page at **arrl.org/soapbox**.

Complete rules and entry forms can be found at www.arrl.org/rookie-roundup

2012 DXCC Honor Roll

Established in April 1962, the DXCC Honor Roll is earned by DX Century Club members who submit confirmation for contacts reached within the numerical top 10 of the overall number of entities on *The ARRL DXCC List.* There were 340 entities on the DXCC list for this period with 331 being required for entry level Honor Roll. The period for this list spans January 1, 2012 through December 31, 2012. The boldface numbers indicate total current DXCC credits. The number next to the call sign represents an individual's total. See **www.arrl.org/system/dxcc/view/DXCC-HR-20130228-USLetter.pdf** for the weekly updated Honor Roll list. See Section I rule 1(v) at **www.arrl.org/dxcc-rules** for the current rules regarding the Honor Roll.

Bill Moore, NC1L, ARRL Awards Branch Manager

MIXED

340

4X1FQ/383
4X4DK/394
4X4JU/391
4X6KA/350
9A1CCY/343
9A2EU/349
9A2YM/361
9A4A/376
9A8A/349
AA1V/356
AA4H/354
AA4V/363
AA5AT/349
AA5AU/353
AA6G/357
AA6YQ/348
AA6Z/351
AA7A/356
AA8BN/347
AA8EY/366
AA9AA/348
AB0X/356
AB4IQ/348
AB5C/354
AB9V/352
AC7DX/347
AC8G/354
AD1C/353
AD5A/348
AE6Y/355
AF2C/353
AG9S/353
AI0O/351
AI9Y/348
AJ6V/354
AK0A/353
AK1N/352
CT1BH/371
CT1BOH/349
CT1EEB/347
CT1ZW/362
CT3BM/352
DF2NS/351
DF2UH/348
DF3CB/350
DF3GY/351
DF3IS/345
DF4PL/350
DF9ZP/350
DF9ZW/349
DJ0MCH/347
DJ1ND/353
DJ1OJ/367
DJ1TO/361
DJ2BW/392
DJ2RB/356
DJ2TI/361
DJ2YA/381
DJ3AS/352
DJ3IW/351
DJ4AX/374
DJ4GJ/351
DJ4LK/370
DJ4PI/369
DJ4PT/368
DJ4TZ/382
DJ4XA/372
DJ5AV/352
DJ5JH/370
DJ5JK/362
DJ6NI/367
DJ6OV/356
DJ6RX/371
DJ6TK/369
DJ6VM/367
DJ7ZG/377
DJ8CG/350
DJ8NK/365
DJ9HX/351
DJ9KG/355
DJ9ON/357
DJ9RQ/360
DJ9RR/352
DJ9WH/350
DJ9ZB/365
DK0EE/349
DK1BX/349
DK1FW/366
DK1RV/352
DK2GZ/348
DK2JX/351
DK3KD/357
DK3SF/360
DK5AD/358
DK5PR/363
DK6IP/355
DK8DB/351
DK8FS/352
DK8UH/348
DK9KX/359
DL0WW/360
DL2DX/354
DL2FAG/349
DL3IE/371
DL3MGK/347
DL3OH/373
DL4MCF/349
DL4MDO/349
DL5DSM/344
DL6ATM/353
DL6JGN/355
DL6QW/371
DL7AFS/349
DL7HU/384
DL7OD/364
DL7VEE/354
DL8NU/372
DL9NC/367
DU9RG/350
EA1AUS/349
EA1RT/351
EA3BT/348
EA3NA/368
EA4DO/372
EA4DX/349
EA4KD/349
EA4MY/360
EA5BM/348
EA5BY/349
EA6BH/362
EA6NB/349
EA7LQ/355
EA8AK/375
EA8AKN/349
EA8ZS/349
EI6FR/348
ES1AR/386
EY8MM/347
F2GL/362
F2VX/365
F3AT/388
F3SG/354
F5BEG/348
F5II/371
F5IL/350
F5NBU/349
F5NBX/348
F5NTV/349
F5OZF/349
F5QF/353
F5VU/365
F5XX/346
F6AJA/365
F6AOI/367
F6BEE/357
F6BKI/358
F6DYY/351
F6DZO/350
F6EXV/354
F6FHO/351
F6FXU/348
F6GCP/350
F6GUG/348
F6HDH/348
F6HUJ/349
F9CZ/352
F9XL/362
G0CGL/349
G0DBE/348
G0DQS/349
G0JHC/349
G3GAF/355
G3HTA/371
G3KHZ/367
G3KMA/378
G3KWK/358
G3LQP/368
G3NDC/371
G3NLY/375
G3OCA/348
G3PLP/352
G3RTE/355
G3RUV/365
G3SJX/352
G3SNN/354
G3UML/374
G3VKW/358
G3VXJ/350
G3WPF/357
G3XTT/352
G4BUE/359
G4BWP/352
G4DDS/353
G4ELZ/350
G4IUF/351
G4OBK/349
G4PTJ/349
G4YRR/349
G4ZCG/349
GJ3LFJ/349
GM0AXY/350
GM3ITN/384
GM3WIL/352
GM3YTS/350
GM4FDM/346
GM4YMM/348
GW3JXN/344
GW4BLE/356
HA0DU/360
HA0HW/350
HA5KG/347
HA5WA/349
HA8IE/349
HA8UT/351
HA9PP/348
HB0LL/367
HB9AAA/370
HB9AFI/361
HB9ANK/358
HB9AQW/363
HB9AZO/353
HB9BGN/354
HB9BGV/350
HB9BHY/347
HB9BOI/352
HB9BOU/345
HB9BZA/350
HB9CGA/349
HB9DDZ/349
HB9DKV/348
HB9KT/352
HB9MX/385
HB9PL/384
HB9QR/381
HB9RG/358
HB9US/366
HL3IUA/348
I0DJV/357
I0EKY/350
I0MWI/357
I0OLK/369
I0WDX/361
I1APQ/365
I1WXY/353
I2AOX/352
I2KMG/376
I2MOV/355
I2MQP/356
I2PEI/356
I2PNB/360
I2YBC/360
I2ZGC/358
I4ACO/352
I4AVG/352
I4EAT/356
I4EWH/349
I4FTU/370
I4LCK/368
I4MKN/369
I4WZT/349
I5ARS/380
I5CRL/357
I5FLN/367
I5GJK/345
I5JHW/353
I5KG/349
I5KKW/354
I5RFD/354
I5SDG/361
I5ZGQ/354
I6FLD/383
I6FYR/352
I6NO/368
I7WL/370
I7ZPB/381
I8ACB/357
I8DVJ/349
I8IHG/352
I8KNT/356
I8MTQ/353
IK0AZG/349
IK0DWN/349
IK0FVC/348
IK0OZD/346
IK1ADH/347
IK1GPG/349
IK2ABJ/349
IK2ANI/349
IK2BLA/349
IK2DFZ/349
IK2GNW/349
IK4CIE/349
IK4GME/349
IK4PLW/346
IK5ACO/349
IK5BAF/349
IK5CQV/349
IK5EKB/348
IK5HHA/350
IK5MEN/348
IK5ORP/344
IK6DLK/349
IK6GPZ/348
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IK8BQE/350
IK8CNT/349
IK8JVG/347
IN3TJV/355
IT9AUA/367
IT9PKO/348
IT9SVJ/349
IT9UCS/354
IV3TQE/353
IV3ZIZ/354
JA0AXV/361
JA0BKX/354
JA0CRG/350
JA0DAI/354
JA0DBQ/352
JA0DWY/357
JA0EKI/343
JA0EOK/351
JA0GCI/354
JA0GRF/361
JA0HXV/351
JA0LXP/357
JA0NZR/342
JA0RYN/351
JA0UH/357
JA0UUA/349
JA1ADN/382
JA1ALT/354
JA1BK/382
JA1BNL/352
JA1BRK/380
JA1CNM/354
JA1CQK/350
JA1DJO/346
JA1EOD/370
JA1FGB/357
JA1FNA/363
JA1FQI/344
JA1GRM/348
JA1GV/373
JA1HEE/350
JA1HGY/369
JA1HQG/355
JA1IFP/371
JA1IOA/354
JA1JAN/368
JA1LSP/360
JA1MLV/359
JA1MOH/360
JA1MRM/356
JA1MZM/352
JA1OCA/369
JA1OND/360
JA1PEV/362
JA1QWT/347
JA1QXC/351
JA1RJU/364
JA1SHE/348
JA1SJV/358
JA1SVP/358
JA1SYY/356
JA1TAA/366
JA1UQP/368
JA1VLK/356
JA1WPX/355
JA1WSK/361
JA1WSX/362
JA1XQC/347
JA2AH/368
JA2AHH/352
JA2AXB/356
JA2BAY/359
JA2BDR/350
JA2BL/374
JA2CXH/357
JA2DLM/354
JA2DSY/365
JA2FCZ/352
JA2FGL/352
JA2FJP/352
JA2FWS/349
JA2IVK/360
JA2JNA/352
JA2JPA/354
JA2JRG/349
JA2JW/385
JA2KVD/359
JA2LMA/351
JA2MNB/349
JA2QPY/350
JA2TBS/350
JA2VMU/348
JA2VPO/355
JA2WYN/350
JA2XYO/361
JA3AAW/372
JA3APU/349
JA3AZD/370
JA3BSL/348
JA3DLE/353
JA3EMU/363
JA3FYC/361
JA3GN/354
JA3LDH/349
JA3MHA/347
JA3THL/363
JA3TJA/351
JA4AFT/368
JA4DLP/363
JA4DND/360
JA4IYL/352
JA4LKB/353
JA4ZA/376
JA5AQC/355
JA5AUC/356
JA5BEN/351
JA5EXW/359
JA5FDJ/356
JA5IU/360
JA5OP/354
JA5XAE/345
JA6BDB/352
JA6BZA/348
JA6BZI/368
JA6CBG/351
JA6CDA/358
JA6GXP/360
JA6JPS/355
JA6LCJ/357
JA6MWW/348
JA6TMU/354
JA6VQA/351
JA7AQR/361
JA7BJS/357
JA7BWT/350
JA7EPO/353
JA7FWR/352
JA7GDU/360
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W7KNT/335
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YL2MU/341
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N4XM/341
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JA2FGL/339
KØBX/341
K3KO/337
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DKØEE/335
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I4FTU/340
JA1FQI/335
JA5EXW/336
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LA7AJ/339
PY2XB/335
RY9C/340
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W4VQ/340

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DL7VEE/334
JAØUUA/334
JA1IQV/337
JA3EOP/339
JJ2LPV/334
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K6YUI/340
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SP9FKQ/334
W1JR/334
W6RLL/339
W9OL/334

"I Am the ARRL"

Video Contest Celebrates Hams Just Like You

To help celebrate the ARRL's Centennial in 2014, we announce the "I am the ARRL" video contest. To enter, submit a pair of short video clips of yourself: one in your work setting, saying "I am [name]. I like [radio activity] and I am the ARRL," as well as a clip that shows you using or working with radio gear. For example, an entry might include a shot of a car mechanic in coveralls working over an engine. The mechanic looks at the camera and says "I am Henry Smith, NØXCC. I like to talk to people in distant countries and I am the ARRL." The paired shot might show him at home talking on the radio. Whether you're a lab technician in a white coat, a doctor with a stethoscope, a teacher in a classroom or a cook in a kitchen, we want you to show us that you are "that guy or gal down the street" and you are the ARRL.

Eligible clips will be assembled into one video that will be shown at the 2014 ARRL National Centennial Convention, scheduled for July 17-20, 2014 in Hartford, Connecticut. The names of everyone who submitted a video will be entered into a prize drawing, with the top prize being a mini-library of major ARRL publications.

In order for videos to be eligible, their subject must be an ARRL member. Entrants may submit more than one pair of videos. Clips should be shot in 9:16 format (widescreen) and 720 or higher definition. MP4 or .mov files preferred. Please, no VHS tapes as we cannot use them. ARRL must have the full rights for use of the video clips submitted. Releases for video participants can be found at **www.arrl.org/adult-picture-release-form** and **www.arrl.org/child-picture-release-form**. The submission deadline is December 31, 2013. Put the videos onto a CD or DVD and send them to: "I am the ARRL Video Contest," ARRL — Media & PR, 225 Main St, Newington, CT 06111.

Bernie McClenny, W3UR, w3ur@arrl.org

Mics on Ice — Amsterdam Island 2014

A multinational DXpedition team sets sail to the always inhospitable southern Indian Ocean.

In last month's column I mentioned that veteran southern Antarctic DXpeditioner and CQ *DX Hall of Famer Dr Ralph Fedor, KØIR, will be heading up a DXpedition to Amsterdam Island in January 2014. During the Dayton Hamvention I had the pleasure of sitting with Ralph and hearing about some of the challenges the team will face operating from rare FT#Z. This month we'll talk about the two islands in the group, their history and the much anticipated DXpedition taking place early next year.* — Bernie, W3UR

Amsterdam and St Paul Islands

Amsterdam Island or New Amsterdam (also known to the French as Ile Amsterdam or Nouvelle Amsterdam) is a French overseas territory located in the southern Indian Ocean at 37° 49' 33" south and 77° 33' 17" east. This volcanic island measures about 7 kilometers wide (4.3 miles) by 10 kilometers long (6.2 miles) and covers 55 square kilometers (21.2 square miles). The highest point on the island is the top of the volcano at 911 meters (2989 feet) above sea level (ASL).

The much smaller triangular shaped St Paul Island is located about 85 kilometers (53 miles) south of Amsterdam Island. St Paul is just less than 5 kilometers at its widest point and covers about 6 square kilometers (2.3 square miles). The island is located at 38° 43' 48" south by 77° 31' 20" east. The highest point on this isle is 270 meters (886 feet) ASL.

History of Amsterdam and St Paul Islands

Amsterdam and St Paul Islands together comprise one of the five districts that make up the French Southern and Antarctic Lands, known in France as *Terres australes et antarctiques françaises* (TAAF). Amsterdam was discovered by Spanish explorer Juan Sebastián Elcano on March 18, 1522. Elcano was second in command to Ferdinand Magellan, eventually taking the helm after Magellan's passing.

On June 17, 1633 the island was named Nieuw (New) Amsterdam by the Dutch captain Anthonie van Diemen, after the name of his ship. Willem de Vlamingh, also a Dutchman, made the first landing on November 29, 1696.

Île Amsterdam
Lat: -37.8328361 Lon: 77.5466533

Throughout the 18th and 19th centuries there were shipwrecks and visitors to the islands. On July 1, 1843 French Captain Martin Dupeyrat along with 12 men rowed ashore to Amsterdam Island and claimed it for France.[1] The French later dropped their claim.

Then in October 1892 the French again took possession of the two islands. A lobster cannery was established on St Paul Island in 1928, employing Bretons and Madagascans. The operation went bankrupt after 3 years and seven workers were left on the island. Three years after the cannery failed a rescue was made of the only two remaining survivors. Since 1949 scientific researchers have been stationed at the research base on Amsterdam Island, which is now called Martin-de-Viviès.

DXCC History of Amsterdam and St Paul Islands

The first official postwar ARRL® DXCC list was published in the February 1950 issue of *QST* magazine.[2] The Kerguelen Islands were listed, but Amsterdam, Crozet and St Paul islands were not. In the November 1950 issue of *QST* the first postwar revision was made, listing Amsterdam Island as being grouped with the Kerguelen Islands for DXCC purposes.[3] The next change came in the April 1951 issue, which stated: "Since the time of that announcement, some additional facts have come to our attention, with the result that we have decided to group Amsterdam

[1] A. Van Clee, *The Lost Island — Alone Among The Fruitful and Multiplying*, Henry Holt and Co., Metropolitan Books, September 2004.

[2] "ARRL Countries List," *QST*, Feb 1950, p 40.
[3] "Countries-List Changes," *QST*, Nov 1950, p 55.

Some of the members of the upcoming FT5ZM DXpedition to Amsterdam Island, and some others, meet before the Dayton Hamvention to discuss logistics for their upcoming adventure. Seated left to right are Bill Barr, N4NX; Jerry Rosalius, WB9Z; Ralph Fedor, KØIR; Bob Allphin, K4UEE; George Nicholson, N4GRN, and Wes Lamboley, W3WL. [Photo courtesy of Mike Weathers, ND4V]

Island & St Paul Island, both FB8, as a country *separate* from the Kerguelen Islands."[4]

The first scientific mission began on December 29, 1949 and in early 1950 FB8ZZ began to operate on the Amateur Radio bands with three French operators. The first contact with France was by Jean Denimal, F8EX, on March 25, 1950. Multiple operators used FB8ZZ from the island through 1972. In 1972 F6BCN (ex FY7AC) was part of the 23rd mission to Amsterdam and was issued the call FB8ZA. The last assigned FB8Z call was issued in 1983 to Michel Jolibert, who made no contacts as FB8ZR.

Then in 1985 France changed prefixes for Amsterdam and St Paul Islands (as well as Crozet and Kerguelen islands) to use FT#, with the first calls for Amsterdam and St Paul being FTØZA and FT8ZA, which were issued to Jean-Claude, F6GWO, in 1987. The last call issued was FT1ZL to Sebastien, F4EIH, who at the time (2004) was only able to operate on VHF (6 meters). The one and only DXpedition to Amsterdam was FT5ZH from November 25 to December 20, 1998 by Mehdi, F5PFP, and Eric, F5SIH, who made some 32,065 contacts, of which approximately 14,000 were uniques. All Amateur Radio operations in the region that we are aware of have taken place from Amsterdam and none from St Paul.

FT5ZM

Dr Ralph Fedor, KØIR, will be leading a team of very experienced DXpeditioners to Amsterdam Island in early 2014. The team's completed application was approved by the TAAF for a stay of up to 18 days with the call sign FT5ZM. Amsterdam is one of two islands (Amsterdam and St Paul) that are part of the DXCC Entity FT#Z, which currently ranks # 6 on the Club Log's most wanted list (see Table 1).

The team is planning to arrive in Fremantle, Australia in early January; there the members will meet up with the 128 foot MV *Braveheart* on January 12. Between then and January 15, when they set sail for Amsterdam Island, they will be gathering fuel and supplies. Their journey to the island will take an estimated 9 days (1900 nautical miles), so they anticipate arriving on January 24. Once there they will immediately begin disembarking, provided sea conditions and weather allow. The team "will have 18 days to set up, conduct the DXpedition and tear down for departure" before taking approximately 9 more days to go back to Fremantle.

FT5ZM Team

Joining Ralph will be Nodir, EY8MM;

[4]"DXCC Notes," *QST*, Apr 1951, p 76.

Michel, FM5CD; Jorge, HK1R; Bob, K4UEE; Craig, K9CT; Erling, LA6VM; Bob, N2OO; George, N4GRN; Dr Arnie, N6HC; Andy, UA3AB; Neil, VA7DX; Steve, VE7CT, and Jerry, WB9Z. Plans are to be QRV on 1.8-28 MHz on CW, SSB and RTTY.

Sponsorship

The budget for this project is $400,000 and as of press time the team has reached almost 60% of the goal. They are seeking support from corporate, club and organizations as well as individuals. In July they will be making a down payment of $50,000. Equipment is expected to be shipped on September 1. The team has a website at **www.amsterdamdx.org**, which includes news, sponsorship details and more information. As the departure time approaches, more details will become available on the website and from other DX outlets.

DX News From Around the Globe

KH9 — Wake Island

A 12 man team is heading to Wake Island in October. This one ranks number 15 worldwide on the Club Log most wanted list, number 10 in Europe and 36 in North America. The exact dates have not been announced as of press time, however the team is planning to use the 1×1 call K9W, which is authorized for use from September 20 to October 20. Plans are to be active on 1.8-50 MHz on CW, SSB and RTTY. The target frequencies are:

CW — 1826.5; 3523; 5405; 7023; 10,103; 14,023; 18,079; 21,023; 24,894; 28,023 and 50,107 kHz.

SSB — 3790; 5403.5; 7082; 14,185; 18,140; 21,285; 24,955; 28,485 and 50,107 kHz.

RTTY — 3580; 7035; 10,142; 14,080; 18,099; 21,080; 24,912 and 28,080 kHz.

The 12 man team includes Joe, AA4NN; John, K6MM; Carl, K9CS; Craig, K9CT; Mike, K9NW; Lou, N2TU; Mark, NA6M; Tom, ND2T; Dick, W3OA; Joe, W8GEX; Hal, W8HC, and Jerry, WB9Z.

The website at **www.wake2013.org** has propagation suggestions and a log search link to Club Log. QSLs will be handled by Joe, AA4NN, either direct, via the bureau or the much preferred method of OQRS (Online QSL Request Service). The other methods will work — eventually. If you are not aware of the benefits of OQRS, I suggest you read the June "How's DX" column on QSLing the DX station.[5]

Table 1
Club Log FT#Z Most Wanted Rankings

Mode/Band	Rank
Mixed	6
CW	6
RTTY	7
SSB	9
6 Meters	13
10 Meters	18
12 Meters	10
15 Meters	6
17 Meters	5
20 Meters	7
30 Meters	5
40 Meters	7
80 Meters	11
160 Meters	4

TN — Congo

Members of the DAGOE Mercy Ships DXpedition team have announced plans for their fourth trip to Africa, following their successful operations in Liberia, 5L2MS; Benin, TY1MS, and Sierra Leone, 9L5MS. This time it will be to the Republic of the Congo where they will sign TN5MS from September 28 to October 11. The operators will be Arie, PA3A; Ad, PA8AD; Angelina, PA8AN, and Marian, PD1AEG. They may also operate from the ship, which does not count for DXCC, from September 22-27. While on shore they will be operating HF from the Pointe-Noire area. More details can be found at **www.tn5ms.nl**. QSL via Henk, PA3AWW, LoTW or the preferred OQRS.

XW — Laos

Steve Telenius-Lowe, 9M6DXX, has announced plans for a multinational DXpedition from Vientiane, Laos that is scheduled for September 6-16, 2013. Joining Steve will be 9V1YC, EA2TA, EA3NT, EA5KA, F4BKV, G3XTT and MMØNDX. Activity will be on CW, SSB and RTTY on 1.8-50 MHz. Call sign, website and more details are forthcoming.

[5]B. McClenny, "How's DX?," *QST*, Jun 2013, pp 88-89.

Wrap Up

That's all for this month with a special thanks to 9M6DXX, KØIR and *The Daily DX*. Don't forget to send your DX news, photos and club newsletters to your DX editor at **w3ur@arrl.org**. Until next month, see you in the pileups! — *Bernie, W3UR*

Jon Jones, NØJK, n0jk@arrl.org

Opening Deconstructed: VK4MA to the Midwest

Some great openings leave us with some big questions.

On the evening of May 19, a big cross-country sporadic E (E_s) opening occurred on 6 meters. As I tuned across the band from eastern Kansas I heard excited stations in New York, Ohio and Virginia working Arizona and California on double hop E_s. It was one of the best such openings so far this season. In Queensland, Australia Paul, VK4MA, was working from home and had his radio on 50.110 MHz "monitoring." The month of May is usually a slow one for 6 meter propagation "down under." Paul notes "At this time of year the band is always dead here and, with few hams in my local area, no signals to be heard at all on six." Perseverance and persistence sometimes pay off. Around 2330 UTC Paul heard a CW CQ on 50.110 MHz and was surprised to hear Warwick, E51WL.

I have worked E51WL many times — but generally the path is via E_s and *multihop E_s is very rare for us in May*. Something about the sound of his signal was also very different — no fading — weak but very consistent — he CQ'd a few times and disappeared.

At the time I was in the middle of a repair so I did not answer E51WL. Upon finishing the repair, about 20 minutes later, I thought I would put out a CQ — CQing in May is usually a waste of time here but the E51 opening suggested that something was afoot on the band.

I put out my first CQ on 50.110.6 CW and *to my amazement W9FF in Illinois came straight back at a steady S5 (2354 UTC)*. A hasty QSO was made and I then hightailed it to my usual CQ frequency, which is 50.102. Just before departing 50.110.6 I heard a local VK4 (VK4WTN) calling W9FF, but he got no reply (I guess W9FF was as dumbstruck as I was!).

Paul posted his QSO with W9FF on the ON4KST chat page (**www.on4kst.com**) along with his new CQ frequency of 50.102 MHz.

It took a minute or so for the news to sink in as I got no replies to my first couple of CQs. I then had a steady trickle of stations — K9MRI (IL) 2359, NWØW (MO) 0002, K9ZM (IL) 0002, WZ8D (OH) 0004, W9WZJ (IN) 0006, WB8ART (OH) 0012 — a long gap and then last was KØGU (CO) at 0030 UTC — all signals were Q-5 but with little strength.

Paul concludes "I have only been active on six since mid-2008 — this is my first opening into the W8, W9 and WØ US call areas." Paul believes "The opening May 20 UTC is a pretty rare event — and different from the usual opening we get into the West Coast and W5 around our usual summer E_s time."

Paul is correct that Australia to mainland USA openings have been very rare in Solar Cycle 24. I did some casual research and found the openings shown in Table 1.

Some features are apparent. The listed openings from Australia are confined to California, south Texas and Florida with most in the winter months but two in April. So exactly what happened May 19-20?

Was it F2?

The solar flux was 132, which is too low for direct F2 on 6 meters. NWØW reported at grid square AH50 an hour before the opening "was at 15.2 MHz on the ionosonde." The maximum usable frequency (MUF) for radio waves transmitted at a low angle to the horizon is about three times the highest frequency returned to the ionosonde from radio waves transmitted directly upwards. So, $3 \times 15.2 = 45.6$ MHz. Close, but not 50 MHz. A CME hit Earth's magnetic field on May 19 at 2250 UTC. The day before a larger CME impacted at 0100 UTC May 18. This may have raised the MUF on portions of North-South F layer and Transequatorial Propagation (TEP) paths, but it would have been too small to boost the F layer MUF all the way to Australia.

Table 1
VK — US Mainland 6-Meter Openings, Solar Cycle 24

2011	
October 26	K6QXY — VK4NA
2012	
January 1	K5RK — VK5PO, VK5ACY, VK5NK, VK3OER N3LL — VK5PO
January 6	K6QXY — VK3ZAZ
January 15	K4RX — VK5PO K5RK — VK5PO
February 8	N5DG — VK4CZ, VK4WM K5RK — VK4WTN
February 29	N5DG — VK4MA
April 6	K6QXY — VK9/ZL1RS
April 8	N5DG — VK4MA
December 31	K5RK — VK5PO

TEP

The timing of this opening was earlier than regular afternoon TEP from Australia to the Northeast Pacific. Afternoon TEP from Hawaii to Australia is typically around 0400-0700 UTC. Fred, KH7Y, was listening while this opening was in progress and heard no signals from either Australia or the US mainland.

E_s

This opening was confined to a small narrow footprint in the midwestern states, a hallmark of a sporadic E link. There was widespread cross-country E_s at this time, so an E_s link is plausible, but an E_s link to where and what? Multihop E_s all the way from the midwestern USA to Australia across the geomagnetic equator is unlikely. More so, as multihop E_s are very rare on the Australian end in May.

F2 couldn't support the entire path nor could TEP by itself, plus the timing seems wrong. The distance is too far for E_s all the way, but I know E_s had a role, particularly on the stateside end of the path.

A Different Idea

Maybe Carl Luetzelschwab, K9LA, can help. Carl's outstanding articles critically examined the path from California to New Zealand.[1] The hypothetical conclusion Carl arrived at for the path was an E_s link from W6 to the TEP zone, chordal propagation

[1]R. C. Luetzelschwab, K9LA, "'Up Over' to 'Down Under': W6 to ZL on 6 meters," World Radio Online (**www.worldradiomagazine.com**) Jun 2010.

across the geomagnetic equator then back down to the Pacific with another E_s link on to New Zealand.

The timing of the openings Carl examined and others occurred mostly from 2230-0100 UTC. Ahhh — so this is how it happened? Before accepting this conclusion remember that the openings Carl studied were in December — not May. Also, Australia is a few thousand kilometers farther west than New Zealand. Finally, it was midwestern stations, not western or Gulf Coast stations working VK4MA. Based on Carl's hypothetical hop structure, it may have taken two hops for the US midwestern stations to reach the TEP zone toward Australia. But how far is it from eastern Australia to the first TEP crest? Too far for one and perhaps even two E_s hops for VK4MA.

E51WL

Paul heard E51WL with "weak but consistent signals" 20 minutes before the opening to the Midwest took place. Perhaps that's a clue?

Scatter

The weak consistent signals from E51WL suggests *scatter*. Perhaps F-layer side, back or forward scatter. If F2 sidescatter from VK4 to E51 — then perhaps the direct F layer path may have been open toward the US mainland for Paul on 50 MHz. A way to investigate this may be to run a "backscatter radar" on 6 meters.

The CME impact at 2250 UTC may have been enough to tweak the MUF over 50 MHz along parts of the path, more so on Paul's end as the sun would be right over the central Pacific. To conclude — the eastern portion of the path may have been double hop E_s from the Midwest to the first TEP crest, then a chordal hop to the second TEP crest and perhaps additional F2 refraction scattering to VK4. Sharp operating by Paul and the careful tuning by observant stateside stations found this opening.

On the Bands

50 MHz Fireworks to South America. There were a series of major E_s-TEP openings May 2-16 and again at the end of the month. Lefty, K1TOL, started out May with PP5JD and 9Z4BM on the 2nd at 1950 UTC. N5DG found CE2AWW at 2102 UTC. The next day there was a strong E_s-TEP opening from W9 to Chile. KA9FOX worked CE2AWW for a "new one" at 2150 UTC. Dennis, K7BV, also worked Dale, CE2AWW, and LW3EX, CE3FZ and LU9AEA. He observed a "hollow quality" to Dale's signal, which may have been from multipath.

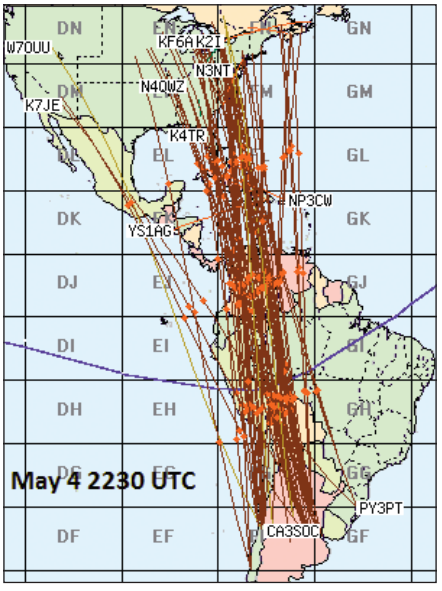


Figure 1 — This map shows the May 4 opening between the Midwest and South America. [dxmaps.com]

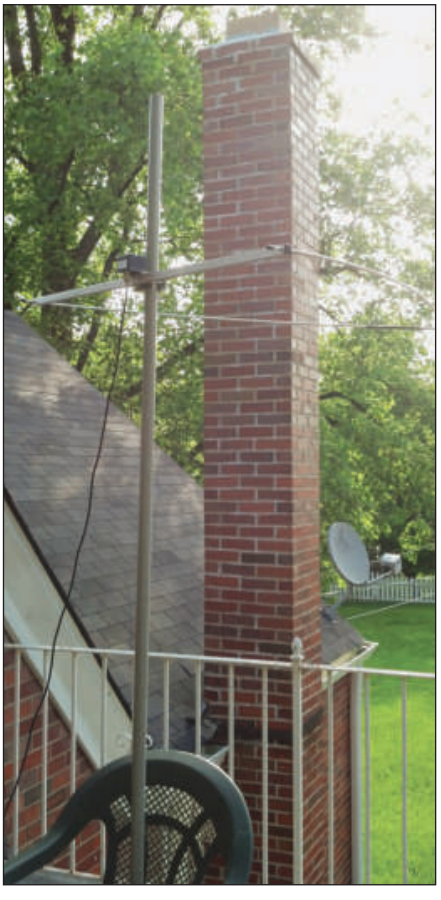


Figure 2 — While participating in the trans-equatorial opening on May 4 Chris Losito, KB9SDX, in Missouri managed to work LU9EHF at 2132 UTC and LU1FP at 2216 UTC. Both were SSB contacts with signal reports around 55-57 and were completed using just 50 W into a PAR Omniangle antenna temporarily installed on his second floor balcony. [Chris Losito, KB9SDX, photo]

The fireworks continued on the 4th with many South American stations working across the Midwest (see Figure 1). KØHA, K3PA, NØXA and NØLL worked many. There was a VHF contest in Brazil, so there were many stations on the air. PY3OR was so strong NØJK (EM28) was able to log him while mobile at 2155 UTC. Chris, KB9SDX, in Missouri logged LU9EHF and LU1FP at 2216 UTC. Chris uses just 50 W and a PAR Omniangle antenna on the second floor balcony of his house (see Figure 2). "It is always encouraging to hear what can be accomplished with a very modest setup." says Chris. WB8VLC in CN84 worked CE2AWW on the 4th at 2310 UTC. Mike, WB8VLC, was running only 35 W to a 5 element loop fed array (LFA) Yagi up 20 feet.

The band cooled off for a few days, then the E_s-TEP openings were back strong on the 7th. NØKE (DM69) logged CE2AWW and PY1RO at 2200 UTC. The 9th was a big day for Jay, KØGU (DM70), who had a 3 hour opening to South America working CE and LU. Phil, NØKE (DM69), was on but "I never even heard one DX station the whole time and I was at the rig here in DM69 with 7/7 Yagi stack and a KW. I did hear KØYW in DM67 calling some stations and I think he made at least a few QSOs but he is almost in NM in DM67." K4QI (EM85) logged CE2AWW.

The E_s links can be loud but fickle depending on the footprint. Within the link's footprint even a dipole or loop can be loud. Out of the footprint — nothing, even for big stations. K9CT worked CX7BBB at 2048 UTC. NØLL (EM09) worked LU1FP and CE2AWW. NDØB (EN07) in North Dakota was in on it logging CE3RR and LU8MB around 2125 UTC. From Florida, Steve, NN4X, worked LU4EFC at 1925 UTC who was running just "1 watt to a bamboo vertical!"

May 10 had extensive E_s in the morning from the Midwest and East Coast to the Pacific Northwest. At 1500 UTC K7CW (CN87) worked KP4EIT (FK68) at 6022 km on three E_s hops or about the same distance as Puerto Rico to Spain! NØJK (EM28) logged K7CW at 1520 UTC, a rare path at 2420 km from eastern Kansas. A difficult distance as it is between one and two E_s hops. The usual maximum for one E_s hop ~ 2300 km. The afternoon featured another strong E_s-TEP opening to South America. NØJK (EM28) was at home watching his grandkids and worked an extremely loud LU9EHF (FF95) at 2200 UTC on 50.130 MHz with an attic dipole (see Figure 3).

Luis was booming in well over S9, one of

the more remarkable things I have heard on 6 meters. He was as loud as WFØN who is only a mile away. I recorded LU9EHF working K9KU (EN65) and Ted, WFØN (EM28). Ted is fluent in Spanish and chatted with Luis a few minutes. The E_s link was confirmed a few minutes later when a strong XE2X (EL06) appeared. AA1BR worked CE2AWW also with just an attic dipole at 2239 UTC. LU9EHF worked all across the US midsection and as far north as Alberta to VE6EGN (DO23) at 2245 UTC. The extremely strong signals for stations running low, simple antennas suggest possibly chordal type E_s for the link to TEP. A chordal E_s link can have a fairly high angle to the E_s cloud. Thus, a low dipole, loop or whip with a high angle of radiation would have low signal loss.

On May 11 the Pacific Northwest had a nice opening to Alaska. WB8VLC (CN84) worked W7IV/KL7 (CO45) at 0409 UTC. Al, KL7NO (BP54), worked K6QXY and VA7FC (CN79). JR2HCB spotted the KH9/WA2YUN/b at 0419 UTC.

An early opening from Hawaii to the mainland states occurred May 13. Fred, KH7Y, logged W6, W7 and as far east as N8JX (EN64) at 1913 UTC. On May 16, Ed, VP9GE, worked Ohio and heard W5JLC (DM81).

May 16 was a nice E_s opening for many to the Caribbean and again some links to deep South America. Bill, KØHA (EN10), logged CX9AU, YV5IUA and CE6RC. NØJK heard HI8W (FK48) work WA8FTA (EN52) at 2245 UTC. NØLL (EM09) heard and called PY1RO for 15 minutes but no luck. Larry worked LU2DEK at 2224 UTC. K4QI (FM06) heard many loud CX, LU and PYs. On May 17 more South America for AC4TO (EM70) who logged seven LUs, four CXs, 11 PYs, TI, YS and CO6CBF in rare grid EL92. KØGU (DN70) worked PA2M at 1756 UTC! Jay believes this is the first US mainland to Europe 6 meter contact via E_s this season. On May 19 AC4TO worked PA2M at 1438 UTC. Later SP4MPB answered his CQ. K4QI (FM06) worked VP5. Arne, N7KA, New Mexico logged CX and LU.

The K5N group was active from rare grid EL58. They caught a good E_s opening to the Northeast May 20. May 21 was the first major Caribbean to Europe opening. 9Z4BM worked G8BCG and 8P6SH worked GM3SEK. May 24 a CME propelled into space by the M5-class explosion of May 22 delivered a glancing blow to Earth's magnetic field. DF9CY (JO54) heard the OX3SIX/b (HP15) 599 via aurora E_s at 2117 UTC. K9KU (EN65) worked K8JA (EN82) at 2125 UTC via aurora.

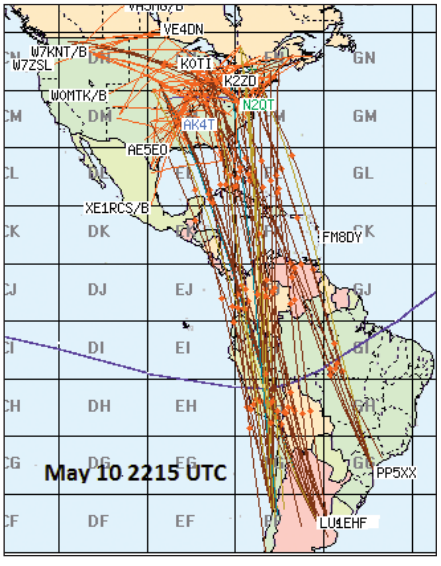


Figure 3 — Map of the May 10 E_s-TEP opening that brought LU9EHF into Kansas. [dxmaps.com]

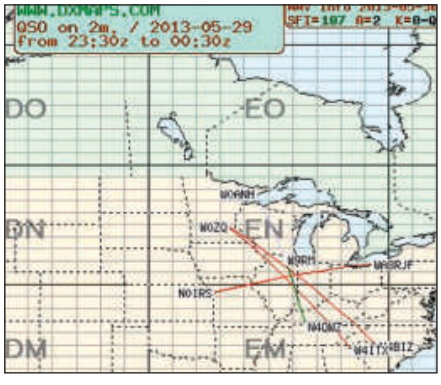


Figure 4 — This map shows the 2 meter E_s and E_s backscatter contacts between WØANH (EN47) and W9RM (EN52). [dxmaps.com]

On May 26 more E_s-TEP for the East Coast. It seems that Argentina, Chile and Brazil were workable from almost all parts of the mainland USA sometime in the month of May for alert operators with modest 6 meter stations. The time frame from 2100-2330 UTC seemed to be the peak period. K2MUB spotted LU5FF at 2130 UTC.

Earlier that day a strong NDØB (EN07) was in on short skip to eastern Kansas at 1550 UTC for NØJK. The WZ8D/b was spotted by KH6SX at 2130 UTC. May 27, KA9CFD and W9EWZ found a loud LU5FF at 2155 UTC. Tim, NWØW (EM47), heard the FM1ZAC/b at 0023 UTC. Kelley, KB3LR, used a 2 element Yagi to work FG4NN and WP4JCF (FK68). Rich, K1HTV, worked F8GGD at 2200 UTC on the 28th. May 29 KQØJ (EN11) worked PJ4NX using a homebrew Squalo and 100 W. VE2XK (FN07) worked his grid # 666 with WDØESF (EM07) on May 30. Also on the 30th, K4QI (EM85) worked EA7KW via multihop E_s. He said many EA8s and CUs were in on the 31st but no "mainland Africa."

2 Meter E-Skip May 29-30! E_s was logged on 2 meters from NØIRS and KYØO (EM29) to WA8RJF (EN91) at 0005 UTC May 30. This is a fairly short path implying a high E_s MUF. Tony, WA8RJF, noted "I worked NØIRS (EM29) on 144.200 MHz and a few minutes later KYØO also in EM29. The band was open to the EM29 area for at least 15 minutes as I last heard NØIRS at 0015 UTC. The usual indicators were present just prior to our contact: Very short skip on 50 MHz with very strong signals. For example K9CT (EN50) was very loud on 50 MHz." W4ITX (EM84) logged WØZQ (EN34) at 0027 UTC. Jay, W9RM (EN52), worked WØANH (EN47) via *E_s backscatter* at 0025 UTC (see Figure 4). Backscatter works on 2 meters as well as the lower frequencies. On May 17, K5SW (EM25) worked XE2OR (DL98) via tropo.

222 MHz. Sam, K5SW (EM25), heard the new K5TRA/b Austin, TX 599 on May 22 via tropo.

432 MHz. Vic, WB4SLM (EM82), worked KD7YZ (EM88) at 1100 UTC via tropo on May 25.

902, 1296 MHz and Up. Vic, WB4SLM (EM82), worked N4TUT (EL98) on 1296 MHz May 26 with a "20 over S9" signal.

Here and There

Rich, K1HTV, says VE3EN's "SolarHam" website (**www.solarham.net/6m/data.htm**) has many resources for VHF propagation. It also has a great data archive that can help predict the best times for 6 meter propagation. One conclusion Rich found was: "Did you know that in the past 9 years on 77% of the May 29 dates there was E-skip between the Eastern USA and Europe and 66% of the days on May 30th?"

Neil, V73NS, has set up a new 6 meter beacon from the Marshall Islands — V73SIX/b on 50.014 MHz grid RJ39. It runs 40 W to stacked M^2 loops at 13 and 25 feet high. More information at **www.qsl.net/v73ns/v73six.htm** (thanks OZ6OM).

The DXpedition to Juan Fernandez Island, XRØZR, November 8-20, 2013 announced that it would include 6 meters (**www.juanfernandez2013.com**).

Special Event Stations

Maty Weinberg, KB1EIB, events@arrl.org; www.arrl.org/special-event-stations

Contact these stations and help commemorate history. Many provide a special QSL card or certificate!

Jan 1-Dec 31, 0000Z-2359Z, EI13CLAN, Dublin, Ireland. Irish Radio Transmitters Society. The Gathering. 28.050 21.320 18.080 14.220. Certificate & QSL. David, O'Connor, Silver Howe, Sydenham Mews, Corrig Ave Dunlaoghaire Co Dublin, Ireland. *Year of the Gathering, a celebration of all things Irish. The IRTS has been issued the special call EI13CLAN that will be on air throughout the year. In keeping with the spirit of the Gathering, the IRTS offers the chance for all amateurs with Irish ancestry to get their call entered to the CLAN Roll of Honor. Details:* **irts.ie/clancq** *or* **www.qrz.com/db/ei13clan**. *Queries:* **clan@irts.ie**. **irts.ie**

Jul 19, 1300Z-2300Z, W2R, Ogdensburg, NY. Frederic Remington Art Museum. 90th Anniversary of the Frederic Remington Art Museum. 28.350 24.950 21.300 14.325. Certificate. Martin Dempsey, 123 CR 4, Ogdensburg, NY 13669. **www.frederic remington.org**

Jul 20-Jul 21, 1300Z-0300Z, K2CAM, Garden City, NY. Long Island Mobile Amateur Radio Club. 44th Anniversary of the First Moon Walk. 14.260 7.160. QSL. Moon Walk, c/o LIMARC, PO Box 392, Levittown, NY 11756. *The Cradle of Aviation Museum celebrates the 44th Anniversary of Neil Armstrong's walk on the moon.* **www.cradleofaviation.org**

Jul 21, 0000Z-2359Z, K8L, Wellston, OH. Jackson County Amateur Radio Club. Kelli Lambert Memorial Event. 21.280 14.280 7.280 3.880. QSL. Roman Brandau, WU8R, 112 Montgomery Mdws, Wellston, OH 45692. *In remembrance of the 10th anniversary of the Line of Duty Death (LODD) of Wellston (Ohio) Police Officer Kelli Lambert (EOW July 21, 2003). All QSL cards received will be presented to Kelli's family.* **www.qrz.com/db/k8l**

Jul 27-Jul 28, 1300Z-2100Z, K8UTT, Dearborn, MI. Ford Amateur Radio League. 4th Annual Detroit Maker Faire at The Henry Ford. SSB: 28.400 14.250 7.270 3.900; CW: 28.170 14.130 7.100 3.550. Certificate. FARL, PO Box 2711, Dearborn, MI 48123. *10 20 40 80 m, satellite attempts will be made.* **www.k8utt.org**

Jul 31-Aug 4, 1500Z-2359Z, W9ZL, Appleton, WI. Fox Cities Amateur Radio Club Inc. EAA AirVenture 2013. 50.150 14.250 7.250. Certificate. FCARC AirVenture 2013, PO Box 2346, Appleton, WI 54912. **www.fcarc.us**

Aug 1-Aug 11, 2000Z-2000Z, W9B, Sheboygan, WI. SCARC. Sheboygan Brat Days. 28.360 21.360 14.260 7.260. Certificate. Sheboygan County Amateur Radio Club, PO Box 1282, Sheboygan, WI 53082. **www.w9vcl.com**

Aug 2-Aug 4, 1502Z-1822Z, N7C, Beaverton, OR. Oregon Tualatin Valley Amateur Radio Club. Crater Lake National Park 111th Anniversary. 28.550 14.240 7.250. Certificate & QSL. Dave Wright, 18535 SW Longacre St, Beaverton, OR 97006. *111th anniversary of Oregon's only National Park.* **www.otvarc.org**

Aug 2-Aug 5, 2000Z-1500Z, W1T, Gloucester, MA. Cape Ann Amateur Radio Association. Thacher Island Activation (NA-148). 21.040-21.065, 14.030-14.035 7.040-7.065 28.400, 14.070, 7.035 14.250, 7.185. QSL. Cape Ann Amateur Radio Assn, 6 Stanwood St, Gloucester, MA 01930. **w1glo@verizon.net** or **www.caara.net**

Aug 2-Aug 19, 1300Z-0100Z, W9ISF, Indianapolis, IN. Indiana State Fair Amateur Radio Club. Indiana State Fair. 21.240 18.140 14.240 7.240. QSL. Indiana State Fair ARC, 7405 E County Rd 900 N, Brownsburg, IN 46112. *PSK31 Aug 8 on 20 and 40 meters. Other dates primarily SSB from off-site QRO stations.* **www.qrz.com/db/w9isf**

Aug 3, 1400Z-2000Z, WØR, Red Wing, MN. Hiawatha Valley Amateur Radio Club. River City Days. 14.250 7.250 147.300. QSL. Bill Eichenlaub, 1966 Launa Ave, Red Wing, MN 55066. **w0ike@q.com**

Aug 3-Aug 4, 1300Z-2200Z, KC2YYL, Youngstown, NY. Niagara County Special Events Radio Club. ILLW Fort Niagara Lighthouse. 7.225, 20 17 15 12 meters. QSL. John Titta, 1460 Staley Rd, Grand Island, NY 14072. *Search YouTube "KC2YYL." ARLHS #1804. Bands may vary depending on conditions.* **ac2dd@arrl.net** *or* **www.kc2yyl.net**

Aug 4, 1500Z-2300Z, KVØCO, Pikes Peak, CO. Colorado 14er Event Task Force. Colorado 14er and Summits On The Air (SOTA) Event. 147.42 446.0 14.060 14.260. QSL. QSL to station worked. *Hams operate from the 14,000 foot mountains* and *the SOTA peaks in Colorado. Many stations will be on the air from multiple summits, including Summits On The Air summits.* **www.14er.org**

Aug 4-Aug 5, 1400Z-0400Z, K1CG, Port Angeles, WA. US Coast Guard CW Ops Association and the CG Club. Coast Guard 223rd Birthday. 21.327 21.052 14.327 14.052 7.227 7.052 3.827 3.552. QSL. *K1CG will be operated by several different stations across the country starting on the east coast and moving west. QSL info at.* **www.qrz.com/db/k1cg**

Aug 7, 0001Z-2359Z, K2JXW, Merchantville, NJ. Amateur Radio Lighthouse Society. National Lighthouse Day. 28.350 14.250 7.250 3.950. Certificate. ARLHS Hdq, 114 Woodbine Ave, Merchantville, NJ 08109. **www.arlhs.com**

Aug 8-Aug 11, 1300Z-2100Z, W9S, Sycamore, IL. Kishwaukee Amateur Radio Club. 57th Annual Northern IL Steam Power Show and Threshing Bee. 14.243 7.243 7.042 3.988. Certificate. Bob Yurs, W9ICU, 1107 Commercial St, Sycamore, IL 60178. **www.karc-club.org**

Aug 8-Aug 18, 1300Z-1700Z, WØISF, Des Moines, IA. Madison County DX Club. Iowa State Fair. 146.520 14.215 7.215. QSL. Mark Mease, 2989 Truro Rd, Truro, IA 50257. *Eleven days of fun. Operating at various times during the fair.* **mmease@netins.net**

Aug 10, 1300Z-2100Z, W4B, Braselton, GA. Tri County Amateur Radio Club. 97th Anniversary of Braselton, Georgia. 21.355 18.145 14.100 7.265. Certificate. Bob Richardson, 1266 Harvest Ln, Hoschton, GA 30548. *Instructions for certificate will be given at time of QSO.* **www.tricountyarc.com**

Aug 10, 1400Z-2200Z, W8VP, Cambridge, OH. Cambridge Amateur Radio Association. Salt Fork Arts & Crafts Festival. 14.260 7.235. Certificate & QSL. Cambridge Amateur Radio Association, PO Box 1804, Cambridge, OH 43725. *8th Special Event in CARA's year-long 100th Birthday Celebration. QSL. Certificate available for anyone who works* all *12 of CARA's monthly 2013 Special Events.* **www.w8vp.org**

Aug 12-Aug 18, 2300Z-2200Z, W9IMS, Indianapolis, IN. Indianapolis Motor Speedway Amateur Radio Club. W9IMS MotoGP Special Event. 21.350 14.245 7.240 3.840. Certificate & QSL. IMS ARC, PO Box 30954, Indianapolis, IN 46230. **w9ims.org**

Aug 14-Aug 17, 0000Z-0000Z, N7C, Window Rock, AZ. Navajo Amateur Radio Club. The Navajo Code Talker Day. 14.265 7.265. QSL. Herb Goodluck, PO Box 3611, Window Rock, AZ 86515.

Aug 16-Aug 19, 1000Z-2300Z, W6A, Placentia, CA. US Coast Guard Auxiliary. International Lighthouse and Lightship Weekend. 14.275. QSL. Roy Lay, 219 Beal Ave, Placentia, CA 92870. *Point Fermin Lighthouse, San Pedro, CA.* **roy@roylay.com**

Aug 17, 1300Z-2100Z, N1KT, Stratford, CT. Housatonic Amateur Radio Club. Gustave Whitehead — Aviation Pioneer. 14.265. Certificate. Gary Moyher, PO Box 331, Stratford, CT 06615.

Aug 17, 1400Z-2100Z, W8LKY, Alliance, OH. Alliance Amateur Radio Club. Alliance, Ohio Carnation Days Festival. 14.240 14.045 7.240 7.045. Certificate & QSL. Alliance Amateur Radio Club, PO Box 3344, Alliance, OH 44601. **www.w8lky.org**

Aug 17-Aug 18, 0000Z-2300Z, W4J, Barnegat, NJ. Amateur Radio Lighthouse Society. ARLHS / ILLW — International Lighthouse-Lightship Week. 28.370 14.270 7.270 3.970. Certificate & QSL. ARLHS, 114 Woodbine Ave, Merchantville, NJ 08109. **arlhs@gmail.com**

Aug 17-Aug 18, 0000Z-2359Z, K6A, Rancho Palos Verdes, CA. United States Coast Guard Auxiliary. International Lighthouse and Lightship Weekend. 14.250. QSL. Tom Budar, 1975 Jaybrook Dr, Rancho Palos Verdes, CA 90275. *From Point Vicente Lighthouse during ILLW.* **vicentelight.org**

Aug 17-Aug 18, 0001Z-2359Z, W7L, Florence, OR. Central Oregon Coast Amateur Radio Club. International Lighthouse Lightship Weekend. 14.250. QSL. Central Oregon Coast Amateur Radio Club, PO Box 254, Florence, OR 97439. **www.w7flo.com**

Aug 17-Aug 18, 0100Z-2359Z, K4J, Jupiter, FL. ILLW Organization ARLHS/ILLW — International Lighthouse-Lightship Weekend. 21.370 14.270 7.270 3.970. Certificate. ILLW Organization, 114 Woodbine Ave, Merchantville, NJ 08109. **illw.co.uk**

Aug 17-Aug 18, 1300Z-0000Z, W9MVA, La Crosse, WI. Mississippi Valley Amateur Radio Association. US Island Activation — Goose Island WI. 21.350 14.260 7.250. QSL. Craig Goldbeck, N3070 Smith Valley Rd, La Crosse, WI 54601. **www.mvara.net**

Aug 17-Aug 18, 1300Z-2200Z, KC2YYL, Youngstown, NY. Niagara County Special Events Radio Club. ILLW Lighthouse Weekend. 7.225; 20/17/15/12 m. QSL. John

Titta, AC2DD, 1460 Staley Rd, Grand Island, NY 14072. *Search YouTube "KC2YYL." Bands may vary with band conditions. Lighthouse # US0048.* **www.kc2yyl.net**

Aug 17-Aug 18, 1400Z-0000Z, K2BWK, Farmington, NY. Squaw Island Amateur Radio Club. 60th Anniversary. 28.380 21.280 14.280 7.280. QSL. Tom Sanders, KB2NCI, 6310 Gillis Rd, Victor, NY 14564. **www.siarc.us**

Aug 17-Aug 18, 1400Z-0200Z, WA3KEY, Hudson River NYC, NY. USS *Intrepid* Association of Former Crewmembers. Aircraft Carrier USS *Intrepid* CV/CVS-11 70th Anniversary. 14.333 7.218. Certificate. Norman Drechsel, PO Box 498, Quakertown, PA 18951. **www.wa3key.com/events.html**

Aug 17-Aug 18, 1600Z-2359Z, N6P, Point Reyes National Seashore, CA. Valley of the Moon Amateur Radio Club. Point Reyes Lighthouse Activation. 14.270 14.070 14.040 7.270. QSL. Kenneth McTaggart, 402 4th St E, Sonoma, CA 95476. **vomarc.org**

Aug 23-Aug 25, 2000Z-2100Z, W2W, Albion, NY. Orleans County Amateur Radio Club and Lockport Radio Club. The Flight of the Five. 14.285. QSL. Terry W. Cook, 14069 W County House Rd, Albion, NY 14411. Restoring the Old Erie Canal Locks in Lockport, NY. **www.lockportara.us** *or* **www.ocarc.us**

Aug 24, 1500Z-2359Z, W7SVD, Hereford, AZ. Sierra Vista Contesting Club. National Park Service Birthday. SSB: 14.275 21.285 28.350; CW: 14.050 21.050 28.050; PSK31: 14.070 21.070 28.120. QSL. Sierra Vista Contesting Club, 3707 Elder Ct, Sierra Vista, AZ 85650. *Establishment of the National Park Service August 25, 1916. Operating from Montezuma Pass high in the Huachuca Mountains of SE Arizona.* **ghays@cis-broadband.com**

Aug 25, 1400Z-2100Z, KØASA, Hanover, KS. Crown Amateur Radio Association. Hollenberg Pony Express Festival 153rd Anniversary of the Pony Express. 18.085 14.245 14.045 7.045. Certificate & QSL. Crown Amateur Radio Association, 11551 W 176th Tr, Olathe, KS 66062. **arrlmidwest.org/pony express.html**

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 **Oct** *QST* would have to be received by **Aug 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.

Special Events listed in this issue include current events received through June 10. You can view all received Special Events at **www.arrl.org/special-event-stations**.

New Books

Reviewed by Rick Lindquist, WW1ME

SolderSmoke — Global Adventures in Wireless Electronics

Bill Meara, N2CQR/MØHBR/CU2JL

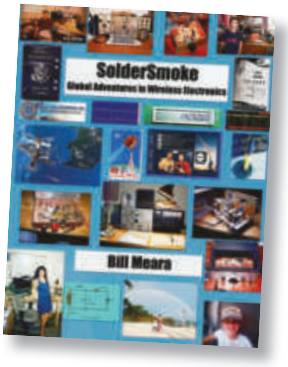
Bill Meara is the sort of ham a lot of us — veterans included — *wish* we were (or *still* were, before the dawn of Amateur Radio's appliance era). He's a *radio amateur's* radio amateur. *SolderSmoke* lets you into his world and mind, and after reading it, you may find yourself being drawn into his "radical fundamentalist" approach to homebrewing.

Meara says the late New York City radio personality and storyteller Jean Shepherd, K2ORS, inspired his interest in ham radio. The author got his start as so many of us did — as a teenager, becoming a Novice, encountering all the typical pitfalls that most newcomers face. At some point, however, he became determined to know the how and why of the gear he was using to talk around the world. (Meara is one of those rare hams who still has — and uses — the gear he acquired as a beginner, in his case a Hallicrafters HT-37 transmitter and a Drake 2B receiver.)

His work in the US Foreign Service has taken him around the world to semi-exotic locations that most radio amateurs never get to visit, much less operate from. Along the way he explains — in an engaging, self-effacing fashion — how he becomes adept at making do with what he has at hand, pulling circuits from dog-eared books, diving deep into his junk box for components, cadging parts from the locals he makes friends with, and sometimes cannibalizing old gear to make new.

Given his fundamentalist bent, Meara enjoys staying more at the molecular (and sometimes atomic) level of electronics, preferring discrete components to lots of ICs and chips.

One particular project of his makes the rounds as he and his family move from one posting to another. It's a low power double-sideband transmitter (eventually, a DSB transceiver with a direct-conversion receiver). Meara describes how, over the years, he modifies, tweaks, rebuilds and revises this rig in an effort to get it right.



Meara gravitates toward the QRP community and to some of its prime proponents and icons of Amateur Radio, such as Wes Hayward, W7ZOI, Doug DeMaw, W1FB (SK) and Lew McCoy, W1ICP (SK), who have written extensively on circuit design and construction over the years. At one point he joins the sometimes-eccentric circle of AM aficionados on 75 meters, finding them a source of valuable information on how to modify older gear for that mode.

As he learns, he shares his newfound electronics knowledge with readers, complete with hand drawn sketches and scribblings from his own experimenter's notebooks. He relishes offering non-mathematical explanations to typical electronics design issues and principles.

An overarching theme of the book is Meara's recognition that radio amateurs are members of an extended family. He has found most hams all over the world ready to lend a helping hand or to provide a needed component or part or scrap of advice. As a result he makes many long and lasting friendships within the ham community. He befriends Mike, KL7R (SK), and as an outgrowth of their mutual interests they develop the SolderSmoke podcast (**www.soldersmoke.com**), a bit of ham radio experimenter evangelizing and outreach that now numbers 151 episodes.

Readers may find themselves pondering how they strayed from the straight and narrow path of experimentation and homebrew construction, and Meara's book — which he calls a "technical memoir" — represents the siren call to a more basic and traditional approach to Amateur Radio. It's an entertaining and worthwhile read.

HBR Press, rev 2010. ISBN: 978-0-578-05312-7, softcover, 8½ × 11 in, 198 pp. Available as download via **www.Lulu.com** and from **Amazon.com**, Perfect Paperback format, $45; Kindle edition, $8.99.

John Dilks, K2TQN, k2tqn@arrl.org

Hollywood Meets Hallicrafters

Vintage radios make a cameo appearance in an upcoming Harrison Ford movie.

Years ago one of my teachers asked my class to write an essay about "What I did last summer." This is my latest version and was probably one of my most enjoyable.

It all started with an e-mail from my friend Nick England, K4NYW. He had been contacted by Michael Jortner, in Philadelphia, a prop master who needed some ham radio equipment for an important scene in a movie being filmed nearby. Jortner's e-mail explained:

> Hi Nick, I'm a prop master working on a feature film in Philadelphia titled *Paranoia*. In the film, one of our main characters, played by Harrison Ford, is an avid ham radio collector and there are two featured ham radios in his study, which are an integral visual that motivates a major scene between two main characters. Ideally, I'm looking to find someone who might be willing to rent me two interesting, strikingly visual ham radios, possibly with (and I'm not sure if this exists) exposed glowing tubes that can lure our actor into the room with some warm glow, and then another radio that has a large assortment of dials that beg to be touched. I'm not sure if this is possible or if you might be someone willing to rent or know collectors that I can speak with. Either way, I welcome any thoughts and input that you might have for me.

After receiving Nick's e-mail, I immediately contacted Michael Jortner at Paranoia Productions, LLC and asked for more information. I was told that Ford plays the part of Jock Goddard, the CEO of a major software corporation, who started tinkering with radios as a youth.

Vintage Radio Prop Master

With this information I concluded that a rich CEO would have a collection of Collins radios and I offered my Collins desk. I sent a photo of the desk along with its dimensions, and mentioned that I had many more radios available.

Jortner replied that they didn't have enough room for the desk but went on to ask: "Would you be willing to rent the production some of your radios and be an on-site consultant to set them up, explain how they work and be of assistance to me in figuring out what ham radios would best fit the bill?"

We exchanged e-mails with photos of radios I thought would look good in the movie. He selected several that he thought would work. I tried to discourage his thinking of "exposed glowing tubes." As the date neared he asked that one new, expensive, state of the art radio be included. I didn't have one, so I contacted my friend Bob Schenck, N2OO, who had a newer radio.

Bob came on board and mentioned he had a friend, Dennis Motschenbacher, K7BV, at Yaesu who might be able to supply a new FTDX5000 transceiver for the movie. Dennis sent the radio and then we were ready for the August 14 setup and August 15 filming date at a mansion in Wyndmoor, Pennsylvania.

Liam Hemsworth (left) and Harrison Ford face off in front of a pair of vintage Hallicrafters in Relativity Media's *Paranoia*. [Courtesy of Relativity Media. ©2012 Paranoia Acquisitions LLC. All rights reserved.]

Liam Hemsworth standing next to two vintage Hallicrafters during a scene in *Paranoia*. On top is an SX-23 and on the bottom is an SX-42 [Peter Lovino photo, courtesy of Relativity Media. ©2012 Paranoia Acquisitions LLC. All rights reserved.]

Sets on the Set

My son Jeff Dilks, KB2CIX, joined us for the adventure. Bob arrived just ahead of Jeff and me at the movie location on the 14th.

I wasn't prepared for the enormity of the organized chaos we found. The area was covered with a churning mass of people working on the movie set. Trucks with furniture and other necessary items were parked nearby. The lighting crew was setting up huge generator powered lamps and screens to shine on the house windows, simulating daylight. Furniture was being moved into and out of the mansion. The prop personnel were busy preparing the inside for filming.

At a preliminary meeting we were asked to leave our radios in a staging area inside the house. Eventually our time arrived and we were asked into the library, which was where the radios were to be placed for a scene with Harrison Ford and Liam Hemsworth. Working with the prop people, we moved the radios around the library. When we were finally satisfied with the placement, we left for the day, after we were asked to return early the next morning.

The 3 Minute Day

The next morning we learned that Harrison Ford wanted only the vintage radios for the scene and we returned the Yaesu to the staging area. Our hope for an operating ham station was gone. Our radios would be used only for decoration.

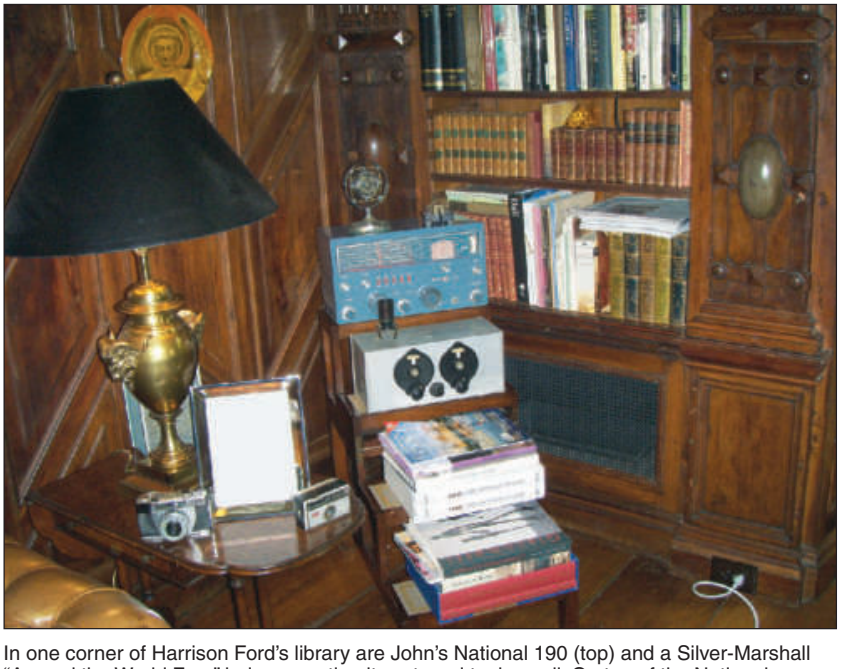
I was told the set crew solved the exposed tubes problem with a 100 W bulb inside the

Harrison Ford confronts Gary Oldman. [Courtesy of Relativity Media. ©2012 Paranoia Acquisitions LLC. All rights reserved.]

cabinet of my SX-23, which gave the effect they were looking for. I also brought some old microphones and Morse keys that were used on Ford's desk.

Once filming started we were able to watch from outside on monitors that were set up for the directors. The prop master even provided a director's chair for me. The actual scene was about 3½ minutes long, but we were there all day as they shot the scene repeatedly, using different camera angles and multiple lighting changes.

John, K2TQN (seated), plays director while Bob, N2OO (white cap), gets ready to take John's close-up. [Jeff Dilks, KB2CIX, photo]



In one corner of Harrison Ford's library are John's National 190 (top) and a Silver-Marshall "Around the World Four" below, sporting its external tuning coil. On top of the National are a 1930s Shure carbon ring microphone and a modern paddle. [John Dilks, K2TQN, photo]

We were treated very well by the movie company, which even chauffeured us to a local high school cafeteria and treated us to a gourmet lunch buffet. We ate surrounded by actors and crew. Gary Oldman sat just behind me. Earlier we had been asked not to talk to the stars and not to take photos of them. This was a disappointment to my granddaughter, who had hoped I would get a photo of Liam Hemsworth for her.

Eyeball With Indiana Jones

The high point came in the afternoon. The actors were taking a break and came outside. I was sitting in my director's chair when Harrison Ford walked directly in front of me and I had to move my feet so he could get by. I mentioned that I was really enjoying the filming. He stopped and asked about us.

I told him we were the ham radio guys. That started a 3 minute dialogue during which he thanked us for bringing the radios and setting them up. Jeff had a photo of his 6 year old son in an Indiana Jones Halloween costume and asked if Ford would autograph it, which he did gladly and mentioned how good my grandson looked in his Indiana Jones getup. He thanked us again and continued on. We were all excited and impressed by how down to earth Ford was, just like the character he was portraying.

As darkness came and the movie wrapped up, we waited for the okay to pick up our radios. Harrison Ford came out and started to enter his chauffeured SUV, which was parked about 25 feet away from us. He stopped and looked over at us and thanked us again for our help. We certainly didn't expect that! We picked up our radios, said our goodbyes and drove home, all the while remarking on the great time we'd had.

Coming to a Theater Near You

Paranoia is being released August 16, 2013. It is a high stakes thriller that takes us deep behind the scenes of global success to a deadly world of greed and deception. The two most powerful tech billionaires in the world (Harrison Ford and Gary Oldman) are bitter rivals with a complicated past who will stop at nothing to destroy each other. A young superstar (Liam Hemsworth) seduced by unlimited wealth and power falls between them and becomes trapped in the middle of their life and death game of corporate espionage. By the time he realizes his life is in danger, he is in far too deep and knows far too much for them to let him walk away. Look for the film this summer and look for the radios in the film!

Engaging the Next Generation of Hams

Ham radio needs to compete with cell phones and robotics to win the interest of today's youth.

Jerry Partrick, KB4FP

Recently I read an article about "Hacker Scouts" on the Internet. The article was about a group of young people in California who gathered to learn about electronics, the main focus being the construction of various electronic kits.

I started to consider how best to fulfill these young people's interests in electronics and what organizations might be most useful. I wondered how to make ham radio attractive to young people who are already immersed in electronics.

Different Viewpoints

Many of us feel it would be productive to gather young people to talk about ham radio, but consider this: These youths have an image of hams speaking with other hams using a handheld transceiver. With only that in their minds, a talk about ham radio would make their eyes glaze over. They would probably think "With my cell phone, which is smaller, I can do the same and much more."

What is difficult to pose to modern youngsters are the essential electronic nuances, capabilities and opportunities for service that lie behind that handheld transceiver. Even when we describe HF activity and such pursuits as DXing, the knowledge and creative efforts required remain a mystery to them. It's very difficult to express the creative enjoyment that hams obtain from their activities; that comes only from personal involvement and hands-on experience.

I wondered how to make ham radio attractive to young people who are already immersed in electronics.

School Program Dilemma

It is natural to want to involve our public educational system in any learning project. However, when one speaks with school administrators and teachers, one discovers that the learning agenda and slate of extracurricular activities are already full. There hardly seems sufficient time to pursue a basic education program.

Because of these educational demands, is it any wonder that a school administrator's eyes roll when a group of hams presents another program? No matter how attractive a learning experience we can offer to an administrator, he or she has to deal with the time factor as well as supervision of the effort by some member of the local educational system. The incentives of gifts of ham radio equipment and furnishing knowledgeable hams of all ages and license classes for support may not be sufficient.

A Change of Focus

It is a formidable problem but having said that, I understand that one of the most popular extracurricular activities is robotics. There are many robotic competitions that give fulfillment to those involved. I'm not sure of the structure of these efforts but I recognize the attempts of young people to involve themselves in creative electronic activities.

In my opinion, the important word here is *creative*! These young people are building projects after learning the fundamentals of electronics. When their creations are first activated, they see a desired action produced, which gives them a feeling of satisfaction. What could be more rewarding than that?

I would hazard a guess that the vast majority of hams became interested when they first experienced the magic of electronics. If we gathered a half-dozen young people in a fun environment where they could learn about elementary electronics, what would happen if such training included the construction of a basic radio? What light would go on in their heads the first time they turned it on and heard a local station they know on a radio they built?

A Broader Approach

The issue of how to present ham radio to young people living in the present world of instant Internet and computer controlled robots raises many questions. Should we continue to talk actively about the wonders of ham radio, which many kids see as dated, or should we emphasize the magic of electronics that leads to ham radio?

We must not put our heads in the sand as we deal with the effects of cell phones on ham radio. Is it best to have a young person visit our shack to see our expensive equipment and hear a ham in Europe say "hello?" Might it not be better to give that youth a feeling for the wonder of the things that happen when a key is pressed and the electrons of a continuous wave flow along a transmission line into a well adjusted antenna? If we show young people the wonder and creativity of electronics, wouldn't a good portion maintain their interest? I think so!

In other words, should we meet the young people of the world, who are involved with robotic and radio controlled models, on their own ground rather than concentrating only on the wonders of ham radio as we know it? We need to think outside the box of our ham shack and find new ways to connect radio with the computer, robotic and cell phone technologies of today's youths.

Jerry Partrick, KB4FP, is a retired oral and maxillofacial surgeon with serious interests in Amateur Radio, watercolor painting, guitar building, woodworking and education. He is originally from southeastern North Carolina but is living out his retirement in Virginia, operating CW with an Amateur Extra class license. Jerry can be reached at 190 Henry Hill Dr, Fairfield, VA 24435, **jnpart@gmail.com**.

Op-Ed Policy

The purpose of Op-Ed is to air member viewpoints that may or may not be consistent with current ARRL policy.

1) Contributions may be up to 900 words in length.

2) No payment will be made to contributors.

3) Any factual assertions must be supported by references, which do not necessarily have to be included in the body of the article to be published.

4) Articles containing statements that could be construed as libel will not be accepted.

5) The subject matter chosen must be of general interest to radio amateurs, and must be discussed in a way that will be understandable to a significant portion of the membership.

6) With the exception that the article need not be consistent with League policy, the article will be subject to the usual editorial review prior to acceptance.

7) No guarantee can be made that an accepted article will be published by a certain date, or indeed, that it will be published at all; however, only articles that we intend to publish will be accepted, and any article we have decided against publishing will be returned promptly.

8) Send your contributions to ARRL Op-Ed, 225 Main St, Newington, CT 06111 or via e-mail to **qst@arrl.org** (subject line Op-Ed).

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

Coming ARRL Conventions

July 19-21
Montana State Convention,
East Glacier, MT*

July 25-27
Central States VHF Conference,
Elk Grove Village, IL*

July 26-27
Oklahoma State Convention,
Oklahoma City, OK*

August 2-3
Texas State Convention, Austin, TX*

August 2-4
Pacific Northwest DX Convention,
Spokane Valley, WA*

August 3
Great Lakes Division Convention,
Columbus, OH*

August 9-11
New Mexico State Convention,
Albuquerque, NM*

August 17
West Virginia State Convention, Weston, WV

August 17-18
Alabama State Convention, Huntsville, AL

August 18
Kansas State Convention, Salina, KS

August 25
Western Pennsylvania Section Convention,
New Kensington, PA

August 31-September 1
North Carolina Section Convention,
Shelby, NC

September 6-8
Southwestern Division Convention,
Buellton, CA

September 14
Roanoke Division Convention, Virginia
Beach, VA

September 20-21
W9DXCC Convention, Elk Grove Village, IL

September 27-28
SEDCO/W4DXCC Convention,
Pigeon Forge, TN

September 27-29
Mid-Atlantic States VHF Conference,
Bensalem, PA

September 28
North Dakota State Convention,
West Fargo, ND
Washington State Convention,
Spokane Valley, WA

September 29
EmComm East Convention, Rochester, NY

October 6
Maryland State Convention,
West Friendship, MD

*See July *QST* for details.

ALABAMA STATE CONVENTION

August 17-18, Huntsville, AL
D F H Q R S V

Saturday 9 AM-4:30 PM, Sunday 9 AM-3 PM. *Sprs:* Huntsville ARC & Huntsville Hamfest Assn. Von Braun Center (South Hall), 700 Monroe St. Youth Lounge, foxhunts, scavenger hunt, kit building, hospitality suites (Friday and Saturday eves, Holiday Inn, across the street), Boy Scouts Radio Merit Badge, convenient parking ($5), limited RV parking. *Tl:* 146.94. *Adm:* $8. Charlie Emerson, N4OKL, 256-882-9137; **bluzman512@comcast.net**; **hamfest.org**.

Alaska (Fairbanks) — Aug 10
D F H R S T V

10 AM-5 PM. *Spr:* Arctic ARC. Associated General Contractors of Alaska, 3750 Bonita St. *Tl:* 146.88 (103.5 Hz), 146.52. *Adm:* Free. Sterling Muth, WL7TV, 907-347-0265; **sterlingmuth@hotmail.com**; **www.kl7kc.com/**.

Arkansas (Mena) — Sep 6-7 D F H R T V

7 AM-5 PM. *Spr:* Queen Wilhelmina Hamfest Assn. Queen Wilhelmina State Park, 3877 Hwy 88 W. 44th Annual Hamfest. *Tl:* 146.79 (100 Hz). *Adm:* Free. Randy Baggett, KG5NE, 479-461-1519; **kg5ne@centurytel.net**; **menahamfest.org**.

SOUTHWESTERN DIVISION CONVENTION

September 6-8, Buellton, CA
D F H Q R S T V

Spr: Santa Barbara ARC. Santa Ynez Valley Marriott Hotel and Convention Center, 555 McMurray Rd. *Tl:* 146.79, 222.92 (both 131.8 Hz). *Adm:* advance $15, door $25. Alan Soenke, WA6VNN, 805-455-7247; **wa6vnn@sbarc.org**; **www.swhamcon.com**.

Colorado (Golden) — Aug 18 D F H R S V

8:30 AM-1 PM. *Spr:* Denver Radio Club. Jefferson County Fairgrounds, 15200 W 6th Ave. *Tl:* 145.49, 448.625 (100 Hz). *Adm:* $5. Bryan Steinberg, KBØA, 303-987-9596; **drcfest@w0tx.org**; **www.w0tx.org**.

Connecticut (Newtown) — Sep 8
D F H R S T

8:30 AM-12:30 PM. *Spr:* Candlewood ARA. Edmond Town Hall, 45 Main St. *Tl:* 147.3 (100 Hz). *Adm:* $6. Joe de Groot, AB1DO, 203-339-2077; **ab1do@arrl.net**; **cararadioclub.org**.

Georgia (Swainsboro) — Aug 24
D F H R S T V

8 AM. *Spr:* Southeast ARA. Varner 4-H Clubhouse, 220 S Circle Dr. 2nd Annual Hamfest. *Tl:* 147.0 (156.7 Hz), 146.715 (88.5 Hz). *Adm:* advance $4, door $5. Ronald Hill, N4SFU, 912-531-5173; **rhill2@pineland.net**; **www.kj4mks.com**.

Illinois (Belvidere) — Sep 7 D F H R S T V

8 AM-4 PM. *Spr:* Chicago FM Club. Boone County Fairgrounds, 8791 IL Rte 76. *Tl:* 146.76 (107.2 Hz), 147.255 (114.8 Hz), 444.725 (107.2 Hz). *Adm:* advance $8, door $10. Michael Brost, WA9FTS, 708-983-9288; **mikeb2006@comcast.net**; **www.chicagofmclub.org.**

Illinois (Ingleside) — Aug 18 D H R T

8 AM-1 PM. *Spr:* Western Lake County ARS. Grant Township Center, 26725 W Molidor Rd. *Tl:* 147.03 (107.2 Hz). *Adm:* Donation. Joe Serocki, N9IFG, **joeserocki@gmail.com**; **www.welcars.org**.

Illinois (Peotone) — Aug 4 D F H R T V

6 AM-4 PM. *Spr:* Hamfesters RC. Will County Fairgrounds, 701 S West St. *Tl:* 146.52. *Adm:* advance $8 (with double-stub ticket), door $10 (with single-stub ticket). Kerry Nelson, AA9SB, 708-335-4574; **kw_nelson@earthlink.net**; **hamfesters.org**.

Indiana (South Bend) — Sep 7 D F H V

8 AM-1 PM. *Spr:* Michiana ARC. Elks Club Lodge #235, 3535 E McKinley. *Tl:* 147.225. *Adm:* $5. John Lackman, KC9RPS, 574-287-3283; **kc9rps@att.net**.

Indiana (Spencer) — Aug 24 D F H R S T V

7 AM to 2 PM. *Sprs:* Owen County ARA and Bloomington ARC. Owen County Fairgrounds, 100 S East St. *Tl:* 146.985 (136.5 Hz). *Adm:* $5. Bob Poortinga, NG9M, 812-876-6174; **ng9m@arrl.net**; **www.owencountyara.org/**.

KANSAS STATE CONVENTION

August 18, Salina, KS
D F H R S T V

8 AM-4 PM. *Spr:* Central Kansas ARC. Webster Conference Center, 2601 N Ohio St. Special guest from ARRL HQ Chuck Skolaut, KØBOG, Field and Regulatory Correspondent. *Tl:* 147.03, 443.9. *Adm:* $7.50. Ron Tremblay, WAØPSF, 785-827-8149; **rtremblay@cox.net**; **centralksarc.com**.

Kentucky (Lawrenceburg) — Aug 11
D F H Q R S T V

8 AM-3 PM. *Spr:* Bluegrass ARS. American Legion Post #34, 745 W Broadway. Special Event MARS Station, State Emergency Communications Vehicle. *Tl:* 146.76, 444.125 (-88.5 Hz). *Adm:* advance $5, door $6. Jeanie Dalton, KB8QLC, 859-619-8164; **jeanie@insightbb.com**; **www.BluegrassARS.org**.

Kentucky (Shepherdsville) — Sep 7
D F H R S T V

8 AM-2 PM. *Spr:* Greater Louisville Hamfest Assn. Paroquet Springs Conference Centre, 395 Paroquet Springs Dr. *Tl:* 146.7 (79.7 Hz). *Adm:* advance $6, door $7. Bob Myers, K4RVM, 502-713-7135; **glh2013@louisvillehamfest.com**; **louisvillehamfest.com**.

Maine (Windsor) — Sep 7 D F H Q R T V

8 AM-1 PM. *Spr:* Augusta ARA. Windsor Fairgrounds, 82 Ridge Rd. *Tl:* 146.67 (100 Hz). *Adm:* $5. Bill Crowley, K1NIT, 207-512-0312; **k1nit@arrl.net**; **www.w1tlc.com**.

Maryland (Westminster) — Aug 18 F H R T

8 AM-noon. *Spr:* Carroll County ARC. Carroll County Agriculture Center, 706 Agriculture

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

Center Dr. *Tl:* 145.41 (114.8 Hz). *Adm:* $5. Steve Beckman, N3SB, 443-435-1089; **n3sb@qis.net**; **www.qis.net/~k3pzn**.

Massachusetts (Adams) — Aug 25
D F H R T V
9 AM-3 PM. *Spr:* Northern Berkshire ARC. Adams Agricultural Fairgrounds (Bowe Field), Old Columbia St (off Rte 8). *Tl:* 146.91 (162.2 Hz). *Adm:* $5. Bill Rech, WA1BR, 413-743-4344; **wa1br@nobarc.org**; **www.nobarc.org**.

Massachusetts (Cambridge) — Aug 18. Nick Altenbernd, KA1MQX, 617-253-3776 (9 AM-5 PM); **w1gsl@mit.edu**; **www.swapfest.us**.

Michigan (Owosso) — Aug 24 D F H R V
8 AM-noon. *Spr:* Shiawassee ARA. Advanced Diesel Institute, Baker College, 1400 South M-52. *Tl:* 147.02 (100 Hz). *Adm:* $3. Don Warner, WB8GUS, 810-599-0729; **wb8gus@arrl.net**; **www.w8qqq.org**.

Michigan (Wyoming) — Sep 7 D F H R T V
8 AM-1 PM. *Spr:* Grand Rapids ARA. Home School Bldg, 5625 Burlingame Ave SW. *Tl:* 147.26 (94.8 Hz). *Adm:* advance $5, door $6. Rich Douglas, KC8NKA, 616-531-6218; **kc8nka@arrl.net**; **www.w8dc.org/grr_images/2013GRAHamFestFlyer.pdf**.

Minnesota (Rush City) — Sep 7 F H R T
9 AM-noon. *Spr:* East Central Minnesota ARC. Rush City High School, 51001 Fairfield Ave. *Tl:* 145.33 (146.2 Hz). *Adm:* Free. John O'Brien, KØDEH, 320-358-4676; **k0deh@midco.net**; **ecmarc.org**.

Missouri (Joplin) — Aug 23-24
D F H Q R S V
Friday 4-9 PM; Saturday 8 AM-2 PM. *Spr:* Joplin ARC. Holiday Inn Convention Center, 3615 Hammons Blvd. 24th Annual Hamfest. *Tl:* 147.21. *Adm:* advance $6, door $8. Jim Johannes, NØZSQ, 417-437-9547; **jimjohannes@sbcglobal.net**; **www.joplin-arc.org**.

Missouri (O'Fallon) — Aug 11 D F H T V
7 AM-1 PM. *Spr:* St Charles ARC. VFW Post 5077, 8500 Veterans Memorial Pkwy. *Tl:* 146.67. *Adm:* $3. Dave Collins, KC6YNC, 636-922-2579; **ds_collins@att.net**; **www.wb0hsi.org**.

Nebraska (Springfield) — Sep 7 D F H R T
8 AM-noon. *Spr:* Ak-Sar-Ben ARC. Sarpy County Fairgrounds 4-H Building, Main St. *Tl:* 146.94. *Adm:* $4. Patrick Joseph, KØCTU, 402-492-9156; **ppjoseph@cox.net**; **www.aksarbenarc.org/main/**.

New Jersey (Haledon) — Aug 24
D F H R T V
8 AM. *Spr:* Ramapo Mountain ARC. Camp Veritans, 225 Pompton Rd. *Tl:* 146.49 (107.2 Hz). *Adm:* advance $5, door $10. Dave Schwartz, W2DIS, 973-616-1011; **w2dis@optimum.net**; **www.qsl.net/rmarc**.

New Mexico (Alamogordo) — Aug 31
D F H R V
7 AM-2 PM. *Spr:* Alamogordo ARC. Otero County Fairgrounds, 401 Fairgrounds Rd. *Tl:* 146.8 (100 Hz). *Adm:* Free. David Pote, AE5OV, 575-446-4441; **ae5ov@arrl.net**; **qsl.net/k5lrw/hamfest.htm**.

New York (Ballston Spa) — Sep 7
D F H R T V
7 AM-3 PM. *Spr:* Saratoga County RACES Assn. Saratoga County Fairgrounds, Fairground Ave. 28th Annual Hamfest. *Tl:* 147.0, 147.24. *Adm:* $10. Darlene Lake, N2XQG, 518-587-2385; **dar@saratogaspringsny.us**; **k2dll.net**.

New York (Hornell) — Aug 17 D F H R T V
8 AM-noon. *Spr:* Keuka Lake ARA. Howard Community Building, 7481 Hopkins Rd. *Tl:* 145.19 (110.9 Hz). *Adm:* $5. Roy Koehler, KB2WXV, 607-566-3688; **keukalakeara@gmail.com**; **www.klara.us**.

NORTH CAROLINA SECTION CONVENTION

August 31-September 1, Shelby, NC
D F H Q R S T V
Saturday 7 AM-5 PM, Sunday 7 AM-2 PM. *Spr:* Shelby ARC. Cleveland County Fairgrounds, 1751 E Marion St. *Tl:* 146.88. *Adm:* advance $6, door $8. Todd Vickery, WA4TV, 980-295-5151; **wa4tv@arrl.net**; **www.shelbyhamfest.com**.

Ohio (Austintown) — Sep 7 D F H R T V
8 AM-2 PM. *Spr:* 20/9 ARC. Austintown Senior Center, 100 Westchester Dr. Silent Auction. *Tl:* 147.315 (156.7 Hz). *Adm:* Free. Dorothy O'Neil-Meleski, KC8SYF, 330-651-8420; **k8tkanews@hotmail.com**; **www.20over9.org**.

Ohio (Cortland) — Aug 18 D F H R S T V
8 AM-2 PM. *Spr:* Warren ARA. Trumbull County Fairgrounds, 899 Everett-Hull Rd. *Tl:* 146.97. *Adm:* $5. Jacqueline Williams, N8JMW, 440-636-2806; **warrenhamfest@gmail.com**; **warrenhamfest.blogspot.com/**.

Ohio (Findlay) — Sep 8 D F H Q R S T
8 AM-2 PM. *Spr:* Findlay RC. Hancock County Fairgrounds, 1017 E Sandusky St. *Tl:* 147.15. *Adm:* $7. Bill Kelsey, N8ET, 419-423-3402; **hamfest@kangaus.com**; **w8ft.org**.

Pennsylvania (Butler) — Sep 8 F H R T
8 AM-3 PM. *Spr:* Butler County ARA. Unionville Fire Department, 102 Mahood Rd. *Tl:* 147.36 (131.8 Hz). *Adm:* $5. Rick Melton, N3VKM, 724-287-8134; **N3VKM@arrl.net**; **www.w3udx.org**.

Pennsylvania (Matamoras) — Aug 11
D F H R T
8 AM. *Spr:* Tri-State ARA. Matamoras Airport Park, 10th St. *Tl:* 145.35 (100 Hz). *Adm:* $5. Jim Seeber, KW3U, 570-486-6773; **wb3gnj@yahoo.com**; **www.k3tsa.com**.

WESTERN PENNSYLVANIA SECTION CONVENTION

August 25, New Kensington, PA
D F H R S T
8 AM-1 PM. *Spr:* Skyview Radio Society. Skyview Radio Society Clubhouse and Grounds, 2335 Turkey Ridge Rd. WPA ARES meeting. *Tl:* 146.64 (131.8 Hz). *Adm:* $3. Pat Cancro, NK3P, 724-309-6304; **jpc2@psu.edu**; **www.skyviewradio.net**.

Pennsylvania (Uniontown) — Aug 31 D F R
8 AM-1 PM. *Spr:* Uniontown ARC. Uniontown ARC Club Grounds, 433 Old Pittsburgh Rd. *Tl:* 147.045 (131.8 Hz). *Adm:* Free. Mike Kosco, KA3WOI, 724-437-9815; **mikeko@verizon.net**; **www.w3pie.org**.

Tennessee (Athens) — Jul 20 D F H R T V
7 AM. *Spr:* McMinn County ARC. McMinn County Expo Center, 2405 Decatur Pike (Hwy 30). *Tl:* 147.06 (141.3 Hz). *Adm:* Free. Scott Duckworth, NA4IT, 423-263-1989; **na4it@yahoo.com**; **www.mcminnarc.com/fest/fest.html**.

Tennessee (Lebanon) — Aug 24
D F H R S T V
8 AM-3 PM. *Spr:* Short Mountain Repeater Club. Cedars of Lebanon State Park, 328 Cedar Forest Rd. *Tl:* 146.91. *Adm:* Free. Raymond Reaux, WA4VDB, 615-542-6338; **WA4VDB@arrl.net**; **smrclub.com**.

Vermont (St Albans) — Aug 10 D F H T V
8 AM-noon. *Spr:* St Albans ARC. VFW Post #758, 353 Lake St. *Tl:* 145.23 (100 Hz). *Adm:* $5. Arnold Benjamin, N1ARN, 802-309-0666; **n1arn@yahoo.com**; **www.starc.org**.

Washington (Des Moines) — Aug 24
D H R T
9 AM-1 PM. *Spr:* Highline ARC. Des Moines Activity Center, 2045 S 216th St. *Tl:* 146.66 (103.5 Hz). *Adm:* $3. Dennis Reanier, W7UBA, 206-241-6812; **swapfest@highlinearc.org**; **www.highlinearc.org/swapfest.html**.

Washington (Vancouver) — Aug 24
D F H R S V
9 AM-2 PM. *Spr:* Clark County ARC. Clark County Square Dance Center, 10713 NE 117th Ave. *Tl:* 147.24. *Adm:* advance $6, door $8. James Newsome, KE7ZAC, 360-903-0266; **1jamsanx@gmail.com**; **W7AIA.org**.

WEST VIRGINIA STATE CONVENTION

August 17, Weston, WV
D F H Q R S T V
8 AM-10 PM. *Spr:* West Virginia State Amateur Radio Council. Jackson's Mill WVU Conference Center, 160 Jackson's Mill Rd. Equipment Auction, NTS Nets Meeting, WV State Radio Council Meeting, QCWA and MARS booths, awards. *Tl:* 145.39, 147.88. *Adm:* $5. Bob West, WA8YCD, 304-672-6381; **wa8ycd@hotmail.com**; **www.qsl.net/wvsarc**.

Wisconsin (Baraboo) — Aug 24
D F H R T V
8 AM-1 PM. *Spr:* Yellow Thunder ARC. Badger Steam & Gas Engine Property, E3347 Sand Rd. *Tl:* 147.315 (123 Hz). *Adm:* $5. Thomas Harrison, N9PQJ, 608-963-0762; **n9pqj@yellowthunder.org**; **yellowthunder.org**.

To All Event Sponsors

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

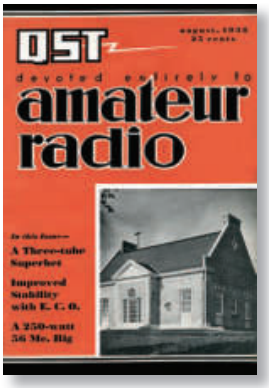
The deadline for receipt of items for this column is the **1st of the second month preceding publication date**. For example, your information must arrive at HQ by **August 1** to be listed in the **October** issue. Information in this column is accurate as of our deadline; contact the sponsor or check the sponsor's website for possible late changes, for driving directions and for other event details. Please note that postal regulations prohibit mention in *QST* of games of chance such as raffles or bingo.

Promoting your event is guaranteed to increase attendance. As an approved event sponsor, you are entitled to special discounted rates on *QST* display advertising and ARRL web banner advertising. Call the ARRL Advertising Desk at 860-594-0207, or e-mail **ads@arrl.org**.

75, 50 and 25 Years Ago

Al Brogdon, W1AB

August 1938



- The cover photo shows the well-known building that houses HQ's station, W1AW.
- The editorial discusses the problem that will begin on September 1, 1939 — that of international broadcast stations moving into the 7200-7300 Kc. portion of our 40 meter band. The editor assures us that we should continue to use that band just as we always have.
- In "A 250-Watt Output Crystal-Controlled 28- and 56-Mc. Transmitter," Abe Hass, W2KPX, reports on how he successfully applied low-frequency techniques to the ultra-high frequencies.
- "56 Mc. Goes on Annual Frolic" reports that 5 meters opened wide for DX during May and June.
- Fred Sylvester, ex-W2ACU, and Richard Briggs, W1BVL, describe their new low-cost rig, "A Four-Band 75-Watt Output 'Phone-C.W. Transmitter."
- "How's DX?" reports that H. A. Maxwell "Ham" Whyte, G6WY, tops the DXCC list, with the remarkable total of 134 countries worked and confirmed!

August 1963

- The cover's aerial photo shows the brand-new HQ building, constructed behind the W1AW building.
- The editorial, "We Move," reports that, on June 27, the HQ staff moved to their new workplace at 225 Main Street in Newington.
- John Isaacs, W6PZV, describes his new baby, "A 7-Mc. Mobile S.S.B. Transceiver" that runs 60 watts P.E.P. output.
- HQ's own By Goodman, W1DX, tells us about his "Inexpensive Power Supply for a Kilowatt Linear" that uses silicon diodes in a voltage-doubling circuit.
- Charles Moody, W3TXF, reports on his project, "A V.F.O. for 50-Mc. Transmitters" that features mechanical and electrical considerations for frequency stability.
- "A Quadhelix Antenna for the 1215-Mc. Band," by W. O. Troetschel, K6UQH, produces high gain, with simple matching.

August 1988

- The cover photo shows Portland, Oregon, and invites us to all come to the forthcoming ARRL National Convention.
- Dave Mascaro, WA3JUF, tells about his "25-Watt Linear Amplifiers for 144 and 220 MHz."
- Doug DeMaw, W1EB, describes his "Preamplifier for 80- and 160-M Loop and Beverage Antennas."
- Mark Mandelkern, KN5S, tells us how to watch for band openings on 10 meters and the VHF/UHF bands by using "A Sensitive Integrating Squelch Circuit."
- Chuck Bender, W1WPR, the well-known chief operator at W1AW, tells about "The Night the Governor Came to Call." It seems that the HQ folks invited Connecticut Governor Ella Grasso to visit W1AW for Amateur Radio Week…and she accepted! When the big night came, the governor arrived in time for an OSCAR 6 pass, and she enjoyed chats with YV5ZZ, W3BWU, W4NUL/5, W5VY, WØCY, W1NU, W1NU and W1FTX while the bird was in sight.

Field Organization Reports

May 2013

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**.

520 W5KAV
484 WB8RCR
405 KT2D
348 KD8EBY
333 WB9FHP
315 KT5SR
300 KB2ETO
299 WM2C
292 KD7THV
290 N8OSL
263 KC2LIX
246 KC5ZGG
240 WA3EZN
237 WB8R
236 W2MTA
222 KØIBS W5DY
215 KK4BVR
210 K2HAT KA2ZNZ N8IO NX8A
206 WA2BSS
205 W4SEE
200 WA7PTM
190 K9LGU W9BGJ N8FVM
189 KB8VXE
185 N5NVP
183 K2ABX
180 KB8QKC N1UMJ
177 KB2KOJ
175 KE5HYW W4DNA WD8USA
170 K7BFL W7FQQ VE7GN
165 K7OAH WK4P KB8RCR NE8B
162 KF7PDV
161 W7JSW
160 WB9WKO KE4CB WB4ZIQ KGØGG
155 KC8YVF
151 KD5RQB
150 KK5NU K6HTN KJ4JPE
148 WS6P
145 KB5SDU KB2RTZ N7CM K7EAJ
140 KJ6PCC KB2BAA KC2QVT KF5IOU KB1NMO KK3F
137 KB1YNE
135 WE2G AG9G N9VC KB1RGQ W3CB W3YVQ
134 K4BEH
132 KA8ZGY
130 WB9QPM WO2H WV8CH W0LAW K4GK K6JT
WI2G K4IWW KB3LNM W8DJG KW1U
129 KK7DEB
128 KE5YTA
125 K1PJS KØVTT N2JBA NA9L KB5KKT
123 N9WLW AB9ZA
120 NN7H WB6UZX N7YRT WA5LOU KA4FZI WB6UZX NA7G WK4WC NM1K WB8WKQ WB2FTX
119 K9LOT
116 KE7QPV
115 K6FRG NX9K KV4MA
110 W7QM N7EIE VE3GT W7GB W9WXN WA4BAM AA2SV WA2NDA K7BDU KA1G N9MN WA1STU N7XG N7YSS N2WKT AK4RJ K4JUU W2EAG KB1UAU N8CJS N1IQI K1YCQ
106 KC5OZT KF7GC
105 K7MQF WA0CGZ
N1TF
104 WB8YYS
103 KJ7NO
102 K4VWK
101 N3RB
100 W8CPG K4SCL K5AXW K6JGL N1JX NØYR N3SW NU8K W5CU N9VT W7YV W4TTO WB4FDT WØCLS NØMEA WA0VKC WB8SIQ WG8Z WD8Q W8MAL N8JMW K8VFZ N2WGF
99 N2VC N7IE
95 WB6OTS
93 KBØDTI
92 WØRJA W2CC KC2EMW
91 KC2SFU N2RTF
90 N5RL N3KB KJ6IJJ KB2QO KB9KEG NC3F WB4BIK W3GQJ KJ4HGH W8IM WB4Y K3IN N3ZOC KB8HJJ N8IBR
89 KC2UMX KK7TN KC8QWH
87 KC8BW
86 KJ4G N2DW N1LKJ
85 WDØGUF KF5TTN K7FLI
83 W9EEU
82 K2GW K8CSI
80 AJ7B WA9QIB AA5VZ WB4RJW KB7RVF KC7ZZ KØDEU NIØI NØMHJ KC0ZDA KB1WXC KZ8Q K8ED
79 KC5MMH KB3LFG
78 KD7OED
77 N9EXM N5MBQ
76 WB3FTQ
75 KA8IAF KC4PZA
74 KA2GQQ NC8V KD8HPG
73 N8YXL
72 NS7K
71 W5XX
70 N2YJZ KDØAYN KØDLK NØDUW NØDUX WØFUI KDØNJK N3NTV KØPTK KØRXC KD7ZUP KC8UR

The following stations qualified for PSHR in previous months, but were not recognized in this column yet. (Apr) NC3F 125, WS6P 90, WA7PTM 77. (Mar) KC2SFU 144. (Jan) KD5SDU 120.

Section Traffic Manager Reports

The following Section Traffic Managers reported: AK, AL, AR, AZ, CO, CT, EB, EMA, ENY, EPA, EWA, GA, IA, ID, IL, IN, KS, LA, LAX, MDC, ME, MI, MN, NC, NFL, NLI, NNJ, NNY, NTX, OH, OK, OR, ORG, SD, SFL, SJV, SNJ, STX, TN, UT, VA, WCF, WI, WMA, WNY, WPA, WV, WY.

Section Emergency Coordinator Reports

The following ARRL Section Emergency Coordinators reported: DE, ENY, GA, IA, IN, KS, KY, MDC, MI, MN, MO, NC, NH, NLI, NM, OH, OK, STX, SV, VA, WTX, WV.

Brass Pounders League

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

KK3F 1720, WB9FHP 1667, K6HTN 1409, K6FRG 1017, NX9K 883, KW1U 828, K7BDU 800, W0RJA 738, N1IQI 682, N9VC 673, WA4BAM 585, WB8SIQ 569, WD8Q 524, K6JT 524.

The following stations qualified for BPL with Originations plus Deliveries: NM1K 114.

Silent Keys

Silent Keys Administrator, sk@arrl.org

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

WB1AKY **Post**, Gerald R., Colleyville, TX
KB1BXL **Guyotte**, Robert E., Springfield, MA
K1CBB **Lewis**, David W., Charlotte, NC
KB1CSX **Webster**, John A. Jr, Northfield, NH
WV1D **Banker**, David P., Bristol, CT
K1DXB **Machesney**, A. Ward, East Windsor, CT
♦ W1DYH **Droese**, William R., Amesbury, MA
N1EMU **Mac Keil**, Kenneth T., Holliston, MA
KA1FGE **Civale**, Paul Jr, Shell Knob, MO
KA1GEU **Seeber**, Christopher, Charlestown, RI
K1JV **Volpe**, Joseph I. Jr, Hingham, MA
KB1KMX **Ness**, Peter J., Hampden, ME
W1MDZ **Whiteman**, Stanley E., Danforth, ME
WA1MIU **Hall**, Wayne D., Northville, NY
W1MTV **Black**, Francis H., Westfield, MA
K1QKW **Scott**, Richard L., Portland, ME
♦ W1QT **Glassmeyer**, Bernard D., Taylor Springs, IL
KB1RUT **Perry**, Joseph C. Sr, Oxford, MA
KB1TMU **Thompson**, John A., Granby, CT
♦ W1TN **McKeen**, John E., Scarborough, ME
KA2AHW **Van Ness**, Murray, Red Hook, NY
KA2CLX **Finkelstein**, Elsie L., Louisville, KY
K2ELR **Kohl**, Herbert F., Schenectady, NY
WB2EOC **Parker**, Clyde A., Rochester, NY
KC2EWP **Rapp**, William F., Pittsford, NY
N2EZI **Trojanowski**, Carol A., Alpine, NY
WB2FAK **Parker**, Donald J., Rensselaerville, NY
KA2FTF **Murin**, Andrew N., Toms River, NJ
WA2FYL **Rourke**, John N., Montague, NJ
WB2FZH **Petrilli**, John D., Fairport, NY
N2GAK **Elliott**, Thomas, Yonkers, NY
K2GN **Eckenrode**, Larry, Waretown, NJ
WB2GQN **Franklin**, Sandford G., Milford, NJ
WA2LII **Klein**, Jay K., New Woodstock, NY
K2MEK **Cox**, Mason Forrest, Medina, NY
KB2MH **Stone**, Marvin, Monroe Township, NJ
W2NXG **Lett**, James R., Matawan, NJ
K2OWE **Mollica**, James M. Sr, Williamstown, NJ
KA2QMO **Boucher**, Oliver, Venice, FL
WB2TGY **Ostrin**, Robert C., Naples, FL
WA2UIB **Mavis**, George W., Rochester, NY
KA2VEG **Connor**, Timothy J., Syracuse, NY
N2VQB **Lindenmuth**, Robert C., Wall, NJ
♦ WE2W **Christopher**, Thomas B., Newburgh, NY
♦ K2WC **Cruikshank**, William G., Blacksburg, VA
KB3BAR **Kimpel**, Francis A. Sr, Ocean Pines, MD
WB3CBD **Lee**, John E., Grayson, GA
WB3CSI **Palace**, Richard J., Upper Marlboro, MD
W3DCN **Plitt**, Gordon F., Gambrills, MD
W3EIA **Miller**, Van S., Myerstown, PA
WB3EKL **Sagett**, Robert N., Bellefonte, PA
K3EYD **Steel**, Robert E., Glenside, PA
W3FSB **Herman**, Albert A., Harmony Township, PA
W3GGY **Lee**, Russell G., Spring City, PA
K3GPJ **Wildman**, Charles W., Yakima, WA
WB3HEW **Osborne**, Donald E. Sr, Newark, DE
N3LHL **Hagens**, Fred G. Jr, Wrightsville, PA
W3NIF **Dusel**, Joseph L., Pottsville, PA
K3OCW **Carbaugh**, Mike, York, PA
W3QDT **Guyton**, Leo R., Frederick, MD
W3QGX **Sullivan**, Daniel J. Jr, Scranton, PA
W4AKL **Reed**, Clayton B., Danville, VA
♦ WB4BLJ **Lamons**, Thomas W., Roanoke, VA
KF4BLL **Danio**, Roger G., Marion, NC
KD4BWT **Lane**, Paul R., Peck, ID
WD4CNG **Stewart**, Robert M., Poquoson, VA
N4DHV **Dickey**, William F., North Charleston, SC
K4DIA **Marrazzo**, Michael D., Madison, AL
KI4DWO **Kazaglis**, Jon C., Piedmont, SC
N4EHL **Cronau**, Robert T., Williamsburg, VA
N4ET **Fontaine**, Donald E., Venice, FL
KI4FPK **Sweeting**, Bobbie J., Daytona Beach, FL
KK4FSZ **Kasley**, John A., Williamsburg, VA
KJ4GA **Hodges**, William, Atlanta, GA
KD4GTF **Ringel**, Charles W., Sanibel, FL
KE4GYW **Maguire**, Thomas J., Morganton, GA
KK4HG **Gardner**, Henry A. III, Rockville, MD
W4HLF **Hager**, Arlie B., Orange, VA
WA4HLM **Arendell**, Elizabeth, Morehead City, NC
KF4ILI **Jacolucci**, Charles C., Pembroke Pines, FL
W4INO **Thompson**, Marion L., Atlanta, GA
KA4IPM **Bolin**, Edmund M., Charleston, SC
W4JQT **Anderson**, Kenneth B., Harrisonburg, VA
KA4KFJ **Howell**, Martha "Faye," Memphis, TN
N4LWQ **Faryniarz**, Stan J., Fort Lauderdale, FL
AE4NG **McGown**, George W., Colorado Springs, CO
K4NZ **Jones**, David Luis, Louisa, VA
AA4PO **Knight**, J. Perry, Lakeland, FL
KC4QAC **Dewerth**, John P., Boiling Springs, SC
WA4RQN **Russell**, Ross G. Sr, Pace, FL
KC4SL **Linz**, Gerhard D., Decatur, GA
WB4SPS **Sanders**, William N., Memphis, TN
WN4SQV **Fletcher**, Allen A., Orlando, FL
W4TAU **MacArthur**, Claude R., Spring Hill, FL
KI4UK **Brothers**, Arthur G., Cary, NC
KC5AUA **Futch**, Michael S., Wichita Falls, TX
W5AV **Luke**, I. Keith, Brandon, MS
K5BJP **Davis**, Robert E. Jr, Dallas, TX
K5DF **Gordon**, L. Wayne, Baton Rouge, LA
KF5FXX **Wooley**, Janie, Goldthwaite, TX
AE5GB **Treleaven**, Dale, Baton Rouge, LA
W5IBZ **Geis**, Louis B. Jr, El Paso, TX
WD5IDU **Kelsey**, Edward T., Everett, WA
W5JAC **Long**, Charles A., Memphis, TN
KF5JDO **vanGoethem**, John L., Austin, TX
AA5JW **Albrecht**, Carl E., Stafford, TX
KE5LDO **Dome**, Gregory L., Seguin, TX
N5LYO **Wise**, Otto V., Canton, MS
W5MMO **Louis**, Arthur W., Bellville, TX
N5PDQ **Brown**, Kenneth W., Jasper, TX
WA5RAQ **Rogers**, William S., Oklahoma City, OK
KC5RQB **King**, Hoyd S., Conroe, TX
W5SAR **Miller**, Dennis J., Waynesboro, MS
KJ5SI **Bishop**, Donald E., Columbus, MS
KD5UVG **Vardiman**, Bill A., Valley Mills, TX
W5UWB **Butrovich**, John III, Orange Grove, TX
AA5XM **Leuchter**, Marcus D., Houston, TX
K5YFW **DuBose**, Walter D., San Antonio, TX
K5ZLA **Unnasch**, Wilbert V., Taylor, TX
WD6ATJ **Lewis**, Paul E., Newark, CA
W6BGB **Burrell**, B. G., Newhall, CA
♦ W6CS **Smithwick**, Robert C., Los Altos Hill, CA
WA6CTP **Henson**, Michael K., San Jose, CA
WK6E **Linden**, John P., Rolling Hills Estates, CA
KI6HT **Krichoff**, Brian R., San Rafael, CA
N6ICM **Lockwood**, Mark P., Modesto, CA
KA6LOX **Seedman**, Howard, Los Angeles, CA
K6LSB **Lamb**, Edward G., Porterville, CA
W6NUM **Powers**, Aaron B., Des Moines, WA
♦ NF7B **Goodspeed**, Rolly L., Bonney Lake, WA
KE7BYO **Clevenger**, David L., Uniontown, OH
W7CWQ **Schade**, George H., Phoenix, AZ
N7FLH **Kittleson**, Garry L., Gold Bar, WA
WA7HYD **Huson**, Robert D., Marysville, WA
W7IJK **Milburn**, Wayne E., Coos Bay, OR
K7IVC **Lockitch**, Steve A., Seattle, WA
KC7KIX **Andrus**, Reginal E., Spokane, WA
KA7LED **Christensen**, Dale E., Price, UT
WA7MNB **Eisenbice**, Edmund D., Phoenix, AZ
W7MYZ **Prentice**, Leon A., Vancouver, WA
KE7NAP **Rackoff**, Ellis S., Prescott Valley, AZ
N7OCY **Duffin**, Bonnie J., North Salt Lake, UT
♦ K7OHW **Watkins**, Olga H., Cottage Grove, OR
K7PAH **McLaren**, Frank D., Monroe, WA
KB7TSX **Coleman**, Leonard M., Grants Pass, OR
KB7TWF **Milburn**, Robert, Munds Park, AZ
♦ N8BGJ **Newton**, Larry B., North Fort Myers, FL
WB8BRO **Spears**, George N., Portsmouth, OH
N8BZ **Sponseller**, Gordon D., Mansfield, OH
W8CGG **Sheppard**, Robert S., Tupper Lake, NY
N8CTC **Loiselle**, J. Ray, Dearborn, MI
W8CUY **Dollhopf**, Joseph V., Saginaw, MI
W8EAR **Caley**, Nelson M., Canton, OH
♦ KC8EWJ **Michelsen**, Lyle J., Kimball, MI
K8FV **Villers**, Frederick L., Virginia Beach, VA
KC8GJW **Grodi**, James D., Port Clinton, OH
KC8GNL **Bookwalter**, Jay D., Ontario, OH
♦ WA8HMG **Geiman**, Edgar D., Quincy, MI
W8HYN **Todd**, Truman, Davison, MI
♦ W8JGB **Walkinshaw**, James R., Holt, MI
♦ KB8KPJ **Morton**, James L., Heath, OH
W8LFU **Thomas**, Richard V., Fairborn, OH
KC8LP **Schultz**, Kenneth L., Essexville, MI
KC8LZM **Pender**, Edith C., Fenton, MI
K8MD **Dabish**, Mark, Howell, MI
W8OGV **Mihaiu**, George, River Rouge, MI
K8PK **Keiser**, Paula E., Topeka, KS
KC8PWA **Korda**, Donald T., Youngstown, OH
N8RXD **Taylor**, Eldon B "Al," B., Muskegon, MI
N9AYO **Johnson**, Joseph N., Plymouth, IL
W9BGM **Ricks**, William B., Jacksonville, IL
WA9BRQ **Wise**, Walter L., Glen Carbon, IL
W9BTY **Anderson**, Laurel O., Fond du Lac, WI
N9BZM **Raymond**, Bill E., Gary, IN
KO9D **Kuykendall**, Virgil L. Jr, Indianapolis, IN
WB9DBA **Severs**, June A., Spring Grove, IL
WB9EPO **Marks**, Walter J. Jr, Kingston, IL
K9EZC **Hadden**, Richard W., Janesville, WI
K9GLK **Sherwood**, Warren G., Michigan City, IN
WD9GLR **Frankowiak**, Robert F., Munster, IN
WA9GUJ **Mayberry**, Helen M., Jacksonville, IL
KC9IJG **Weiland**, Henry R., Milwaukee, WI
W9IQK **Thomson**, Robert E. Sr, Wilmington, NC
KAØBCB **Rice**, Shirley M., Scottsbluff, NE
WBØCBS **Grayum**, Alan M., Prior Lake, MN
♦ KDØG **Nelson**, Stanley R., Fairway, KS
WJØG **Samaras**, Timothy M., Bennett, CO
WDØGMM **Voss**, John A., Longmont, CO
WAØHFH **Plantz**, Merrit A., Ainsworth, NE
KØIKN **Burrell**, John H., Englewood, CO
NØIUA **Miller**, Richard, Longmont, CO
♦ WVØJ **Carroll**, Charles "Steve,"Port Orange, FL
KØLQB **Sidebottom**, Robert J., Yuma, AZ
♦ WØPFR **Shilhanek**, Terence, Marion, IA
WØPKX **Hull**, Charles N., Des Moines, IA
WØQHB **Wilson**, Robert W., Ames, IA
WBØRBY **Graham**, Richard L., Leawood, KS
VE6BMM **McVicar**, Barry M., Calgary, AB, Canada
VE6QSL **Elliott**, John K., Clagary, AB, Canada
VE7CF **Wiebe**, Jack, Burnaby, BC, Canada
VE7FHT **Humphreys**, Thomas C., West Vancouver, BC, Canada
VE7FSX **Gellatly**, Bruce, Victoria, BC, Canada

The April 2013 *QST* Silent Key column listed Douglas A. Tippett, W8RTN, in error. We're happy to report he is alive and well. Addis "Lee" Tippett's call sign was listed as ex-N8ESW; correct call is ex-W8RTN. We apologize for the errors.

♦ Life Member, ARRL

Note: Silent Key reports must confirm the death by one of the following means: a letter or note from a family member, a copy of a newspaper obituary notice, a copy of the death certificate, or a letter from the family lawyer or the executor. Please be sure to include the amateur's name, address and call sign. Allow several months for the listing to appear in this column.

Many hams remember a Silent Key with a memorial contribution to the ARRL Foundation or to ARRL. If you wish to make a contribution in a friend or relative's memory, you can designate it for an existing youth scholarship, the Jesse A. Bieberman Meritorious Membership Fund, the Victor C. Clark Youth Incentive Program Fund, or the General Fund. Contributions to the Foundation are tax deductible to the extent permitted under current tax law. Our address is: The ARRL Foundation Inc, 225 Main St, Newington, CT 06111.

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• 50W 2M, 45W on 440MHz • Weather Alert • 1000+ Memories • WIRES capability • Wideband receiver (cell blocked)

Call Now For Your Low Price!

FT-8800R 2M/440 Mobile

• V+U/V+V/U+U operation • V+U full duplex • Cross Band repeater function • 50W 2M 35W UHF • 1000+ memory channels • WIRES ready

Call Now For Low Pricing!

FTM-400DR 2M/440 Mobile

• Color display-green, blue, orange, purple, gray • GPS/APRS • Packet 1200/9600 bd ready • Spectrum scope • Bluetooth • MicroSD slot • 500 mem per band

FT1DR C4FM FDMA 144/430 5W Digital Xcvr

• 1200/9600bps AX.25 APRS & GPS Recvr Built-in • Dual Band Operation w/Dual Recvrs (V+V/U+V/V+U) • Wideband Receive/AM Bar Antenna/ Aircraft Receive • 1266 Memory Channels w/16 Char Alpha Tagging

Also Available in Silver!

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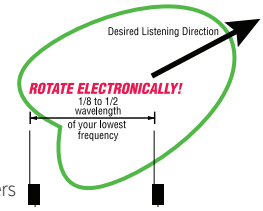

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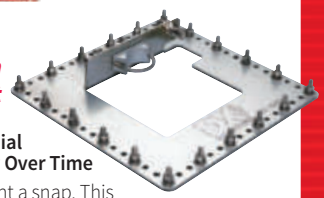

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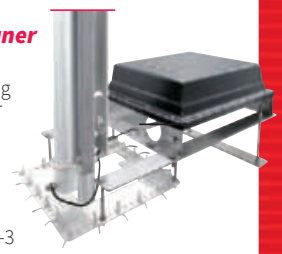

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DXE-PSAD-250A	2.50"	5/16"-18	$17.05
DXE-PSAD-300A	3.00"	5/16"-18	$18.60

V-Bolt Black Powdercoated Saddle	Tube O.D.	Bolt Thread	Price
DXE-PCAVS-1P	0.50"-1.75"	1/4"-20	$10.90
DXE-PCAVS-2P	1.00"-2.00"	5/16"-18	$12.95

V-Bolt Stainless Steel Saddles

The saddles feature serrated edges to grip hard pipe surfaces. These clamps include stainless steel V-bolts, and can be ordered with a tab and 1/4" hardware for grounding applications.

V-Bolt Stainless Saddle	Pipe Size	Ground Lug	Price
DXE-SSVC-1P	1/2"-3/4"	No	$6.95
DXE-SSVC-1PG	1/2"-3/4"	Yes	$7.95
DXE-SSVC-150P	1"-1 1/2"	No	$9.95
DXE-SSVC-150PG	1"-1 1/2"	Yes	$10.95
DXE-SSVC-2P	1"-2"	No	$11.95
DXE-SSVC-3P	2"-3"	No	$14.95

Super Duty Saddle Clamps

Super Duty Saddle Clamps are designed for maximum clamping strength to control large or unbalanced loads. They feature an A356-T6 cast aluminum saddle, with rough, as-cast finish for a secure grip. The clamps include a cast stainless reinforcement plate; armor coated bolt sets are available separately.

Part Number	Tube O.D.	Price
DXE-SDS-200P	2.00"	$34.00
DXE-SDS-250P	2.50"	$41.00
DXE-SDS-300P	3.00"	$51.00

Resin Support Blocks

Securely mount tubing to any flat surface. These blocks have an insulated mount between the tubing and plates, ideal for antenna construction and electrical applications.

Block Part Number	Tube O.D.	Reinforcement Plate Required	Price
DXE-RSB-I02500	1/4"	DXE-RSB-DP-1	$2.65
DXE-RSB-I03125	5/16"	DXE-RSB-DP-1	$2.85
DXE-RSB-I03750	3/8"	DXE-RSB-DP-1	$2.65
DXE-RSB-I05000	1/2"	DXE-RSB-DP-2	$2.90
DXE-RSB-I06250	5/8"	DXE-RSB-DP-2	$2.90
DXE-RSB-I03400	3/4"	DXE-RSB-DP-3	$3.10
DXE-RSB-I10000	1"	DXE-RSB-DP-3	$3.15
DXE-RSB-I11250	1 1/8"	DXE-RSB-DP-4	$4.70
DXE-RSB-I12500	1 1/4"	DXE-RSB-DP-5	$4.70
DXE-RSB-I11500	1 1/2"	DXE-RSB-DP-5	$4.70
DXE-RSB-I13400	1 3/4"	DXE-RSB-DP-6	$7.30
DXE-RSB-I20000	2"	DXE-RSB-DP-6	$7.30
DXE-RSB-I22500	2 1/4"	DXE-RSB-DP-6	$7.95

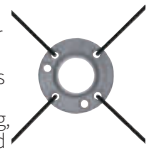
Coaxial Cable Grounding Brackets

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.

DXE-CGB-150 Bracket for 0.50" to 1.50" O.D. Tube.....$15.95

DXE-CGB-200 Bracket for 1.00" to 2.00" O.D. Tube $15.95

Guy Rings



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.

DXE-GR-5P Set of 5 Guy Rings $7.95

Telescoping Antenna Tubing Kits

Available in either fiberglass or aluminum, these kits contain several tapered sections of DX Engineering tubing and stainless steel band camps, allowing you to build your own vertical antenna. You can design, experiment and create an adjustable setup tailored specifically to your specs. The tubing telescopes smoothly and comes in larger sizes and wall thicknesses.

DXE-FTK50 Fiberglass Antenna Tubing Kit, 50' Max. Length $138.00

DXE-ATK65 Aluminum Antenna Tubing Kit, 65' Max. Length $194.50

Exclusively from DX Engineering!

1K2 VHF 1,200 Watt Amplifiers

These compact amps are perfect for Field Day and DXpeditions, and they're also perfect for your shack. The 1K2 is the smallest 1,200 watt amplifier ever offered and it weighs a mere 13 pounds. Adding the built-in switching power supply brings the total weight to just 20 pounds. These amplifiers use a single LDMOS FET rated at an incredible 1,250 Watts, able to handle a 65:1 SWR.

1K2 Amplifiers are designed for EME (CW and JT65), SSB, CW or the very popular JT6M for meteor scatter.

MSQ-6M-1K2 6 Meter 1,200 Watt Amplifier with Power Supply Was ~~$3,299.00~~ Sale $2,995.00

MSQ-6M-1K2-NOPS 6 Meter 1,200 Watt Amplifier without Power Supply Was ~~$2,699.00~~ Sale $2,425.00

MSQ-2M-1K2* 2 Meter 1,200 Watt Amplifier with Power Supply Was ~~$3,299.00~~ Sale $2,995.00

MSQ-2M-1K2-NOPS* 2 Meter 1,200 Watt Amplifier without Power Supply Was ~~$2,699.00~~ Sale $2,425.00

Sale prices on M2 Amplifiers expire on 8/1/2013

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Sale Code: **1308QS**

Prices & specifications subject to change without notice.

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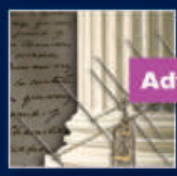
800-777-0703



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International *QST*	$62	$118	$167	Monthly *QST* via air mail for international members
International – no printed *QST*	$39	$76	$111	Digital *QST* only
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Source Code: QST 2/2013

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Made in USA

Available in full spools or cut to your custom length.

Bulk Cable	Impedance	Length	Price
Low-Loss Mini-8 Cable			
DXE-8X	50 Ω	per foot	**$0.31**
DXE-8X-1000	50 Ω	1,000'	**$259.99**
Low-Loss Cable			
DXE-213U	50 Ω	per foot	**$0.89**
DXE-213U-500	50 Ω	500'	**$409.99**
DXE-11U	75 Ω	per foot	**$0.52**
Premium Low-Loss Cable			
DXE-400MAX	50 Ω	per foot	**$0.82**
DXE-400MAX-500	50 Ω	500'	**$364.99**
Low-Loss Foam Cable			
DXE-8U	50 Ω	per foot	**$0.79**
DXE-8U-500	50 Ω	500'	**$359.99**
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**

Multi-Conductor Control Cable

The ideal cable to control your rotator or antenna switch, this color-coded stranded copper cable is reliable and flexible. A vinyl jacket shields it from the elements and it is available by the foot and in bulk spools. Find all the details at DXEngineering.com.

Part Number	Conductors (Gauge)	Description	Price/ Foot
COM-CW3	3 (20 AWG)	Standard	**$0.25**
COM-CW4	4 (20 AWG)	Standard	**$0.28**
DXE-CW8	2 (18 AWG) 6 (22 AWG)	Standard	**$0.48**
DXE-CW8-HD	2 (16 AWG) 6 (18 AWG)	Heavy Duty	**$0.89**
DXE-CW9	9 (24 AWG)	Cat5e	**$0.32**
DXE-CW9S	9 (24 AWG)	Shielded	**$0.36**

DXE-8X BNC Jumper Cables

These male BNC jumper cables use secure, crimped connectors and tube-shrink seals, which make them impervious to the elements. They are Hi-Pot and high voltage tested. In addition to these 50 Ω assemblies, 75 Ω cables are available as well.

DXE-8XDB002 2' Length.....**$14.25**
DXE-8XDB003 3' Length.....**$14.75**
DXE-8XDB006 6' Length.....**$15.75**
DXE-8XDB012 12' Length.....**$17.75**
DXE-8XDB025 25' Length....**$21.75**

Phasing Cables

DX Engineering provides precision, electrically-tuned phasing lines for your 50 or 75 Ω applications. Choose from pre-manufactured four-square and two-antenna array cables or contact us with your custom application.

Multi-Conductor Heavy Duty Tinned Copper Flat Braid

A critical part of any grounding system, this Flat Braid is made with terminals for quick, easy installation. See more sizes and grounding solutions at DXEngineering.com.

Part Number	Length	Price
7 AWG Braid Rated at 85 Amps 1" Wide, for a 1/4" Stud		
DXE-TCB10-RT01	1'	**$5.75**
DXE-TCB10-RT03	3'	**$8.75**
DXE-TCB10-RT05	5'	**$12.75**
DXE-TCB10-RT10	10'	**$18.75**
10 AWG Braid Rated at 53 Amps 1/2" Wide, for a #10 Stud		
DXE-TCB05-RT01	1'	**$4.75**
DXE-TCB05-RT03	3'	**$5.75**
DXE-TCB05-RT05	5'	**$6.75**
DXE-TCB05-RT10	10'	**$9.75**

DX Engineering is the Best Place to Get Coax, Here's Why:

- 100% Hi-Pot and High Voltage Tested
- Your Coax Cable Order is Shipped FREE Anywhere in the Contiguous 48 States
- Weatherproof: Adhesive Shrink Tubing Seals Connections
- Silver-plated PTFE-insulated Connectors
- Hand Crafted by Top Techs

See DXEngineering.com for more connector options.

Made in USA

Black PVC Jacket

DXE-8U 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%

Pre-cut Cable with Connectors		
Part Number	Length	Price
DXE-8UDU002	2'	**$13.25**
DXE-8UDU003	3'	**$13.75**
DXE-8UDU006	6'	**$16.75**
DXE-8UDU025	25'	**$41.75**
DXE-8UDU050	50'	**$64.75**
DXE-8UDU100	100'	**$117.75**

UV-Resistant, Non-Contaminating, Black PVC Jacket

DXE-213U 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%

Pre-cut Cable with Connectors		
Part Number	Length	Price
DXE-213UDU003	3'	**$14.75**
DXE-213UDU006	6'	**$18.75**
DXE-213UDU012	12'	**$24.75**
DXE-213UDU025	25'	**$39.75**
DXE-213UDU050	50'	**$68.75**
DXE-213UDU075	75'	**$95.75**
DXE-213UDU100	100'	**$118.75**
DXE-213UDU150	150'	**$171.75**

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 @ 10 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%

Pre-cut Cable with Connectors		
Part Number	Length	Price
DXE-8XDU003	3'	**$11.75**
DXE-8XDU006	6'	**$12.75**
DXE-8XDU012	12'	**$16.75**
DXE-8XDU025	25'	**$21.75**
DXE-8XDU050	50'	**$32.75**
DXE-8XDU075	75'	**$43.75**
DXE-8XDU100	100'	**$53.75**
DXE-8XDU150	150'	**$74.75**

UV-Resistant, Non-Contaminating, Black PVC Jacket

DXE-400MAX 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%

Pre-cut Cable with Connectors		
Part Number	Length	Price
DXE-400MAXDU003	3'	**$16.75**
DXE-400MAXDU006	6'	**$18.75**
DXE-400MAXDU018	18'	**$35.75**
DXE-400MAXDU025	25'	**$43.75**
DXE-400MAXDU050	50'	**$66.75**
DXE-400MAXDU075	75'	**$99.75**
DXE-400MAXDU100	100'	**$119.75**
DXE-400MAXDU150	150'	**$179.75**

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Antennas

FREE! RBA-1:1 Balun or RU-4:1 Unun
When You Buy A S9V 43', 31' or 18' Multiband Antenna

Purchase an S9v 43', 31' or 18' antenna and fill out the included form. Mail it to LDG Electronics, and we will send you either a 200 watt balun or unun, your choice!

S9v43 $199.99
80-6 meters *Fixed Operation*

The S9v 43' is a high-performance lightweight telescoping fiberglass vertical. The best value in high-performance 'tall' verticals!

S9v31 $99.99
40-6 meters *Fixed or Portable Operation*

S9v18 $49.99
20-6 meters *Fixed or Portable Operation*

The S9v 31' and 18' are tapered, ultra-lightweight fiberglass vertical antennas. Friction-locking sections and high-tech polymer tube rings allow the antenna to be quickly and safely deployed in practically any environment without tools!

S9rp $39.99
Aluminum Radial Plate
Includes 20 sets of stainless steel nuts & bolts

Designed to handle the higher power of the Tokyo Hi Power HL-45B.

NEW! 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. One button push on the tuner and the Z-817H takes care of the rest. Will also function as a general purpose antenna tuner with other QRP radios or QRP radios with up to 75 watt HF amps. Powered by four AA internal Alkaline batteries (not included). 2000 memories cover 160 through 6 meters.
Suggested Price $159.99

- RF Sensing
- Tunes Automatically
- No Interface Cables Needed

AT-200ProII
The AT-200ProII now includes LEDs to show antenna position and if the tuner is in bypass. A two position antenna switch stores 2000 memories per switch. Handles up to 250 watts SSB or CW on 1.8 to 30 MHz and 100 watts on 54 MHz. Rugged and easy to read LED bar graphs simultaneously show RF power and SWR. Includes a six foot DC power cable. **Suggested Price $259.99**

AT-1000ProII
LDG Electronics' new flagship 1KW tuner features: 5 to 1,000Watts PEP; RF Sensing; Auto and Semi Tuning Modes; 1.8 to 54 MHz range; 6 to 800 ohm range (15 to 150 on 6M); simplified operation; and an optional external 4.5" analog meter. With the two position antenna switch, there are 2,000 memories that store tuning parameters for almost instantaneous memory recall whenever you transmit on or near a frequency you've used before. Includes six foot DC power cable. **Suggested Price $539.99**
Optional M-1000 external analog meter $129.99

IT-100
Matched in size to the IC-7000 and IC-706, for either manual or automatic tunes, and status LEDs. 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

KT-100
For AT-300 compatible Kenwood transceivers (except TS-480HX). The KT-100 actually allows you to use the Tune button on the radio. 2,000 memories for instant recall of the tuning parameters for your favorite bands and frequencies.
Suggested Price $199.99

YT-450
Designed for Yaesu's newest 100 watt radios. Interfaces directly with the Yaesu FT-450 and FT-950 radios. Press the tune button on the tuner and the rest happens automatically. It will quickly match nearly any kind of coax fed antenna with an SWR of up to 10:1. 2000 memories recall settings in an instant! Seamless connection to a PC. **Suggested Price $249.99**

YT-847
YT-847 Autotuner is an integrated tuner for the Yaesu FT-847. An included CAT/Power cable interfaces with your FT-847. Just press the tune button on the tuner and everything else happens automatically! **Suggested Price $249.99**

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LDG ELECTRONICS

radio not included

AT-897Plus
for the Yaesu FT-897

If you own a Yaesu FT-897 and want a broad range automatic antenna tuner, look no further! The AT-897Plus Autotuner mounts on the side of your FT-897 just like the original equipment 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***

NEW! AT-600ProII

Building on the success of the AT-600Pro, we refined and expanded the model with an optional external 4.5" analog meter. The new AT-600ProII keeps many of the same features of the previous model, but simplifies the operation. With the two-position antenna switch, there are 2,000 memories that store tuning parameters for almost instantaneous memory recall whenever you transmit on or near a frequency you've used before. Includes six-foot DC power cable.
Suggested Price $369.99
Optional M-600 external analog meter $129.99

Z-100Plus

Small and simple to use, the Z-100Plus sports 2000 memories that store both frequency and tuning parameters. It will run on any voltage source from 7 to 18 volts; six AA batteries will run it for a year of normal use. Current draw while tuning is less than 100ma. The Z-100Plus now includes an internal frequency counter so the operating frequency is stored with tuning parameters to make memory tunes a blazingly fast 0.1 seconds; full tunes take an average of only 6 seconds. Includes six foot DC power cable. ***Suggested Price $159.99***

• RF Sensing
• Tunes Automatically
• No Interface Cables Needed

AT-100ProII

This desktop tuner covers all frequencies from 1.8 – 54 MHz (including 6 meters), and will automatically match your antenna in no time. It features a two-position antenna switch with LEDs, allowing you to switch instantly between two antennas. The AT-100ProII requires just 1 watt for operation, but will handle up to 125 watts. Includes six foot DC power cable.
Suggested Price $229.99

Z-11ProII

Meet the Z-11ProII, everything you always wanted in a small, portable tuner. Designed from the ground up for battery operation. Only 5" x 7.7" x 1.5", and weighing only 1.5 pounds, it handles 0.1 to 125 watts, making it ideal for both QRP and standard 100 watt transceivers from 160 - 6 meters. The Z-11ProII uses LDG's state-of-the-art processor-controlled Switched-L tuning network. It will match dipoles, verticals, inverted-Vs or virtually any coax-fed antenna. With an optional LDG balun, it will also match longwires or antennas fed with ladder-line. Includes six foot DC power cable. ***Suggested Price $179.99***

radio not included

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. It will switch to PKT mode, transmit a carrier, tune the tuner, then restore the radio to the previous mode! 2000 memories cover 160 through 6 meters. The Z-817 will also function as a general purpose antenna tuner with other QRP radios. Just transmit a carrier and press the tune button on the tuner. Powered by four AA internal Alkaline batteries (not included), so there are no additional cables required.
Suggested Price $129.99

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. . . the first choice of hams around the world!

HAM-IV

The most popular rotator in the world!

HAM-IV **$649.95**

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*

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.

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.

HAM IV and HAM V Rotator Specifications	
Wind Load capacity (inside tower)	15 square feet
Wind Load (w/mast adapter)	**7.5 square feet**
Turning Power	800 in.-lbs.
Brake Power	**5000 in.-lbs.**
Brake Construction	Electric Wedge
Bearing Assembly	**dual race/96 ball bearings**
Mounting Hardware	Clamp plate/steel U-bolts
Control Cable Conductors	**8**
Shipping Weight	26 lbs.
Effective Moment (in tower)	**2800 ft.-lbs.**

TAILTWISTER Rotator Specifications	
Wind load capacity (inside tower)	20 square feet
Wind Load (w/ mast adapter)	**10 square feet**
Turning Power	1000 in.-lbs.
Brake Power	**9000** in.-lbs.
Brake Construction	Electric Wedge
Bearing Assembly	**Triple race/138 ball brngs**
Mounting Hardware	Clamp plate/steel U-bolts
Control Cable Conductors	**8**
Shipping Weight	31 lbs.
Effective Moment (in tower)	**3400 ft.-lbs.**

CD-45II Rotator Specifications	
Wind load capacity (inside tower)	8.5 square feet
Wind Load (w/ mast adapter)	**5.0 square feet**
Turning Power	600 in.-lbs.
Brake Power	**800 in.-lbs.**
Brake Construction	Disc Brake
Bearing Assembly	**Dual race/48 ball brings**
Mounting Hardware	Clamp plate/steel U-bolts
Control Cable Conductors	**8**
Shipping Weight	22 lbs.
Effective Moment (in tower)	**1200 ft.-lbs.**

hy-gain® DCU-3 Digital Rotator Controller

6 Programmable Beam Headings . . .

Gives you fully automatic and manual control of your hy-gain rotators

New!

DCU-3 **$449.95**

New DCU-3 Digital Controller lets you program 6 beam headings! Gives you fully automatic or manual control of your hy-gain HAM or Tailtwister Rotators.

Push a memory button or dial in your beam heading or let *Ham Radio Deluxe* (or other) control your DCU-3. Your antenna automatically rotates precisely and safely to your desired direction.

DCU-3 makes sure your antenna is free and safely unlocked before turning begins and then turns off your motor before your antenna reaches its final destination. Your antenna *gently* coasts to a stop before the brake locks. Greatly reduces potentially damaging overshoot.

Fine tuning and full manual control is effortless with *automated* Left and Right direction buttons - - no more worrying about releasing and relocking the brake. Brake *automatically* releases before fine tuning begins and relocks after fine tuning.

Bright blue LCD displays actual, dial-in and computer controlled beam headings in one degree increments and your call.

AutoBrake Release - no need to remember to release brake -- release time is automatic and adjustable 0 to 8 seconds.

***Coast* feature** allows antenna to gently stop before brake locks. Adjustable coast delay (*0-10 degrees*) turns off motor before antenna reaches its final destination to reduce potentially damaging overshoot.

AutoJog unlocks and frees antenna before turning -- great for older rotators with "sticky" brakes. It jogs the rotator backwards slightly to ease brake pressure enough to release.

Offset feature allows you to calibrate display to show actual beam heading. USB/RS-232 ports. Adjustable LCD sleep time. Field upgradeable. 8.5Wx4.3H x9D". 110 VAC. **DCU-3X** for 220 VAC.

DCU-2, $399.95. **Digital** Rotator Controller, like DCU-3, but no programmable memories. 110 VAC. Order **DCU-2X**, for 220 VAC.

HAM-VI & HAM-VII

New!* HAM-VII, $799.95.** Like HAM-IV but with ***DCU-3 digital controller with *six programmable memories*. For medium antennas up to 15 sq. ft. wind load.

New!

HAM-VII **$799.95** *with DCU-3*

HAM-VI **$749.95** *with DCU-2*

HAM-VI, $749.95. Like HAM-VII but with ***DCU-2*** digital controller.

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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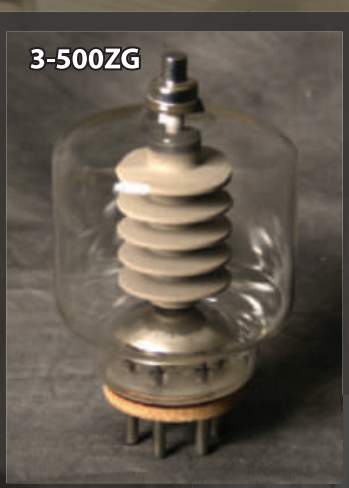

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MFJ-259B is a complete ham radio test station including -- frequency counter, RF signal generator, *SWR Analyzer*™, RF Resistance/Reactance Analyzer, Coax Analyzer, Capacitance/Inductance Meter and more!

You can read Complex Impedance as series resistance and reactance (R+jX) or as magnitude (Z) and phase (degrees).

Determine velocity factor, coax cable loss in dB, length of coax and distance to short/open.

You can read SWR, return loss and reflection coefficient at any frequency simultaneously.

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Large easy-to-read two line LCD screen and side-by-side meters clearly display your information.

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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-249B, $269.95. If digital display is all you need MFJ-249B does everything MFJ-259B does without analog meters.

More hams use MFJ analyzers than all others in the world!

MFJ-269 1.8-170 MHz *plus* 415-470 MHz, 12-bit A/D

MFJ-269
$389.95

MFJ-269 is a *super* MFJ-259B that adds 415-470 MHz and 12-bit A/D converter that gives you much better accuracy. *Complex Impedance Analyzer* reads series/*parallel* equivalents and magnitude/phase. *CoaxCalculator*™ gives line length from electrical degrees and vice-versa for any frequency, Velocity Factor, coax loss in dB. Use any characteristic impedance 10-600 Ohms. Has LCD log SWR bargraph, N-connector.

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

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MFJ-269*PRO*™ Analyzer

MFJ-269Pro, $419.95.
Like MFJ-269, but UHF range covers *430 to 520 MHz* to include commercial and industrial frequencies. Rugged protective shell protects knobs, switches, meters, digital display for commercial, industrial and lab work.

HF/VHF/UHF SWR Analyzer™

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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.

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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.

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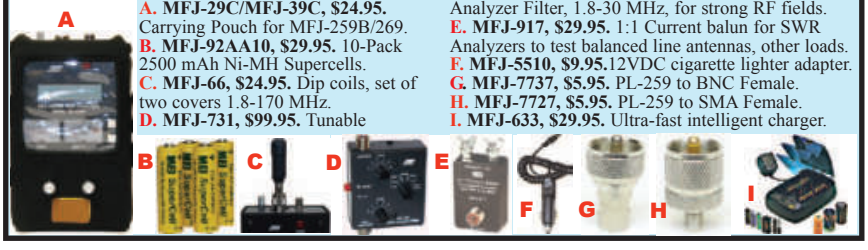

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Tune your antenna for minimum SWR! Works 1.8-30 MHz on dipoles, verticals, inverted vees, random wires, beams, mobile whips, shortwave receiving antennas . . . Use coax, random wire, balanced lines. Has heavy duty 4:1 balun for balanced lines.

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Custom designed inductor switch, 1000 volt tuning capacitors, *Teflon*(R) insulating washers and proper L/C ratio gives you *arc-free* no worries operation up to 300 Watts PEP transceiver input power.

MFJ-949E **$179.95**

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!

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MFJ-986 Two knob *Differential-T™*

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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 **$299.95**

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 **$219.95**

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 **$139.95**

***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 **$119.95**

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-902 *Tiny Travel* Tuner

MFJ-902 **$99.95**

Tiny $4^{1}/_{2}$x$2^{1}/_{4}$x3 inches, full 150 Watts, 80-10 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 has lighted Cross-Needle SWR/Wattmeter, bypass switch. Handles 100 W FM, 200W SSB. MFJ-906 **$99.95**

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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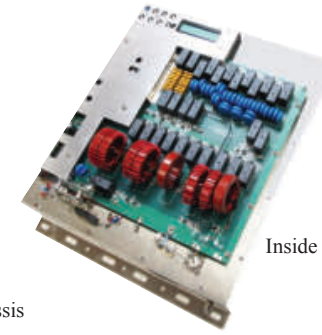
MFJ 1500 Watt *Remote* Auto Tuner

Place this MFJ-998RT remote tuner at your antenna to match high SWR antennas/long coaxes -- greatly reduce losses for high efficiency

. . . Match 12-1600 Ohms, 1.5 kW, SSB/CW, 1.8-30 MHz . . . Match coax/wire antennas . . . Weather-sealed . . . Remotely powered thru coax . . . Amplifier, radio, tuner protection . . . Output static/lightning protection . . . StickyTune™ always tunes when power folds back . . . DC power jack . . .

MFJ-998RT
$769.95

Bottom Chassis



Inside View

Tune your antenna AT your antenna!

Get greatly reduced losses and high efficiencies with long coax runs and high SWR antennas with this new MFJ-998RT 1.5 kW Remote Antenna Tuner.

Weather-Sealed

A tough, durable weather-sealed ABS cabinet with over-lapping lips, sealing gasket and stainless steel chassis protects the MFJ-998RT from all kinds of weather.

No Power Cable Needed!

No power cable needed -- remotely powered through coax. Includes MFJ-4117 Bias-Tee with on/off switch for station end of coax. Has 12 VDC jack for power cable, if desired.

Fully Protected

MFJ exclusive algorithms protect your tuner, radio and RF power amplifier from damage.

Automatic inductor and capacitor limiting prevents tuning extreme loads which can destroy your tuner.

Your tuner will not tune if more than 75 Watts with SWR greater than 3:1 is applied or if more than 125 Watts is applied.

Tuner output is static electricity and lightning induced surge protected.

MFJ exclusive StickyTune™

Very high SWR can fold back transmitter power and *prevent tuning* caused by extreme differences in loads (example: changing bands and other conditions).

But MFJ exclusive *StickyTune™ always* tunes with a simple on/off power cycle and re-transmit.

Tunes Coax fed and Wire Antennas

Tunes both coax fed and wire antennas. Has *ceramic* feed-through insulator for wire antennas. 2 kV *Teflon*® insulated SO-239 -- prevents arcing from high SWR.

High Power, Highly Efficient

A highly efficient L-network matches 6-1600 Ohms at *full* 1500 Watts legal limit SSB/CW 1.8 to 30 MHz with Hi-Q Ls, Cs.

MFJ-998RT Learns as you Operate

As you operate, the MFJ-998RT automatically tunes for minimum SWR and remembers your frequency and tuner settings. The next time you operate on that frequency and antenna, its tuner solution is restored in milliseconds and you're ready to operate!

Highly Intelligent, Ultra-fast Tuning

MFJ *InstantRecall*™ recalls stored tuning solutions from 10,000 memories. For new frequencies, MFJ *Intelli-Tune*™ measures your antenna impedance and instantly determines the correct matching components. If antenna impedances cannot be measured, MFJ *AdaptiveSearch*™ searches *only* the relevant components that can match your antenna giving you ultra-fast tuning.

Field upgradeable firmware. Requires 12-15 VDC at 1.4 Amps maximum or 110 VAC with optional MFJ-1316, $21.95. Weighs 9.5 lbs. 13¼Wx6¾Hx17½D inches.

600W *Remote IntelliTuner™*

MFJ-994BRT
$399.95

MFJ-994BRT -- perfect for 600 Watt SSB/CW amplifiers like Ameritron's AL-811/ALS-600/ALS-500M. Matches 12-800 Ohms. Coax/wire antennas, 1.8-30 MHz. Fully *weather-sealed* for outdoor use. Remotely powered through coax. Tough, durable, *built-to-last* cabinet, 9¼Wx3Hx 14¼D inches, 4 lbs. Includes MFJ-4117 BiasTee Power Injector.

300W *Remote IntelliTuner™*

MFJ-993BRT
$299.95

MFJ-993BRT handles 300 Watts SSB/CW and matches an *extra-wide* 6-1600 Ohm impedances. Coax/wire antennas, 1.8-30 MHz. Fully *weather-sealed* for remote outdoor or marine use. Remotely powered through coax. Tough, durable, *built-to-last* cabinet measures 9¼Wx3Hx14¼D inches. Weighs just 4 pounds. Includes MFJ-4117 BiasTee Power Injector.

200W *Remote IntelliTuner™*

MFJ-926B
$279.95

MFJ-926B, 200 Watts SSB/CW, matches 6-1600 Ohms, Coax/wire antennas, 1.8-30 MHz. Includes BiasTee.

200W *Remote Econo Tuner™*

MFJ-927
$259.95

MFJ-927, 200 Watts SSB/CW, 6-1600 Ohms, Coax/Wire antennas, 1.8-30 MHz. Weather-sealed, BiasTee. 7½Wx5¼Hx8½D in.

MFJ-2990
$359.95

160-6 Meters 43 foot Vertical Antenna

Operate all bands 160-6 Meters at full 1500 Watts with this self-supporting, 43 foot high performance vertical! Assembles in less than an hour. Low profile blends in with sky and trees -- barely see it. Entire length radiates. Exceptional low angle DX performance on 160-20 Meters and very good performance on 17-6 Meters. Telescope it shorter for more effective low angle radiation on 17-6 M if desired. One of these wide-range *MFJ automatic tuners* at the antenna easily matches all bands 160-6 Meters. There's no physical tuning adjustments on the antenna -- you *simply put it up!* Requires ground system, at least one radial, more the better. Includes balun and base mount. **MFJ-1932, $34.95.** All band ground radial system.

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http://www.mfjenterprises.com

10 Bands: 80-2 Meters

$299.95 MFJ-1799

- ***10 Bands: 75/80, 40, 30, 20, 17, 15, 12, 10, 6, 2 Meters including 75/80M***
- ***Handles 1500 Watts PEP SSB/CW***
- ***No ground or ground radials needed!***
- ***Low radiation angle for great DX, omni-directional, automatic bandswitching***

Only 20 feet tall! Mounts anywhere!

Self-supporting and just 20 feet tall. Mounts easily from ground level to tower top -- small lots, backyards, apartments, condos, mobile homes, roofs, tower mounts.

Highly Efficient End-Loading

No lossy traps! *End-loading*, the most efficient loading known -- gives you highly efficient performance, excellent bandwidth, low angle radiation and automatic bandswitching.

High-Q loading coils are wound on tough, low loss fiberglass forms with *Teflon*(R) wire where needed.

Entire Length Radiates

End-loading results in uniform current distribution and the *entire length radiates*. This puts the radiating elements up high giving you more QSOs.

No Feedline Radiation/Distorted Pattern

MFJ's center-fed *balanced* halfwave vertical dipole design is decoupled and isolated from the feedline with MFJ's *AirCore*™ high power balun. It can't saturate, no matter how high your power.

This gives you consistently high performance by killing feedline radiation, pattern distortion, SWR shifts, RFI, noise pickups.

Easy to Tune!

Tuning to your favorite part of one band does not affect other bands and is done at the *bottom* of the antenna by simply adjusting a length of the capacitive hat.

Built-to-Last!

Incredibly strong *solid* 1 1/4 inch diameter fiberglass center insulator and 1 3/8 inch diameter 6061 T6 aircraft strength aluminum tubing will make it the only antenna you will ever need.

MFJ 6-Band Halfwave Vertical Antenna

MFJ-1796 **$229.95**

MFJ-1796, like MFJ-1799, but for 6 bands: 40, 20, 15, 10, 6 and 2 Meters. 12 foot high, 24 inch foot print, mounts anywhere. No ground, no radials, self-supporting.

MFJ's Super High-Q Loop™ Antennas

MFJ's *tiny* 36 inch diameter loop antenna lets you operate 10 through 30 MHz *continuously* -- including the WARC bands!

Ideal for limited space -- apartments, small lots, motor homes, attics, or mobile homes. Enjoy DX and local contacts mounted vertically. Get both low angle radiation for excellent DX and high angle radiation for local, close-in contacts. Handles 150 watts.

Super easy-to-use! Only MFJ's super remote control has *Auto Band Selection*™. It auto tunes to desired band, then beeps to let you know. No control cable is needed. Fast/slow tune buttons and built-in two range Cross-Needle SWR/Wattmeter lets you quickly tune to your exact frequency.

All welded construction, welded butterfly capacitor with no rotating contacts, large 1.050 inch diameter round radiator -- *gives you highest possible efficiency*.

Each plate in MFJ's tuning capacitor is welded for low loss and polished to prevent high voltage arcing, welded to the radiator, has nylon bearing, anti-backlash mechanism, limit switches, continuous no-step DC motor -- smooth precision tuning. Heavy duty thick ABS plastic housing has ultraviolet inhibitor protection.

Cover 40-15 Meters. MFJ-1788, $469.95. Like MFJ-1786 but covers 40 - 15 Meters continuous. Includes remote control.

6-Band, 40-2 Meters *Rotatable* Mini-Dipole

Low profile 14 feet . . . 7 ft. turning radius . . . 40, 20, 15, 10, 6, 2 Meters . . . 1500 Watts . . .

MFJ-1775 is inconspicuous and low profile -- not much bigger than a TV antenna and is easily tuned by a lightweight rotator like Hy-Gain's *AR-35*.

It's no Wimp! Its directivity reduces QRM/noise and lets you *focus* your signal in the direction you want -- work some real DX.

You can operate 6 bands -- 40, 20, 15, 10, 6 and 2 Meters -- and run *full 1500 Watts* SSB/CW on all HF bands!

Features automatic band switching and uses highly efficient end-loading with its *entire length* always radiating. With 6 and 2 Meters thrown in, you have ham radio's most versatile *rotatable* dipole!

Each HF band uses a separate, efficient end-loading coil wound on fiberglass forms with *Teflon*™ wire, and capacitance hats at each end (no lossy traps). 6 and 2 meters are *full-length* halfwave dipoles.

Built-to-last -- incredibly strong solid rod fiberglass center insulator and 6063 T6 aircraft strength aluminum tubing radiator. Assembles in an afternoon. Adjusting one band has little effect on other bands.

MFJ-1775W, $249.95. WARC band version for 12, 17, 30, 60 Meters only.

MFJ *G5RV Antenna*

MFJ-1778 **$44.95**

Covers all bands, 160-10 Meters with antenna tuner. 102 feet long. Can use as inverted vee or sloper. Use on 160 M as Marconi. 1500 Watts. Super-strong fiberglass center/feedpoint 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.

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- Single USB connection to computer
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- 3-Way Rig Control built-in - logic level, RS-232 & USB!
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As Always- Upgrade any PK-232 ever made to the PK-232SC!

Customize your PK-232 with our complete line of upgrades and accessories.

The incredible PK-232SC again expands its role in your radio station. Now it 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 new logic level and RS-232 rig control is optically isolated for your Icom CI-V, Yaesu CAT, Kenwood and other radios. Now it has a new DTR PTT option for legacy sound card software and radios. You never have enough downstream USB ports so we even added a pair for that new radio with USB rig control and other accessories.

Need Software? Check the new Ham Radio Deluxe & Radio Operating Center bundle!
Optimized for the PK-232SC and other Timewave/AEA TNCs www.ham-radio-deluxe.com

Signal Processing, Antenna Analysis, Data & Remote Control

DSP-599zx Audio Signal Processor*

Now shipping with new bigger & brighter display!

Noise Reduction, precision highpass, lowpass, bandpass & notch filtering for audio, CW & data.

TZ-900 Antenna Analyzer

Once you use the TZ-900 - you'll never want to use any other!

Sweep and analyze antennas in seconds. Zoom, Compare & Store Data. Sunlight-visible color graphics, handheld, rechargable batteries, no computer required.

ANC-4 Antenna Noise Canceller

See & hear a demo on YouTube!

Kill Noise before it reaches your receiver! Great for supressing power line noise, plasma TV noise & many other local electrical noises.

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- **HamLinkUSB™ Rig Control Plus**
  C-IV, CAT, RTS (PTT, FSK or CW) for sound card software
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  Proven FTDI Chip. 9 and 25 pins for all radios and TNCs!

TNC & Multimode Data Controller

- **PK-96/100 TNC - 1200/9600 Packet***
  Available with USB or RS-232
- **DSP-232+ Multimode Data Controller***
  Sound card interface, USB, Pactor, 1200/9600 Packet

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MFJ Off-Center Fed Dipoles

No antenna tuner needed!

OCFDs professionally engineered for 40/20/10/6; 60/30; 80/40; 160/75 Meters with wide bandwidth, ground-reinforced gain, balun, matching network!

How good are these MFJ *Off Center Fed Dipoles*?
http://www.eham.net/reviews/detail/8917 for reviews by real users.
Visit ***http://www.mfjenterprises.com/ocfd/*** *for more information.*

New MFJ wideband Off-Center Fed Dipoles (OCFD) deliver ground reinforced gain that more expensive multiband verticals can't match. Plus, on second harmonic bands the clover-leaf pattern doubles signal intensity yet again! The MFJ-2010 and MFJ-2012 can even quadruple your signal on the higher bands!

No Tuner Needed!

MFJ's computer modeling determined a feedline offset that gives the *same* feedpoint impedance on every band. MFJ's exclusive *ExactRatio*™ broadband RF transformers convert this impedance to 50 Ohms to give you low SWR on *all* bands.

Use as Dipole, Vee, Sloper

Use as dipole, inverted Vee or sloper. Horizontal mounting up 35-70 feet is ideal. Feed block has attachment points for tower or tree support.

Stealthy -- Low Profile

The single wire radiator and compact matching network are virtually invisible in the air.

Built-in Current Balun

OCFDs *require* excellent current baluns to eliminate feedline radiation. *Built-in* Guanella current-balun has 30-dB of *measured* common-mode rejection 80-10 Meters. Kills feedline radiation, pattern distortion, SWR shifts, RFI, noise pickup.

Best SWR at Typical Height

Feedpoints are compensated for ground proximity at typical backyard mounting height to ensure best SWR at your location.

98 Percent Efficient

MFJ's unique matching network delivers 98% of every watt you apply directly into the antenna's full-sized dipole radiator for unparalleled efficiency.

Handles 1500 Watts

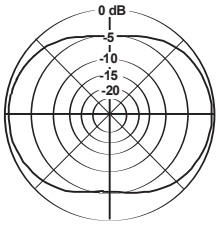
The MFJ-2012/2014/2016 feature heavy-duty high power components to handle 1500 Watts PEP SSB/CW.

Built-to-Last

Rugged 14-guage 7-strand copper antenna wire, porcelain end insulators. Pull-tested to 200 lbs. UV-resistant, stainless-steel hardware, *Teflon*(R) SO-239 connector -- *built-to-last*.

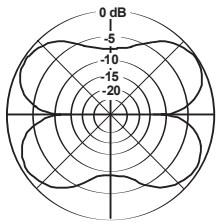
Modeled Azimuth Radiation Patterns, Measured SWR for MFJ-2012/2010*

160M/MFJ-2016, 80M/MFJ-2014, 60M/MFJ-2013, 40M/MFJ-2012/10



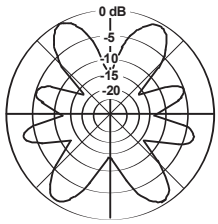
Outer Ring 6.5 dBi

80M/MFJ-2016, 40M/MFJ-2014, 30M/MFJ-2013, 20M/MFJ-2012/10



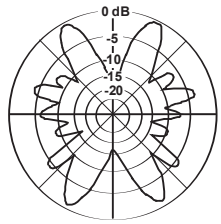
Outer Ring 9.1 dBi

10M/MFJ-2012/MFJ-2010



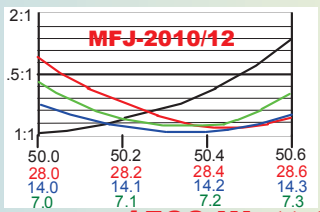
Outer Ring 9.8 dBi

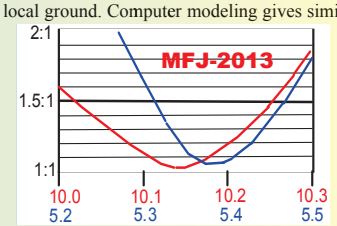
6M/MFJ-2012/MFJ-2010

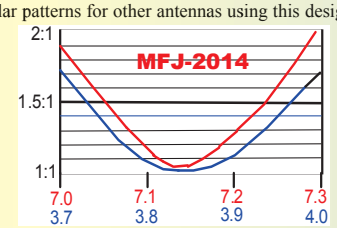


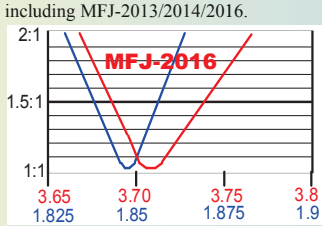
Outer Ring 11.5 dBi

*All models made at 50 feet over local ground. Computer modeling gives similar patterns for other antennas using this design including MFJ-2013/2014/2016.

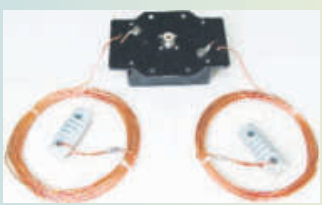








1500 Watt OCFD Models



MFJ-2012
$79.95
40, 20, 10, 6M

MFJ-2012, $79.95. For 40, 20, 10 and 6 Meters. Day or night, there's always DX on one of these bands. If you hear it, you'll work it -- even QRP! MFJ-2012 is 66 feet long.

MFJ-2014, $99.95. DX-Caster for 75 and 40 Meters: Replace your old 75-Meter dipole and add 9-dBi of power-house coverage on 40 Meters for superb DX. 122 feet long.

MFJ-2014
$99.95
75, 40 Meters

Normally, a OCFD cut for 3.85 MHz resonates on 7.7 MHz. The frequency compensated MFJ-2014 resonates at *mid-band* on both 75 and 40!

MFJ-2016, $129.95. For 160 and 75 Meters. Covers low end of 160 Meters plus delivers 9-dBi gain in 75 Meter SSB DX window. MFJ-2016 is 240 feet long with strong porcelain end insulators.

300 Watt OCFD Models

MFJ-2010, $59.95. For 40, 20, 10 and 6 Meters. Perfect for low-profile set-ups, portable, QRP, and DX-peditions.Weighs less than two pounds, tucks easily into a backpack and pulls high in the air with lightweight cord. The 66 foot wire element and compact matching network are virtually invisible in the air.

MFJ-2010
$59.95
40, 20, 10, 6 Meters

MFJ-2013, $79.95. For 60/30 Meters. Get full halfwave dipole performance on 60-Meters plus up to 9-dBi of globe spanning gain on 30M. Brings a whole new meaning to 30-Meter QRP. 86 feet long.

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MFJ G5RV Antennas

Operate all bands 10 thru 160 Meters with a single wire antenna!

MFJ-1778
$44.95

***The** famous G5RV antenna is the most popular ham radio antenna in the world!* You will transmit and receive strong signals day and night.

And it's no wonder . . . it's an efficient, *all band* antenna that's only 102 feet long -- shorter than an 80 Meter dipole. Has 32.5 foot ladder line matching section ending in SO-239 connector for your coax feedline.

Use as Inverted Vee or Sloper and it's even more compact and needs just one support.

With an antenna tuner, you can operate all bands 80 Meters through 10 Meters and even 160 Meters with a ground.

MFJ's fully assembled G5RV handles 1500 Watts. *Ceramic* end and fiberglass center insulators. *Hang and Play™* -- add coax, some rope to hang and you're on air!

MFJ-1778M, $39.95. *Half-size*, 52 foot *G5RV JUNIOR* covers 40-10 Meters with tuner. Handles full 1500 Watts.

MFJ All Band Doublet

MFJ-1777
$59.95

MFJ-1777 is a 102 foot *all band* doublet antenna that covers 160 through 6 Meters with a balanced line tuner. Super strong custom fiberglass center insulator provides stress relief for ladder line (100 ft. included). Authentic *glazed ceramic* end insulators. Handles full 1500 Watts.

MFJ *Dual Band* 80/40 *or* 40/20M Dipoles

MFJ-17758
$89.95
80/40 Meters

MFJ-17758 is a short *dual band* 80/40 Meter dipole antenna that is only 85 feet. *Full-size* on 40 Meters with ultra-efficient end-loading on 80 Meters. Full 1500 Watts. Super-strong injection-molded center insulator with *built-in* SO-239 connector and hang hole. Solderless, crimped construction. 7-strand, #14 gauge hard copper wire. Connect your coax feedline directly, *no tuner needed*.

MFJ-17754, $59.95. Short *dual band* 40/20 Meter dipole antenna is only 42 feet. *Full-size* on 20 Meters, ultra-efficient end-loading on 40 Meters. 1500 Watts. Center insulator with SO-239 connector and hang hole.

MFJ *Single Band* Dipole Antennas

Ultra high quality center fed dipoles will give you trouble-free operation for years. Custom injection-molded UV-resistant center insulator has built-in coax connector and hanging hole. Heavy duty 7-strand, 14-gauge hard copper antenna wire. Extremely strong solderless crimped construction. Authentic *glazed ceramic* end insulators. Use as horizontal or sloping dipole or inverted vee. Handles full 1500 Watts. Simply cut to length for your favorite frequency with cutting chart provided.

MFJ-1779A **$69.95** 160M, 265 ft.
MFJ-1779B **$49.95** 80-40M, 135 ft.
MFJ-1779C **$29.95** 20-6M, 35 ft.

True 1:1 Current *Balun & Center Insulator*

MFJ-918
$24.95

True *1:1 Current Balun/ Center Insulator* forces equal antenna currents in dipoles for superior performance. Reduces coax feedline radiation and field pattern distortion -- your signal goes where *you* want it. Reduces TVI, RFI and RF hot spots in your shack. *Don't build a dipole without one!* 50 hi-permeability ferrite beads on high quality RG-303 *Teflon*® coax and *Teflon*® coax connector. Handles full 1.5kW 1.8-30 MHz. Stainless steel hardware with *direct* 14 gauge stranded copper wire connection to antenna. 5x2 inches. Heavy duty weather housing.

RF Isolator

MFJ-915
$29.95

MFJ-915 *RF Isolator* prevents unwanted RF from traveling on the outside of your coax shield into your transceiver. This unwanted stray RF can cause painful RF "bites" when you touch your microphone or volume control, cause your display or settings to go crazy, lock up your transceiver or turn off your power supply. In mobile installations, stray RF could cause your car to do funny things even blow your car computer. Clear up these problems, plug an MFJ-915 between your antenna and transceiver. 5x2 in. Handles full 1500 Watts. Covers 1.8-30 MHz. **MFJ-919, $59.95.** 4:1 current balun,1.5 kW. **MFJ-913, $29.95.** 4:1 balun, 300 Watts.

Antenna Switches

MFJ-1704
$79.95

MFJ-1704 heavy duty 4-Positions *antenna switch* lets you select 4 antennas or ground them for static and lightning protection. Unused antennas automatically grounded. Replaceable lightning surge protection. Good to 500 MHz. 60 dB isolation at 30 MHz. 2.5 kW PEP. Less than .2 dB insertion loss, SWR below 1.2:1. SO-239 connectors. Handy mounting holes. 6¼Wx4¼Hx1¼D in.

MFJ-1702C
$39.95
2-Positions

MFJ-1702C Like MFJ-1704, but for 2 antennas. 3Wx2Hx2D"

MFJ-1700C
$99.95

MFJ-1700C *Antenna/ Transceiver Switch* lets you select one of six antennas and one of six transceivers in any combination. Plug in an antenna tuner or SWR wattmeter and it's always in-line for any antenna/transceiver combination. Has lightning surge protection. Handles 2 kW PEP SSB, 1 kW CW, 50-75 Ohm loads. Unused terminals are automatically grounded. 1.8 to 30 MHz. SO-239 connectors. 4¾W6½Hx3D inches.

MFJ-1701
$69.95

MFJ-1701 *Antenna Switch* like MFJ-1700C but lets you select one of six antennas only. 10Wx3Hx1½D inches.

33 ft. Telescoping fiberglass Mast

3.8 feet collapsed, 3.3 lbs.

MFJ-1910
$79.95

Super strong fiberglass mast has huge 1¾ inch bottom section. Flexes to resist breaking. Resists UV. Put up *full size* inverted Vee dipole/vertical antenna in minutes and get *full size performance!*

Make your own antennas

Dipoles, G5RV, Random Wire, Doublets, Beverage Antennas, etc.

MFJ-16C06, $4.56. 6-pack authentic *glazed ceramic* end/center antenna insulators.
MFJ-16B01, $19.95. Custom injection-molded UV-resistant center insulator has built-in coax connector and hanging hole.
MFJ-18G100, $24.95. 100 ft. of flexible, 7-strand, 14-gauge solid copper antenna wire.
MFJ-58100X, $49.95. 100 ft. 50-Ohm RG-8X with PL-259s on each end.
MFJ-18H100, $34.95. 100 feet, 450 Ohm ladder line, 18 gauge copper covered steel.

Lightning Surge Protectors

Ultra-fast gas discharge tube shunts 5000 amps peak. Less than 0.1 dB loss. Up to 1000 MHz. SO-239s. **MFJ-270, $29.95.** 400W PEP. **MFJ-272, $39.95.** 1500W PEP.

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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. An *ultra low loss*, high-Q adjustable *air-wound* loading coil gives you highly efficient loaded dipole performance on 30/40 Meters.

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, $139.95.

***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, 3/4 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

MFJ-1979, $59.95. Super-strong, super long *17 foot stainless steel* telescoping whip. 27 in. collapsed. 10 sections. 3/8-24 threaded base. **MFJ-1977, $44.95**/12ft;**MFJ-1796, $39.95**/10ft **MFJ-1974, $34.95**/8ft;**MFJ-1972,** $14.95/4½ft

Single-band Rotatable *mini*-Dipoles

$44.95 per band.

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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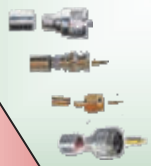

The Ultimate Powerpole *and* Coax Prep, Strip & Crimp Kit

Full-cycle ratchet crimper with Andy-Crimp Pro™ die set, two coax die sets, coax strippers, wire strippers, and coax cutter, in a sturdy ABS case. Crimps 15-30-45-50-75A Powerpoles, Molex, insulated and non-insulated terminals, LMR-400, 9913, RG-8, RG-213, RG-8X, RG-58, RG-316, RG-174, more. High quality Type N, PL-259, Mini-UHF, BNC, TNC and SMA connectors are always in stock.

Cheap Coax Is No Bargain!

Poor quality feedline can easily eat up half of your transmit power. We carry a wide variety of high quality, low loss coax to meet your needs.

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MFJ Weather-Proof *Window Feedthrough Panels*

Weather-proof window feedthrough panels bring coax, balanced lines, HF/VHF/UHF antennas, random wire antennas, ground, rotator/antenna switch cables and DC/AC power into your hamshack without drilling through walls!

MFJ Weather-Proof *Window Feedthrough Panels* mount in your window sill. Lets you bring all your antenna connections into your hamshack *without* drilling holes through walls.

Simply place in window sill and close window. One cut customizes it for any window up to 48 inches. Use horizontally or vertically. Connectors are mounted on inside/outside stainless steel plates and attached to a 4 foot long, 3½ inch high, ¾ inch thick *pressure-treated* wood panel. Has excellent insulating properties. Weather-sealed with a heavy coat of long-lasting white outdoor enamel paint. Edges sealed by weather-stripping. Seals and insulates against all weather conditions. Includes window locking rod.

Inside/outside stainless steel plates ground all coax shields. Stainless steel ground post brings ground in.

MFJ-4603 Universal Window Feedthru Panel

MFJ-4603 **$89.95**

Four 50 Ohm *Teflon*(R) SO-239 coax connectors lets you feed HF/VHF/UHF antennas at full legal power limit.

A 50 Ohm *Teflon*(R) coax *N-connector* lets you use any antenna up to 11 GHz, including 450 MHz, UHF, satellite, moon bounce and 2.4/5.8 GHz Wi-Fi antennas.

A 75 Ohm, 1 GHz *F-connector* makes it easy to bring in television, Satellite, HD, cable TV and FM radio signals.

A pair of high-voltage *ceramic feedthru insulators* lets you bring in 450/300 Ohm balanced lines directly to your antenna tuner.

Has random/longwire antenna *ceramic feedthru insulator*.

***5-way** binding posts* lets you supply 50 Volts/15 Amps DC/AC power to your outside antenna tuners/relays/switches.

Stainless ground post brings in ground connection, bonds inside/outside stainless steel panels together and drains away static charges.

MFJ's exclusive *Adaptive Cable Feedthru*™ lets you bring in rotator/antenna switch cable, etc. without removing connectors (up to 1¼X1⅝ in). Adapts to virtually *any* cable size. Seals out rain, snow, adverse weather.

3 Coax, Balanced Line, Random Wire

Best Seller! 3 *Teflon*(R) coax connectors for HF/VHF/UHF antennas. Separate high voltage *ceramic* feed-thru insulators for balanced lines and longwire/random wire, Stainless steel ground post.

MFJ-4602 **$69.95**

6 Coax

6 high quality *Teflon*(R) coax connectors for HF/VHF/UHF antennas. Stainless steel ground post. Full 1500 Watt legal limit.

MFJ-4601 **$59.95**

4 Balanced Line, 2 Coax

4 pairs of high-voltage *ceramic* feed-thru insulators for balanced lines and 2 coax connectors.

New! MFJ-4600 **$79.95**

5 Cables, any-size

5 *Adaptive Cable Feedthrus*™. Pass any cable with connector: 2 cables with large connectors up to 1¼x1⅝ inches and 3 cables with UHF/N size coax connectors. Seals out weather.

MFJ-4604 **$99.95**

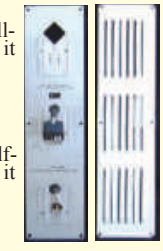
All-Purpose FeedThru/CableThru™

***Stacks** MFJ-4603 **and** MFJ-4604!* Gives you every possible cable connection you'll ever need through your window without drilling holes in wall -- including UHF, N and F coax connectors, balanced lines, random wire, ground, DC/AC power and cables of any size for rotators, antenna switches, etc.

MFJ-4605 **$159.95** **New!**

Bring cables thru eave of your house

MFJ-4616 shown with standard full-size vent (not included) it replaces. For *6 Cables* **$26.95**



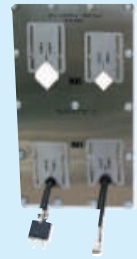
MFJ-4613 shown with standard half-size vent (not included) it replaces. For *3 Cables* **$14.95**

Replace your standard air vents on the eave/sofitt of your house with these *MFJ AdaptiveCable*™ *Air Vent Plates* and…

Bring in coax, rotator, antenna switch, power cables, etc. *with connectors* up to 1¼x1⅝ inches!

Sliding plates and rubber grommets adjust for virtually any cable size to seal out adverse weather, insects and varmints. Use existing vent hole, mounting screws and screw holes.

AdaptiveCable™ Wall Plates



MFJ-4614 *For 4 Cables* **$34.95**

Bring nearly any cable -- rotator, antenna switch, coax, DC/ AC power, etc. -- through walls *without removing connectors* (up to 1¼x1⅝ inches). Sliding plates and rubber grommets adjust hole size to weather-seal virtually any size cable.

Includes *stainless steel* plates for each side of wall, sliding plates, rubber grommets, weather stripping and screws.

MFJ-4612 *For 2 Cables* **$24.95**

MFJ-4611 *For 1 Cable* **$14.95**

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As of 6/1/13, the IC-7100 has not been approved by the Federal Communications Commission.
This device may not be sold or leased, or be offered for sale or lease, until approval of the FCC has been obtained.
*Frequency coverage may vary. Refer to owner's manual for exact specifications.

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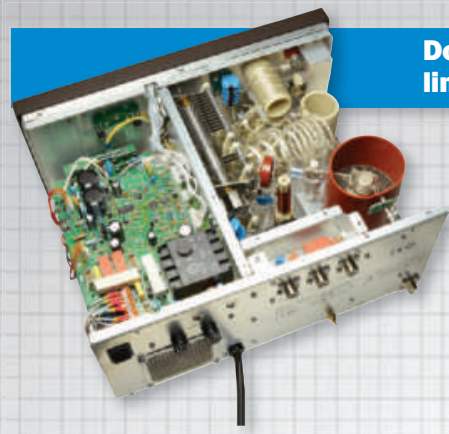
QST QuickStats

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 May 8 through June 4, 2013.
Get on the web and vote today at **www.arrl.org/quickstats**!



Do you own a solid state or tube-type linear amplifier?

- Solid state **15%**
- Tube **27%**
- I own both **11%**
- I don't own a linear amplifier **47%**

Do you own a software defined receiver or transceiver?

- Transceiver **14%**
- Receiver **10%**
- Both **5%**
- Neither **71%**

Where will you be operating during Field Day 2013?

- Inside a building **17%**
- Inside a vehicle or trailer **6%**
- Outdoors in a yard, field, park, etc **40%**
- On a boat **1%**
- Other location **3%**
- I won't be participating in Field Day **33%**

W3IZ Field Day
[Debbie Fusaro, N3ZXF, photo]

Have you participated in any VHF/UHF contests during the last five years?

- No **66%**
- Yes, a few **26%**
- Yes, quite a few **7%**

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IC-7800

200 Watt Output (50W AM), Built-in Power Supply

RX: 0.030–60.000MHz*

Four 32 Bit IF-DSPs + 24 Bit AD/DA Converters

2 Independent Receivers

+40dBm 3rd Order Intercept Point

3 Roofing Filters

Selectable, "Build Your Own" IF Filter Shapes

IC-7700

200 Watt Output (50W AM), Built-in Power Supply

RX: 0.030–60.000MHz*

Two 32 Bit IF-DSPs + 24 Bit AD/DA Converters

Single Receive

+40dBm 3rd Order Intercept Point

3 Roofing Filters

Selectable, "Build Your Own" IF Filter Shapes

IC-7600

USB Control Audio

100 Watt Output (30W AM), Optional PS-126

RX: 0.030–60.000MHz*

USB Port for CI-V Format PC Control and Audio In/Out

Dual Receive

+30 dBm 3rd Order Intercept Point

3 Roofing Filters

Selectable, "Build Your Own" IF Filter Shapes

RS-BA1

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Memory Channels

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IF Filter Settings

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RX Voice Recording Function

RC-28

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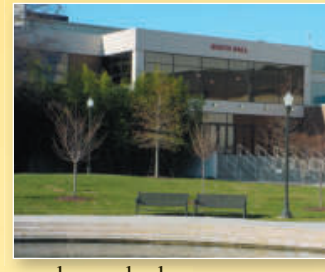
Huntsville Hamfest and Alabama State Convention

August 17-18, 2013

South Hall, Von Braun Center, Huntsville, Alabama



Program Highlights

- **Huntsville Hamfest:** Featuring a huge new equipment dealer show, many major manufacturers, giant flea market. Huge forum slate including ARRL, public service, DX, technical and contesting topics.
- **DX Card Checking:** Representatives will be available to field check your DX cards for DXCC credit. Visit the NADXC booth for information.
- **Hospitality Suites:** Huntsville Hamfest will host Hospitality Rooms at the Holiday Inn across the street from the VBC on Friday and Saturday nights.
- **2012 YHOTY (Young Ham of the Year):** An award intended to recognize a young ham who has demonstrated his or her dedication to Amateur Radio through his or her activities.
- **Talk-in station:** Our always welcoming and always helpful talk-in crew (they haven't lost a visitor yet) will be operating as K4BFT on the 146.94 repeater for complete talk-in information. Back-up frequency is 147.30. No PL required during the hamfest weekend.
- **HAYLARC YL Breakfast:** The Huntsville Area Young Ladies Amateur Radio Club (HAYLARC) invites all YLs attending the Huntsville Hamfest to join them for a Dutch breakfast Sunday, 7:00 AM at Mullins Drive In.

- **DX Banquet** – Saturday evening sponsored by the North Alabama DX Club, featuring Rob Sherwood, NC0B, who has published receiver comparisons for 35 years, and will speak on historical perspectives in the growth of radio performance. Ticket info: Bob DePierre, K8KI@comcast.net. The DX Banquet is held at the Holiday Inn across from the Von Braun Center.
- **License Exams:** Exams will begin at 10:00 sharp Saturday and Sunday in the curtained area outside the South Hall. Bring your original license, copy of same, any CSCE's you want to present, some means of personal identification and the $15 test fee.

Hotels

Holiday Inn Downtown, Huntsville Hamfest Official Hotel
Right across the street from the hamfest site, is the Holiday Inn, Huntsville Downtown. Call them at (256) 533-1400 (Huntsville) or 1-877-320-8455 (Corporate). Mention the Group/Convention code "**SHF**" to get the special Hamfest rate of $85. **www.holidayinn.com/hunsvilleal**

Embassy Suites, Huntsville, AL
You may also want to consider reservations at the Embassy Suites adjacent to the Von Braun Center. Call (256) 539-7373 (Huntsville) or 1-800-362-2779 (Corporate) and mention the Group/Convention code "**HMF**" for the special Hamfest rate of $112 (single or double).
www.embassysuiteshuntsville.com

Spring Hill Suites, well within walking distance to the VBC. See our special link at www.hamfest.org under Hotels Button.

Nearby Points of Interest

- ✓ U.S. Space & Rocket Center and U.S. Space Camp
- ✓ Bridge Street Centre – Upscale Shopping Mall
- ✓ Huntsville Botanical Garden
- ✓ Huntsville Museum of Art
- ✓ Cathedral Caverns State Park
- ✓ Historic Huntsville Depot Museum and Alabama's Constitution Village

Parking: The parking garage across the street from the VBC will be open with a parking fee of $5. The South Hall where the Hamfest is located has a 500 space ground level garage with a parking fee of $5. Elevators carry you up to the hamfest.

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CW Short 80	80-10 m in just 84 or 100 feet	$169.95
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CW 40 Compact™	40-6m, 34' Fits almost anywhere	$159.95
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80, 40, 20, 17, 15, 12, 10, 6 m
1.5 kW 80-10, 200w on 6

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.5"(RG-213) $5.00 each. #31 mix for HF and VHF

Low Prices, Top Quality

PL-259ST	Silver-Teflon Special	$2.19 ea.
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9096 Extra Flex	Same specs as 9913, flexible	90¢/80¢
SALE RG-8X	Made to Mil Spec Top Quality	42¢/37¢
RG-8X 100'	PL-259 Connectors installed + strain relief	$44.95

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A big antenna that makes a very big signal.
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3/16" 750# test	antenna support rope $30/ 200' hank
1/4" 1200# test	- this is strong! Use in trees $60/200'
Kevlar .075"	Dacron jacket 500# test $23/200' spool
Kevlar 1/8"	Dacron jacket 1000#+ test $36/200' hank

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Pacificon 2013 will take place Friday, October 11th through Sunday, October 13th, at the Marriott Santa Clara Hotel at 2700 Mission College Blvd. in Santa Clara, California. Please check the website for tickets, vendor registration, and schedule updates.

www.pacificon.org

Make your hotel reservations by September 28, 2013, and ask for the special PACIFICON 2013 room rate of $109 per night. Call 1-800-228-9290 for resevations. To ensure availability reserve early.

Pacificon 2013 Events Include
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- Antenna Seminar
- Open MDARC Meeting
- QRP Activities
- HFpack Activities
- Breakfast/Keynote & Evening Banquet
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7. AN IMPORTANT NOTICE TO ALL HAM AD POSTERS AND RESPONDERS, FROM THE ARRL ADVERTISING DEPARTMENT Greetings from ARRL HQ! Please note that we have received reports from many ARRL members who have placed classified ads in these listings, and have received responses from individuals proposing "creative" payment schemes. These particular instances involved offers of overpayments for goods by bank check, followed by instructions to deduct the cost of your item from the overpayment, and to transfer the overage back or to another individual. This is a well-known scam. Unfortunately, we have no control over this and other scams of this type. Once your email address is posted, you are vulnerable to those individuals seeking to provide you with questionable information.

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991B/993B	$199/249
1702C/1704	$39/79
1778/1778M	$45/39
1796/1798	$$229/339
4225MV/4245MV	$99/149

ROTATORS

Hygain AR-40	$319
Hygain AR-303	$89
Hygain AR-500	$119
Hygain CD-45II	$419
Hygain Ham-IV	$599
Hygain Ham-V	$939
Hygain T2X	$699
Hygain T2X Digital	$1159
M2 OR-2800PDX	$1879
Yaesu G-450A	$329
Yaesu G-550	$409
Yaesu G-800SA	$399
Yaesu G-800DXA	$499
Yaesu, G-1000DXA	$599
Yaesu, G-2800DXA	$1399
Yaesu G-5500	$789

US TOWER

We Ain't Braggin'
But we've helped so many Hams order US Towers over the years that we've become the US Tower experts. Please call for help selecting the perfect US Tower for your QTH!

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TX-438	$1829
TX-455	$2549
TX-472	$4199
TX-472MDP	$6779
TX-489MDPL	$10959

HDX Series

HDX-538	$2179
HDX-555	$3819
HDX-572MDPL	$9969
HDX-589MDPL	$12969
HDX-689MDPL	$38199

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We carry the complete line of Universal self-supporting aluminum towers.

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4-30	$419

B18 Series

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7-40/9-30	$839/549

B22 Series

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5-50/6-60	$1069/1619
7-50/9-40	$1199/939
9-50/12-40	$1329/1079
15-40/21-30	$1209/819

B26 Series

4-70/4-80	$2199/2739
6-70/7-60	$2219/1749
7-70/9-60	$2309/1889
15-50/21-40	$1759/1369
23-40/35-30	$1629/1239

B30 Series

HD8-70/HD8-80	$2379/3059
HD8-90/HD8-100	$3709/4409
HD9-60/HD9-80	$2109/3129
HD11-80/HD11-90	$3559/4189
HD12-70/HD12-80	$2899/3579
HD16-60/HD16-80	$2569/3799
HD21-50/HD21-60	$1989/2619
HD21-70/HD35-40	$3239/1859

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3/16"EHS, 500 / 1000'	$139/259
1/4"EHS, 500' / 1000'	$159/329
3/16" / 1/4" Big Grip™	$7/8
5/16" Thimble	$1.35
3/8" Thimble	$1.45
3/8x6" EE Turnbuckle	$16
3/8" x6" EJ Turnbuckle	$19
1/2"x9" EE Turnbickle	$25
1/2"x9" EJ Turnbuckle	$28
1/2x12" EE Turnbuckle	$29
1/2"x12" EJ Turnbuckle	$32
#502 Strain Insulator	$8
#504 Strain Insulator	$10

GLEN MARTIN

H2 Hazer (12 sq. ft.)	$609
H3 Hazer (8 sq. ft.)	$459
H4 Hazer (16 sq. ft.)	$589
RT-424, 4.5' (6 sq. ft.)	$319
RT-832, 8' (8 sq. ft.)	$469
RT-936, 9' (18 sq. ft.)	$779
RT-1832, 17.5' (12 sq. ft.)	$1029
RT-2632, 26' (9 sq. ft.)	$1709

PHILLYSTRAN

HPTG-1200I	$.49/ft.
HPTG-2100I	$.75/ft.
HPTG-4000I	$1.05/ft.
HPTG-6700I	$1.45/ft.
PLP-2738 Big Grip™	$9
PLP-2739 Big Grip™	$12
PLP-2755 Big Grip™	$18

ROHN

25G, Middle Section	$119
25AG2, Sleeve Top	$189
25AG4, Flat Top	$239
AS25G, Rotor Shelf	$65
BPC25G, Base Plate	$69
BPH25G, Hinged Base	$279
HB-25AG/BG/CG	$119/129/149
GA25GD, Guy Assembly	$179
SB25G, Short Base	$79
SB25G5, Short Base (5')	$109
SBH25G, Hinged Short Base	$249
TB3, Thrust Bearing	$159

ALUMINUM

O.D.	WALL	$/FT.
6063-T832 DRAWN TUBING		
.375"	.058"	$.65
.500"	.058"	$.70
.625"	.058"	$.80
.750"	.058"	$.90
.875"	.058"	$.95
1.000"	.058"	$1.00
1.125"	.058"	$1.10
1.250"	.058"	$1.30
1.375"	.058"	$1.40
1.500"	.058"	$1.50
1.625"	.058"	$1.65
1.750"	.058"	$1.80
1.875"	.058"	$1.95
2.000"	.058"	$2.10
2.125"	.058"	$2.25

ROTOR CABLE

R62, 6-C (6#18)	$.59/ft.
R81, 8-C (2#18/6#22)	$.49/ft.
R82, 8-C (2#16/6#18)	$.79/ft.
R83, 8-C (2#14/6#18)	$.89/ft.

COAX

9913F7	$1.39/ft.
BuryFLEX	$.89/ft.
LMR-100	$.59/ft.
LMR-200	$.65/ft.
LMR-200 Ultraflex	$.85/ft.
LMR-240	$.69/ft.
LMR-240 Ultraflex	$.89/ft.
LMR-400	$.89/ft.
LMR-400 Ultraflex	$1.39/ft.
LMR-600	$1.59/ft.
LMR-600 Ultraflex	$2.49/ft.
RG-8X Mini	$.29/ft.
RG-213/U	$.79/ft.

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The high dynamic range IP3 performance that was realized and proven in the FTDX5000.

IF DSP provides effective and optimized QRM rejection

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The newly developed LCD has a wider viewing angle and higher contrast.

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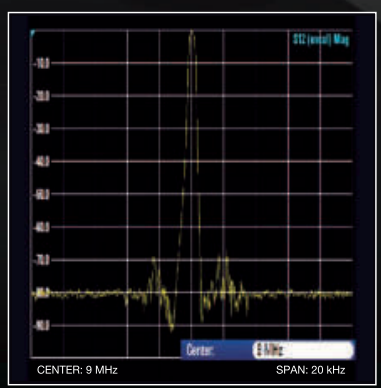
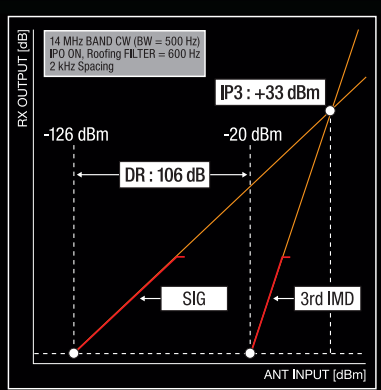
The specialized Receiver amplifier for 50 MHz is built in / Three antenna connectors are provided / The "ANT-3" terminal may be assigned to "RX-only" / Signal output for an external receiver and the 9 MHz IF output are furnished / High speed Automatic antenna tuner built in / Optional μ-tune unit available / USB interface equipped



Characteristics of the Crystal Roofing Filter (300 Hz)



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