SPECIAL DIGITAL ISSUE

QST

DEVOTED ENTIRELY TO AMATEUR RADIO

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Page 30

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Official Journal of ARRL The national association for AMATEUR RADIO®

MAY 2012 QST Vol 96 No 5

The radio YAESU ...

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

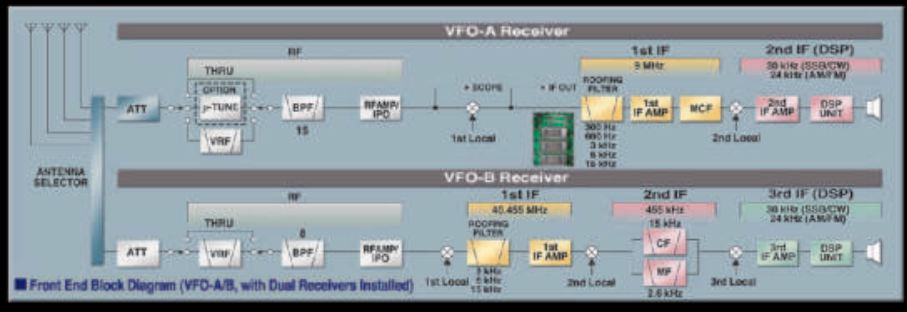
The New Premium HF/50 MHz Transceiver
FT DX 5000 Series

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

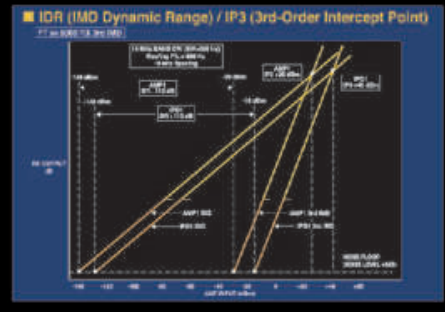
The tight shape factor 6 pole crystal filters and D Quad Double Balanced Mixer design afford incredible improvement in 3rd – Order dynamic range and IP3 performance

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)



Front End Block Diagram (VFO-A/B, with Dual Receivers Installed)



HF/50 MHz 200 W Transceiver NEW
FT DX 5000MP

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

HF/50 MHz 200 W Transceiver NEW
FT DX 5000D

Station Monitor SM-5000 included
± 0.5ppm TCXO included
300 Hz Roofing Filter optional

HF/50 MHz 200 W Transceiver NEW
FT DX 5000

Station Monitor SM-5000 optional
± 0.5ppm TCXO included
300 Hz Roofing Filter optional

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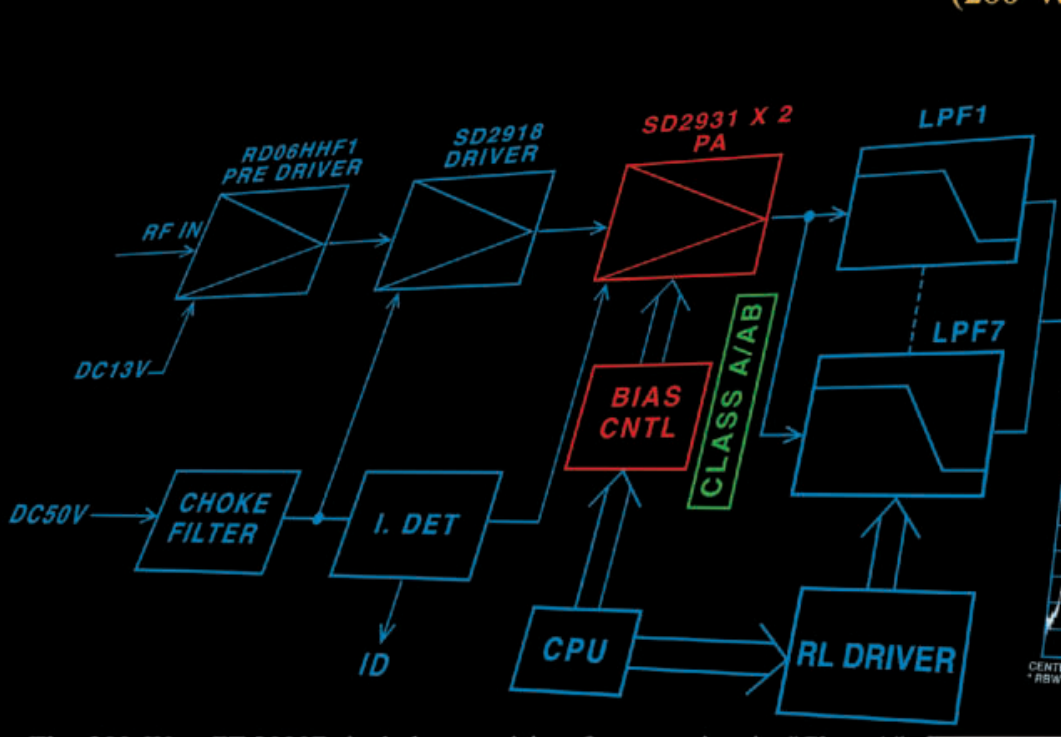
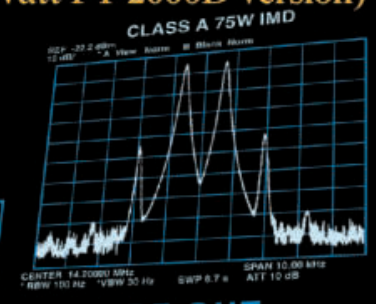
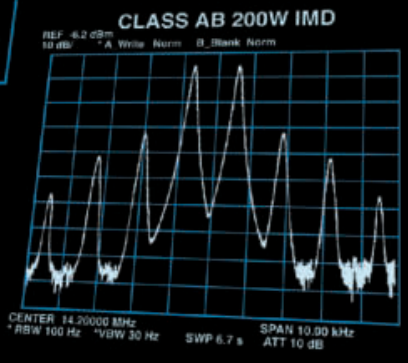
The radio... YAESU
Choice of the World's top DX'ers

Ultra-low Distortion Class-A Final Amplifier

(200-Watt FT-2000D version)







The 200-Watt FT-2000D includes provision for operation in "Class-A" mode at 75 Watts of power output. It utilizes high bias current to produce very low transmitter Intermodulation products. The 3rd-order IMD products are typically suppressed 45 dB or better. The 5th and higher-order IMD is typically suppressed 70 dB or more. You may adjust the bias level between Classes A and AB to meet the demands of high ambient temperature in your station, and the long duty cycles associated with contest or DX-pedition use.

The FT-2000D (200-Watt version) utilizes push-pull SD2931 MOS FET devices, operating at 50 Volts. The user-adjustable bias control permits adjustment for optimum suppression of Intermodulation distortion products. The elaborate heat sink design includes a combination of aluminum and 3mm thick high-conductivity copper plate. The total heat sink capacity of 2720 ccm will ensure many years of reliable operation of this 200-Watt powerhouse.

HF/50 MHz Transceiver

FT-2000D 200 W Version (External Power Supply)

FT-2000 100 W Version (Internal Power Supply)

For the latest Yaesu news, visit us on the Internet:
http://www.yaesu.com

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

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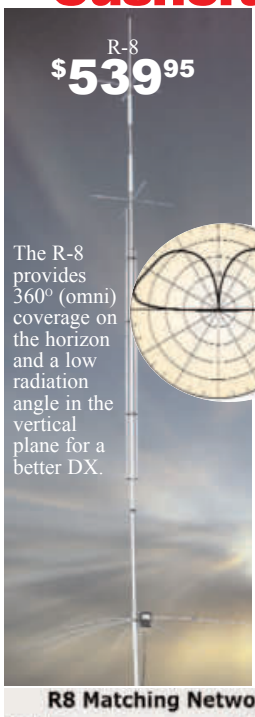
Cushcraft R8 *8-Band Vertical*



Covers 6, 10, 12, 15, 17, 20, 30, and 40 Meters!

The Cushcraft R8 is recognized as the industry gold standard for multi-band verticals, with thousands in use worldwide. Efficient, rugged, and built to withstand the test of time, the R8's unique ground-independent design has a well-earned reputation for delivering top DX results under tough conditions. Best of all, the R8 is easy to assemble, installs just about anywhere, and blends inconspicuously with urban and country settings alike.

Automatic Band Switching: The R8's famous "black box" matching network combines with traps and parallel resonators to cover 8 bands. You QSY instantly, without a tuner!

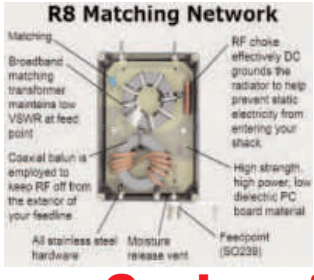
Rugged Construction: Thick fiberglass insulators, all-stainless hardware, and 6063 aircraft-aluminum tubing that is double or triple walled at key stress points handle anything Mother Nature can dish out.

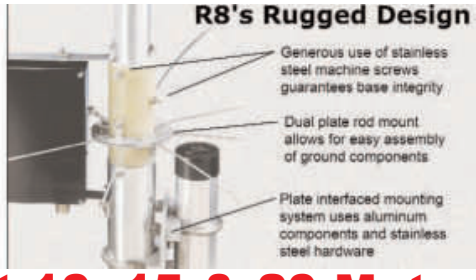
Compact Footprint: Installs in an area about the size of a child's sandbox -- no ground radials to bury and all RF-energized surfaces safely out of reach.

Legal-Limit Power: Heavy-duty components are contest-proven to handle all the power your amplifier can legally deliver and radiating it as RF rather than heat.

The sunspot count is climbing and long-awaited band openings are finally becoming a reality. Now is the perfect time to discover why Cushcraft's R8 multi-band vertical is the premier choice of DX-wise hams everywhere!

R-8GK, $56.95. R-8 three-point guy kit for high winds.





MA-5B *5-Band* Beam

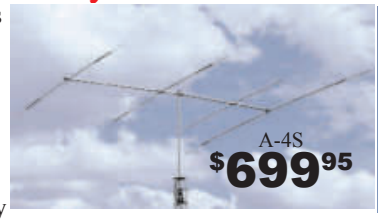
Small Footprint -- Big Signal

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!

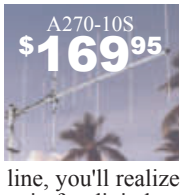


It goes without saying that the World-Ranger lineup is also famous for its rugged construction. In fact, the majority of these antennas sold years ago are still in service today! Conservative mechanical design, rugged over-sized components, stainless-steel hardware, and aircraft-grade 6063 make all the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

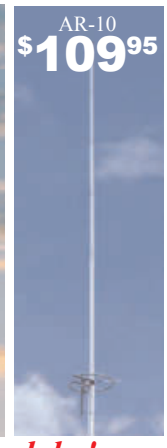
Cushcraft Dual Band Yagis

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).

For a complete catalog, call or visit your local dealer.

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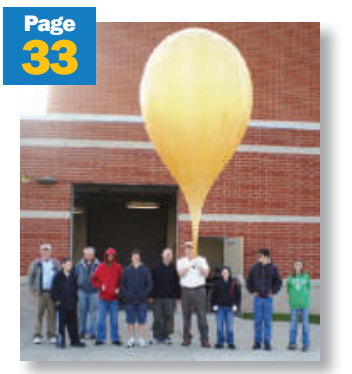
Technical



News and Features

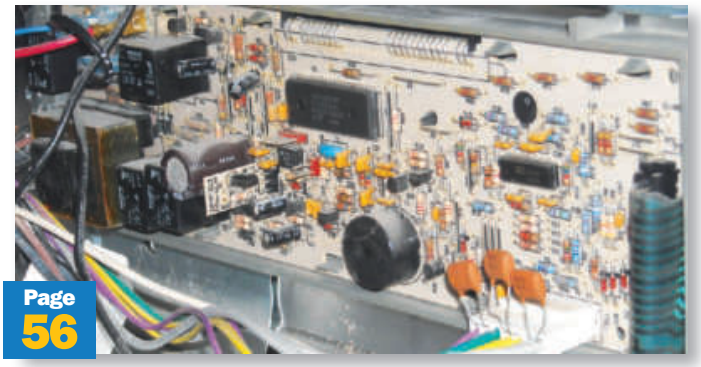
Our Cover

A recurring gag on the late-1960s comedy *Get Smart* involved telephones. Not only did Maxwell Smart (Agent 86) have a shoe phone, phones on the show were hidden in more than 50 everyday objects, including a necktie, comb, watch, clock, handkerchief, magazine and a garden hose. You, too, can "get smart" when you turn your Android smartphone into a digital communications terminal. Find out how in "An AFSK Interface for Android Smartphones" by Martin Huyett, KØBXB, beginning on page 30.

Radiosport

Field Day 2012 – June 23-June 24

Are YOU ready?



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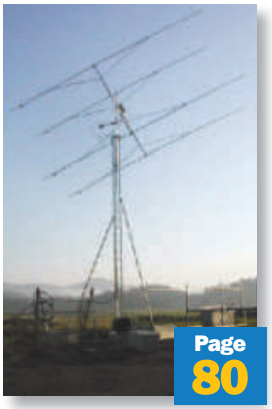

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Columns

Departments

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Volume 96 Number 5

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*108 to 520 MHz/ 700 to 999.99 MHz (Cellular blocked)

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*70 cm 45 W

FT-7900R

Size: 5.5" (W) x 1.6" (H) x 6.6" (D) / Weight: 2.2 lb

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The King of Mobile

75 WATTS

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HEAVY-DUTY 75 W 2 m FM TRANSCEIVER

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ULTRA RUGGED 55 W 2 m FM TRANSCEIVER

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Size: 5.5" (W) x 1.6" (H) x 5.8" (D) / Weight: 2.2 lb

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Commercial Grade Field Radio Submersible Construction

COMPACT 5 W 2 m FM HANDHELD TRANSCEIVER

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Compact Field Radio with Top Mounted LCD and Loud Audio

ULTRA-COMPACT 5 W 2 m FM HANDHELD TRANSCEIVER

FT-250R

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The Ultimate Backpack, Multi-Mode Portable Transceiver

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- Covering the HF, VHF, and UHF Bands
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Introducing the Yaesu FT-950 transceiver for DX enthusiasts
Superb receiver performance
Direct lineage from the legendary FT DX 9000 and FT-2000

HF/50 MHz 100 W Transceiver

FT-950

- Triple-conversion super-heterodyne receiver architecture, using 69.450 MHz 1st IF
- Eight narrow, band-pass filters in the RF stage eliminate out of band interference and protect the powerful 1st IF
- 1st IF 3 kHz Roofing filter included
- High-speed Direct Digital Synthesizer (DDS) and high-spec Digital PLL for outstanding Local Oscillator performance
- Original YAESU IF DSP advanced design, provides comfortable and effective reception. IF SHIFT / IF WIDTH / CONTOUR / NOTCH / DNR
- DSP enhancement of Transmit SSB/AM signal quality with Parametric Microphone Equalizer and Speech Processor
- Built-in high stability TCXO (±0.5 ppm after 1 minute@77 ° F)
- Built-in automatic antenna tuner ATU, with 100 memories
- Powerful CW operating capabilities for CW enthusiasts
- Five Voice Message memories, with the optional DVS-6 unit
- Large Multi-color VFD (Vacuum Fluorescent Display)
- Optional Data Management Unit (DMU-2000) permits display of various operating conditions, transceiver status and station logging.
- Optional RF μ -Tune Units for 160 m, 80/40 m and 30/20 m Bands

Optional, YAESU Exclusive, Fully-Automatic μ -Tuning Preselector System!

Fully automatic, Ultra-sharp, External μ -Tuning Preselector (optional) features a 1.1" (28 mm) Coil for High Q

On the lower Amateur bands, strong signal voltages impinge on a receiver and create noise and intermod that can cover up the weak signals you're trying to pull through. YAESU engineers developed the μ (Mu) Tuning system for the FT DX 9000/FT-2000, and it is now available as an option for the FT-950. Three modules are available (MTU-160, MTU-80/40, MTU-30/20); these may be connected externally with no internal modification required! When μ -Tuning is engaged, the VRF system is bypassed, but the fixed Bandpass Filters are still in the received signal path.

Optional External Data Management Unit (DMU-2000) Provides Many Display Capabilities

Enjoy the ultimate in operating ease by adding the DMU-2000! Enjoy the same displays available with the FT DX 9000 and FT-2000: Band Scope, Audio Scope, X-Y Oscilloscope, World Clock, Rotator Control, Extensive Transceiver Status Displays, and Station Logging Capability. These extensive functions are displayed on your user-supplied computer monitor.

Shown with after-market keyer paddle, keyboard, and monitor (not supplied).

DMU-2000
Data Management Unit (option)

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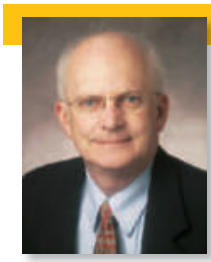

David Sumner, K1ZZ – dsumner@arrl.org
ARRL Chief Executive Officer

A Painless History Lesson

"This year the ARRL is celebrating the Diamond (75th) Anniversary of the DX Century Club, Amateur Radio's premier operating award. Earning a Diamond DXCC Challenge award is not just an enjoyable way to spend one's operating time. It's also an opportunity to recall how much the world has changed, mostly for the better."

A brainchild of Membership and Volunteer Programs Manager Dave Patton, NN1N, the Diamond DXCC Challenge celebrates the achievements of the pioneers whose quest to contact other radio amateurs in as many places as possible led to the DXCC awards program that we know today. The first list of DXCC members, published in November 1937 *QST*, contained just five entries. No one at the time could have imagined that 75 years later somewhere between 50 and 60 thousand stations would have earned at least one DXCC award. After all, in 1937 there were only about 70,000 amateurs in the entire world and most of them — then as now — were not DXers.

The unique challenge of Diamond DXCC is that, instead of using the current DXCC list with 340 entities, we are using the list as first published in January 1937 *QST*. There's where the history lesson comes in. Just assembling the list was a lesson in itself, and we're still learning — the list of 1937 countries and their current equivalents is online at **www.arrl.org/diamond-challenge** and is updated as new information comes to light.

DXers are pretty good at geography but the 1937 list contains many place names that are unfamiliar today. If you want credit for Bechuanaland, what country do you look for today? Where were the Straits Settlements? What was the difference between the Federated Malay States and the Non-Federated Malay States? How many Somalilands were there, and how many equivalent entities are on today's list?

While the 1937 list was much shorter, some of today's entities are represented on that list by several different countries (they didn't call them "entities" in those days). If you work Kaliningrad, a relatively rare spot today, don't get too excited; in 1937 it was part of Germany. On the other hand, Newfoundland and Labrador were not yet part of Canada and count separately for the Diamond DXCC Challenge. Tasmania counts separately from the rest of Australia. If you work five Indonesians you might pick up as many as five credits. In general, working stations within the 1937 boundaries of the Soviet Union won't add much to your total but there are exceptions. Work UAØYAY or one of his neighbors and you will get credit for Tannu Tuva. Work Wrangel Island and you will accomplish what no one did before World War Two — it was on the list but no one ever confirmed a contact. (Where is Wrangel Island? Hint: It causes a jog in the International Date Line.)

While we tried to define the territory of each of the 1937 countries in current terms, one of our ground rules in developing the Diamond DXCC Challenge was to not redraw existing borders. If you work an SP2 in Gdansk you earn credit for Danzig, but if a border was relocated after World War Two between two countries that retained their separate existence the current borders apply. The goal is to have some fun, not to stir up old enmity.

Make no mistake: no one should wax nostalgic for the world of 1937. In ways too numerous and depressing to recount, that world was in dreadful shape. Europe was plunged into war just two years after the announcement of the DX Century Club. DXCC listings were suspended with the December 1940 issue of *QST* — by which time, incidentally, there were 220 call signs on the list. Even with all the problems facing the world today, on the whole it's a much happier place.

Nor should we pine for Amateur Radio's "good old days." As proud as they must have been of their accomplishments, none of the prewar holders of DXCC would hesitate to trade their operating privileges and their equipment for what we enjoy today. In those days DX meant 20 meters. At times they might work some DX on 10 meters but it wasn't easy to get a transmitter to operate reliably at such a "high" frequency and there was no 15 meter band, much less 30, 17, or 12. The longer wavelengths of 40, 80, and 160 meters were popular for domestic work, not for DXing. Neither mechanical nor electrical design of antennas was well understood by most amateurs, and rotary antennas were a rare exception.

DX also meant CW. By December 1940 only four amateurs had earned DXCC on "radiotelephone." The DXers in that era would have been amazed to be told that, thanks to the introduction of SSB, by 1975 the pendulum would swing so far toward phone that the ARRL would create CW DXCC in an effort to restore some balance. Of course, digital modes and satellites did not exist and probably could not even have been imagined.

Without a doubt, except for the fact that there is more competition DXing is much easier today. DX Cluster tells us who's on the air. We can find them easily because we can dial up the exact frequency, or let the computer do it for us. We have many bands and modes to choose from and can change between them at the press of a button.

If you accept the Diamond DXCC Challenge, and we hope you will, take some time to think about what the world was like in 1937. Think about those early DXers, especially those who went off to war a few years later and did not return. Try to see today's world and today's Amateur Radio through their eyes. Through their eyes, the world we enjoy would truly sparkle.

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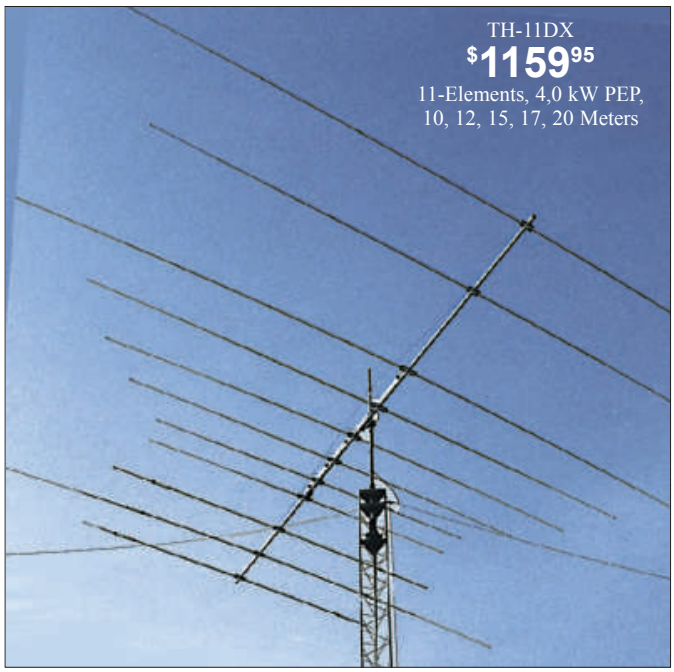

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TH-5MK2, $759.95. 5-element, 1.5 kW PEP, 10,15,20 Meters

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

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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

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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.

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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.

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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.

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TH-11DX	11	*For Gain and F/B ratio--See…*		4000	10,12,15,17,20	12.5	100	24	37	22	88	1.9-2.5	T2X	$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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3. Thick-wall *swaged* aluminum tubing

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Joel P. Kleinman, N1BKE – jkleinman@arrl.org

In Brief

- RACES teams and SKYWARN nets assisted in the aftermath of two waves of devastating storms that produced tornadoes across the Midwest and Mid-South.
- A new federal law includes a provision for a study of the uses and capabilities of Amateur Radio in emergencies and disaster relief.
- Changes are coming to the DXCC Program: A new fee structure is effective April 2, and a new Online Application will streamline processing.
- Among this year's Dayton Hamvention® award winners is ARRL Technical Editor Joel Hallas, W1ZR.
- The ARRL UHF/Microwave Band Plan Committee is looking for comments on a draft band plan for the 9 cm band.
- The FCC has reduced a $10,000 fine levied against a Florida man to $450. See Happenings for more details.
- The deadline for the 2012 ARRL Photo Contest is May 31.
- Three operations — the 2012 VKØTH and AX/VKØTH (Macquarie Island) operation, the 2011 6OØM (Somalia) operation and the December 2011-January 2012 9U3TMM (Burundi) operation — have been approved for DXCC credit.
- Malyj Vysotskij Island (MVI), R1M, has been deleted from the DXCC Entities List as of February 17, 2012, and added to the Deleted Entities List.
- The movie *Journey 2: The Mysterious Island* includes references to Morse code and ham radio.
- Former Radio Amateurs of Canada President Earle Smith, VE6NM, of Grande Prairie, Alberta, became a silent key in February.
- The winner of the *QST* Cover Plaque Award for February is Phil Salas, AD5X, for his article "A Relay-Based Full Break-In TR Switch for Your Vintage System."

Media Hits

Allen Pitts, W1AGP – apitts@arrl.org
Media & Public Relations Manager

- Things were "looking up" in the beginning of February as high flying hams and balloons made news. "Campus Buzzing with Flight Fever" showed prominently on WLOS-TV (NC) when his school was excited about the balloon launch by senior James McNichols, KK4ETE. *Calvin 1* made a successful flight, carrying the cartoon character (stuck on the end of an antenna) to new heights. Almost immediately after came a trio of media hits on Mashable, ZDNet and Space.com as Erin King, AK4JG, also used a weather balloon with GPS-equipped ham radio transmitters to launch her college admission letter from MIT into near space. "I decided to do this project because I just thought it would be fun." Erin will be one of the presenters on the ARRL's DIY stage at Dayton in May. Be sure to drop by! Not as high but a whole lot farther were the ambitions of The South Texas Balloon Launch Team in "Aimed for China: Ham operators to launch balloon Saturday" as reported in the *Katy Times* (TX). Their goal was a landing in Nanjing, China.
- You and I know that most hams are really very nice people and do a lot for their communities, but it is always nice to see it in the media. KXII-TV (TX) had a series titled "12 Who Care" and featured Bob Sholl, W5DSA, who works behind the scenes coordinating volunteers during emergencies. He's a member of the Grayson County Amateur Radio Club and ARES ®. Meanwhile, "Red Cross honors 2 for crucial radio coordination after Joplin tornado" appeared on KYTV-3 in Springfield, MO as the American Red Cross honored Bill Gilmore, KCØTCF, and Ken Baremore, WØKRB, who coordinated relief efforts in Joplin for the first 48 hours — all by Amateur Radio. "There was a need. We practice for that need," said Baremore.
- Schools and hams got even more notice in articles such as "Electronics students get crash course from radio operators" in the *Moultrie Observer* (GA) when members of the Colquitt County Ham Radio Society presented their hobby to the students in Moultrie Technical College's (MTC) electronics technology program. William Byrd High School, always a major competitor in the School Club Roundup, was the subject of "Students work the radio dial to win a national contest" on WDBJ-TV in Roanoke, VA. The school won the contest last fall and wanted a repeat. "Making Airwaves" in *The Newport Daily News* (RI) told of Zach Wakefield, a fifth grader at Cluny School, using W1SYE at the school and making contact with other ham operators in Wales and France. "It was really cool to talk to someone so far away," he said.
- As always, emergency communications shared media interest. "Ham Radio operators shine in disasters" appeared in the *Indianapolis Southsider Voice* as Jack Parker, W8ISH, was interviewed. But the old adage, "Be careful what you wish for," almost applied when Fire Chief Robert Jefferson and the Town of Arlington, MA put out a call for hams in Boston.com, Patch.com, WickedLocal.com, the *Boston Globe* and other locations all at once. Thankfully, ARRL section and ARES officials quickly got ahead of things and made an orderly presentation instead of the stampede that might have ensued.
- Media attention comes in several forms. Director Richard Norton, N6AA, represented ARRL leadership recently at the set of the TV show *Last Man Standing* as the ham-heavy crew that produces the show made contacts with the outside world. John Amodeo, NN6JA, has been the sparkplug of the Amateur Radio actions there. At the other end of the country, Gary Pearce, KN4AQ, known for his ARVN productions, is now launching a podcast on HamRadioNow.TV.
- Finally, broadcasters are always looking for new ways to get more coverage with less power. There are several modulation-dependent carrier level technologies being hotly debated. So when "MDCL Techniques Draw Debate" appeared in *Radio World* with their observation, "And, for those who think this is something new and miraculous, I refer them to January 1935 issue of *QST*, the ARRL Magazine. This is an amateur-radio version of a technique used by WGY in 1931!" We smile and take pride in being a ham.
- PR-101, the special course for Amateur Radio Public Information Officers and other hams who present our hobby to the media, continues to grow. As of this writing, we have 141 graduates (**www.arrl.org/pr101-grads**). If you really want to help Amateur Radio grow in your area, get noticed by the media and present hams in the best ways, this is the course to take! You can complete it in about three evenings as you work at your own pace — and it's free. With Field Day events coming up, learn how to get community attention, look good and get media hits by giving the reporters what they want and need. Go to **www.arrl.org/pr-courses** for more information.

ARRL President Meets NWS Deputy Director

In mid-March, ARRL President Kay Craigie, N3KN, had the chance to meet Laura K. Furgione, deputy director of the National Weather Service. "She is very well aware of the value of Amateur Radio volunteers in the SKYWARN program," said Craigie, "and made several very positive and knowledgeable comments about us in her speech at a conference on Women in Science held at Virginia Tech. Her presentation was titled "Building a Weather-Ready Nation: The Next Generation." Kay was pleasantly surprised to learn that Ms Furgione holds KLØXG — she earned her license while she was with the NWS in Alaska.

At the NWS Forecast Office, Blacksburg, Virginia: (from the left) Kay Craigie, N3KN; Laura Furgione, KLØXG, and David Wert, meteorologist-in-charge, Blacksburg NWS Forecast Office. [Carter Craigie, N3AO, photo]

D-STAR Group Invades Mike Baxter's Office/Hamshack

John Amodeo, NN6JA, producer of the ABC-TV hit comedy *Last Man Standing*, reports: "We have an ICOM IC-9100 as a regular part of our set in Mike Baxter's (Tim Allen's) office. We brought in the PAPA D-STAR group to work live contacts from the set. There were over 100 check-ins. D-STAR operators from all over the US, Canada and as far away as New Zealand reached us on Stage 9 at CBS Studio Center."

Heading to Hamvention later this month? If so, you'll have the chance to meet John, who will be presenting at ARRL EXPO as a guest of the ARRL. For more about ARRL EXPO see **www.arrl.org/expo**.

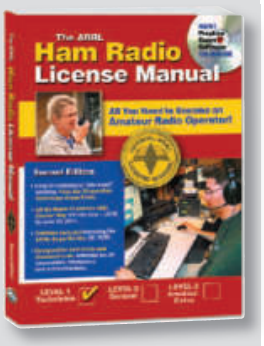
At the PAPA D-STAR event: From the left — ARRL Southwestern Division Director Dick Norton, N6AA; Ed Kane, W6ONT; Karl "KC" Cain, KC6B; Evan Taubenfeld, K1LA; Michael Lackie, N6HKH; Steve Burns, KI6LOV; Don Jacob, WB5EKU; John Amodeo, NN6JA, and Billy McLellan, KJ6RVA. [Tim Clark photo]

Inside HQ

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

ARRL Educational Resources Abound

License Manuals, Exam Review Software, Q&A books — and much more



I have been teaching a Technician licensing class here inside HQ. Anyone who has taught a licensing class knows that it is a challenging yet rewarding experience, particularly when students get their tickets.

In my class, I am using many of the resources that we offer for folks who want to obtain their first Amateur Radio license and for those amateurs who want to upgrade their licenses. We publish up-to-date License Manuals for each license class. We call the Technician Manual, *The ARRL Ham Radio License Manual*, to make it easier to find using Internet search engines. The other two manuals are aptly named *The ARRL General Class License Manual* and *The ARRL Extra Class License Manual*.

These manuals are actually comprehensive courses for each license class and they include expanded material that goes beyond addressing the material in the Question Pools. They contain information about setting up and operating a station legally, courteously and safely for each license class. Each License Manual also includes the complete Question Pool for its license class and we include a CD-ROM of exam review software with each manual. You can use the CD for practice exams. The CD also has brief explanations for each question and you can select the sections of the question pool that you need to review.

In addition to the License Manuals, we publish three Q&A books, one for each license class. These contain only the Question Pools along with brief, clear explanations of each question. Along with the print editions, they are available in Kindle format and they can be downloaded from the Kindle store. The most comprehensive resource for students is available our website at **www.arrl.org/licensing-preparation-exams**.

For Technician class instructors, we publish the *ARRL Instructors Manual for Technician License Courses*. This book contains Modular Lesson Plans along with practice exams. A helpful CD-ROM is included that contains *PowerPoint* slides organized by lesson modules and digital versions of many of the illustrations and photos from the license manual itself. There is also a complete PDF version of the Technician Question Pool. (You can also download the Question Pools from our website.) I have been using this material in my class and I have found it very helpful.

Instructors will find many other helpful resources at this location on our website: **www.arrl.org/resources-for-license-instruction**. If you are an ARRL Registered Instructor you are also eligible for the instructor's discount on these publications. Information about becoming a registered instructor can be found at **www.arrl.org/license-instructor-registration**. Instructors will want to check out this main subsection of our website: **www.arrl.org/volunteer-instructors-mentors**. Here you'll find, collected for easy access, materials and information relevant to those teaching licensing classes as well as emergency communications course instructors.

Whether you are helping someone obtain their first license, upgrading yours or teaching a licensing class, we have a wide variety of resources for you.

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- **Customized ARRL.org home page**
  Customize your home page to see local ham radio events, clubs and news.
- **ARRL Member Directory**
  Connect with other ARRL members via a searchable online Member Directory. Share profiles, photos and more with members who have similar interests.

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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  ARRL members may qualify for up to a 10% discount on home or auto insurance.

* ARRL Group Benefit Programs are offered by third parties through contractual arrangements with ARRL. The programs and coverage are available in the US only. Other restrictions may apply.

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ARRL Field Organization – **www.arrl.org/field-organization**

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Books, Software and Operating Resources – **www.arrl.org/shop**

Quick Links and Resources

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QEX – *A Forum for Communications Experimenters* – **www.arrl.org/qex**
NCJ – *National Contest Journal* – **www.arrl.org/ncj**
Support for Instructors – **www.arrl.org/instructors**
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ARRL Volunteer Examiner Coordinator (ARRL VEC) – **www.arrl.org/vec**
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Joel P. Kleinman, N1BKE, upfront@arrl.org

Three Watts in a Coffee Can

George Dorner, W9ZSJ

In years when I haven't been involved in a low power Field Day station, I have had a personal goal of 100 contacts during the 24 hour period, either in the field or from home. This always leads to a flurry of building, operating or at least dreaming of low-power ventures. 2011 was a little different. Instead of looking forward, I looked back to my first dip into the "less is more" aspect of ham radio.

I was licensed as a Novice in 1953. That June, I bought a copy of *Radio & Television News*. I pored over it time and time again, until there was neither a small print ad nor an article detail that had escaped my study.

This magazine was aimed at a broad audience of electronics enthusiasts, which included radio-TV servicemen, audio equipment fans, electronics industry followers and, yes, radio hams. In what single publication today could you expect to find articles like these: *Tunable Hum in Broadcast Receivers, Service Hints on Philco TV Sets, New TV Stations on the Air, The Fisher Master Audio Control, A Transistor Band Spotter* and *A $5 Low-Pass Filter*. But, the article that became most dog-eared was *Three Watts in a Coffee Can*.

A close-up of the 3 W coffee-can transmitter built using the "ugly" construction method. [George Dorner, W9ZSJ, photo]

The completed 1953 coffee can transmitter. Its 3 W provided the author with his first low-power experience. [George Dorner, W9ZSJ, photo]

My Novice station consisted of an Army Surplus BC-457 Command transmitter running 40-75 W on 80 meters and a Hallicrafters S40A receiver. I was not much of a builder or experimenter, but the prospect of building a piece of gear that I could use on the air was intriguing.

The *Coffee Can* article made it sound easy, if I could find one of the surplus BC-746 tuning units that simplified this project and kept it inexpensive. I put aside a coffee can and began to gather parts, but it was over a year before I obtained a BC-746 module. Eventually, I proved the author's assertion that one could acquire all the parts for less than a $5 bill. The single tube was an 117L7GT, half of which was the dc rectifier, while the other half would provide the 3 W as a modified Pierce oscillator.

The evening I put the coffee can on the air for the first time it was tuned for maximum output by sliding a link coil up and down the coil on the subchassis. Using a neon bulb with a pickup loop I was never sure that I had peak output, but I had enough power to make a contact in Pennsylvania. It was a thrill! This was far enough from central Indiana and with little enough power to make me a low power operator for life.

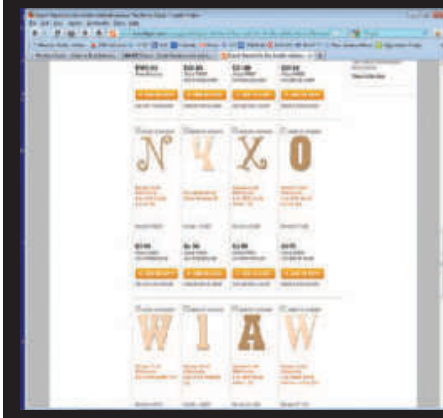
Nonetheless, I relive that moment often and have done so over the years when ham radio was less, then more, a part of my life. I still have this coffee can and its original radio contents. I have fired up the coffee can transmitter for Straight Key Night on a couple of occasions, but mostly it sits on a shelf to bring back memories and to prod me to try something different.

Looking Ahead to Hamvention 2012

Head to Dayton over the weekend of May 18-20 for the chance to meet someone famous — or simply the folks you enjoy seeing there every year. ARRL EXPO will be teeming with Hamvention visitors looking to have cards checked for DXCC, looking for a new *Repeater Directory* or other publication, looking to renew their ARRL membership – or looking to say hello to an ARRL volunteer or staff member. We're looking forward to seeing you there!

Young hams and future hams meet KF5BOC

NASA Astronaut Doug Wheelock, KF5BOC, paid a visit to the ARRL Youth Lounge at Hamvention 2011. That's Southeastern Division Vice Director Andrea Hartlage, KG4IUM, at the left. [Steve Ford, WB8IMY, photo]



Coincidence? We think not: John Rudy, K3QF, of Manheim, Pennsylvania was searching for some adhesive at a major home improvement website and came upon this combination of household lettering. [Jon Rudy, K3QF, photo]

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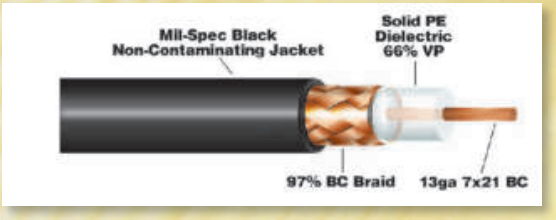

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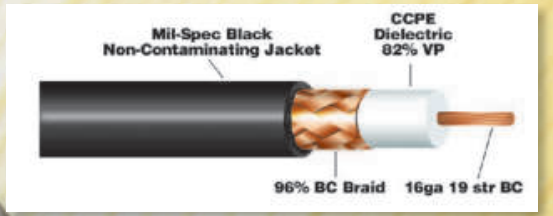

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• 0.9dB @ 10MHz	2.16kW	80%
• 1.4dB @ 30MHz	1.24kW	69%
• 2.1dB @ 50MHz	0.96kW	62%

Part #	Length/Ft	Price/ea
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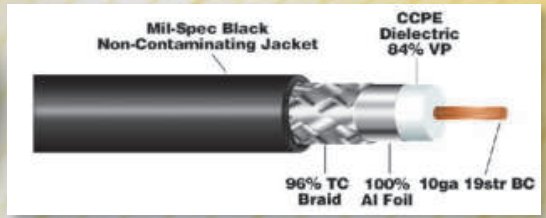
218XA-PL-18	18	$14.95
218XA-PL-50	50	$26.95
218XA-PL-75	75	$35.95
218XA-PL-100	100	$44.95
218XA-PL-150	150	$62.95



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• 1.1dB @ 50MHz	2.14kW	78.5%
• 1.8dB @ 150MHz	1.22kW	65.4%
• 3.3dB @ 450MHz	0.69kW	47.3%

Part #	Length/Ft	Price/ea
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25400F-PL-18	18	$26.95
25400F-PL-35	35	$43.95
25400F-PL-50	50	$58.95
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Letters from Our Members

Celebrating on 60 Meters

Although the events of March 5, 2012 at 12:01AM EST weren't quite as exciting as the opening of a brand-new amateur band, the changes in regulations on the five 60 meter channels were celebrated by a few hardy operators who wanted to be the first to operate CW on the channels. It was a little different from regular operating on CW, as everyone was zero-beat with everyone else, but everything was orderly.

I'm not sure who gets the claim of the absolute first CW contact on 60 meters, but it seemed that everyone was either using electronic keyers or keyboards — except for Larry Newby, WBØB, and me. We made what I believe is the first straight key contact on 60 meters, and we were both using WW II-era keys. Mine was a navy flameproof key; Larry used a J47 leg key, the kind used by the army. Our contact was at 0503 UTC on 5.348 MHz, and we were both 599. Near vertical incidence propagation works great on 5 MHz, although we also heard stations from the western portion of the country from our homes in Iowa.

Want to try something different? Try CW on 60 meters and have some fun!

Ben Johnson, NYØO
Mount Union, Iowa

Proud to Be a "No-Code-Extra"

I have been a member of the ARRL since I was first licensed in 1994. Though that's only 18 years — and a short span of time compared to some of the licensed hams I encounter daily — I like to think that I have done my fair share. Then I read the letter from Ted Jeffries, ND4K ["Correspondence: Communicating to the Max," Apr 2012, page 24]. I found it to be the best example of backwards thinking I have ever seen!

The continuation and expansion of the Amateur Radio Service is not limited to one mere mode of operation. I happen to be an Amateur Extra class operator, and I like to think that I am every bit as much of an Extra Class as those before me. In fact, I do much more for the hobby than most in my license class. I am a Volunteer Examiner, I teach and Elmer other hams, I participate in many clubs and organizations and I also manage, repair, build and maintain many repeaters in my state, as well as neighboring states. I have built equipment from scratch — both for myself and others — and donated my time and knowledge.

I am a "No-Code Extra" and proud of it. I operate more modes nightly than some Extras who had to take a CW test. I have taught Coded Extras how to use the new digital modes, expand their station, make improvements to their antenna system and even repaired their radios for them! A mere CW exam has *nothing* to do with one's ability or intelligence.

I don't need to take a CW exam to prove my worth and would never stoop so low as to take one to obtain some false "MaxCom" moniker. I know what class of operator I am — I don't need someone telling me otherwise.

Don't take a wide brush and paint all the No-Code Extras with one stroke! Do your fair share for the hobby; don't sit behind a license exclaiming your greatness because your test was different than mine, get out of that chair and show the new hams how it's done. Do something for the hobby to show your experience instead of merely bragging.

Scott Lichtsinn, KBØNLY
Tyler, Minnesota

■ I must take exception to those who think that just because they can do Morse code, they are far better than those who can't — or don't — use it, separating themselves from the rest of us and considering themselves to be exalted in status. There are people who are just as smart and intelligent who have a hearing condition that prevents accurately hearing and deciphering Morse code. I am one of those, and for more than 50 years, I could not get an amateur license because I could not "hear" Morse code correctly! I have tried everything I could find to help correct this condition. I would love to be able to do Morse code, but I am stopped physically from telling the difference between a DIT and DAH as it is received. So those who cannot or don't do Morse code should be relegated to the ranks of the very inferior? Have any of these who do Morse code ever consider that those who don't, might have a legitimate reason for not doing so, and really want nothing more than to be able to do so? I was under the impression that the amateur community was above the petty practice of discrimination in any form, refusing to look down on others this way. Maybe I'm wrong, but I am a licensed ham now and proud of it, regardless of how someone who can do something I can't, thinks of me for it. Being able to do Morse code does *not* make anyone else smarter, more intelligent or better than others. I envy those who do code, but you're not "the top of the crop" because you can. Morse code will always be a part of Amateur Radio, but it does not qualify anyone as a "unique class" of person.

John Rader, KD8PAF
Union Furnace, Ohio

Looking Back with LoTW

I was first licensed back in 1964 when I was still in high school. During the past 48 years, I've made thousands and thousands of QSOs, every one of which has been entered in one of the ARRL's paper log books. Needless to say, I have quite a stack of those log books sitting in my shack! A few years ago I bought a computer and started doing my logging on it. As my data base grew, I kept thinking about those paper logs.

A few months ago, I signed up on to Logbook of The World and entered several hundred of my most recent (2011-2012) QSOs into it. After the initial setup, I was pleasantly surprised to see how easy it was — and how quickly I started getting confirmations from others I've worked who also upload their contacts into LoTW. So I decided to start uploading some of old Novice QSOs into LoTW. Imagine my surprise to see that I got verification from TF2WLC in Iceland and F5QF in France for QSOs that I had with them back in 1968 when my call was WA3FGU! I was shocked, to say the least. It appears that I'm not the only one adding these old QSOs into LoTW and getting some surprising results. If you haven't started using LoTW, I highly recommend it — it's easy, fast and every so often, you may be surprised to see what you get!

Jim Bennett, W6JHB
Folsom, California

Kudos!

It was great to see ARRL Chief Operating Officer Harold Kramer, WJ1B, with his 5 Band DXCC plaque ["Inside HQ: How I Earned 5B DXCC," Apr 2012, page 13]. Congratulations on the achievement with simple wires, and thanks for highlighting the ability of contesting to help one accumulate DXCC totals. I also completed my 5 Band DXCC award in 2011 — something I had hoped to do for a long time. I did mine solely via Logbook of The World. Since earning this distinction, I have come to appreciate the LoTW resource even more since I started contesting for DXCC totals.

Scott Wright, KØMD
Rochester, Minnesota

Send your letters to "Correspondence," ARRL, 225 Main St, Newington, CT 06111. You can also submit letters by fax at 860-594-0259, or via e-mail to qst@arrl.org. We read every letter received, but we can only publish a few each month. We reserve the right to edit your letter for clarity, and to fit the available page space. Letters published in "Correspondence" may also appear in other ARRL media. Of course, the publishers of *QST* assume no responsibility for statements made by correspondents.

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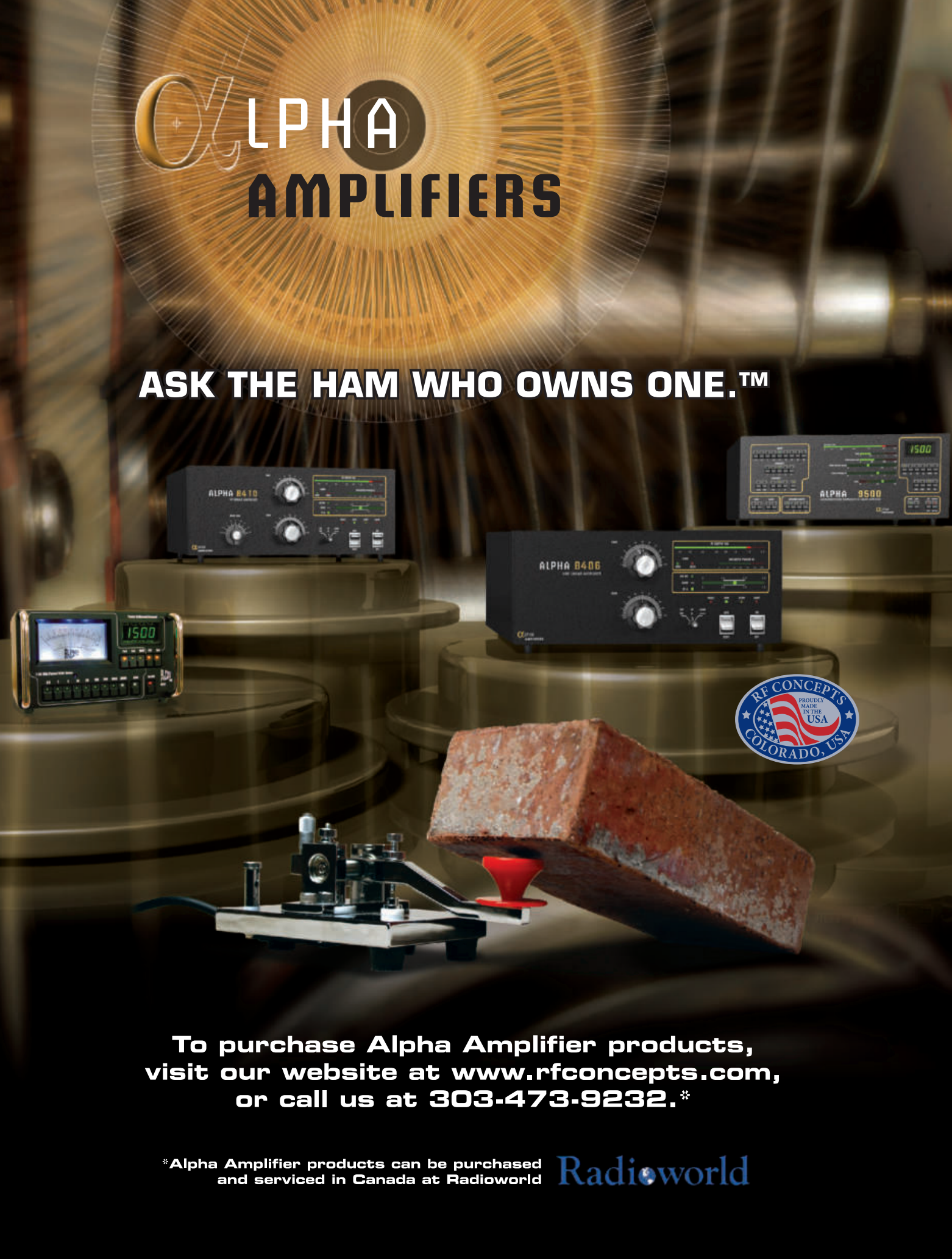
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First SteppIR purchased by Kim Bottles, K7IM 2001

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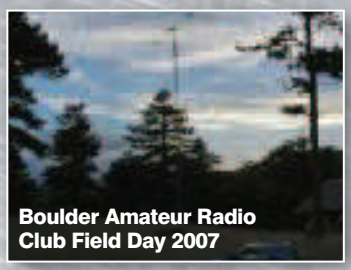
Of all the many different pieces of ham radio equipment I have owned and used over the last 47 years I can truly say the SteppIR Yagi is my all time favorite piece of gear.

It was truly a breakthrough idea!

Cheers,
Kim Bottles - K7IM



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Yoshiki Ato JH1OBS

CQ-Japan Magazine-DB42 March 2012

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Martin Huyett, KØBXB

Since I was a kid technology, and in particular radio related technology, has been one of my preoccupations. So it didn't take me long after getting my Android-based smartphone to begin thinking about how I could use it with ham radio. Right away I found a number of interesting apps for it including *Morse Trainer*, *QTH Locator*, *Callsign Database*, *DX Cluster* and others.[1-4] But most of them dealt with the administrative aspects of Amateur Radio, not the actual operating.

Radio related technology has been one of my preoccupations.

That changed for me when WOLPHI Solutions recently released *DroidPSK*. I was immediately impressed — by holding my phone near my radio speaker it easily displayed PSK31 messages. Nifty! I had to find out how to wire my phone to my radio! The lead photo shows the result — a portable PSK station using an Android smartphone, the AFSK interface described in this article and a Yaesu FT-817ND low power HF/VHF transceiver.

The Design Process

I began by searching the Internet, which brought me to the website of Wolfgang Philipps, W8DA, **www.wolphi.com**. There, he not only offered the *DroidPSK* and other Android apps but also an interface for an Android phone and a Yaesu FT-817 radio. I suggest studying the article on his website, **www.wolphi.com/android-apps/droidpsk/droidpsk-to-ft817-interface**, for more background on marrying your phone and radio.

I contacted Wolfgang and then breadboarded his circuit. The audio output from my phone was a bit too low to get it to key my transceiver. So I began experimenting and ended up with a design using a MOSFET transistor amplifier and a 9 V battery. It worked well, but the battery requirement bothered both Wolfgang and me. As we discussed this we realized that neither of us had taken advantage of the fact that Android phones provide approximately 2 V dc on their external headset microphone input line to power an electret microphone.

With that in mind we went back to the drawing board

Circuit Description

With that in mind we went back to the drawing board and came up with the bipolar transistor amplifier circuit shown in Figure 1. The transceiver connections are on the right side of the schematic and the phone connections are on the left. First, the received signal from the transceiver audio output is connected to receive level potentiometer R6 by way of R10. Resistor R7 and capacitors C3 and C1 pass it to the base of transistor Q1, which passes it to the audio input of the phone headset jack through R4. Next, transmit audio is taken from one stereo channel of the phone headset jack and passed to the transceiver audio input by way of capacitor C3, resistor R9, transmit audio level potentiometer R8 and resistor R11. Finally, the PUSH-TO-TALK line (collector of Q2) is connected to the PTT pin of the transceiver.

Q2's collector is "open" when no transmit audio is present. But when transmit audio from the phone is fed by capacitor C1 to the base of transistor Q1 it is amplified and fed through capacitor C4 to rectifier diodes D1 and D2 producing a smooth dc voltage across capacitor C5. That voltage pulls up the base of transistor Q2 through resistor R5, pulling its collector to ground and switching the transceiver to transmit. Note that this circuit assumes that transmit is activated by grounding the transceiver's PTT line. Capacitors C3, C4 and C6 provide dc isolation between the phone and the transceiver while providing an audio path for both transmit and receive. Capacitors C7 and C8 are RF bypass capacitors.

[1]Notes appear on page 32.

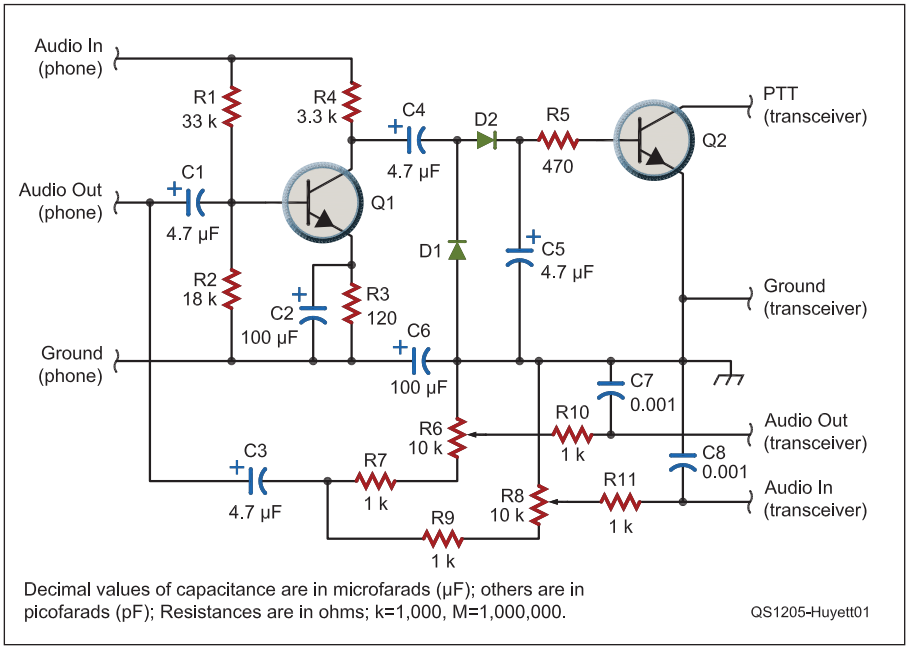

Figure 1 — Schematic diagram and parts list for the Android smartphone.

C1, C3-C5 — 4.7 µF, 15 V electrolytic capacitor.
C2, C6 — 100 µF, 15 V electrolytic capacitor.
C7, C8 — 0.001 µF, ceramic capacitor.
D1, D2 — General purpose diodes, 1N4148 or equivalent.
Q1, Q2 — NPN low signal or switching transistor such as the 2N2222 or the MPS4124.
R1 — 33 kΩ, ¼ W resistor.
R2 — 18 kΩ, ¼ W resistor.
R3 — 120 Ω, ¼ W resistor.
R4 — 3.3 kΩ, ¼ W resistor.
R5 — 470 Ω, ¼ W resistor.
R6, R8 — 10 kΩ, miniature potentiometer.
R7, R9-R11 — 1 kΩ, ¼ W resistor.

diodes. The capacitors can be any size from a few microfarads up. I used capacitors removed from the circuit boards of junked electronic equipment. Resistor values are more critical, but even here some variance won't have a major affect.

Deciding on an enclosure, fabricating the circuit and picking connectors are always interesting questions when homebrewing. I already had interface cables for my radios that used RJ45 plugs for other homebrew interfaces I had previously built. So I found a small inexpensive RJ45 surface mount box measuring 2¼ × 2 × ¾ inches. The inside opening would only accept a ¾ × 1 inch circuit board, so I built my interface by gluing small pads of PC board onto a larger piece of circuit board that size, shown in Figure 2. This building technique often referred to as Manhattan style is a relatively easy way to build a circuit. If you are unfamiliar with the Manhattan building technique, one good resource is the excellent article by Chuck Adams, K7QO, at **www.k7qo.net/manart.pdf**. My board, nestled into the RJ45 box is shown in Figure 3 and the finished product in the lead photo. Wolfgang likes to lay out and etch circuit boards so his, built that way, is shown in Figure 4. If there is enough interest he may offer his board. If interested contact him via his website.

Construction Notes

Nearly any NPN low signal or switching transistor such as the 2N2222 or the MPS4124 can be used for both Q1 and Q2. I used some unmarked ones from my junk box with an h_{fe} of about 180, as measured on my digital multimeter. Diodes D1 and D2 are also not critical. I used 1N4148

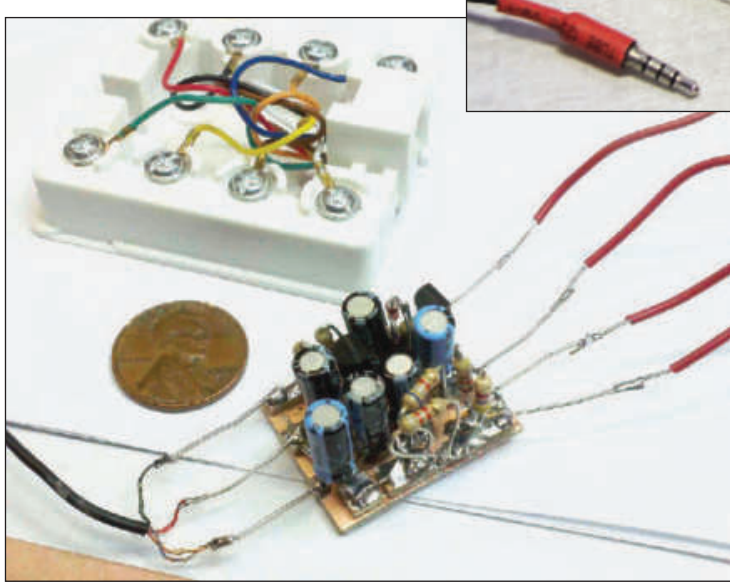

Figure 2 — KØBXB's interface built using Manhattan style construction.

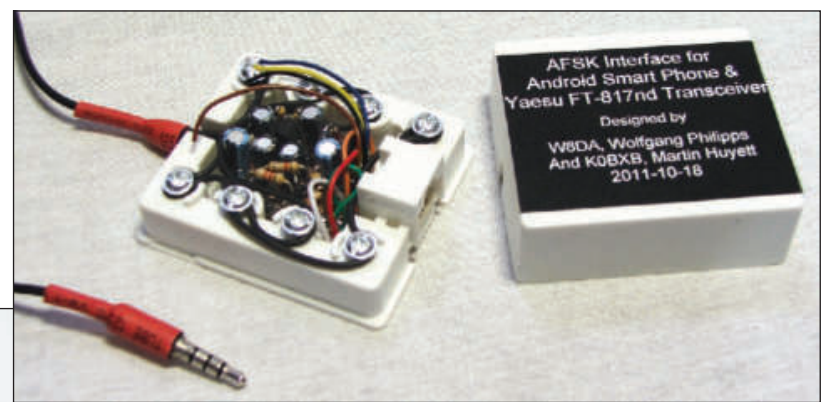

Figure 3 — The KØBXB interface in RJ45 wall mount box.

Also, take note that the wiring of the ⅛ inch four wire audio plug for the phone's headset jack may be different than you expect. The tip is one stereo output channel, the adjacent ring is the other stereo output channel, the next ring is ground and finally the sleeve is the microphone audio. So connect the plug to your interface accordingly.

On the Air

As of this writing I have had one PSK31 contact with this setup. Wolfgang has tested the interface on several other Android phones and reports that it works well. It

Figure 4 — W8DA's interface built using a home designed and etched printed circuit board.

also has been used successfully with Yaesu FT-857D and ICOM IC-756PROIII HF/VHF transceivers. The interface should work with almost any transceiver that is switched to transmit by grounding the PTT line.

Conclusions

Here are a few closing thoughts. First, the Android phone is potentially the most expensive item in the radio/phone combination, so be careful. Second, battery capacity on the phone is one of the weakest links, so we tried hard to minimize the current draw. This interface draws less than 0.5 mA.

My intent with this article is not necessarily to encourage you to build the exact interface described here, though you certainly are welcome to do so. I hope rather that this discussion will inspire others to experiment with smartphones and interfaces. The resulting developments will enable us all to have even more fun combining Android phones or pads and Amateur Radio.

Speaking of that and as pointed out by KJ4ORX in his November 2011 *QST* article, a lot is going on in this arena.[5] I suggest that you again go to **www.wolphi.com** and look at the *DroidPSK* software that got me started on this interface project. You'll also find other Amateur Radio apps there. Apps can also be found on Android Market and the Amazon appstore for Android. But don't limit your search to these app sites, as many interesting apps are available elsewhere on the Internet. The world of Android smartphones and ham radio will only get more interesting, and I hope this article will encourage others to join in the fun.

Notes

[1]**www.wolphi.com/category/morse-trainer**
[2]QTH Locator, **www.spieglhof-media.de**.
[3]Amateur Radio callsign database created by Infantry Company.
[4]**www.wolphi.com/category/dx-cluster**
[5]W. Vartorella, KJ4ORX, "Android Apps for the Amateur," *QST*, Nov 2011, pp 69-70.

Photos by the author.

ARRL member Martin Huyett, KØBXB, was first licensed as KNØBXB in high school in Topeka, Kansas about 1958 and now holds an Amateur Extra class license. He studied Electrical Engineering in college and worked several years as an engineer before moving into management. He has spent 41 years in various technical and nontechnical roles with Wycliffe Bible Translators, currently overseeing publications for affiliate organizations in Asia. Except for a lull in the 1990s Martin has been an active ham most of his life. His special ham radio "love" is practical technical things, homebrewing things he designs himself, as well as others' ideas and kits. He also enjoys writing and has written several previous articles for *QST*. You can contact Martin at 7735 Big Pine Ln, Burlington, WI 53105 or via e-mail at **huyettmeh@gmail.com**.

New Products

70 CM ATV Transmitter from PC Electronics

The PC Electronics TX70-5s four channel ATV transmitter for the 70 cm band is designed primarily for emergency communications applications, but it may also be used in home stations. RF output is adjustable from 0-5 W PEP. Stations using 5 element beams on both ends can work up to 15 miles line of sight, with live full motion color video and sound from an incident site back to an Emergency Operations Center. The TX70-5s accepts video and line level audio from video cameras and camcorders. There is also a separate low impedance dynamic mic input that can be used for doing voice-overs while transmitting a recording. Both audio inputs are processed through a deviation compressor to improve quality. A standard television cable tuner (channels 58-60) can directly receive the video from this transmitter, or an ATV downconverter can be placed ahead of the TV for better sensitivity and DX. A built-in TR relay switches the antenna jack between the transmitter output and a jack for the receiver. Price: TX70-5s, $499; TX33-.1 (33 cm band, 50-100 mW) or TX23-.1 (23 cm band, 50-100 mW), $449. For more information on these products or to browse the ATV application notes and general information, or to order, visit **www.hamtv.com**.

Strays

Have a *QST* Delivery Issue?

If your copy of *QST* does not arrive by the end of the month before the issue date, please contact the ARRL Circulation Department at **circulation@arrl.org**, tel 860-594-0200. Also contact them if your address changes or your copy of *QST* arrives in damaged condition.

Not This CQ, the Otter Sekiu

The baby sea otter born January 14 now has a name. Selected by popular vote at the Seattle Aquarium's website, the baby's name is Sekiu (pronounced "C-Q"). The possible names were all based on Washington state place names. Of course I voted for Sekiu. — *Mike Pearson, KD7PVT*

I would like to get in touch with...

anyone with an updated schematic diagram of the Drake R4 receiver. The version I'm looking for has an OB2 voltage regulator and a 12BA6 crystal calibrator tube. — *Ron Distler, W3JEH,* **rondistler@aol.com**

ARRL Education and Technology Program Space/Sea Buoy

Mark Spencer, WA8SME

"As hurricane Irene approaches, the sustained winds are 75 MPH as reported by a buoy located in Long Island Sound."

"The west coast is on high alert after an earthquake hit Japan a few hours ago."

"The tsunami early warning buoy system is being monitored for the first signs of potentially dangerous waves that are generated by seismic events of this magnitude."

"The debate about global climate change is again heating up, discussions on both sides are being supported from environmental buoys reporting weather data from the North Pole."

All of these fictitious scenarios have one thing in common — remote sensing from seaborne or airborne buoys. But how does that work?

A Hands-On Teachable Experience

The latest addition to the ARRL's Education and Technology Program (ETP) portfolio of offerings is a Teachers Institute-2 based on just that question — the technology behind environmental buoys. The current cost of a single seaborne environmental buoy with simple temperature and pressure sensors is approximately $16,000, excluding the cost of deploying the buoy and the satellite data link time to report out the data collected. Obviously the cost is far outside the reach of most schools, yet our lives can depend on this technology.

The goal of the ETP is to allow schools to access, study and participate in the use of this kind (and other kinds) of technology in an affordable, hands-on way. It also provides the teachers with the fundamental understanding of the technology so that they can in turn develop lessons to teach the technology to their students. Yes, the ETP encourages schools to include Amateur Radio in their curriculum, but not necessarily as a stand-alone subject. Amateur Radio more importantly provides a conduit, avenue or tool that schools and teachers can use to support the study of other curricular areas.
In other words, Amateur Radio provides a gateway to discovery. The ETP Sea/Space Buoy project is an example.

The ETP Sea/Space Buoy Project

This introductory article summarizes the sea/space buoy system that has been developed. This development is a work in progress; modifications and improvements will be made as the system develops. This is an introductory article because the scope of the technology cannot be covered adequately in one printed article. Consequently, the details of the individual components of the system will be provided online through links on the ARRL website as they are developed. The buoy is called a sea/space buoy because the system can be deployed either in a surface buoy or attached to a weather balloon payload and deployed into near space.

The purpose of a buoy is to access remote areas for long periods of time that are either too dangerous, too expensive or too remote to visit and to make direct observations for study and monitoring. Setting up the technology to make the observations is one thing; getting the information out of the buoy in a timely manner is another matter altogether.

Remote measurement technology can be the beginning of many rewarding classroom experiences.

The weather services around the globe deploy weather balloons many times a day to take climatological readings in the upper atmosphere.

These readings are data linked down by a transmitter, and the balloons are tracked by ground stations to make wind measurements. At a predetermined altitude, the balloons burst and the sensor packages return to Earth,

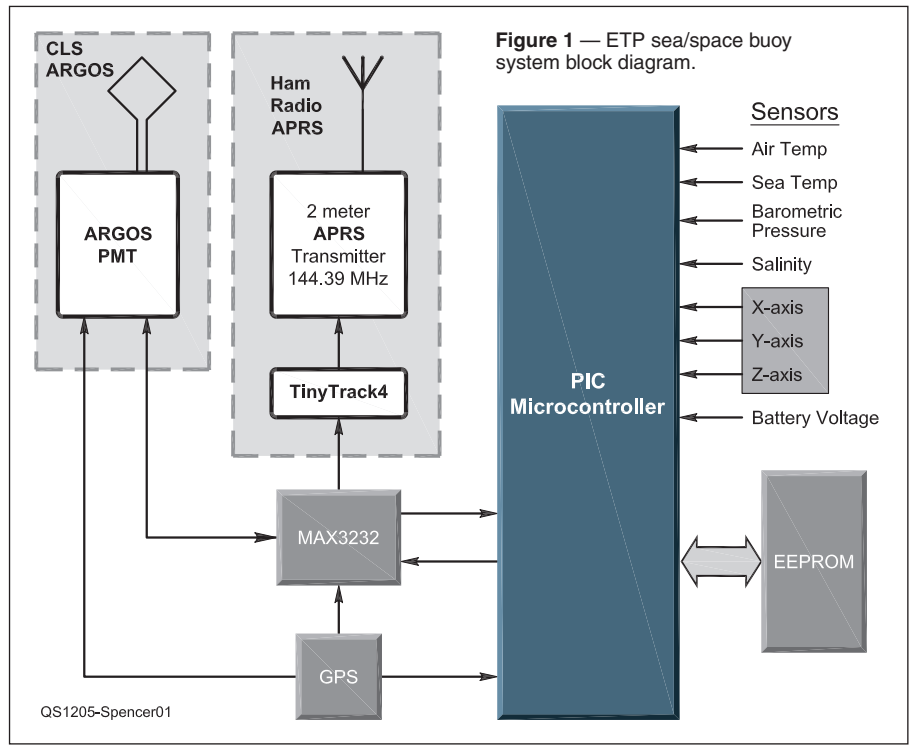

Figure 1 — ETP sea/space buoy system block diagram.

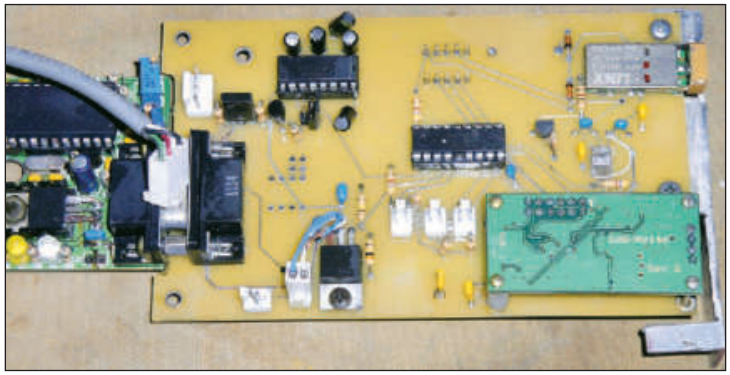

Figure 2 — Sensor package circuit board mounted on buoy body top hatch below the 2 meter data link vertical dipole antenna.

ARRL's Education and Technology Program

This curriculum was developed as part of ARRL's Education and Technology Program (ETP). The ETP is funded by donations from individuals and clubs in the amateur radio community. The ETP is an outreach program to US schools to introduce teachers to Amateur Radio as an instructional resource and to provide an educationally sound curriculum focused on wireless communications. The goal is to offer the resources to build a foundation of wireless technology literacy among American teachers and students. Find more information about the ETP at **www.arrl.org/etp**. To make a donation, visit **www.arrl.org/education-and-technology-fund**.

in all likelihood never to be seen again.[1] Government and education institutions are doing climate change studies by deploying sea and ice borne buoy systems around the globe and in the regions of the Earth's poles.

Measuring Data Remotely

The battery operated sensor packages take temperature, pressure, salinity and other environmental readings and transmit the information to passing NOAA weather satellites using a commercial package carried on the satellites called Advanced Research and Global Observation Satellite (ARGOS). Once the data is in the ARGOS system, it is disseminated to interested users via the Internet. The use of the ARGOS system is not limited to environmental research. Users also track wildlife in remote areas.

Position information can be transmitted from on-buoy (or attached collar when tracking animals) GPS systems or the ARGOS system can use the Doppler shift of the transmitted signal to determine the transmitter's location with remarkable accuracy. The ARGOS system is a subscription service and is not free. The ETP sea/space buoy system is intended to simulate, in the typical classroom environment, the actual buoy systems used. Amateur Radio and the Automatic Position Reporting System (APRS) is a perfect, alternative, affordable fit for this project for the data link.

What's in the Package?

The ETP sea/space buoy system is depicted in the block diagram of Figure 1, and the prototype board outside the buoy body is shown in Figure 2. The centerpiece of the system is the microcontroller that is used to manage the attached sensor packages. The system is flexible enough to adapt the sensors to a particular application. In the case of the ETP sea buoy, the sensors include air and sea temperature sensors, an air pressure sensor, a salinity probe, a three axis accelerometer to measure wave activity and a GPS module to report position information. Alternatively, if the system were to be deployed as a balloon payload, the sensor package might include just the air pressure sensor, air temperature and accelerometers.

Because the space buoy package will have a short mission duration, and the data is to be collected at a shorter time interval (seconds or minutes versus the hour duration between data points in the sea borne application), power limitations (battery life) are not a factor but data link stability is. Consequently, the space buoy has an onboard recording capability to back up the data link so that the collected data can be recovered when the payload is retrieved.

Internal and External Data Links

Besides the microcontroller and sensors, the other integral part of the buoy system is the data link. The ETP system is flexible enough to interface to the ARGOS transceiver for a professional application, or use the ham radio APRS system. The majority of the schools that will use the ETP Space/Sea Buoy system as an educational resource will use the APRS as a data link. The ETP system interfaces to the Byonic TinyTrak 4 modem and the SRB Electronics SRB-MX-146 APRS 2 meter transmitter module.

The sensor/microcontroller interface requires the extensive use of basic electronics from Ohm's law, to voltage dividers, voltage regulation, current limiting, filtering and beyond. Basic algebra skills are employed to calibrate the sensors and to translate the raw data collected (basically proportional voltages and currents) into useable data (temperature in degrees C and pressure in millibars, for example).

The intrasystem communications between the microcontroller and the sensor systems use a number of the common communications strategies including universal synchronous asynchronous receiver transmitter (USART serial communications) and inter-integrated circuit bus (I2C) protocols. For voltage and current measurements, the microcontroller's analog to digital converters (ADC) are used.

All of these topics and some basic C language programming techniques for the microcontroller will be introduced to the teachers during the Teachers Institute and will be covered in greater detail in the supporting web-based articles on this project.

Figure 3 — Buoy body constructed out of common PVC plumbing fixtures available in home improvement retail stores.

The Physical Plant

The sea borne buoy body is constructed out of common household building supplies that can be found at home improvement stores. Figure 3 illustrates the construction of the "spur" ETP buoy. The sensor package, battery pack and ballast are located inside the buoy body. The sea temp and salinity

[1]The US National Weather Service attaches a return mailing sticker so the finder can simply drop the sensor package in the mail to return it to the NWS.

sensors are mounted on the outside of the buoy below the water line. The air temperature sensor is mounted in the tip of the 2 meter vertical dipole antenna used for the APRS data link. The buoy is ballasted to sink to a predetermined level to keep the GPS antenna above the water surface while having the center or gravity and buoyancy well below the water line for stability.

Setting it Free

The prototype sea borne buoy was deployed for "wet" bench testing and shakedown in a brackish water cove located near the mouth of the Thames River in Connecticut where it spills into Long Island Sound (see Figure 4). In operation, the data is collected at 30 minute intervals and packaged as UNPROTO text that is sent via the APRS system. Once captured by the local APRS node, the data is disseminated through the Internet to interested users. Using *FindU and call sign* in a Google search, users can access the raw data. Figure 5 is a map display of the buoy location from a *FindU* server. The raw data as captured and relayed by APRS is illustrated in Figure 6.

Figure 4 — The buoy is ballasted to keep the GPS antenna above the water line.

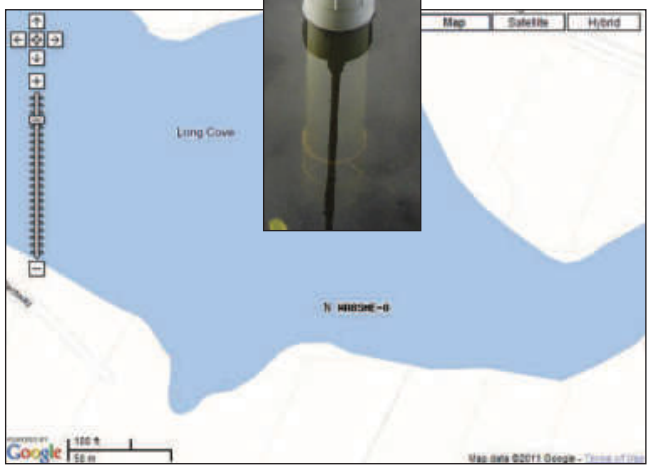

Figure 5 — Map plot of buoy location generated by **findU.com**.

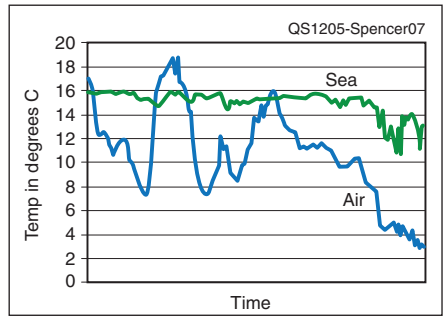

Figure 7 — Air and sea temperature data.

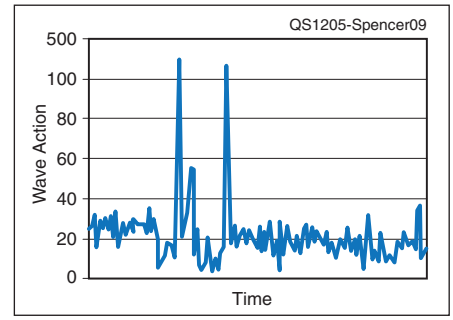

Figure 8 — Wave action data.

After the identification, time, location and routing fields, the sensor data is shown in comma-delimited fields that can be imported into an *Excel* spreadsheet for interpretation. The system owners would have to publish the algorithms needed to translate the reported data into meaningful information — and that is where the rubber meets the road for this project. Figures 7 and 8 show representative graphs of environmental data generated during the wet bench testing of the system and represent the end product that would be generated, interpreted and used in the classroom. There is not sufficient space to go into the interpretation of this data set here, but suffice it to say that the teachable moments you are looking at are *huge*!

Alternatively, the buoy sensor package can be modified and adapted for a balloon payload and launched with a weather balloon. This is a very popular school activity. There are, however, a few notes of caution about both the sea and air buoy systems. If you are going to deploy the systems, you have to assume that they will be lost.

There are also numerous liability issues that need to be addressed, particularly with balloon launched systems. I hope the liability concerns that some schools might have about ballooning activity and retrieving sensor packages that land in less than ideal locations is obvious. But frankly, even the discussion of potential liabilities is a teachable moment.

The Next Steps

I hope this introduction to the ETP sea/space buoy project has piqued your interest. More details will be published and posted on the ARRL web pages as they are finalized. If you can't wait, feel free to contact me for the specifics that are immediately available. For those teachers who are interested in this project and would like to participate in the Teachers Institute-2 this summer, fill out and submit an application at **www.arrl.org/teachers-institute-on-wireless-technology**.

There are two prerequisites for this TI2. First, the applicants must have attended a basic TI, and second, because the system depends on ham radio for the data link, the applicant must have an Amateur Radio operator's license. See the sidebar for more on the Education and Technology Program.

Photos courtesy of the author, unless otherwise noted.

Mark Spencer, WA8SME, is the ARRL Education and Technology Program Director. You can reach him at **mspencer@arrl.org**.


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Figure 6 — Data reported through the APRS system and posted on **findU.com**.

From Analog to D-STAR

D-STAR has come of age. Learn how to use its networking features and join in even if you don't yet have a D-STAR radio.

Gary Pearce, KN4AQ

Is D-STAR confusing? Difficult to master? Hams who know it well say "no," and hams who have yet to get over the learning hump say "yes." Let's see if I can smooth out that initial hill a little.

What is D-STAR?

D-STAR is system for ham radio digital voice and data communication for VHF/UHF. Think of it as an upgrade to the FM you've been using for years. As with FM, you push the PTT, talk into the microphone and listen to people on the speaker. You can talk to amateurs via simplex (on the same frequency) or through D-STAR repeaters. For repeaters you each transmit on one frequency and listen on another, so you have to both dial in a frequency and set an offset. Because it's all digital, there are some unique characteristics and added capabilities — especially networking.

D-STAR uses GMSK (Gaussian minimum shift keying). That's a complex frequency-shift keying technique that squeezes a lot of zeros and ones in a small amount of spectrum — about 4800 bits per second (bps) — into just 7 kHz of bandwidth. The D-STAR protocol organizes the bits into voice, control data, display data, some free form ASCII, forward error correction (FEC) and the usual overhead to run the show. Another form of D-STAR uses higher speed data — 128 kbps — but is only used on the 1200 MHz band.

Programming the Radio

You program a D-STAR radio the same way you'd program an FM radio — enter frequency, offset, channel step, mode (DV for D-STAR) and tone. Most D-STAR radios are full-up, high end analog radios too, so you'll put in all your favorite FM repeater and simplex channels. D-STAR adds even more programming (that's what this article is all about), but first, is there even a D-STAR repeater in your area? Not every urban area has one, and rural coverage is more miss than hit in most states. *The ARRL Repeater Directory* lists D-STAR machines, but since we're seeing fairly rapid growth, it's best to check some web resources including **www.dstarusers.org** and **www.dstarinfo.com**.[1]

Do some local research, too. The directories aren't perfect. You'll need that local info. Coordination groups have been shoehorning narrow D-STAR channels onto what may look like some unusual frequencies.

Figure 1 — The four D-STAR call sign fields are shown in the display of this ICOM IC-92AD handheld. Note that the RPT1 and RPT2 call signs have a port letter appended.

The Call Sign Fields

Now for the D-STAR specific programming. D-STAR is "controlled" by four call sign fields. They're named MY call, YOUR call, REPEATER 1 and REPEATER 2 (see Figure 1). The call signs you put in those fields somewhat correspond to the continuous tone coded squelch system (CTCSS) and dual tone multifrequency (DTMF) tone functions you use in an FM radio.[2] They tell repeaters to do things such as key up or create a link. Some of the call signs have an extra letter or two that control specific functions.

The data field MY call is the simplest to understand. That's the call sign of the person doing the transmitting on the radio. I would say that it's "your call sign," but that really confuses the language because YOUR call means something else in the D-STAR world. This is best done in first-person English. I run my radio. I put in my call sign in the MY call field. Bad journalism, but good instruction manual.[3]

Is D-STAR difficult to master? Hams who know it well say "No."

I put my call sign in the MY call field of my radio using the display, the knobs and the keypad to navigate menus and enter digits (see Figure 2). It is tedious. I push buttons to get to the point at which a blinking cursor prompts me to enter the first letter. Next, I turn a knob and scroll to K (for KN4AQ). I press a button, the cursor jumps to the next position, and I scroll to N. Press, scroll, press, scroll, until my whole call sign is in there, plus four more characters at the end of the field that can be anything, so I add my name — GARY.

The information I put in MY call is seen on the screen of all the stations receiving my transmission. It's also used by the D-STAR network to find me, but I'm getting ahead of the story. You have to register that call sign before you can use the networking features. You usually do this on the website of your local D-STAR repeater, and it's generally free.

More explanation is needed to cover YOUR call . It's the key — the most useful, flexible field in the system. It's not complicated, but we'll deal with it last. You can talk on D-STAR repeaters just fine without programming YOUR call beyond the "placeholder" CQCQCQ.

The REPEATER 1 and REPEATER 2 fields both get my local repeater's call sign with an added character (see Figure 1). This is similar to using CTCSS on FM. It tells the repeater, "Hey, I'm talkin' to you."

In REPEATER 1, the added character will be an A, B or C, in the eighth position of the eight-character field. That's because a D-STAR site might have three repeaters, one each on 144, 440 and 1200 MHz. They all use the same call sign, so I differentiate between them by adding a port letter, which corresponds to the control port that each repeater module plugs into on the controller. By convention in most of the world, the 1200 MHz repeater plugs into the A port, the 440 MHz repeater goes into the B port and the 144 MHz deck plugs into the C port. That's now ingrained in D-STAR culture. Figure 1 shows my local UHF repeater's call sign entered as KR4RDU B. That's a blank space in the seventh position. Shorter call signs would have more blank spaces between the call sign and the port letter.

The same call sign goes into REPEATER 2, with a G in the eighth position. Doing that routes your signal to the gateway, a computer that accompanies the D-STAR repeater and

[1]Notes appear on page 39.

controls the Internet connection. Always fill this field with the repeater's call sign plus a G, even for local contacts. I'll explain why later.

Your First Digital Contact

It's time for your first digital contact. You key up and announce yourself, the same as you would on FM. And you are greeted by a voice from Mars.

I exaggerate. The voice is human, but it's been digitized by a hard working voice encoder (vocoder) to fit in a small stream of zeros and ones. D-STAR has a unique timbre that colors voices to some extent. You can still recognize individuals. It's just that they've gone a little bit Claymation.

Notice the noise floor. It's dead quiet, far quieter than on FM. You can't tell how strong a D-STAR signal is by listening. Very weak signals can have some garble as the vocoder tries to reconstruct missing bits using FEC. Early D-STAR users dubbed this garble "R2D2," because it resembles the sound of that little Star Wars robot. The rest of your contact is routine. Press to talk, release to listen.

Gateway to Heaven

Time to learn all about YOUR call. D-STAR is designed to be networked. You can put up a stand-alone D-STAR repeater, but D-STAR comes alive when you connect it to the Internet by adding a gateway computer and an Internet connection to the repeater site. Then you join a worldwide community of hams, right on your handheld or mobile radio, through your repeater. Local activity will probably be light at first, but the gateway will keep your repeater busy. Drive down the road and be in a roundtable with hams in the US, Europe, Africa, Australia and Asia. Repeaters can be linked one to one, or can join reflectors that can tie dozens to hundreds of repeaters together.

FM repeaters have been using *EchoLink* and IRLP to link via the Internet for a decade. But D-STAR has some differences:

- The sound. D-STAR audio may start a bit more limited, but it stays the same from end to end — it doesn't degrade a bit (pun intended).
- D-STAR networking gets used a lot. A D-STAR reflector becomes a community of hams who talk to each other routinely as if they're all on the same local machine.
- No codes to remember. The control is in the call signs, and it's all stored in memory on your radio.

Using the Network

This is where the YOUR call field works its magic. There are two fundamentally different ways to use D-STAR over the network: *Call Sign Routing* (the original system) and a newer overlay called *DPLUS*.

- *Call Sign Routing*. When I put a specific call sign in the YOUR call field of my radio (with my local repeater call signs in RPT1 and RPT2), I cause my signal to be routed through the Internet and appear on another D-STAR repeater. I can route to a specific ham or to a specific repeater.

To reach a specific ham, I put that ham's call sign in my radio's YOUR call field (see Figure 3). Since everyone is sending their call sign with every transmission, the D-STAR network knows where everyone is. I key up, and my local repeater's gateway checks YOUR call, and routes my signal through the Internet to the repeater that ham used most recently, all within a fraction of a second. If my friend is still listening there, he hears me. I don't even need to know what repeater he was on.

To reach a specific repeater, I put that repeater's call sign in YOUR call, preceded by a "/" slash bar to identify the call sign as a repeater, and followed by the port letter A, B or C in the eighth position. Remember that a D-STAR site may have three repeaters sharing one call sign, so I have to pick which one I want.

Let's take an example. I want to route my signal to the KI4WXS, Charlotte, VHF repeater (see Figure 4). I enter /KI4WXSC in the YOUR call field of my radio. I key up here in Raleigh on KR4RDU, and my voice is heard in Charlotte.

Call Sign Routing works, and it has some unique advantages, but most D-STAR users find it confusing and never master it. Some say the design is flawed, and some say it's elegant. Here are the facts:

The routing is done for every individual transmission. I'm not linking the repeaters. With each transmission, the gateway looks up the call sign, sees where my signal has to go, and sends it there. It does this in a fraction of a second. That's impressive, but it means that:

- The ham I'm calling can't just transmit back to me. That person has to enter either my call sign or my repeater's call sign (and the / and port letter) in their YOUR call field, so their signal is routed back to me. D-STAR radios have a button or menu function to do this quickly.
- Other hams on the repeaters at either end can hear all the traffic, but they can't join in unless they also enter the correct call sign in their YOUR call field.
- Repeaters can't be linked for all-to-all conversations, where everyone talks to everyone without configuring their own radios.
- Multiple repeaters can't be linked together. Any conversation has to be between two repeaters.
- *DPLUS*. *DPLUS* added the linking and conferencing capability that hams wanted in D-STAR. It's a utility program created by Robin Cutshaw, AA4RC, that runs on the gateway computer. Once the link is set up,

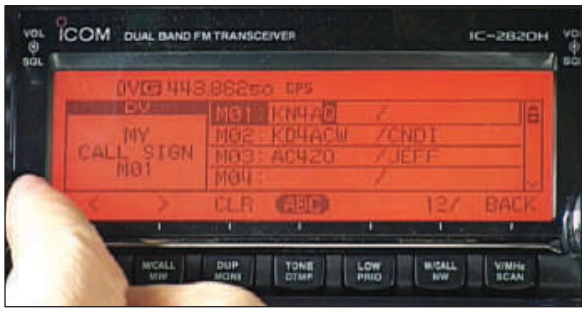

Figure 2 — Programming the MY call field on an ICOM IC-2820H mobile. I've just finished dialing in the Q of KN4AQ. Below that are two call signs entered previously — KD4ACW and AC4ZO.

Figure 3 — When I key up with AC4ZO in the YOUR call field, the D-STAR network will route my transmission to the repeater Jeff used most recently. And if he's using call sign squelch, his speaker will open for my signal.

Figure 4 — The YOUR call field is configured to send my transmission to the Charlotte 2 meter D-STAR repeater. The / tells the system that I want a repeater, not an individual ham. The C at the end tells the Charlotte system that I want its 2 meter machine.

But, Is It Ham Radio?

We don't have any "all ham radio" system that can let us communicate worldwide with ease using VHF/UHF equipment. We can do that by using the Internet. Does that mean we shouldn't do it? Should we deny ourselves the fun of talking to hams in Hawaii and Australia while walking down a North Carolina street with a handheld transceiver?

Do be aware that in a disaster area, the Internet may not be available. So don't depend on it for EOC communication. It will be nice to have a few hundred miles of RF linking on D-STAR, but today that doesn't exist.

D-STAR's 1200 MHz "Ethernet" can be especially valuable in a disaster area. Tactical voice communication is good, but what most emergency management really wants these days is to keep their Internet and e-mail working. The low speed data and D-RATS on VHF and UHF will get things started, and it can hop radio to radio on simplex until it reaches a working Internet connection. The 1200 MHz 'ID1 can do the same at 128 kbps, especially if you can get the antennas up high.

Figure 5 — Robin Cutshaw, AA4RC, speaking at a D-STAR forum at the Dayton Hamvention.® Robin reverse engineered the D-STAR protocol, then wrote the *DPLUS* utility program for gateways and was co-creator of the DVDongle and DVAP devices.

nobody has to do anything special to their radio to communicate. Even stations that are not registered will pass through the network.

I command my local repeater to set up a link to another repeater or to a multirepeater "reflector" by putting call signs in my YOUR call field, with an extra character. For example, to set up a link from here in Raleigh to the Atlanta W4DOC UHF machine, I put W4DOC BL in my YOUR call field. I key up for a half second. If the Atlanta repeater is available and not already linked somewhere, a link is established and my repeater announces "remote system linked." Now I'll hear any traffic on the W4DOC machine, and they'll hear any traffic on the KR4RDU machine here. I set my YOUR call field back to CQCQCQ because I only have to issue the link command once. Note that the port letter — "B" for the W4DOC UHF machine — moved to the seventh position in the field. The letter "L" in the eighth position tells *DPLUS* to create the link.

Reflectors don't have call signs, but Robin emulated them by giving reflectors six character designations: REF001, REF002 and on up. Each reflector has three "ports" — A, B and C — to make them similar to the repeater sites. A recent update has added extra ports to some reflectors for nonrepeater use. The three reflector ports are really separate reflectors sharing one Internet connection in a big data center somewhere. There are over 40 reflectors as I write this.

To connect my repeater to Reflector 1C, I put REF001CL in the YOUR call field and key up once (see Figure 6). Now all traffic on my local repeater appears on all the other repeaters on the reflector, and we hear all their traffic. To disconnect, I put a U in the eighth position of YOUR call and key up. Most D-STAR administrators allow registered users to control *DPLUS*.

By the way, *DPLUS* is the reason you need to keep the RPT2 field filled with the repeater's call sign and the G. *DPLUS* runs on the gateway, and that G routes your signal to the gateway where *DPLUS* can hear it. No gateway, no network.

Data and More Data

There's more to D-STAR than flapping your yap. Non-voice data comes in two flavors: low speed data that's included in every voice transmission, and (relatively) high speed data available on the ICOM ID-1 1200 MHz radio.

- *Low speed data*. Each D-STAR voice signal is sending 4800 bits of data per second. 2400 bits are used for voice. 1200 bits are used for forward error correction that's applied to the voice signal (that's a lot of FEC, but it's needed to keep you intelligible when your signal gets weak and what would be noisy on FM). Most of the remaining 1200 bits are available for you to use as ASCII data — anything you want to do with it — through a serial port on the radio. A few programs have been written to format the ASCII into something more useful. The most popular is *D-RATS*. Dan Smith, KK7DS, wrote *D-RATS* as a messaging program, but he's expanded it to handle all kinds of traffic. It can populate forms, and put you on a map. You can send small files and pictures in a few seconds.

- *GPS*. D-STAR can send location data on its low-speed data channel. ICOM's IC-2820H mobile and IC-80, IC-92 and ID-31 handhelds can display a compass rose with bearing and distance to another station sending GPS data (see Figure 7). The handhelds need a fairly expensive GPS/speaker mic to do this. Note that this isn't APRS. You can't put a D-STAR radio on 144.39 and use the APRS system. But there is a one way bridge between D-STAR and the APRS network via the Internet. A gateway program called *DPRS* takes your GPS information and forwards it to the APRS IS network. The **Find-U** and **aprs.fi** websites will show you on their maps, along with all the other APRS stations in your area.

- High(er) speed data. On 1200 MHz, the one radio available — the IC-ID1 (the original D-STAR radio) — has a separate data function with a higher bandwidth of 128 kbps. It's not cable or DSL, but it's faster than dial-up, and way faster than the zero bps available when disaster knocks out the lines. It appears as an Ethernet port on the back of the 'ID1

Figure 6 — The YOUR call field is set up to initiate a link to Reflector 1C. This reflector has become a popular worldwide repeater, with hams checking in from everywhere. Everyone speaks English on REF 1C. Other reflectors are used regionally with local languages.

Figure 7 — This display shows that the station I'm listening to is 12.5 miles north-northeast of my location, and it gives me their coordinates. It updates in real time as long as the signal is still transmitting.

radio, and can talk to a computer through a browser window. At the repeater site, a data module (not really a repeater) can pipe the Internet out to the users. So you can drive around with an 'ID1 and a laptop, and use the Internet mobile. You won't be downloading *YouTube* videos, but websites that aren't too graphics intensive work fine.

Other Ways to Do D-STAR

ICOM is currently the only company making off the shelf radios, but there are some other ways to do D-STAR. Robin Cutshaw, AA4RC, the ham who developed *DPLUS*, also collaborated on two devices for using D-STAR without a local repeater.

The first is the DVDongle (see Figure 8). It's a little slab of plastic that plugs into your computer via USB. It contains the vocoder chip, and it lets you use your computer's audio system to communicate through D-STAR repeaters and reflectors directly via the Internet. I reviewed it in the February 2009 issue of *QST*.[4]

Next is the DVAP Dongle, or DV Access Point. It looks like the DVDongle, but instead of a vocoder, it has a little 2 meter transceiver with a 10 mW transmitter and an antenna. You need a computer with Internet and a D-STAR radio (usually a handheld) to use it, and like the DVDongle, it lets you connect to D-STAR repeaters and reflectors. Note that it does not convert an FM signal to D-STAR. Both devices are available from ham retailers. The websites for info are **www.dvdongle.com** and **www.dvapdongle.com**.

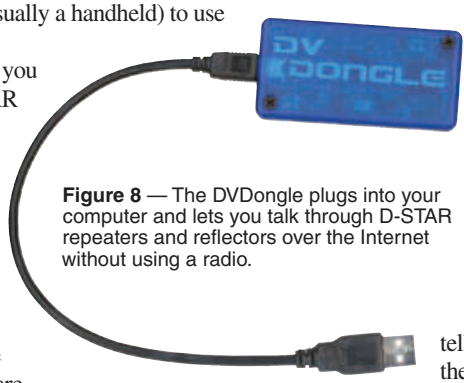

Figure 8 — The DVDongle plugs into your computer and lets you talk through D-STAR repeaters and reflectors over the Internet without using a radio.

You won't get far on 10 mW. You can create a bigger pool of coverage by connecting an analog FM radio that has a 9600 bps packet port to a device called the D-STAR HotSpot. This isn't quite the finished product that the DVAP and DVDongle are, but you can find kits or finished boards, software and firmware on the Internet (Google "D-STAR HotSpot"). Though it uses an FM radio as the RF deck, it also does not convert FM to D-STAR.

But there is a device that does make an FM radio work on D-STAR — the DV Adapter (Google "D-STAR DV Adapter"). It's an outboard box that has the buttons and display you need to program all the functionality this article describes for ICOM radios. It might be a little kludgey in a mobile, but would work well in the shack. I'm being vague on the HotSpot and DVAdapter because they're not really polished commercial products yet, and I've never used them. So you'll need to do some research.

The Dongles and HotSpot all reach across the Internet and tap into the *DPLUS* program running on Gateways and Reflectors. Radio users who do not have the gateway in RPT2 will not be able to talk to Dongle users, so that's why everyone now keeps the gateway in RPT2.

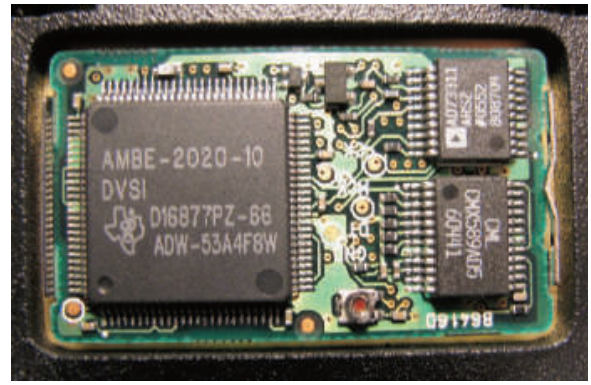

Figure 9 — The AMBE 2020 Vocoder in this IC-91AD handheld does the analog to digital encoding and decoding. It is the only proprietary component of the D-STAR system.

In Conclusion

D-STAR advantages — high signal-to-noise (and no "noise" until the signal is just about gone), narrow RF footprint, designed for networking, including call sign routing to find hams anywhere, voice+data on the same signal, features such as call sign squelch. devices like the DVDongle, DVAP and Hot Spot to extend the network beyond local repeaters.

Disadvantages — single source for radios, some complexity and learning curve, repeater availability/coverage limited (but growing), no RF networking (yet), small user base (so far), equipment cost (20 to 50% more than analog).

A few years ago, if someone asked me if they should get D-STAR equipment I'd tell them to consider it only if they were willing to risk being out there on the edge and having that edge break off from under them. That's not the case anymore. While it would be nice to have a second or third source of radios, ICOM has proven its commitment to D-STAR by developing new models and incorporating D-STAR into new radios including the adapter available for their IC-9100.

There are enough repeaters running that I don't think the mode is going away any time soon. D-STAR could use more participation just about everywhere, but the reflectors, dongles, DVAPS and such ensure you that you'll be able to play with your D-STAR equipment as much as you want, every day. D-RATS will give you something to experiment with. If you're in the market for a new radio, and a new experience, consider D-STAR.

This Just In

Yaesu's Dennis Motschenbacher, K7BV, told me at the Orlando HamCation that Yaesu will introduce their own digital voice mobiles, handhelds and repeaters at the Dayton Hamvention.® He would not reveal what digital protocol the radios would be other than *not D-STAR*. (See the interview at **www.HamRadioNow.TV**, Episode 2.)

The good news — a second line confirms digital voice's place in Amateur Radio's future. The bad news — a different protocol, whatever it might be, might dilute the pool of D-STAR users that has become strong worldwide, but remains thin locally for many repeaters. This was going to happen sooner or later. D-STAR is over 10 years old. That's an infant in the hardware-intensive world of Amateur Radio, but an antique in the fast moving world of digital communication.

Notes

[1] *The ARRL Repeater Directory,* 2011-2012 Edition. Available from your ARRL dealer or the ARRL Bookstore, ARRL in either desktop-sized edition, order no. 0861, or pocket-sized edition, order no. 1769. Telephone 860-594-0355, or toll-free in the US 888-277-5289; **www.arrl.org/shop/**; **pubsales@arrl.org**.

[2] S. Ford, WB8IMY, "Low Tones in High Places," *QST*, Jul 2007, p 52.

[3] G. Pearce, KN4AQ, "Operating D-STAR," *QST*, Sep 2007, pp 30-33.

[4] G. Pearce, KN4AQ, "Product Review — DV Dongle D-STAR Adapter," *QST*, Feb 2009, pp 47-49.

Photos by the author.

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RMS Express — Software for Automatic Digital Messaging on HF

With this software you can originate and relay digital message data on HF with just a sound card interface.

Ken Heitner, WB4AKK/AFA3PB;
Rick Muething, KN6KB

RMS (Radio Message Server) *Express* is a powerful software program written by Vic Poor, W5SMM, that sends e-mail messages over HF radio.[1]

It is a program amateurs can use to forward emergency message traffic. *RMS Express* and its *WINMOR* protocol enable you to handle digital messages automatically with RMS peer or server stations worldwide.[2,3] For emergencies, the goal is to be able to work reliably with *RMS* stations up to several hundred miles away.

You Already Have the Hardware

The program is designed to be set up on any reasonably modern personal computer running under *Windows* software, version *XP* or later. The machine should have a CPU operating at about 1 GHz or faster. Today, almost any used computer will do this. The only other key requirement is for the computer to have a serial or USB port, a sound card and a radio interface arrangement.

Why You Want It

Many amateurs ask why there is so much emphasis on automatic digital messaging systems in emergencies. The answer is simple: Automatic digital messaging systems allow volumes of emergency traffic to be handled accurately, quickly and efficiently. *RMS Express* in particular is powerful because it interfaces seamlessly with existing e-mail systems that will be in use outside of the emergency zone.

RMS Express is a new addition to the existing *Winlink 2000* (*WL2K*) messaging system already in use by radio amateurs worldwide (see **www.winlink.org**). The existing *Winlink 2000* messaging system has been using the PACTOR protocol (P1, P2 and P3) on HF. It also uses the *AX.25* packet protocol on VHF/UHF and the *Telnet* protocol to utilize Internet connections. Where applicable, it will automatically take advantage of existing Internet resources. *WL2K* is also familiar to many MARS users.

What is a Protocol?

A protocol such as *AX.25* packet, PACTOR or D-STAR defines the specific way digital information (bits or bytes) are moved over a radio circuit. Some protocols are associated with a specific hardware controller, such as a PACTOR TNC or controller. Other protocols can be implemented today completely in software. These include *AX.25* packet, *PSK 31* or *WINMOR*. (An example of *AX.25* packet implementation in software is that done by the program *MixW*.) The protocol usually has nothing to do with the actual message or data being exchanged. It is simply the mechanism use to modulate and demodulate the radio and transfer the digital information. For messaging systems, absolute accuracy requires the use of some form of automatic repeat request (ARQ). ARQ ensures that the message is received accurately and that is complete reception is acknowledged by the receiving station.

RMS Express and its WINMOR protocol enable you to handle digital messages automatically.

RMS Express adds the *WINMOR* protocol to this system. *WINMOR* is a new protocol optimized for HF message operation. However, it only requires the use of the PC sound card and USB or serial ports already found on most PCs. The *WINMOR* protocol can be implemented totally in software without the need for any other external hardware such as a terminal node controller (TNC). Since the *WINMOR* protocol is now integrated into the *Winlink 2000* messaging system users can now use the *WL2K* system on HF without the need for expensive hardware TNCs.

We've Been Here Before

Digital messaging by radio is not new. Amateur Radio operators were adapting teletype machines for amateur use when they became available as surplus after World War II. The development by amateurs of packet radio in the 1970s moved digital messaging into the computer age. More recently, amateurs began linking their computers to their radios with the advent of keyboard to keyboard modes, such as PSK 31.

In parallel, messaging systems were developed using HF packet and PACTOR protocols, as well as a number of other digital protocols. Most of these approaches depended on the use of an external TNC in order to implement the particular communications protocol. Protocols such as PACTOR 1 and later PACTOR 2 and 3 became the benchmark for modern HF digital messaging.

[1]Notes appear on page 43.

RMS Express with *WINMOR* offers the potential performance of these advanced protocols, but simplifies the hardware requirements to just the PC equipped with a sound card and serial or USB port for control of the radio.

How Does it All Work

One may well ask how *RMS Express* achieves this goal. *RMS Express* and the *WINMOR* protocol were designed from the outset to be optimized for HF messaging. The designers strove to create a protocol and software package that would achieve good performance with only the PC using standard components. These components with optimized DSP (digital signal processing) software achieve a virtual terminal node controller. That means the TNC functions are entirely implemented in software. The only hardware used was that of the normal PC.

Thus, the virtual TNC in *RMS Express* automatically performs many important functions. These include:

- Automatic repeat requests (ARQ) to ensure the data is received correctly. Only failed packets are repeated to improve traffic throughput.
- Digital modulation and demodulation is used to transmit the data over the SSB radio's audio circuits. The modulation modes of *WINMOR* are adjusted automatically to best fit the current propagation channel.
- Digital signal processing (DSP) is employed to ensure efficient demodulation of signals received over noisy and fading HF signal paths,
- Multi-layer forward error correction (FEC) maximizes the accuracy and throughput of the data transfer process, and
- Automatic radio tuning is used to correct for transceiver frequency offset and sound card time-base errors.

These features of the *RMS Express* software and *WINMOR* protocol provide superior data transfer performance over HF paths. *RMS Express* rivals the performance of more sophisticated (proprietary) Pactor controllers by utilizing the significant advances in personal computer technology to deliver very high performance at a low cost. It is available to every amateur, allowing your personal computer to effectively modulate and demodulate the radio's audio signals and control the radio to facilitate the handling of digital messages.

RMS Express is more precisely a user client (or program). *RMS Express* interfaces with the *WINMOR* virtual TNC to efficiently send and receive message traffic. *RMS Express* provides error free transmission of incoming and outgoing messages to the *Winlink 2000* messaging system. The *Winlink 2000* messaging system then acknowledges receipt of the message and proceeds to deliver it to its radio or Internet destination. Any problems with the message delivery will be reported back to the originator of the message.

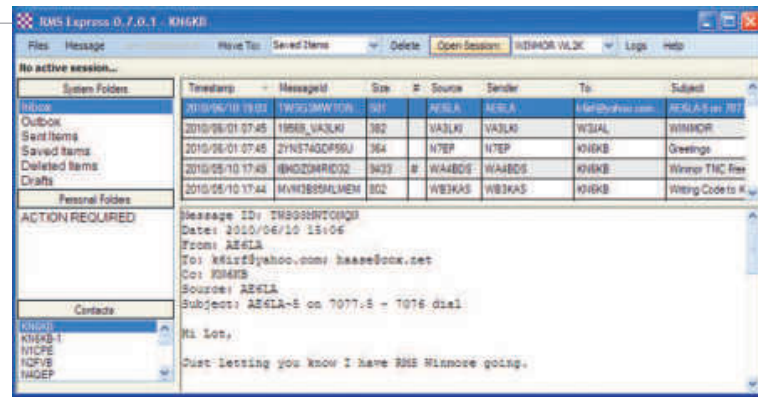


Figure 1 — The *RMS Express* OPENING screen used to create, read and manage messages.

Figure 2 — Screen shot of *RMS Express* sound card and radio SETUP screen.

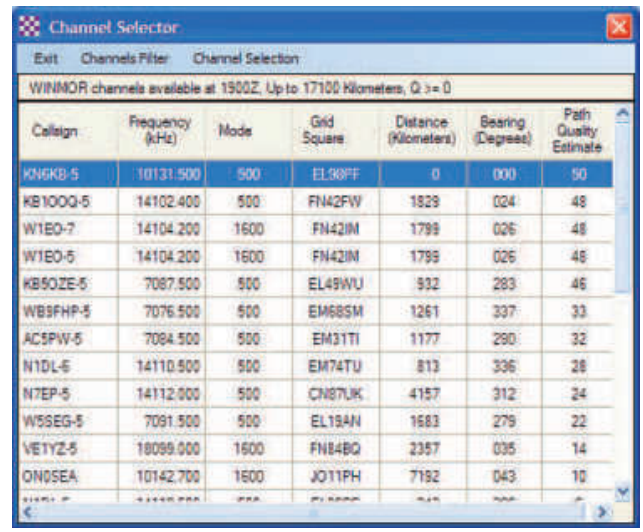


Figure 3 — *RMS Express* and *VOACAP* combine to sort stations based on predicted Path Quality.

With *RMS Express*, almost all of the critical functions needed to effectively handle digital messages over an HF link are handled by the software package. If the radio has serial control capability *RMS Express* software can even set the radio dial frequency, mode and key the transmitter. The operator needs to set the transmit power levels for the equipment using a two-tone test built into the software along with the initial operating bandwidth for incoming connect requests. Most computer sound cards will operate with this software acceptably but a good isolated interface to the radio is necessary. Certain sound cards have been demonstrated to give very good performance. More information on this can be found at **groups.yahoo.com/group/winmor**.

Give it a Spin

Actual on-the-air operation with this system is the best proof of its effectiveness. When you try this system on the air with *WINMOR RMS* stations near and far, you will see how well it works with the sound card you have in your computer. Most sound cards with sample rate errors less then 1000 ppm (12,000 and 48,000 sample rates) and good isolated and RF filtered interfaces will work well with *WINMOR*. External USB sound cards with integrated isolated interfaces (such as the SignaLink USB) are available off the shelf and offer near plug and play setup.

Setting up for *RMS Express* is relatively easy. The *RMS Express* software depends on a larger Microsoft package called *.NET Framework 3.5*. This can be downloaded from Microsoft but is now standard on most new or updated OS versions. The actual *RMS Express* software is available from

What is a Client?

The user client (or user program) is software that interfaces the protocol to what the user wants to do. In this case that is transmitting and receiving messages. In a PC a user might use a program (e-mail client) such as *Outlook Express* to interface to the *SMTP* mail protocol used by many mail servers to send and receive (standard) Internet e-mail.

In this case, the client is *RMS Express,* which actually interfaces with five protocols: PACTOR, *Packet*, *RobustPacket*, *Telnet* and *WINMOR*. Any of these protocols allows *RMS Express* to interchange messages with the *Winlink 2000* messaging system.

The *Winlink 2000* messaging system is the mechanism that receives, stores, forwards and delivers all messages. It consists of both hardware (computers, firewalls, radios, and routers) and software (backup mechanisms, databases, mail handlers and spam filters) that enable its overall operation. All the Radio Mail Servers, including *WINMOR*, PACTOR and Packet are part of the *Winlink 2000* messaging system.

www.winlink.org/clientsoftware. The software installs from a standard .ZIP file. If you are connected to the Internet, *RMS Express* will automatically download (and update) the current amateur or MARS *RMS WINMOR* station list. The compact list can also be downloaded via the radio. *RMS Express* also uses the popular *VOACAP* propagation prediction software to rank and sort the various RMS stations, so you can link with those most likely to have good HF propagation with your station.

If you are already set up to operate in sound card modes such as PSK31 or RTTY, then all you have to do is configure your software appropriately. If not, you need to install the hardware and cables to create an isolated interface between your sound card and the radio's audio channels for receive and transmit. Depending on your interface and radio you may also have to install an appropriate radio control interface to key the radio (PTT – push to talk) for transmit. More modern transceivers with computer control allow the software to set the radio to the appropriate frequency for the *WINMOR RMS* stations on the list. Then your computer and radio become a seamless communications system.

Figure 1 shows the *RMS Express* Opening Screen. This screen allows you to read, compose, post and manage messages. Figure 2 shows the menu for setting up the sound card and the control port for the radio. Selecting the best *RMS WINMOR* server to use is made easy when *RMS Express* combines with the *VOACAP* propagation predictor shown in the channel selection screen of Figure 3.

Figure 4 shows the *WINMOR* Virtual Terminal Node Controller Screen. This allows you to follow the *RMS Express* operating state, as well as the quality and frequency alignment of the received signals and becomes the "front panel" of the virtual TNC

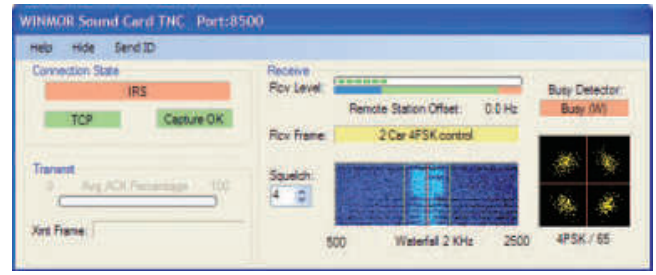


Figure 4 — *WINMOR* virtual terminal node controller screen showing connection state, receive waterfall and received constellation (phase display).

Figure 5 — *WINMOR* session screen KN6KB to VE1YZ-5

The Session Screen (Figure 5) allows the selection of operation with a *RMS WINMOR* server or peer to peer operation. It also allows for the selection of the specific *RMS* to be used for the message exchange.

When you have completed the program installation and set up, you are ready to call your first *RMS* station. Your screen will appear as in Figure 1. You click on OPEN SESSION and the SESSION screen opens as shown in Figure 5. There you select a specific *RMS* station from the listing shown in Figure 3. The SESSION screen shows you the center and dial frequency to use for that *RMS*. You just have to set the radio to the dial frequency shown (in upper side band). If your radio is being controlled by the software, this will be done for you. Make sure your antenna setup is correct. This could require the use of an antenna coupler. The other alternative is the use of a broadband antenna.

Then just click on START. The *RMS Express* virtual TNC shown in Figure 4 does the rest and keeps you informed about what is going on. There is no tuning. The *WINMOR* TNC software automatically and quickly tunes up to 200 Hz offset to accommodate dial offsets or drift. The upper left side shows the status of the TNC. The waterfall display in the center shows the audio spectrum of the received signals from the other station. The constellation display on the right side shows how well the PSK and FSK signals are being received. *WINMOR*'s layered Viterbi + Reed-Solomon FEC allow decoding with some pretty messy constellations! The constellation shown in Figure 4 is typical of a relatively good symbol clustering at an S/N of about 5 dB.

RMS Express is a complete radio messaging client. If you have outgoing traffic, you should compose or forward that traffic with the OPENING screen before your connect to the *RMS* station. Messages are created in an e-mail format, with addressees, subject lines, message bodies and attachments. If you are transferring an existing e-mail to *RMS Express*, you basically can cut and paste the parts into the appropriate boxes. Any attachment would be downloaded to your PC's desktop and then attached to the outgoing message. Message traffic should be placed in the OUTBOX for automatic transfer and forwarding to the *WINMOR RMS*.

Be reasonable. HF propagation can be marginal and very big attachments, such as digital photos often will not transfer very fast depending on the quality of the HF link to the *RMS*. You also want to have a clean radio setup and use the two-tone test feature built into the software to test your transmit setup. Keeping your average power during the two-tone test below 60% of your rated PEP will ensure you don't overdrive the transmitter and cause splatter. Once you have selected a preset channel you are ready to connect and observe the message transfer process. Try this with several *WINMOR RMS* stations that are reasonably close to

you or show a high predicted path quality. Note which connections result in message transfer taking place rapidly and without excessive retries. These are the *WINMOR RMS* stations you would nominally use in an emergency when getting the traffic through is really important. The *Winlink 2000* system ensures your messages can be sent and picked up from any *RMS* station.

RMS Express will generate a summary at the end of each session showing statistics on how well this particular link worked. This data can help you identify the *WINMOR RMS* stations that you can transfer data to with high reliability.

Store and Forward or Peer to Peer?

A special feature included in *RMS Express* is the capability to exchange messages directly with other amateurs who are also running the *RMS Express* software interfaced to their HF radio. This is called *peer-to-peer* message exchange. In this case, *RMS Express* can accept over the air connection requests from another *RMS Express* station. In the peer-to-peer mode, the station initiating the request can be considered the client and the one receiving the connection is the server. Do not confuse the direction in which the message traffic flows with these designations of client and server. No matter which station initiates the connection request, all pending traffic will flow automatically in either direction as required.

In practical terms, most amateurs will prefer to use *RMS Express* as the client to connect to *WINMOR RMS* stations that are listening 24/7/365 for their call. This is usually the most efficient way to get traffic promptly to its destination whether a radio user or an Internet recipient

Wrapping Up

In summary, your amateur station can be connected by e-mail to anywhere in the world with just a sound card and a suitable radio control interface. *RMS Express* allows two way HF messaging from anywhere suitable HF links to *RMS* stations can be established. Set up your station to operate with *RMS Express* today. Your will enjoy the experience. And you will see its great potential for automatic message handling in emergencies. You may even become interested in becoming part of the network and establishing your own *RMS WINMOR* HF gateway server.[4-7]

Notes

[1]V. Poor, W5SMM/AAA9WL, "*RMS Express* — A Multimode *Winlink 2000* User Client Program," 29th ARRL and TAPR Digital Communication Conference, 2010. Available at **www.tapr.org/pub_dcc29.html**.

[2]R. Muething, KN6KB/AAA9WK, "*WINMOR* — A Sound Card ARQ Mode for Winlink HF Digital Messaging," 27th ARRL and TAPR Digital Communication Conference, 2008. Available at **www.tapr.org/pub_dcc27.html**.

[3]R. Muething, KN6KB/AAA9WK, "*WINMOR* Phase 2: Demonstration to Deployment," 29th ARRL and TAPR Digital Communication Conference, 2010. Available at **www.tapr.org/pub_dcc29.html**.

[4]**www.winlink.org/winmor** includes specs, documents, past papers and the *WINMOR* primer.

[5]**groups.yahoo.com/group/winmor**, The Yahoo *WINMOR* group. File downloads and help.

[6]**groups.yahoo.com/group/winlink_programs_group**. The main support group for all *Winlink* programs.

[7]**groups.yahoo.com/group/MARS_Winlink**. The support group for all MARS-related *Winlink* activity.

Photos by the authors.

Advanced class licensee Ken Heitner, WB4AKK/AFA3PB, was trained as a mechanical engineer, earning a BS at Webb Institute and a PhD at Caltech. He worked his entire career in energy and environmental engineering. He was first licensed in 1966 and has been in AF MARS for about 40 years. You can reach Ken at 6116 N 36th St, Arlington, VA 22213 or at **kenheitner@hotmail.com**.

Advanced class licensee and ARRL member Rick Muething, KN6KB, is a retired entrepreneur and electrical engineer and is currently a member of the volunteer *Winlink* development team. Rick has been a ham since 1962 and currently operates some of the radio gateways into the WL2K system. The *WINMOR* effort is the result of interest and work over the past seven years in sound card modes for digital message transmission. You can reach Rick at 6143 Anchor Ln, Rockledge, FL 32955 or at **rmuething@cfl.rr.com**.

New Products

MFJ Portable Tripods with Mast Extensions

MFJ portable tripods feature black steel bases with braced equilateral triangles on each side, non-skid feet and base and mast locks. The MFJ-1919 portable tripod is rated to hold 100 pounds of antenna and extends 7.8 feet. The 1.4 inch diameter mast accepts most U-bolts. It collapses to 54 inches by 6 inches diameter and weighs 9.75 pounds. The MFJ-1919EX has the base of the MFJ-1919 plus an extra telescopic fiberglass mast with clamps that quickly lock in place. It extends to 18 feet and collapses to 5 feet. Made of ⅛ inch wall fiberglass, sections range from 1.5 inches diameter at the bottom to ¾ inch at the top. The extension mast weighs 15 pounds.

The MFJ-1918 is a lightweight portable tripod rated to support 66 pounds of antenna. It is 6 feet fully extended with a 1 inch diameter mast. It collapses to 38 inches and weighs 6.75 pounds. MFJ-1918EX has the base of the MFJ-1918 plus a 9.5 foot telescopic fiberglass mast extension with clamps that quickly lock in place. It collapses to 3.8 feet, is made of fiberglass, sections ranging from 1 inch diameter at the bottom to ¾ inch at the top, and weighs 6.5 pounds.

Price: MFJ-1919, $89.95; MFJ-1919EX, $139.95; MFJ-1918, $49.95; MFJ-1918EX, $89.95. For more information, to order, or for your nearest dealer, call 800-647-1800 or see **www.mfjenterprises.com.**

Inflatable Antenna Tower from LTA Projects

The inflatable HAM33 antenna tower from LTA Projects offers a fast and safe way to deploy antenna systems without using a traditional steel tower. The portable HAM33 tower system is said to set up in less than 10 minutes. The inflatable HAM33 Tower stakes into the ground and uses a continuous 5.5 A blower to rapidly inflate to its full height of 33 feet. The HAM33 has a 59 inch base diameter and is made of 10 oz vinyl-coated 1000d polyester available in eight colors with call sign printing available. The HAM33 is rated to lift up to a 10 pound payload at the top, with additional payload options along the sides. For more information and pricing, visit **ltaprojects.com**.

Who's on JT65?

JT65 is seeing strong growth on the HF bands. Who is doing it and why?

JT65-HF software in action. The dots and lines in the waterfall display represent JT65 signals. You can download *JT65-HF* for *Windows* at **http://jt65-hf.sourceforge.net/**, or at the ARRL *Get on the Air With HF Digital* page at **www.arrl.org/hf-digital**.

Steve Ford, WB8IMY

If you've heard those odd musical sounds at 14.076 MHz USB and similar frequencies on other bands, you're hearing one of the fastest-growing HF digital modes today: *JT65*.

JT65 was originally developed by Dr Joe Taylor, K1JT, with moonbounce in mind. However, with the debut of the *JT65-HF* program for *Windows* by Joe Large, W6CQZ, the robust mode suddenly spread to the HF bands. You can download *JT65-HF* free at Joe's Sourceforge page at **http://jt65-hf.sourceforge.net/**, or at the ARRL *Get on the Air With HF Digital* page at **www.arrl.org/hf-digital**. As with PSK31 and other popular digital modes, all you need is an SSB transceiver, a computer and a so-called "sound card interface" to tie everything together.

Unlike PSK31, however, you can't enjoy a conversation with JT65. The exchanges are almost entirely limited to call signs, signal reports and grid squares — the basics of a valid contact. Each transmission lasts slightly longer than 47 seconds and you have to take turns transmitting and receiving during even and odd minutes. On that basis, it takes about 5 minutes to complete a contact.

Sergey Kohno, UR3CTB, is a familiar presence on JT65 from Ukraine. [Photo courtesy UR3CTB]

So what's the attraction?

Weak Signals and Weak Antennas

The key to JT65's burgeoning popularity is found in the fact that you can use it to make contacts over great distances with a few watts and just about any antenna. As you might imagine, hams confined to indoor operating have embraced JT65 with a passion.

Some amateurs have done astonishing things with this mode. Take Ron Kolarik, KØIDT, as an example. With a mere 20 W applied to an Alpha Delta DX-A wire antenna at 35 feet he has achieved his ARRL Worked All States (WAS) award on 160 meters using only JT65!

"I started on 160 meters with JT65 in August of 2010," Ron said. "In fact, the JT65 contact with N6ML was my first contact ever on 160. The band isn't supposed to work at that time of the year, but a noisy band doesn't mean a dead band when you're running JT65. I had no intention of chasing anything, but I finished last season with 42 states and decided to go for it. The last one was KH6LC on January 6, 2012, so it took about 18 months to finish WAS at just a leisurely pace. KH6LC was operated by AH6RE and he gets a lot of the credit for filling the last slot for a bunch of ops.

"The biggest challenge of trying to operate 160 meters with JT65 was the lack of active states. The most difficult ones to work were Alaska, Hawaii, Utah and Maine. Most nights 1.838 MHz is jammed with JT65 signals and I know a few ops are close to WAS. It was interesting the night I worked KH6LC as KL7J was in at the same time. There were some happy WAS hunters that night! All my contacts were made between my sunset and 2 AM local time."

JT65 is picking up steam overseas with many signals out of Europe, South America, Australia and Japan in particular. Sergey Kohno, UR3CTB, in Ukraine reports having worked more than 400 individual US stations and his DXCC entity count was up to 71 when this article was written. He has done it all with just 30 W to a low wire dipole antenna.

To give you a sense of JT65 activity during an average weekend, W6CQZ's reverse beacon page at **http://jt65.w6cqz.org/receptions.php** provides this 24 hour snapshot taken on Sunday, February 20, 2012.

Unique Call Signs Heard

Band (meters)

160	*80*	*40*	*30*	*20*	*17*	*15*	*12*	*10*
31	177	358	95	808	246	530	43	369

How Low Can You Go?

I've heard from a number of amateurs who've taken a minimalist approach when it comes to RF output power and JT65. For these guys a single watt is excessive; they're working stations with *milliwatts*. One gentleman described his JT65 RF powerhouse as consisting of 500 mW to an attic dipole.

For my part, I once put two 20 meter mobile antennas back to back in a dipole configuration about 10 feet off the patio and fed the pitiful contraption with 5 W of JT65-modulated RF from a Yaesu FT-817ND transceiver. In less than an hour, with interruptions for lawn mowing and a thunderstorm, I…well…let's just let the log speak for itself.…

Date	*Time (UTC)*	*Call Sign*
July 23, 2011	2211	I5UIN
	2220	WØRSB
	2243	UR3CTB
	2301	SP6ECQ

Steve Ford, WB8IMY, is the Editor of *QST*. You can contact Steve at **sford@arrl.org**.

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

Kenwood TM-281A 2 Meter FM Transceiver

Kenwood's latest 2 meter workhorse packs a punch.

Reviewed by Gary Pearce KN4AQ
QST *Contributing Editor*
kn4aq@arrl.net

Most new hams have the same question: What radio should I buy? There's no one-size-fits-all answer, of course. But if you're on a budget and looking for a VHF FM mobile, the Kenwood TM-281A should be high on your list. It has a lot of good points and a few things to pay attention to, in case one is a deal breaker for you. As I review it, I have to set aside my bias toward dual band, dual display radios such as Kenwood's TM-V71A (I call them TWOBATTS).[1] The '281A sells for well under $200, though, and you won't find a dual bander that's close.

Here's the quick overview of the '281A:

- 65/25 W RF output. There is no 5 W level, typical of today's FM mobiles.
- 100 or 200 memory channels, depending on whether or not you want to use the six character alphanumeric labels. It's not a choice to make lightly, as I'll explain.
- Fixed control panel with a front facing speaker, so you won't be remote mounting this baby. The front facing speaker is nice for installations in which the typical top or bottom firing speaker would be hard to hear. This one's loud and clear.
- Receive coverage from 136 to 174 MHz, FM only, so you get NOAA weather, business, public safety, marine and railroad channels but not the AM aircraft band.
- You can do 1200 bps packet with connections through the mic and speaker jack, but no DATA port, so no 9600 bps packet.

Some Nice Touches

The display is easy to read. It's not huge, but it offers high contrast and it's not too cluttered. It shows up well under any light and angle except from below, where it fades out.

The VOLUME and TUNING knobs are rubberized and easy to grip. The VOLUME knob has a bit of friction, so setting it is more positive in a moving (bouncing) car.

Transmit audio got consistent praise for good fidelity, clarity and volume.

There's no fan. The bottom and back of the radio have substantial heat dissipation fins, so the radio is quiet. That's especially nice for home operation.

Using the TM-281A

I'd like to say that the radio is simple to set up and use. I'd like to, but that hasn't been possible with *any* radio since the early 1980s. All of them have basic stuff that you need to set — frequency, offset, tone encode/decode — and many more set-and-forget functions. There's no way to dedicate buttons and knobs to all that while keeping the radio small, so that means double duty for the buttons, and it means menus.

The trick is deciding how many buttons and knobs to cram onto the panel, what to make a primary function, what to recess into a secondary function (either through a FUNCTION key or a long press), and what to bury in a menu. Most hams find their radios easy to use once they get the memories, menu preferences and programmable buttons set up for their needs. It's changing features on the fly — especially ones that you haven't used in a while — that can be hard.

The '281A has five buttons — CALL, VFO, MEMORY, REVERSE and FUNCTION — and the two knobs handle VOLUME/ON-OFF and TUNING/MENU. The FUNCTION (F) button gives each of the other buttons a second job (TONE, MEM>VFO, M.IN and SQUELCH). Primary functions are labeled on the button, and the buttons are illuminated for night operation. Secondary functions are printed on the panel, and that disappears in the dark, so you'll want to memorize them for mobile use.

The MENU side of the TUNING knob traverses the usual SET menu with a few dozen more settings and functions that you dial through and adjust. The on-screen labels for a few are obvious, such as OFFSET. Others are somewhat cryptic.

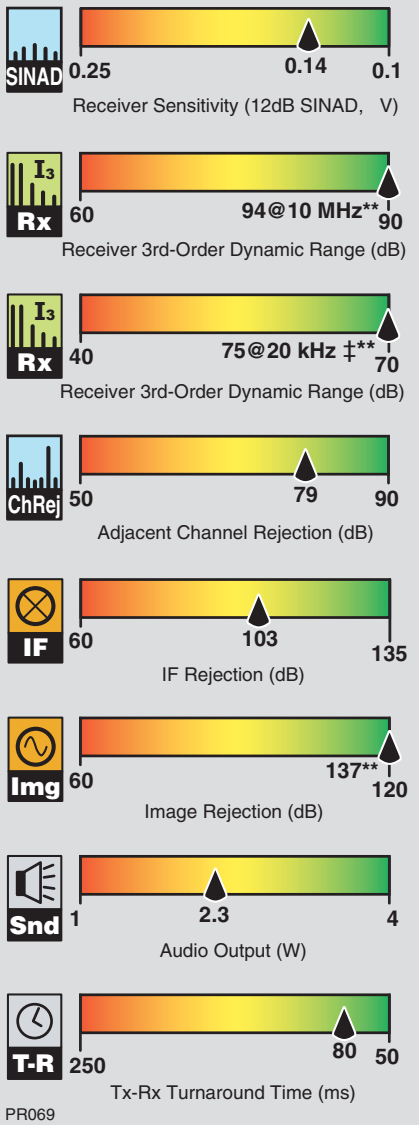
The SQUELCH setting hides as a secondary function of the REVERSE button. It doesn't have its own knob. That simplifies the front panel, but setting the squelch requires some button pushing. That kind of squelch opera-

Bottom Line

The TM-281A is a solidly built, good performing 2 meter FM mobile with a nice selection of features for the price.

[1]OBAAT: One Band At A Time. A dual-band radio that can receive and display only one frequency at a time. TWOBAAT: Two Bands At A Time. A dual (or multi-) band radio that can receive and display two frequencies at the same time. (Don't try to look up these terms — I invented them.) Most TWOBATTs will let you receive two frequencies in the *same* or in different bands. A TWOBAAT is more flexible than an OBATT, usually for just a little more money. And Kenwood makes some good ones!

Key Measurements Summary



Key:
** Off Scale
‡ Measurement noise limited at value shown.

tion has been standard on handheld radios for years because their shrunken bodies have limited real estate for controls. This isn't a problem unless you like fiddling with the squelch. It *is* an issue if you want to adjust the volume on a channel that nobody's using at the moment. I just open the squelch and use the noise as a reference. Now that takes a few button pushes, or you can assign a MONITOR function from the SET menus onto one of four programmable buttons on the mic for a single button push.

The microphone doesn't try to run the whole radio. The only controls are the PTT switch and a back-lighted 16 button pad. In transmit, that pad selects DTMF tones. In receive, you can directly enter frequencies or memory channel numbers, and the A, B, C and D keys are programmable for one button access to some of the SET menu items.

There are several scanning modes. In VFO mode you can scan between lower and upper limits. In memory mode you can scan the memories. The radio doesn't have memory banks or groups to define narrower memory scans, but it can be set to scan within a 20 channel range (0-19, 20-39, etc). So pay attention to where you program channels. The resume times are fixed. Higher tier radios let you adjust those times, and I prefer that the radio wait longer than these fixed values.

Programming Cable and Software

The radio I reviewed came with the optional KPG-46U programming cable and it works with Kenwood's *MCP-1A* programming software (a free *Windows* only download). The cable plugs into a USB port (yeah!) rather than a serial port. The cable comes with a CD with drivers. I have *Windows 7*, which usually doesn't need additional drivers, so I plugged the cable in without loading the CD. *Windows* reported that it was satisfied and assigned the cable COM port 24. The *MCP-1A* software would only let me use COM ports 1 through 20 so I used *Windows Device Manager* to set the COM port to 2. After that, everything worked.

The free *MCP-1A* software does the job, but it's basic. RT Systems (**www.rtsystemsinc.com**) sells a more sophisticated program, *KRS Programmer*, that I've used with other radios. If you have more than one radio, *KRS Programmer* will let you cut and paste blocks of data between radio models, keeping every scrap of information it possibly can.

Memories

You need to make a choice between 100 memories *with* alphanumeric labels, or 200 memories *without*. You can switch back and forth in the SET menu, but there are consequences. If you start with the alpha option and discover you need more than 100 memories, you lose the alphas forever. If you choose the 200 memory option, and then decide you can't remember what's what without alpha labels, you lose *everything* above 100. This change is so drastic that the radio asks if you're SURE? before executing the function.

If you have the optional cable, you can save your setup using the *MCP-1A* programming software before you switch modes. Note that when you use the software, you have to "read" the radio (download from it) first so that the program knows if the radio is in 100 or 200 memory mode. The software can't change that mode — you have to do it on the radio itself. If you read from a radio in 200 channel mode, the software will not have fields for alphanumeric names.

If you've chosen the 100 memory mode, you can label your memory channels with six alphanumeric characters, including letters (all upper case), numbers and a few symbols.

Programming memories manually is easy enough. Enter the frequency and other parameters while in VFO mode, then press the FUNCTION key and dial for an empty memory position (or overwrite a busy one). While some other radios let you see the contents of the memories as you dial across them before you lock the new frequency in, the '281A only shows a little caret that's filled if the memory is busy, or hollow if it's empty, so plan ahead.

The '281A does some clever things with memories. First, you can store "odd split" repeaters frequencies without changing the default offset. In some areas, there are repeaters that don't use the usual 600 kHz offset, and the '281A makes it easy to store them in memory. Second, if you have the radio in REVERSE mode (listening on the repeater input frequency, transmitting on the output) and store a memory channel, it gets stored as REVERSE. I'm not sure how I'd use that, since REV is one of those precious front panel buttons, but it's there.

Tone Operation

The TM-281A has the usual CTCSS (continuous tone coded squelch system) and DCS (digital coded squelch) features — I'm going to call it "tone" from here on. Turning tone on and off isn't hard. The secondary function of the CALL button steps you through OFF, ENCODE-ONLY, ENCODE/DECODE and DIGITAL CODE. Setting the tone frequencies is done through the SET menu. All pretty routine.

I have a pet peeve about tone operation in general. In the repeater world, tone is a necessary evil. Repeaters that require tone — about half from a rough survey of *The ARRL Repeater Directory* — are no problem for their regular users. But I like to say that tone is *traveler hostile.* Figuring out the tone of a repeater you encounter on the road is a hassle.

Repeater owners can help by making sure their repeaters *transmit* their tone, yet many don't. And here's where radio designers could help: Better firmware could make it

easier for radios to discover and implement a tone with minimal operator intervention.

The '281A tone solution is a fairly routine *tone scan* feature in the SET menu. With a few button pushes and knob twists, and a little patience while the radio does the scan, you can learn what the tone is on an active repeater — *if* the repeater is sending the tone. That's fine if you're sitting in the shack, more difficult when you're driving. I'm on a one ham crusade to improve how radios handle this.

Miscellaneous Thoughts

The HIGH/LOW power setting is a SET menu function, not a dedicated button, so it's a push-twiddle-push operation. You can dedicate one of your four programmable mic buttons to toggle it. Also, 25 W is a pretty high "low power" value. It's often overkill for talking on local repeaters from a mobile or base.

Next, I said you can directly enter frequencies (or memory channels) using the mic keys. The problem is that you have to *enable* that with the SET menu ENTER function each time you want to do it. You can use another microphone programmable key for that ENTER function, but we're using those precious keys up fast!

Weather Alert

The TM-281A includes weather channels and weather alert. One special memory channel comes set for 162.55 MHz, one of the seven NOAA weather information frequencies. You can set the radio to monitor that silently and open up if the NOAA station sends its 1050 Hz alert tone. If your area uses a different frequency, you can change the alert memory. If you are mobile and moving between NOAA coverage areas, though, you have to keep adjusting that memory or lose the alert function.

The radio will monitor the alert channel in the background while letting you listen to another frequency. You would expect to lose the alert function while you're transmitting, but you also lose it while *receiving* another signal as noted in the manual. The problem is that while the 1050 Hz alert tone lasts several seconds, ham transmissions can go minutes, long enough to miss an alert.

The TM-281A's weather alert feature uses only the generic 1050 Hz tone to recognize an alert. NOAA now uses a system called S.A.M.E. (Specific Area Message Encoder) that sends some data to define both the type of weather (tornado, hurricane, flood, watch or warning, etc) and location by county in the coverage area. The 1050 Hz tone goes off for *everything*, so the '281A may wake you up in the middle of the night for a flood warning 70 miles away.

Table 1
Kenwood TM-281A serial number B1A00518

Manufacturer's Specifications	Measured in ARRL Lab
Frequency coverage: Receive, 136-174 MHz; transmit, 144-148 MHz.	Receive, as specified; transmit, 144 to 147.995 MHz.
Modes: FM, NFM.	As specified.
Power requirements: Receive: <1 A at 2 W audio output; transmit, ≤14 A at 13.8 V dc ± 15%.	Receive, 420 mA (max vol, max lights, no signal), 203 mA (standby, no lights), transmit, 9.55 A (high), 5.67 A (low) at 13.8 V dc. Operation confirmed at 11.4 V dc (58 W output).
Receiver	**Receiver Dynamic Testing**
FM sensitivity: 12 dB SINAD, <0.18 µV (wide), <0.22 µV (narrow).	For 12 dB SINAD, 0.14 µV wide, 0.13 µV narrow at 146 MHz and 162 MHz.
FM two-tone, third-order IMD dynamic range: Not specified.	20 kHz offset: 75 dB*; 10 MHz offset: 94 dB.
FM two-tone, second-order IMD dynamic range: Not specified.	86 dB.
Adjacent-channel rejection: Not specified.	20 kHz offset: 79 dB.
Spurious response: Not specified.	IF rejection, 103 dB; image rejection, >137 dB.
Squelch sensitivity: Not specified.	At threshold, 0.18 µV min, 0.28 µV max.
Audio output: 2 W at 5% THD into 8 Ω.	2.06 W at 5% THD, 2.3 W at 10% THD into 8 Ω. THD at 1 V RMS, 1.8%.
S meter sensitivity: Not specified.	1.27 µV.
Transmitter	**Transmitter Dynamic Testing**
Power output: 65 W (high), ~25 W (low), at 13.8 V dc ± 15%.	63 W (high), 24 W (low) at 13.8 V dc.
Spurious signal and harmonic suppression: >60 dB.	>70 dB, meets FCC requirements.
Transmit-receive turnaround time (PTT release to 50% of full audio output): Not specified.	Squelch on, S9 signal, 80 ms.
Receive-transmit turnaround time ("tx delay"): Not specified.	60 ms.
Size (height, width, depth): 1.7 × 6.3 × 4.7 inches (w/o knobs); weight, 2.5 lbs.	
Price: TM-281A, $170; KPG-46U programming cable, $60.	
*Measurement was noise limited at the value indicated.	

Bang for the Buck

The Kenwood TM-281A is a lot of radio for the money. To sell at this price point, Kenwood had to make some choices. There isn't anything here you can't live with (or without) except possibly a detachable control head. Some vehicles just won't let you put the whole radio up front. It's plenty of radio for new hams or anyone looking for a good basic 2 meter FM mobile transceiver.

Manufacturer: Kenwood USA Corp, 3970 Johns Creek Ct, Suite 100, Suwanee, GA 30024; tel 310-639-4200, fax 310-537-8235; **www.kenwoodusa.com**.

Kenwood TM-281

If you own a tablet or smartphone with the appropriate application, scan this QR Code to see a video overview of the Kenwood TM-281 transceiver. You can also watch this video on your computer by going to (case sensitive):

http://youtu.be/SIEVQNFg4FU

Tokyo Hy-Power Labs HL-350VDX 2 Meter Linear Amplifier

Reviewed by Joel R. Hallas, W1ZR
QST *Technical Editor*
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Since I started using the K144XV2 meter transverter in my Elecraft K3 HF and 6 meter transceiver, I've been looking for a suitable power amplifier to up the transmit power.[2-4] That transverter came with a very low noise receive section and a transmitter output of 10 W PEP, so I could hear many stations that couldn't copy my low level signal. This would be the perfect spot for a 2 meter linear!

The first three amplifiers I looked at were compact, relatively economical "brick" units with few controls or indicators. They're frequently used as companions to FM handheld or mobile transceivers. All were sold with an indication that they could also serve as amplifiers for CW and SSB service, and they did. During testing, however, we noted that they were not quite linear. That's not a problem for FM or CW, but they produced intermodulation products that would have been deemed unacceptable for HF SSB use.

A reader was kind enough to point out that during contests or openings, when most VHF SSB activity occurs, the VHF bands can be almost as crowded as HF bands in some areas. The intermod products thus can be just as disruptive. We thought that we'd see if moving up a notch in the hierarchy of amplifiers would result in improved performance, along with additional power and other features. Enter the HL-350VDX amplifier.

Not a Piece of Masonry

Even a quick glance at the HL-350VDX will assure you that this is a different kind of amplifier than the typical brick. This amplifier just looks like a serious piece of desktop radio equipment rather than something to stick in your car trunk. It features an analog multimeter on the front, stylish pushbuttons that offer receive preamp options and other control functionality and multiple LED status indicators.

The rear panel (Figure 1) is equipped with two Type N jacks for RF INPUT and RF OUTPUT (a look at the manual, or the sticker on the amplifier bottom is needed to see which is which) and a three position DRIVE POWER selection switch (see below) also isn't labeled on the rear, so use caution with that. Two heavy screw terminals are used for power — a 300 W amplifier needs some serious current at 13.8 V — and it has a pair of mini-DIN connectors, one for an optional remote control, the other for a keying line from your transceiver, if desired. Unlike the amplifiers we've looked at before, this one won't piggyback off your transceiver's power supply at full output. It's looking for 40 A or more at full output.

Figure 1 — Rear panel of the HL-350VDX linear amplifier. The RF INPUT and RF OUTPUT connectors are both Type-N. The slide switch selects nominal 10, 25 or 50 W nominal drive levels (see text). Mini DIN connectors are for a remote control option and for TR control. Note that the identification markings are on a sticker on the bottom of the amplifier.

Bottom Line

The HL-350VDX is a very flexible and compact 2 meter medium power amplifier that can follow many types of equipment. It is easy to set up and run and operates in all modes very well. It is truly a *linear* amplifier such that it produces SSB intermodulation products that would be appropriate for an HF linear.

So How's It Work?

This is a very smooth running amplifier. It is quite flexible in that it can be driven to full output by an input of 10, 25 or 50 W through switch selection. This makes it usable with a wide range of exciters, starting with a 5 W output handheld. It's a match for most FM mobile gear, HF/VHF SSB transceivers or transverters. It's even a perfect match to my K3's 10 W PEP output on 2 meters.

Consider those as nominal input power levels for CW or FM use. For use in SSB or other linear modes, the amplifier is well into gain compression before you get there. As noted in Table 2, significantly less drive is required for 300 W PEP output, a good target for SSB operation, with the amplifier just starting to go into compression. That is the level at which we measured the IMD levels shown in Table 2.

During key down testing, the amplifier power output didn't sag over time, nor did the amplifier get noticeably warm. The temperature is controlled by an internal fan, which operates at different speeds depending on temperature rise. It is normally on at its lowest setting, not acoustically evident to me, and it increased some during heavy use but never got very intense.

The receive preamp is settable to four gain levels, including 20 dB attenuation and bypassed. As noted in Table 2, the preamp alignment of our sample appears slanted toward the FM end of the band with both the noise figure (NF) and gain somewhat better there, but it does provide reasonable performance across the range. The 0.45 dB insertion loss acts to reduce the system NF and is a contributor to the results shown. Of more importance to me, it also degrades the K3 NF by that amount even if the preamp is switched off, no doubt the result of having no fewer than four sets of relay contacts in the receive path.

[2]J. Hallas, W1ZR, "K144XV 2 Meter Transverter for the K3," Product Review, *QST*, Aug 2010, pp 47-50.
[3]J. Hallas, W1ZR, "A Pair of Mirage 2 Meter Amplifiers," Product Review, *QST*, Aug 2010, pp 52-53.
[4]J. Hallas, W1ZR, "TE Systems 1410G 2 Meter Linear Amplifier," Product Review, *QST*, Jan 2012, pp 54-55.

Table 2
Tokyo Hy-Power Labs HL-350VDX, serial number 0402322

Manufacturer's Specifications	Measured in ARRL Lab
Frequency range: 144-148 MHz.	As specified.
Power requirements: 13.8 V dc, 42 A maximum (at 250 W output).	Transmit, at 300 W output, 39 A (10 W drive setting), 38 A (25 W drive setting), 37 A (50 W drive setting); 346 mA (standby, max). Receive, preamp off, 0 mA, preamp on, 83 mA (maximum) at 13.8 V dc.
Driving power required: 10/25/50 W.	*Drive (W)** / *Power Out (W)* Set for 10 W: 0.65 to 4.2 / 94 to 300 Set for 25 W: 0.65 to 9.0 / 53 to 300 Set for 50 W: 0.65 to 36 / 8 to 300
Power output: 300 W nominal, 330 W maximum.	342 W at maximum drive level.
Spurious and harmonic suppression: Not specified.	64 dB; meets FCC requirements.
Transmit intermodulation distortion: Not specified.	3rd/5th/7th/9th order: –27/–43/–45/–53 dB.
Preamp gain: –20/+6/+15 dB	144/145/146/147/148 MHz** Set to –20 dB: –7.1/–20.3/–16.9/–13.7/–9.5 dB. Set to +6 dB: 4.0/4.6/5.5/6.2/6.7 dB. Set to +15 dB: 11.5/12.2/13.4/14.3/14.9 dB.
Receive preamp noise figure: Not specified.	144/145/146/147/148 MHz Set to +6 dB: 2.7/2.7/2.7/2.6/2.6 dB. Set to +15 dB: 2.0/1.9/2.0/1.9/2.0 dB.
Size (HWD): 4.1 × 9.6 × 14.5 inches (including protrusions); weight, 12.5 pounds.	
Price: $1230.	

*RF input sensing relay threshold is 650 mW; lower drive possible using hard key line.
**Figures include 0.45 dB of insertion loss.

Transmit Receive Switchover

The HL-350VDX can be switched to transmit either by sensing applied RF or via a hard key connection driven by the transceiver. As mentioned in the notes to Table 2, 650 mW will cause it to switch using RF, a reasonable value for all but the lowest powered transceivers or transverters. As soon as the threshold is reached, the amplifier quickly does its TR switching.

The switching time from transmit back to receive is set by a front panel MODE switch with selections for FM and SSB. In the FM position, it expects a steady carrier and switches to receive as soon as it detects that the carrier is gone. In the SSB position it provides a slight delay so that it won't switch back and forth between speech syllables. We found that the RF switching was quick enough for general SSB and CW use up to perhaps 25 WPM without noticeably shortening the first dit. Using the FM position provided just about the right delay for semi break-in CW.

Using the hardwired connection to the transceiver's amplifier keying line eliminated any delay on the switch from receive to transmit, but there is no provision to have the transmit-to-receive transition also controlled by the keying connection. The amplifier stayed in transmit as long as the keying line was closed and then reverted to receive with a TR delay based on the MODE switch position. I found that the FM position was quick enough for all but full break-in CW, which the amplifier didn't promise it could handle anyway.

Power Sources

As noted, a 300 W amplifier running on 13.8 V needs a lot of current. Those with a 50 A station supply should be good to go, running the amplifier and a low power transceiver, but not much else. We used a commercial 75 A switching supply. It powered the unit without complaint. Keep in mind that short, very heavy conductors are needed to avoid resistive drop at these current levels. The calculated voltage drop at 40 A is about 0.2 V for the supplied 2 meter length of about #6 AWG size red-black stranded wire.

There are other power options as well. For occasional use a heavy duty battery with a charger might do the trick, especially for low duty cycle modes such as SSB or CW. Another possibility, one that would allow deferring the purchase of a special supply, is to run the amplifier with the POWER LEVEL switch set to LO at first. Adjustment of the drive level can result in a 100 W output level for a peak current of around 20 A.

On the Air with the HL-350VDX

I used the amplifier for a few months, including casual CW, SSB and FM operation and a good workout during the ARRL January VHF Sweepstakes. This made for quite a difference from running the K3 barefoot, or even from using the 100 W class amplifiers. During the contest, there was never a station that I heard who didn't hear me. This makes operation so much more fun than getting hoarse trying unsuccessfully to get through.

The contest operation was flawless — no fuss, no bother. It just quietly kept doing what I asked, whether on CW or SSB. I never saw the fan light come on, although the operation was somewhat low duty cycle in nature.

Documentation

The amplifier is supplied with a competent 22 page *Instruction Manual* that tells you everything you need to know to set up and use the amplifier, including descriptions of the front and real panel controls and connections and how to use them. An extra large fold out schematic is a real plus.

A notable deficiency in my view (the only one) is that the connectors and switches are not identified on the rear panel itself. With the same Type-N connectors used for RF INPUT and RF OUTPUT, similar DIN sockets for ACCESSORY (TR keying) and REMOTE, and no indicator for the DRIVE LEVEL switch positions, it seems to me to be an invitation for an accident. Yes, there is a tag on the bottom that describes the options, but still it seems like some silk screening is in order. If it were my amplifier, I would have put on my own labels with a marking pen, but that seems inappropriate to me for an amplifier in this price class.

US Distributor: Tokyo Hy-Power Labs USA, 6046 FM 2920 Rd, Suite 133, Spring, TX 77379; tel 713-818-4544; **www.tokyohypower.com**. Available from Ham Radio Outlet.

Tokyo Hy-Power HL-350Vdx

If you own a tablet or smartphone with the appropriate application, scan this QR Code to see a video overview of the Tokyo Hy-Power HL-350Vdx amplifier. You can also watch this video on your computer by going to (case sensitive):

http://youtu.be/bkXKD_0phm4

Network Sciences/ACØC Roofing Filter for the Yaesu FT-2000

Reviewed by Joe Carcia, NJ1Q
W1AW Station Manager
nj1q@arrl.org

ARRL Test Engineer Bob Allison, WB1GCM, asked if I would be willing to install an aftermarket roofing filter in the Yaesu FT-2000 transceiver at W1AW. It's a 2.4 kHz roofing filter for the 69.45 MHz IF in the Yaesu FT-2000 or FT-950. Manufactured by Network Sciences (NS) and marketed by Jeff Blaine, ACØC, the filter is designed to improve the radio's close-in strong signal performance. In the FT-2000 Product Review, the Lab measured IMD dynamic range of 64 dB at 2 kHz spacing with the stock 3 kHz roofing filter.[5] A later FT-2000D (200 W model) reviewed in October 2007 measured 69 dB. Serious contesters and DXers listening to weak signals on bands crowded with strong nearby signals often want better performance. We've measured 80 dB or more with other radios in the FT-2000's price class, and at the high end Yaesu's FTDX5000 measured 104 dB in the Lab.

This review will describe my experiences with the filter installation and the results of Bob's testing in the Lab before and after modification. I've worked with surface mounted devices (SMD) and tight PC boards in the past and haven't had a problem tearing into a piece of equipment if necessary. Check out the installation instructions online at **www.ac0c.com**. If the modification looks useful but the installation is a bit much, ask an experienced friend for help or consider contacting one of the installers listed on the website.

Where to Begin

Read all the instructions carefully a couple of times before you break out the soldering iron. The step-by-step instructions are well-written, well illustrated and fairly concise. Because of the complexity, having a good understanding of what you may encounter in this process will go a long way in making the installation go smoothly.

As with most aftermarket modifications of this nature, the NS FT-2000 filter installation requires not just a steady hand, fine pointed tweezers and small hand tools, but also a really good eye. The PCB traces are *extremely* small and the area of the radio in which you need to work is very cramped.

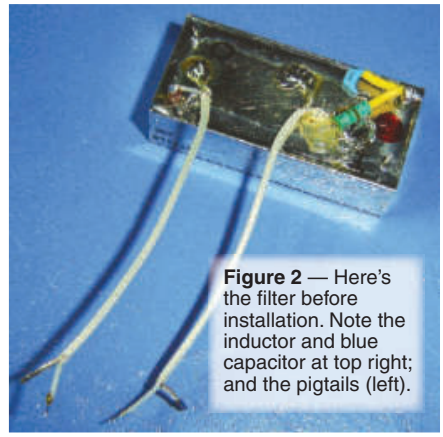


Figure 2 — Here's the filter before installation. Note the inductor and blue capacitor at top right; and the pigtails (left).

Therefore, having a good magnifying glass and a very sharp hobby knife is a must. A low-wattage soldering iron — either modified for SMD work or one designed for the task — is also required. It's also been suggested that having a good digital camera at the ready may assist in some aspects of the installation.

Installing the Filter

The installation of the NS filter requires removing a surface mounted resistor, cutting a PCB trace, soldering the filter input and output to the PCB and then tack soldering the filter case to keep it from floating around in the radio.

Before you open the radio, prepare the filter. This entails making two very short coaxial pigtails, as well as mounting components for a small LC filter input matching network. See Figure 2. The input of the filter is marked, so there's no need to guess which end is which.

While making the pigtails, take care not to damage the center conductor. The center conductor wire is extremely small and fragile. I found it easier to use the hobby knife instead of a wire stripper to remove the jacket and strip the center conductor. Fine tweezers assisted with the bending of the center conductor as well as with the installation.

While the capacitor is connected between the filter's input and ground, the inductor is "floating," in that one end is attached to the filter input and the other is used to make the connection to the radio via one of the coaxial pig tails. I used a small bit of hot glue to hold the components in place.

A word about the capacitor: Although you want to make all the component leads as short as possible, you *might* need to remove this capacitor. (More on this later.) The filter will be accessible once it's completely installed. Therefore I suggest you leave just a little extra bit of length on a capacitor lead in the event you need to clip it out of circuit. See Figure 3.

Once the filter is ready, open the radio. This requires removal of the rig's outer casing (both top and bottom halves) and the protective bottom shield. There are a number of screws removed in this process — don't lose them. Place the radio on a soft surface to protect it. I have a soft electrostatic discharge (ESD) mat that protects the radio not only externally, but also diminishes the possibility of ESD damage.

Before doing any work within the radio, I placed a sheet of paper over those sections near the area where I would be working to protect them from accidental damage or dropped solder or wire bits. Painter's tape does a good job of holding the paper without leaving behind a sticky mess.

What to Watch Out For

According to the instructions, the filter should have the coax pigtails attached *before* connection is made to the radio although that's not set in stone. I found that during installation the filter got in the way. The pigtails are rather short, so when it came to making the solder connections to the PCB, it was all I could do to keep the filter out of the way and not block the soldering iron.

Granted, others have installed the filter using the step-by-step process and didn't experi-

Bottom Line

The Network Sciences roofing filter from ACØC made a noticeable improvement in W1AW's FT-2000 transceiver's close-in strong signal handling performance. Installation requires the proper tools and a steady hand.

[5]J. Hallas, W1ZR, "Yaesu FT-2000 HF and 6 Meter Transceiver," Product Review, *QST*, Feb 2007, pp 72-78. Reviews of all the Yaesu radios mentioned here are available to ARRL members online at **www.arrl.org/product-review**.

Table 3
NS Roofing Filter Modification for the Yaesu FT-2000 from ACØC

Parameter	Measured in the ARRL Lab	
Noise floor (MDS), 500 Hz bandwidth	*6 dB attenuator/preamp off/1/2*	
Unmodified	–121/–127/–136/–141 dBm	
Modified	–121/–127/–136/–141 dBm	
Blocking gain compression:	*6 dB attenuator/preamp off/1/2*	
Unmodified, 20 kHz offset	125/126/125/122 dB	
Modified	131/133/132/129 dBm	
	5/2 kHz offset	
Unmodified, preamp off	112/94 dB	
Modified, preamp off	122/109 dB	
Reciprocal mixing dynamic range:	*20/5/2 kHz offset*	
Unmodified, 20/5/2 kHz offset	102/87/76 dB	
Modified, 20/5/2 kHz offset	102/89/77 dB	
ARRL Lab Two Tone IMD Testing	*Measured IMD DR*	*Calculated IP3*
	20/2 kHz offset	*20/2 kHz offset*
Unmodified, preamp off, 6 dB attenuator	98/70 dB	+26/–16 dBm
Modified, preamp off, 6 dB attenuator	98/83 dB	+26/+5 dBm
	20/5/2 kHz offset	*20/5/2 kHz offset*
Unmodified, preamp off	99/94/70 dB	+20/+16/–19 dBm
Modified, preamp off	99/95/80 dB	+22/+16/–7 dBm
	Preamp 1/2	*Preamp 1/2*
Unmodified, 20 kHz offset, preamp on	97/95 dB	+10/–1 dBm
Modified, 20 kHz offset, preamp on	97/96 dB	+11/+2 dBm
Price: $310 postpaid in the US; $329 uninsured and $350 insured outside the US.		

Notes: FT-2000 transceiver serial number 6K050057. Data taken at 14 MHz.
"Unmodified" measurements taken with stock 3 kHz roofing filter. The "IP3" column is the calculated third-order intercept point determined using –97 dBm reference.

ence any issues. Try a dry run. If the filter hinders your access to the PCB, I suggest removing the coax pigtails from the filter. Make the connections to the PCB first, tack-solder the filter in place as per the instructions and then solder the pigtails to the filter. Regardless of how you do it, keep in mind the mechanical stress you may place on the pigtails and their PCB connections. Make any necessary bends in the coax pigtails before you solder them to the PCB.

Okay, so you've prepared the filter and carefully followed the installation instructions and it's installed and ready to go. What's next? Power up the FT-2000 and check for smoke!

Assuming you did everything right and took your time, at a minimum you should hear audio coming out of the radio's speaker. If you do not, then it is possible that somewhere along the line the signal has gotten lost. Given the complexity of the connections, I would suggest you check the area near transformer T1040. Since this is the most critical solder joint, this is where a problem may occur.

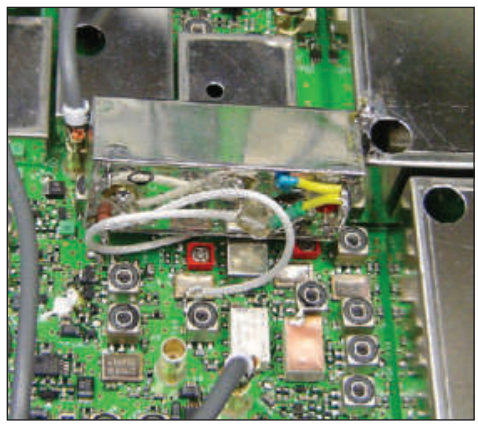


Figure 3 — Initially we installed the filter as shown here. It didn't perform as expected, and we learned that the leads were too long and the capacitor was not needed with our radio.

Filter Performance

Prior to the filter installation, Bob Allison conducted MDS, third order IMD, blocking gain compression and reciprocal mixing dynamic range tests on the FT-2000 to obtain some baseline measurements. After the filter installation, he conducted these tests again. He found the MDS on 14 MHz dropped by 2 dB. Blocking was improved and reciprocal mixing stayed about the same. The AM audio bandwidth was reduced a bit, but this was expected. However, Bob had gotten some unexpected IMD test results. The IMD dynamic range at 5 kHz spacing was actually worse than with the stock filter and there was little improvement at 2 kHz spacing. We contacted Jeff and asked for advice. We included photographs of the install.

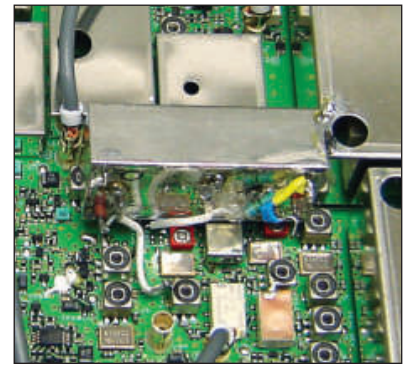


Figure 4 — In the final installation, the leads are shortened and moved apart more, and one side of the capacitor is lifted.

Jeff's first recommendation was to shorten the coax pigtails much more than they already were. The pigtails were also parallel to each other. They need to be as far away from each other as is physically possible.

The other issue was the capacitor in the LC matching network. Jeff has received reports that some hams had better receive performance by not using the capacitor. While there is not a lot of information available as to why this may be an issue, it might be due to the radio itself. It may very well be that this filter — with the capacitor — will work just fine on older FT-2000s, but not on newer ones (based on construction and release dates). This is attributed to enhancements or updates made to the newer FT-2000s that are not in the older units.

Based on Jeff's recommendations, I made the coax pigtails even smaller and snipped one lead of the capacitor (as shown in Figure 4). The test results were much better, as shown in Table 3. IMD dynamic range improved to 80 dB at 2 kHz spacing with the preamp off, and to 83 dB with the 6 dB attenuator in line. Blocking dynamic range at 2 kHz spacing went from 96 dB to 109 dB.

Final Thoughts

Clearly the Network Sciences roofing filter improves our FT-2000's strong signal handling performance. Serious contesters or DXers who own an FT-2000 may want to consider the new filter, especially if they are experiencing IMD issues on crowded bands.

Available from Jeff Blaine, ACØC, 15922 West 91st Ter, Lenexa, KS 66219; **www.ac0c.com**; **jeff@ac0c.com**.

Larry D. Wolfgang, WR1B, tc@arrl.org

Perseverance Tracks Down Some Odd Problems

PN Junction = Photodetector

Recently, I added a swing-arm incandescent light to my workbench. There is nothing like a little extra illumination to aid in tracking down circuit bugs, or so I thought.

One day I was looking at a high-voltage power supply that I had been working on earlier. The supply bucks up the voltage from a 9 V battery to about 400 V and is regulated by feedback through Zener diodes. It had been working perfectly and now it exhibited a strange "hand effect." As I moved my hand in the vicinity of the circuit, the voltage would vary between full voltage and a hundred volts or so. I had certainly seen the hand effect come into play with antenna tuners and regenerative receivers, but a power supply — what was going on here?

I thumped and tapped every component, resoldered connections and even replaced the transistor in the feedback path. No change. I decided to give up for the day when I switched off the desk light and the voltage shot back up to 400 V! Light on, light off, light on, light off… it only took a few minutes to eventually cast a shadow on the Zener diodes and isolate the problem.

The Zeners are glass encapsulated, and in this particular circuit they are only passing a microamp or less. Light hitting the reverse-biased PN junction lowered the effective series resistance (photo conduction), which increased the feedback and reduced the power supply output voltage.

When photons impinge upon the hole/electron pairs along the PN junction, it causes them to separate. The resulting ionization creates a net *current* proportional to the illumination.[1]

Figure 1 shows a simple test setup that demonstrates the effect. If you are using an auto-ranging digital multimeter (DMM), set it to a fixed range (either a high-megohm or a low voltage range with a 10 MΩ input impedance). When the Zener is *not illuminated*, the indicated resistance will be very high and the voltage will be close to zero.

Illuminating the Zener should cause the displayed resistance to drop to a megohm or less and the displayed voltage to increase to –300 mV or more. I obtained similar results for both a 1N4762 (82 V Zener) and a 1N966B (16 V Zener) that I happened to have available.

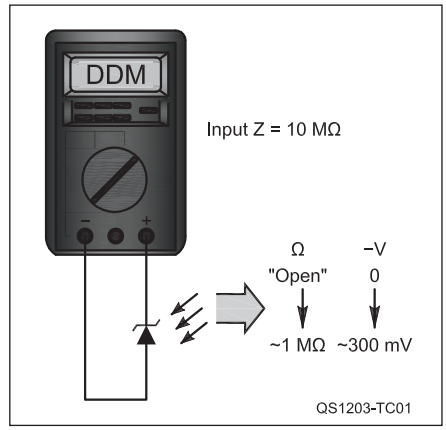


Figure 1 — Simple test setup to illustrate vulnerability of glass-encapsulated Zener diodes to ambient light. Dim light will show an open circuit and close to 0 V, while the light from a 100 W bulb several inches away can drive the indicated resistance to less than a megohm and an indicated voltage to more than –300 mV.

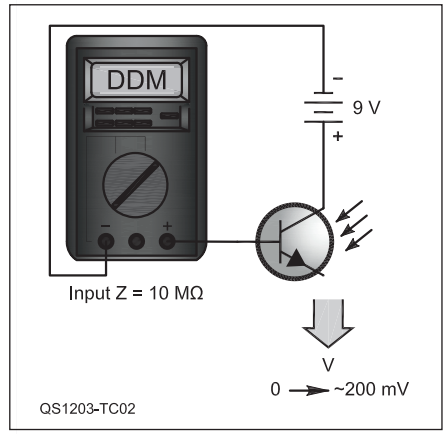


Figure 2 — A 2N2102 bipolar transistor housed in a TO-39 metal case shows sensitivity to light entering through glass seals around the base and emitter leads. In dim light the meter read near 0 V, while light from a 100 W bulb several inches away increased the reading to roughly 200 mV. Note that the input impedance of the digital multimeter will affect the magnitude of the reading.

Note that the illuminated Zener diode PN junction is a current source, not a voltage source. So, the roughly 300 mV displayed by a 10 MΩ input impedance DMM is the result of the junction generating 30 nA.

This effect is not limited to glass encapsulated diodes. Transistors housed in metal cans may have a glass seal that can admit light, possibly resulting in spurious operation. I tested a 2N2102 bipolar transistor in a TO-39 metal case with the circuit shown in Figure 2. With no light, the meter read near zero; exposing the base to a 100 W bulb several inches away caused the reading to increase to roughly 200 mV. The base of the TO-39 is all metal except where the base and collector leads exit through glass seals roughly 1/16 inch in diameter. — *73, Barry Shackleford, W6YE, ARRL Technical Advisor*, **w6ye@arrl.net**

A Ham Radio Detective Story (Finding an ODD RFI Source)

Starting around the holiday season of 2010/11 I experienced a puzzling problem at my station. I began to receive reports that there was some extraneous noise on my transmitted audio signal. Sometimes the noise would disappear when I switched from my homebrewed headset adapter (May 2009 *QST*) to the stock hand microphone for my ICOM IC-706 Mk II G.[2] Sometimes it would vanish completely for a few days, only to reappear, usually at some inopportune time like the start of a net. Since I was usually the net control station, this caused me plenty of aggravation and embarrassment.

With lots of helpful suggestions from my fellow hams, I began to try to track down the source of the noise. Initially, I did not believe it could be a problem with the headset adapter, since I had been using that design successfully for several years. I found some problems with the extra fan I had mounted on the heat sink of my IC-706, so I removed the fan and the noise disappeared. My satisfaction was short lived because a few days later, the noise came back. Someone suggested that it might be the tuner control cable or the

[1] *Reference Data for Radio Engineers*, Howard W. Sams, 6th ed, 1975, Ch 19: Semiconductors and Transistors, p 19-6.

[2] Geoff Haines, N1GY, "A Cell Phone Headset Adapter for Amateur Radio," *QST*, May 2009, p 40.

AH-4 tuner (remotely mounted on the base of my flagpole vertical antenna. I had the AH-4 checked by a professional technician (Steve Senft, KG4LJB), and it came back with a clean bill of health. I checked the control cable for shorts or broken wires, but that was fine. What now?

I sent the IC-706 out to Steve as well, and he tuned the radio up so every possible parameter was within the factory specs. The noise continued. Then I realized that I had installed a new LCD flat screen TV and the set top box almost right next to my radio stack. The TV and set top box were banished to the far side of the room. The noise then pulled a vanishing act for a few days before returning.

The only thing that kept my radio station on the air was the fact that the stock hand mic did not seem to have the problem. Being used to my featherweight cellular headset, using the hand mic for nets was a real chore. I realized that the hand mic probably had a lot more circuitry devoted to filtering than my headset adapter did, but I was still doubtful that the problem was internal to the adapter. I have been using this same adapter for several years with universal reports of great audio and clear signals.

At the end of June 2011, the "rainy season" commenced here in Florida. Rainy season is kind of unique to central Florida. Each afternoon, the sea breeze from the West coast meets the sea breeze from the East coast of the peninsula. This causes afternoon thunderstorms, which are epic. Fortunately, they tend to be brief.

At this time our house began to suffer from power outages. Each time the power went out, both the main 150 A breaker inside the power distribution panel and the 150 A breaker outside, under the electric meter would trip. Also the 50 A breaker for the air conditioning would trip. After they were reset, everything would be normal until the next outage, which might be days away or mere hours. This always seemed to coincide with rainfall. No other circuit breakers were affected. My son-in-law, who is a pretty good journeyman electrician, came over and we decided that the main breaker out on the pole under the meter might be age-weakened since it had been there since the mid 1970s. He replaced it, and I found out just how expensive big circuit breakers can be.

Being used to my featherweight cellular headset, using the hand mic for nets was a real chore.

This did not solve the problem with the outages. Since the air conditioner seemed to be affected along with the main breakers, I called the company that installed the unit and also provides routine maintenance for it. They sent a technician the next day. He was doubtful about the AC causing the outages, because the unit checked out fine, but he agreed to run some tests on the power feed to the air conditioner. What he found amazed both of us.

Between the AC unit and the breaker on the distribution panel in the house is what is called a T-handle shut-off. This is installed on all AC units, at least here in Florida, so that the serviceperson does not have to have access to the house to service the unit. He or she just pulls the T-handle and power is disconnected from the unit, making it safe to work on. Inside our T-handle box, there are also connections to a surge protector and a control box supplied by our electric utility that allows them to shut off our AC temporarily to avoid brown-outs during the summer. We get a slight discount for the flexibility this provides the utility.

The problem was that between a wire nut that had come loose and a ground wire from the 240 V cables that was too close to the neutral and/or the hot wires in the same cable where it enters the shut-off box, fate had created a crude "spark-gap transmitter." See Figure 3. When the weather turned damp, that slight arcing would turn into a full blown power short, and the breakers would trip. When the weather was less damp, the arcing simply created an RF generator that was then passed through the power distribution panel about 24 inches away from my radios.

The moral of this tale is self-evident. Do not ignore possible sources of interference just because they are not in the immediate vicinity of the radios. Before this episode, I never would have thought that an intermittent short circuit in the air conditioner power feed could cause all the problems it did. I would have expected the short to simply defy any attempt to turn the power back on. I also would not have thought to look outside of the house to solve a problem only noted on my radios for several months. These things can and do happen. Keep an open mind when trying to solve RFI problems.

With the "spark gap transmitter" permanently shut down, two problems instantly disappeared. We no longer suffer power outages that don't affect anyone else in our neighborhood and my transmitted audio is now free of extraneous noise. Plus, I am again able to use my little cell-phone headset and run my nets in total comfort. Yippee! — *73, Geoff Haines, N1GY, 904 52nd Avenue Blvd W, Bradenton, FL 34207*; **n1gy@arrl.net**

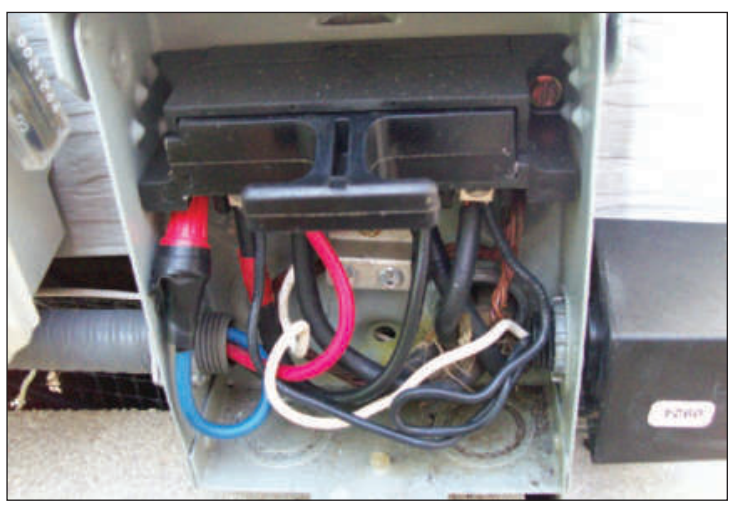


Figure 3 — Here is the T-handle shutoff that caused all the problems. The arcing was occurring between one of the large black wires (center right) and the bare ground wire just to the right of that. The wire nut had also fallen off the blue wire (center left) and it was intermittently grounding to the box. The red and blue wires are connected to the utility company's control box. The blue wire is not connected to anything since it is apparently used for a different device, which we do not have.

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

That "Single-Wire" Antenna Tuner Can Feed Other Transmission Systems, Too

Q Carl, K8CM, asks: Referring to the question about feeding an 80 meter dipole on other bands raised by WB8ZTP in the February 2012 column, I wonder if you would go a bit further. I'm curious how to interface a tuner designed to match single wire antennas to such a dipole while employing low loss window line from the tuner to the antenna. How might that configuration affect radiation patterns on 60 and 40 meters and on bands above 40 meters. Would it be reasonable to expect such a configuration to be useable on 160 meters?

A I'm aware of two ways to tie a window line feed to an inherently unbalanced tuner, such as the those designed for single wires — or designed to feed coax fed antennas, for that matter.

The first way is the "hot tuner" approach. Just connect one side of the window line to the antenna terminal, the other side to the ground connection (see Figure 1). Now you will need to deal with the balanced to unbalanced transition on the coax side of the tuner. Get a 2.5 inch ferrite core, 43 mix, and wrap as many turns of the combined coax and control cable as you can through the core. Note that the enclosure of the tuner is now "hot" with RF and needs to be insulated from ground and protected from people coming in contact with it. Even tuners with plastic cases may have some exposed screw connections to the frame, so don't assume that a plastic case solves the problem.

The other way is to use a balun or common mode choke between the window line and the tuner. Many commercial tuners use this method with an internal balun, typically a 4:1 ratio, to provide provision for both balanced and unbalanced outputs. Some offer them as accessories, so this is nothing new — you just provide your own that fits your needs.

The common mode choke could be a piece of coax wrapped around the same core as in the first method — in fact, you could try it both ways and see which works best for your transmission line length. Alternately you could use a commercial balun in this application. The trick is selecting the transformation ratio that will work best, since the impedance will vary from quite high on the higher frequency harmonics — good for a 4:1 balun, to quite low on some non-harmonic bands — suggesting a 1:1. Most people just pick one and use it for all.

Having the balun on the antenna side will allow the tuner to be at ground potential, and avoid the small imbalance in the first method due to the tuner chassis hanging on one side of the balanced line. Having the balun on the antenna side may introduce a bit more loss in the balun, since the balun will need to deal with a wider range of impedances and won't do as well at those far from its design transformation range.

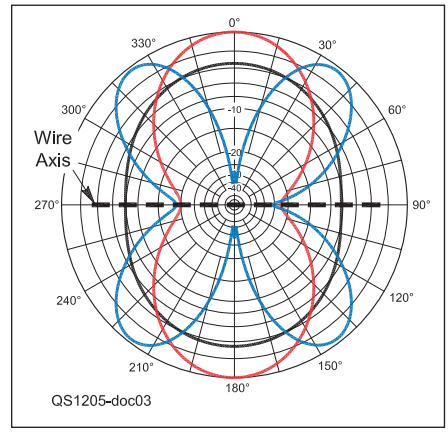


Figure 2 — *EZNEC* azimuth pattern of an 80 meter half wave center-fed dipole on 80 meters (black), 40 meters (red) and 20 meters (blue).[1] In all cases, the antenna is 70 feet above typical ground (conductivity 0.005 S/m, relative dielectric constant 13). Each pattern is at the elevation of maximum response, 45° on 80, 25° on 40 and 13° on 20 meters. On higher frequency bands, the pattern breaks into more lobes with nulls in between. On 10 meters there are eight lobes, for example.

The pattern of an 80 meter dipole on 40, becomes the "two half waves in phase" antenna pattern. This looks a lot like a half wave dipole pattern (see Figure 2), but has gain of about 2 dB and a beamwidth of about 55° on each side (at 70 feet of height). On 60 meters it is very much like a half wave dipole.

On the bands above 40 meters, the pattern breaks into multiple lobes, four on 20, eight on 10 and in between, in between. Each lobe has significant gain over a half wave dipole, but the nulls are quite deep on the resonant bands. It is good to calculate where they are so you can select bands that go in the directions that work to a particular azimuth.

160 meters is tough. It might work, but it will

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

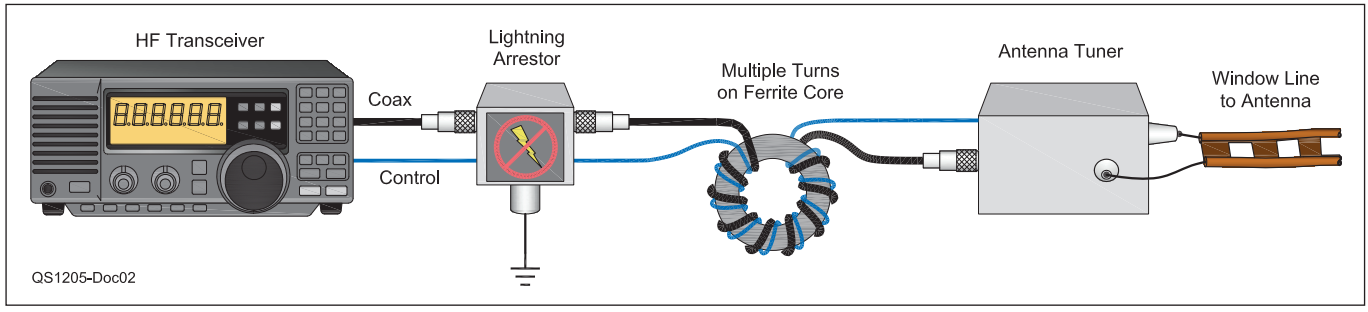


Figure 1 — Unbalanced tuner isolated from ground driving a balanced load. The common mode choke on the radio side maintains the balance on the antenna side. Note that it is necessary to provide a choke on all balun connections, as shown, in order to elevate the whole tuner above RF ground.

depend on the feeder length and the resulting transformed impedance presented to the tuner. Use caution and reduce power if you find a position that tunes. The SWR will likely be well beyond the tuner's SWR specification, which means that the current or the voltage in the tuner may be higher than its designed for. I have melted the switch contacts in my 1500 W tuner with 500 W on 160 meters doing just this!

Q Joe, N3TTE, asks: I'm interested in adding an oscilloscope output from my antenna tuner so I can monitor my signal and check modulation and other waveform parameters. Since I'm just monitoring, I only need a low level signal, so I'm planning on adding a BNC connector to the back and running a loop of wire around the SO-239 for the transceiver. Is this the best way to make an RF probe?

A That should work — except that it will be essentially capacitive coupling, so the level will be different on each band, likely requiring a change in the scope's VERTICAL GAIN with each band change. A more constant output would be provided by a current transformer, which is simple to make, if the physical configuration provides just a bit of space. This is similar to one used to measure antenna current in a recent *QST* article, except it is even simpler since you just need the transformer, not the measuring circuit.[2]

All it takes is sliding a ferrite toroid over the same wire from the input connector and then winding a few turns of wire around the core. One side of the new coil goes to ground at the coax connector and the other goes to your new BNC connector (see Figure 3). The same connection could be used for a frequency counter or spectrum analyzer if desired. Note that if you aren't using an antenna tuner, or don't want to modify yours, you could build the probe in a small box with two coaxial jacks and use it in any coax line you wish to probe.

[2]P. Danzer, N1II, "A Simple Transformer to Measure Your Antenna Current," *QST*, Sep 2009, p 35.

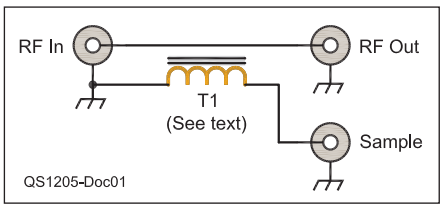


Figure 3 — Schematic diagram of an RF probe transformer that can be built into equipment or used as a stand-alone device. If built into a separate box, the box acts as the coax shield, and just the inner conductor is the transformer primary. For RG-58 cable inner conductor, an Amidon (**www.amidoncorp.com**) FT-37-61 or Palomar (**www.palomar-engineers.com**) F37-61 toroid is suggested. For RG-8/213 size coax, an Amidon FT-82-61 or Palomar F82-61 toroid should be a good fit.

Paul Danzer, N1II, the author of the referenced article found that a 37 size toroid fit around the inner conductor of RG-58 coax with enough space for 20 turns of #24 AWG enameled wire. While either the input or output of the tuner could be used, the input side is a better choice for a spot to measure since, after tuning, it will always be a 50 Ω point, so it should provide a constant level. Start with 10 turns and experiment with the number of turns to get the sensitivity you want.

Q JD, K6RDO, asks: I have a new HF transceiver and have read the user manual from cover to cover, yet cannot find any guidance regarding the correct application of the three adjustable RF strength controls, RF GAIN, a variable knob, ATT, a 20 dB RF attenuator, either ON or OFF, and IPO, the RF preamp, either ON (bypassed) or OFF (notbypassed). Is there any "best practice" or other technical procedure regarding how these three related controls should be used for best results, or is one expected to simply fiddle with them however they please?

A Let's start with the preamp. A receiver preamp amplifies signals from the antenna, which include desired signals and atmospheric noise. If the atmospheric noise is a lot stronger than the receiver's internal noise, the preamp will just increase the signal level (and the S-meter reading in many receivers), but not increase the signal to noise ratio (SNR). Not only that, it will actually decrease the dynamic range — making the receiver more likely to overload in the presence of strong signals.

Sounds like we don't really want a preamp, and that is sometimes true, especially on the lower frequency half of HF (80 through 30 meters). It is often the case, however, on 10, 12 and 15 meters, and sometimes on 20 meters — that the atmospheric noise will be lower than the receiver's internal noise. Now if we turn on the preamp we will improve the SNR and make it easier to copy weak signals. A quick on and off should determine which is better — although it is easier to confuse louder with better — adjust the VOLUME control to make both cases sound just as loud for a good test. By the way, the preamp will still degrade the dynamic range, so if it's on, beware of strong signals nearby — turning it off should let you know.

The attenuator is used to reduce the strength of very strong nearby (in frequency) signals that might be degrading performance. There is never a need to have both the preamp and attenuator on. If you have strong signal problems, first turn off the preamp, then add in the attenuator if needed. It will degrade the SNR on the higher frequency bands, but if it avoids overload problems it may still be of benefit.

Think of the RF GAIN control as making the preamp (or other early stages) adjustable in gain. Turning it down is somewhat like turning the preamp off, but in small steps. Depending on the receiver characteristics, you may find that it actually quiets the receiver faster than it reduces signals — some find a "sweet spot" at 70 or 80% of wide open — but each receiver is somewhat different in this regard.

You may find "Getting to Know Your Radio — Receiver Gain Control" helpful.[3] It is part of a series especially for those new to modern transceivers, check them all out on the ARRL website at **www.arrl.org/arrl-periodicals-archive-search**. You may also find some benefit to the successor column, "Getting on the Air."

[3]J. Hallas, W1ZR, "Getting to Know Your Radio — Receiver Gain Control," *QST*, Jun 2006, pp 59-60.

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**.

Feedback

- In "A Coaxial Vertical for 160 and 80 meter" [Mar 2012, pp 30-32] the entry for Section 4 in the caption for Figure 5 should be 3960 not 1960 kHz.
- In "Hands-On Radio" [Mar 2012, pp 59-60] Ed, N5KZW, points out that to bring your workplace up to standard practices for ESD, the best method is to use a static dissipative mat and cuff. These are widely available from distributors such as Digi-Key and Jameco. With their current-limiting series resistance, these are also safer in case of electrical fault.
- The antenna photo on page 120 of the Apr 2012 issue was taken by Tim Raven, G4ARI.
- The cover of the Apr 2012 issue should have referred to RMS *Titanic*, not HMS.
- In "Level Converter to Allow Full Control of Peripherals by Computer or Radio" [Apr 2012, pp 38-40] the ground connection on J4 should go to pin 5, not pin 4.
- In "Where is the DX Now?" [Mar 2012, p 67] the link in the gray box under *CC User* should be **www.bcdxc.org/ve7cc/ccc/cluster.htm**.

H. Ward Silver, NØAX, n0ax@arrl.org

Experiment 112

RFI Hunt

This month's story begins with a *clank* — a rather loud sound emanating from somewhere inside our gas cooking stove. I'd just put up a 105 foot dipole about 30 feet above the kitchen. Operating on 20 and 15 meters was no problem but when I dropped to 30 or 40 meters — *clank.* The oven door latch solenoid was activating whenever a dot or dash was sent, holding for a few seconds after the RF stopped and — *clank* releasing, only to — *clank* activate again on the next transmission. Ellen is tolerant but not so tolerant that I could ignore it, and so the story begins.

General Approach to RFI

Let's back up a little bit. Solving RFI problems requires a somewhat organized approach — without it you'll chase your tail forever or until you give up and go off the air entirely. We can start by dividing RFI into two categories: RFI *caused by* your ham radio equipment and RFI *to* your ham radio equipment. This was clearly in the former category.

In the cases for which your transmissions are causing RFI, there are a series of cases to evaluate. First, is the *victim* device experiencing the RFI designed to receive a radio signal as part of its normal operation — such as a TV or cordless phone? If so, the first thing you must do — even according to the FCC rules — is to determine or ensure that your station is not generating a spurious signal on the frequencies intended to be received by the victim. For example, in the case of RFI to a weather radio, your station should not be generating any signals on the frequencies of the weather alert transmissions. If it is, go no further and either fix the transmitter or add the necessary transmit filters.

Assuming that the device is a receiver of some sort and your transmissions are *clean* (free of spurious emissions), determine whether or not it is simply the strength of your signal causing the problem. For example, a commercial broadcast FM receiver's front end circuitry could be overwhelmed by a strong 2 meter FM signal from your nearby mobile rig. This is called *fundamental overload* and is a symptom of a receiver being overwhelmed by a strong signal via its normal receive path. The usual fix here is a filter in the receive signal path to the receiver (such as in the antenna feed line). Obviously, the stove was not designed to receive RF signals so it was on to the final case.

This final case is the most common form of RFI from ham transmissions now that most TV reception is not via over-the-air analog signals. In this case, the signal from your station is being picked up as *common-mode current* by external cables or wires attached to the victim device. (See Hands-On Radio experiment #91, "The Common-Mode Choke," for a discussion of common and differential mode signals.)[1] Those currents are then conducted into the device where they disturb its normal operation in some way. If you can block those signals from getting into the device — usually by using some kind of common-mode choke or shielding — you can solve the problem. That's what I expected would solve my problem with the stove.

There is one additional frequent RFI case — *direct pickup* — in which the wiring inside the device picks up the signal without any external cables or wires. This is often the case for battery powered devices and can be very difficult to solve. Guess which mine turned out to be?

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

Let's Get Cooking

The stove is made of heavy sheet metal and, as with every other appliance these days, has a microprocessor that controls its functions. The only external wiring is the ac line cord. As Figure 1 shows, the stove sits directly under the antenna. Testing showed that the RFI only occurred at power levels greater than 25 W and only on the bands at and below 10 MHz. With the antenna so close, the stove was clearly in enough V/m of field strength to cause interference.

My first — and only — candidate for picking up common-mode signals was the ac line cord to a socket directly in back of the stove. Opening up my shack notebook and starting a troubleshooting log for recording each step, I grabbed some ferrite split cores (the common variety available at RadioShack) and snapped them on the ac power line where it entered the back of the stove through a hole in the sheet metal. [While the split core type of ferrite bead is

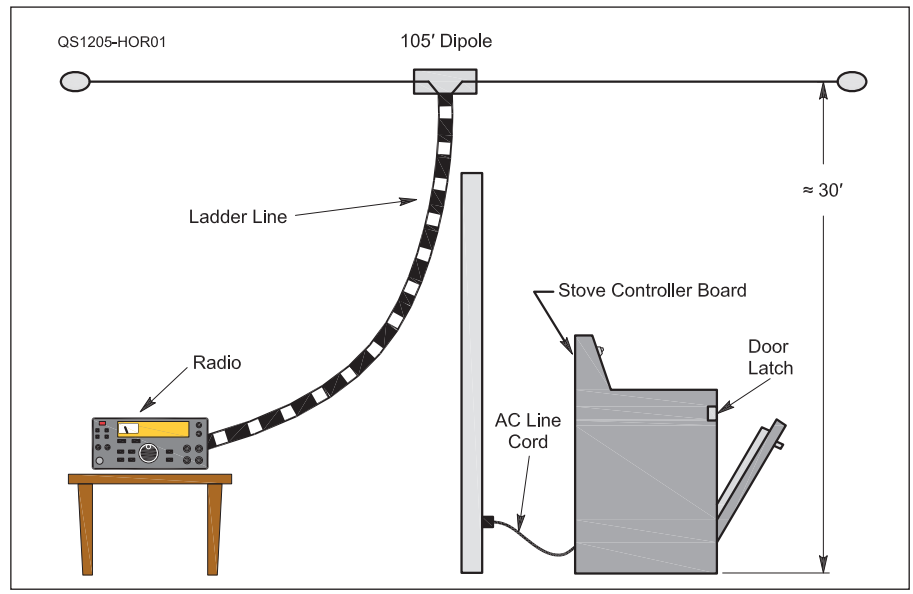


Figure 1 — The gas stove experiencing the RFI was directly underneath the HF dipole less than 30 feet above it. Even though the stove was made of sheet metal and the wiring completely enclosed, there was still enough RF picked up by the latch solenoid wiring to cause a problem.

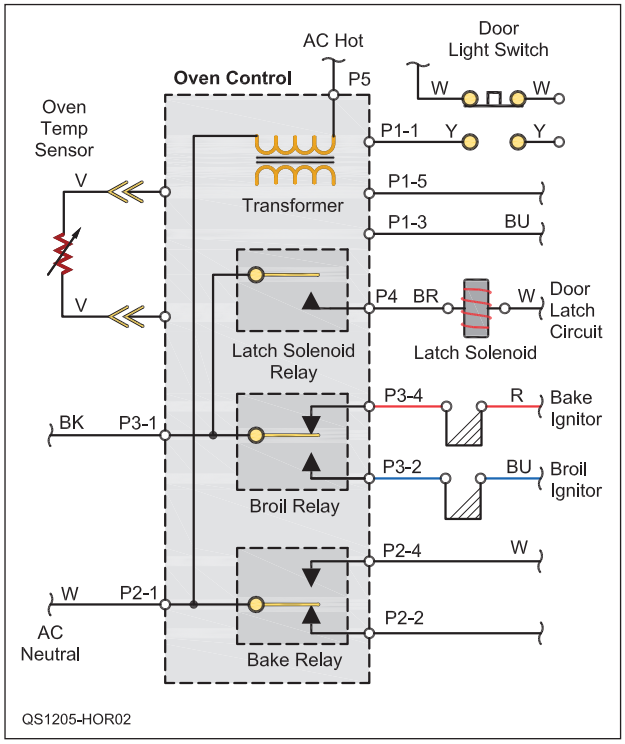


Figure 2 — This excerpt from the stove service manual shows the connection terminal numbering for each input and output to the controller board. This helps identify which terminals to bypass and what voltages may be present.

handy, it generally is more appropriate to suppression of VHF signals. HF RFI generally requires multiple turns around a toroidal core or multiple split cores of appropriate mix. — *Ed.*]

At the lowest power at which the RFI occurred, the cores had no effect on the RFI. I have since obtained cores made of #31 material, optimized for RFI suppression below 10 MHz. See K9YC's online tutorial about RFI and ferrite, the RF Interference chapter of *The ARRL Handbook* or *The ARRL RFI Book*.[2-4]

The next step was to apply sterner filtering. I purchased a Delta 10DEEG3B ac filter line with a 10 A rating,[5] attached short pigtails with a plug and receptacle (a metal junction box could also be used), and inserted the filter in the line. Again, no effect on the RFI, even with both the ferrite cores and the line filter. I was going to have to open up the patient.

Finding Resources

The owner's manual for the stove was available but it didn't provide a schematic nor was there a schematic on the inside of the stove's rear cover. By entering the stove's model number (Whirlpool SF385PEE) into an Internet search engine I was able to locate a service manual with the internal wiring diagram showing the wiring for the sensors, power and switches, summarized by Figure 2. I was getting warmer, so to speak.

Safety Check

Before we go any further, it's important to remember some basic safety guidelines. When dealing with an ac line powered appliance, any component that you attach to the ac line *must* be rated for ac line use. Capacitors should be rated for at least 600 V ac, and both capacitors and inductors should use flame retardant insulating materials. This is not the place for components intended for use in low voltage electronics. If you insert any components in series with the ac line, be sure the connections are well insulated with sleeve or heat-shrink tubing. Use cable clamps or small enclosures so that the components and connections can't touch the body of the appliance and aren't subjected to vibration. Appliances often have elevated internal temperatures (particularly stoves) so the components and materials must be adequately rated for high temperature use, as well. And never work on energized equipment.

I'm Going In!

The control board was covered by a single piece of sheet metal and mounted behind the display panel at the top of the range. Along with the hot and neutral ac line wires (safety ground was connected where the line cord entered the stove) there was a bundle of individual wires connected to the control board that carried sensor, switch and control signals. With the external ac filter and cores still on the external line cord, I added two more cores to the ac line and control bundle — no effect on the RFI. Note that I left all of the attempted fixes in place while I continued to work since the fix can be cumulative — there might not be a "magic bullet" that solves the problem by itself.

The next step was to bypass individual connections to the controller board using capacitors. I'd purchased some line rated 0.0068 µF capacitors and connected one from the hot and neutral to a nearby chassis sheet metal screw. This had the effect of raising the power level required to trigger the solenoid, so I was on the right track. I then added a bypass capacitor across each switch input or control output, one at a time. Bypassing the door latch control output eliminated the clank at all power levels and bands (I can run up to 100 W). Bypassing the other inputs or outputs had no effect.

To verify I'd really found and fixed the problem, it was important to remove the bypass capacitors to see if the problem came back. It turned out that I needed bypass capacitors both on the ac line inputs and across the door latch control output — either alone didn't solve the problem completely. (That there is more than one path for the RF to cause a problem is fairly common.) I also verified that removing the ferrite cores and the ac line filter had no effect so the external components were removed. I left the core on the ac line inside the stove for good measure as shown in Figure 3 in the *QST* Digital Edition and the QST-in-Depth website.[6] In retrospect, the door latch solenoid has the longest wiring run in the stove except for the ac line cord so it was logical to be the weak link.

All this was duly noted in my shack notebook — you *do* keep a shack notebook, don't you? I also put this information out where other Internet search engines could find it by sending an e-mail to the RFI Reflector containing the specifics of the symptom, the affected device, and the solution (available at **lists.contesting.com/_rfi/2010-12/msg00044.html**). Posting this wouldn't be a bad idea, if you are able to thoroughly solve a similar problem at your location.

Summary

The point of this RFI travelogue is not to teach you how to get rid of RFI in a specific type of gas stove. The description of the journey is its own reward in that it is an example of how to whittle the problem down one step at a time and then solve it in an orderly manner. A deliberate, documented approach may seem like plodding overkill but in my experience, this type of tortoise beats the rabbit more often than not!

[2]J. Brown, K9YC, "A Ham's Guide to RFI, Ferrites, Baluns, and Audio Interfacing," **audiosystemsgroup.com/RFI-Ham.pdf**.

[3]*The ARRL Handbook for Radio Communications,* 2012 Edition. Available from your ARRL dealer or the ARRL Bookstore, ARRL order no. 6672 (Hardcover 6634). Telephone 860-594-0355, or toll-free in the US 888-277-5289; **www.arrl.org/shop**; **pubsales@arrl.org**.

[4]*The ARRL RFI Book*. Available from your ARRL dealer or the ARRL Bookstore, ARRL order no. 6834. Telephone 860-594-0355, or toll-free in the US 888-277-5289; **www.arrl.org/shop/**; **pubsales@arrl.org**.

[5]Available from Digi-Key (**www.digikey.com**), part number 603-1135-ND.

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

Steve Ford, WB8IMY, wb8imy@arrl.org

RemoteShack RBC-212 Remote Station Controller

Hams have been experimenting with remote station control for decades. Until recent times this aspect of the hobby was only for the select few, the hams with the chops necessary to figure out how to make stations respond to commands sent over radio links or telephone lines. Not only did these intrepid amateurs have to establish reliable control of their rigs, they also had to figure out a means to get the audio back and forth.

Today the requirements are the same — rig control and audio management — but with the advent of microprocessor-based transceivers and the Internet, our options have expanded tremendously. This has been a boon to amateurs who suffer under severe antenna restrictions. Where they once were off the air completely, they can now enjoy Amateur Radio simply by using remote-controlled stations.

The most common means of remote station control is via the Internet. For example, imagine a remote station with a high-speed Internet connection and a computer connected to the transceiver. The computer may also be connected to the antenna rotator and other devices. By using the proper software, the remote user can access the computer and operate the station as though he were seated right in front of the radio.

The RemoteShack RBC-212 controlling the author's Kenwood TS-2000 transceiver.

While this approach works well, it usually requires a computer and an Internet connection at both ends of the path. Onthegodevices LLC has created a less complicated alternative.

Control by Telephone (or Radio)

The RemoteShack RBC-212 is a device that allows remote station control over telephone, radio or Internet. The ability to send DTMF tones (aka *TouchTones*) is key. As long as you have a telephone, a transceiver with a DTMF keypad, or a laptop and *Skype* or similar software with DTMF capability, you can control your radio from anywhere with RemoteShack.

At the risk of oversimplifying, RemoteShack works by listening for specific DTMF tones. It decodes the tones and then commands the remote transceiver accordingly. In addition to passing the transmit and receive audio in both directions, RemoteShack responds with a pleasant voice that confirms your commands, reads back the transceiver frequency settings, and so on.

RemoteShack will work with just about any transceiver that offers a computer connection. When you order RemoteShack, you're asked to specify the transceiver model so that they can configure the device and include the proper interconnecting cables.

Putting RemoteShack to the Test

For this review I chose to try the telephone configuration. This is the most straightforward way to use the RBC-212 for remote station control and it's the one I suspect might appeal to most readers. With this configuration you are totally computer free; you don't need a computer at the radio or the control point. You don't even need an Internet connection. Everything is handled over telephone lines with the RemoteShack box doing all the work. In addition to controlling your radio, the RBC-212 can also switch antennas and command rotators.

The RemoteShack arrived completely preconfigured for my Kenwood TS-2000 transcevier. All I had to do was attach the serial control line and the audio cable, and connect a standard telephone cable between the RBC-212 and a nearby telephone jack.

I powered up the RBC-212, switched on the radio, set the front-panel switch on the RBC-212 to ON and reached for my cell phone. The RemoteShack answered after two rings and prompted me for a passcode. After I entered the 4-digit code the RemoteShack switched on my transceiver and we were off to the races.

I began punching in commands and the RemoteShack responded instantly. The RBC-212 includes a laminated "cheat card" and it comes in very handy — at least until you have the commands committed to memory. There is a bit of a learning curve, so your first sessions with the RBC-212 demand patience. For example, despite having the card it took me a while to figure out how to enter a frequency. To get to 7250 kHz you have to press * followed by 0072500 and then * once again. It is important to point out that RemoteShack is designed strictly for voice communication. You can't operate CW or digital.

The receive audio quality was acceptable over a cellular telephone connection, but it was best with a wired line (or a wired line with a wireless handset). On the transmit side, you're working with telephone-quality audio, but according to reports I sounded fine.

Plug and Play — Literally

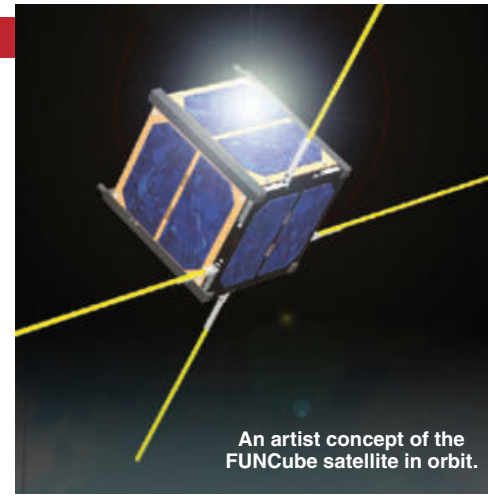
At almost $575, the RemoteShack RBC-212 is not inexpensive. However, keep in mind that not only is the device pre-configured for your radio (with a radio-specific cheat card included), it is about as close to plug-and-play remote control as you're likely to find — no computer, no Internet. There is no software to buy and no need to open ports in your network router. Set up takes all of 15 minutes in most cases.

With RemoteShack at the ready, on-the-air enjoyment is just a telephone call away. Remote station control doesn't get much easier than that.

Manufacturer: Onthegodevices LLC, 6900 NW 6th Court, Plantation, FL 33317; tel 954-261-8968; **www.remoteshack.com**. *$574.90.*

Steve Ford, WB8IMY, wb8imy@arrl.org

FUNCube to Launch this Year



An artist concept of the FUNCube satellite in orbit.

In January AMSAT-UK announced that they had reached an agreement with ISIS Launch Services in the Netherlands to provide a ride to orbit for their FUNcube-1 satellite. The tiny CubeSat is scheduled to fly aboard a Russian DNEPR rocket sometime in the third quarter of this year.

In case you've never heard of FUNCube, the satellite is the product of a team of volunteer radio amateurs and other specialists in the UK. It will transmit telemetry signals that can be easily received with minimal equipment. FUNCube's target audience is students at the high school and college level, but this bird will be of particular interest to hams as well. That's because it contains a UHF/VHF linear transponder that will be available for SSB and CW QSOs during local nighttime passes and on weekends and holidays.

More information about this exciting project will be made available over the coming months at the FUNCube website at **www.funcube.org.uk**.

The Ascent of *Windows 7*

The lines on the operating system user charts have finally crossed. As of February 2012, *Windows 7* had surpassed *Windows XP* as the most widely used computer operating system in the world, according to the metrics company StatCounter.

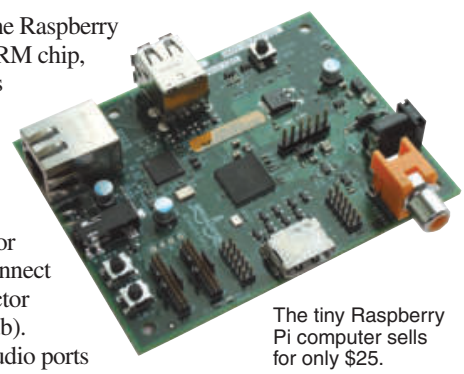
Windows 7 now accounts for 42% of global desktop and laptop operating system usage; *Windows XP* has slipped to 39%. According to Gartner Research, 60% of all computers in the world will be running *Windows 7* by July.

Other operating systems take much smaller slices of the remaining pie. To no one's surprise, *Windows Vista* usage is down to just 10% worldwide. *MacOs* is showing a small uptick in usage at 7% while *Linux* is trending flat at just 2%.

In ARRL surveys, *XP* still dominates among hams who use *Windows*, but just barely. If trends continue, most amateurs will also have gone over to *Windows 7* by late this year. Otherwise, the ham population reflects the consumer and business world with a slight increase in *MacOS* and only a very small number of shack computers using *Linux*.

A $25 *Linux* Computer?

Believe it. It may look like a credit card, but the Raspberry Pi computer is the real deal. The Pi uses an ARM chip, the kind you often find in cell phones, and it is designed to run the *Linux* operating system.



The tiny Raspberry Pi computer sells for only $25.

Raspberry Pi should be available by the time you read this column. It will be sold in two configurations: The Model A for $25, which lacks a network connector, and the Model B for $35 that offers an Ethernet socket. You can connect a mouse or keyboard through the USB connector (both simultaneously with a common USB hub). There are also composite video, HDMI and audio ports on the board as well.

Maximum memory is 256 MB, but that's plenty for dedicated applications. I'll be eager to see what amateur "softbrewers" do with this product. You can find out more at **www.raspberrypi.org**.

Super Piezo

Amateurs deal with the piezoelectric effect on an almost daily basis. It manifests as a charge that accumulates in certain solid materials in response to "mechanical stress." Crystals are among the best known examples in the ham world. Thanks to the piezoelectric effect a tiny sliver of quartz will oscillate only at a specific frequency.

Scientists at Aachen Technical University in Germany have noticed a *reverse* piezoelectric effect — defined as creating a mechanical strain by applying an electrical voltage — while conducting research on polymers.

Polymers aren't usually thought of as piezoelectric, but their research revealed up to *10 times* the measured electro-active response as compared to the strongest known piezoelectric materials.

They observed this effect when they combined polystyrene and rubber. According to their analysis, the astonishing results were caused by an intricate balance of the repulsion between the unlike polymer blocks and the elastic "restoring force" found in rubber. Some believe this discovery could revolutionize the field of electro-active devices. Examples include sensors, actuators, energy storage devices and power sources.

Their paper, titled "Piezoelectric Properties of Non-Polar Block Copolymers," was published late last year as the cover article in *Advanced Materials* magazine.

Steve Sant Andrea, AG1YK, h&k@arrl.org

Under-Table Radio, Finding Sneaky RF

Marine "Under-Table" Mount

Many Amateur Radio operators are also avid boaters. No matter if it's a rowboat or even a large yacht, the issue of bringing along or mounting an amateur transceiver usually comes up sooner or later.

In my case, I have a 21 foot pontoon boat and I was trying to decide how to mount two mobile transceivers in an out-of-the-way, yet somewhat accessible location. I was looking at the floor-mounted pedestal table and it occurred to me that it would be neat to mount the radios underneath the table surface.

Figure 1 — The under-table completed and all decked out with radios ready for a maritime adventure. Note the pass-through holes for the wiring and the Velcro tie on the pedestal below to keep the wiring neat. [Don Dorward, VA3DDN, photo]

The pedestal table in my boat is about 23 inches in diameter with four molded cup holders. This or something similar is used on powerboats and yachts in varying sizes and configurations.

At first, I thought I could just use the underside of the drink holders to mount a round piece of plywood that would, in turn, support the usual mobile radio mounting brackets. After examining the thin plastic used in the molded cup holders I changed my mind.

Figure 1 shows what is a much better idea. I have the radios mounted on an 18 inch diameter piece of marine plywood fastened to a suitable bushing, located under the regular table. This under-table table works great and can be easily rotated lazy Susan style so the radio you want to use is always handy. Four radios could easily be accommodated and there is still room beside each radio for the microphone, SWR meter, etc.

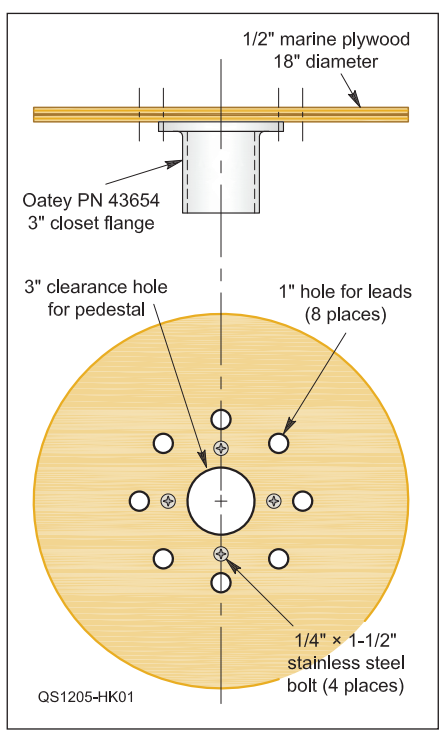


Figure 2 — This is a drawing showing the construction details of the table and flange.

The basic components are an 18 inch diameter piece cut from some exterior or marine plywood, into which is drilled a 3 inch diameter center hole to clear the pedestal and a 3 inch plastic closet flange made by Oatey (p/n 43654) that seemed made for the purpose. The lip of the flange is 3 inch OD but about 2½ inch ID. With a little shimming, it's a perfect fit for the 2¼ inch diameter pedestal. A simple screw type pipe clamp on the pedestal below the flange keeps it from slipping down and yet allows it to turn easily.

Figure 2 provides some dimensions and shows the addition of 1 inch clearance holes in the table for radio power and antenna leads. These cables are kept neat using a Velcro wrap on the pedestal. — *73, Don Dorward, VA3DDN, 1363 Brands Ct, Pickering, ON L1V 2T2, Canada*, **va3ddn@arrl.net**

Switching Supply Receiver Noise

Twice in the past 5 years, switching mode power supply noise has suddenly appeared in the receivers at N4GG. This type of noise is easy to identify once you know how it sounds — it tends to peak every 20 kHz or so and drifts in frequency. It is most noticeable on 160 and 80 meters.

Care has gone into the shack design at N4GG and one key element is to use linear power supplies wherever possible, particularly for the 13.8 V dc "house power" that runs to many accessories. Everything is properly grounded and most coax in the shack is high quality and double shielded. Where was this new noise coming from and why did it start suddenly?

I have two switching supplies in the shack — I decided they would not be worth the trouble to replace with linear supplies. One is for my Dell notebook computer. The other powers an LCD monitor. Both supplies lie on the floor together with myriad runs of coax. While I operate, my feet tend to rearrange the spacing between these items. Both of my sudden jumps in receive noise were due to one of the supplies winding up on top of a coax cable that was carrying receive signals. In both cases, the quick fix was to move the switching supply a few inches away from the coax. That's all it takes to eliminate the noise. The final fix was to hang those little switchers up off the floor.

What's happening? Electromagnetic radiation causes the switch mode noise we are most familiar with — both conducted and radiated. Within an inch or two of a switch-

ing supply, there is also a magnetic field emitted from the power transformer and the internal wiring. Coax is a good "shielded cable" for electromagnetic fields; it is not a good shielded cable for magnetic fields. The magnetic field from a switching power supply induces unequal currents in the shield and the center conductor of coax, which appears as a signal at the receiver.

This phenomenon is easy to demonstrate. Hook any receiver to a dummy load through a short run of coax and rest a small switching supply on top of the coax. Hear the noise? Notice how the noise increases when the supply's load is on and decreases or even disappears with the load off? Under load, the power supply's internal currents are higher — hence the radiated magnetic field is higher.

Also, it's not just computer products that have small switching supplies. SteppIR antennas are one of many examples of amateur-market products that come with their own switching power supplies. So keep those switchers away from your coax. *— 73, Hal Kennedy, N4GG, 5033 Winding Hills Ln, Woodstock, GA 30189-2566*, **n4gg@arrl.net**

Hold the Solder

I suffered a stroke 10 years ago, which left me with only one working hand. This presented a problem. How could I solder parts in place to a circuit board where you hold the soldering iron with one hand and the solder with the other? I thought of at least two ways.

First, get at thin nail, pin or other piece of metal with a diameter slightly larger than the leads of the resistor, capacitor or other component you intend to solder. Clamp the nail with a vise, letting about 1-1½ inches extend above the vise. Then take your solder and wrap it around the nail one or two times, leaving the end of solder as part of the coil. Remove the coil from the nail and slip it over the wire until it touches the board. At this point, you may take your wire clippers and cut the solder, so that only the solder coil is left (Figure 3) or leave the coil and let the heat from the soldering iron separate it.

Another way to manage the solder is to clamp the solder with an alligator clip attached to a small portable vise or other holder. Leave 2-6 inches of the solder free, which you can then place on the board at the point requiring the solder. I found this method good where the components had short leads.

What if there is too much solder and some needs to be removed? I have a desoldering tool consisting of a small vacuum bulb that is put over molten solder to remove it. Here, again, you need two hands: one holds the bulb while the other guides the soldering iron. I solved this problem by building a stand for the soldering iron. I cut a piece of aluminum to about 4×1 inch. The aluminum is wrapped around the handle of the soldering iron and held in place by a vise (I use an X-acto mini vise). It's then positioned so it heats the area to be desoldered while I use my hand to work the bulb. *— 73, Jim Bull, KE7OW, 26441 161st Ave SE, Covington, WA 98042*, **ke7ow@comcast.net**

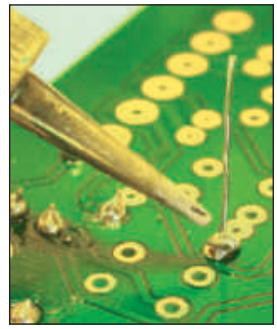


Figure 3 — By preforming the solder into a coil that can be slipped over the component lead, soldering can be a one-hand operation. [Jim Bull, KE7OW, photo]

Simple Crowbar Circuit

Does your power supply have a "crowbar"? Most low voltage (12 V) power supplies use high current pass transistors to control output voltage. The voltage sensing components feed control signals to the base of the pass transistors holding the output voltage to 13.8 V. Ahead of the pass transistors is a brute power supply of 18-24 V. If one of the pass transistors failed it will most likely short emitter to collector. This will apply 18-24 V directly to your transceiver, which could be bad news and it's back to the factory for an expensive repair.

Figure 4 is a simple and effective crowbar circuit I have used for many years. As the supply voltage rises above 14 V, the Zener diode draws current causing a voltage across R1. At 15 V the silicon control rectifier (SCR), which has a 100 A surge capacity, fires shorting the output, blowing the primary fuse and protecting your transceiver.

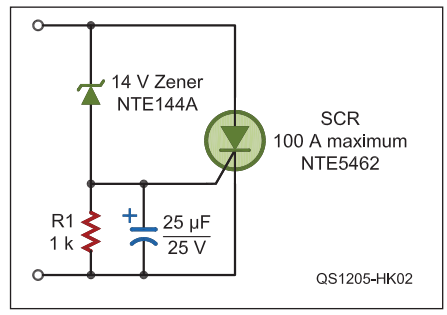


Figure 4 — This crowbar circuit is a simple and reliable method for preventing an overvoltage that could damage your equipment.

Check to make sure that flea market special power supply has a crowbar. If it doesn't, you can install one inside or outside in a minibox or a RadioShack project box. Simply connect it across the output of your power supply using a short piece of #12 AWG wire. *— 73, Roger Snowdall, WØKWJ, 8405 Everett St, Raytown, MO 64138-3132*, **w0kwj@att.net**

Portable Yagi Update

I had an idea to simplify the construction of the portable 2 meter Yagi described in my recent *QST* article.[1] While removing a roll pin from my garage door opener, I observed that a banana plug would fit into the pin as if it was a banana jack. A ¼ inch pin 1½ inches long makes a perfect jack set for my 2 meter Yagi's directors and reflector. No soldering required. Just drill a ¼ inch through-hole in the boom and tap it in. Use the zinc plated ones; they were two for 65 cents at my local home center. Figure 5 shows the two I purchased, one being boom mounted. *— 73, Richard Gillette, W9PE, 131 W Kentwick Pl, Conroe, TX 77384-5113*, **w9pe@arrl.net**

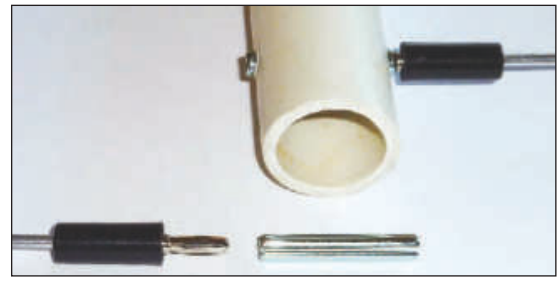


Figure 5 — A ¼ inch wide by 1½ inch long roll pin driven through the PVC boom of the portable Yagi will replace the two banana jacks used in the original design. [Richard Gillette, W9PE, photo]

[1]R. Gillette, W9PE, "A Portable 2 Meter Yagi," *QST*, Feb 2011, pp 34-36.

"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 **h&k@arrl.org**. Please include your name, call sign, complete mailing address, daytime telephone number and e-mail address on all correspondence. Whether praising or criticizing an item, please send the author(s) a copy of your comments.

WRC-12 Results in New Amateur MF Allocation

David Sumner, K1ZZ

By any measure it was a major event: a four-week conference with more than 3,000 participants from 165 countries, conducted in six languages. The mission: to reach consensus on 30 different issues related to the allocation and sharing of the radio spectrum and the efficient use of satellite orbits for telecommunications and scientific research. This was the World Radiocommunication Conference (WRC) 2012 of the International Telecommunication Union (ITU), held in a bitterly cold Geneva, Switzerland between January 23 and February 17.

The conference agenda had been set in November 2007 by the previous WRC and later confirmed by the ITU Council. Originally scheduled for 2011, WRC-12 slipped into the following year which provided a little more time for preparation. And preparation was needed: many of the agenda items dealt with introducing new uses into a radio spectrum that already was fully allocated to radiocommunication services. Incumbent services are intent on protecting their existing and future use of the spectrum from interference, new constraints, and the possible loss of allocations. The advocates of new and expanded applications are equally intent on gaining the access they need in order either to bring new benefits to humankind or to make money (and occasionally both).

The years preceding a WRC are marked by countless meetings at domestic, regional and global levels as technical analyses are conducted, reported, and debated. The process includes a two-week Conference Preparatory Meeting (CPM) at which a comprehensive CPM Report covering the technical and regulatory issues for each WRC agenda item is agreed (see May 2011 *QST*, p 73).

The years preceding a WRC are marked by countless meetings at domestic, regional and global levels.

The amateur and amateur-satellite services are a small but respected part of the ITU community. The International Amateur Radio Union (IARU) is recognized both as an international organization and as a Sector Member of the ITU Radiocommunication (ITU-R) and Development (ITU-D) Sectors. WRCs are held under the auspices of the Radiocommunication Bureau, the current Director of which is Francois Rancy of France. The IARU is able to send accredited observers to WRCs and to participate fully in the technical preparations for the conferences. In addition, the three IARU regional organizations participate in most of the six regional telecommunications organizations (RTOs) through which coordinated regional positions and proposals on WRC agenda items are developed: CEPT (Europe), CITEL (the Americas), ATU (Africa), APT (Asia-Pacific), RCC (principally countries of the former Soviet Union), and ASMG (Arab countries). The ARRL and other IARU member-societies represent the amateur and amateur-satellite services during domestic preparations in their own countries and may be included on national delegations to WRCs.

Years of planning paid dividends at World Radiocommunication Conference 2012.

This view captures just a portion of the main meeting room in the CICG. [Carter Craigie, N3AO, photo]

The official ITU press release issued at the conclusion of WRC-12 highlighted the consideration of additional allocations for mobile broadband applications and more intensive use of the geostationary satellite orbit. These issues have great commercial and societal significance so it stands to reason that they would receive the lion's share of the publicity, while other issues considered at WRC-12 were more narrowly focused. One WRC-12 agenda item was "to consider an allocation of about 15 kHz in parts of the band 415-526.5 kHz to the amateur service on a secondary basis, taking into account the need to protect existing services." This was the only agenda item that made a direct reference to the amateur or amateur-satellite services but was not the only one of interest to us; several others had the potential for negative impact. In addition, there were potential risks and rewards in the process of determining the agenda for the next WRC which is now scheduled for the latter part of 2015.

Here is a recap of how the issues of particular interest to radio amateurs were handled in the runup to WRC-12 and at the conference itself, and the ultimate outcomes.

New MF Allocation (Agenda Item 1.23)

As reported in "It Seems to Us" in April *QST*, after days of wrangling, WRC-12 eventually saw fit to modify the international Table of Frequency Allocations to provide a secondary allocation of 472-479 kHz to the amateur service. It didn't take just a few days to reach that conclusion. It took years.

At the initiation of Germany, at WRC-07 a European Common Proposal (ECP) had been offered for the next conference "to consider a secondary allocation to the amateur service in parts of the frequency band 415-526.5 kHz" which became the more wordy WRC-12 agenda item quoted earlier. Preparation of the technical basis for the allocation began in earnest in 2008 and continued through the CPM in February 2011. ITU-R Working Party (WP) 5A was the responsible group, with the task assigned to its Working Group (WG) 1 which was chaired by then-ARRL Chief Technology Officer Paul Rinaldo, W4RI, when this cycle began. On his retirement, Paul was succeeded as WG 1 Chairman by IARU volunteer Ken Pulfer, VE3PU.

IARU Region 2 President Reinaldo Leandro, YV5AM, and Joe Taylor, K1JT. [Carter Craigie, N3AO, photo]

Longtime IARU volunteer Tafa Diop, 6W1KI, and ARRL President Kay Craigie, N3KN, caught during a quiet moment. [Carter Craigie, N3AO, photo]

Numerous contributions from administrations and the IARU over a period of more than two years shaped the analysis of what would be required in order for existing services in the band to be protected from interference by amateur stations. The task was complicated when proponents of a new digital system for broadcasting safety and security related information to ships set their sights on 495-505 kHz. This band had become underutilized with the phasing out of its use as an international calling and distress frequency for radiotelegraphy and was initially thought to be the logical place for a new amateur MF allocation. With the development of this new maritime mobile application it became necessary to look somewhat lower in frequency to fulfill the amateur requirement.

ITU-R studies showed that 3 kHz of separation was sufficient to protect reception of the 490 kHz NAVTEX frequency, although some maritime interests insisted they wanted more separation than was justified by the technical analysis. A more difficult challenge was posed by aeronautical radionavigation beacons (non-directional beacons, or NDBs). One study showed that in the worst case, co-channel operation of an amateur station and an NDB required geographic separation of about 800 km. Another showed that co-channel operation was not feasible. Most NDBs operate below 435 kHz in order to minimize the effect of skywave propagation and to avoid interference to and from maritime mobile, but several administrations came to WRC-12 determined to protect aeronautical radionavigation from any possible interference by opposing any amateur allocation. These "no change" (NOC) administrations included Russia, China, the Arab States, and Iran.

Several administrations came to WRC-12 determined to protect aeronautical radionavigation from any possible interference by opposing any amateur allocation.

On the other hand, a large number of administrations came to the conference supporting some form of amateur allocation. Many African administrations and 15 members of the Asia-Pacific Telecommunity (APT) supported a secondary allocation of 472-487 kHz. Canada and some other administrations in the Americas initially had favored this method of satisfying the agenda item, but the United States was unwilling to support it so the joint Inter-American Proposal submitted to the conference and supported by 16 CITEL administrations became 461-469 and 471-478 kHz. European administrations initially had been divided on whether to support an amateur allocation but settled on 472-480 kHz as an internal compromise that ultimately was supported by 35 CEPT administrations.

With 3000 delegates assembled to consider 30 different issues it is clearly impractical to conduct the discussions in one large meeting, even one conducted by a chairman as capable as WRC-12 Chairman Tariq Al Awadhi of the United Arab Emirates. Therefore, as in the past the WRC was structured into Committees, with subordinate Working Groups (WGs), Sub Working Groups (SWGs), and in some cases Drafting Groups to consider individual items. Meetings are held in the International Conference Centre Geneva (abbreviated CICG in French) as well as in the ITU's own three buildings, immediately adjacent.

Agenda Item 1.23 was assigned to Committee 4 chaired by John Mettrop of the United Kingdom, then to Working Group (WG) 4C chaired by Lisa Amirault of Canada, and ultimately to SWG 4C3 chaired by Brennan Price, N4QX, of the United States. Brennan is the ARRL Chief Technology Officer and earned a position on the US delegation during the domestic preparations for the conference. See the Digital Edition and the QST-In-Depth website, **www.arrl.org/qst-in-depth**, for Brennan's "View from the Dais." His mission as SWG 4C3 Chairman was to guide the group to a consensus. This Brennan was almost, but not quite, able to do.

SWG 4C3 held a series of meetings but in the first few days made little progress toward bridging the gulf between the administrations supporting an allocation and those opposing one. At the end of the conference's first week a Drafting Group was established under the chairmanship of Dale Hughes, VK1DSH of the Australian delegation (and the Wireless Institute of Australia, an IARU member-society) to consolidate the pro-allocation proposals and to accommodate at least some of the concerns of the NOC administrations. The output of the Drafting Group called for a worldwide secondary allocation of 472-479 kHz to the amateur service, with footnotes providing additional protection to incumbent services and to the 490 kHz NAVTEX frequency. Discussions in the SWG led to further modification of the footnotes that brought a few of the NOC

IARU Vice President Ole Garpestad, LA2RR, is flanked by two Canadian delegates who played important roles in our success at 472 kHz: Lisa Amirault and Justine Sider of Industry Canada. [photo courtesy Ole Garpestad, LA2RR]

administrations on board, but there were still two options as reported out of SWG 4C3: an allocation in most of the world with an equivalent isotropically radiated power (EIRP) limit of 5 watts but further limited to 1 watt within 800 km of specified countries as Option 1 and NOC as Option 2. Further consideration in WG 4C did not resolve the issue although the tide clearly was running in the direction of an allocation.

On Tuesday afternoon, February 7, Committee 4 took up the report of the Chairman of WG 4C. Committee 4 Chairman Mettrop proposed that Option 1, the compromise allocation, be adopted. There was some additional sparring but the Chairman's proposal ultimately was accepted. The IARU team cheered quietly, knowing that this should have been the decisive step but also realizing that decisions are not final until the text clears a second reading in Plenary.

From Committee 4 the document passed through the Editorial Committee for review and finally was submitted for first reading in Plenary on Friday afternoon, February 10. Unfortunately, what normally would have been expected to be a pro forma process became a lengthy wordsmithing exercise. After what seemed like an eternity to the IARU team, the WRC Chairman announced that the document would be revised to incorporate the comments made and would be resubmitted for first reading the following week. This occurred the following Tuesday, February 14. When no comments were offered on this second "first reading" the Chairman immediately moved to second reading and declared it adopted. Thus the allocation became a Valentine's Day present to the Amateur Radio community.

The Final Acts of WRC-12 were formally signed on Friday, February 17 with a date of entry into force of January 1, 2013. This doesn't mean that amateurs may begin using the allocation on that date. They must adhere to the regulations of their respective telecommunications administrations, which may be more restrictive than the international allocation. In the case of the FCC, rulemaking is likely to take more than a few months. Still, securing the international allocation moves amateurs much closer to having access to this part of the radio spectrum than they have had in the century since amateur licensing first began.

HF Oceanographic Radar (Agenda Item 1.15)

A WRC-12 agenda item that gave us some cause for concern was "to consider possible allocations in the range 3-50 MHz to the radiolocation service for oceanographic radar applications…." Such radars have operated for many years on a not-to-interfere basis, but their proponents sought the greater security that comes from having allocations.

The allocation became a Valentine's Day present to the Amateur Radio community.

Fortunately, thanks to work done previously in WP 5A it was possible to demonstrate that HF radars are not compatible with the amateur service. The CPM Report on this agenda item included the finding that "Sharing with amateur, broadcasting, and radio astronomy services seems to be difficult due to their protection requirements." As a result there were no WRC proposals to introduce the radiolocation service into amateur bands; the proposals were limited to bands allocated to the fixed and mobile services. It is easy to imagine what the CPM Report might have said, or not said, on this issue had the protection requirements for the amateur service not already been established in ITU-R documentation. Credit for laying this groundwork belongs to the IARU and its member-societies, including but not limited to the ARRL.

At the WRC, reaching consensus on allocations for oceanographic radars and the conditions for their operation proved to be quite difficult. Andrew Clegg of the United States chaired the SWG responsible for this agenda item. Andy happens to be W4JE and his amateur experience certainly helped him to understand the issues. One of these, how to identify the source of interference from HF oceanographic radars, was addressed with a requirement "that each oceanographic radar station shall transmit a station identification (call sign) on the assigned frequency, in international Morse code at manual speed, at the end of each data acquisition cycle, but at an interval of no more than 20 minutes."

Ultimately the SWG was able to reach agreement on the introduction of radiolocation into several bands between 4438 kHz and 44 MHz, none of them in or adjacent to amateur allocations. Proposals for radiolocation in the band 5250-5450 kHz were pared down to 5250-5275 kHz.

WRC-15 to Consider 5 MHz Amateur Allocation

Among the proposals submitted to WRC-12 by Cuba was for the next WRC to "consider the possibility of making an allocation of up to 50 kHz to the amateur service on a secondary basis in the band 5250-5450 kHz." An allocation within this band has been on the list of IARU spectrum requirements for many years and some countries, including the United States, have made limited domestic allocations in order to give amateurs the opportunity to bridge the propagation gap between the internationally allocated bands at 3.5 and 7 MHz. Needless to say, the Cuban proposal was of considerable interest to us. The proposal included a draft resolution that effectively argued the case for an allocation, citing amateurs' capabilities in disaster situations and the difficulty of maintaining communications using typical amateur antennas and power levels when the maximum usable frequency (MUF) falls below 7 MHz.

Proposals for future agenda items for the next

two WRCs, tentatively scheduled for 2015 and 2018, were assigned to Committee 6 and Working Group 6C, the latter chaired by Taghi Shafiee of Iran. From the Working Group's published agenda it was not easy to determine exactly when proposals would be brought up for consideration, and when the time came for Cuba to present its proposal no one from its small delegation was in the room. The IARU team immediately contacted the Cuban delegation and a later introduction of the document was arranged. After Cuba's presentation the Dominican Republic, Venezuela, New Zealand and the ATU all spoke in favor. The United States took the floor to say it was not opposed but that it would like to discuss the amount of spectrum to be considered. Chairman Shafiee asked Cuba and the United States to work out mutually agreeable text, which was done offline over the next several days.

The WRC-15 agenda was not settled until the final week of the conference. Ultimately Committee 6 agreed to an agenda item for WRC-15 "to consider … the possibility of making an allocation of an appropriate amount of spectrum, not necessarily contiguous, to the amateur service on a secondary basis within the band 5250-5450 kHz" based on a study of amateur spectrum requirements and "sharing studies on the impact to other services currently allocated in the band … and in the adjacent bands." This was part of a package of agenda items agreed by the RTOs; in addition to the administrations previously mentioned, the support of CEPT was important for its inclusion.

Nano- and Picosatellites

If you follow developments in the amateur-satellite service you know that many small satellites are being built — often by or on behalf of universities — that use frequencies in the amateur-satellite bands but do not conform strictly to the definition of the service. A contributing factor to this situation is that the ITU Radio Regulations do not contain specific provisions or allocations for such satellites, which are sometimes classified by their mass: nanosatellites if between 1 and 10 kg, picosatellites if less than 1 kg.

A late proposal — submitted a full week after the WRC began — was submitted by the Netherlands and a dozen other European countries for a WRC-15 agenda item to consider allocations "on a primary, worldwide basis … preferably within the range 137-2450 MHz" and "to identify the regulatory requirements to enable the successful operation and deployment of nano- and picosatellites." Other delegations had difficulty coming to grips with the idea of making allocations on the basis of satellites' size rather than to a defined service. Another problem for the proposal's backers was that it was difficult to picture where spectrum for new primary, worldwide satellite allocations could be found in this frequency range, particularly in view of the emphasis currently being placed on mobile broadband. They had to settle for an item on the preliminary agenda for 2018 to consider whether, for these smaller satellites, regulatory procedures for notifying satellite networks can be simplified.

WRC-12 is Over — On to WRC-15

As mentioned earlier, mobile broadband cast a large shadow over WRC-12. The hunt for additional allocations to satisfy the thirst for mobile connectivity is already intense and will become even more so in the coming months as preparations go forward for the related WRC-15 agenda item. One of the most contentious issues at WRC-12 was how this preparatory work would be organized, and it was not settled until the week after the conference when the first Conference Preparatory Meeting for WRC-15 agreed on the creation of a Joint Task Group (JTG) encompassing all four of the ITU-R Study Groups with interests in the spectrum under consideration. The membership of JTG 4-5-6-7 is potentially so large that the ITU does not have sufficient meeting space to accommodate it.

For WRC-15 the mobile broadband agenda item is designated 1.1 while the 5 MHz amateur item is 1.4. Other agenda items that the IARU will be following closely and with appropriate participation include:

- Possible additional fixed-satellite allocations in Region 1 in the range between 10 and 17 GHz (Agenda Item 1.6.1)
- Possible additional mobile-satellite allocations in the range between 22 and 26 GHz (Agenda Item 1.10)
- Possible extension of the Earth exploration-satellite allocation of 9300-9900 MHz by up to 600 MHz within the bands 8700-9300 MHz and/or 9900 MHz-10.5 GHz (Agenda Item 1.12)
- A possible primary allocation to the radiolocation service for automotive applications at 77.5-78.0 GHz (Agenda Item 1.18)

Key Players

No report on WRC-12 from the amateur perspective would be complete without

K1JT Visits ITU; 4U1ITU 50th Anniversary

ITU Secretary-General Dr Hamadoun Touré, HB9EHT, invited Nobel Laureate Professor Joseph H. Taylor, K1JT, to come to Geneva and deliver a brief address to the WRC-12 Plenary. Dr Touré's introduction of Joe to more than 1,000 assembled delegates on Friday afternoon, February 3 credited Amateur Radio as the origin of his career as a radio astronomer, including sharing the 1993 Nobel Prize in Physics. After the address Dr Touré presented the ITU Gold Medal to Joe in recognition of his outstanding contribution to research in the field of radio communication.

Later that evening K1JT delivered the keynote speech at the celebration of the 50th anniversary of the founding of the International Amateur Radio Club (IARC), 4U1ITU. The ceremony was held in the recently and beautifully renovated Popov Room, the main meeting room in the ITU Tower. It included a copiously illustrated history of the club presented by IARC President Attila Matas, OM1AM/HB9IAJ, and awards given to individuals and organizations who had contributed significantly to IARC and 4U1ITU activities.

Among more than 100 attendees were present and past ITU officials including former Secretary-General Richard Butler, former Deputy Secretary-General Jean Jipguep, and former Radiocommunication Bureau Directors Robert Jones, VE7RWJ, and Valery Timofeev. ARRL President Kay Craigie, N3KN, and husband Carter, N3AO, came to pay tribute to the good work of the IARC members over the years.

It was a memorable day — but if you ask Joe, K1JT, he probably will tell you that the highlight of the trip occurred the following evening when he operated 4U1ITU and made its first EME QSOs on 1296 MHz!

At the February 3 WRC-12 Plenary, Dr Hamadoun Touré, Secretary-General, International Telecommunication Union (ITU) awards Professor Joe Taylor, K1JT, a certificate and a medal. [ITU/P. M. Virot photo; used with permission]

The antennas of International Amateur Radio Club station 4U1ITU are located on the roof of one of the ITU's three buildings. The special call sign 4U1WRC was used during the conference, reverting to 4U1ITU for the ARRL CW DX Contest the following weekend. [Ole Garpestad, LA2RR, photo]

mentioning the people who contributed to our success. Heading the IARU team were the three international officers: President Tim Ellam, VE6SH, Vice President Ole Garpestad, LA2RR, and Secretary Rod Stafford, W6ROD. Tim and Rod were present only during the first half of the conference, but they continued to monitor subsequent developments closely and offered advice and counsel whenever required. The key strategist for Agenda Item 1.23 was Ken Pulfer, VE3PU, who had shepherded the issue as Chairman of WP 5A WG1 and secured essential support from Canada. Ken deserves special mention for another reason: he has announced his retirement from active representation of the IARU, ending a volunteer role in which he served with distinction for 14 years.

IARU Region 2 President Reinaldo Leandro, YV5AM, was present for the first half of the WRC and played an essential role in securing support for the Cuban proposal. IARU Region 1 President Hans Blondeel Timmerman, PB2T, came for the second half and helped on the nano- and picosatellite issue among others.

All of the aforementioned members of the IARU team are volunteers, contributing their time and talent so radio amateurs throughout the world can continue to enjoy access to the radio spectrum. Assisting them as "utility infielder" throughout the conference was ARRL Chief Executive Officer David Sumner, K1ZZ.

Wearing other hats but equally important to the positive outcome were other amateurs who earned positions on national delegations or representing RTOs specifically for Amateur Radio. In addition to Brennan Price, N4QX, and Dale Hughes, VK1DSH, as previously mentioned, they included ARRL Technical Relations Specialist Jonathan Siverling, WB3ERA, who as a US delegate served as CITEL Coordinator on Agenda Item 1.23; IARU Region 1 Executive Committee member Colin Thomas, G3PSM, who served as CEPT Coordinator on this agenda item as a member of the United Kingdom delegation; IARU Region 3 Secretary Ken Yamamoto, JA1CJP, on the delegation of Japan for the Japan Amateur Radio League; Bryan Rawlings, VE3QN, on the Canadian delegation for the Radio Amateurs of Canada; Don Wallace, ZL2TLL, on the New Zealand delegation for the New Zealand Association of Radio Transmitters; IARU Region 1 HF Committee Chairman Ulrich Mueller, DK4VW, on the German delegation; and past IARU Region 1 Vice President Moustapha Diop, 6W1KI, representing the African Telecommunications Union. Except for the ARRL and JARL personnel they were also all volunteers. Others did not make it to Geneva for WRC-12 but contributed significantly during the preparatory process.

Amateur Radio's standing at the ITU as a respected radio service was not achieved overnight or through the efforts of this group alone. It was achieved over a period of decades through the shared passion and sense of purpose of an extraordinary band of people, nearly all of them volunteers, from many countries and diverse backgrounds. Many are now Silent Keys; others have retired from active involvement after decades of devoted service. They have worked through the IARU to present a highly professional visage and to ensure that the representation of the amateur and amateur-satellite services at the national, regional and international levels is of a quality that is equal to that of any other radio service, and second to none.

If you are an ARRL member or a member of any other IARU member-society, you are entitled to share our pride in what was accomplished at WRC-12.

David Sumner, K1ZZ, is ARRL Chief Executive Officer. He can be reached at **dsumner@arrl.org**.

The FCC's Laura Smith addressed the ARRL National Convention in Plano, Texas in 2011. She has praised the ARRL Official Observer program on several occasions. [Bob Inderbitzen, NQ1R, photo]

Observation Post: OOs and the Amateur Auxiliary

Next time you come across an ARRL Official Observer, take a minute to thank him or her.

Rick Palm, K1CE

Often misunderstood and occasionally maligned, the venerable ARRL Official Observer program has withstood the test of time in realizing its mission of friendly help and support of radio amateurs on the air. Often misinterpreted as Amateur Radio's "police force," it is rather a program of volunteers who give up their own operating time to help others identify issues with their signals and operating habits in a spirit of fraternity.

Its goals are straightforward: (1) to foster good stewardship of our valuable frequency spectrum in the eyes of the public, (2) to help amateurs avoid FCC scrutiny and interventions and (3) to make Amateur Radio more fun for all. It's a friendly, good neighborly, helping program. It is not a "big brother" of zealous super sleuths aching for an unsuspecting operator to pounce on, humiliate or turn over to the FCC. Nor is it composed of a bunch of vigilantes.

Fast Facts

The country's roster of Official Observers (OO) stands at 701 as this is written, according to Chuck Skolaut, KØBOG, the program's coordinator at ARRL Headquarters. "We added a total of 50 new appointees in 2011," he said. Among the most active ARRL sections participating and sending in monthly reports are Western Washington, Eastern Washington, South Texas, Georgia, Oregon, Western New York, Ohio, Idaho, Michigan, Western Pennsylvania, and Orange. Active OOs in all sections also send in monthly reports that make the program successful.

The OO mails the OO Advisory Notice to inform amateurs of operating discrepancies in a friendly, non-threatening manner. Advisories are sent for lack of proper station ID, operating outside of band privileges (Technicians in the General sub-band, for example), poor language, careless interference and operating too close to band edges. The OO also issues Good Operator cards when an OO observes on-air conduct above and beyond the usual good operating standards. Many are unaware of this aspect of the program.

Advisories are sent without bias to assist amateurs who are receptive. The task is not to find fault, but to find solutions. OOs are special appointees who must have mature judgment. The mission is not enforcement, nor even the appearance of enforcement. It deals with *on-the-air issues of Part 97 rules only*. It does not cover fraud in the VE program, off-the-air behavior, RFI cases, non-amateur HF intruders and other issues.

Realistic Expectations Required

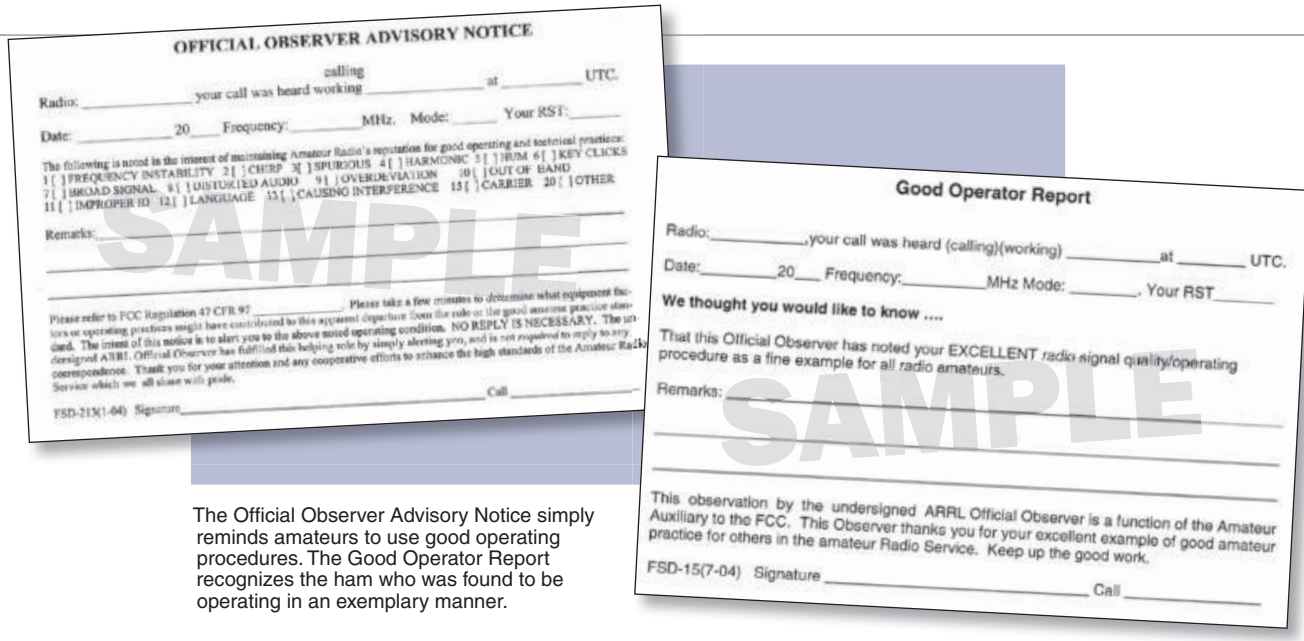
The OO can't solve all of the problems encountered on the air, some of which are clear violations while others are not. The ability to differentiate between the two is perhaps the most important task of the OO. A local interference matter, for example, can be complex, with numerous points of view. Working such problems through several stages, including the extreme stage of documenting the activity for the FCC, proceeds with deliberate speed. Due process of law must be followed. Entrenched problems can take years to resolve.

When OOs are seen as complimenting good behavior as well as offering friendly advice or help, the credibility of the entire program is enhanced.

Some History

Trained members of one of the oldest and most traditional League programs, Official Observers have been assisting their peers for over 85 years. In 1984, the program was enhanced by an agreement with the FCC and became the *Amateur Auxiliary to the FCC*. The Auxiliary has augmented the FCC's limited enforcement resources in those rare, extreme cases where an amateur was deliberately in violation of the more serious Part 97 rules, such as malicious interference. In such circumstances, Official Observers were allowed to gather and submit evidence in accordance with protocols and chain of custody rules. The expectation was that the FCC would use the evidence to take the enforcement actions needed to solve those few, but serious, problems.

In 1999, after a drought of FCC enforcement action, the program began to realize its potential as a reinvigorated Commission staff began acting on case evidence with sometimes dramatic results. See "Pleased with More FCC Enforcement? Thank an OO!" in "It Seems to Us," April 1999 *QST*. Since that new beginning, the FCC is to be commended for its continuing enforcement efforts and support of its Amateur Auxiliary program. Laura Smith at the FCC has lauded the "fantastic" program that the ARRL and the amateur community should take pride in.



The Official Observer Advisory Notice simply reminds amateurs to use good operating procedures. The Good Operator Report recognizes the ham who was found to be operating in an exemplary manner.

Then, of course, there are the free speakers who derive their pleasure in breaking long-established gentlemen's agreements. In general, they revel in making the rest of us miserable. We're baited into arguing about who had the frequency first, who is going to call the FCC first and so on. Flames are fanned and the innocent bystander can end up screaming into his microphone, too — precisely what the anarchist wanted in the first place. The OO program can't fix these types of problems. Although rare, they are part and parcel of all human behavior.

FCC Provides Oomph

Given that the program is friendly, advisory and helping, the FCC did say early in 1999 that hams who receive OO notices should take them seriously. "Failure to take the notices seriously and to take corrective action where possible will not be tolerated by the Commission," the FCC said. "The volunteer work of these Official Observers is a critical element of the Commission's enforcement program." The FCC statement also said that a pattern of failure to act on OO notices could lead to fines and other sanctions.

The FCC's comments were contained in a station inspection follow-up letter to a subject. The FCC noted that the subject had "apparently ignored notices from Official Observers," and pointed out that the volunteer OOs work "in accordance with an agreement between the Commission and the ARRL and in accordance with our statutory authority." The subject was told that, although the FCC considers hams to be self-policing, "the success of that regulatory approach depends upon the adherence to notices of possible improper operation from other licensed amateurs who are recognized Official Observers."

Technical Support

There are practical limitations to the extent an OO can become involved in the problems of an amateur to whom an Advisory Notice is sent. Although the OO should not ignore a recipient's follow-up request for assistance with a technical problem, the appointee can refer the correspondence to the ARRL Technical Information Service to assist in suggesting corrective technical action.

Obscenity, False Signals, Malicious Interference

Difficult cases often cannot be resolved by a single OO. It's even questionable at times if the OO should get involved at all. If it's an HF issue, it can be referred to a higher level, when other aspects of the Amateur Auxiliary can be invoked. Decisions for such referrals are made by ARRL HQ, and only the most serious cases will go to the FCC. Those cases are brought to the FCC with the full expectation that the FCC will act. FCC prosecution of several hard-core cases has had a marked positive effect and has been a deterrent to other would-be miscreants.

...these volunteers work behind the scenes to make Amateur Radio more enjoyable for the rest of us.

The bottom line is this: Most amateur problems are for amateurs to solve, and the FCC is the "court of last resort" for only a few extreme cases. There are several types of interference, for example, ranging from inadvertent to extreme. Most, aside from the exceptionally egregious, need to be solved within the amateur community.

Content violations can be even more difficult to assess and address. These are complex, not often black-and-white. Even the FCC, the courts and Congress have had difficulty regulating them in the context of the First Amendment. The FCC argued content issues again just recently. In the case of off-color language, the OO needs to determine if what has been transmitted rises to the level of a rules violation. They are guided by the specifications listed in their training manual. In cases like these, the OO often consults with higher-ups for guidance.

Underbelly of Amateur Radio

Some amateurs discuss topics on the air that the rest of us do not tolerate in civil circles. Some nets advance an agenda of racial or religious persecution under the license of the First Amendment right of free speech. As mentioned earlier, these groups enjoy baiting other amateurs into arguments that rapidly devolve into mud wrestling events. Traditionally, there was little that could be done and the best advice was to "turn your VFO." That is still good advice today. In the late '90s, the FCC did take interest in some of these cases, and a few amateurs were advised to refrain from such discussions, sometimes in real time on the air!

VHF/UHF Repeater Solutions

VHF/UHF interference problems are primarily local requiring local resolution. They can be intensely political and personal, and have resulted in feuds, lawsuits and even assaults at times. Local Interference Committees can be constituted on an ad-hoc basis, with the help of the Section Manager and OO Coordinator, to attempt to resolve

interference problems. Such entrenched problems can simmer and erupt in cycles for years.

Problems involving repeater coordination and repeater-to-repeater interference are beyond the scope of the Amateur Auxiliary's mission. These kinds of problems can only be solved by the repeater community itself, through its representative repeater coordinating groups. Many of the issues are often based on "political" factors and not on black-and-white regulatory concerns. Therefore, OOs are advised to steer clear of such areas.

Only *harmful interference* is actionable. The occasional opening of the squelch on the repeater, or on users' mobile rigs, "hill-topping" and propagation anomalies do not constitute harmful interference, and should be accepted as a fact of life on the repeater bands. Hearing the downlink of the "offending" machine, even hearing it clearly, may be a nuisance, but not necessarily "harmful." If the downlink on one repeater regularly overrides the downlink of another in its primary service area, however, there could be harmful interference.

The other pitfall for OOs in local cases is involvement where they have a personal stake in the outcome. Some have used the OO Advisory Notice as a tool of revenge or out of spite against local club members who have "done them wrong," although this is rare. OOs should avoid personal involvement in repeater disputes since they are often politically and emotionally charged, with much subjective "evidence" being bandied about. If the OOs do get involved, they must confine their activity to situations involving clear, black-and-white violations that can be supported by good, hard evidence. Repeater-to-repeater interference cases can be resolved through a recognized arbiter, such as the ARRL's arbitration service.

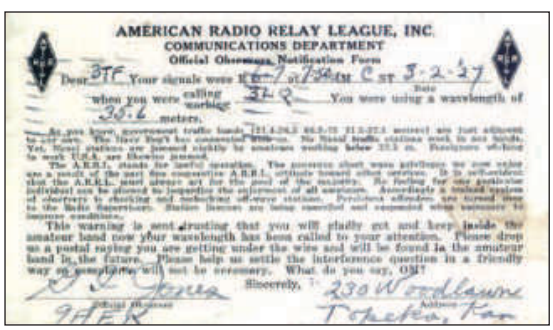
Testimonials

- I received the Good Operator report yesterday. I must tell you that when first seeing it my heart skipped a beat as I thought I did something wrong. A smile quickly spread across my face after I flipped the card over. Thank you for taking the time to send that. It means an awful lot! — *73, Bev, K1*
- Thanks for the OO report. I am looking for the cause of the spurs. As soon as I can get some test equipment together, I will be making measurements. I have not been able to detect spurs on any other bands, so will be staying off 160 until I get this fixed. Thanks again for the report. I really appreciate the time and effort you put into monitoring and detecting problems. — *73, Bill, W7*
- I received your Advisory Notice today on my out-of-band transmission. I wanted to thank you for the heads up. I usually don't find myself so close to the upper band edge on the upper sideband. I really do appreciate the feedback. I will be more careful in the future. — *73, David, K2*
- Thank you for the OO report. The out-of-band signal was unintentional and a case of not paying attention. Good to know you OO folks are on the ball keeping things in good order. I was playing the low end around 14.150 MHz in the contest and turned the dial not watching the display. — *73, Jim, K7*
- Thank you for the report. I must have been having way too much fun to have forgotten to ID. I will do better. — *73, Gordon, W5*
- Thanks for the Good Operator Report. It is certainly appreciated! — *73 de W5*

Bootleggers and Station ID

Bootleggers use the call sign of another amateur to identify their transmissions. They can be licensed or unlicensed, but their transmissions are illegal and unauthorized. In the event of a serious ongoing campaign of unauthorized, illegal use of another person's station call sign, the Amateur Auxiliary may be brought in to identify the perpetrator and to report the problem. The Auxiliary could then work to develop the evidentiary materials for transmittal to the FCC for action, pursuant to program guidelines.

Stations making a good faith effort to meet the standards of the identification rule should not be sent an advisory notice. Particularly in small group communications on repeaters, some participants may not have the opportunity to identify until just over the 10 minute mark. Sending advisories for this and other trivial and unintentional breaches of the Amateur Service rules does not further the goals of the Amateur Auxiliary.


AMERICAN RADIO RELAY LEAGUE, INC.
COMMUNICATIONS DEPARTMENT
Official Observer Notification Form

An 85 year old communication from an OO to a ham who seems to have operated outside the allocated bands.

Studied in 2009 by ARRL, FCC

The program was last studied by a special select committee in 2009, with FCC input. Called a "priceless asset" by the FCC, the Amateur Auxiliary works well in assisting FCC officials with their enforcement responsibilities. The FCC sees the program as a buffer between the licensee and the FCC — and allows for most issues to be self-resolved. The FCC uses the OO reports and evidence, provided through the appropriate channels, as their first source of information on serious cases. Once information is forwarded to the FCC, the Commission handles further fact-finding responsibilities. This insulates the OOs from being drawn directly into formal FCC proceedings.

The FCC sees the most value from the OO program as coming from technical violations of the rules. The FCC also said that OOs should not overlook the value that "Good Operator" notices bring to their efforts. When OOs are seen as complimenting good behavior as well as offering friendly advice or help, the credibility of the entire program is enhanced. The FCC also realizes that the work of the OO is often unheralded. While the program may not receive a lot of publicity and attention, the Commission staff understands the commitment made by the OOs and appreciates their work. So does the ARRL!

The next time you see a ham at a local club meeting wearing a call sign badge with a notation of the OO appointment, thank him or her with a handshake. It's these volunteers that work behind the scenes to make Amateur Radio more enjoyable for the rest of us. Make a point of it!

Rick Palm, K1CE, is a *QST* contributing editor and the editor of the bi-monthly *ARES E-Letter*. You can reach him at **k1ce@arrl.org**.

A Touch of Gray

Despite that touch of gray, you don't have to lose your feel for ham radio.

That touch of gray kinda suits you anyway. [Rick Lindquist, WW3DE, photo]

Rick Lindquist, WW3DE

Lost that fire for hamming? You are not alone. Our tastes change as we age and Amateur Radio operators are an aging cohort, averaging 60 years old in the US. While we may not be shadows of our former selves, we can lose the incentive to get on the air or enjoy operating as we once did.

That touch of gray — or a whole head of it — should not put you off ham radio altogether but even if your health is solid, it could cause your enthusiasm to flag and your ham radio habits to recalibrate. So, try something new or different! Change is good.

Times Change and So Do We

Pete, K4BKD, a ham for more than 50 years, says the fire is still there but glowing in different areas. He's less aggressive stalking DX than he was in his younger years and avoids huge pileups and DX contests. At 66, he enjoys ragchewing more than quickie contacts and makes a point of getting on the air every evening.

...the fire is still there, although it burns differently now.

Al, KØAD, a serious contester in his mid-60s, finds it more difficult to "stay in the chair" for long spells and needs more breaks than he once did. He also says he can't stay up much past midnight. He concedes that none of these things are good for his scores. He's observed another more subtle change, too: "Although I still am comfortable with CW in the 35 to 40 WPM range, I notice that every once in a while I just miss something for no reason at all. It's just like something in my brain did not fire as it should have."

But with age comes experience and a lot of hams find their store of accumulated knowledge about propagation, operating and technology to be a valuable asset. Joe, VO1NA, quips, "The fire is still there but a little more steeped in wisdom, having been jolted many times by kilovolts and RF burns." Now in his 50s Joe still loves building things, fixing his gear, experimenting with new technology and chasing DX, especially on 160. (He's now trying to work Europe on 2200 meters.)

Emptying the Basement

As you reach the stage when the kids move out (they have moved out, right?) you'll have more time to devote to ham radio pursuits. Larry, WB1DBY, who's 50, took a hiatus from ham radio after he got married and started a family, selling his HF gear and just keeping a VHF mobile.

This is fairly typical. Contesters who give up the game during those childrearing years often discover a new freedom after their offspring move on with their own lives (or at least out of the basement). Larry's dry spell lasted into his late 30s. When he found himself missing ham radio, he bought some new gear and got back on HF. As he journeyed further into middle age, Larry scaled down his station to a single transceiver. He also moved his shack from the basement (more room for those returning progeny) and into his dining room. This way he keeps close to his family even while on the air.

...changing priorities can pose daunting challenges to maintaining your on-the-air presence.

Oh, My Achin'...

As if the drawbacks of hearing or eyesight that are past their peak, back pain and other assorted geriatric medical issues weren't enough, retirement, transitioning to a fixed income, getting a handle on new technology and modes, and even changing priorities can pose daunting challenges to maintaining your on-the-air presence.

During my working years, I was a very active CW mobile operator. Nary a day passed that I wasn't on the air chatting with old friends and making new ones or working DX. Today, I drive only occasionally and no longer have HF gear in my car, although the wiring harness and antenna remain (ya never know).

When I get on the air from home now, it's more likely for a contest, to work a new one, try a new digital mode or check out equipment and antenna system changes. A small stroke disabled my CW-sending ability for quite a while and it's still not 100 percent. This makes me less inclined to inflict my faltering fist on the world at large. After another CW enthusiast I once knew suffered a serious stroke, he only wanted to operate (horror of horrors!) VHF FM. He can still operate CW but just doesn't care to.

Looking down the road, KØAD raises the specter of antenna-restricted neighborhoods that retirees may face as they downsize. While giving up the antenna farm may be hard, he speculates the result could be a surge in remote operating or "stealth" antennas on townhouses and condos.

For WB1DBY, so far the fire is still there, although it burns differently now. "But," he adds, "I still feel the thrill every time I make an HF contact. It's hard to describe the feeling."

As the Grateful Dead once sang, "Oh well, a touch of gray kinda suits you anyway." And, yes, "we will get by"; we will adapt and survive.

Rick Lindquist, WW3DE, is the managing editor of *National Contest Journal*. He can be reached at **ww3de@arrl.org**.

The QSL Card – Still Relevant, Still Fun

Not just a confirmation, QSL cards add a personal touch to your contact.

The first QSL card I received over 30 years ago. I get the same thrill every time a new card arrives in my mailbox.

T. J. "Skip" Arey, N2EI

The personal computer/Internet revolution has changed the face of Amateur Radio confirmation in ways we could hardly imagine even a few short years ago. Logbook of The World (LoTW) has removed the vagaries of the International Postal System, allowing prompt confirmation of contacts worldwide. Since receiving my first QSL over 30 years ago, I still get a thrill every time a hardcopy confirmation arrives at my address.

Current electronic QSL practice, coupled with rising international postal rates, has created a situation where some DX stations are either limiting or eliminating the time honored practice of paper QSL cards. I can't imagine the work that goes into addressing the needs of thousands of requests to a "Big Gun" contester or DXpedition for QSLs. But everyday Amateur Radio should still make room for the time honored exchange of cards between two amateurs, especially between domestic hams. Let's look at the common concerns surrounding exchanging domestic QSL cards.

Postage Keeps Going Up

Does it really? In doing research about changes in our society, I often make use of **www.measuringworth.com**, a website that lists a number of economic tools to compare the cost of items from one era to the next. Back in 1976 when I was first licensed, it cost 9 cents to send a domestic post card. Since that is the most common route for a QSL card, we can use that as a benchmark. Today, sending the same card costs 32 cents.

Using an average of the six price indices provided for showing 1976 money in 2012 dollars, what I could normally buy with my 9 cents in 1976 should cost me 42 cents today. So at the current actual rate of 32 cents, I am still ahead a dime per card compared to those QSLs I shipped out from my graduate school dorm room so long ago. Even at the current First Class rate of 45 cents, I am still only 3 cents over what sending a postcard in the '70s cost me! So, for about the cost of a cup of coffee at my local convenience store, I can send out five QSL cards to fellow US hams. When all is said and done, sending a domestic QSL card is still a great value. I send out a QSL card to every US station I work. The rate of return runs around 50%. If I really need a card for awards or other reasons, I include either return postcard postage or a self-addressed stamped envelope.

QSL Cards are Expensive

Is 14 cents expensive? That's all it costs to get a basic one-color card from a commercial printer. Have a little more change in your pocket? There are dozens of printers each with a wide range of designs from the simple one color basic to fancy, multicolor graphics.

Still not finding exactly what you want? Well, you can always *roll your own*. Modern computers, printers and graphics scanners allow anybody to create everything from passable cards to true works of art worthy of a special place on the wall of the recipient.

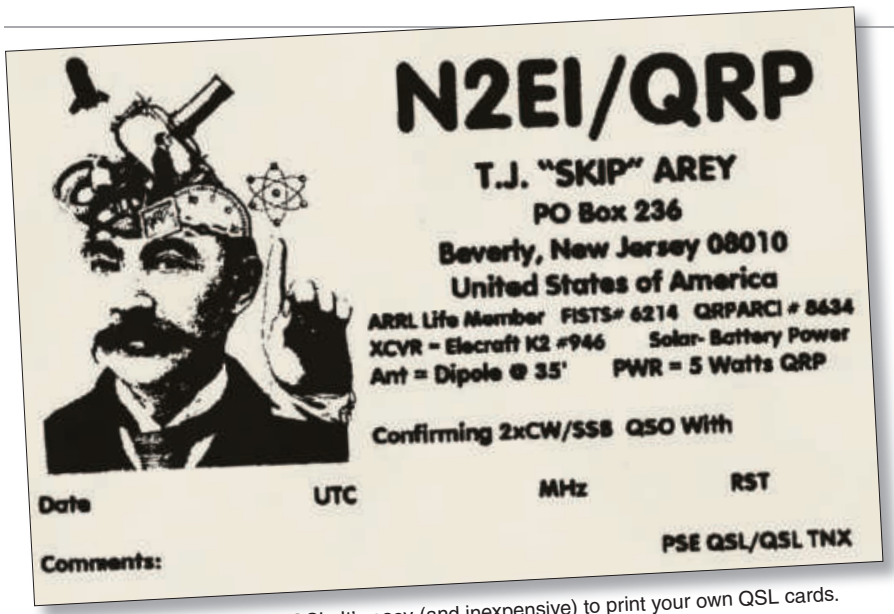
The added value of creating your own cards is that each can reflect specific aspects of any particular contact. You can list different equipment used in as much detail as space allows. You can tailor club affiliations and membership numbers, often important for awards and certificates. If the exchange occurred during a certain contest or event, it is easily added when printing out your own QSLs. You can add pictures and color up to the limits of your printer or you can create a file that can be taken to an office supply store with a more sophisticated printer.

Several fine (and free) QSL design programs are found on the Internet. One popular choice is *QSL Maker 2.4* designed by Simone, IW5EDI (**www.iw5edi.com/ham-radio/?qsl-maker,63**). Personally, I build my own cards using *Microsoft Word*. I purchase heavy card stock and, while I do need to do a bit of cutting and trimming, my cards will pass muster against anything I can purchase commercially.

A Great Way to Say Thanks

Many hams put out great efforts beyond their personal station activities. Hams will operate from a club station, a special event or staff a large multioperator contest station. For example, as I write this, the Straight Key Century Club is just finishing up their annual K3Y operation. This club makes use of this special call sign using different operators on a

Whenever the opportunity presents itself to show appreciation to the actions of brother or sister hams, a QSL card is a great way to go.



Here is my homemade QSL. It's easy (and inexpensive) to print your own QSL cards.

rotating schedule. I usually work the stations involved several times during the month-long event. I make a point of finding out the name and personal call sign of each operator. I then send out a QSL to their home station address to thank them for taking time away from their own log to help the club out.

I do the same for other operations where hams are on the air but not using their own call. Whenever the opportunity presents itself to show appreciation to the actions of brother or sister hams, a QSL card is a great way to go.

A Great Way to Interest Other Radio Hobbyists

From time to time, every ham gets a request for confirmation from a nonham shortwave listener. Personally, I think any ham who fails to send a card out to one of these folks is missing a great opportunity. Most SWLs who take the time to listen and report to ham stations are just the kind of folks we want to invite into our hobby with open arms.

When I get an SWL QSL request, I don't just send a card. I'll put it in a first-class envelope with a note telling them more about my station and inviting them to join in the fun by contacting their local ham community or an online source such as **www.arrl.org/new-to-ham-radio** for more information. I started out as an SWL. I am happy to acknowledge any SWL who takes the time to copy my signal and let me know about it.

QSL Cards Make Sense to Non-hams

Hams often use QSL cards to show and tell a little about themselves beyond their interest in radio. This has strong appeal to nonhams.

My spouse and I are dedicated kayak campers. We have a great group of folks we like to go on river and bay trips with and we had them over for dinner to plan trips for the next season. I casually mentioned that, a few nights back, I had a conversation via Amateur Radio with a guy in Maryland named Ken. This brought about a general yawn from the gathered boaters. But then I showed my kayaking companions the QSL card Ken, N3GN, sent me. On it was Ken, out in the bay, in his sea kayak. This got everybody excited. They couldn't stop talking about it. It turns out that Ken regularly kayaks along the Delmarva Peninsula (Maryland) where our group often goes.

My younger son is a talented musician but never had much interest in ham radio. I gave him a gander at a QSL card from Ed, W4ELP. Ed is not only a great low power CW operator but he plays a beautiful old Gretsch guitar as shown on his QSL. I think I had a longer talk about ham radio with my son than I ever had before.

Even nonhams in our neighborhood get a kick out of looking over all his QSLs.

I can't begin to count the number of times folks have given little more than a nod toward my ham shack but would spend a great deal of time looking over my QSL collection. If folks didn't exchange cards with me, I wouldn't be able to use this wonderful resource to try to grow interest and understanding of our hobby. When thought of this way, QSLing is almost a duty to the cause.

I was recently given stewardship over the QSL card collection of Wilbert "Bubby" Jobes, WA2YOB (SK). Bubby is now gone, but when I look at his cards I can still see him at his Yaesu FT-101 transceiver building his QSL collection. Even nonhams in our neighborhood get a kick out of looking over all his QSLs.

Keep the Tradition Alive

One of the earliest known QSL card exchanges happened when 8VX in New York sent a card to 3TQ in Pennsylvania in 1916. Since then so many things have changed within Amateur Radio. Still, this simple courtesy continues to underscore the fellowship and camaraderie that makes our hobby great. Keep an eye on your mailbox my friends!

Photos by T. J. "Skip" Arey, N2EI.

T. J. "Skip" Arey, N2EI, an ARRL Life Member, was first licensed as WN2GHA in 1976. He has been a freelance writer on the subjects of radio and technology for over 30 years. He is the author of the book *Radio Monitoring — A How-to Guide* out of print after two editions but now freely available under Creative Commons License at **naswa.net/areybook.html**. Skip can be reached at PO Box 236, Beverly, NJ 08010, **n2ei@arrl.net**.

Strays

QST congratulates...

ARRL member Terry J. Stuckey, AB9JK, of Evansville, Indiana, who was recently awarded a US Patent No. 8,053,941 titled "Encapsulated Outer Stator Isolated Rotor Stepper Motor Valve Assembly."

ARRL member Rhonda Curtis, WS9H, of Indianapolis, who has been named the 2011 Indiana Outstanding Amateur of the Year by the Indiana Radio Club Council, IRCC. — *Jack Parker, W8ISH*

ARRL member Ron Glass, WN7Y, of Billings, who was honored recently by the state of Montana Governor's Office of Community Service and the Montana Commission on Community Service for his work as coordinator of Yellowstone Amateur Radio Emergency Services. Ron serves as Emergency Coordinator for Yellowstone County. — *Todd Gansel, AE7V/AAR8AD*

Who Was Bill Orr, W6SAI?

"If I have seen further it is by standing on ye shoulders of Giants." — *Sir Isaac Newton*

The author's well-used copy of Bill Orr's *Radio Handbook*. The book was first published in the 1930s.

Eric P. Nichols, KL7AJ

Legendary Amateur Radio pioneer and prolific author Bill Orr, W6SAI, needs no introduction to most hams of the baby-boom generation. For the countless new hams who may not have heard of this "giant" of ham radio, I'd like to provide a tribute to this Elmer's Elmer.

Recently, I was honored and humbled to learn that I had been awarded the Bill Orr, W6SAI, Technical Writing Award. The inscription on the beautiful plaque says, "... honoring writers who possess Bill's gift for using clear language to explain diverse technical subjects of interest to hams."

What an unspeakable compliment — and an awesome responsibility! Fortunately, I didn't have to start from scratch. I had some broad shoulders to stand upon.

Looking through the ARRL archives, I see that Bill wrote 584 articles for *QST* and *Ham Radio* over a period spanning nearly half a century. This is in addition to the numerous books and articles he had written independently. A beloved, battered, coffee-stained and solder-scorched 1972 edition of his *Radio Handbook* has been one of my constant companions for my entire Amateur Radio career.

Looking Up

Bill had a central role to play in the vision and development of the first OSCAR satellite in 1961. The interesting thing is that by this time Bill was already well-qualified as an "Old Man" of ham radio. (Bill was actually a generation older than I; in fact, he was a half-decade older than my parents). While many of his peers were probably ruminating on their rheumatism on 75 meters, Bill was casting longing glances spaceward. I strongly recommend you read the ARRL archives of the years immediately preceding the first OSCAR launch to discover how far Bill stuck his neck out to make it happen.

Bill had written 584 articles for *QST* and *Ham Radio* over a period spanning nearly half a century.

Back on Earth

Bill did an awful lot for us earthbound hams, as well. He was very closely associated with Eimac tubes and well known as a "high-power guru" both within the amateur ranks as well as in commercial circles. In fact, I first corresponded with him in the latter role. I was a very green broadcast engineer struggling to get better tube life out of the high power transmitters over which I rode herd. Bill had the right answer, of course (actually several right answers), which made me a hero in the eyes of my station management and for which I was eternally grateful.

Again, referring to the vast number of *QST* and *Ham Radio* articles bearing Bill's name, we see that he touched on every aspect of Amateur Radio: homebrewing, contesting, DXing (including being on several DXpeditions himself), ragchewing, writing, traffic handling and general ham statesmanship.

Bill's writing style clearly demonstrated that you didn't have to be stiff to be accurate. Everything he wrote was eminently readable; his books and articles read more like stories than lessons. I especially appreciated this during my formative ham years, because I was already enduring enough lessons in college at the time.

Although, for most of my career, Bill and I have practically been in different universes, (Bill being in the middle of Silicon Valley where everything happens and I being outside of North Pole, Alaska, where nothing happens), I have always felt at home with Bill's writings. This is the wonderful thing about the written word and ham radio: they both transcend distance and lifestyle.

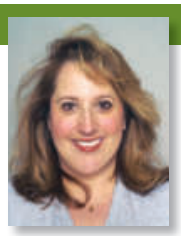
Not So Silent Key

Bill Orr's forward thinking didn't end with his passing more than a decade ago. The ARRL's setting up the coveted Technical Writing Award to, in perpetuity, encourage and promote excellence in Amateur Radio literature was consistent with the way he did things. Of course, there will never be another Bill Orr, but there will be many who will desire to follow in his footsteps. My "15 minutes of fame" afforded by this award will soon pass, naturally enough, but it is only fitting and right that I honor this Silent Key who has meant so much throughout my entire ham career and a significant part of my professional life.

I wish to thank the ARRL for honoring Bill Orr in this manner, as well. My prayer is that I will continue to deserve the honor of being associated with this great Elmer.

There is more about Bill Orr, W6SAI, on the QST-in-Depth website, **www.arrl.org/qst-in-depth**, and in the Digital Edition.

Eric Nichols, KL7AJ, an ARRL member, obtained his Novice license, WN6TEE, in Manhattan Beach, California in 1972. His first station was a Johnson Adventurer and a pair of brand new surplus ARC-5 receivers (one for 80 meters and one for 40) for which he paid a grand total of $20. Eric eventually moved to North Pole, Alaska, to become chief engineer of KJNP Radio. He spent the next 17 years crawling around inside transmitters. He now works at Eielson Air Force Base. Eric is a fanatic homebrewer and CW freak. He enjoys all aspects of low band operation and fiddles around with some 1750 meter operation as well as PSK31. He can be reached at PO Box 56235, North Pole, AK 99705-1235, **kl7aj@arrl.net**.



S. Khrystyne Keane, K1SFA, k1sfa@arrl.org

ARRL Announces New DXCC Fee Structure

The DX Century Club (DXCC) is the premier Amateur Radio operating award. Available to hams around the world, tens of thousands of awards have been issued since 1945 under the modern award program. In 2012, the DXCC program is not only still thriving, but it is growing, both in participation and in numbers of award options. The addition of Logbook of the World (LoTW), as well as a new Online DXCC Application utility, will continue to help the program grow. Due to this growth, the way DXCC fees are assessed has changed to include both rate increases and rate decreases, effective April 2.

The ARRL continues to add new and exciting twists to the DXCC platform, including a special 75th anniversary Diamond DXCC Challenge award for 2012. The DXCC Challenge — which counts total entities confirmed on 160-6 meters — has proven to be extremely popular as a competitive supplement for everyone, complementing the lifetime achievement of the DXCC Honor Roll. The ARRL website continues to add to the fun with many pages of award statistics and information, including DXCC standings for each award that are updated daily. Inside Logbook of The World, each user can see which records are stored in the DXCC system for all of his or her entities on each band and mode. In 2011, the DXCC Desk processed more than 11,450 DXCC applications and endorsements.

As a direct result of the terrific popularity of the DXCC program, our customer service has lagged a bit. DXCC participants know that when the end-of-year deadline is reached, the load on the staff is quite heavy and the turnaround time increases to more than 10 weeks. Our staff want to provide better service and will continue to try to do so. The old fee structure is one of the culprits that increased the workload; most participants submitted one or two applications each year, with each of those applications loaded with at least 120 QSOs and included a Logbook application component, as well.

One of the reasons these applications have been so large is that for many years, DXCC charged extra fees for second and subsequent applications each year. Additionally, application fees were waived for LoTW applications

Due to the phenomenal growth of the DXCC program, the ARRL has restructured the program, adding a new way for hams to apply for awards.

if they were tied to a paper application, adding a large amount of work for the staff as they matched applications. Frequently, there were hundreds of applications on both the paper application side and on the LoTW side, waiting for their "hybrid match" to arrive, delaying processing and setting the whole operation back.

New Fee Structure

For applications received on April 2, 2012 and after, the fee structure will change for several reasons:

- To promote more frequent applications.
- To remove the "hybrid application" problem.
- To simplify the price structure for DXCC.
- To raise the rates slightly to help offset ARRL's increased costs.
- To improve customer service.

The rates for DXCC have not changed since 2003. While the rates are going up for some single applications, for those who continue to submit multiple applications each year, the costs will be less. Accompanying the end of the "hybrid application" is a lower per-QSO fee for using credits in LoTW and the addition of a small application fee. "We want participants to use LoTW as often as they can and like" explained said Membership and Volunteer Programs Department Manager Dave Patton, NN1N. "LoTW applications are easier for everyone to process and remain the 'way of the future' to participate in awards programs. The costs of using LoTW are far less than traditional QSLing, when one considers the costs of obtaining QSLs which then need to be stored, recorded and carried to a card checker or sent to HQ." As in the past, US participants must be ARRL members to receive a DXCC award. See the link below for an explanation of the new fees.

Online DXCC

In April, the ARRL launched a new Online DXCC Application. This new tool allows the client to supply the data from traditional paper QSLs in a digital form so that DXCC staff will not have to perform the data entry.

The way the Online Application works is that the participant can select the cards that he or she would like to have checked by a card checker and, at his or her convenience, type that data into a form (which can be saved and retrieved at any time until submitted) and make an application for DXCC. When the application is finished, the participant will be able to print the list of cards and take the list and the cards (in the same order that they are entered into the form) to a card checker who will check the cards, note any changes and send the form to ARRL HQ.

The card checker's job is exactly the same as before, except he or she does not need to collect a payment (unless the participant has worked that out with the card checker), as the client can pay online. At ARRL HQ, DXCC staff will be able to access the file submitted by the client, quickly making any changes noted by the card checker and process the application. The Online DXCC Application will have rates that are half those of a traditional paper QSL application that is sent to ARRL HQ.

On and after April 2, 2012, this is how the DXCC fee system changed:

- No more hybrid applications. Each DXCC application — be it paper QSLs, LoTW or Online DXCC — will be considered a separate application with separate application fees.
- There are no limits on the number of applications that can be submitted. There will be no more surcharges added to the second or subsequent applications.
- A traditional, paper QSL application will have an application fee of $15 for ARRL members, and $25 for non-members outside the US. These applications will be allowed to include up to 101 QSOs. Additional QSOs in this sort of application will continue to cost 15 cents each.
- A DXCC application submitted using

LoTW will have an application fee of $5 for ARRL members and $10 for non-members. There are no limits on the number of QSOs that can be included as part of a LoTW application. Each QSO used in LoTW for an award will cost 12 cents, down from a minimum of 15 cents in 2011. We will no longer sell LoTW "credits" in bulk. If you have credits stored, you will still be able to use them.

- DXCC staff will not mail any paperwork for LoTW applications (credit matrix or application summary), as all application information will be available online in the LoTW User account.
- An Online DXCC Application will have an application fee of $7.50 for ARRL members and $12.50 for non-members and will be allowed to include up to 101 QSOs. Additional QSOs will cost 8 cents. This application is primarily intended to be used in conjunction with field checkers, but can be used by applicants who do not have access to a card checker and are willing to ship cards to ARRL HQ.
- Certificates will still cost $14 delivered in the USA, and $16.50 delivered outside the USA. Pins will continue to cost $7 delivered anywhere.
- The fee for an initial DXCC award will now be the same as for any DXCC application.
- The free *DXCC Yearbook* that was sent to ARRL members will now be made available electronically, and it will appear in an edition of Digital *QST*. For those who want a League-printed *Yearbook*, it will still be available at a modest cost.

The new fee structure is available online at **www.arrl.org/files/media/News/2012_DXCC_Fee-Structure.pdf**. Please e-mail any questions to **dxccadmin@arrl.org**.

Payroll Tax Bill Includes Provision for Amateur Radio Study

A bill that passed both the House and the Senate on February 17 — and signed into law by President Obama on February 22 — includes a provision for a study of the uses and capabilities of Amateur Radio Service communications in emergencies and disaster relief. The bill passed in the House by a vote of 293-132. In the Senate, it passed by a 60-36 vote.

Section 6414 of the *Middle Class Tax Relief and Job Creation Act of 2012* mandates the completion of the study, with a report of the findings to the House Committee on Energy and Commerce and the Senate Committee on Commerce, Science, and Transportation. This study will "use the expertise of stakeholder entities and organizations" to recommend how to best use radio amateurs in emergency communications and disaster relief efforts, and how to best utilize the Amateur Radio Service in coordination with the federal government in these efforts. In addition, the study will also discuss the effects of unreasonable or unnecessary private land use restrictions on residential antenna installations and recommend ways to remove such impediments.

Find a link to the bill, as well as a summary of Section 6414, at **www.arrl.org/news/payroll-tax-bill-includes-provision-for-amateur-radio-study**.

On February 22, President Barack Obama signed Public Law 112-96, *The Middle Class Tax Relief and Job Creation Act of 2012*, which includes a study of the uses and capabilities of Amateur Radio Service communications in emergencies and disaster relief. [Pete Souza, official White House photo]

Dayton Hamvention® Honors *QST* Technical Editor Joel Hallas, W1ZR, with Technical Achievement Award

The Dayton Hamvention® Awards Committee has announced the recipients of the 2012 Hamvention's four annual awards. *QST* Technical Editor Joel Hallas, W1ZR, was named the winner of the Technical Achievement Award. The recipient of the Amateur of the Year is S. Suri, VU2MY. Steven Betza, WZ2V, was selected as the recipient of the Special Achievement Award. The Deutscher Amateur Radio Club — Germany's IARU Member-Society — was selected as the Club of the Year.

QST Technical Editor Joel Hallas, W1ZR, was named winner of the 2012 Dayton Hamvention Technical Achievement Award.

Technical Achievement Award

Technical Achievement Award winner Joel Hallas, W1ZR, is perhaps best known for his monthly *QST* column, "The Doctor Is In." According to the Awards Committee, this lively column "answers many of the basic and not-so-basic technical questions of ham radio. Joel answers these questions in an easy-to-read format that has a low 'intimidation factor.' Many amateurs worldwide appreciate his help."

"I am deeply honored to have been selected to receive this year's Hamvention Technical Achievement Award for my writing efforts at the ARRL," Hallas said. "Since I've been a licensed ham since I was 13, I can truly say that Amateur Radio has shaped the direction for both my personal and professional lives. I feel an obligation to provide a helping hand to those who come after me so that they have the opportunity to appreciate the same rewards that I have obtained. My ARRL writing assignments provide my most recent outlet for this objective."

Hallas is the author of *Basic Radio*, *Basic Antennas*, *The ARRL Guide to Antenna Tuners* and *ARRL's Hamspeak: A Dictionary for Radio Amateurs*, as well as the soon-to-be-published Care and Feeding of Transmission Lines and *Understanding and Using Your Antenna Analyzer*. "Joel has garnered many technical awards and remains

one of the top technical authors in our avocation," the Awards Committee noted. Hallas has written more than 150 articles for *QST* in his tenure at the ARRL. The Technical Achievement Award is given to a radio amateur who has made an outstanding technical advancement in the field of Amateur Radio.

Amateur of the Year

In selecting S. Suri, VU2MY, as the Dayton Hamvention Amateur of the Year, the Awards Committee said he was "instrumental in establishing the art and science of Amateur Radio in India, as well as leading that country's effort to establish the National Institute of Amateur Radio (NIAR). Suri has also lead search-and-rescue and recovery efforts in many natural emergency events throughout India and elsewhere." The Amateur of the Year Award is given to a radio amateur who has made a long-term commitment to the advancement of Amateur Radio and who has contributed to the hobby in some outstanding way.

Special Achievement Award

Steven Betza, WZ2V, of Endicott, New York, was named the recipient of the Special Achievement Award for 2012. Betza, an ARRL Member, enjoys teaching a wide range of students through live experiments and missions. "Through a project called Blue Horizon, he caused the licensing of 38 new hams, set the world record for the highest amateur balloon vehicle (125,000 feet above ground level) and demonstrated many technical feats relating to the flight," the committee noted. "Steve has contributed in a major way to college and high school education programs in electronics engineering." The Special Achievement Award is given to a radio amateur who has made an outstanding contribution to the advancement of Amateur Radio, spearheading a single significant project.

Club of the Year Award

The Annual Club Award goes to Deutscher Amateur Radio Club (DARC). "DARC has organized the country of Germany into one unified national radio organization," the Awards Committee explained. "It can be compared to the ARRL in the United States. DARC provides educational and technical support for radio amateurs and shortwave listeners. Prior to formal regulations in Germany, DARC provided guidance in terms of frequency and power. DARC plays a major role in training and licensing and is well respected throughout the European Union."

The 2012 Dayton Hamvention is scheduled for May 18-20 at Hara Arena, located just outside Dayton in the town of Trotwood, Ohio.

In Brief

- **W1AW Video Tour Available on ARRL Website**: In case you missed the live web tour of W1AW, the Hiram Percy Maxim Station at ARRL Headquarters, you can now watch the 18 minute video on the ARRL website. On February 12, W1AW Station Manager Joe Carcia, NJ1Q, led Emmy Award-winning meteorologist Geoff Fox, K1GF, on a tour of the famed station. Al Petrunti, KA1TCH, of the New Day Group followed Carcia as he led Fox and viewers through the station, recording it for viewers to watch. "We wanted viewers of this live Internet tour to feel as if they are actually at W1AW," Carcia explained. "If you came to W1AW in person, you would see the same things that we showed on the virtual tour: The three operating stations, the transmitter racks that we use to send out our bulletins and use for the code practice transmission, the control console and 'Old Betsy,' Hiram Percy Maxim's personal spark gap transmitter." You can view the video of the tour on the ARRL website at **www.arrl.org/w1aw**.

- **Republic of South Sudan Assigned Prefix Z8**: More than seven months after being accepted as a member of the United Nations, the Republic of South Sudan requested and received its prefix block from the International Telecommunication Union (ITU): Z8. On July 14, 2011 — after South Sudan's admittance to the UN — the new country became a DXCC entity by way of Section II, 1(a) of the DXCC rules.

Section Manager Nomination Notice

To all ARRL members in Connecticut, Idaho, Minnesota, North Dakota, Ohio, Oklahoma, Southern Florida, Western New York, Puerto Rico, South Dakota* and Virgin Islands: You are hereby solicited for nominating petitions pursuant to an election for Section Manager (SM). Incumbents are listed on page 16 of this issue.

To be valid, a petition must contain the signatures of five or more full ARRL members residing in the section concerned. It is advisable to have a few more than five signatures on each petition. A sample nomination form is available on the ARRL website at **www.arrl.org/section-terms-nomination-information**. Nominating petitions may be made by facsimile or electronic transmission of images, provided that upon request by the Membership and Volunteer Programs Manager the original documents are received by the Manager within seven days of the request.

We suggest the following format:

(Place and Date)

Membership and Volunteer Programs Manager,
ARRL
225 Main St
Newington, CT 06111

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

(Signature _____ Call Sign___ City __ ZIP____)

Any candidate for the office of Section Manager must be a resident of the Section, an Amateur Radio licensee of Technician class or higher and a full member of the League for a continuous term of at least two years immediately preceding receipt of a nominating petition. Petitions must be received at Headquarters by 4 PM Eastern Time on June 8, 2012. If more than one member is nominated in a single section, ballots will be mailed from Headquarters on or before July 2, 2012, to full members of record as June 8, 2012, which is the closing date for nominations. Returns will be counted August 21, 2012. Section Managers elected as a result of the above procedure will take office October 1, 2012.

If only one valid petition is received from a section, that nominee shall be declared elected without opposition for a two-year term beginning October 1, 2012. If *no* petitions are received from a section by the specified closing date, such section will be resolicited in the October 2012 *QST*. A Section Manager elected through the resolicitation will serve a term of 18 months. Vacancies in any Section Manager's office between elections are filled by the Membership and Volunteer Programs Manager.
— David Patton, NN1N, Membership and Volunteer Programs Manager

***SM Resolicitation Notice**: Since no nominations were received for the South Dakota Section Manager election by the nomination deadline of December 9, 2011, nominations are hereby resolicited.

Rick Palm, K1CE, k1ce@arrl.org

APCO International: ARRL Partner

Ham radio's new place in the changing world of Public Safety Communications.

The partnership between public service professionals and radio amateurs has enabled both to meet the increasing challenges since 9/11. The Association of Public-Safety Communications Officials International, Inc (APCO) and the ARRL have been partners under a formal memorandum of understanding (MOU) since 1996 and share the common bond of communications in the public interest. APCO International is composed of emergency medical, law enforcement, fire and other public safety communications personnel whose primary responsibility is the management, design, maintenance and operation of communications facilities in the public domain. APCO has the lead in establishing international standards for public safety communications.

ARES® members have long worked with public safety telecom professionals in EOCs, sheriff's offices, hospitals and other facilities for disaster planning, preparation, drills and, of course, the real thing. APCO and the ARRL form a natural partnership. Specifically, APCO members may request "the establishment and maintenance of fixed, mobile and portable station emergency communication facilities for local radio coverage and point-to-point contact between public safety officials and locations, as required," under the terms of the MOU. From time to time, national ARRL officials meet with their counterparts at national APCO headquarters in Daytona Beach, Florida, to share information. On the local level, APCO International recommends that its chapters and membership appoint standing committees to maintain liaison with local ARRL officials. APCO chapters can admit local ARRL officials to appropriate training classes.

APCO Issues and Trends

APCO has been working with its members on meeting FCC mandates for FM narrowbanding their land mobile radio systems. On January 1, 2013, all public safety land mobile systems operating in the 150-512 MHz bands must cease operating using 25 kHz efficiency technology and begin operating using at least 12.5 kHz efficiency technology. This is part of an FCC effort to ensure more efficient use of the spectrum and greater spectrum access for public safety and non-public safety users. ARRL has also been studying narrowbanding in amateur applications through its Narrowband Study Committee (2010). We share these goals of using spectrum efficiently and keeping Amateur Radio as a leader in technological development.

Under the post 9/11 era banner of interoperability in the public safety telecommunications arena, APCO recently applauded Congress on HR 3630, which provides public safety with the spectrum, funding and authority to launch a nationwide public safety broadband network. (That same measure, by the way, includes a provision for a study of the uses and capabilities of Amateur Radio communications in emergencies and disaster relief.)

Members may recall the original House Bill 607 involved amateur frequencies at 420-440 MHz. It proposed that the band be reallocated for commercial auction within 10 years of its passage. While the ARRL supports the work of public safety agencies and understands their desire for an interoperable network, the inclusion of most of the amateur 70 cm spectrum as one of the replacement bands was unacceptable. (Public Safety spectrum is located at 700 MHz and 800 MHz.) The ARRL lobbied Congress concerning Amateur Radio's need for the 70 cm band and it appears our access to 70 cm is protected.

APCO realizes that spectrum is becoming more congested.

APCO Project 25

As public safety evaluates its complex, ever-changing narrowband radio needs for the future, APCO realizes that spectrum is becoming more congested. It needs more voice and data functionality, better voice quality over extended coverage areas, secure communications and interoperability. Digital solutions, like D-STAR in Amateur Radio applications, are available, but the decision to "go digital" is only the first step. There are several technologies on the market. APCO is trying to make the selection process easier through its Project 25 (P25), a long-standing partnership between the public safety communications community and industry manufacturers of interoperable, narrowband land mobile radio (LMR) equipment. P25 protocols are seeing some use in Amateur Radio applications as well.

APCO, Public Safety and Amateur Radio

Traditionally, many public safety telecom professionals got their start in radio communications as amateurs, which sparked their interest in career paths. Today, many if not most public safety dispatchers and radio users are hams and get together at APCO conferences, conventions and shows. In 2006, APCO appointed a formal "Amateur Radio Task Force" that consisted of four members appointed by the APCO Board of Officers. The task force used the existing APCO ham group, which consists of more than 130 members, as a resource to develop formal projects to support the role of the Amateur Radio operator in public safety response.

APCO Annual Conference in August

The 78th Annual Conference and Expo is scheduled for August 19-22, 2012, at Minneapolis, Minnesota. New products and services, and many expert speakers will be on hand, as well as many amateurs. Registration and other conference information can be found at **www.apco2012.org**.

Next time you see an APCO member, thank him or her for their longtime support of us as radio amateurs. We are two partners intertwined in the goal of providing safety and security to communities across the country; there's no higher calling.

Rapid Change and Complexity to Define Emergency Management's Environment

In a compelling new report of its Strategic Foresight Initiative (SFI), FEMA paints a dramatic picture of what future challenges will be like for the emergency management community. It cites globalization, technological development, demographic shifts, technology, environmental changes and economic uncertainty as drivers of new approaches, tools and capabilities that will be required of emergency managers. The paper, entitled *Crisis Response and Disaster Resilience 2030: Forging Strategic Action in an Age of Uncertainty*, was released in January.

The main challenge seen by FEMA is "increasing complexity and decreasing predictability in [emergency management's] operating environment. Complexity will take the form of more incidents, new and unfamiliar threats, more information to analyze (possibly with less time to process it), new players and participants, sophisticated technologies and exceedingly high public expectations."

The most visible impacts will likely result from an increase in the magnitude and frequency of natural disasters.

FEMA sees limited future funding for emergency management. These constraints will push emergency managers to find creative ways to deal with shortfalls. They will need to find new ways "to ensure interoperability of personnel, equipment, systems and functions." Thus, the private sectors will likely play an increasingly active role in meeting emergency management needs, said FEMA.

Among others, FEMA looked at environmental stressors such as pollution, ecosystem degradation, resource depletion and diminishing fresh water supplies, but felt that climate change is the major environmental force confronting the emergency management community in the US: "Climate change impacts are expected to increase the severity, frequency, or scale of extreme weather events, droughts, floods, sea-level rise, precipitation patterns, and the spread of life-threatening diseases. The most visible impacts will likely result from an increase in the magnitude and frequency of natural disasters."

FEMA also noted that critical infrastructure in the US is deteriorating and the global balance of power is shifting toward "emerging markets." Compounding these drivers is the evolving terrorist threat. Terrorist organizations continue to plot attacks while inciting and radicalizing small groups and individuals to target America. These factors will also have a significant impact on emergency management.

Implications for Amateur Radio

The report posed several ways that ham radio can keep pace with the coming changes. Here are a few of the more relevant needed "capabilities" for us as radio amateurs and suggestions for personal and ARES® group actions.

FEMA: Since building trust in government emergency management is essential to successful outcomes in disasters and emergencies, the best pathway for doing so is by gaining more public participation. *ARES*: Establish good relationships with local and county emergency managers and sheriff's offices. Train, get certified and registered on their volunteer rosters.

FEMA: Develop emergency management capabilities to address shifts in local and regional population characteristics and migratory flows. Among other things, this could include building multilingual proficiencies. New challenges will arise from migrations within the US, possibly because of environmental issues and changes in regional climates. *ARES*: Learn a second language; learn of cultural needs of new communities. Consider emergency operations plans to deal with an influx of refugees of domestic disasters.

FEMA: Practice omnidirectional knowledge and information sharing. The public's role as an information source will be vital. *ARES*: Set up social media accounts for alerting, information sharing and management. Support neighborhood Community Emergency Response Team (CERT) groups with ARES communications.

FEMA: Infuse emergency management principles and life skills across the entire educational experience to empower individuals to assume more responsibility. *ARES*: Present seminars on personal disaster preparedness at schools and community groups. "Schools and youth programs will be critically important channels, especially in creating awareness of new and unfamiliar threats such as pandemics or cyber attacks," said FEMA.

FEMA: Leverage volunteer capabilities across all emergency management phases. Emergency management resources, especially personnel, are apt to be stretched in future operating environments marked by tight budgets and/or more frequent national emergencies. In some cases, skill gaps may become more pronounced and alternative staffing models will become important. *ARES*: The implication is obvious — volunteer in ARES programs and register and train with local emergency management offices and EOCs to fill their gaps.

FEMA: Establish flexible frameworks that optimize emergency management interoperability across all boundaries because of increasing jurisdictional and technological complexities. *ARES*: Offer an interoperability communications solution across emergency support functions (ESFs) and departments in your community or county.

"Professionalization" of Volunteers

FEMA noted that "volunteers serve in both operational and support emergency management roles," and that "databases contain pre-approved rosters of volunteer emergency management personnel with skills/qualifications." FEMA said that there is a de facto "professionalization" of volunteer corps going on currently with opportunities for advanced training, certification and granting of appropriate authorities: "The emergency management community is leveraging the surge in baby boom retirement by creating meaningful volunteer opportunities, including important support roles, including communications."

Again, the implications are obvious for us as radio amateurs: We are currently and patently undergoing the "professionalization" of our ARES personnel through FEMA ICS and NIMS training and being preapproved, qualified and registered on EOC-controlled databases of volunteers at the local level. That trend will continue at an ever increasing rate.

"They're not amateurs but they are very much professionals." — *Deputy Administrator Richard Serino*

Bottom Line

FEMA's SFI report is a must-read: **www.fema.gov/library/viewRecord.do?id=4995**. Not full of the usual federal jargon and legalese, it is rather a sobering, gripping look at our future challenges not only as radio amateurs, but also as human beings. Don't miss it.

Contest Corral – May 2012

Check for updates and a downloadable PDF version online at www.arrl.org/contests

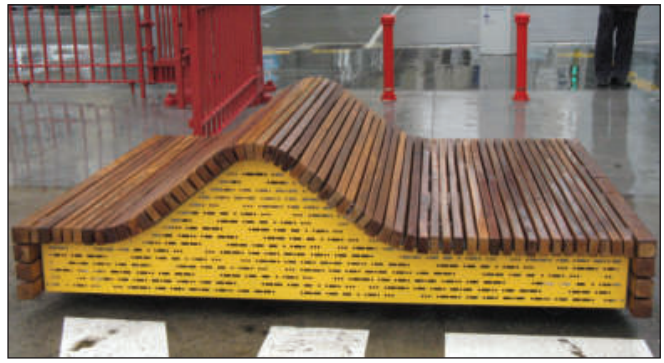
Refer to the contest websites for full rules, scoring information, operating periods or time limits, and log submission information.

Start - Finish Date-Time		Date-Time		Bands HF / VHF+	Contest Title	Mode	Exchange	Sponsor's Website
5	6 AM	6	7:59 PM	- / 2.3G+	2 GHz and Up World Wide Contest	Ph CW Dig	6-char grid locator	www.ham-radio.com/sbms
5	6 AM	5	12:59 PM	- / 902+	Microwave Spring Sprint	Ph CW Dig	Grid square (6-character preferred)	sites.google.com/site/springvhfupsprints
5	0001Z	6	2359Z	28 / -	Ten-Ten Spring CW Contest	CW	Call sign, name, 10-10 number, state	www.ten-ten.org
5	1300Z	6	0659Z	1.8-28 / 50,144	7th Area QSO Party	Ph CW Dig	RS(T)+S/P or 7th-area county code	7qp.org
5	1600Z	6	0359Z	1.8-28 / -	Indiana QSO Party	Ph CW	RS(T) + S/P or IN county, DX RS(T) only	www.hdxcc.org/inqp
5	1700Z	6	0459Z	3.5-21 / -	Radio Club of America QSO Party	Ph	RS, QTH, name, equipment	www.radio-club-of-america.org
5	2000Z	6	1959Z	1.8-28 / -	ARI International DX Contest	Ph CW Dig	RS(T), serial or Italian province	www.ari.it
5	2000Z	6	see web	3.5-28 / -	New England QSO Party	Ph CW Dig	RS(T) and S/P or New England county	www.neqp.org
8	0200Z	8	0359Z	3.5-28 / -	ARS Spartan Sprint	CW	RST, S/P/C, and power	www.arsqrp.blogspot.com
8	1600Z	8	see web	3.5 / 50	OK1WC Memorial Contest	Ph CW	RS(T) and serial	www.hamradio.cz/ok1wc
9	1300Z	9	see web	1.8-28 / -	CWops Monthly Mini-CWT Test	CW	Name, member number or S/P/C	www.cwops.org/onair.html
11	0200Z	11	0259Z	1.8-14 / -	SNS and NS Weekly Sprints	CW	Serial, name, and S/P/C	www.ncccsprint.com/rules.html
12	0000Z	12	2359Z	1.8-28 / -	FOC QSO Party	CW	Name, FOC member number	www.g4foc.org
12	1000Z	12	see web	3.5-28 / -	EUCW Fraternizing CW QSO Party	CW	RST, name, club, member number	www.eucw.org
12	1200Z	13	1159Z	3.5-28 / -	Alessandro Volta RTTY DX Contest	Dig	RST, serial, CQ zone	www.contestvolta.com
12	1200Z	13	2359Z	1.8-28 / -	Armed Forces Comm'ns Test	Ph Dig	RS(T)	www.netcom.army.mil/mars
12	1200Z	13	1159Z	1.8-28 / -	CQ-M International DX Contest	Ph CW	RS(T) and serial	www.cq-m.andys.ru
12	1500Z	13	1459Z	3.5-28 / -	Portuguese Navy Day	Ph CW	RS(T), serial, CQ zone	www.nra.pt
12	1700Z	13	1659Z	1.8-28 / 50	Nevada Mustang Roundup	Ph CW Dig	RS(T) and S/P/C or NV county	www.nvqsoparty.info
12	1700Z	13	2059Z	3.5-28 / -	FISTS Spring Sprint	CW	RS(T), S/P/C, name, FISTS nr or power	www.fists.org/sprints.html
12	2300Z	13	0259Z	- / 50	50 MHz Spring Sprint	Ph CW Dig	Grid square (6-character preferred)	sites.google.com/site/springvhfupsprints
13	1000Z	13	1359Z	1.8-7 / -	Worked All Britain - LF Phone	Ph	RS, serial, and WAB nr or DXCC entity	www.worked-all-britain.co.uk
17	0030Z	17	0229Z	3.5-14 / -	NAQCC Monthly QRP Sprint	CW	RST, S/P/C, and NAQCC mbr nr or power	naqcc.info
19	0800Z	19	1459Z	3.5-28 / -	Portuguese Navy Day	Dig	RST, serial, CQ zone	www.nra.pt
19	1200Z	20	1159Z	3.5-28 / -	EU PSK DX Contest	Dig	RST and EU area code or serial	www.eu.srars.org
19	1200Z	20	1158Z	1.8-28 / -	His Majesty King of Spain Contest	CW	RST and serial or EA province	www.ure.es
19	1500Z	19	see web	1.8-28 / -	Feld-Hell Hamvention Sprint	Dig	RST, S/P/C, Feld-Hell member nr	www.feldhellclub.org
19	2100Z	20	0159Z	3.5 / -	Baltic Contest	Ph CW	RS(T) and serial	www.lrsf.lt/bcontest/english/rules_html.htm
20	0200Z	20	0359Z	1.8-28 / -	Run For the Bacon	CW	RST, S/P/C, Flying Pig nr or power	www.fpqrp.org
26	0000Z	27	2359Z	- / 1.2G	Worldwide EME Contest	Ph CW	TMO/RS(T) and "R"	www.dubus.org
26	0000Z	27	2359Z	1.8-28 / -	CQ WW WPX Contest	CW	RST and serial	www.cqwpx.com
27	8 PM	27	midnight	3.5-28 / -	QRP ARCI Hootowl Sprint	CW	RST, S/P/C QRP number or power	www.qrparci.org/contests
28	2300Z	29	0259Z	1.8-28 / -	MI QRP Memorial Day CW Sprint	CW	RST, S/P/C, MI QRP number or power	www.miqrp.org

All dates refer to UTC and may be different from calendar date 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 (May 1 for July *QST*) — send information to contests@arrl.org. Listings in blue indicate contests sponsored by ARRL or *NCJ*. The latest time for a valid contest QSO is the minute listed in the "Finish Time" column.

Strays

Auckland's sparklag waters: There's a sculpture/bench/luggage rest located at the foot of Queen Street in Auckland, New Zealand next to the Ferry Building. I was baffled by the message SPARKLAG WATERS repeated over and over in Morse code until I contacted some local hams. Bottom line: Someone tried,unsuccessfully, to spell out SPARKLING WATERS.
— *Bob Kernish, KD2ADL*



May 2012 W1AW Qualifying Runs

W1AW Qualifying Runs are 7 PM EDT (2300Z) Monday, May 7 and 9 AM EDT (1300Z) Friday, May 25 (10-40 WPM). The West Coast Qualifying Run will be transmitted by station K9JM on 3590 and 7047.5 kHz at 9 PM PDT Wednesday, May 16 (0400Z May 17). Unless indicated otherwise, speeds are from 10-35 WPM.

2011 ARRL International EME Competition Results

More efficient and robust moonbounce contesting

Jeremy Alexander, W7EME, w7eme@yahoo.com

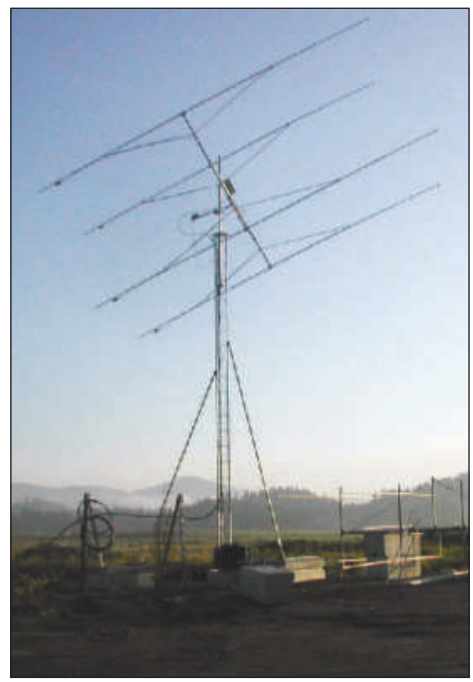
The 33rd annual ARRL International EME Competition scores are in. The first weekend of the competition was September 24-25 for entrants on 2.3 GHz and up. The second weekend was October 22-23 for VHF and UHF using 50-1296 MHz. The final weekend segment of the competition was also for 50-1296 MHz operators and was held during the full moon of November 19 and 20.

The contest was again structured with the new four-category format put in place in 2010. The popular Single Operator, All Mode — any combination of CW, phone, or digital modes — is available for Single-Band or All-Band operation. The most challenging category is Single Operator, CW Only, which is open to 144, 432 and 1296 MHz Single-Band and All-Band logs. Multioperator, All Mode is open to any combination of CW, phone or digital modes on all bands. The Multioperator, CW Only category is open to 144, 432 and 1296 MHz Single-Band and All-Band logs. All categories forbid any real-time assistance.

Top Scores

The overall highest score once again goes to the station of Joe, K1JT, producing a final score of 4,977,000 points — outstanding! K1JT entered the competition as a Multi-operator, All Mode, All Band participant. Gerald, K5GW's super-station produced an amazing score of 4,727,500 points in the Single Operator, All Mode, All-Band category. This is also outstanding and, needless to say, Gerald was very busy!

In the Single Operator and Multioperator, CW Only categories there were also some exceptional entries. As in past years Jimmy, SV1BTR, reeled in 2,724,000 points in the Single Operator, CW Only, All-Band category. Krzysztof, SP7DCS, took the high score for Multioperator, CW Only, All-Band with 876,300 points. For a complete list of Single-Band scores and a list of all entrants, please see the online version of this article at **www.arrl.org/contests**.



Jeremy, W7EME, used this remotely operated 2 meter array of four 17 element Yagis to monitor activity during the contest. [Photo courtesy W7EME]

Third Year without Assistance

The 2011 ARRL International EME Competition remained a "no assistance allowed" contest. Once again the scores reflect many contest QSOs logged with stations not actually participating in the event. The online logger websites were crowded with non-competitors seeking activity with stations operating during the 2011 competition. This was especially evident during the second and third VHF-UHF segments of the contest.

Each year more operators have been adapting new techniques to detect and demodulate EME signals. This is creating a more efficient and robust EME contester for whom the use of online spotting is no longer much of an advantage for finding stations. The utilization of wide-band receiving schemes, dual polarity antenna systems at VHF and UHF, and band-mapping software such as K1JT's MAP65 offer powerful tools for successful point-gathering. Technology and state-of-the-art station configurations are offering the operator the ability to contest without input from anything other than their receivers.

2012 EME Contest

Questions and comments about the 2012 ARRL International EME Competition should be addressed to the ARRL VUAC. The ARRL welcomes your input, pro and con, regarding this contest. Please provide your ideas in a polite and collected manner at **www.arrl.org/contact-arrl**. (Be sure to click CONTESTS in the form fields.) Dates for the 2012 contest will be announced on the ARRL website when the best dates have been determined.

Category Winners

Class	Call	QSOs	Mults	Score	Operators
Single Operator, CW Only, All Band	SV1BTR	227	120	2,724,000	
Single Operator, All Mode, All Band	K5GW	305	155	4,727,500	
Single Operator, CW Only, 144 MHz	OZ1HNE	56	30	168,000	
Single Operator, All Mode, 144 MHz	KB8RQ	188	75	1,410,000	
Single Operator, CW Only, 432 MHz	DL9KR	43	24	103,200	
Single Operator, All Mode, 432 MHz	OK2POI	28	21	58,800	
Single Operator, CW Only, 1.2 GHz	G4CCH	106	40	424,000	
Single Operator, All Mode, 1.2 GHz	OK2DL	116	42	487,200	
Single Operator, All Mode, 2.4 GHz	ON5TA	20	18	36,000	
Multioperator, CW Only, All Band	SP7DCS	127	69	876,300	(+ SP7MC)
Multioperator, All Mode, All Band	K1JT	315	158	4,977,000	(+ K2BMI, K2QM, K2TXB, K2UYH, K3TUF)
Multioperator, CW Only, 144 MHz	J48OAA	11	11	12,100	(SV8GKE & SV1OAA)
Multioperator, All Mode, 144 MHz	RU1AA	247	73	1,803,100	(+ RX1AS)
Multioperator, All Mode, 432 MHz	OH2PO	76	30	228,000	(+ OH2BGR, OH2HYT, OH6DD)
Multioperator, CW Only, 1.2 GHz	N2UO	96	41	393,600	(+ W9EQ)
Multioperator, All Mode, 1.2 GHz	RA3AUB	105	38	399,000	(+ UA3PF)
Multioperator, All Mode, 2.4 GHz	SP6OPN	33	25	82,500	(+ SP6JLW)
Multioperator, All Mode, 5.7 GHz	SQ6OPG	4	4	1,600	(+ SP6JLW & SP6OPN)
Multioperator, All Mode, 24 GHz	OK1KIR	4	4	1,600	(OK1DAI, OK1DAK, OK1VAO)

2011 ARRL CW Sweepstakes Results

Ali vs Frazier, Mets vs Yankees, Bruins vs Canadiens, Trott vs Martin — excuse me?

Kelly Taylor, VE4XT, ve4xt@mymts.net

Yes, it's been shaping up that way for about the past 10 years, at least as far as the ARRL November CW Sweepstakes are concerned. Matt Trott, K7BG and Randy Martin, KØEU have been battling in Single Operator, Low Power for at least as long as the online records database goes back, to 2001. And some of those have been epic battles between the two — in 2001, Randy beat Matt by only three QSOs.

While it hasn't always been Randy and Matt splitting No.1 and No.2, when it has it's been Randy coming out on top. Not this year. Matt's shaken his bridesmaid status with a convincing 32 QSO victory over his Colorado friend.

Sweepstakes is a contest that's almost as old as ham radio itself and it remains one of the most-popular domestic contests. A lot of that has to do with The Sweep — it's one of a few major contests where you can — and lots of people regularly do — work all of the multipliers. Canada and the US are split up into 80 sections as multipliers (83 beginning in 2012) and many stations find the challenge of working all 80 to be their main motivation.

Some stations even set 80-in-80 — working nothing but new sections — as a particular challenge and if there was an award for 80-in-80, this year it goes only to John, N6MU whose 80-in-80 in Single-Operator, Low Power survived log checking. VE9AA came close, working 79-in-79. It's not easy for a few reasons: You have to make sure your log is golden (zero copying errors) because if you lose any QSOs to log checking, you miss your target. As well, you can really only do it by search-and-pounce (S&P), which is hard since some stations in some of the rarer sections also only work S&P.

Single Operator, Low Power (A)

The biggest category by a large margin with 611 operators entered was won by Matt, K7BG who edged his friend and longtime rival Randy, KØEU 192,960 to 187,680. Matt, who traveled to Denver in 2010 to visit Randy and see his station, credits improved high-band propagation for the win. "Propagation seemed good all the way around," he said. "I had all the mults in the bag by 0600Z the first night. That took the pressure off to go mult hunting on Sunday. Hats off to Randy for the manifold wins he has had in this category over the years. It will be a long, long time before anybody comes close to his phenomenal performance."

Top Ten by Category

Single Operator, High Power

N2IC	235,520
N9RV	232,000
VY2ZM (K1ZM, op)	229,760
NØNI (AG9A, op)	227,040
KH7X (KH6ND, op)	219,360
N5RZ	218,720
N2NT (N2NC, op)	216,000
WDØT	215,360
K6LA	212,000
W7RN (N6TV, op)	210,720

Single Operator, Low Power

K7BG	192,960
KØEU	187,680
NAØN	183,680
N9CK	178,066
N8OO	175,040
N7VM	174,560
KØLUZ	171,520
NO3M	169,920
W7WA	169,760
KØAD	168,640

Single Operator, QRP

W7RM (N6TR, op)	145,518
K4RO	124,030
WØMHS	119,520
NØUR	115,340
NN7SS (K6UFO, op)	114,080
KØPC	113,568
KØAV	112,320
W1XX	109,512
N7IR	109,336
K9ZO	108,546

Single Operator Unlimited, High Power

N6RO	210,560
K6LL	210,080
K3MM	209,120
W4MR (AA4NC, op)	204,160
N4ZZ	200,480
NY3A	196,800
K7NV	193,600
KB7Q	185,120
K6SRZ	184,640
N4BP	182,720

Single Operator Unlimited, Low Power

KK7S	168,480
VA2WA (VA2WDQ, op)	167,840
KE7X	167,360
K2NNY (K2DB, op)	165,760
K8BL	158,080
N9CO	156,000
N4PN	154,720
K3AU (K2YWE, op)	154,080
ACØDS	143,040
N2MM	140,000

Multioperator, High Power

W6YI	225,600
W2FU	208,800
KP2M	205,920
VE6EX	190,720
W5RU	189,440
WØDLE	183,680
KØBJ	182,880
W4RM	169,280
W6TK	163,200
N6WIN	160,320

Multioperator, Low Power

NP4DX	181,760
N6KI	128,320
K3LID	100,800
KØUK	79,772
WR4I	69,888
VE4DR	60,532
WA6KYR	52,128
WDØGTY	35,568
N2AW	16,048
KK5OV	12,480

School Club

W6YX	213,600
KØHC (WØBH, op)	179,040
W4UAL	55,616
W3ABT (K3BHX, op)	53,592
N5XU (AA5BT, op)	36,656

Where does Matt go from here? "The trick to increases in score from here on out will be to develop skills in working part-time stations on Saturday who may just show up for an hour or two to run some stations of their own. If I am running and not finding them, they may not be around on Sunday when I will be doing more S&P with the second radio."

Single Operator, High Power (B)

Fellow *QST* author Steve, N2IC returned to competition for 2011 and returned to the top of the podium. Hot on his heels was Pat, N9RV who missed Steve's mark by 22 QSOs. Like A-category winner K7BG, Pat's Montana QTH seems to be benefiting from increased high-band propagation. Pat beat or matched Steve on all bands but 15, where Steve's 352 QSOs to Pat's 211 made the difference. Pat scored 345 QSOs on 10 to Steve's 270, but the 10 meter gains weren't enough to offset that 15 meter advantage.

Pat said he's not worried about band-by-band results since you can only work a station once. For someone who says he's still "learning the ropes" of SS, he's doing pretty well, having tied for first last year and missing the title this year by a nose.

Single Operator, QRP (Q)

There's a TV show called "Glutton for Punishment" in which host Bob Blumer has competed in eating stinging nettles, husking coconuts and cycling up an infamous Tour de France stage to the peak of Alp d'Huez. But he's never faced the true punishment: facing off against some of the world's best operators in a contest with arguably the most complex exchange around, using just 5 W of power. Tree, N6TR who still holds the QRP record from a 2002 effort at W5WMU, won QRP for 2011 with 145,518 points. Kirk, K4RO took second, followed by WØMHS.

Single Operator Unlimited, High Power (U)

The sun rising in the east, the Charlotte Bobcats losing another game — and N6RO and K6LL at the top of the Unlimited category. There are some things you can just count on. Unlimited allows operators to use spotting but since most top stations work all available multipliers quite quickly, it's also handy for finding new stations to work. You can only work each station once so every new one is welcome, particularly on Sundays.

"I somehow managed to squeeze by Dave, K6LL again but it was the hardest work I've ever done in SS," said Ken, N6RO. When Ken said "squeeze," he wasn't kidding. His 1316 QSOs just nudged out Dave's 1313. Both earned a sweep. Indeed, only nine QSOs separated Ken from No. 3 Ty, K3MM. As propagation ramps up, expect this battle to be quite hot again this year.

Unlimited is the second most-popular category with 272 logs, yet the scores are routinely lower than the top scores in Single

Sponsored Plaque Winners for CW Sweepstakes

We are pleased to announce that the Overall and Division Leaders in each category receive a sponsored Sweepstakes plaque. ARRL is grateful to ICOM America and numerous clubs and individuals for sponsoring Sweepstakes awards. For more information on awards sponsorship, or to order a duplicate plaque, contact ARRL Contest Branch Manager Sean Kutzko, KX9X at 860-594-0232 or by e-mail at **kx9x@arrl.org**. Plaques cost $75 each, which includes all shipping charges.

Division/Plaque Category	Winner	Plaque Sponsor
Overall Winner		
Single Operator High Power CW	N2IC	Trey Garlough, N5KO
Single Operator Low Power CW	K7BG	Sean Kutzko, KX9X
Single Operator QRP CW	W7RM (N6TR, op)	QRP Amateur Radio Club International
Single Operator Unlimited High Power CW	N6RO	Joe KO4RR & Victoria N4WV
Single Operator Unlimited Low Power CW	KK7S	Icom America
Multioperator High Power CW	W6YI	In Memory of Jerry Grokowsky, WA9HCZ
Multioperator Low Power CW	NP4DX	Icom America
School Club CW	W6YX	Straight Key Contest Club
Atlantic		
Single Operator High Power CW	AA3B	Icom America
Single Operator Low Power CW	NO3M	Potomac Valley Radio Club
Single Operator QRP CW	K2ZR	Milt Coleman, K4OSO
Single Operator Unlimited High Power CW	K3MM	Icom America
Single Operator Unlimited Low Power CW	K2NNY (K2DB, op)	Icom America
Multioperator High Power CW	W2FU	Icom America
Multioperator Low Power CW	K3LID	Icom America
School Club CW	W3ABT (K3BHX, op)	Icom America
Central		
Single Operator High Power CW	W9RE	Society Of Midwest Contesters
Single Operator Low Power CW	N9CK	Society Of Midwest Contesters
Single Operator QRP CW	K9ZO	Sean Kutzko, KX9X
Single Operator Unlimited High Power CW	NE9U	Straight Key Contest Club
Single Operator Unlimited Low Power CW	N9CO	Icom America
Multioperator High Power CW	K9SD	Icom America
Multioperator Low Power CW	No Entrant	
School Club CW	No Entrant	
Dakota		
Single Operator High Power CW	WDØT	Minnesota Wireless Association
Single Operator Low Power CW	NAØN	Minnesota Wireless Association
Single Operator QRP CW	NØUR	Tod Olson, KØTO
Single Operator Unlimited High Power CW	K1KD	Minnesota Wireless Association
Single Operator Unlimited Low Power CW	KØMPH	Icom America
Multioperator High Power CW	KØHB	Minnesota Wireless Association
Multioperator Low Power CW	No Entrant	
School Club CW	No Entrant	
Delta		
Single Operator High Power CW	WO4O	Icom America
Single Operator Low Power CW	N8OO	Icom America
Single Operator QRP CW	K4RO	Icom America
Single Operator Unlimited High Power CW	N4ZZ	Icom America
Single Operator Unlimited Low Power CW	N4DW	Icom America
Multioperator High Power CW	W5RU	Icom America
Multioperator Low Power CW	No Entrant	
School Club CW	No Entrant	
Great Lakes		
Single Operator High Power CW	W5MX	Mad River Radio Club
Single Operator Low Power CW	W1NN	Mad River Radio Club
Single Operator QRP CW	N5EE	Mad River Radio Club
Single Operator Unlimited High Power CW	K8BZ	KD8LL & K4EQ - N8CVH Memorial
Single Operator Unlimited Low Power CW	K8BL	In Memory of Robert "Val" Edwards, W8KIC
Multioperator High Power CW	W8EDU	In memory of Raleigh Wert, W8QOI
Multioperator Low Power CW	K4BRI	Icom America
School Club CW	No Entrant	
Hudson		
Single Operator High Power CW	N2NT (N2NC, op)	Icom America
Single Operator Low Power CW	W2LK	Icom America
Single Operator QRP CW	KR2Q	Icom America
Single Operator Unlimited High Power CW	W2VQ	Icom America
Single Operator Unlimited Low Power CW	WA2PJI	Icom America
Multioperator High Power CW	AB2DE	Stuart Silverstein, K3UEI, Memorial
Multioperator Low Power CW	No Entrant	
School Club CW	No Entrant	
Midwest		
Single Operator High Power CW	NØNI (AG9A, op)	Icom America
Single Operator Low Power CW	KØVBU	Society of Midwest Contesters
Single Operator QRP CW	WØMHS	Icom America
Single Operator Unlimited High Power CW	NØXR	Icom America
Single Operator Unlimited Low Power CW	NU0Q	Icom America
Multioperator High Power CW	KØBJ	Icom America
Multioperator Low Power CW	No Entrant	
School Club CW	KØHC (WØBH, op)	Icom America
New England		
Single Operator High Power CW	K8PO	Mark Olsen, KF1V
Single Operator Low Power CW	K1BX	Michael McKaughan, K1DM
Single Operator QRP CW	W1XX	Mark Olsen, KF1V
Single Operator Unlimited High Power CW	W1SJ	Mark Olsen, KF1V
Single Operator Unlimited Low Power CW	W1WBB	Mark Olsen, KF1V
Multioperator High Power CW	No Entrant	
Multioperator Low Power CW	WA1QKT	Icom America
School Club CW	No Entrant	
Northwestern		
Single Operator High Power CW	N9RV	Icom America
Single Operator Low Power CW	K7BG	Paul Beringer, NG7Z - Western Washington DX Club
Single Operator QRP CW	W7RM (N6TR, op)	Phil Yasson, AB7RW
Single Operator Unlimited High Power CW	KB7Q	Icom America
Single Operator Unlimited Low Power CW	KK7S	Icom America
Multioperator High Power CW	K7GT	Icom America
Multioperator Low Power CW	No Entrant	
School Club CW	No Entrant	
Pacific		
Single Operator High Power CW	KH7X (KH6ND, op)	The Carroll Dean Jensen Memorial (K6CDJ)
Single Operator Low Power CW	KF6T	Robert A. Wilson, N6TV
Single Operator QRP CW	W6JTI	Jim Davis, NN6EE
Single Operator Unlimited High Power CW	N6RO	Icom America
Single Operator Unlimited Low Power CW	K7GK	Icom America
Multioperator High Power CW	W6BO	Straight Key Contest Club
Multioperator Low Power CW	No Entrant	
School Club CW	W6YX	Icom America
Roanoke		
Single Operator High Power CW	N4AF	Potomac Valley Radio Club
Single Operator Low Power CW	N4UA	Icom America
Single Operator QRP CW	W7IY	Icom America
Single Operator Unlimited High Power CW	W4MR (AA4NC, op)	Icom America
Single Operator Unlimited Low Power CW	K4XD	Icom America
Multioperator High Power CW	W4RM	Icom America
Multioperator Low Power CW	WR4I	Icom America
School Club CW	No Entrant	
Rocky Mountain		
Single Operator High Power CW	N2IC	Grand Mesa Contesters of Colorado
Single Operator Low Power CW	KØEU	Icom America
Single Operator QRP CW	KØAV	Colorado QRP Club
Single Operator Unlimited High Power CW	WØZA	Icom America
Single Operator Unlimited Low Power CW	ACØDS	Icom America
Multioperator High Power CW	WØDLE	Icom America
Multioperator Low Power CW	KØUK	Icom America
School Club CW	No Entrant	
Southeastern		
Single Operator High Power CW	NP2X	Tom Alderman, W4BQF
Single Operator Low Power CW	KØLUZ	David Brandenburg, K5RQ
Single Operator QRP CW	N4JF	Straight Key Contest Club
Single Operator Unlimited High Power CW	N4BP	Charlie Wooten, NF4A
Single Operator Unlimited Low Power CW	N4PN	Icom America
Multioperator High Power CW	KP2M	Icom America
Multioperator Low Power CW	NP4DX	Icom America
School Club CW	W4UAL	David Brandenburg, K5RQ
Southwestern		
Single Operator High Power CW	K6LA	Icom America
Single Operator Low Power CW	AA6PW	Larry Serra, N6NC
Single Operator QRP CW	N7IR	N6HE and W6DLD
Single Operator Unlimited High Power CW	K6LL	Icom America
Single Operator Unlimited Low Power CW	KU7Y	Icom America
Multioperator High Power CW	W6YI	Icom America
Multioperator Low Power CW	N6KI	Icom America
School Club CW	No Entrant	
West Gulf		
Single Operator High Power CW	N5RZ	David Brandenburg, K5RQ
Single Operator Low Power CW	W8FN	David Brandenburg, K5RQ
Single Operator QRP CW	K5NZ	In Memory of Mick Lange, WB5RSS
Single Operator Unlimited High Power CW	W5RQ	Icom America
Single Operator Unlimited Low Power CW	N1CC	Icom America
Multioperator High Power CW	No Entrant	
Multioperator Low Power CW	WDØGTY	Icom America
School Club CW	N5XU (AA5BT, op)	David Brandenburg, K5RQ
Canada		
Single Operator High Power CW	VY2ZM (K1ZM, op)	Icom America
Single Operator Low Power CW	VE5ZX	Icom America
Single Operator QRP CW	VA3DF	QRP Amateur Radio Club International
Single Operator Unlimited High Power CW	VE3KI (@ VE3FU)	Icom America
Single Operator Unlimited Low Power CW	VA2WA (VA2WDQ, op)	Icom America
Multioperator High Power CW	VE6EX	Straight Key Contest Club
Multioperator Low Power CW	VE4DR	Icom America
School Club CW	No Entrant	Icom America

Regional Leaders

Northeast Region (New England, Hudson and Atlantic Divisions; Maritime and Quebec Sections)			Southeast Region (Delta, Roanoke and Southeastern Divisions)			Central Region (Central and Great Lakes Divisions; Ontario Section)			Midwest Region (Dakota, Midwest, Rocky Mountain and West Gulf Divisions; Manitoba and Saskatchewan Sections)			West Coast Region (Pacific, Northwestern and Southwestern Divisions; Alberta, British Columbia and NWT Sections)		
VY2ZM (K1ZM, op)	229,760	B	N4AF	198,400	B	W9RE	209,120	B	N2IC	235,520	B	N9RV	232,000	B
N2NT (N2NC, op)	216,000	B	NP2X	195,520	B	W5MX	185,760	B	NØNI (AG9A, op)	227,040	B	KH7X (KH6ND, op)	219,360	B
AA3B	203,680	B	K4BAI	185,440	B	K9CT	177,440	B	N5RZ	218,720	B	K6LA	212,000	B
K8PO	196,000	B	W4AU	149,600	B	K1LT	173,440	B	WDØT	215,360	B	W7RN (N6TV, op)	210,720	B
KD4D	193,600	B	N4UU	143,676	B	KE9I	169,120	B	WXØB (K5GA, op)	209,600	B	VE7CC	206,880	B
NO3M	169,920	A	N8OO	175,040	A	N9CK	178,066	A	KØEU	187,680	A	K7BG	192,960	A
N8NA	167,680	A	KØLUZ	171,520	A	W1NN	161,760	A	NAØN	183,680	A	W7WA	169,760	A
K1BX	165,760	A	K1TO	163,840	A	AJ9C	158,560	A	N7VM	174,560	A	N7XU (K4XU, op)	166,240	A
W2ID (@ K9RS)	148,160	A	NA4K	143,840	A	K9KM	132,404	A	KØAD	168,640	A	KF6T	155,360	A
K1XM	144,960	A	K1PT	139,672	A	KV8Q	132,160	A	NØAT (NØKK, op)	166,080	A	AA6PW	152,000	A
W1XX	109,512	Q	K4RO	124,030	Q	K9ZO	108,546	Q	WØMHS	119,520	Q	W7RM (N6TR, op)	145,518	Q
K2ZR	99,176	Q	W7IY	104,052	Q	N9NE	100,932	Q	NØUR	115,340	Q	NN7SS (K6UFO, op)	114,080	Q
KR2Q	85,488	Q	N4JF	99,066	Q	VA3DF	97,032	Q	KØPC	113,568	Q	N7IR	109,336	Q
W1QK	71,288	Q	K3TW	91,884	Q	N5EE	93,288	Q	KØAV	112,320	Q	W7YAQ	107,840	Q
AA1CA	59,496	Q	K4QPL	88,638	Q	WI9WI	86,856	Q	K5NZ	93,784	Q	W6JTI	102,400	Q
K3MM	209,120	U	W4MR (AA4NC, op)	204,160	U	NE9U	159,200	U	WØZA	170,400	U	N6RO	210,560	U
NY3A	196,800	U	N4ZZ	200,480	U	VE3KI (@ VE3FU)	158,080	U	K1KD	167,360	U	K6LL	210,080	U
WX3B	177,280	U	N4BP	182,720	U	VE3RZ	157,440	U	KTØR (KØOB, op)	166,720	U	K7NV	193,600	U
AB3CX	174,880	U	KE3X	180,640	U	K9NR	154,400	U	WT9Q	163,360	U	KB7Q	185,120	U
WR3Z	173,760	U	AD4EB	176,160	U	W9IU	115,814	U	NØXR	162,740	U	K6SRZ	184,640	U
VA2WA (VA2WDQ, op)	167,840	UL	N4PN	154,720	UL	K8BL	158,080	UL	ACØDS	143,040	UL	KK7S	168,480	UL
K2NNY (K2DB, op)	165,760	UL	K4XD	131,840	UL	N9CO	156,000	UL	KØMPH	131,930	UL	KE7X	167,360	UL
K3AU (K2YWE, op)	154,080	UL	N4DW	129,920	UL	KB9S	102,542	UL	NØSXX	130,560	UL	K7QQ	115,498	UL
N2MM	140,000	UL	AA4FU	116,000	UL	K9WX	99,060	UL	WØPI	119,360	UL	VA6AM	99,856	UL
K3MD	113,280	UL	KU8E	99,680	UL	K4FXN	77,262	UL	N1CC	100,960	UL	K7GK	95,940	UL
W2FU	208,800	M	KP2M	205,920	M	W8EDU	147,200	M	WØDLE	183,680	M	W6YI	225,600	M
W3LJ	41,890	M	W5RU	189,440	M	NT8V	77,600	M	KØBJ	182,880	M	VE6EX	190,720	M
AB2DE	38,710	M	W4RM	169,280	M	K9SD	73,766	M	KØHB	151,200	M	W6TK	163,200	M
			AD4Z	146,624	M				NØMA	69,120	M	N6WIN	160,320	M
			N4FX	121,760	M				KØJA	44,352	M	K7GT	81,212	M
K3LID (WM3O, op)	100,800	ML	NP4DX	181,760	ML	K4BRI	11,152	ML	KØUK	79,772	ML	N6KI	128,320	ML
WA1QKT	480	ML	WR4I	69,888	ML	KC8OBH	10,340	ML	VE4DR	60,532	ML	WA6KYR	52,128	ML
			N2AW	16,048	ML	W8PLP	9,152	ML	WDØGTY	35,568	ML			
									KK5OV	12,480	ML			
W3ABT (K3BHX, op)	53,592	S	W4UAL	55,616	S							W6YX	213,600	S

Operator, High Power. The reason for that may be nothing more than geography. The Top 5 stations in U were each the top station in their sections regardless of category, sometimes by large margins. Some sections just get better skip angles than others and the hottest sections seem to have a propagation pipeline into the heart of the US ham population centered, approximately, on Ohio.

After years of "close, but no cigar" efforts, Montana's own Matt Trott, K7BG, finally pulled off a SS CW victory in Single Operator, Low Power. [Photo courtesy Matt Trott, K7BG]

Single Operator Unlimited, Low Power (UL)

New for 2011, the Unlimited, Low Power category is a place to play for those with access to spotting but who don't have or don't wish to use an amplifier. Like A-category, 150 W is the maximum allowed. UL was quickly embraced by operators. With 148 logs, it was the fourth most-popular category. The category was won by Chadd, KK7S from WWA. Coming in second was VA2WA, piloted by Victor, VA2WDQ who narrowly beat out Fred, KE7X.

"I really like the Unlimited, Low Power category! It's hard enough finding new sections to work and then actually working the rare ones with low power. Being able to see them on a spotting network is extremely helpful!" said Bob, K8BL whose 158,080 points were good for a victory in UL in the Central Region and No.5 in UL overall.

Multioperator, High Power (M)

Unlike 48-hour marathons, SS — with a 24 hour limit — doesn't earn a huge following in Multioperator categories. But those who play multiop all seem to have fun doing it. M-category can be quite the production, too, with some great food to fuel the troops and some excellent camaraderie. W6YI rode to a large victory over No. 2 W2FU with 105 more QSOs. KP2M in the Virgin Islands placed third and Alberta's VE6EX was fourth.

Multioperator, Low Power (ML)

Also a new category for 2011, ML wasn't embraced as heartily as was Unlimited, Low Power with 14 logs entered. But it appears to be a great introduction to SS with an inspirational appearance in Top 10 available to stations that otherwise wouldn't.

VE3 — Four Sections in 2012

Ontario will consist of four sections for the 2012 Sweepstakes. There will be a Greater Toronto section (like LAX or SF), and North, South and East Ontario sections. Section abbreviations will be announced in due course — make sure your logging software is up to date before the 2012 contest!

Bob Liddy, K8BL, of Mentor, Ohio shows what a modest station can do: He made the best score in the Central Region in the new Single Operator Unlimited, Low Power category, which was also good for 5th in the country. [Photo courtesy Bob Liddy, K8BL]

NP4DX won ML with 181, 760 points and 1,136 QSOs, which is an excellent result for a station limited to 150 W. That score would have put them into eighth place in multiop-erator against stations with the full 1500 W available. N6KI placed second at 128,320 points followed by K3LID.

School Club (S)

A record was set in 2011, with W6YX at Stanford University at 213,600. W6YX operator, Mike, N7MH said he was excited to join School category when it was opened up to alumni. In second place was Bob, KØBH, operating KØHC at Hesston College in Kansas.

With all the fine schools throughout Canada and the United States it would be good to see more entries in this category, which is designed to help Elmer students and staff into Amateur Radio contesting. A recent change opened up the category to alumni (previously, only current students and staff could enter) which should make it more attractive for hams to go back to their alma mater and get more people involved in the category. Sadly, only 5 entries were received in the School Club category.

The low entry count is something Mike, N7MH and Rebecca, KBØVVT lament. "I would like to see at least one School Club category entry for each of the 80 ARRL sections," Rebecca wrote (prior to the addition of three new sections for 2012).

Use the Database

There are a number of ways you can compare your score against others. With the online database at **www.arrl.org/results-database** you can sort by section, by category, and by club membership. It is a meaningful way to add context to your efforts, to find ways to improve your score, and to gain inspiration you might lack if you only focus on the Top 10.

See You in November!

The 2012 November CW Sweepstakes runs from 2100 UTC November 3 to 0259 UTC November 5. A sweep will be a little harder this year as the Canadian province of Ontario has been split into four sections that are yet to be named, growing the section count to 83. Dust off your paddle (and broom) and get ready for some contesting fun!

Radiosport

2012 ARRL June VHF QSO Party

Fun in the sun on 50 MHz + up!

1800 UTC Saturday June 9 – 0300 UTC Monday, June 11

- E-mail logs to **junevhf@arrl.org**. Paper logs to ARRL June VHF QSO Party, 225 Main St, Newington, CT 06111.
- Logs must be postmarked by 0300 UTC Wednesday, July 11, 2012.

Sporadic E propagation peaks in the Northern Hemisphere between May and August. For VHFers, this means excellent openings on 6 and even 2 meters, and the ARRL June VHF QSO Party capitalizes on the sporadic-E season. There have been incredible sporadic-E openings for this contest three years in a row. The ARRL June VHF QSO Party has estab-lished itself as the best VHF+ contest around!

- Most all-band rigs made today have a VHF band or two in them. Take your rig, get an antenna for 6 or 2 meters and set them up in your back yard, on a nearby hilltop, operate from your car or operate portable from a rare grid square and be the DX!

Complete rules and entry forms can be found at
www.arrl.org/sweepstakes

"No Problem, Mon!" Don Drennon, N4TZH/R sets up in the Florida Keys in EL94 during the 2011 ARRL June VHF QSO Party. Sadly, the Conch Republic doesn't count for DXCC. [photo courtesy N4TZH]

ARRL Field Day 2012

The largest on-air Amateur Radio event in the world is returning June 23 and 24! If you haven't already started planning your effort, now is the time to do so. Complete details and the official 2012 Field Day Kit can be downloaded at **www.arrl.org/fieldday**.

Is Field Day a contest, an emergency preparedness exercise, a public outreach event, or simply a fun day on the air away from home? The answer is — as the largest participation of any on-the-air Amateur Radio operating event, Field Day is all of these things! Field Day can take on many facets, depending on what you or your club wants to do with it. Whether you will be part of a large club effort in a city park, or backpacking your way into the wilderness for a solo QRP effort, Field Day encompasses everything that is fun and good about Amateur Radio.

VHF Stations and Field Day

For several years, ARRL has allowed Class 2A and higher stations to use a free VHF/UHF station to promote VHF/UHF activity. Since 2011, this free station has been extended to *all* Class A stations!

Most Field Day participants see the event as an HF-only affair. Not so! There are thousands of VHF enthusiasts that enjoy Field Day as well. With summer sporadic-E propagation, 6 and even 2 meters can have excellent openings to 1000 miles or more. During such good conditions, 6 meters can be as packed as 20 meters. Two meters and 70 cm are the homes of many a satellite, which offers even more chances for bonus points.

VHF operation is perfectly tailored for Field Day. Antennas are small and portable, and QSOs are easy during a good opening. A 6 meter dipole is less than 10 feet long, and small beams or loops for 2 meters or 440 MHz are easy to construct. See *The ARRL Handbook* or *ARRL Antenna Book* for easy homebrew VHF antennas projects.

If you have never used VHF/UHF in your Field Day effort, the ARRL has created a PDF document to get you started. The Field Day VHF Operating Tips paper gives frequency allocations and band plans, VHF/UHF operating techniques, antenna suggestions, brief propagation tutorials and other useful information for the VHF beginner. You can find the paper at **www.arrl.org/fieldday**. Like matching funds in a retirement account, don't miss this opportunity to get something for nothing.

Daryle Brooks, WB7TNE, and his wife, Kristine, KDØMPW, took to the water in Bear Creek Lake Park, near Morrison, Colorado for Field Day 2011. [photo courtesy Kristine Brooks, KDØMPW]

Members of the South Park (CO) Marauders had a spectacular view of the Rockies during their 2A entry in Field Day 2011. [photo courtesy Walter Baranger III, N6HKD]

Don't Forget The Field Day Public Relations Bonuses!

How would you like to be a hero and bring in 500 FD points for your group before a radio contact is ever made? A major purpose of Field Day is for Amateur Radio to tell its story to our friends, our neighbors, our communities and the leaders in our communities. As you plan Field Day, why not "think outside the box" and earn some bonuses for doing so?

✔ Instead of heading to a mountain top, how about a Wal-Mart lot?

Being in a conspicuous public place is good for *100 points*

✔ Instead of just telling your fellow hams and club members, how about telling the newspapers and local radio and TV? Press release samples are available at **www.arrl.org/pio** or in the Field Day Information Packet.

Having a media release or link is good for *100 points*

✔ Instead of staffing a radio, how about manning a public information table with brochures, signs and a smile?

Having a public information table/center is good for *100 points*

✔ Instead of glad-handing the mike, how about shaking hands with your areas elected officials and politicians? A sample invitation is in your Field Day packet

If an *invited*, elected local official visits you earn *100 points.*

✔ Instead of talking *to* a served agency, how about inviting one of their leaders to come down and visit you, perhaps even getting to talk on your radio?

If an *invited* official served agency representative visits — *100 points*

Total = 500 points!

Basic Info

When: 1800 UTC Saturday June 23 through 1759 UTC Sunday, June 24.

Setup: Stations may not begin setting up until 1800 UTC Friday, June 22. If you wait until 1800 UTC Saturday to begin setup, you may operate until 2100 UTC Sunday.

Reporting Your Score: All scores must be received at ARRL HQ no later than July 31, 2012. Participants are *strongly encouraged* to use the online Field Day score reporting system at **www.b4h.net/cabforms**. You get instant satisfaction of your score summary being accepted, with a receipted copy e-mailed to you for verification and you earn 50 bonus points!

Use The Field Day Locator! Want to tell the world where your club's Field Day effort will be? Going to be out of town and want to find a Field Day site to join? You can do both at the ARRL Field Day Locator page. Visit **www.arrl.org/field-day-locator** and get started.

Don't Forget the VHF gear! All Class A stations receive a *free* VHF+ station. Don't leave free points on the table. For ideas on VHF station implementation and operation, download the Field Day VHF Operating Tips PDF at **www.arrl.org/fieldday**.

Questions? E-mail Field Day Manager Dan Henderson, N1ND at **n1nd@arrl.org**.

Bernie McClenny, W3UR, w3ur@arrl.org

Internet Resources

The web delivers a deluge of DX data.

DX University

On Friday, April 20 I'll be participating in an all-day event called "DX University," as one of nine professors teaching the "secrets of operating techniques for working DX, optimizing stations & antennas for DXing, about propagation, information sources, awards, ethics, remote operating, QSLing and much more." This will be the second running of DX University, which will take place in Visalia, California at the International DX Convention. My 30 minute topic will be "Internet Resources."

Since I am currently working on my presentation (**www.dxuniversity.com**), what better way to kill two birds with one stone than write this month's column on my topic? This article will be on the street right around the time of the event. For the 90 students planning to attend — don't worry, I won't give out all the secrets.

Internet Resources

Some of you might remember my first article in the "How's DX?" column, almost 14 years ago, on this very subject entitled "The Internet: A Tool for the DXer."[1] Being a DX editor (*The Daily DX*, *The Weekly DX* and "How's DX?") I have relied heavily on the Internet both for information and to communicate with sources around the world. It provides a means to get news, confirm information and to produce all three of my publications. There is a lot of information on the web — not all of it is correct! Mistakes need to be corrected as soon as possible before they go viral.

DX News

The World Wide Web (WWW) offers a huge resource for DX news with global sources. Some information comes from reflectors or mailing lists, DX bulletins or newsletters (some free, some by subscription), websites, blogs and, of course, e-mail.

There are hundreds of Amateur Radio e-mail mailing lists (**www.ac6v.com/mail.htm**), which cover all aspects of the hobby. An e-mail is sent to one e-mail address (the mailing list) and then "reflected" to all those on the list. There are over a dozen DX mailing lists, many in other languages besides English. The North Jersey DX Association runs what is probably the most popular English language DX mailing list. With mailing lists, there is usually a lot of excess noise. Unless you want to filter it manually or it has a heavy handed moderator, it may not be the best place to get your news.

On the other hand, if you have questions about DXing they usually offer someone willing to help. My favorite DX mailing list is the *Topband* reflector as Tree Tyree, N6TR, is the moderator and keeps us on subject. Many DX and contest clubs also have their own mailing lists and these can be great sources for DX news, keeping up with the local DXers and contesters and finding out about local conditions. Some of my favorite club reflectors are the West Virginia DX Association, the Twin City DX Association, Central Arizona DX Association, Southeastern DX Club and the Chiltern DX Club. I support all these clubs through my membership. All of them offer good comradery and local DX happenings. There are also some special interest mailing lists, such as for Islands On The Air (IOTA), the 6, 60 and 10 meter bands, low power, RTTY and much more.

The WWW, through e-mail and websites, offers several DX newsletters or bulletins. Some are free and others are available by subscription. On the free side, you have the *ARRL DX Bulletin*, which comes out on Thursday afternoons. If you are an ARRL member, you can have it automatically e-mailed to you. Other notable weeklies include *425 DX News*, *OPDX* (Ohio/Penn DX) and *DX Mitteilungsblatt* (DXMB in German and DXNL in English). On the pay side are *QRZ DX*, *Les Nouvelles DX* (in French) and my newsletters *The Daily DX* and *The Weekly DX*.

Several DX sources publish news items throughout the day that are worth reviewing. They include 4L5A's website (**dxing.at-communication.com/en**), *DX World.net* (**www.dx-world.net**) and *DXCoffee* out of Italy (**www.dxcoffee.com/eng**).

DXpedition Websites

Many serious DXpeditions have their own websites, which include such things as dates of the DXpedition, biographies of team members, equipment and antennas to be used, suggested frequencies, a great circle map, propagation forecast, picture gallery, QSL information, sponsorship information, log search and usually a contact person or pilot station. We've all heard the saying "don't judge a book by its cover." Well, you can say the same about DXpedition websites. Sometimes the websites have all the bells and whistles but the actual DXpedition doesn't live up to those same expectations. For some DXpedition websites it's vice versa; they don't have any bells or whistles, but put all their efforts into the most important aspect of the DXpedition, putting stations in their logs!

While we are on the subject of DXpeditions, websites and logs I need to get something off my chest that I have been meaning to say for some time. Now don't misunderstand me; I think online logs are great but you should know if you made a solid contact or not. Now we all realize things happen. Interference, lids, DX police, propagation, etc can make it difficult. If you don't think you had a good contact or you are not comfortable with a contact, then try again until you are sure it was a good contact. But remember, if you can't hear the DX then you should not be calling him!

There is a lot of information on the web — not all of it is correct!

Back in the old days, before Internet log searches what did DXers do? They made sure they had a solid contact and until then they kept calling, as long as they could copy the DX station. Okay, so let's say you honestly

[1] B. McClenny, W3UR, "The Internet: A Tool for the DXer—Part 1," *QST*, Sep 1998, p 82; "The Internet: A Tool for the DXer—Part 2," *QST*, Oct 1998, p 90.

believe you made a contact and after ample time you check the online log and your call is not there. Is it the end of the world? No. So what should you do?

Honestly, the best thing you can do is to request a QSL card from the QSL manager by postal mail. Put a short, direct note in the envelope explaining what happened and that you are sure the contact took place. Tell the QSL manager you checked the online log and did not see the contact. Make certain you include your e-mail address, in case he needs to contact you with other questions about the contact. After all the good contacts have been confirmed, a good QSL manager will research the problem. The QSL manager will most likely communicate with the actual operator for the contact in question to try to resolve the issue. Do not e-mail the QSL manager as this just slows down the process for everyone else and most QSL managers will just repeat this information.

Using Search Engines

Internet search engines such as Google or Bing are great ways to find information about stations you have worked in the past. This is especially true if you are trying to track down an old QSL card. Although I will say that the older the contact the more difficult it will be to find information about it.

For example, let's say you are looking for a QSL route for a 1957 contact with VS9ABL from the deleted DXCC Entity of Aden, People's Democratic Republic of Yemen. It's not listed in **QRZ.com** or Buckmaster. So try going to the normal Google search page and put in the call "VS9ABL." More than likely you will get too many results. So try adding another search word in addition to the call. For example, the operator's name was Brian (you did write down his name in your log didn't you?). Add in the year of the contact "1957." Now you have just eight results, instead of the initial 20.

Narrowing down the results will help. Clicking on the first result returns the ever helpful Les Nouvelles DX (French DX News) website with photos of QSL cards. Yes, it's written in French but you can easily tell the operator was Brian G. Levett, G3TXH. You can now go to **QRZ.com** and enter G3TXH to find his e-mail. Another way to find an old QSL card is to go to Google, click on "Images" and then put in the call sign.

DX Awards

For those who enjoy chasing awards the best place to go is the K1BV DX Awards website at **www.dxawards.com**. If there is a DX Award out there that is not listed on this site it must be because it's brand new as Ted seems to keep his site very up to date.

IOTA News

The Islands On The Air (IOTA) award is probably the fastest growing of the popular operating events. Besides the DX newsletters and the IOTA mailing list, you can also find announced operations on the RSGB IOTA website (**www.rsgbiota.org/activations/today.php**) and the Island Chaser website (**www.islandchaser.com/iotw/calendar2**).

DX Cluster Network

The DX Cluster Network, a term coined by Jim Reisert, AD1C, is a conglomeration of all the DX cluster nodes that are networked around the world. DX spots from around the globe are sent and collected by hundreds of cluster nodes and then distributed to DXers around the planet via their computers, cell phones and yes even a few dumb terminals.

There are many ways to view this information. You can use the web-based DX Summit or other similar web pages (Asia DX Window, Mega DX Cluster, DX Watch, DX Scape or Ham Radio Deluxe) or connect using your computer logging program (like *DX4WIN* or *DX Keeper*). If you don't have a computer logging program you can use VE7CC's very popular *CC Cluster User* program. There are also multiple apps for cell phones, which can also monitor the DX Cluster Network.

Your editor's opinion is that the web pages like DX Summit are great for doing research, but not so much for real time DX spotting since pages don't update instantaneously. For example, DX Summit updates about every 2 minutes. They are great for going back and finding out information like QSL routes and seeing DX stations patterns or trends. If you want real-time spots you are better off using software to connect to one of the many telnet clusters. If you are a CW operator you probably will want a node connected to the Reverse Beacon Network (RBN) spots, but be aware those spots are nowhere near 100% accurate. True, the human spots are also not 100% but the RBN spots are down a notch or two from DXers' spots.

By using software like VE7CC's (and others), you can define what DX *is*! In other words, you can filter out spots you don't want, either by spotter or by the DX stations being spotted. You can decide which band or mode spots are important to you. I believe that the DX Cluster Network should allow all spots to pass through with an option to allow or disallow spots from the RBN. The choice of what is DX should be left up to the individual. Let them implement filters using their own software or options on the node they use.

Spotting Protocols

Since we are on the subject of DX spots through the DX Cluster Network, there really does need to be a protocol of what is and is not an acceptable use of the system. Spots should be just that! They should be relevant. In other words, the information in a spot should let everyone know the call sign of the DX station and the frequency he is operating on, possibly along with a very short pertinent comment such as "QSL via," "listening up 3 kHz" or "now working VK and ZL only."

If the DX spot does not contain useful significant information, don't post it. Asking a DX station or DXpedition to change frequency to another band by using the spot feature is not a good use of the spotting system. Saying you received a QSL today through the spotting system, although this is good news, it is not a good use of the network. It's also not a good idea to self-spot or spot your log as you work stations on your own frequency. When someone makes these types of spots and the DX station really is not on the spotted frequency you're just asking for problems.

Remember, 6 meter spots and some others are recorded on maps on some websites. So, when someone makes a bogus spot asking a station to show up on a certain frequency or when bragging that they received a QSL card, it causes errors on these maps. Probably the best place for irrelevant or immaterial information would be as an announce message, which you can also filter.

Propagation

Many propagation websites offer great information. My favorite has to be **SolarHam.com** by Kevin, VE3EN. This has just about all the data you need right in front of you on one page. I've also listed a few other useful pages at **www.dailydx.com/propagation.html**.

QSL Information

The web is full of QSL information but some resources are better than others. My favorite ones are IK3QAR, QSLINFO and OZ7C. I have these and others listed at **www.dailydx.com/routes.html**.

Wrap Up

Well that's all we have room for this month. For those of you going to the International DX Convention in Visalia, California I look forward to seeing you there. Don't forget to send me your DX news, photos and club newsletters. My e-mail is **w3ur@arrl.org**. Until next month, see you in the pileups!
— *Bernie, W3UR*

Jon Jones, NØJK, n0jk@arrl.org

New Digital TV DX Record

Digital TV and Sporadic E keep things hopping this month

I mentioned KH6HTV's report of Bill, KØRZ, setting a new HDTV 70 cm record of 75 miles in the March 2012 column.[1] Here is Jim Andrews, KH6HTV, telling the story of their remarkable achievement and the equipment they used. — Ed.

A new Colorado record for long distance transmission of amateur Digital Television (HDTV) was set on November 21, 2011. The distance was 75 miles from Cheyenne, Wyoming to Boulder, Colorado. A live, high-definition, (1080i, 16:9) DTV picture was transmitted on 70 cm by Jim Andrews, KH6HTV, from a ridge line on I-25 just south of Cheyenne to Bill McCaa, KØRZ, on Davidson Mesa, southeast of Boulder. In addition, we successfully transmitted NTSC, analog, 70 cm TV pictures over this same path. There were three other Boulder hams, Roger Salaman, KØIHX; Don Nelson, NØYE, and Jack Quinn, KØHEH, who participated in the TV DXpedition attempting to receive both the analog and digital TV signals at their home stations.

Jim was transmitting a 5 W DTV signal on channel 58.1 (429 MHz) with a KH6HTV VIDEO, model 70-8, analog/digital TV transmitter. The antenna was a vertically polarized, KLM, 6 element Yagi with 11 dBi gain at 10 feet. The modulation used was QAM-64, which is the same modulation used on the US cable TV (CATV) systems. Standard home analog/digital TV receivers can receive QAM-64 signals without a converter box. We also tested conventional NTSC (480i, 4:3) and Vestigial Upper Sideband TV (VUSB-TV). For VUSB-TV, the model 70-8 output power was raised to 25 W PEP on channel 57 (421.25 MHz).

The secret to the success of this 75 mile DTV DX contact was Bill's large antenna system. Bill used an array of eight, 22 element Yagis with a 0.3 dB noise figure (NF) preamplifier mounted at the antenna (see Figure 1). The antenna gain was 27 dBi. To emulate a more conventional ham TV station, Bill also used a KLM 6 element Yagi (11 dBi gain) with a 0.5 dB NF preamplifier. The DTV receiver was a conventional Insignia 22 inch LCD-TV. A precision step attenuator was used in front of the 0.5 dB NF preamp/TV receiver to determine the received signal margin above QAM-64 digital threshold (–85 dBm).

The 75 mile path from Cheyenne to Boulder was a perfect line of sight path with no intermediate obstructions. KH6HTV's transmit location was at 41° 2' 53" N × 104° 53' 26" W at an elevation of 6265 feet. KØRZ's receive location was at his home station at 39° 59' 0" N × 105° 10' 6" W at an elevation of 5620 feet (see Figure 2). The low point on the signal path was at the Cache la Poudre River at an elevation of 4900 feet.

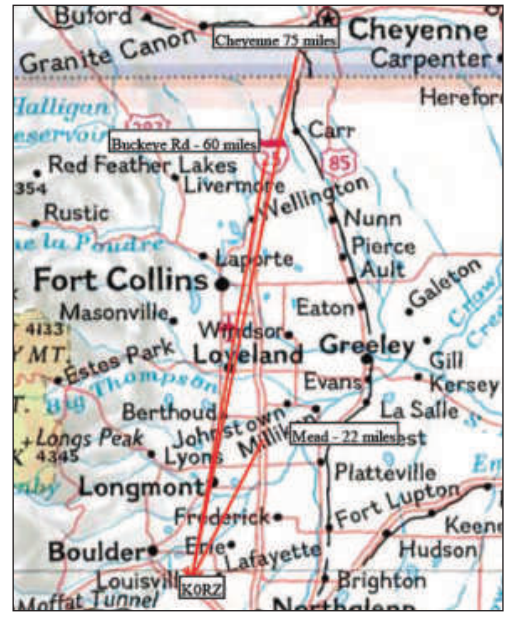


Figure 2 — This map shows the DTV DX contact, which happened between Cheyenne, Wyoming and Boulder, Colorado.

KØRZ had a lot of prior experience using this particular path for successful 10 GHz SSB contests. For the Cheyenne to Boulder DTV test, Bill needed to use his big antenna array to receive the 5 W DTV signal. The receive margin was 7 dB. No DTV signal was received on the 6 element Yagi. For the 25 W analog TV signal, Bill reported a P2 (poor) picture on the 6 element Yagi and a P5 (excellent) picture with the big antenna.

Figure 1 — Bill McCaa's, KØRZ, array of eight, 22 element Yagis used to set the 75 mile DTV DX record. [Bill McCaa, KØRZ, photo]

This Month

May 26-27	Good EME conditions*
May 27-30	Best EME conditions*

*Moon data from EA6VQ

[1] J. Jones, NØJK, "World Above 50 MHz," *QST*, Mar 2012, p 94.

Roger, KØIHX, was using an 11 element, 14 dBi, M^2 Yagi antenna at 27 feet and no preamplifier. He was unable to receive the DTV signal, but he reported receiving a P3 (fair) picture on the analog TV signal.

On the Bands

50 MHz. The big news for February was one station — **FK8CP** in New Caledonia. Remi caught numerous openings to the US including several extensive ones all the way east to West Virginia. E_s links to TEP played a crucial role in many of these openings.

On February 7 (0800Z), Dan, K3ZXL, (EL87) worked Remi on both SSB and CW using a 4 element Yagi at 25 feet. Dave, N9HF (EL99) also worked him on both modes for country #74 on 6 meters. John, W5UWB (EL17) worked Remi that evening as well. Terry, K4RX (EM70) noted the February 7 opening was "huge" to FK8CP from W4 and W5 and lasted several hours. He observed there was a "long sustaining E_s cloud over Mexico that produced E_s links."

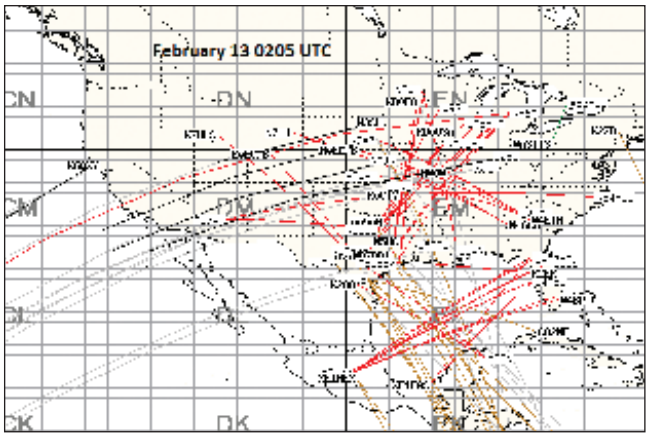


Figure 3 — Remi, FK8CP, in New Caledonia was a big surprise for lucky 6 meter stations from California to the Midwest. New Caledonia is located in the South Pacific about 1000 miles east of Australia. [DXSHERLOCK]

Terry also logged ZL1RS and VK4CS that evening. Joey, W5TFW, put FK8CP in his log at 0155 UTC. "I got him tonight. I am tickled!" Joey uses a 9 element Yagi at 21 meters for 50 MHz. Pat, W5OZI, in south Texas worked FK8CP, ZL1RS and several XE1s via E_s. Earlier in the afternoon of the 7th Pat worked TI5XP and OA4TT around 2315 UTC. From the Heartland, Bill, KØHA (EN10) and NØJK (EM28) noted E_s to XE2O/b (EL05) for several hours, from 2300 UTC February 7 to after 0200 UTC February 8.

The next evening (February 9 UTC) FK8CP was back, this time working into the Dallas/Ft Worth Metroplex. W5LUA, WD5K and WUØR were among the lucky ones to work Remi.

February 10 it was "FK8CP again" and W5UWB heard him for 10 minutes around 0030 UTC.

Saturday, February 11 (1200 UTC) a strong E_s-TEP opening to South America occurred. Tim, NWØW (EM47) Missouri heard Doug, ZP6CW, and worked PY2XB, LU5FF, CE1/K7CA and CE2/VE7SV around 0130 UTC. He heard XE3ARV strong via E_s. He copied CE1/K7CA for 1½ hours! This opening was better for the Gulf Coast stations. Operators in the Houston area had many of the South American stations 5×9 plus. Bruce, KØYW (DM69) worked Jack, OA4TT, at 0241 UTC February 12: "My first 2 way QSO with OA after nearly 60 years of trying...beginning with OA4C back in the late 50's."

On February 13 (UTC) a huge breakout opening occurred for FK8CP (see Figure 3). Remi worked across a wide swath of the midsection, from California through the Midwest to W8. This was the biggest opening to date outside of the Gulf Coast region for FK8CP. NWØW said Remi was "unbelievably loud." K9RT in Indiana spotted Remi simplex on SSB at 0158 UTC. I copied FK8CP through heavy power noise up to S-9 on SSB while I was portable in Topeka, Kansas. NØLL (EM09) also heard Remi. FK8CP worked W5KI, N3SL (EN12) at 0156 UTC, KØHA (EN10) at 0213 UTC and W8IF (EM79) at 0221 UTC. Remi switched often between CW and SSB, simplex and up 3 on CW, changing modes and split frequently. He then said "up 10" on SSB. Some stations thought he was changing frequency up 10 kHz, rather than that he was listening there.

Charlie, N8RR, may have been the most easterly station to work FK8CP. Here's his story:

> I was noticing FK8CP and VK/ZL being spotted on 6M by south coastal stations in FL and TX on several days and always listened, hearing nothing at my WV QTH. On the evening of February 12 local (early morning Feb 13 UTC) I saw a spot for FK8CP of 50.110 from a K9. Thinking it was likely a K9 from down south, without any expectation of hearing anything, I flipped the rig to 6 meters.
>
> *There was Remi, in the clear, calling CQ on CW with a Q5 signal, peaking about S6*. I was shocked and unprepared. My amplifier, a converted SB-220, was on the workbench after a repair, and was not available in the operating lineup. Still, his signal was good enough there was hope for a QSO. I called barefoot (200W), along with a K9, who worked him first. After the K9 QSO, I had a clear shot; there was no pileup that I could hear.
>
> Remi had little difficulty copying me, despite the 419 report I received, and he was logged on 13 Feb @ 0150 UTC. Talk about a shot out of the blue, this was it! Rig was a FT5K with 200w and a 6M7JHV at 68' on a small hilltop. His signal was in here for 5 or 10 minutes, then the prop seemed to move west. I heard W8IF work him on SSB, then later WZ8D.

The following evening February 14, K5SW (EM25) worked FK8CP on CW on a short opening.

An aurora E_s opening took place on February 18. Al, KL7NO, worked VE8NSD (DP20), K7CW (CN87) and KE7V around 0300 UTC. TF3ML in Iceland heard the VE4VHF/b at 0416 UTC with an aurora buzz! The aurora may have been caused by a corotating interaction region (CIR). *CIRs are transition zones between fast and slow solar wind streams. Solar wind plasma piles up in these regions, producing density gradients and shock waves that do a good job of sparking auroras. Local solar wind data suggest that Earth moved through a CIR on February 18.* (**Spaceweather.com**)

Remi and other South Pacific stations continued to make appearances through the last week of February. On February 21 Steve, W5KI, heard FK8CP (again) and worked ZL3NW at 0032 UTC. "I started monitoring 50.100, and at about 0032z, in popped Rod, solid copy. Jumped out of seat. Started calling while amp warmed, but nothing. Finally after the 2.5 minutes, punched the button, and got him right away. A weak 559 here, but very solid. My first ZL."

Pat, W5OZI, also worked ZL3NW and received this e-mail from Rod:

> Hello Pat,
>
> Great to catch up with after all these years and let's hope there is more to follow. Looking at my note pad I see when you first called with your 35 watts I got the 'W' and the 'Z' and if my cw skills were better I may well have got more too. Rather interesting how long you could copy me for and it was good to get your reports as at times I though the propagation had gone and I was about to go QRT. I also managed to

work W5KI and W5EU. Perhaps they are not too far away from you?

Best wishes from down here and good DX.

73, Rod ZL3NW

On February 22 rare Guantanamo Bay appeared on the band. K1HTV, N2QT and others reported contacts with KG4AS around 2330 UTC via E_s. That evening, guess who's back — FK8CP! Remi showed up around 0200 UTC and made contacts to Florida, Texas, KS7S (DM41), K5YY (EM26), K9IL (EM56) and was 589 for K5SW at 0229 UTC. K9IL reported, "I worked Remi, FK8CP, on 6 meter CW, a pretty good thrill for me in EM56, NW Tennessee."

FK8CP later worked west coast stations such as K7JA (DM03), K6QXY and KR7O Nevada. K5SW was still hearing Remi at 0415 UTC! I heard FK8CP in KS along with the XE2O/b (EL05), XE2NBW (DL95) and XE2K/b (DM22) at 0245 UTC. From EM28, the great circle bearing for FK8CP is 255° and for XE2K/b it is 257°. There were extensive E_s as well February 22-23, from KS to NM, AZ and XE2. Bob, W4GCB, had double-hop E_s to N7AMA (DM33), AF6AV (DM12) at 0214 and W6YLZ (DM04) at 0223 UTC. Earlier the afternoon of the 22nd, Ken, AC4TO, worked ZL1RS at 2235 UTC.

There was Remi, in the clear, calling CQ on CW with a Q5 signal, peaking about S6.

Observations — the vast majority of openings from FK8CP were to the Gulf Coast region, particularly around Houston to Panama City. The peak time was around 0200 UTC. Some distances and times seem to "work" well on 50 MHz for TEP. The openings farther north and east were definitely E_s linked to TEP. Remi, FK8CP, advises "no dupes" and prefers only a CW or SSB contact. Remi's outstanding dedication and patience on 6 meters is appreciated.

Dave, N7DB, reported a rare E_s opening in the Pacific Northwest the afternoon of February 23. He logged four stations in AZ.

A widespread E_s-TEP opening from the eastern seaboard and Rocky Mountain states to South America occurred on February 26. Arne, N7KA (DM65) "worked LU8EEM on SSB with S9 signals and also heard CX2CC, CE6SAX, LU6ARR, and LU1AG."

On February 28 the "left coast" had a South American opening. "Little Pistols" as well as the big stations were successful. Phil, AF6AV, in San Diego using an IC-7000 and a "4 element Comet Yagi at 35 feet" worked LU8EEM, LU3CM, LU1DMA and LU6ARR around 2330 UTC. Gene, K7GZB, in Arizona with 100 W and a 3 element Yagi at 23 feet logged CX2CC, LU8EEM and CE6SAX. Gene went on "but wait, there's more. At 0150 UTC on the 29th I worked FK8CP!" Chris, WUØR (EM12) heard FK8CP, worked ZL1RS with 599 signals followed by E51CG 5×7 on SSB. WUØR uses a 5 element Yagi at 60 feet.

FFMA Rare Grid

Lance, W7GJ, worked K7VK portable in DN20 on 6 meters for a new rare grid February 22.

"This afternoon as K7VK was traveling down through Nevada (about 450 miles away), he set up a portable 6M dipole in DN20 and I worked him with his barefoot transceiver running FSK441 mode. You got to love what can be done with WSJT for working rare FFMA grids!"

144 MHz. Tropo reported by Sam, K5SW (EM25) on February 22 to W5RWT (DL99) at 1330 UTC. A few hours later stations in Florida including N3LL, KD4ESV and W4AS worked Eden, ZF1EJ, around 1720 UTC on tropo. In May of 1998 there were numerous tropo openings from the Gulf Coast and Midwest to the Caribbean. Does this early opening suggest May of 2012 will be a repeat?

Here and There

CY9 on 6 Meters. An international group of 10 operators will activate St Paul Island July 26-August 1, 2012. VE3EN is one of the announced operators and is very active on 6 meters. There's more information at **www.cy9m.com**.

Six Club. George, KØNNO, and Lisa, KAØNNO, now manage the Six Club and are building a new web page at **6mt.com**. Many interesting technical files are in their library for 50 MHz, UHF and microwave bands. Of interest to classic VHF radio enthusiasts are manuals for the Clegg and Swan VHF radios.

222 MHz Standings

Published 222 MHz standings include call sign district leaders as of August 7, 2011. For a complete listing, check the Standings Boxes on "The World Above 50 MHz" web pages at **www.arrl.org/wa50-standings**. To ensure that the Standings Boxes reflect current activity, submit reports at least every 2 years by e-mail to **standings@arrl.org**. Printed forms are available by sending a request with an SASE to Standings, ARRL, 225 Main St, Newington, CT 06111.

Call Sign	State	States Worked	DXCC Entities Worked	Grids Worked	DX (km)
1					
W1AIM	VT	22	2	59	2,021
K1WVX	CT	10	1	13	691
2					
K1JT	NJ	21	2	60	1,727
NY2NY	NY	9	1	17	650
3					
WA2FGK	PA	29	2	84	—
4					
K4ZOO	VA	27	4	94	1,690
K4RF	GA	37	2	105	1,968
AA4ZZ	NC	34	2	103	1,987
K4QI	NC	34	2	96	—
W4WA	GA	29	2	89	2,143
AA4H	TN	27	2	81	1,737
N4QWZ	TN	26	2	92	—
K4RTS	VA	18	2	66	1,337
KC4AYX	TN	9	2	---	1,289
KØVXM	FL	11	1	51	1,747
W4SW	VA	9	1	23	641
KE4WBO	FL	3	1	8	1,065
N9HF	FL	11	1	16	1,525
5					
K5QE	TX	27	4	86	1,736
K5UR	AR	42	2	220	—
K5SW	OK	33	2	135	2,059
W5UWB	TX	23	2	63	2,197
K5LLL	TX	17	2	70	2,089
WD5AGO	OK	12	2	30	1,975
K5YY	AR	22	1	78	1,560
K5YPV	MS	8	1	16	1,198
AA5AM	TX	7	1	24	1,100
AA5JG	OK	2	1	5	101
W5LUA*	TX	50	---	---	—
WA5VJB	TX	18	---	---	1,830
6					
KR7O	CA	9	3	48	1,638
K6QXY	CA	4	3	32	3,794
KC6ZWT	CA	9	2	53	1,371
N6ZE	CA	1	1	13	583.5
7					
W7MEM	ID	9	2	25	3,344
W7EME	MT	---	---	22	—
W7RV	AZ	12	3	55	1,740
8					
WA8RJF	OH	28	2	91	1,733
K8DIO	OH	28	---	---	1,355
K2YAZ	MI	23	2	76	2,167
N8IEZ	M	12	2	42	1,034
K8ROX	OH	12	2	15	1,239
N8PVT	MI	7	1	23	1,247
N8PUM	MI	5	2	21	1,390
9					
N9LR	IL	38	2	135	1,808
W9RPM	WI	21	2	98	1,400
AA9MY	IL	25	2	64	1,751
KA9UVY	IL	28	1	66	1,536
W9RM	IL	13	1	51	1,781
Ø					
NØLL	KS	25	2	110	1,900
KØAWU	MN	24	2	77	2,008
WØRT	KS	17	2	21	1,584
KØRZ	CO	16	2	55	2,002
WBØULX	SD	11	2	31	—
KBØPE	MO	21	1	65	1,033
KØFF	MO	18	1	52	1,174
KØGU	CO	10	1	18	1,913
WØLD	CO	3	1	3	632
Canada					
VE3KH	ON	15	2	51	1,093
VE2PIJ	PQ	9	2	33	694

*Includes EME contacts
— Not given

Special Events

Maty Weinberg, KB1EIB, events@arrl.org

Contact these stations and help commemorate history. Many provide a special QSL card or certificate!

Apr 1-Apr 30, 0000Z-2359Z, GI100MGY, Belfast, Great Britain. Project Whitestar. Titanic Sinking Centenary. 14.010. QSL. Via bureau or direct to: Charlie Morrison, GI4FUE, 60 Windslow Dr, Carrickfergus BT38 9BB, Great Britain. **groups.yahoo.com/group/projectwhitestar2012**

Apr 12-Apr 18, 1430Z-1800Z, W1S, Mystic, CT. Southeastern CT Radio Amateur Mobile System. Remembering the RMS *Titanic*. 20 m. Certificate & QSL. SCRAMS, PO Box 1174, Waterford, CT 06385. Facebook or **scrams.webs.com**

Apr 14, 1400Z-1900Z, K5DAK, White Hall, AR. Pine Bluff Amateur Radio Club. 819 Steam Locomotive. 14.250. Certificate & QSL. E. Glenn Wolf Jr, 210 S Estates Cove, White Hall, AR 7102. **radionovember@arwolfpack.com**

Apr 14-Apr 15, 1300Z-0200Z, WX4TN, Johnson City, TN. Northeast Tennessee District 7 SKYWARN. SKYWARN Recognition Day. 146.550 28.700 14.240 7.180. Certificate. Jason McCord, 608 Goods Dr, Kingsport, TN 37663. **www.wx4tn.org**

Apr 14-Apr 15, 2230Z-0200Z, DDH47 & DLØSW, Pinneberg, Germany. NWS Deutscher Wetterdienst Radio Group. Centenary *Titanic* Loss. 147.3 & HF bands. QSL. Via Bureau DARC – Baunatal, Germany or direct to Juergen Gerpott, Rebhuhnweg 21, Wedel DL 22880, Germany. *Special Morse code cross-band event for centenary of the loss of British luxury liner RMS* Titanic*/MGY*. **www.doese-apprt.de/mrd/titanic.html**

Apr 28, 1000Z-1600Z, W4BUG, Pompano Beach, FL. Gold Coast Amateur Radio Association. GCARA Goodyear Blimp Base Special Event Station. 14.325 146.610. QSL. GCARA, PO Box 773, Pompano Beach, FL 33061. **w4bug.org**

Apr 28, 1600Z-2200Z, W4XI, Tuscaloosa, AL. Tuscaloosa Amateur Radio Club. T-town Twister. 14.270 7.270. Certificate. Joel Black, 3967 Aspen St, Northport, AL 35475. *In remembrance of the 44 deaths due to the April 27, 2011 tornado.* **w4xi.org**

Apr 28-Apr 29, 1500Z-2300Z, K4T, Harvest, AL. KS3P. One Year Anniversary of April 27, 2011 Alabama Tornadoes. 7.250 14.250 18.130 21.310. QSL. Kaitlyn Cole, KS3P, 17 Willow Valley Dr, Harvest, AL 35749. **ks3p@arrl.net**

Apr 28-Apr 30, 1500Z-1700Z, K5F, Blue Ridge, TX. McKinney Amateur Radio Club. International Save the Frog Day — Frognot, Texas. SSB 28.450 21.300 14.227 CW 7.060. QSL. McKinney Amateur Radio Club, c/o QSL Manager, PO Box 267, McKinney, TX 75069. **www.mckinneyarc.org/frognot**

May 1-May 15, 0000Z-2359Z, K1A, Concord, NH. Sky is No Limit and Contoocook Valley Amateur Radio Clubs. Aerospacefest 2012. 28.460 21.360 14.260 7.260. Certificate. Fred Reed, KK1KW, 103 Berry Pond Rd, Pittsfield, NH 03263. **www.qrz.com/db/ka1sky**

May 1-May 15, 0001Z-0000Z, Various call signs, Various locations. CTRI Contest Group. 20th Anniversary Special Event. 28.380 21.090 7.035 3.540. Certificate & QSL. Patrick Atwood, NG1G, 197 Sand Pond Rd, Warwick, RI 02888. *Operation from CT, RI, MA and VT using individual 1×1 call signs, various freqs, modes and times, including numerous entries in the NEQP, May 5-6. Work 10 call signs for certificate; send QSL card or log info, large SASE and $2 to defray the cost of certificate. Submissions must be postmarked no later than June 1, 2012. See members'* **www.qrz.com** *page or* **www.wa1rr.org**

May 2-May 7, 0000Z-2359Z, W5S, Capitan, NM. Sierra Blanca Amateur Radio Club. Smokey Bear Days. 14.250 14.030 7.250 7.030; 20 m PSK31; other bands possible. QSL. SBARC, PO Box 773, Ruidoso, NM 88355. **www.sbarcnm.org**

May 4-May 6, 1200Z-1800Z, W1ACT, Chilmark, MA. Team HAMCOW/Fall River Amateur Radio Club. Martha's Vineyard DXpedition. 28.380 28.040 14.280 14.040 21.380 21.040 7.280 7.035. QSL. Roland Daignault Jr, 19 Davis Rd, Westport, MA 02790. *19th Annual DXpedition to Gay Head Lighthouse, Martha's Vineyard Island IOTA NA-046, US Islands MA-005S. Dukes County, MA. Operating during NEQP. Watch for updates on the HAMCOW web site throughout the weekend. SASE only please. QSL direct via N1JOY*. **www.qsl.net/bcra** *or* **hamcow.net**

May 4-May 6, 1900Z-0200Z, W5CCW, Liberty, MS. Amateur Radio Club of Amite County. Liberty Heritage Days. 28.450 14.240 14.040 7.240. QSL. Paul J. McGehee, 4044B Hwy 567N, Liberty, MS 39645. **w5ccw.net**

May 5, 1300Z-1700Z, W5AUU, Conway, AR. Faulkner County Amateur Radio Club. Toad Suck Daze. 14.260 7.260. Certificate & QSL. Faulkner County Amateur Radio Club, PO Box 324, Conway, AR 72033. **www.w5auu.org**

May 5, 1300Z-2200Z, K5SRC, Pawnee, OK. Stillwater Amateur Radio Club. Oklahoma Gas and Steam Engine Show. 14.270 7.260 3.885. QSL. Nelson Ehrlich, WB5ONA, 1716 Summit Ridge Dr, Stillwater, OK 74074.

May 5, 1600Z-2100Z, WE7GV, Green Valley, AZ. Green Valley Amateur Radio Club. Titan Missile Museum Special Event. 14.246 14.244 14.242. Certificate & QSL. Green Valley Amateur Radio Club, 601 N La Canada Dr (SAV), Green Valley, AZ 85614. *Titan Missile Site in Sahuarita, AZ; will be using the Collins discage antenna*. **gvarc.us**

May 5, 1700Z-2300Z, N7K, Kingman, AZ. Hualapai Amateur Radio Club. Army Airfield WW2 Gunnery School. 28.480 21.380 14.240 7.240. QSL. Hualapai Amateur Radio Club, PO Box 6908, Kingman, AZ 86402. *To thank the 36,000 gunners trained in Kingman, AZ, who fought for freedom during WW2. "All gave some and some gave all." Special QSL issued with SASE and QSO information 30 days after event.*

May 6-May 15, 0000Z-0000Z, AAØNC, Lake Ozark, MO. Northside Amateur Radio Club. Oma Noma Days. 28.375 14.240 7.178 3.908. Certificate. Luke Milka, 19285 Wonderland Rd, Rocky Mount, MO 65072. *Celebration of the opening of Bagnel Dam at Lake Ozarks, Missouri. Sisters Oma and Noma were the first to cross the dam by automobile.* **www.aa0nc.com**

May 10-May 12, 1500Z-2100Z daily, W7G, Ogden, UT. Ogden Amateur Radio Club. 143rd Golden Spike Commemoration Celebration. 28.355 21.285 14.255. QSL. OARC — W7G , PO Box 3353, Ogden, UT 84409. *From the Golden Spike National Historic Site. Celebrating the joining of the rails connecting the Union and Central Pacific Railroads on May 10, 1869 at Promontory Summit, Utah Territory.* **www.ogdenarc.org**

May 10-Jun 8, 0700Z-1900Z, VE3A, Mississauga, ON. Robert Emerson. Diamond Jubilee of HM The Queen of Canada. 28.490 21.290 14.290 7.143. QSL. Robert Emerson, 6950 Summer Heights Dr, Mississauga, ON L5N 7E9, Canada. *$2US for QSL card; US postage cannot be used in Canada. LoTW available*. **www.qrz.com/db/ve3a**

May 12, 0000Z-2359Z, W8SP, Grafton, WV. Mountaineer Amateur Radio Association. 2012 Mother's Day Special Event. Bottom of Gen bands 80 40 20 15 m phone; CW bands; and Novice 10 m phone subband. Certificate & QSL. Charles T. McClain, K8UQY, Rt 4 Box 161, Grafton, WV 26354. *Commemorating the first official observance of Mother's Day at the International Mother's Day Shrine in Grafton, WV*.

May 12, 1000Z-1800Z, WA4TRS, Fairview, NC. The Road Show Amateur Radio Club. The Road Show ARC Chili Team. 28.380 7.240. QSL. The Road Show ARC, 57 Echo Lake Dr, Fairview, NC 28730. *Other frequencies possible; find the Chili Pot, VHF and HF Fox Hunt.* **chillieteam@theroadshowarc.com** *or* **www.theroadshowarc.com**

May 12, 1500Z-2100Z, WX5MC, Locust Grove, OK. Mayes County Amateur Radio Club. Centennial Anniversary Locust Grove, OK. 28.380 14.280 7.180 147.06 88.5 PL. Certificate & QSL. Shelley Horton, AE5DQ, 7689 S 443, Locust Grove, OK 74352. **qrz.com/db/WX5MC**

May 12, 1600Z-2359Z, NI6IW, San Diego, CA. USS *Midway* (CV-41) Museum Radio Operations Room. Armed Forces Day, National Maritime Day, MARS Amateur Radio Crossband Operations Event. SSB 14.320 7.250; PSK31; 14.070 D-STAR 012C and 2 m/70 cm SOCAL rptrs. QSL. USS *Midway* Museum Radio Room, 910 N Harbor Dr, San Diego, CA 92101. **kk6fz@arrl.net**

May 12-May 13, 1300Z-2300Z daily, W1S, Waltham, MA. Waltham Amateur Radio Association. 3rd Annual Steampunk City Festival. 14.280. Certificate & QSL. Bill McInnich, KA1MOM, 26 Margo Rd, Brighton, MA 02135.

May 13-May 14, 0700Z-0700Z, N7Q, Seaside, OR. Mouth of the Columbia Amateur Radio Club. Mouth of the Columbia Day. RTTY 14.120 10.125; Voice 28.305 3.950. Certificate & QSL. MOTCARC QSL Manager, 41155 Schoolhouse Ln, Astoria, OR 97103. *In honor of Silent Key N7LWQ, known as "The Mouth of the Columbia." More frequencies* **mouthofthecolumbiaarc.org/motcday**

May 13-May 18, 0000Z-2359Z, GB5LCT, Lambert's Castle, Marshwood, Dorset, England. Radio Society of Great Britain. Lambert's Castle Shutter Telegraph. 14.200. QSL. RSGB or direct to John Wakefield, Oakhurst, Lower Common Rd, West Wellow, Romsey SO51 6BT, England. **www.qrz.com/db/gb5lct**

May 17-May 20, 1000Z-1700Z, HB9MERK, Sumiswald, Emmental, Switzer-

land. PAØHEL/HB9ELZ. MERK Mennonite European Regional Konferenz. 14.292. 80 40 20 15 10 propagation permitting. QSL. H. H. de Vries, PAØHEL, Knoopshofte 4, Almelo 7605 AN, Netherlands. **www.merk2012.ch**

May 17-May 20, 1200Z-2000Z, W8H, Dayton, OH. Feld Hell Club. Dayton Hamvention. 50.286 28.074 14.063 7.077. QSL. Scott Pettigrew, N8VSI, 6015 Driftwood Ct, Maineville, OH 45039. **www.feldhellclub.org**

May 17-May 21, 2300Z-2300Z, N4G, Woodbury, TN. Dekalb-Cannon Amateur Radio Club. Cannon County Good Old Days. 14.240 14.040 7.040. QSL. Jerry Elkins, N4LZY, 108 Bellehill Ln, Woodbury, TN 37190. **geode@heartoftn.net**

May 18-May 20, 1600Z-2200Z, N2C, Norwich, NY. UHS Chenango Memorial Hospital. 100th Anniversary. All bands, all modes. Certificate. Tony Masi, N2GVB, 3289 State Hwy 206, Bainbridge, NY 13733. *Cut off date for receiving certificate is June 23, 2012.* **amasijr@stny.rr.com** *or* **www.qrz.com/db/n2gvb**

May 18-May 21, 2300Z-2300Z, K6M, San Mateo, CA. Blackberry REACT. Maker Faire Amateur Radio. 14.250. QSL. Phil Stripling, 301 S Grant St, San Mateo, CA 94401. **blackberryreact.org**

May 19, 1400Z-2300Z, W5C, Hearne, TX. Bryan Amateur Radio Club. Inaugural Armed Forces Day Appreciation at Camp Hearne. 28.400 14.250 7.200. Certificate & QSL. Bryan Amateur Radio Club, PO Box 4442, Bryan, TX 77805. **www.bryanarc.org/camphearne**

May 19, 1500Z-2300Z, W5I, Denison, TX. Grayson County Amateur Radio Club and the Perrin Air Force Base Museum. Armed Forces Day. 14.250 7.250. QSL. Grayson County Amateur Radio Club, 1026 Valentine Dr, Sherman, TX 75090. *Special Event Station and Tailgater's Swap meet, 9 am to 5 pm on Sat May 19 at the Museum.* **ab5nx@gmail.com** *or* **ki5dq@verizon.net**

May 19-May 20, 1200Z-2100Z, W2GSB/APM, West Babylon, NY. Great South Bay Amateur Radio Club. American Air Power Museum. 14.225 7.175 3.850; PSK 14.070. QSL. Great South Bay Amateur Radio Club/APM, PO Box 1356, West Babylon, NY 11704. *Also be operating on AO-27- SO-50 Amateur Satellites.* **www.gsbarc.org**

May 19-Jun 2, 1700Z-0200Z, W7OTV, Hillsboro, OR. Oregon Tualatin Valley Amateur Radio Club. SEA-PAC 30th Anniversary — ARRL Northwestern Division Convention. 28.460 21.290 14.260 7.190. QSL. Oregon Tualatin Valley Amateur Radio Club, 880 NE 25th Ave, Ste 2-160, Hillsboro, OR 97124. *Celebrating the first 30-years of the SEA-PAC Convention held in Seaside Oregon.* **www.otvarc.org**

May 20, 1600Z-2000Z, W8C, Muskegon, MI. First Baptist Church and Dave Thill, KD8OCZ. First Baptist Church Annual Car Show. 28.233 14.233. QSL. Dave, KD8OCZ, 521 Wood St, Muskegon, MI 49442.

May 20, 1600Z-2000Z, K2A, Roseland, NJ. Roseland Amateur Radio Club. Coastal Defense Forces Day. 14.275 7.275. QSL. Roseland Amateur Radio Club, 300 Eagle Rock Ave, Roseland, NJ 07068. *Celebrating Coastal Forces Day at the Sandy Hook, NJ, Lighthouse*

May 26, 1400Z-2000Z, N4USA, Floyd, VA. Foundation for Amateur International Radio Service. Chantilly Farm Bluegrass Festival. 28.400 21.325 14.318 14.250 7.235. Certificate. N4USA, PO Box 179, Floyd, VA 24091. *See us at Dayton Hamvention booth 412.* **www.fairs.org**

May 26-May 27, 0000Z-2359Z, N6G, Healdsburg, CA. Will Pattullo. 75th Anniversary of the Golden Gate Bridge 21.265 14.265 7.265. QSL. Will Pattullo, 161 Presidential Cir, Healdsburg, CA 95448. **ae6yb.tripod.com/n6g**

May 26-May 27, 1300Z-1600Z, W4JUP, West Palm Beach, FL. Jupiter Tequesta Repeater Group. Peanut Island. 18.130 14.240 14.072 7.180. QSL. QSL Manager, PO Box 7751, Jupiter, FL 33469. *Operating from underground in the bunker built as an atomic shelter and command center for President J. F. Kennedy during the height of the cold war.* **JTRG.org**

May 26-May 27, 2000Z-2200Z, W6G, San Francisco, CA. San Francisco Amateur Radio Club. Golden Gate Bridge 75th Anniversary. 28.375 24.975 21.275 18.125 14.275 7.175 3.750. Certificate & QSL. Tony Dowler, PO Box 1749, Pacifica, CA 94044. *SSB and CW. Certificate available for working 5 Bands.* **www.sfarc.org**

May 28, 1500Z-2200Z, WØFSB, Waterloo, IA. Five Sullivan Brothers Amateur Radio Club. Commemorating Memorial Day. 21.240 14.240 7.240. Certificate & QSL. Vernon Mc Nulty, 4015 Independence Ave, Waterloo, IA 50703. **t-mc-nulty@msn.com**

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. Off-line 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 **July** *QST* would have to be received by **May 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 Mar 10. You can view all received Special Events at **www.arrl.org/special-event-stations**.

Sean's Picks

Sean Kutzko, KX9X, ARRL Contest Manager

All dates/times are in UTC.

- **State QSO Parties this month:** The first weekend in May is **the** weekend for state QSO parties. The New England QSO Party, 7th area QSO Party and the Indiana QSO Party all fall on this weekend. This is your chance to work several dozen counties in a single weekend…or activate rare counties if you live in these areas. Nevada has their Mustang Roundup the weekend of May 12.
- **QRP contests this month:** ARS Spartan Sprint (May 8), NAQCC Monthly QRP Sprint (May 17), Flying Pigs' Run for the Bacon (May 21), QRP ARCI Hootowl Sprint (May 28), MI QRP Club Memorial Day CW Sprint (May 28-29).
- **Ten-Ten Spring CW Contest (May 5-6):** In case you haven't heard, 10 meters is back! This 48 hour event will help you work a lot of stations on the band, and collect Ten-Ten numbers. Don't have a Ten-Ten number? Work 10 stations, submit their numbers to Ten-Ten and get your own!
- **Alessandro Volta RTTY DX Contest (May 11-12):** This marks the 46th running of this contest in honor of the Italian inventor of the battery. Everybody works everybody, but you can't work a station in your own call area (W1AW can work a W3, but not another W1).
- **His Majesty the King of Spain Contest, CW (May 19-20):** How many Spanish provinces can you work? Point your beams toward España and find out! Everybody works everybody, but special points and multipliers are awarded for QSOs with Spanish provinces.
- **CQ WPX Contest, CW (May 26-27):** Prefixes, prefixes! Every new prefix you work is a multiplier. And now that ARRL's Logbook of the World will soon track prefixes for the CQ WPX Award, there's even more of an incentive to work this already-great contest.

John Dilks, K2TQN, k2tqn@arrl.org

Collins Radio 30FX

A rare transmitter and the man who restored it.

This rear view shows the interior of the Collins 30FX transmitter after Don's exceptional restoration job.

As far as I'm concerned, the pinnacle of collecting vintage commercial ham radios is owning a Collins. When I was a young ham in high school, all I could think about was owning a new Collins radio or one of the other great names. Instead, like most of us, I built my transmitters out of old TV sets and donated parts from my Elmers. I did own several older, used big name receivers as I gained experience, age and earnings from my part-time jobs. When I finally was old enough, I got a good full-time job, but then marriage and children came along and my dream of owning a Collins remained just that.

Even later, after I started collecting, owning a Collins eluded me as I found they were very collectable and their prices were still out of reach. Eventually, I found some affordable (to me) Collins radios — most needed work. Over time, I gathered several nice ones.

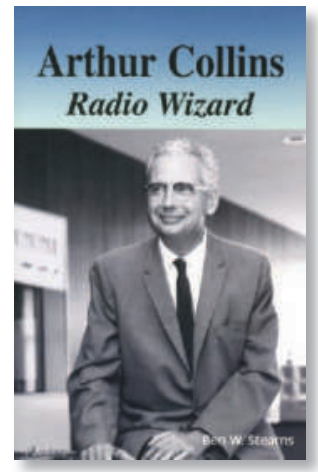
Why does a Collins radio hold its value when others do not? The answer is Art Collins, WØCXX.

As a teenager during 1924 Art Collins, 9CXX, became well known when he hooked up with John Reinartz, 1QP, the schooner *Bowdoin*, WNP, and with naval pilot and explorer Richard Byrd who was attempting to fly over the North Pole. Art founded his radio company in the early 1930s to manufacture high quality transmitters for hams. Later in 1933, he was chosen by Byrd to manufacture transmitters for his Antarctic Expedition. His radios worked very well and that good publicity spurred his company's growth.

A front view of the restored Collins 30FX transmitter.

Arthur Collins, Radio Wizard

I recommend this book, written by Ben Stearns, on Art Collins and his company's history. When I read this, I was filled with pride. Pride in Art Collins and pride for all that he did for our country. It's a long story that I'll cover in parts from time to time in the future. In the meantime, you can find this book at **www.collinsbook.com** and at several locations on the Internet.



Ben Stearns' book is an excellent history of Collins Radio.

Finding the Collins 30FX

We all dream of finding an exceptional piece for our collection. I wish this story was about me, but I'm still looking for one. In September 2003 Don Benecchi, K1DC, received a telephone call from the son of a Silent Key who said he needed to clean out the garage filled with old radio parts and that if Don wanted anything to come over and pick it up. Otherwise, it was going to the dump.

Don went over and found lots of junk and half-complete radio projects from the 1930s. Then he spotted the 30FX and saw the Collins label on it. Don was unaware of this early radio. He checked on the Collins Collectors Association web page (**www.collinsradio.org**) and found out what it was.

It showed evidence of arcing and needed a complete restoration.

Don Benecchi, K1DC, in his vintage station.

Don said he didn't realize what a rare find he had until he investigated it. He found that there are two more of them out there and contacted the other owners. He noted that it had no tubes in it and appeared that it had not been used for years. There were no coils and the modulator was missing. Scrounging parts to restore it, he went to the Hosstraders hamfest in New Hampshire, long noted to be the best Boatanchor hamfest in the Northeast. (Now known as NEAR-Fest, it continues to be the best.)

The general appearance of the cabinet and RF deck was good, but the power supply was in rough condition. It showed evidence of arcing and needed a complete restoration. Don completely stripped the power supply, sanded the rust and painted the steel chassis. He cleaned the transformers and repainted their covers. It needed cloth-covered wire for rewiring. He salvaged the lacing cord and reused that to keep the original appearance.

This photo shows Don's version of the Collins 7X speech amplifier/control-grid modulator.

The aluminum RF deck also needed to be cleaned and rewired. He used the dishwasher to clean the variable capacitors and said they looked like new when done.

A big problem he had was finding coils for this rare piece. He received information from one of the other owners and was able to construct suitable replacements.

His biggest problem was the missing Collins 7X speech amplifier/control-grid modulator. As far as Don knows, no schematics exist for the transmitter or the missing modulator. Using photos from the Collins advertisements in *QST* as a guide, he found schematics in a 1936 *Frank Jones Handbook* and was able to build a suitable replacement.

[1]D. Benecchi, K1DC, *Electric Radio*, #180, May 2004, p 14. (Reprints are available at **www.ermag.com**.)

Seeing It Myself

I became aware of the existence of 30FX when Don wrote a detailed article on the restoration and published it in *Electric Radio* magazine.[1] When I read this I decided I needed to visit K1DC on one of my trips to visit my daughter, who lives near Don in Massachusetts. Telephoning him on one trip, he invited me over. We spent a couple of hours talking about this fine radio. Putting it on the air, Don received complementary reports from other hams in the area. It was pure pleasure for me to see and hear this beauty working in Don's station, complete with a nice vintage National HRO receiver.

Seeing It Yourself

Don made a presentation to a local ham club, which Whitey Doherty, K1VV, videotaped. You can view it online, search on YouTube for K1DC. There are three 10 minute parts. At the end of the third video you can hear how it actually sounds on the air.

Last Minute Update

Don has relocated to Dothan, Alabama. He is anxious to get the old 30FX on the air, as there is a lot of 75 meter AM activity in the area. His new home should be completed by June. He'd love to hear from anyone who has knowledge or familiarity with the 30FX. In addition, he's still hoping to find original coils and a schematic.

He used the dishwasher to clean the variable capacitors...

Mark Your Calendars for More Collins

NEAR-Fest XI is scheduled for May 4-5, 2012, 0900 Friday through 1500 Saturday at the Deerfield Fairgrounds, Deerfield, New Hampshire. Many Collins and Boatanchor radios plus other good vintage ham accessories will be for sale. For more information go to **www.near-fest.com**.

The Antique Wireless Association World Convention is scheduled for August 21-25, 2012. This year the convention has Collins Radio as its theme. Many members of the Collins Collectors Association will be there speaking and displaying their rare and restored Collins radios. For information on AWA memberships, the address and times, check AWA's web pages: **www.antiquewireless.org**, **www.awamuseum.org** and the AWA Museum at **www.antiquewirelessmuseum.com**.

I hope to see you at the AWA meet near Rochester, New York, in August.
— *K2TQN*

Photos by K2TQN.

My Club Experience

Paul Thomas, K3PRT

Now that I have had my license for about 2 years, I wanted to share my experiences with clubs that may want to encourage new recruits. From the time I was a boy, I was excited about ham radio. I learned about it in a unique way. My father's job moved him from state to state. At one point, we moved to an area with few kids my age. To keep me busy, my parents bought me a set of walkie-talkies. I took them outside and for hours I would sit and try to talk to anyone who would listen. Finally I heard a voice. He was a ham passing through my area on his way to another state. He told me about ham radio and then faded out. I fell in love with the idea of being able to talk to people around the world.

As with most childhood dreams, mine faded and was forgotten until recently when my son, who volunteers with a disaster team, was asked if he was interested in communications. He said yes and soon a package with a *Ham Radio License Manual* arrived from the ARRL.[1] This immediately brought back my childhood memory of the day I spoke with a ham. My son didn't have time to read the manual so I appropriated it for myself.

When I went for the Technician test, the club was friendly enough but not very outgoing. I passed the test, which resulted in a congratulations and have a nice day.

After the Technician test I moved on to *The ARRL General Class License Manual* wanting to take the General test sooner rather than later.[2] While I was at it, I also ordered *The ARRL Extra Class License Manual*.[3] I discovered another testing facility in Delaware, not far from my home in Pennsylvania. The club members were friendly, outgoing and very encouraging. I passed the General but failed the Extra class exam. They encouraged me to continue learning and try again. They made me feel like I could do anything.

I passed the test, which resulted in a congratulations and have a nice day.

After passing the General class test I studied the Extra class manual and passed the test with flying colors. I attribute this to the Delaware group that passed on their excitement and encouraged me to continue.

Because of the complaints I was hearing, I was embarrassed about my lack of knowledge and experience.

A Sour Experience

Now licensed, I looked for a radio club near my home. Here I was a new ham and I went in and sat down waiting for the meeting to begin. Prior to introductions, a member was voicing his distress about new hams. He was annoyed that they were asking him how to make a dipole or install a radio in their car to the point where he wanted to scream. Yet, during the meeting he said he was interested in teaching young people about ham radio. I heard others chiming in with complaints as well.

Because of the complaints I was hearing, I was embarrassed about my lack of knowledge and experience. I didn't ask how to make specific antennas, how to really work HF or even how to compete in contesting. That meeting shut me down as a new operator.

I did find an ARES®/RACES group that was interested in new operators to be extremely helpful and excited about radio. It brought out my childlike excitement again. Having been a paramedic, firefighter and flight medic, I have worked with all types of communication. I see the need for hams and enjoy being able to give back to the community.

As a VE, I have found that encouraging young people really keeps their interest. I think that we, as a group, need to be excited about the hobby and thrilled that individuals, especially young people, are showing an interest.

We need to impart the excitement we have for the hobby to everyone else. We need to transfer our knowledge and wisdom to the younger generations without complaint if we want the hobby to survive. Maybe it is because I have not been in the hobby for 30 years, but I have some excitement for ham radio and want to pass that on.

I hope that this may remind some people to encourage those who are just learning or have just gotten their licenses to go on as far as they can and to keep learning whether they are 16 or 60.

Paul Thomas, K3PRT, an ARRL member, has been active for 2 years. His experiences as an ER nurse and medic with fire departments and disaster teams have made him especially interested in emergency and digital communications. Paul enjoys teaching and is a VE helping to promote ham radio to younger generations. Paul is currently a product/project manager for a computer software company. He is married with three boys all in their 20s. Paul can be reached at 426 Maiden Ln, King of Prussia, PA 19406-1805, **k3prt@arrl.net**.

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 or slander 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).

[1]Available from your ARRL dealer, or from the ARRL Store, ARRL order no. 0977. Telephone toll-free in the US 888-277-5289, or 860-594-0355, fax 860-594-0303; **www.arrl.org/shop/**; **pubsales@arrl.org**.
[2]See Note 1; order no. 8119.
[3]See Note 1; order no. 8874.

Convention and Hamfest Calendar

Gail Iannone, giannone@arrl.org

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

Arizona (Show Low) — Jun 2
F H Q R S T V
7 AM-1 PM. *Spr:* Kachina ARC. Show Low City Hall, 180 N 9th St. *Tl:* 145.31 (110.9 Hz). *Adm:* Free. Tables: $5 per space. Mike Elders, AD7W, Box 2467, Pinetop, AZ 85935; 928-242-4658; **ad7w@arrl.net**; **www.kachina-arc.org**.

ARKANSAS STATE CONVENTION
June 9, Rogers
D F H Q R S T V
The Arkansas State Convention, sponsored by the Benton County Radio Operators Club, will be held at the Rogers First Church of the Nazarene, 4911 W Pleasant Grove Rd. Doors are open 8 AM-2 PM. Features include flea market, tailgating, dealers, VE sessions, QSL card checking, forums, handicapped accessible, refreshments. Talk-in on 145.29 (110.9 Hz). Admission is $5 in advance, $7 at the door. Tables are $5. Contact Jay Harrison, KCØCNB, 1519 W Magnolia St, Rogers, AR 72758; 479-631-7727; **texgun19@cox.net**; **BCRO.org**.

California (Sacramento) — May 20 D F H R
7 AM-noon. *Spr:* North Hills RC. Natomas High School, 3301 Fong Ranch Rd. *Tl:* 145.19, 224.4 (both 162.2 Hz). *Adm:* Free. Tables: $20 (2 car spaces). Kim Scheidel, KE6RKX, 6257 S Brewer Rd, Pleasant Grove, CA 95668; 916-417-4864; **k6is@arrl.net**; **www.k6is.org**.

Connecticut (Goshen) — May 19
D F H R T V
8 AM-1 PM. *Spr:* Southern Berkshire ARC. Goshen Fairgrounds, 116 Old Middle St (Rte 63). 21st Annual Hamfest. *Tl:* 147.285 (77 Hz). *Adm:* $4. Tables: 10-ft $10 (first table); $5 (each additional table). Lee Collins, K1LEE, 5 White Hollow Rd, Lakeville, CT 06039; 860-435-0051 (phone and fax); **k1lee@arrl.net**; **www.w1baa.org**.

Florida (Orlando) — Apr 14 D F H R T V
6 AM-noon. *Spr:* AES Orlando. Amateur Electronic Supply, 621 Commonwealth Ave. *Tl:* 444.125 (103.5 Hz). *Adm:* Free. Tables: Bring your own tables and chairs. Jim Stout, W9QC, 621 Commonwealth Ave, Orlando, FL 32803; 800-327-1917; fax 407-894-7553; **w9qc@arrl.net**; **aesham.com**.

Florida (Pinellas Park) — May 26 D H R T
7 AM-noon. *Spr:* The Glorious Society of the Wormhole. Freedom Lake Park, 9990 46th St. WormFest 2012. *Tl:* 146.85 (146.2 Hz). *Adm:* Free. Tables: Free. Bill Williams, AG4QX, 3215 W Tambay Ave, Tampa, FL 33611; 813-837-3833; **ag4qx@arrl.net**; **www.thewormholesociety.org**.

Georgia (Byron) — May 12 D F H R S T V
8 AM-3 PM. *Sprs:* Central Georgia ARC, Middle Georgia Radio Assn, Byron Middle School ARC. Byron Middle School, 201 Linda Dr. "Heart of Georgia Hamfest." *Tl:* 146.85. *Adm:* $5. Tables: $5. Dave Stewart, KN4DS, 124 Sauls Branch, Perry, GA 31069; 478-335-2852; **kn4ds@arrl.net**; **wa4ort.com**.

Georgia (Ellijay) — May 12 D F H R T V
8 AM-3 PM. *Spr:* Ellijay ARS. Gilmer County Civic Center, 1561 S Main St. *Tl:* 145.17 (100 Hz). *Adm:* $5. Tables: $5. Paul Craft, KE4GC, 11 Amy Creek Cir, Ellijay, GA 30540; 706-698-7200; **ke4gc@arrl.net**; **www.ngamtn.com/w4hhh/**.

Coming ARRL Conventions

April 14
Delta Division, Bartlett, TN*

April 14-15
Communications Academy, Seattle, WA*

April 20-21
Southeastern VHF Society, Charlotte, NC*

April 20-22
International DX, Visalia, CA*
Idaho State, Boise*

April 21
Delaware State, Georgetown*
Louisiana Section, Monroe*

May 4-6
EMCOMMWEST, Reno, NV*

May 18-20
Dayton Hamvention®, Dayton (Trotwood), OH

June 1-3
Northwestern Division, Seaside, OR

June 2
Georgia Section, Marietta

June 8-9
West Gulf Division, Plano, TX

June 9
Arkansas State, Rogers
Tennessee State, Knoxville

June 30
Eastern Pennsylvania Section, Harrisburg

July 4-7
Mobile AR Awards Club, Vancouver, WA

*See April *QST* for details.

GEORGIA SECTION CONVENTION
June 2, Marietta
D F H Q R S T V
The Georgia Section Convention (84th Annual Hamfest), sponsored by the Atlanta Radio Club, will be held at Jim Miller Park (Cobb Cty), 2245 Callaway Rd. Doors are open 8 AM-3 PM. Features include indoor air-conditioned flea market, exhibitors, dealers, new and used equipment, vendors, tailgating, QSL card checking, forums, VE sessions, handicapped accessible, refreshments. Talk-in on 146.82 (146.2 Hz). Admission is $5 (17 and under are free when accompanied by a paying adult). Tables are $15. Contact John Talipsky, N3ACK, 385 Madison Chase Dr, Lawrenceville, GA 30045; 770-995-6446; **n3ack@atlantaradioclub.org**; **www.atlantahamfest.com**.

Idaho (Post Falls) — Jun 9 F H R S V
7 AM-2 PM. *Spr:* Kootenai ARS. American Legion Hall, 1138 E Poleline Ave. *Tl:* 146.98 (100 Hz). *Adm:* $5. Tables: $10 (includes 1 admission). Bonnie Patterson, KG6QQM, 8959 E Howard Rd, Athol, ID 83801; 208-683-2939; **kg6qqm@arrl.net**; **www.k7id.org**.

Illinois (Granite City) — Jun 10
D F H R T V
7 AM-2 PM. *Spr:* Egyptian RC. Moose Lodge, 2521 Maryville Rd. *Tl:* 146.76 (141.3 Hz). *Adm:* advance $5, door $7. Tables: $10. Larry Unfried, WA9KJV, 2226 Cleveland Blvd, Granite City, IL 62040; **unclefred5683@sbcglobal.net**; **www.w9aiu.org**.

Illinois (Princeton) — Jun 3 D F H R T V
8 AM-3 PM. *Spr:* Starved Rock RC. Bureau County Fairgrounds, 811 W Peru St. IL Chase Vehicle and Red Cross or Homeland Security Vehicles on site. *Tl:* 146.955 (103.5 Hz). *Adm:* advance $7, door $8. Tables: advance $13, door $15. Matthew Weaver, KB9VZH, 319 Desoto St, Ottawa, IL 61350; 815-313-5924; **kb9vzh@mchsi.com**; **www.qsl.net/w9mks/hamfest.htm**.

Kentucky (Louisa) — May 12 F H Q R T V
8 AM-1 PM. *Spr:* Big Sandy ARC. Louisa Senior Citizens Bldg, 101 W Pike St. *Tl:* 147.39. *Adm:* $4. Tables: $5. Fred Jones, WA4SWF, 511 N Lackey Ave, Louisa, KY 41230; 606-483-1109; **wa4swf@arrl.net**; **www.bsarc.org**.

Louisiana (Ruston) — May 5 R S T V
9 AM-4 PM. *Spr:* Piney Hills ARA. Cook Park, 2800 Kavanaugh Rd. Swapfest/Hot Dog Social, APRS, weather balloon launch, new hams operating opportunities. *Tl:* 147.12 (94.8 Hz). *Adm:* Free. Debbie Christian, KD5RWQ, 555 Pisgah Church Rd, Bernice, LA 71222; 318-990-0888; **debbiec57@email.com**; **phara.us**.

Maine (Hermon) — Jun 2 D F H Q R S T V
Set up 6 AM; public 8 AM-1 PM. *Spr:* Pine State ARC. Hermon High School, Rte 2. 25th Annual Hermon Hamfest, balloon launch, R/C airplane demo, on-site foxhunt. *Tl:* 146.94 (100 Hz). *Adm:* $5. Jerry Burns, K1GUP, Box 61, Carmel, ME 04419; 207-848-3400; **k1gup@roadrunner.com**; **n1me.com**.

Maryland (West Friendship) — May 27
D F H Q R T V
8 AM-2 PM. *Spr:* Maryland FM Assn. Howard County Fairgrounds, 2210 Fairgrounds Rd. *Tl:* 146.76, 224.76, 444.0 (107.2 Hz). *Adm:* $6. Tables: $20. John Elgin, WA3MNN, 518 Copley Ln, Silver Spring, MD 20904; 301-641-5313; **wa3mnn@verizon.net**; **www.marylandfm.org**.

Michigan (Chelsea) — Jun 3 D F H R T
8 AM. *Spr:* Chelsea ARC. Chelsea Fairgrounds, 20501 Old US Hwy 12. Overnight camping (no hookups). *Tl:* 145.45 (100 Hz). *Adm:* advance $4, door $5. Tables: $10. Frank Pohs, KD8ABW, 636 W Main St, Manchester, MI 48158; 734-945-1915; **frank.pohs@gmail.com**; **wd8iel.net**.

Michigan (Hudsonville) — Jun 2
D F H Q R S T V
8 AM. *Spr:* Independent Repeater Assn. Hudsonville County Fairgrounds, 5235 Park Ave. Foxhunt. *Tl:* 147.16 (94.8 Hz). *Adm:* advance $5, door $6. Tables: $8. Don Andrews, K8YES, Box 8122, Kentwood, MI 49518; 616-532-7769; **ira-hamfest@w8hvg.org**; **www.w8ira.org**.

Michigan (Newberry) — Jun 9 D F H R S V
9 AM-1 PM. *Spr:* Luce ARS. Pentland Township Hall, Hwy M-28. *Tl:* 146.61. *Adm:* $5. Tables: $7. Dave Hopper, KA8K, 22926 Maple Dr, McMillan, MI 49853; 906-586-3928; fax 906-293-8300; **hopperd@michigan.gov**; **www.w8nby.com**.

Minnesota (Maplewood) — Jun 2 F H R T
7 AM-1 PM. *Sprs:* TwinsLAN and Mining ARCs. 3M Center, 5th St. *Tl:* 147.12. *Adm:* buyers $8 (under 16 free with paying adult), sellers $18 per vehicle (includes 1 admission). Anders Johansson, KBØPJV, 8201 32nd Ave N, Crystal, MN 55427; 763-208-7493; **kb0pjv@arrl.net**; **www.twinslan.net**.

New Jersey (Tinton Falls) — May 12
D F H R T V
8 AM-noon. *Spr:* Garden State ARA. MOESC (formerly called MAECOM), 100 Tornillo Way

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

(corner of Shafto Rd). *Tl:* 147.045 (67 Hz) and W2NJR Link System. *Adm:* $5 (spouse and kids free). Tables: $15 (per parking space; includes 1 admission, extra spots $10 each). Joe Dreifuss, W2KQ, 6 Fredric St, Ocean NJ 07712; 732-493-4236; **w2kq@arrl.net**; **www.gardenstateara.org**.

New Mexico (Las Cruces) — Apr 29
D F H R T V
8 AM-1 PM. *Spr:* Mesilla Valley RC. MVRC Clubhouse, 6609 Jefferson. "Bean Feed." *Tl:* 146.64 (100 Hz). *Adm:* Free. Tables: Free. Terry Angle, AE5XI, 795 Suzanne Ave, Las Cruces, NM 88005; 575-640-9669; **ae5xi1@gmail.com**; **n5bl.org**.

New York (Chaffee) — Jun 9 D F H R T V
Set up 7 AM; public 8 AM-noon. *Spr:* Pioneer Radio Operators Society. Manion Park, 9990 Grove St. *Tl:* 145.39. *Adm:* $5. Tables: First table free with 1 paid admission; $5 for each additional table. Roy Schwedt, KC2LEE, 57 N Main St, Franklinville, NY 14737; 716-676-3903; **rschwedt@netscape.com**; **pioneerradiooperatorssociety.bravehost.com**.

New York (Cortland) — Jun 9 D F H R T V
7 AM-1 PM. *Spr:* Skyline ARC. Cortland County Fairgrounds, Carroll St. Indoor flea market for bad weather only. *Tl:* 147.18 (71.9 Hz). *Adm:* advance $4, door $5. Tables: $10. Andrew Slaugh, KB2LUV, Box 5241, Cortland, NY 13045; 315-395-7640; fax 315-425-9072; **kb2luv@arrl.net**; **www.skylineradioclub.org**.

New York (Rensselaer) — May 12 D F H R T
Set up 6 AM; public 8 AM-1 PM. *Spr:* East Greenbush ARA. East Greenbush Fire Company, 68 Phillips Rd. 9th Annual Hamfest. *Tl:* 147.27 (94.8 Hz). *Adm:* $6. Tables: $6 (8-ft, Pavilion); $6 per 8-ft tailgate space. Thomas Scorsone, KC2FCP, 1310 10th Ave, Watervliet, NY 12189; 518-272-1494; **kc2fcp@nycap.rr.com**; **www.w2egb.org**.

North Carolina (Bahama) — May 26
D F H R T V
8 AM-2 PM. *Spr:* Durham FM Assn. Little River Community Complex, 8307 N Roxboro Rd (Hwy 501 N). 39th Annual DurHamFest. *Tl:* 147.225. *Adm:* $5. Tables: $12. Paul Van Doren, KE4OXN, 5309 Falkirk Dr, Durham, NC 27712; 919-309-2457; **elivand@aol.com**; **dfma.org**.

North Carolina (Reidsville) — May 12
D F H R T
8 AM-noon. *Spr:* Rockingham County ARC. Calvary Baptist Church, 7860 NC Hwy 87. 8th Annual Swapfest. *Tl:* 146.85 (103.5 Hz). *Adm:* advance $4, door $5. Tables: $5 (tailgate space). George Brewer, WN4LTY, 5190 NC Hwy 700, Eden, NC 27288; 336-635-1261; **wn4lty@rcarc.com**; **www.rcarc.com**.

North Carolina (Winston-Salem) — Jun 9
D F H R T
7 AM-noon. *Spr:* Forsyth ARC. Summit School Eagles Nest, 2100 Reynolda Rd. *Tl:* 146.64 (100 Hz). *Adm:* advance $4 (with web coupon), door $5. Tables: $15. Henry Heidtmann, W2DZO, Box 11361, Winston-Salem, NC 27116; 336-245-5740; **hamfest@w4nc.com**; **www.w4nc.com/events.htm**.

DAYTON HAMVENTION®

May 18-20, Dayton (Trotwood), OH
D F H Q R S T V

The Dayton Hamvention® (61st consecutive year), sponsored by the Dayton ARA, will be held at the Hara Arena, 1001 Shiloh Springs Rd (Trotwood). Doors are open Friday 8 AM-6 PM, Saturday 8 AM-5 PM, Sunday 8 AM-1 PM. Hamvention's 2012 theme is "Internationally Connected." Features include exhibitors and vendors showing their latest products and equipment; huge outside flea market/vending area; forums and presentations on all facets of Amateur Radio; awards; VE sessions (Friday 2:30 PM, Saturday 9:30 AM and 1:30 PM; first-come, first-served basis, no pre-registration is available, no fee for exams; **exams@hamvention.org**); operating station; "ARRL Expo" area (located in the Ballarena Hall near the 400-numbered booths) - this is a showcase of ARRL exhibits, activities and program representatives celebrating the very best of Amateur Radio - meet the ARRL staff and volunteers, DXCC card checking, bookstore, project building booth, ARRL Youth activities, and many other ARRL services and programs representing a wide variety of Amateur Radio interests (**www.arrl.org/arrl-expo**). Talk-in on 146.94, 146.91, 146.64, 223.94, 442.1. Admission is $20 in advance, $25 at the door (good all 3 days); age 12 and under are free when accompanied by a paying ticket holder. Contact Michael Kalter, W8CI, c/o Dayton Hamvention®, Box 964, Dayton, OH 45401-0964; 937-276-6930, fax 937-276-6934; **info@hamvention.org**; **www.hamvention.org**.

Ohio (Tedrow) — Jun 2 F R T V
8 AM-1 PM. *Spr:* Fulton County ARC. Roth Family Park, 101 Hill Ave. *Tl:* 147.195. *Adm:* $3 donation. Lindsay Infante, K8LI, 7649 County Rd L, Delta, OH 43515; 419-346-8261; **lindsayinf@yahoo.com**; **k8bxq.org**.

NORTHWESTERN DIVISION CONVENTION

June 1-3, Seaside, OR
D F H Q R S V

The Northwestern Division Convention (30th Annual SeaPac Event), sponsored by the Oregon Tualatin Valley ARC, will be held at the Seaside Convention Center, 415 1st Ave. Doors are open for setup on Friday 11 AM-8 PM and Saturday 7:30-9 AM; public Saturday 9 AM-4 PM, Sunday 9 AM-1 PM. Features include flea market (Saturday and Sunday only); commercial exhibitors; new equipment dealers; Friday Workshop (9 AM-5 PM, $18; Software Defined Radio with keynote speakers); Annual Spaghetti Feed (Friday, 5-8 PM, Bob Chisholm Community Center, 1255 Avenue A); seminars and forums on Saturday and Sunday; W7OTV Special Event Station; VE sessions (Saturday 9 AM, Our Saviour's Lutheran Church-East Parish Hall; pre-register with Carl Clawson, WS7L, 503-629-5796; **VE@seapac.org**); RAGS Country Store; SeaPac Collector's Pins ($5); DX and YLRL luncheons; Saturday eve happy hour and banquet featuring special guest speaker NASA Astronaut Dr Michael Reed Barratt, KD5MIJ (6:30-9:30 PM); handicapped accessible; refreshments. Talk in on 145.45, 145.49 (both 118.8 Hz), 146.52. Admission is $8 in advance, $10 at the door (under 12 free when accompanied by paying adult). Tables are $15 each for 1 day and $25 each for 2 days. Contact C. Wayne Schuler, AI9Q, 16414 NE 21st St, Vancouver, WA 98684; 360-892-5580; **ai9q@arrl.net**; **www.seapac.org**.

Pennsylvania (Butler) — Jun 3
D F H Q R S T V
8 AM-3 PM. *Spr:* Breeze Shooters ARC. Butler Farm Showgrounds, 627 Evans City Rd. 58th Annual Hamfest and Computer Show. *Tl:* 147.0. *Adm:* $5. Tables: $20. Robert Benna, N3LWP, 1010 Willow Dr, Pittsburgh, PA 15237; 412-366-0488; fax 412-366-0486; **n3lwp@verizon.net**; **hamfest2012@breezeshooters.net**.

Pennsylvania (Lime Ridge) — Jun 9
D F H R T V
7 AM-1 PM. *Spr:* Columbia-Montour ARC. Lime Ridge Community Center, 6405 Fourth St. 22nd Annual Bloomsburg Hamfest. *Tl:* 147.225 (203.5 Hz). *Adm:* $5. Tables: $10. Randy Kishbaugh, N3JPV, 2508 Heights Rd, Berwick, PA 18603; 570-759-2306; **n3jpv@verizon.net**; **www.qsl.net/cm-arc/**.

South Carolina (Columbia) — Apr 21 F H T
8 AM-noon. *Spr:* Columbia ARC. South Carolina ETV Studios, 1041 George Rogers Blvd. *Tl:* 147.33 (156.7 Hz). *Adm:* Free. Tables: Bring your own or sell out of your trunk. Thom Ashton, W4THA, 500 Pickett Thomas Rd, Camden, SC 29020; 803-420-8888; **w4tha@w4cae.com**; **www.w4cae.com**.

TENNESSEE STATE CONVENTION

June 9, Knoxville
D F H Q R S T V

The Tennessee State Convention, sponsored by the Radio Amateur Club of Knoxville, will be held at the Kerbela Temple, 315 Mimosa Ave. Doors are open 8:30 AM-4 PM. Features include 46th Annual Knoxville Hamfest and Electronics Exposition; outside flea market/tailgating, inside dealers and clubs, forums, exhibits, demonstrations, on site VE sessions, QSL card checking, handicapped accessible, breakfast and lunch. Talk-in on 147.3 (100 Hz). Admission is $7. Tables are $20. Contact Dave Garner, K4YRK, 10917 Sonja Dr, Farragut, TN 37934; 865-966-9811; **dgarner@usit.net** or Lou Dreinhoefer, WB3JKQ, 865-995-1588; **wb3jkq@arrl.net**; **www.w4bbb.org**.

Texas (Amarillo) — May 12 F H R T V
9 AM-2 PM. *Spr:* Panhandle ARC. Thompson Park (Area 17), 2400 N Polk St. 12th Annual Swapfest/Picnic. *Tl:* 146.94 (88.5 Hz). *Adm:* Free. Tables: Free. Carl Jeans, N5YXN, 6112 Calumet Rd, Amarillo, TX 79106; 806-352-6987; **carl.jeans@att.net**; **www.w5wx.org**.

WEST GULF DIVISION CONVENTION

June 8-9, Plano, TX
D F H Q R S T V

The West Gulf Division Convention (Ham-Com 2012), co-sponsored by Ham-Com, Inc and other supporting clubs, will be held at the Plano Centre, 2000 W Spring Creek Pkwy. Doors are open Friday and Saturday 9 AM-5 PM. Features include indoor and outdoor flea markets, tailgate market ($8 per space per day; first-come, first-served), commercial exhibitors, equipment dealers, manufacturers, vendors, programs, forums, presentations, transmitter hunts, Boy Scout "One-Day" Merit Badge Program, VE sessions (Friday 11 AM-5 PM and Saturday 9 AM-4 PM), Lone Star DX Dinner (Friday, June 8, 6 PM, $40), DXCC card checking, handicapped accessible. Talk-in on 147.18 (107.2 Hz). Admission is $8 in advance, $10 at the door; student admission (K-12) and Scouts in uniform (18 and under) are free. Contact Bill Nelson, AB5QZ, 1915 Centenary Dr, Richardson, TX 75081; 214-532-3848; **ab5qz@swbell.net**; **www.hamcom.org**.

Washington (Dryden) — Jun 8-10 H T V
Friday noon-Sunday late morning. *Spr:* Apple City ARC. Dryden Gun Club, 7653 Saunders Rd. Wenatchee Hamfest, bunny hunt. *Tl:* 146.68 (156.7 Hz). *Adm:* $7. Judy Chrisco, KA7ZNA, 1812 S Soden St, E Wenatchee, WA 98802; 509-884-1251; **ka7zna@msn.com**; **www.qsl.net/w7td**.

Washington (Stanwood) — May 12
D F H R V
9 AM-3 PM. *Spr:* Stanwood-Camano ARC. Stanwood Middle School, 9405 271st St NW. 21st Annual Hamfest and Electronics Flea Market. *Tl:* 145.19 (127.3 Hz). *Adm:* $5. Tables: $15 (before Apr 25), $20 (after Apr 25). Jim Ruble, KE7MHF, Box 941, Stanwood, WA 98292; 360-629-4713; **ke7mhf@arrl.net**; **www.scarcwa.org**.

West Virginia (Beckley) — Jun 9
D H R S T V
6 AM. *Spr:* Black Diamond ARC. Commission on Aging, 1614 S Kanawha St. *Tl:* 145.37 (100 Hz). *Adm:* $5. Tables: $10 (standard), $15 (with power). Zandle Cline, AC8DU, Box 909, Sophia, WV 25921; 304-683-3395; **ac8du@yahoo.com**; **wv8bd.multiply.com**.

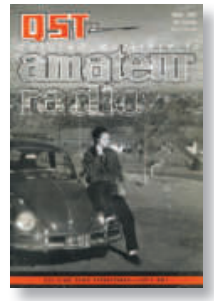
75, 50 and 25 Years Ago

Al Brogdon, W1AB

May 1937

- The cover photo shows Jim Lamb working in the A.R.R.L. Lab as he pursues his study of techniques and circuits for continuously variable selectivity. Watch for his article on this subject in next month's issue.
- The editorial takes a look into the future, speculating about how amateur radio's public service will likely grow, and also hoping some of the bad practices of today might be reined in.
- The lead article, "Post Mortem —1937 DX Contests, gives us the highlights of the contests and shows photos of some of the stations that participated.
- Don Mix, W1TS, shows us how build "A 100 Kc. E.C. Oscillator for Frequency Checking."
- George Grammer, W1DF, presents "A Modulator for the Low-Power Five-Band Transmitter" that uses two metal 6L6 tubes in parallel in the Class A output stage.
- Ross Hull studied multiple records of observations at various frequencies over 100-mile direct paths to write Part One of "Air-Wave Bending of Ultra-High-Frequency Waves."
- James Millen, W1HRX, describes "A Universal Exciter with Variable-Frequency Crystal Control."
- Jack Wagenseller, W3GS, tells about his "Ultra-Midget Equipment for the Ultra-High Frequencies."
- E. L. Battey, W4IA, presents the results of the seventh national QSO contest, in "The 1936 Sweepstakes." This year's 860 contesters made a total of 64,946 QSOs!

May 1962



- The cover photo shows W1YDS trying out his compact 420 Mc mobile/portable transceiver.
- The editorial reports that "We're Off!" pursuing the task of raising funds for the new Headquarters Building.
- Walter Lange, W1YDS, tells us how he built "A Simple 420-Mc. Transceiver," using both tubes ad transistors.
- Lew McCoy, W1ICP, describes how to build "Simple Wavemeters for V.H.F. Beginners," so we are sure to get the correct harmonic when we use multipliers in our transmitters.
- The "1961 Sweepstakes Results" were compiled by Ellen White, W1YYM, and John Lindholm, W1DGL. An accompanying cartoon by Gil, W1CJD, illustrates K5HDU's report of having used an aluminum lawn chair as his antenna during SS!
- Frank Gue, VE3DPC, reports on his new skyhook, "A Small Tilt-Over Mast for Roof-Top."
- Emmett Jannings, W6EI, stuns us with the description of his high-power transceiver built into a small suitcase, in "A Hand-Portable Kilowatt (P.E.P.) Linear with Power Supply"! The "small suitcase" is only slightly larger than a standard briefcase.
- George Thurston, W4MLE, tells us how he built "A Versatile Receiver Audio System."
- Cecil Johnson, W6EOT, describes his simple adapter for simultaneous transmitter and receiver control, in "'Little John' on 40 and 80."

May 1987

- The cover shows N6KUS, N6FAX, and KF6FX putting together a FD antenna for last year's FD, and asks "Are you ready for Field Day?"
- The editorial, "220: Write Now!", reminds us of the current FCC proposal to take part of the 220 MHz band away from hams, and tells us how we can join the effort to save it..
- Bruce Vaughan, NR5Q, writes an appreciation of Hiram Percy Maxim that he calls "A Letter to T.O.M."
- Rusty Lewis, WA4RKV, tells us how we can have "Split-Screen RTTY for Atari Computers."
- "The Public Service Boom Box," by Phil McGan, WA2MBQ, tells how he packaged a small but effective 2-meter station for portable use during emergencies.
- Greg McIntire, AA5C, reports on his latest project, "A Line-Side Regulator for High-Voltage Power Suppiles."
- Doug DeMaw, W1FB, uses five telescoping whips, a piece of wood, and a short piece of PVC pipe to build "A Traveler's 2-Meter GP Antenna."
- Wendell Turlencik, K8OIP, presents "A Few Thoughts on Emergency Power," to help us make good choices among the various possibilities.
- Dave Newkirk, AK7M, asks, "What's Going on in the New Novice Bands?" and then gives us the answer.

Field Organization Reports

February 2012

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 are at this web page: **www.arrl.org/public-service-honor-roll**.

480
KØIBS
374
W4CAC
344
KI4KWR
320
KA2ZNZ
317
AL7N
310
K8OLY
300
KT2D
290
KB2ETO
268
KA4IZN
252
W2MTA
245
KC5ZGG
K2DYB
235
K8RDN
228
AD4BL
220
K2HAT
214
NC4VA
202
WB8RCR
190
KB2KOJ
WB9JSR
180
AG9G
N8IO
179
W5DY
174
WA2BSS
164
K2ABX
163
W7JSW
160
NM1K

KG0GG
157
AE5VY
WD8USA
155
KE5HYW
W4DNA
WK4P
151
K5CRX
WA4UJC
150
KØVTT
WD9FLJ
N9VC
N8SY
K7OAH
148
K4VWK
K4BEH
145
KT5SR
KB2RTZ
KB2BAA
N7CM
140
K4GK
KK3F
KW1U
NX8A
139
KC8QWH
138
WS6P
135
K7EAJ
W3YVQ
130
WA9LFO
KK5NU
K6JT
WB2FTX
W0LAW
K2TV
K4IWW
125
K6FRG
N5NVP
KJ4JPE
KB8RCR
124
KC2SFU
122
W2LIE
121
W2DWR

120
K6HTN
NX9K
K9LGU
NN7H
KA4FZI
W8UL
WA3EZN
N2JBA
WE2G
KB5SDU
WI2G
K4JUU
WB8WKQ
119
KA8ZGY
115
KC5OZT
N3RB
KB1NMO
110
W7QM
WB9WKO
N9MN
KE4CB
KC2EMW
K4BG
KB1RGQ
N7XG
N7YSS
N2HJS
W3CB
N1IQI
N1LKJ
N2RDB
W2EAG
109
N2GJ
108
N7EIE
WM2C
105
KF5IOU
KF7GC
100
K4SCL
N5OUJ
KA1G
NU8K
KT4YA
N3SW
W3TWV
N1JX
WB8SIQ
WB8HHZ
WG8Z
WD8Q
N8CJS
WB6OTS
KB3LNM
K3IN
AA3SB
WB4FDT
N7IE

W0CLS
N0MEA
WA0VKC
W4TTO
K8VFZ
99
W8CPG
98
WB8YYS
K7FLI
97
K2GW
95
N2DW
N2WKT
K1YCQ
WB6UZX
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N8OSL
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K1PJS
N1TF
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N2VC
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KK7DEB
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W5CU
KB5PGY
N4ELI
W3GQJ
KJ4HGH
W8IM
KZ8Q
W2CC
N2GS
NC3F
KB8HJJ
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WB4BIK
N3ZOC
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KE5YTA
KK7TN
KC2SYM
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K6RAU
W5ESE
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KD8LZB
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K5AXW
N5RL
K8KV
WB4RJW
W8MAL
WD0GUF
KB7RVF
KØDEU
NIØI
N0MHJ
KFØXO
KCØZDA
KJ4RUD
KC8BW
W8QZ
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KBØDTI
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WB8WJV
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K2UL
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KJ6IJJ
W8DJG
N2RTF
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W0RJA
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KB2YAA
KD8EBY
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W5XX
KD7OED
70
N2YJZ
KD0AYN
KØDLK
N0DUW
N0DUX
W0FUI
N3NTV
KØPTK
KØRXC
KD7ZUP

The following stations qualified for PSHR in previous months, but were not recognized in this column: (Jan) KT5SR 235, K1PJS 133, W5CU 90. (Dec) K1PJS 106.

Section Traffic Manager Reports

The following Section Traffic Managers reported: AK, AR, AZ, CO, CT, EB, EMA, ENY, EPA, GA, IA, IL, KS, LA, MDC, ME, MI, MN, MS, NC, NE, NFL, NLI, NNJ, NNY, NTX, OH, OK, OR, ORG SD, SFL, SJV, SNJ, STX, TN, UT, VA, WCF, WI, WNY, WV, WY.

Section Emergency Coordinator Reports

The following ARRL Section Emergency Coordinators reported: ENY, EWA, GA, IA, IN, KS, MDC, MI, MN, MO, MT, NM, NNJ, OH, OK, SFL, STX, WTX, WWA.

Brass Pounders League

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

KK3F 1739, N1IQI 1539, WB5NKD 1493, K6HTN 1467, WB2FTX 1205, W8UL 837, KW1U 776, NX9K 770, WB9JSR 741, N9VC 707, K6FRG 654, K6GPZ 567, WD8Q 548, W9WXN 506.

Silent Keys

Silent Keys Administrator, sk@arrl.org

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

♦W1BDL **Kigel**, Charles, Waldoboro, ME
WB1BSY **Flanders**, Herb, Bradenton, FL
♦N1EKV **Blanchard**, Byron E., Lexington, MA
W1EUL **Brown**, Stuart J., Ledyard, CT
WB1EZC **Alves**, Leo St John, Randolph, MA
N1GEB **Koluch**, Adele T., Noblesville, IN
W1GFM **Barber**, Richard L., Rockingham, NC
KA1IWX **Nutting**, Henry, Perham, ME
ex-WA1J **Coughlin**, Harold E., Cohasset, MA
KA1JKV **Tammany**, Elizabeth M., Rumford, MA
K1JUO **McKown**, Kenneth T., Northampton, MA
W1LXZ **Saunders**, Robert H., Tilton, NH
K1NQC **Ambrose**, Raymond J., Pawtucket, RI
KD1T **Stucchi**, Rudolph M., Hopkinton, MA
K1UKX **Randall**, Fred S., Uxbridge, MA
KA1UOI **Saucier**, Edmund E., Waterville, ME
W1YDH **Woodhouse**, J. Ray, Barrington, RI
W1YUW **Kimball**, William F., Milford, MA
KA2AAM **Hackett**, John W., Canton, NY
W2BJ **Minsky**, Barry J., Savannah, GA
KE2BX **Souers**, Robert C., Fishkill, NY
WA2CAI **Gilbert**, Thomas C., Midland Park, NJ
KB2CJU **Murray**, Thomas N., Bradenton, FL
W2CKD **Richardson**, Harry W., Glen Cove, NY
K2EGU **Mercer**, Allen C., Brockport, NY
W2EWM **Progy**, Stanley, Binghamton, NY
WB2FLA **Leifer**, Adam M., Boonton, NJ
WB2FXE **Savarese**, Joseph X., Belvidere, NJ
KF2GM **De Monte**, Joseph F., Hamilton, NJ
WB2GUB **Cutler**, Sidney P., Kings Park, NY
♦KB2HQ **Bradway**, Philip, Schenectady, NY
N2HRK **Laighton**, A. Ken, La Mesa, CA
K2HTR **Desiato**, Oreste "Rusty," Middlesex, NJ
WB2KCR **McPherson**, Patrick G., Poughkeepsie, NY
WX2M **Grant**, Hilliard T., Beach Haven, NJ
WA2MHA **Pollock**, Donald A., Manchester, NJ
KB2NBK **Conaghy**, Eli E. Jr, Collings Lakes, NJ
N2PUR **Rothbeck**, Frederick A. Sr, Toms River, NJ
♦K2QQN **Tabor**, Kenneth W., Brasher Falls, NY
W2RCR **Rivenburgh**, Robert C. Sr, Ballston Spa, NY
KB2UMY **Unrath**, William A., Ramsey, NJ
W2UW **Yingling**, Glenn E., Newark Valley, NY
KB2VSC **Zebraski**, Joseph T., Cedarville, NJ
N2VTM **Leven**, Christopher, Geneva, NY
KB2WXT **White**, Eugene M., Camillus, NY
N2XS **Stephany**, Joseph F., Williamson, NY
WB2YWJ **Dragon**, Christine M., Spotswood, NJ
K2ZXO **Schwartz**, Milton S., New Milford, NJ
N3AH **Haupt**, Alfred, Clarksville, TN
KB3ASC **Schmeusser**, Paul R., Bryant, SD
N3BYU **Wilson**, Phyllis R., Sykesville, MD
N3DLQ **Edwards**, John, Barto, PA
W3KDK **Smertneck**, Joseph A., Williamsport, PA
KD3KN **Hinman**, Arthur R., Punta Gorda, FL
KB3KY **Clark**, Craig R., Erie, PA
W3LQA **Zettle**, Edward C., Kane, PA
KK3S **Berrevoets**, Jacobus J., Windsor, PA
ex-W3TYL **Reitmeyer**, Luther E., Briar Creek, PA
WA3UNX **Quiggle**, Donald L., Clemmons, NC
WA4BRU **Duncan**, Carlton "Ed," Greenville, SC
K4BSX **Wardwell**, Arthur L., West Newton, MA
♦W4CF **Friend**, Alfred E. Jr, Mountain City, GA
WE4D **Bigger**, Walter H., Sarasota, FL
WB4DDB **Dorris**, Bob, Franklin, TN
WA4DHV **Henry**, E. E., Chesapeake, VA
WA4DIW **Grant**, Donald W., Jonesboro, GA
W4DOL **Lomax**, Deborah O., Powell, TN
K4FEP **Harrod**, Melvin L., Cary, NC
K4FLA **Robbins**, Ernest, Chesnee, SC
KG4GFR **Courtney**, Morey J., Mineral Bluff, GA
K4GLT **Kelley**, Milton R., Beaufort, SC
KI4IJT **Rogers**, Suzette, Bronson, FL
N4IKO **Hutto**, Alburn E., Chapin, SC
W4IUP **Cox**, Orville E. Sr, Smithfield, KY
W4LMN **Shultz**, Oscar L. Jr, Nashville, TN
KJ4LRW **Robinson**, Carl J., Telford, TN
KI4LXT **Imburgia**, Joseph J. Jr, Yorktown, VA
W4OSU **Mitchell**, Thomas G., Sevierville, TN
KF4OWD **Childers**, Jerry L., Gray, TN
KI4PKP **Burckhalter**, James M., Barnwell, SC
W4PUJ **Daniels**, Richard L., Arlington, VA
KB4SSD **Simmons**, Dennis R., Lyndhurst, VA
KI4TFL **Hendricks**, Walton R. Sr, Cairo, GA
W4TXM **Stuckey**, Grace, Tuscaloosa, AL
W4WH **Hufham**, Ernest T., Clarkton, NC
KD4WOA **Eanes**, Walter S. Jr, Lynchburg, VA
KA4YCL **Fow**, Albert S., Dunnellon, FL
KA4YSR **Farris**, Velma "June," Hixson, TN
W5AE **Stover**, Jerry S., Dallas, TX
ex-N5AZF **Stockwell**, Nelson B., Annapolis, MD
K5CFA **McCarty**, Don R., Midland, TX
KA5FYW **Grimsley**, Willie L., Sumrall, MS
KC5GQP **Passannante**, Arthur, Greenville, TX
W5HZU **Webster**, Harold L., Rogers, AR
W5ITK **Thomas**, Thomas H., North Richland Hills, TX
K5RPT **Cook**, Hiel J., Lafayette, LA
KA5RRL **Guyse**, Houston V. Jr, Lewisville, TX
W5WKH **Hair**, Ulis R., Fort Worth, TX
K5YQV **McKinney**, Michael W., Austin, TX
KJ6AW **Bohner**, John, Manhattan Beach, CA
K6BAW **Gebel**, James L., Hayward, CA
♦W6DDB **Welsh**, William G. Sr, Lancaster, CA
N6EM **Leddy**, John Barnes., San Jose, CA
KJ6GJR **Bourne**, Andrew, Mammoth Lakes, CA
KN6HQ **Sheeler**, Francis D., La Mesa, CA
KE6LW **Barnes**, Barry F., Yuba City, CA
K6LWO **Sutherland**, Leon R., Snelling, CA
K6OEF **Pfeiffer**, Theodore R., Bakersfield, CA
♦K6QFG **Armstrong**, Jack L., Corona, CA
N6QGX **Holland**, Ronald L., Riverside, CA
KE6QPQ **Raugust**, Carol T., Hayward, CA
W6SFW **Sadler**, A. J., San Francisco, CA
W6SMX **Magerkurth**, James G., Big Bear City, CA
AA6SQ **Thomas**, Christopher S., Los Angeles, CA
K6TS **Jones**, Thomas F., Livermore, CA
KI6TUH **Ahnell**, Karl I., Fallbrook, CA
W6TZN **Anderson**, Allan L., Tucson, AZ
KG6ZYN **Mckinsey**, Charles L., Modesto, CA
N7DLS **Shaner**, Donald L., Laramie, WY
KA7DZI **Wolford**, John A., Klamath Falls, OR
N7EUC **Riffle**, Robert E., Tacoma, WA
W7EYA **Arata**, William A., Portland, OR
W7FDQ **Nelskog**, Walter N., Woodway, WA
KL7HGO **Lloyd**, Patrick W., Anacortes, WA
W7HPT **Potts**, Beverly J., Albany, OR
WA7HZO **Grubb**, Louis S., Phoenix, AZ
W7JGU **Chase**, Clement K., Tucson, AZ
KF7KXF **Dempsey**, Keith, Mayer, AZ
AA7SC **Knudson**, Rodney O., Kenmore, WA
K7SD **Bertalan**, Steve, Clackamas, OR
KA7SGY **Mitchem**, John C., Portland, OR
W7SLB **Larkin**, Floyd A., Eatonville, WA
AD7SX **McLoughlin**, Timothy I., Vancouver, WA
W7TJS **Saade**, Tareq J., Seattle, WA
KC7TMW **Price**, Elden G., Salt Lake City, UT
K7UOB **Leeling**, Robert G., Klamath Falls, OR
N7VUR **Logan**, Jeremy J., Hot Springs Village, AR
N7VZT **Timlin**, Michael L., Yakima, WA
W8BO **Gloystein**, Thomas W., Cincinnati, OH
KD8CJF **Stankiewicz**, John B. Jr, Weirton, WV
N8DKQ **White**, Emil, Cleveland, OH
KD8FQN **Kitchen**, Charles W., Greenbush, MI
N8GB **Bair**, George R., Painesville, OH
K8IIA **Cunningham**, Donald C., Plymouth, OH
N8JC **Choma**, Richard A., Morgantown, WV
W8LA **Faulkner**, Aubrey V., Fort Pierce, FL
W8LES **Ferrell**, Millard R., Grand Blanc, MI
N8MGW **Bell**, James "Ed," Mingo Junction, OH
KD8NW **Dominy**, Gareth H., Saint Joseph, MI
WD8PIK **Porter**, George R., Glennie, MI
ex-W8QL **Fanning**, Richard C., Westlake, OH
K8RRQ **Dunlap**, John A., Toronto, OH
K8RVH **Hollingsworth**, Richard V., Huber Heights, OH
KC8TGP **Goodwin**, Gary, Dade City, FL
W8TSP **Estep**, Joseph A., Oxford, GA
W8UES **Camp**, Donald C., Niles, MI
K8UKC **Hengartner**, Jack R., Manistee, MI
KB8UMJ **Adams**, Herbert H., Bucyrus, OH
K8XQ **Kafton**, Kevin R., Weirton, WV
W9BQL **Lembcke**, Clark W., Lansing, IL
WB9D **Jones**, Robert J. Jr, Anna, IL
♦WB9GIU **Merkel**, Russell D., Ocala, FL
W9JLZ **McClaskey**, Charles F., Wellston, OH
W9JPS **Hudzinski**, Roman J., Milwaukee, WI
N9JQR **Podach**, Frank B., Stevens Point, WI
KA9NMU **Justice**, Dearld E., Decatur, IL
K9OST **Tinkham**, Theodore, Cameron, IL
KD9UD **Corcoran**, Charles A., Cumming, IA
W9VOW **Van Den Wymelenberg**, G. M., De Pere, WI
♦WØBIU **Jackson**, William C., Poplar Bluff, MO
KAØBQL **Sick**, Alfred, Magnolia, IA
WAØGBN **Graves**, J. D., Goodland, KS
WØIHD **Palmer**, Charles M., Sarasota, FL
NØJOU **Lambert**, Donald R., Gardner, KS
WAØKLD **Lewis**, Roy E., Mount Pleasant, IA
♦KØMW **Myers**, Calvin P., Lees Summit, MO
WØNS **De Cheff**, Mike, Kansas City, MO
KØRPW **Wiese**, Robert P., Newton, IA
NØRUS **Goodwin**, Glen R., Wichita, KS
WØSER **Westeren**, Bernt A., Fridley, MN
WØSZF **Francis**, Verle D., McCook, NE
WØTVR **Myers**, Vernon, Parker, CO
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VE3DJX **Douglas**, James M., Smiths Falls, ON, Canada
VE3GTS **Shortt**, Terence M., Colborne, ON, Canada
ex-VE3RA **Andrews,** G. Robert, Peterborough, ON, Canada
♦VE3WV **Taylor**, Allan K. R. Trenton, ON, Canada
VE6NM **Smith**, Earle W., Grande Prairie, AB, Canada
VE7BPV **Bleue**, Arthur W., Penticton, BC, Canada
DJ4PI **Neuerer**, Emil, Stutensee, Germany
VK6ZD **Govier**, Brian, Perth, WA, Australia

♦ 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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• 65W RF Output Power • 4.5W Audio Output • MIL-STD 810 G Specifications • 207 alphanumeric Memory Channels • Built-in CTCSS/DTCS Encode/Decode • DMS

IC-92AD Analog + Digital Dual Bander

• 2M/70CM @ 5W • Wide-band RX 495 kHz - 999.9 MHz** • 1304 alphanumeric memories • Dualwatch capability • IPX7 Submersible*** • Optional GPS speaker Mic HM-175GPS

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• 1.8-24MHz + 6M Amp • 1KW amplifier • 100% duty cycle • Compact body • Detachable controller • Automatic antenna tuner

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• 160-10M • 100W • Simple & tough with IF DSP • AGC Loop Management • Digital IF Filter • Digital Twin PBT • Digital Noise Reduction • Digital Noise Blanker • USB Port for PC Control

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• D-STAR DV mode operation • DR (D-STAR repeater) mode • Free software download • GPS A mode for easy D-PRS operation • One touch reply button (DV mode) • Wideband receiver

IC-V80 2M Handheld Transceiver

• 2M @ 5.5W • Loud BTL audio output • Military rugged • Classic 2M operation

IC-80AD Analog + Digital Dual Bander D-STAR

• D-STAR DV mode operation • DR (D-STAR repeater) mode • Free software download • GPS A mode for easy D-PRS operation

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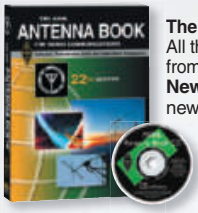

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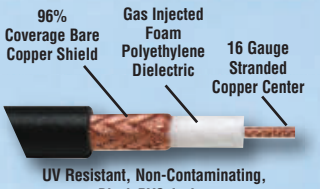

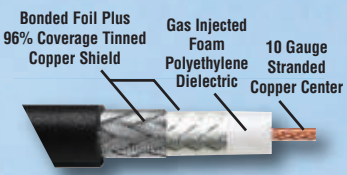

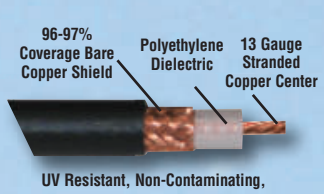

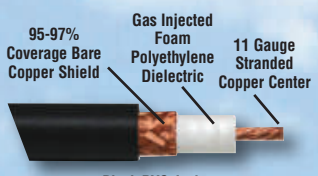

DXE-8X Low-Loss Foam Dielectric Cable (also known as RG-8X or Mini-8)

- Very flexible; ideal for short, in-shack jumper cables
- .242" Type II jacket is non-contaminating and UV resistant
- Direct bury

Attenuation/ 100 ft.	Power Rating	Efficiency %
0.6 dB @ 5 MHz	3.0 kW	86%
0.9 dB @ 10 MHz	2.2 kW	81%
1.4 dB @ 30 MHz	1.2 kW	69%
2.0 dB @ 50 MHz	0.9 kW	62%
3.8 dB @ 150 MHz	0.4 kW	42%

Cable Only		
DXE-8X	By the foot	**$.31/ft.**
DXE-8X-1000	1000 ft.	**$259.99**

Pre-cut Cable with Connectors		
Part Number	**Length/Ft**	**Price**
DXE-8XDU003	3	**$9.88**
DXE-8XDU006	6	**$10.88**
DXE-8XDU012	12	**$12.88**
DXE-8XDU025	25	**$17.88**
DXE-8XDU050	50	**$26.88**
DXE-8XDU075	75	**$35.88**
DXE-8XDU100	100	**$44.88**
DXE-8XDU150	150	**$62.88**

DXE-400MAX Cable

- Low-loss, gas-injected foam polyethylene dielectric bonded tape foil covered by a braided copper shield
- .405" low-density polyethylene jacket is UV resistant, ideal for outdoor use
- Direct bury

Gas Injected Foam Won't Absorb Water.

Attenuation/ 100 ft.	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	0.7 kW	47%

Cable Only		
DXE-400MAX	By the foot	**$.82/ft.**
DXE-400MAX-500	500 ft.	**$364.99**

Pre-cut Cable with Connectors		
Part Number	**Length/Ft**	**Price**
DXE-400MAXDU003	3	**$11.88**
DXE-400MAXDU006	6	**$14.88**
DXE-400MAXDU018	18	**$26.88**
DXE-400MAXDU025	25	**$33.88**
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DXE-400MAXDU075	75	**$83.88**
DXE-400MAXDU100	100	**$100.88**
DXE-400MAXDU150	150	**$158.88**

DXE-213U MIL-Spec Cable

- .405" Type II jacket is non-contaminating and UV resistant, suitable for outdoor use
- Direct bury

Attenuation/ 100 ft.	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%

Cable Only		
DXE-213U	By the foot	**$.89/ft.**
DXE-213U-500	500 ft.	**$409.99**

Pre-cut Cable with Connectors		
Part Number	**Length/Ft**	**Price**
DXE-213UDU003	3	**$11.88**
DXE-213UDU006	6	**$14.88**
DXE-213UDU012	12	**$20.88**
DXE-213UDU025	25	**$33.88**
DXE-213UDU050	50	**$57.88**
DXE-213UDU075	75	**$80.88**
DXE-213UDU100	100	**$99.88**
DXE-213UDU150	150	**$144.88**

DXE-8U Low-Loss Foam Dielectric Cable

- .405" high-flex PVC jacket
- Low-loss foam dielectric

Attenuation/ 100 ft.	Power Rating	Efficiency %
0.4 dB @ 5 MHz	5.1 kW	91%
0.9 dB @ 10 MHz	3.1 kW	81%
1.3 dB @ 30 MHZ	1.8 kW	74%
1.4 dB @ 50 MHz	1.6 kW	72%
2.2 dB @ 150 MHz	1.0 kW	60%

Cable Only		
DXE-8UDU	By the foot	**$.79/ft.**
DXE-8UDU-500	500 ft.	**$359.99**

Pre-cut Cable with Connectors		
Part Number	**Length/Ft**	**Price**
DXE-8UDU002	2	**$10.48**
DXE-8UDU003	3	**$11.48**
DXE-8UDU006	6	**$14.48**
DXE-8UDU025	25	**$30.48**
DXE-8UDU050	50	**$50.48**
DXE-8UDU100	100	**$90.48**

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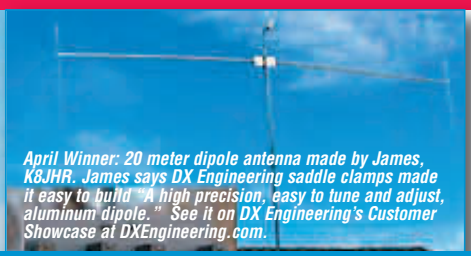

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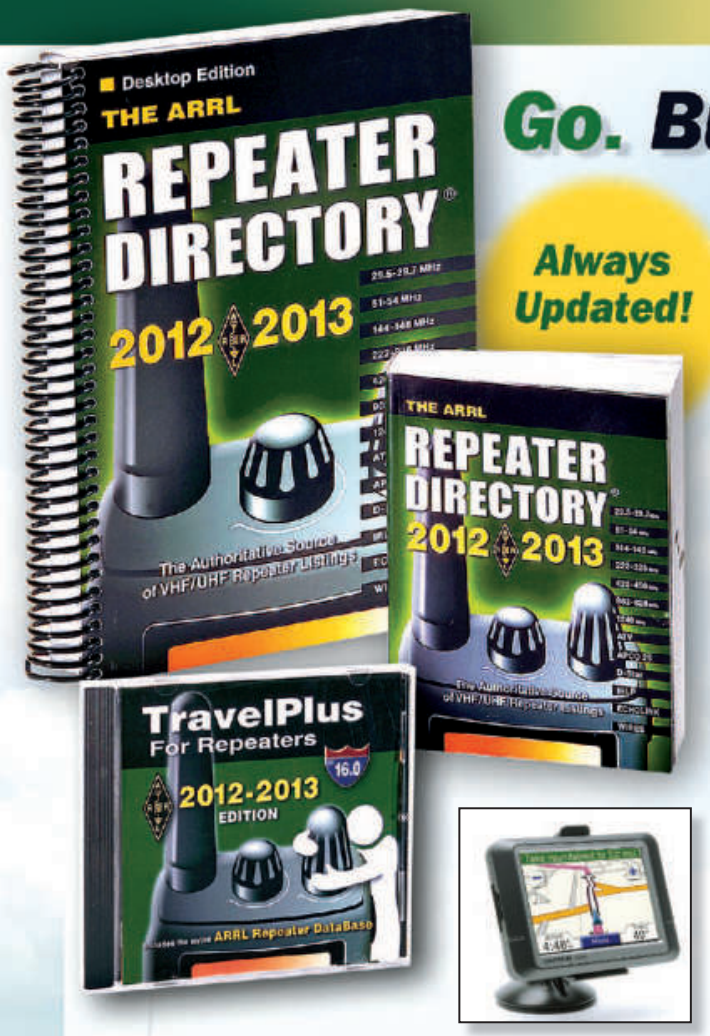

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QS5/2012

DX ENGINEERING

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DX Engineering Full Size 75/80 Meter Quarter-Wave Vertical Antennas

The 68 foot tall, high performance, full size antennas have rugged base sections (2, 3 or 4 inch diameter) made from aircraft-grade aluminum tubing. The VA-1 requires simple guying. The VA-2 and VA-3 models are very stout and don't require guying. The VA-2 and VA-3 antennas are supplied with a Heavy Duty Plus Stainless Pivot Base and can be lowered easily with the optional, DXE-VRW one-man, manual winch.

- 2:1bandwidth up to 500 kHz
- DX Engineering structural design + high strength tubing manufactured to rigid specifications **= Highest Wind Ratings**
- High strength, UV-protected Extren® insulator **= High Power Handling Capacity**
- Specially manufactured stainless steel and aluminum saddle clamps, stainless steel bolts, and precision machining **= Reliability Second to None**
- Specially manufactured Pivot Base supplied with VA-2 and VA-3 antennas **= Easy Tilt Up and Down**

DXE-7580FS-VA-1	Vertical Antenna, standard HD, 2 inch OD base section	**$379.50**
DXE-7580FS-VA-2	Vertical Antenna, Heavy Duty, 3 inch OD base section	**$675.50**
DXE-7580FS-VA-3	Vertical Antenna, Super Duty, 4 inch OD base section	**$1,675.50**

DXE-VRW-1 Manual Winch

A great option, this winch allows one person to easily raise or lower a VA-2 or VA-3 vertical antenna.

DXE-VRW-1 Manual Winch.....**$169.99**

65 Ft. Telescoping Antenna Kit

- Eleven telescoping sections from 2" to 7/8" O.D.
- Stainless steel element clamps

DXE-ATK65	Telescoping Antenna Kit	**$194.50**
DXE-VE-BASE	Fixed Vertical Insulated Base Kit	**$99.50**
DXE-VA-BASE	HD Vertical Insulated Tilt Base Kit	**$159.50**

6063-T832 Aluminum Tubing

- Smoothly telescoping sections
- Drawn, not extruded, tubing
- Best quality at the lowest price, guaranteed
- Custom made to DX Engineering's rigid specifications
- For best results, use DXE Stainless Steel Element Clamps to assemble slit lengths

DX Engineering Has Stainless Steel Element Clamps that Fit Exact Tubing Sizes! See DXEngineering.com for details.

Telescoping, High Strength, FiberGlass Tubing

Great for wire antenna spreaders or insulated stacking frames.

- Tubing custom made to DX Engineering's rigid specifications in smoothly telescoping sections
- Neutral, light gray color
- 1/8" nominal wall x 8 feet long
- Available in unslit tubing or one end slit tubing

Unslit End, Telescoping Fiberglass Tubing
available in sizes from 0.500" O.D. to 2.000" O.D.
(in .25" increments).....**$6.45 to $25.95**

Slit One End, Telescoping Fiberglass Tubing
available in sizes from 0.750" O.D. to 2.000" O.D.
(in .25" increments).....**$18.95 to $30.95**

50 Ft. Telescoping Fiberglass Tubing Mast Kit

- Includes DX Engineering Stainless Steel Element Clamps
- Tapers from 2.00" to .50" O.D. in seven 8 ft. sections

DXE-FTK50 50 ft. Telescoping Tubing Kit.....**$138.00**

Rohn Commercial Towers

Rohn Commercial Tower products and accessories are now available at DX Engineering. We have the Rohn products – Towers, Masts, and Tower and Installation Accessories – to meet your tower structural needs.

Contact DX Engineering Customer Support for your application.

SignaLink™ USB Unit from Tigertronics

- Easiest installation and setup—for Mac or PC
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- Works with ALL radios
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TIG-SL-USB **$89.95**

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Any Radio Interface Cable (except the special Elecraft K3 cable), is only **$12.95** when purchased with a SignaLink™ unit

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Design inspired by Jerry Sevick, W2FMI, and perfected by DX Engineering's Balun R&D department.

- Featuring a DX Engineering innovation: High voltage compensating capacitors for unequalled low SWR
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- Silver-plated gasketed SO-239 connectors, stainless hardware and a weatherproof NEMA box

1:1 Dual Wire/Single Core, 1.8 to 54 MHz		
COM-BAL-11130E	3 kW, side eyebolts	**$49.95**
COM-BAL-11130ET	3 kW, side and top eyebolts	**$49.95**
COM-BAL-11130S	3 kW, side studs/wingnuts	**$49.95**
COM-BAL-11130T	3 kW, top studs/wingnuts	**$49.95**
1:1 Coax/Single Core		
COM-BAL-11150E	5 kW, side eyebolts	**$49.95**
COM-BAL-11150ET	5 kW, side and top eyebolts	**$49.95**
COM-BAL-11150S	5 kW, side studs/wingnuts	**$49.95**
COM-BAL-11150T	5 kW, top studs/wingnuts	**$49.95**
1:1 Dual Wire/Dual Core		
COM-BAL-11140T	5 kW, top studs/wingnuts	**$69.95**
COM-BAL-11140S	5 kW, side studs/wingnuts	**$69.95**
1:1 Coax/Dual Core		
COM-BAL-11150DS	5 kW, side studs/wingnuts	**$69.95**
COM-BAL-11150DT	5 kW, top studs/wingnuts	**$69.95**
4:1 Dual Wire/Single Core		
COM-BAL-41130E	3 kW, side eyebolts	**$59.95**
COM-BAL-41130ET	3 kW, side and top eyebolts	**$59.95**
COM-BAL-41130T	3 kW, top studs/wingnuts	**$59.95**
COM-BAL-41130S	3 kW, side studs/wingnuts	**$59.95**
4:1 Dual Wire/Dual Core		
COM-BAL-41150T	5 kW, top studs/wingnuts	**$89.95**
COM-BAL-41150S	5 kW, side studs/wingnuts	**$89.95**
COM-BAL-41150E	5 kW, side eyebolts	**$89.95**

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- *Two-Position Antenna Switch*
- *2,000 Memories per Antenna*
- *1.8 to 54 MHz range*
- *6 to 800 ohm range (15 to 150 on 6M)*

M-1000 Meter sold separately

NEW! AT-1000Proll

Building on the success of the AT-1000Pro, LDG Electronics has refined and expanded its flagship 1KW tuner with optional external 4.5" analog meter. The new AT-1000Proll 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 $539.99; Optional M-1000 external analog meter $129.99

Z-11Proll

Meet the Z-11Pro II, everything you always wanted in a small, portable tuner. Designed from the ground up for battery operation. Only 5" × 7.7" × 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 through 6 meters. The Z-11Proll 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! 2,000 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

We have a tuner that will work for you!

We make tuners that will work with any transceiver. Don't know which one is right for you? Give us a call or see the ***Tuner Comparison Chart*** *on our web site for more selection help!*

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, 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***

AT-600Pro

The AT-600Pro handles up to 600 watts SSB and CW, 300 on RTTY (1.8–30 MHz), and 250 watts on 54 MHz. Matches virtually any kind of coax-fed antenna and will typically match a 10:1 SWR down to 1.5:1 in just a few seconds. You can also use it with longwires, random wires, and antennas fed with ladder line just by adding a balun. Two antenna ports with a front-panel indicator, and separate memory banks for each antenna. LED bar-graph meters shows RF power, SWR and tuner status, tactile feedback control buttons and an LED bypass indicator. Operates from 11–16 volts DC at 750 mA. Includes six-foot DC power cable.

Suggested Price $359.99

Z-100Plus

Small and simple to use, the Z-100Plus sports 2,000 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

LDG Electronics, Inc. 1445 Parran Road, St. Leonard, MD 20685 ***Phone 410-586-2177 • Fax 410-586-8475***

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). 2,000 memories cover 160 through 6 meters.

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

- *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 2,000 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

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 2,000 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. 2,000 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

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!

Antennas!

S9V 43' $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!

S9V 31' $99.99

40-6 meters *Fixed or Portable Operation*

S9V 18' $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.

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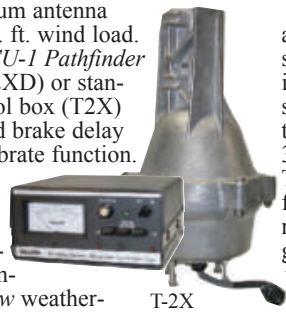
HAM-IV

HAM-IV **$649.95**

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

HAM IV and HAM V Rotator Specifications	
Wind Load capacity (inside tower)	15 square feet
Wind Load (w/mast adapter)	**7.5 square feet**
Turning Power	800 in.-lbs.
Brake Power	**5000 in.-lbs.**
Brake Construction	Electric Wedge
Bearing Assembly	**dual race/96 ball bearings**
Mounting Hardware	Clamp plate/steel U-bolts
Control Cable Conductors	**8**
Shipping Weight	26 lbs.
Effective Moment (in tower)	**2800 ft.-lbs.**

TAILTWISTER SERIES II



For large medium antenna arrays up to 20 sq. ft. wind load. Available with *DCU-1 Pathfinder* digital control (T2XD) or standard analog control box (T2X) with *new* 5-second brake delay and *new* Test/Calibrate function. Low temperature grease, alloy ring gear, indicator potentiometer, ferrite beads on potentiometer wires, *new* weatherproof AMP connectors plus 8-pin plug at control box, triple bearing race with 138 ball bearings for large load bearing strength, electric locking steel wedge brake, North or South center of rotation scale on meter, low voltage control, $2^{1}/_{16}$ inch max. mast.

T-2X **$799.95**

T-2XD **$1229.95** with DCU-1

TAILTWISTER Rotator Specifications	
Wind load capacity (inside tower)	20 square feet
Wind Load (w/ mast adapter)	**10 square feet**
Turning Power	1000 in.-lbs.
Brake Power	**9000** in.-lbs.
Brake Construction	Electric Wedge
Bearing Assembly	**Triple race/138 ball brngs**
Mounting Hardware	Clamp plate/steel U-bolts
Control Cable Conductors	**8**
Shipping Weight	31 lbs.
Effective Moment (in tower)	**3400 ft.-lbs.**

CD-45II

CD-45II **$449.95**

For antenna arrays up to 8.5 sq. feet mounted inside tower or 5 sq. ft. with mast adapter. Low temperature grease good to -30 F degrees. *New* Test/Calibrate function. Bell rotator design gives total weather protection, dual 58 ball bearing race gives proven support. Die-cast ring gear, stamped steel gear drive, heavy duty, trouble free gear train, North center scale, lighted directional indicator, 8-pin plug/socket on control unit, snap-action control switches, low voltage control, safe operation, takes maximum mast size to $2^{1}/_{16}$ inches. MSLD light duty lower mast support included.

CD-45II Rotator Specifications	
Wind load capacity (inside tower)	8.5 square feet
Wind Load (w/ mast adapter)	**5.0 square feet**
Turning Power	600 in.-lbs.
Brake Power	**800 in.-lbs.**
Brake Construction	Disc Brake
Bearing Assembly	**Dual race/48 ball brings**
Mounting Hardware	Clamp plate/steel U-bolts
Control Cable Conductors	**8**
Shipping Weight	22 lbs.
Effective Moment (in tower)	**1200 ft.-lbs.**

HAM-V

HAM-V **$1099.95** with DCU-1

For medium antenna arrays up to 15 square feet wind load area. Similar to the HAM IV, but includes *DCU-1 Pathfinder* digital control unit with gas plasma display. Provides automatic operation of brake and rotor, compatible with many logging/contest programs, 6 presets for beam headings, 1 degree accuracy, auto 8-second brake delay, 360 degree choice for center location, *more!*

ROTATOR OPTIONS

MSHD, $109.95. Heavy duty mast support for T2X, HAM-IV and HAM-V.
MSLD, $49.95. Light duty mast support for CD-45II and AR-40.
TSP-1, $34.95. Lower spacer plate for HAM-IV and HAM-V.

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.**

HDR-300A

HDR-300A **$1499.95**

King-sized antenna arrays up to 25 sq.ft. wind load area. Control cable connector, *new* hardened stainless steel output shaft, *new* North or South centered calibration, *new* ferrite beads on potentiometer wires reduce RF susceptibility, *new* longer output shaft keyway adds reliability. Heavy-duty self-centering steel clamp and hardware. Display accurate to 1°. Machined steel output.

HDR-300A Rotator Specifications	
Wind load capacity (inside tower)	25 square feet
Wind Load (w/ mast adapter)	**not applicable**
Turning Power	5000 in.-lbs.
Brake Power	**7500 in.-lbs.**
Brake Construction	solenoid operated locking
Bearing Assembly	**bronze sleeve w/rollers**
Mounting Hardware	stainless steel bolts
Control Cable Conductors	**7**
Shipping Weight	61 lbs.
Effective Moment (in tower)	**5000 ft.-lbs.**

Digital Automatic Controller

DCU-1 **$749.95**

Automatically controls T2X, HAM-IV, V rotators. 6 presets for favorite headings, 1° accuracy, 8-sec. brake delay, choice for center of rotation, crisp *plasma* display. Computer controlled with many logging/contest programs.

AR-35 Rotator/Controller

AR-35 **$89.95**

For UHF, VHF, 6-Meter, TV/FM antennas. Includes automatic controller, rotator, mounting clamps, mounting hardware. 110 VAC. One Year Warranty.

RBD-5 **$29.95**

NEW! **Automatic Rotator Brake Delay**
Provides automatic 5-second brake delay -- insures your rotator is fully stopped before brake is engaged. Prevents accidentally engaging brake while rotator is moving. Use with HAM II, III, IV, V, T2Xs. Easy-to-install. Includes pre-assembled PCB, hardware.

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- Power: 7/4/0.5W • Memories: 200
- D-Star upgradable with optional UT-118

ID-31A 440 FM & D-STAR HT w/GPS

- TX: 420-450 MHz • RX: 400-479 MHz
- Power: 5/2.5/0.5/0.1W • Memories: 1252
- D-Star Digital Voice and GPS receiver is built-in
- Large Dot Matrix Display and Directional Keypad makes the radio easy to navigate through the menus

IC-2200H 2M FM Mobile

- TX: 144-148 MHz • RX: 118-174 MHz
- Power: 65/25/10/5W • Memories: 207
- D-Star upgradable with optional UT-118

IC-208H 2M/440 FM Mobile

- TX: 144-148, 430-450 MHz • Memories: 512
- RX: 118-173, 230-549, 810-999 MHz (cell blkd)
- Power: 55/15/5W (2M), 50/15/5W (440 MHz)

IC-2820H 2M/440 FM Mobile

- TX: 144-148, 430-450 MHz • RX: 118-549.95, 810-999.990 MHz (cell blkd) • Power: 50/15/5W
- Packet ready (9600 BPS) • Upgradable D-Star DV (digital voice) & GPS capabilities w/optional UT-123

IC-718 HF Transceiver

- TX: HF (except 60M) • RX: 0.03-30 MHz
- Power: 5-100W • Memories: 101 • DSP built-in
- SSB, CW, RTTY and AM (2-40W)

IC-7200 HF/6M Portable

- TX: HF/6M • RX: 0.03-60 MHz • Power: 2-100W
- Memories: 201 • Rugged design for outdoor use
- 32-bit IF-DSPs + 24-bit AD/DA Converters
- USB Port for CI-V Format PC Control & Audio In/Out

IC-7410 HF/6M Transceiver

- TX: HF/6M • RX: 0.03-60 MHz • Power: 2-100W
- 15kHz 1st IF filter and optional 3kHz & 6kHz filters to protect against strong unwanted adjacent signals
- Much faster DSP unit compared to the IC-746PRO
- Automatic antenna tuner • USB connector for PC control

IC-9100 HF/6/2M/440 MHz All Mode

- TX: HF/6/2M/440 MHz • RX: 0.03-60, 136-174, 420-480 MHz • Optional 1.2 GHz, 1-10W Operation
- Power: 2-100W HF/6/2M & 2-75W 440 MHz
- Memories: 297 • Optional D-Star Board • Auto Tuner
- USB Port for CI-V Format PC Control & Audio In/Out

IC-7700 HF/6M Transceiver

- TX: HF/6M • RX: 0.03-60 MHz • Power: 5-200W
- Memories: 101 • 7 inch color screen
- Two 32-bit floating DSPs • Power supply built-in
- Three roofing filters • External VGA connector
- Automatic antenna tuner • USB memory drive socket
- Real time spectrum scope

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GRE

PSR-100

PSR-800

GRE PSR-100 Analog HT Scanner

• RX: 29-54, 108-174, 380-512 • Memories: 200
• Same Weather Alert • Skywarn one button access
• 5 Pre-programmed bands (Marine, Fire Dept/Police Dept, Air Ham, WX) for one touch search

GRE PSR-800 Easy To Use Scanner

• Uses a 2GB SD card that is preloaded with the USA Radio Reference database • RX: 25-54, 108-174, 216-512, 764-782, 791-799, 806-960 & 1240-1300 MHz (less cellular) • Scans digital and analog trunked radio system signaling formats, including Project 25, Motorola Type I/II/Hybrid, EDACS and LTR systems

GRE PSR-700 Easy To Use Scanner

• Same looks and features of the PSR-800 but does NOT receive digital trucked systems • Receives Motorola type I/II systems, EDACS and LTR analog trunking systems

GRE PSR-410
Triple Trunking Analog Mobile Scanner

• RX: 25-54, 108-174, 216-512, 764-781, 791-796, 806-823, 849-868, 894-960 & 1240-1300 MHz (less cellular) • Memories: 1,800 • Scans most common Trunked radio system signaling formats, including Motorola, EDACS Standard, EDACS Narrow, and LTR Trunked radio systems

GRE PSR-600
Analog/Digital Mobile Scanner

• RX: 25-54, 108-174, 216-512, 764-960 & 1240-1300 MHz (less cellular) • Memories: 1,800
• Digital Triple Trunking Desktop/Mobile Scanner
• Scans most common trucked systems such as Motorola, EDACS Standard, EDACS Narrow, LTR and P25 networks

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DJ-G29T

DJ-V57T 2M/440 FM HT

• TX: 144-148, 420-450 • RX: 136-174, 400-512 MHz
• Power: 5/2/0.5W on 2M & 4.5/2/0.5W on 440
• Memories: 200 • Quick-write function copies current VFO info to the lowest available memory channel

DJ-G29T 220/900 FM HT

• TX: 222-225, 902-928 • RX: 216-250, 902-928 MHz
• Power: 5/2/0.8/0.3W on 220 & 2.5/0.8/0.3W on 900
• Memories: 500 • Quick-write function copies current VFO info to the lowest available memory channel

DR-135TMKIII 2M FM Mobile

• TX: 144-148 MHz • RX: 118-136 (AM), 136-174 MHz
• Power: 50/10/5W • Memories: 100
• Optional EJ-41U TNC board for 1200/9600bps packet

DR-235TMKIII 220 FM Mobile

• TX: 222-225 MHz • RX: 216-280 MHz
• Power: 25/10/5W • Memories: 100
• Optional EJ-41U TNC board for 1200/9600bps packet

DR-635T 2M/440 FM Mobile

• TX: 144-148, 430-450 • RX: 87.5-174, 335-480 MHz
• Power: 50/20/5W on 2M & 35/20/5W on 440
• Memories: 200 • Cross Band Repeat
• Dual Band Receive (V/V, U/U, V/U, U/V)
• Optional EJ-50U TNC board for 1200/9600bps packet

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MFJ-259B *World's* most popular Antenna Analyzer is super easy-to-use!

MFJ-259B
$289.95

The MFJ-259B is the world's most popular Antenna Analyzer and the easiest to use! Just select a band and mode. Set frequency. Your measurements are instantly displayed!

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Owning the MFJ-259B is like having an entire antenna lab in the palm of your hand!

Measure SWR quickly or make sophisticated measurements such as Return Loss, Reflection Coefficient, Resonance, Complex Impedance (R+jX), Impedance Magnitude (Z) plus Phase in degrees. Covers 1.8 to 170 MHz -- no gaps.

Coax Analyzer

Determine coax cable velocity factor (Vf), loss in dB, coax length, distance to open or short plus detect wrong coax impedance.

Frequency Counter

Measure frequency of external signals using the separate BNC counter input.

Signal Generator

Use as a signal source 1.8-170 MHz with digital dial accuracy for testing and alignment.

Inductance and Capacitance

Measure Inductance (uH) and Capacitance (pF) at RF frequencies not at audio frequencies used by most L/C meters.

Digital and *Analog* Meters

A high-contrast backlit LCD gives precision readings and *two* side-by-side *analog meters* make antenna adjustments intuitive.

Smooth, Stable Tuning

Velvet-smooth reduction drive tuning and precision *air-variable capacitor* makes setting frequency easy and stable.

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Battery-saver, low-battery warning, battery voltage meter and charger are all built in. Use ten Alkaline, NiCad or NiMH AA batteries (not included) or 110 VAC with MFJ-1312D, $15.95. 4Wx6¾Hx2D inches.

Here's What You Can Do

Find true antenna resonant frequency
Tune *antenna quickly for minimum SWR*
Match complex loads to your feedline
Adjust *mobile whips without stressing finals*
Determine safe 2:1-SWR operating windows
Adjust *tuners without generating QRM*
Find exact location of shorts and opens
Cut *stubs and phasing lines accurately*
Check cable for loss and contamination
Find *value of unknown coils and caps*
Test RF transformers and baluns
Troubleshoot *filters and networks*
Find self-resonance and relative Q
Check *patterns and compare gain*
MFJ-259B does all this and more!

MFJ Analyzer Accessories

MFJ-29C, $24.95. Tote your MFJ-259B anywhere with this *genuine* MFJ custom carrying case. Special foam-filled fabric cushions blows, deflects scrapes and protects knobs and meters from harm. **MFJ-39C, $24.95.** Like MFJ-29C, but for MFJ-269.

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MFJ-92AA10, $29.95. Ten MFJ *SuperCell*™ Ni-MH AA rechargeable batteries.

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MFJ-99, $60.85. ***Save $5!*** Like MFJ-99B, less batteries, for MFJ-259B. **MFJ-98, $60.85.** Like MFJ-99 but for MFJ-269.

MFJ-99C, $40.90. ***Save $5!*** AC Adapter and 10 Ni-MH batteries for MFJ-259B/269.

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MFJ-269 ...1.8-170 MHz and 415-470 MHz plus 12-bit A/D!

The MFJ-269 does everything the MFJ-259B does - and much more!

Expanded Frequency Coverage

MFJ-269 adds UHF coverage from 415 to 470 MHz -- right up into the commercial band. With it, you can adjust UHF dipoles, verticals, Yagis, quads and repeater collinear arrays with ease -- plus construct accurate phasing harnesses and timed cables. Also use it as a signal source to check UHF duplexers, diplexers, IMD filters and antenna patterns.

Much Better Accuracy

New *12-bit* A/D converter gives much better accuracy and resolution than common 8-bit A/D converters -- *an MFJ-269 exclusive!*

Complex Impedance Analyzer

Read Complex Impedance (1.8 to 170 MHz)as series equivalent resistance and reactance (Rs+jXs) or as magnitude (Z) and phase (degrees). Also reads *parallel* equivalent resistance and reactance (Rp+jXp) -- *an MFJ-269 exclusive!*

MFJ-269
$389.95

CoxCalculator™

Lets you calculate coax line length in feet given electrical degrees and vice versa for any frequency and any velocity factor -- *an MFJ-269 exclusive!*

Use any Characteristic Impedance

You can measure SWR and coax loss with *any* characteristic impedance (1.8 to 170 MHz) from 10 to over 600 Ohms, including 50, 51, 52, 53, 73, 75, 93, 95, 300, 450 Ohms -- *an MFJ-269 exclusive!*

Logarithmic Bar Graph

Has easy-to-read LCD *logarithmic* SWR bargraph and SWR meter for quick tuning.

Uses instrumentation grade N-connector to ensure minimum mismatch on all frequencies. Includes N to SO-239 adapter.

MFJ-269*PRO*™ *Analyzer*

MFJ-269PRO
$419.95

Like MFJ-269, but has extended commercial frequency coverage in UHF range ***(430 to 520 MHz)*** and *ruggedized* cabinet that protects LCD display, knobs, meters and connectors from damage in the field/lab.

MFJ-266 ...Wide range 1.5-185 MHz and 300-490 MHz!

New!

MFJ-266
$349.95

The compact MFJ-266 covers HF (1.5-65 MHz) in 6 bands, plus VHF (85-185 MHz) and UHF (300-490 MHz).

In *Antenna Analyzer* mode, you get Frequency, SWR, Complex Impedance (R+jX), and Impedance Magnitude (Z) *all displayed simultaneously* on a high-contrast backlighted LCD (SWR only on UHF).

In *Frequency-Counter* mode, the MFJ-266 functions as a 500-MHz counter with up to 100 Hz resolution and measures relative field strength of a signal and its frequency and can be used for tracking measurement interference.

MFJ-266 also functions as a 10 dBm signal source with digital-frequency readout. It can also measure inductance and capacitance at RF frequencies.

Features include solid-state band switching and electronic varicap tuning with a smooth 10:1 lockable vernier tuning drive.

Use eight AA *alkaline* batteries or 110 VAC with MFJ-1312D, $15.95. Includes N-to-SO-239 adapter. 3¾Wx6½Hx2¾D inches. 1.3 lbs.

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More hams use MFJ-949s than any other antenna tuner in the world!

Why? Because the world's leading tuner has earned a world-wide reputation for being able to match just about anything.

Full 1.8-30 MHz Operation

Tune your antenna for minimum SWR! Works 1.8-30 MHz on dipoles, verticals, inverted vees, random wires, beams, mobile whips, shortwave receiving antennas . . . Use coax, random wire, balanced lines. Has heavy duty 4:1 balun for balanced lines.

Custom inductor switch

Custom designed inductor switch, 1000 volt tuning capacitors, *Teflon*® insulating washers and proper L/C ratio gives you *arc-free* no worries operation 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!

MFJ-948, $159.95. Econo version MFJ-949E. Has all features except for dummy load.

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More hams use MFJ tuners than all other tuners in the world!

MFJ-989D *Legal Limit* Tuner

MFJ-989D **$389.95**

New, improved MFJ-989D *legal limit* antenna tuner gives you better efficiency, lower losses and a new *true* peak reading meter. Easily handles *full* 1500 Watts SSB/CW, 1.8-30 MHz, including MARS/WARC bands. Six position antenna switch, dummy load. *New* 500 pF air variable capacitors. *New* improved *AirCore™* Roller Inductor. *New* high voltage current balun. *New* crank knob. $12^{7}/_{8}$Wx6Hx$11^{5}/_{8}$D".

MFJ-986 Two knob *Differential-T™*

MFJ-986 **$349.95**

Two knob tuning (differential capacitor and *AirCore™* roller inductor) makes tuning foolproof and easier than ever. Gives minimum SWR at only one setting. Handles 3 KW PEP SSB amplifier input power (1.5 KW output). Gear-driven turns counter, lighted peak/average Cross-Needle SWR/Wattmeter, antenna switch, balun. 1.8 to 30 MHz. $10^{3}/_{4}$Wx$4^{1}/_{2}$Hx15 in.

MFJ-962D *compact* kW Tuner

MFJ-962D **$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 **$99.95**

MFJ-906 has lighted Cross-Needle SWR/Wattmeter, bypass switch. Handles 100 W FM, 200W SSB. **MFJ-903, $69.95**, Like MFJ-906, less SWR/Wattmeter, bypass switch.

MFJ-921/924 *VHF/UHF* Tuners

MFJ-921/924 **$89.95**

MFJ-921 covers 2 Meters/220 MHz. **MFJ-924** covers 440 MHz. SWR/Wattmeter. 8x$2^{1}/_{2}$x3 in.

MFJ-931 *artificial* RF Ground

MFJ-931 **$109.95**

Eliminates RF hot spots, RF feedback, TVI/RFI, weak signals caused by poor RF grounding. Creates artificial RF ground or electrically places far away RF ground directly at rig. **MFJ-934, $209.95**, Artificial ground/300 Watt Tuner/Cross-Needle SWR/Wattmeter.

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MFJ-993B 300 Watt *IntelliTuner*™

The World's Best Selling Automatic Antenna Tuner!

The MFJ-993B *IntelliTuner*™ lets you tune any antenna -- balanced or unbalanced -- *automatically* and *ultra fast*.

It's a comprehensive automatic *antenna tuning center* complete with SWR/Wattmeter, antenna switch for two antennas and 4:1 current balun for balanced lines.

MFJ's exclusive *IntelliTuner*™, *Adaptive Search*™ and *Instant Recall*™ algorithms give you *ultra fast* automatic tuning with over 20,000 *VirtualAntenna*™ Memories.

Select 300 Watt SSB/CW power level and match 6-1600 Ohm antennas ***Or . . .*** select **150 Watt** SSB/CW power level and match *extra wide-range* 6-3200 Ohms!

You get a highly efficient L-network, 1.8-30 MHz coverage, Cross-Needle *and* digital meters, audio SWR meter, *backlit* LCD, remote control port, radio interface, heavy-duty 16 amp/1000V relays.

MFJ-993B **$259.95**

The MFJ-993B automatically tunes for minimum SWR and remembers your frequency and tuner settings. The next time you operate on that frequency and antenna, these tuner settings are instantly restored and *you're ready to operate in milliseconds!* 10W x2¾ Hx9D". Use 12-15 VDC/1 amp or 110 VAC with **MFJ-1316, $21.95**. Radio interface cables, remote control available. See ***www.mfjenterprises.com***

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1500 Watt *Legal Limit*

for Ameritron AL-1500/1200/82 amps

Roam the entire HF spectrum 1.8-30 MHz *hands-free* with full *1500 Watt* legal limit on SSB/CW and near-perfect SWR! Lighted LCD/Cross-Needle Meter.

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300 Watt...Extra Wide Range

SWR/Wattmeter, 10000 VA Memories

Extra *wide matching range at less cost.* Exclusive dual power level: 300 Watts/6-1600 Ohms; 150W/6-3200 Ohms. Cross-Needle SWR/Wattmeter.

MFJ-991B **$219.95**

200 Watt ...Compact

Digital Meter, Ant Switch, Wide Range

World's fastest compact auto tuner uses MFJ *Adaptive Search*™ and *InstantRecall*™ algorithms. 132,072 tuning solutions instantly match virtually any antenna with near perfect SWR.

MFJ-929 **$219.95**

200 Watt ...Econo

Small, Ant Switch, 20K VA Memories

High-speed, wide matching range and compactness at low cost! Leave in-line and forget it -- your antenna is *always* automatically tuned! 2-position antenna switch.

MFJ-928 **$199.95**

200 Watt *MightyMite*™

Matches IC-706, FT-857D, TS-50S

No *extra space needed!* Just set your IC-706/7000, FT-857D, TS-50S on top of this matching low-profile automatic tuner -- it's all you need for a completely automated station using *any* antenna! Just tune and talk!

MFJ-925 **$179.95**

G5RV Antenna

Covers all bands, 160-10 Meters with antenna tuner. 102 ft. long. Can use as inverted vee or sloper. Use on 160 Meters as Marconi.1500 Watts. Super-strong fiberglass center/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.

MFJ-1778 **$44.95**

200W...Weather-sealed

for Remote/Outdoor/Marine

Fully *weather-sealed for remote Outdoor/Marine use*! Tough, durable, built-to-last the elements for years.

MFJ-926B **$279.95**

200 Watt...Remote

Coax/Wire Ant, No pwr cable needed

Weather protected fully automatic *remote* auto tuner for wire ***and*** *coax* antennas -- an MFJ exclusive. Powers through coax -- No separate power cable needed.

MFJ-927 **$259.95**

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MFJ 160-6 Meter Antenna

Self-supporting 43 foot vertical -- no guy wires required . . . 1500 Watts . . . exceptional performance . . . low-profile . . . includes base mount and legal limit balun . . . assembles in an hour . . .

MFJ-2990
$359.95

New!

Operate all bands 160 through 6 Meters at full 1500 Watt with this self-supporting, 43 feet high performance vertical! It assembles in less than an hour and its low-profile blends in with the sky and trees -- you can barely see it from across the street.

Exceptional Performance

The entire length radiates to provide exceptional low angle DX performance on 160 through 20 meters and very good performance on 17 through 6 Meters. You can shorten it by telescoping it down for more effective low angle radiation on higher bands if desired.

With an automatic antenna tuner there's no fuss -- just talk!

A wide-range automatic or manual antenna tuner *at your rig* easily matches this antenna for all bands 160-6 Meters. There's no physical tuning adjustments on the antenna -- you simply put it up!

An optimized balun design allows *direct coax feed* with negligible coax loss (typically less than 1/2 dB 60-6 Meters and less than 1 dB 160-80 M with good quality, low-loss coax).

Fully self-supporting, Extremely low wind loading, Very low visibility . . .

With just 2 square feet wind load, the fully self-supporting MFJ-2990 -- *no guy wires needed* -- has the lowest wind-loading and lowest visibility of any vertical antenna! The key is a six foot section of tapering diameter *stainless steel* whip that flexes in strong wind instead of stressing the bottom sections. Its 2-inch O.D. and .120 inch thick walled tubing bottom section makes it incredibly strong -- it'll stay up!

Weighs just 20 pounds -- you can easily put it up by yourself because its corrosion resistant *6063 aircraft aluminum* tubing and stainless steel construction make it light *and* super-strong.

Assembles in an hour

You can easily assemble it in an hour! Ground mounting lets you completely hide its antenna base in shrubbery. Includes ATB-65 high-strength antenna mount. Requires ground system -- at least one radial. More extensive ground system will give much better performance.

Great for Stealth Operation in antenna restricted areas

This very low-profile antenna is perfect for stealth operation in antenna restricted areas. Hide it behind trees, fences, buildings, bushes. Use it as a flagpole. Telescope it down during the day. Put it up at night and take it down in the morning before the neighbors even notice!

Quick and easy installation makes it great for DXpeditions, field day and other portable and temporary operations.

MFJ *Automatic* Tuners

MFJ-998
$699.95

For legal limit 1500 Watt SSB/CW amplifiers. Auto-ranging LCD and Cross-Needle SWR/Wattmeter, antenna switch, amp bypass, matches 12-1600 Ohms, 1.8-30 MHz.

MFJ-993B
$259.95

Dual power range -- 300 Watt range matches 6-1600 Ohms. 150 Watt/6-3200 Ohms. Auto-ranging LCD and Cross-Needle SWR/Wattmeter, antenna switch, 1.8-30 MHz.

MFJ *Manual* Tuners

MFJ-989D
$389.95

1500 Watts SSB/CW, 1.8-30 MHz. Active peak-reading Cross-Needle SWR/Wattmeter, balun, dummy load, antenna switch, aircore roller inductor.

MFJ-949E
$179.95

World's most popular tuner! 300 Watts, 1.8-30 MHz. Peak/Average Cross-Needle SWR/Wattmeter, 8 pos. antenna switch, dummy load, 1kV capacitors.

Window Feedthru

MFJ-4602
$69.95

Bring 3 coaxes, balanced line, random wire, ground thru window. Connectors mounted on *stainless steel* panel. 3/4" thick *pressure-treated* weather-proof wood.

Free MFJ Catalog

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MFJ All-Band G5RV Antennas

Operate all bands through 10 Meters, even 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 hear strong signals from G5RVs day and night, 24/7.

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 an antenna tuner and a ground.

MFJ's fully assembled G5RV handles 1500 Watts. *Hang and Play™* -- add coax, some rope to hang and you're on the 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 85 foot long *dual band* 80/40 Meter dipole antenna. It's *full-size* on 40 Meters and has ultra-efficient end-loading on 80 Meters. Handles 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 coax fed 42 foot long *dual band* 40/20 Meter dipole antenna. *Full-size* on 20 Meters, ultra-efficient end-loading on 40 Meters. Same construction as MFJ-17758.

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*(R) coax and *Teflon*(R) 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
4-Positions

MFJ-1704 heavy duty *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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http://www.mfjenterprises.com for instruction manuals, catalog, info

MFJ *Switching* Power Supplies

Power your HF transceiver, 2 meter/440 MHz mobile/base and accessories with these highly reliable 15, 22, 30, 40 or 75 Amp MFJ Switching Power Supplies!

No RF hash . . . Super lightweight . . . Super small . . . Volt/Amp Meters . . .

MFJ's adjustable voltage switching power supplies do it all! Power your HF or 2M/440 MHz radio and accessories.

MFJ's *MightyLites*™ are so light and small you can carry them with one hand! Take them with you anywhere.

No more picking up and hauling around heavy, bulky supplies that can give you a painful backache, pulled muscle or hernia.

These babies are clean . . . Your buddies won't hear *any* RF hash on your signal! *None* in your receiver either! These super clean *MightyLites*™ meet all FCC Class B regulations.

Less than 35 mV peak-to-peak ripple under 25 or 45 amp full load. Load regulation is better than 1.5% under full load.

You won't burn up our power supplies!

MFJ Power supplies are *fully protected* with Over Voltage, Over-temperature and Over Current protection circuits.

MFJ *MightyLites*™ can be used anywhere in the world! They have switchable AC input voltage and work from 85 to 135 VAC or 170 to 260 VAC. Replaceable fuse.

A whisper quiet internal fan efficiently cools your power supply for long life.

22 Amp Continuous

Ham Radio's smallest and lightest 22 Amp continuous power supply is also its best selling!

MFJ-4125 **$84.95**

22 Amps continuous/25 Amps max at 13.8VDC. 5-way binding posts on front, 5A quick connects on back. 85-135/170-260 VAC input. 2.9 lbs. 5¾Wx3Hx5¾D".

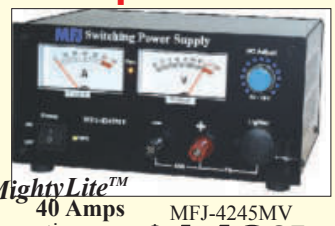
MFJ-4125P, $94.95. Adds 2-pairs *Anderson PowerPoles*™.

22 Amp Continuous

MFJ-4225MV **$99.95**

22 Amps continuous, 25 Amps maximum. Like MFJ-4125 but adds Volt/Amp meters, cigarette lighter plug. Adjustable 9-15 VDC Output. 5¼Wx 4½Hx6D in. Weighs 3.7 lbs. Use 85-135 VAC or 170-260 VAC input. Replaceable fuse.

40 Amp Continuous



MightyLite™

MFJ-4245MV **$149.95**

40 Amps continuous, 45 Amps max. Adjustable 9-15 VDC output. Volt/Amp meters, cigarette lighter plug, front 5-way binding posts, two rear quick connects. 5.5 lbs. 7½Wx 4¾Hx9D inches. Use 85-135 VAC or 170-260 VAC input. Replaceable fuse.

70 Amp Continuous

MFJ-4275MV **$249.95**

75 Amps maximum and 70 Amps continuously. Adjustable voltage 4.0-16 VDC. Short circuit, overload and over-temperature protection, 10.5 lbs. 9¾Wx5½Hx9½D". Great for Ameritron's ALS-500M mobile amplifier!

High Current Multiple DC Power Outlets

Power multiple Transceivers/accessories from a* single *DC power supply . . . Keeps you neat, organized and safe . . .Prevents fire hazard . . . Keeps wires from tangling up and shorting . . . Fused and RF bypassed . . . 6 foot, 8 gauge color coded cable . . .

Versatile 5-Way Binding Posts

MFJ-1118, $84.95. Power two HF and/or VHF rigs and six accessories from your main 12 VDC supply. *Built-in 0-25 VDC voltmeter*. Two pairs 35 amp 5-way binding posts, fused and RF bypassed for transceivers. Six pairs RF bypassed binding posts provide 15 Amps for accessories. Master fuse, ON/OFF switch,"ON" LED. 12½x2¾x2½ in.

MFJ-1116, $59.95. 8 pairs binding posts, 15A total.Voltmeter, on/off switch.

MFJ-1112, $44.95. 6 pairs binding posts, 15 Amps total.

MFJ-1117, $64.95. Powers *four* transceivers simultaneously (two at 35 Amps each and two at 35 Amps combined). 8x2x3 inches.

***All PowerPoles*™**

MFJ-1128, $104.95. 3 high-current outlets for transceivers. 9 *switched* outlets for accessories. Mix & match included fuses as needed (one-40A, one-25A, four-10A, four-5A, three-1A fuses installed). 0-25 VDC *Voltmeter*. *Extra* contacts, fuses. 12Wx1¼Hx2¾D".

MFJ-1126, $84.95. 8 outlets, each fused, 40 Amps total. Factory installed fuses: two 1A, three 5A, two 10A, one 25A, one 40A. *0-25 VDC Voltmeter*. Includes *extra PowerPoles*®, *extra* fuses -- *no extra cost*. 9Wx1¼Hx2¾ inches.

PowerPoles*™ *AND 5-Way Binding Posts

MFJ-1129, $114.95. 10 outlets each fused, 40 Amp total. 3 high-current outlets for rigs -- 2 *PowerPoles*® and one 5-way binding post. 7 *switched* outlets for accessories (20A max) -- 5 *PowerPoles*® and 2 binding posts. Fuses include (1- 40A, 2-25A, 3-10A, 3-5A, 2-1A installed). *0-25 VDC Voltmeter*. Includes extra *PowerPoles*® and fuses, 12½Wx1¼Hx2¾D inches.

MFJ-1124, $64.95. 6 outlets each fused, 40 Amps total. 4 *PowerPoles*®, 2 high-current binding posts, Installed fuses: 1-40A, 2-25A, 2-10A, 1-5A, 1-1A. Includes extra *PowerPoles*® & fuses -- *no extra cost*.

MFJ-1118 **$84.95**

MFJ-1116 **$59.95**

MFJ-1112 **$44.95**

MFJ-1117 **$64.95**

MFJ-1128 **$104.95**

MFJ-1126 **$84.95**

MFJ-1129 **$114.95**

MFJ-1124 **$64.95**

15 Amp Continuous

15 Amps continuous, 17 Amps max at 13.8 VDC. Over-voltage, over-current protection. 5-way binding posts. Load fault indicator and automatic shutdown. 90-130 VAC input. 1½ lbs. Tiny 3¾Wx2¼Hx3¾D inches fits easily in an overnight bag.

MFJ-4115 **$59.95**

30 Amps Continuous

Linear with 19.2 lb.Transformer

This heavy-duty linearly regulated MFJ-4035MV has *abolutely no RF Hash*. It delivers 30 Amps continuous, 35 Amps maximum from its massive 19.2 lb. transformer. Front panel adjustable 1-14 VDC output with convenient detent at 13.8 VDC. Volt/Amp Meters. 1% load regulation, 30 mV ripple. Over-voltage/current/temperature protection, 5-way binding posts, 2 pairs of quick-connects and a covered cigarette lighter socket for mobile accessories. Front panel replaceable fuse. 110 VAC input. 9½Wx6Hx9¾D in.

MFJ-4035MV **$149.95**

***Free* MFJ Catalog**

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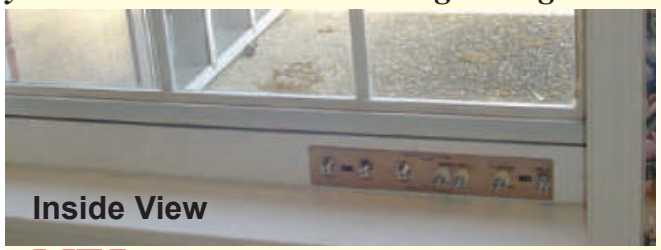
MFJ Weather-Proof *Window Feedthrough Panels*

Weather-proof window feedthrough panels bring coax, balanced lines, HF/VHF/UHF antennas, random wire antennas, ground, rotator/antenna switch cables and DC/AC power into your hamshack without drilling through walls!



MFJ Weather-Proof *Window Feedthrough Panels* mount in your window sill. Lets you bring all your antenna connections into your hamshack *without* drilling holes through walls.

Simply place in window sill and close window. One cut customizes it for any window up to 48 inches. Use horizontally or vertically. Connectors are mounted on inside/outside stainless steel plates and attached to a 4 foot long, $3^{1}/_{2}$ inch high, $^{3}/_{4}$ inch thick *pressure-treated* wood panel. 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 $1^{1}/_{4}$X$1^{5}/_{8}$ in). Adapts to virtually *any* cable size. Seals out rain, snow, adverse weather.

3 Coax, Balanced Line, Random Wire

Best Seller! 3 *Teflon*(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 $1^{1}/_{4}$x$1^{5}/_{8}$ inches and 3 cables with UHF/N size coax connectors. Seals out weather.

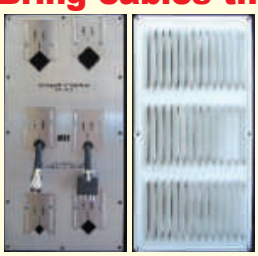
MFJ-4604 **$99.95**

All-Purpose FeedThru/CableThru™

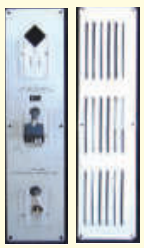
***Stacks** MFJ-4603 **and** MFJ-4604!* Gives you every possible cable connection you'll ever need through your window without drilling holes in wall -- including UHF, N and F coax connectors, balanced lines, random wire, ground, DC/AC power and cables of any size for rotators, antenna switches, etc.

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**



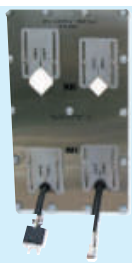
MFJ-4613 shown with standard half-size vent (not included) it replaces. For *3 Cables* **$14.95**

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 $1^{1}/4$x$1^{5}/8$ inches!

Sliding plates and rubber grommets adjust for virtually any cable size to seal out adverse weather, insects and varmints. Use existing vent hole, mounting screws and screw holes.

AdaptiveCable™ Wall Plates



MFJ-4614 *For 4 Cables* **$34.95**

Bring nearly any cable -- rotator, antenna switch, coax, DC/ AC power, etc. -- through walls *without removing connectors* (up to $1^{1}/_{4}$x$1^{5}/_{8}$ inches). Sliding plates and rubber grommets adjust hole size to weather-seal virtually any size cable.

Includes *stainless steel* plates for each side of wall, sliding plates, rubber grommets, weather stripping and screws.

MFJ-4612 *For 2 Cables* **$24.95**

MFJ-4611 *For 1 Cable* **$14.95**

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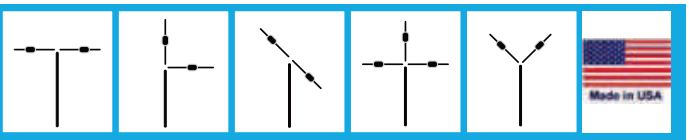
BUDDIPOLE



ANTENNAS & MORE

From beaches to mountaintops, condos to RV parks and everywhere in between, the Buddipole line of portable HF antennas and accessories is ideal for both novice and expert operators alike.

We manufacture all of our antennas using custom CNC parts and injection molds with carefully selected materials.

We also manufacture A123 Nanophosphate battery packs for all portable radios. These power packs provide unparalleled performance in the field. See our website for more details.

BUDDIPOLE FEATURES

- Multi-band design works 9 bands (40 meters thru 2 meters) with one set of adjustable coils!
- Rated from QRP to 250 watts PEP
- Modular Design – create dozens of different antennas with interchangeable parts
- Rotatable/Directional
- Lightweight, rugged components
- Rotating Arm Kit allows users to instantly change antenna configurations
- Used by Emergency Services Groups throughout the world

WHAT IS THE BUDDIPOLE?

The Buddipole™ Portable Dipole fits in your travel bag and assembles in minutes. The Buddipole is more than an antenna, it's a versatile system for launching your signal. Optimized for transmit power and proven for DX work, the Buddipole is the secret weapon used by HF portable operators all over the world.

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www.buddipole.com

See our videos
www.youtube.com/buddipole

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Hillsboro, OR 97123

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fax: (503) 214 6802

info@buddipole.com

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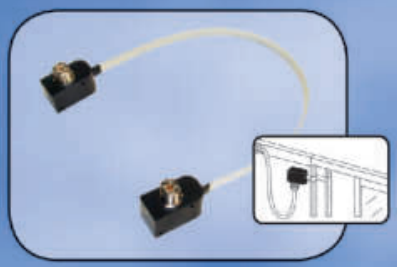
Life is a JOURNEY, Enjoy the ride!



NEW! COMET CTC-50M
Window Gap Adapter!

Max Power: HF 100W PEP
VHF: 60W FM
UHF: 40W FM
900MHz - 1.3GHz: 10W
VSWR: <500MHz 1.3:1
>500MHz 1.5:1
Impedance: 50Ohm
Length: 15.75"
Conn: 24k Gold Plated SO-239s

MALDOL HVU-8
Ultra-Compact 8 Band Antenna!

Unique ground radial system rotates 180 degrees around the base if building side mounting is required.

Max Power: HF 200W SSB/100W FM
6M - 70cm: 150W FM
TX: 80/40/20/15/10/6/2M/70cm
Impedance: 50 Ohm
Length: 8'6" approx
Weight: 5lbs 7oz
Conn: SO-239
Max Wind Speed: 92MPH

Each band tunes independently.
Approx 2:1 band-width:
80M 22kHz
40M 52kHz
20M 52kHz
15M 134kHz
10M 260kHz

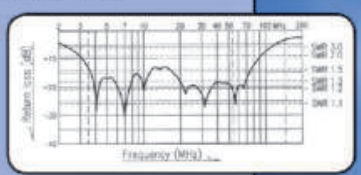
COMET CHA-250B
Broadband HF Vertical!

3.5 - 57MHz with SWR of 1.6:1 or less!

- *NO ANTENNA TUNER NEEDED*
- *NO RADIALS*
- *NO TRAPS*
- *NO COILS*

If you suffer in an antenna restricted area, must manage with space restrictions or you simply want to operate incognito you will be forced to make significant antenna compromises. The CHA-250B makes the most of the situation, making operating HF easy!!

Max Power: 250W SSB/125W FM
TX: 3.5– 57MHz
RX: 2.0– 90MHz
Impedance: 50Ohm
Length: 23'5"
Weight: 7lbs 1 oz
Conn: SO-239
Max Wind Speed: 67MPH



NEW! COMET H-422
40/20/15/10M compact, broadband, rotatable dipole!

Assemble in either a "V or horizontal ("H") configuration.
CBL-2500 2.5kW balun and heavy duty hardware included.

Max Power: 1000W SSB / 500W FM
SWR: Less than 1.5:1 at center frequency
Rotation Radius: "V" 12' 6" "H" 17' 5"
Length: "V" 24' 5" "H" 33' 10"
Weight: 11 lbs 14 ozs
Wind load: 3.01 sq feet
Max Wind Speed: 67 MPH

COMET and Maldol

For a complete catalog, call or visit your local dealer.

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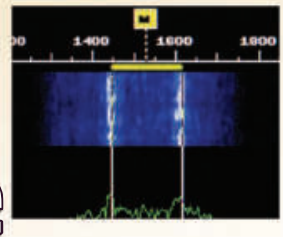
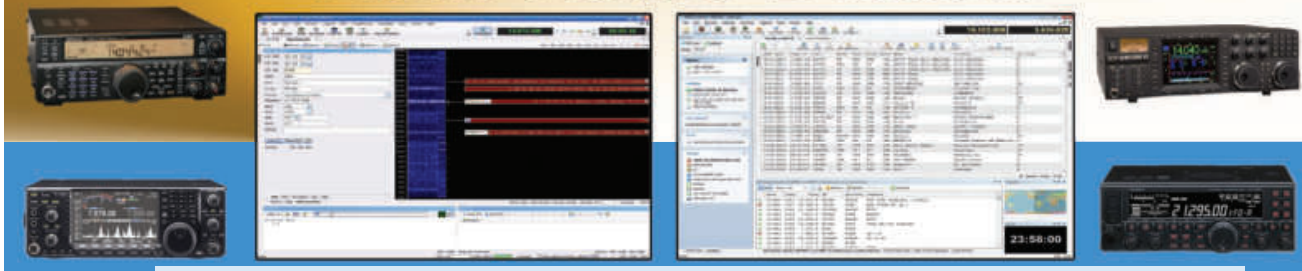
- More than **250** detailed Amateur Radio prefix maps
- Beacon scheduler for the IARU/NCDXF beacon system
- Loads of additional features
- More than **60,000** QSL manager listings
- Summer 2012 Edition available in May
- Available from your local radio store, ARRL and at our website www.callbook.biz
- **For the whole story see our website at www.callbook.biz**

DXers Excel With Ham Radio Deluxe





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New! - PK-232SC with Sound Card, Rig Control, USB - All built-in!

PK-232SC Multimode Data Controller*

Sound Card, Rig Control, USB, Pactor, RTTY, CW Packet & more!

100,000 sold - All-time top selling data controller!

New PK-232SC Now shipping!

- Single USB connection to computer
- USB Sound Card built-in
- 3-Way Rig Control built-in - logic level, RS-232 & USB!
- Computer isolated from radio

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. You never have enough downstream USB ports so we even added a pair for that new radio with USB rig control and other accessories.

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Customize your PK-232 with our complete line of upgrades and accessories.

Need Software? Download the new Ham Radio Deluxe to sync with Radio Operating Center!

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DSP-599zx Audio Signal Processor*

Noise Reduction, precision highpass, lowpass, bandpass & notch filtering for audio, CW & data.

Now shipping with new bigger & brighter display!

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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.

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Kill Noise before it reaches your receiver! Great for supressing power line noise, plasma TV noise & many other local electrical noises.

DSP-232+ Multimode Data Controller*

Sound card interface, USB, Pactor, 1200/9600 Packet

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Logic Level plus PTT

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Turn your mobile, base or handheld into 160 Watt powerhouses and talk further, longer, clearer. . . All modes: FM, SSB, CW . . . Superb GaAsFET preamp . . . Overdrive, high SWR, Over-temperature protection . . . Remote controllable . . .

The MIRAGE B-5018-G gives you 160 Watts output for 50 Watts input on all modes -- FM, SSB, or CW!

Ideal for 25-50 Watt 2 Meter mobile or base. Weak signals pop out with its low noise *GaAsFET* preamp and its excellent 0.6 dB noise figure. Selectable 5, 8 or 14 dB preamp gain.

Exclusive MIRAGE *ActiveBias*™ circuit gives *crystal clear SSB* without splatter or distortion.

B-5018-G is legendary for its ruggedness and is fully protected -- high SWR or excessive input power automatically bypasses the B-5018-G to prevent damage.

Heavy-duty heatsink spans entire length of cabinet. Power transistors protected by MIRAGE's *Therm-O-Guard*™.

Has adjustable delay *RF sense* Transmit/Receive switch *and* remote external keying. 16-20 Amps at 13.8 VDC.12x3x5½ inches.

B-5018-G **$329.95**

B-1018-G, $409.95. MIRAGE's most popular *dual purpose* HT or mobile/base amplifier. 160 Watts out for 10 Watts in. For 0.25-10 Watt rigs.

B-2518-G, $329.95. Same as B-5018-G but for 10 to 25 Watt mobile or base. 160 Watts out for 25 Watts in.

RC-2, $49.95. Remote Control. On/Off,pre-amp On/Off, selects SSB/FM. With 25 foot cable.

Power Curve -- typical output power in Watts

B-1018-G	25	50	140	150	160	160	--	--	--	--
B-2518-G	5	7	40	60	80	100	125	160	--	--
B-5018-G	--	2	15	25	40	50	70	100	130	160
Watts In	.25	.5	3	5	8	10	15	25	35	50

35 Watts for 2 Meter HT

For handhelds up to 8 Watts. 35 Watts out for 3-8 Watts in (18 W out/1W in)! 18 dB *GaAsFET* preamp. All modes: FM, SSB, CW. RF sense T/R switch. Reverse polarity protection. Includes mobile bracket, 1 year warranty. 5¼Wx1¾Hx4¾D in.

B-34-G **$129.95**

35 Watts, $109.95, FM only

B-34, $109.95. 35 Watts out for 2 Watts in. Like B-34-G, FM only, less pre-amp, mobile bracket. 3⅛Wx1¾Hx4¼D in.

MIRAGE Dual Band 144/440 MHz Amp

Boost your *dual band* 144/440 MHz handheld to a powerful mobile/base -- 45 Watts on 2 Meters/ 35 Watts on 440 MHz! Works with all FM handhelds to 7 Watts. Includes *full duplex* operation -- lets you talk on one band, listen on other at same time. Auto band selection, RF sense T/R switch, single connector, reverse polarity protection, 5Wx1¾Hx5D in. Mobile bracket. One year warranty.

BD-35 **$199.95**

100 Watts for 2M HT

100 Watts out for 2-8 Watts in! Great for HTs up to 8W. FM, SSB, CW. 15 dB *GaAs-FET* preamp, RF sense T/R, high-SWR protected.

B-310-G **$249.95**

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the *finest* antenna tuner made!

. . . the VECTRONICS HFT-1500

- ***High Current Roller Inductor***
- ***SSB*Analyzer Bargraph™***
- ***Cross-Needle Meter***
- ***6 Position Antenna Switch***
- ***Built-in 4:1 Balun***
- ***Gear driven Turns Counter***

The VECTRONICS HFT-1500 is not just an antenna tuner . . . it's a beautifully crafted work of art, using the finest components available and the highest quality construction.

Every HFT-1500 aluminum cabinet is carefully crafted with a super durable paint that won't scratch or chip.

Attractive two-color Lexan front panel is scratch-proof. Take a quarter. Scratch the front panel. You won't leave a mark!

Arc-Free Operation

Two 4.5 kV transmitting variable capacitors and a massive roller inductor gives you arc-free operation up to 2 kW PEP SSB.

Precision Resetability

A sturdy hand cranked roller inductor lets you quickly fly from band to band. A precision 5-digit gear driven turns counter lets you accurately retune.

HFT-1500 **$479.95**

Large comfortable knobs and smooth vernier drives make tuning precise and easy. Bright red pointers on logging scales make accurate resetability a breeze.

Absolute Minimum SWR

You can tune your SWR down to the absolute minimum! **Why?** Because all network components -- roller inductor and variable capacitors are fully adjustable.

Tune any Antenna

You can tune any *real* antenna from 1.8 to 30 MHz, including all MARS and WARC bands. You can tune verticals, dipoles, inverted vees, Yagis, quads, long-wires, whips, G5RVs, and more.

SSB*Analyzer Bargraph™

Exclusive 21 segment bargraph lets you visually follow your instantaneous voice peaks. Has level and delay controls.

Accurate SWR/Power Meter

A shielded directional coupler and backlit Cross-Needle meter displays accurate SWR, forward and reflected power simultaneously. Reads both peak and average power on 300/3000 Watt scales.

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Select two coax fed antennas (tuned or bypassed), balanced line/wire or bypass.

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A heavy duty two ferrite core 4:1 balun feeds dual high voltage Delrin terminal posts for balanced lines. 5.5x12.5x12 inches. One year limited warranty.

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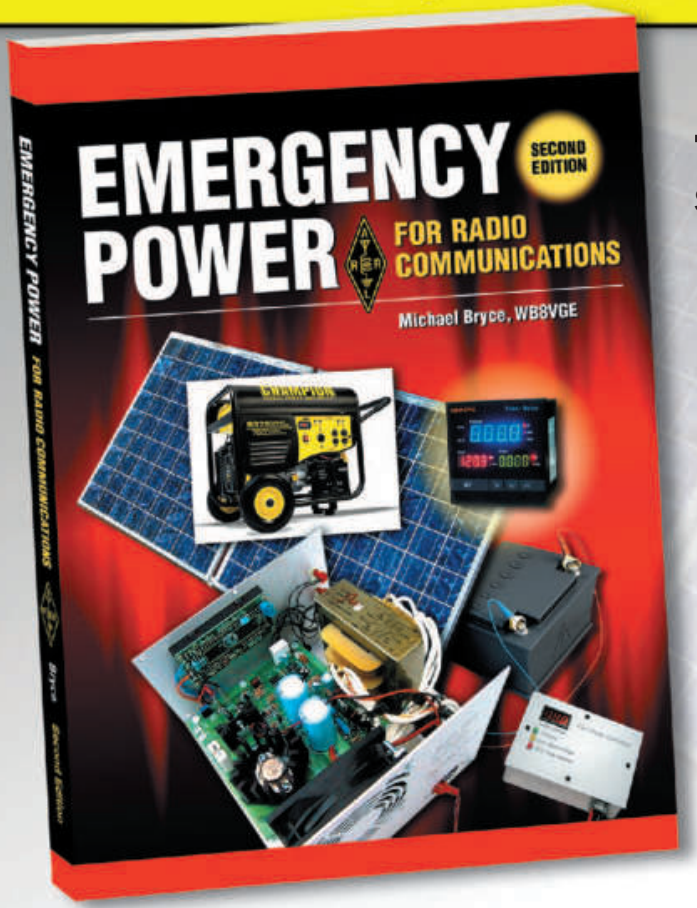

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By Michael Bryce, WB8VGE

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QST 2/2012

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Kenwood's dual-band transceiver with full APRS® and EchoLink® support. Featuring the SiRFstar III™ high-performance GPS receiver.

The TH-D72A is perhaps the most technology advanced, feature rich portable offered to the Amateur market. Easy to use, yet affordable. You be the judge!

TH-D72A

144/440 MHz FM Dual Bander

- 1200/9600 bps packet TNC
- Sky Command II
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- MIL-STD810 and IP54 weatherproofing
- 1000 memory channels
- Cross-tone

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100 Watts of power output on SSB, CW, and FM (25 Watts AM carrier).

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FTM-350AR
2M/440 50W
220MHz 1W
APRS & WIRES Ready
GPS (optional)

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state of the art
IF DSP technology,
world class performance,
easy to use

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HF/6/2/440 all mode
Portable 100W HF/6,
50W 2M, 20W,
440MHz

FT-817ND
HF/6/2/440

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144/440MHz 50/40W

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2M/440MHz

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2 meter transceiver

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Dual bander

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FT-250R
2 Meter

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2M 5W

$30 Coupon

NEW!

VX-8GR
Full 5 watts

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2M/440MHz

VX-7R/RB
Triple Band

VX-6R

$120 Coupon

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400 watts, dual analog meter sets, LCD display, memory card installed, main and sub receiver

KENWOOD

Coupons good through April 30, 2012.

$175 Coupon

TS-B2000
Suitable for mobile applications with the use of the optional RC-2000 Mobile Controller.

TH-F6A
Compact 144/220/440MHz Transceiver/ Receiver

TH-D72A
144/440 MHz 5W HT/ GPS/TNC

$25 Coupon

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TS-480HX/TS-480SAT
HF/6M

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TM-V71A
1000 Alpha Memories, Dual Display

$200 Coupon TS-2000S

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TS-2000S/TS-2000X
High performance true IF/stage DSP on main band.

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50W/50W, Optional
Voice Synthesizer,

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Wouxun and TYT Handhelds

TYT TH-UVF1 A Dual Band HT
144-148 MHz VHF(TX), 430-450 MHz UHF(TX), 136-174 & 400-470MHz plus FM broadcast (RX) FCC 2013 narrow band compliant, 128 memory channels, alpha numeric display, standard SMA antenna connector

New!

NEW! Wouxun KG-UV6D Dual Band
Frequency Range: VHF/UHF
Memory Channels: 199 channels
2.5KHz VFO steps, FCC 2013 narrowband compliant, Frequency Stability: ±2.5ppm
Operating Voltage: 7.4V
Waterproof: IP 55, Standard SMA antenna connector

Wouxun KG-UVD1P Dual Band HT
Dual Frequency, Dual Display
144-148 MHz, VHF(TX)
430-450 MHz, UHF(TX)
136-174 & 400
480MHz plus FM broadcast(RX)

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QJE PS30SWIV
30 amps Max (10% duty cycle), 20 amps continuous 110/220 VAC.
New in time for Dayton!

Voltage is adjustable from 9-15 Volts or can be a fixed out-put of 13.8 VDC via a control located on the front panel.

QJE PS50SWIII
Switching Power Supply
13.8 VDC at 40 amps continuous, Adjustable output voltage from 9 to 15 VDC

QJE PS30SWI
DC Power Supply
Output voltage: DC13.8+0. 3V
Output current: 0-30A, 20A cont.

QJE PS30SWII *Back in Stock!*
DC Power Supply
DC 13.8V Output: (9-15V adjustable)
Output current: 0-30A, 25A cont.
Ripple & Noise: <15m Vp-p
See February 2012 *QST* Product Review, Page 57

QJE PS30SWIII
DC Power Supply
Output DC 13.8V (9-15V adjustable) Output current 0-30A, 20A cont.

Surmen Max-1 Antenna Black SO-239 Now in Black and Natural
Frequency (MHz): 144/430
Max.Power(W): 60
V.S.W.R: <1.5
Length (M): 0.92
Weight(g): 135
Connector: PL-259

PRESENTING the Surmen NEW Max-1 NMO in Black!
Frequency (MHz): 144/430
Max.Power(W): 60
V.S.W.R: <1.5
Length (M): 0.92
Weight(g): 135
Connector: PL-259

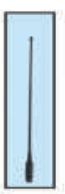
S-850B Antenna
Frequency (MHz): 144/430
Max.Power(W): 150
V.S.W.R: <1.5
Length (M): 1.04
Weight(g): 350
Connector: PL-259

Surmen Max1 Antenna
Frequency (MHz): 144/430
Max.Power(W): 150
V.S.W.R: <1.5
Length (M): 0.995
Weight(g): 260
Connector: PL-259

Surmen Max2 Antenna
Frequency (MHz): 144/430
Max.Power(W): 60
V.S.W.R: <1.5
Length (M): 0.92
Weight(g): 135
Connector: PL-259

KY-66 Trunk Lid/ Hatch Back Door Mount
Color: Chrome
Weight: 168g

WP-115
Frequency(MHz): 144/430 MHz
Z (ohms): 50
Max Power: 10W
Length (mm): 400
Weight: 42g
Connector: SMA or BNC



UL-01 Hatchback Door Trunk Lid Mount
Color: Black
Weight: 202g

P-600 Small External Speaker
Speaker Max Power: 3 Watts, Cord: 4.5M
Plug: 3.5mm mono
Size: 80x70x40MM

RB-80 Tilt Angle Adjustable Mount (Bracket only)
Color: Black
Weight: 253g

S-77BH Antenna
Frequency (MHz): 144/430
Max.Power(W): 60
V.S.W.R: <1.5
Length (M): 0.7
Weight(g): 135
Connecter: PL-259

P-800 External Speaker
Speaker Max
Power: 5 Watts
Cord: 4M
Plug: 3.5mm mono
Size: 90x85x35MM

SM-X1 Antenna
Frequency (MHz): 144/430
Max.Power(W): 60
V.S.W.R: <1.5
Length (M): 0.5
Weight(g): 125
Connector: PL-259

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Strong Magnetic Base,
Teflon RG-316
4M Cable

UT-108 SMA Antenna
Male or Female
Frequency (MHz): 144/430 Max.
Power(W): 100
V.S.W.R: <1.5
Length (M): 0.46
Weight(g): 246
Connector: SMA

SC-ECH* Mobile Antenna Cable
Color: Black
Cable: RG-58
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Connector: PL-259---SO-239
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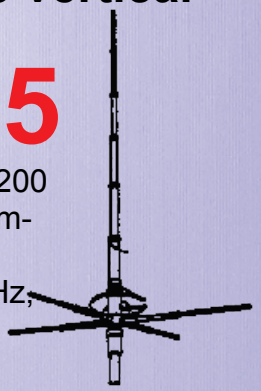

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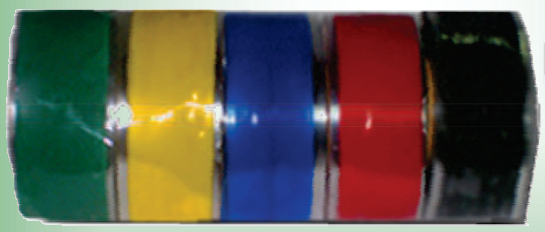

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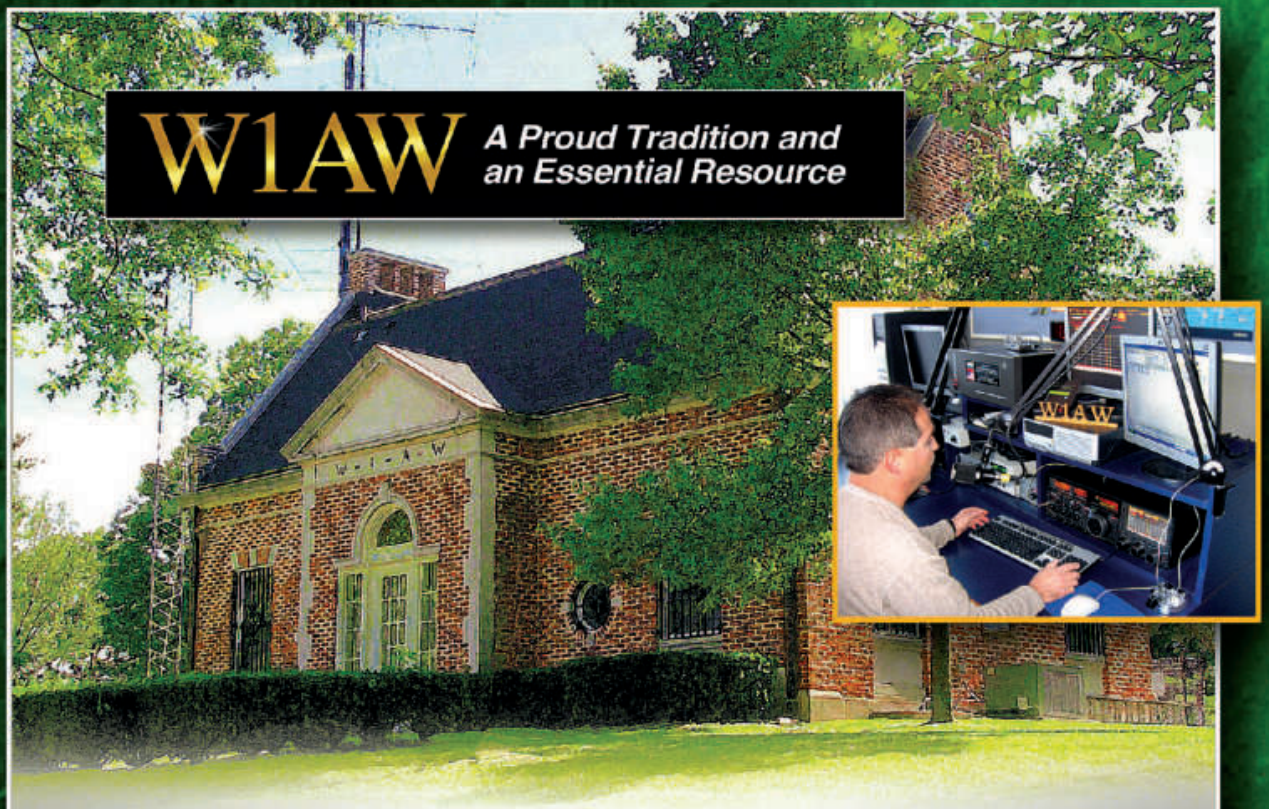

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Application Deadline: May 15, 2012

Date: July 23-26, 2012
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Application Deadline: May 15, 2012

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Date: July 9-12, 2012 (tentative)
Location: TBA
Application Deadline: May 15, 2012

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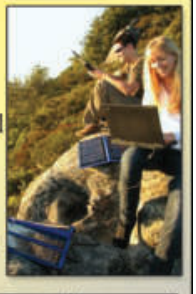

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QST Advertising Deadlines:

Issue	Reservation Date	Materials Due Date
June 2012	Friday, April 13, 2012	Monday, April 16, 2012
July 2012	Wednesday, May 16, 2012	Friday, May 18, 2012

For links to the Web sites of all ARRL advertisers, visit www.arrl.org/ads/adlinks.html

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 February 6 through March 6.

Get on the web and vote today at **www.arrl.org/quickstats**!

Do you check the activity on a DX Cluster before getting on the air?

Yes: **42%**
No: **52%**
I've never heard of a DX Cluster: **6%**

DX Cluster

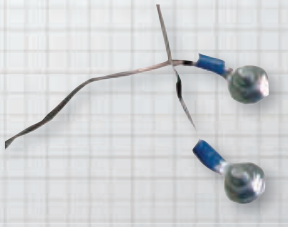
What type of ac power supply do you use as the primary source of power at your home station?

Linear: **49%**
Switching: **40%**
I don't know: **10%**
I don't use an independent ac power supply as my primary power source: **1%**

Do you have antennas installed in your attic?

Yes: **20%**
No: **68%**
My home does not have an attic: **12%**

How many radials have you installed at the base of your HF vertical antenna?



None: **13%**
1 to 5: **14%**
6 to 10: **9%**
11 to 20: **7%**
21 to 30: **4%**
More than 30: **8%**
I don't own an HF vertical antenna: **45%**

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