A Cold Night with "The Survivor," p. 63

Amateur Radio

http://www.cq-amateur-radio.com

COMMUNICATIONS & TECHNOLOGY

DECEMBER 2013

CQ

The Technology Issue

Season's Greetings

$6.99US/CAN

12

0 74820 08223 2

2013 CQ DX Marathon Ends December 31

What's on your list this year?

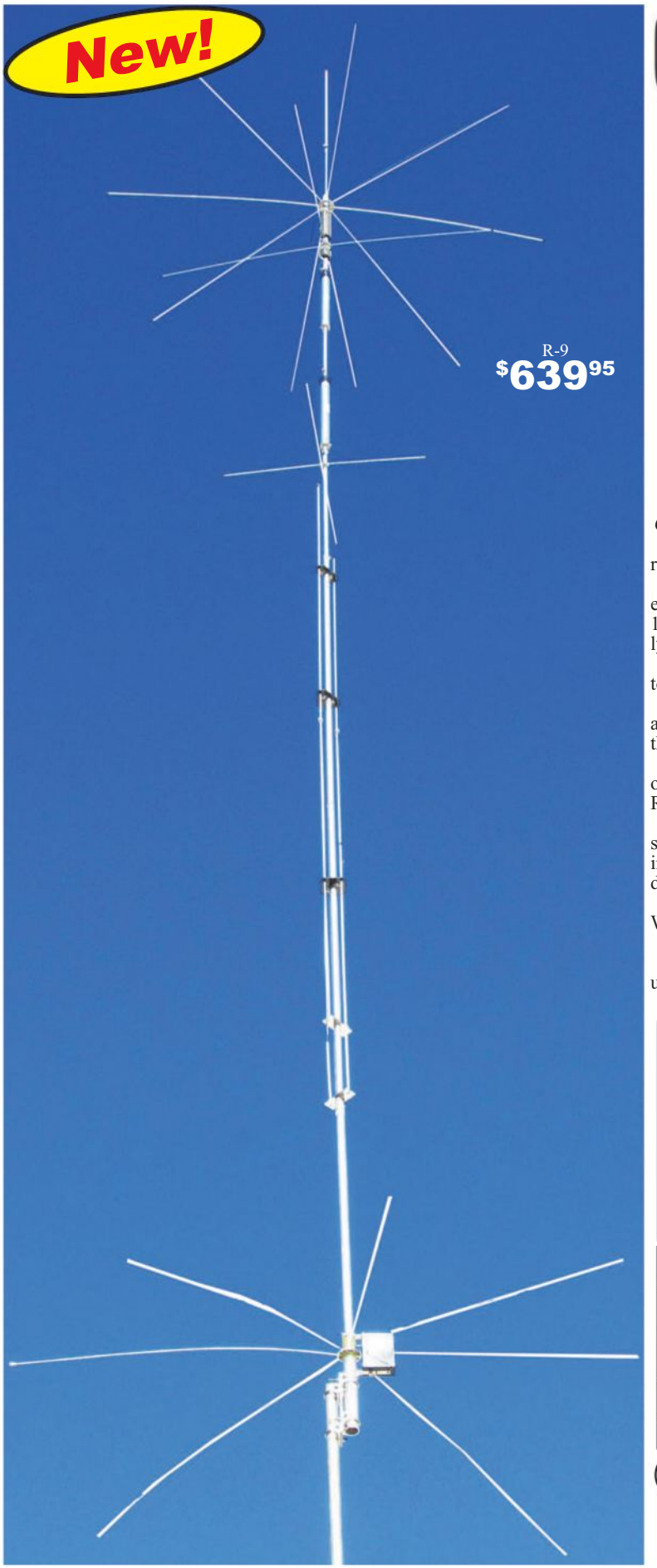
Bring Kenwood Home for Christmas

KENWOOD

Customer Support: (310) 639-4200 • Fax: (310) 537-8235

www.kenwoodusa.com

ADS#39413



Cushcraft

R9

80-6 Meters!
No Radials!

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

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

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

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

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

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

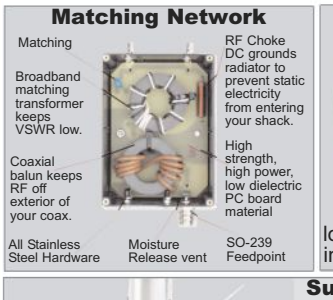
Rugged Construction: Thick fiberglass insulators, all-stainless steel hardware and 6063 aircraft-aluminum tubing is double or triple walled at key stress points to handle anything Mother Nature can dish out.

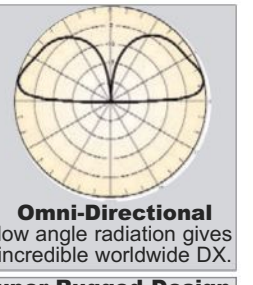
31.5 feet tall, 25 lbs. Mounting mast 1.25 to 2 inches. Wind surface area is 4 square feet.

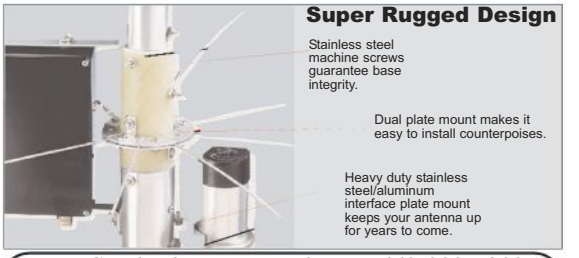
R8, $539.95. Like R9 antenna but less 75/80 Meters.

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

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







Free Catalog/Nearest Dealer . . . 662-323-5803
Call your dealer for your best price!

Cushcraft
Amateur Radio Antennas
308 Industrial Pk. Rd., Starkville, MS 39759 • 8-4:30 CST, M-F.
http://www.cushcraftamateur.com

Prices/specifications subject to change without notice/obligation.

Cushcraft . . . Keeping you in touch around the globe!

Government Shutdown Impacts Widespread but Short-Lived

The two-and-a-half week shutdown of the U.S. federal government had widespread effects on hams, but most were temporary and resolved quickly once the government re-opened.

The FCC was effectively closed from October 1-16, and no applications for new licenses, license renewals or vanity call signs were processed. After the shutdown ended, the Commission said any filings due between October 1 and 6 would be extended to October 22, and due dates on filings due between October 7 and 16 would be extended by 16 days. Amateurs who filed renewal applications before the shutdown for licenses expiring during the above time period were permitted to continue operating, and the Universal Licensing System (ULS) began processing applications immediately after the government re-opened. Vanity call applications filed or received during the shutdown, as well as those filed between October 17 and 22, were treated as though *all* had been filed on October 22. Finally, the deadline for reply comments on the FCC's reassessment of RF exposure limits (ET Docket #s 03-137 & 13-84) was extended to November 18.

The government shutdown also forced postponement of the long-planned K9W DXpedition to Wake Island. At press time, expedition leaders said they were working with the U.S. Air Force (which controls the island) to set new dates. In addition, organizers of the annual National Wildlife Refuge Week amateur radio special event from October 12-20 suspended the rule requiring that operations be conducted from the grounds of a national wildlife refuge.

FCC Says No to Expanded 10-Meter Tech Privileges

The FCC has turned away a petition to allow Technician Class hams to use 10-meter FM repeaters. The Toledo Mobile Radio Association had asked the FCC in June to allow Techs to transmit between 29.5 and 29.7 MHz, the repeater subband, in addition to current privileges from 28.0-28.5 MHz. In an unusually-quick response, the FCC said no, noting that Techs may already use VHF or UHF inputs that are linked to many 10-meter repeaters, and that Technicians who really want to use 10-meter repeaters may easily upgrade to General Class by taking only a 35-question written exam.

Hamvention® Seeks Award Nominations

The Dayton Amateur Radio Association is soliciting nominations for next year's Hamvention® awards, which include Amateur of the Year, Special Achievement, Technical Excellence and Club of the Year. Nominations must be received by January 17, 2014. For more information, visit <www.hamvention.org/awards.php>.

California Ham Honored as "Champion of Change"

Matt Brisbois, KI6RBS, of Newport Beach, California, has been recognized by the White House as a "Champion of Change for Community Preparedness and Resilience," in recognition of his work as coordinator of the city's Community Emergency Response Team (CERT). According to the *ARRL Letter*, Brisbois has trained more than 1000 of his fellow citizens to help in emergencies, giving Newport Beach the highest volunteer-to-resident ratio for any CERT program in California. He was presented with the award in September at a ceremony in Washington headed by FEMA Administrator Craig Fugate, KK4INZ.

South Sudan Activated for CQ WW CW Contest

An international group of hams, including *CQ* DX Editor Wayne Mills, N7NG, was planning to operate from South Sudan as Z81X from November 14-28, a time period that includes the CW weekend of the 2013 CQ World Wide DX Contest. The group of 10 hams includes two local operators and is led by International Amateur Radio Union Region 1 President Hans Timmerman, PB2T, according to Project Goodwill South Sudan spokesman Martti Laine, OH2BH. The operation is hosted by South Sudan's Ministry of Posts and Telecommunications, and will include a series of workshops aimed at developing a permanent amateur radio licensing and regulatory structure. On the operating side, the plan is to activate all HF bands with an emphasis on 80 and 160 meters. QSL via OHØXX.

Ham Industry Changes

Some changes of note in the amateur radio industry:

DaySaver Power Systems is merging with Elk Antennas of Walnut Creek, California. DaySaver products will continue to be offered by Elk, which reported that the merger helps fulfill its goal of expanding its line of products for emergency communications and remote or portable operating.

DX Engineering has become the sole distributor for Hi-Z Antenna products, taking on marketing, distribution, customer service and fulfillment for both product lines. Hi-Z specializes in receiving antennas.

And QRP kit-maker Small Wonder Labs has closed its doors. In an announcement on its website, owner Dave Benson, K1SWL, said "There comes a time in everyone's career when they've 'had enough!' I've reached that point." At press time, Benson said he was negotiating with "another QRP vendor" to take over manufacturing and sales of his popular RockMite CW transceiver kit.

W5OLY, ex-AC4RF, Silent Keys

HF design pioneer and *CQ* author Warren Bruene, W5OLY, passed away in late September at age 96. Bruene was one of the people "behind the scenes" at Collins Radio and later at Rockwell Collins, working on many aspects of HF design during a 44-year career. According to the *ARRL Letter,* he held 22 patents and was a prolific writer. Bruene's most recent article for *CQ,* "How a Few Elmers Unknowingly Changed the World," appeared in our August 2013 issue.

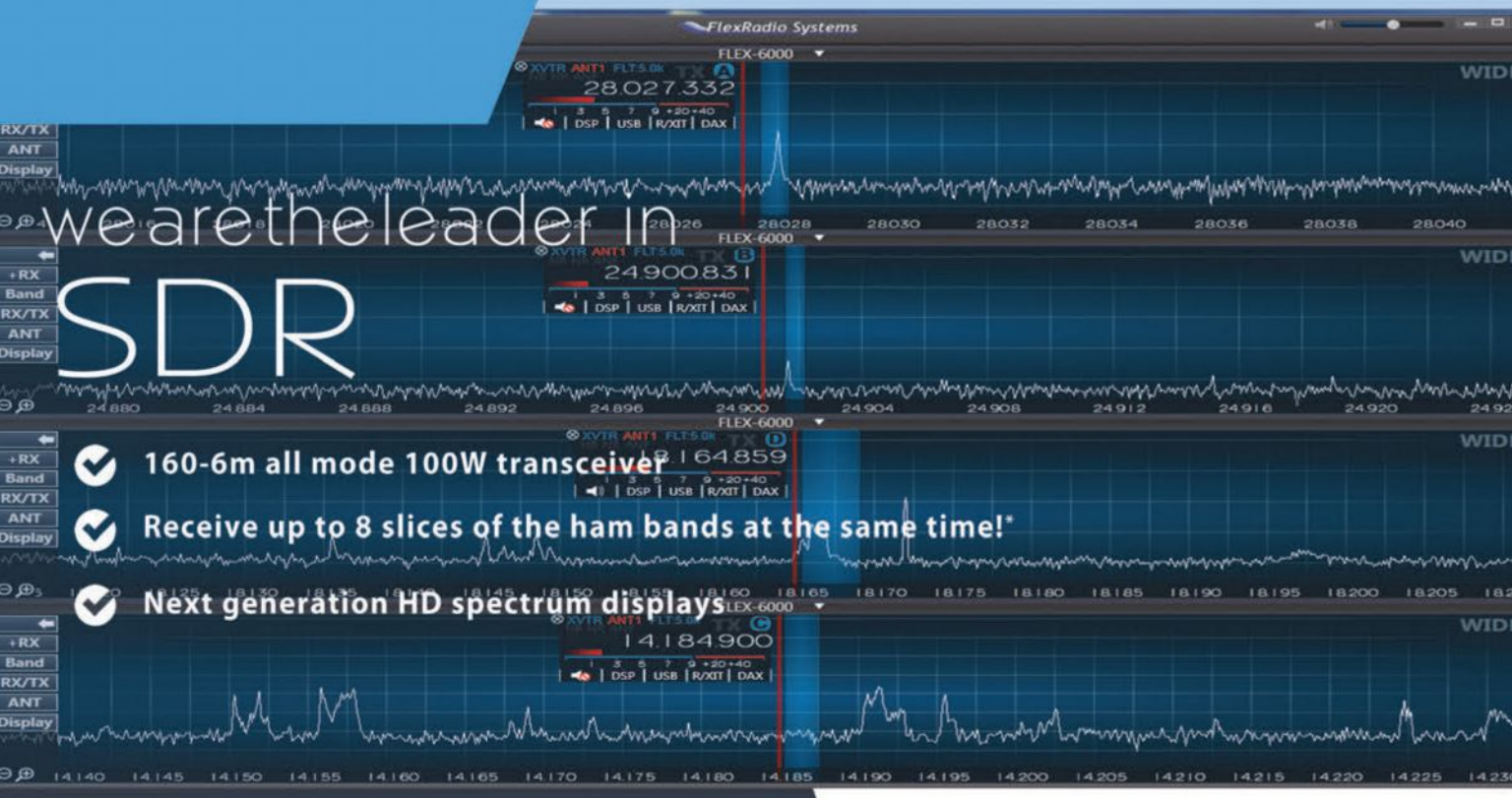
Retired British diplomat Robert Ford, ex-AC4RF, died in London at age 90. According to the *ARRL Letter*, he operated from Tibet from 1948 until China took it over in 1950. He was responsible for starting the Tibetan government's shortwave station, Radio Lhasa. Ford spent five years imprisoned in China for "radio espionage," and later served in a variety of postings for the British Diplomatic Service. He retired in 1987.

Still alive and active at age 96, but stepping down from a longtime position as Wireless Room Manager aboard the Queen Mary museum ship, is Nate Brightman, K6OSC. *Newsline* reports that Brightman, who established the W6RO club station and has served as its manager for 34 years, cited a recent illness and his age as reasons for retiring. The new W6RO station manager is David Akins, N6HHR.

Additional and updated news is available on the Ham Radio News page of the CQ *website at <http://www.cq-amateur-radio.com>. For breaking news stories, plus info on additional items of interest, sign up for* CQ*'s free online newsletter service. Just click on "CQ Newsletter" on the home page of our website.*

FlexRadio Systems®
Software Defined Radios

ELEGANT | POWERFUL | SIMPLE | SMART



we are the leader in SDR

- 160-6m all mode 100W transceiver
- Receive up to 8 slices of the ham bands at the same time!*
- Next generation HD spectrum displays

Welcome to the Future

FLEX-6000 SIGNATURE SERIES
with SmartSDR™

Never before in amateur radio has the advanced operator been given the ability to be on so many bands at the same time. Check into your favorite net... while chasing the latest DXPedition... while watching for a far away propagation beacon...all at the same time! The new FLEX-6000 Signature Series transceivers give you the ability to be there now. Our ultra low noise direct sampling receiver technology captures the entire HF spectrum then delivers sharp, crisp reception on up to eight (8) simultaneous band slices*. Advanced digital audio processing, plus a high linearity 100W power amplifier, delivers the punch to be heard. FlexRadio's Signature Series radio server platform technology with industry standard shack automation interfaces ensures your investment into the future.

(*8 slices on FLEX-6700 only)

- New SmartSDR™ simple user interface
- Ultra low noise direct sampling receiver
- Built in antenna tuner
- Optional GPS Disciplined Master Oscillator
- Ethernet-attached Radio Server
- State of the art digital audio processing

Visit us at at a Hamfest near you!

4616 W HOWARD LANE, STE. 1-150, AUSTIN, TX 78728
P 512-535-4713 | F 512-233-5143 | www.flexradio.com

CQ contents

DECEMBER 2013

p. 34

p. 96

features

Vol. 69 No. 12

Technology Special

p. 30

p. 52

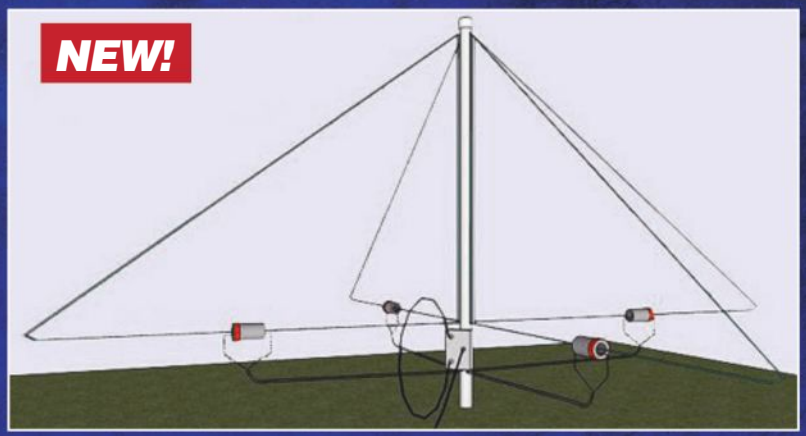
departments

Array Solutions

Your Source for Outstanding Radio Products

FT5ZM AMSTERDAM ISLAND 2014 DXPEDITION

Professional Grade Equipment from Array Solutions



Introducing the Shared Apex Loop Array™!

The Shared Apex Loop Array™ is a revolutionary receiving antenna that will change the way that you listen to the radio! The patented design provides performance in a size and over a range of frequencies that will please both the rag-chewer and DX'er alike.

Two models to chose from:

- AS-SAL-20 - optimized for VLF, BCB, Low Band DXing, shortwave to 15MHz, 20 feet tall and about 40 foot diameter
- AS-SAL-12 - optimized for BCB, and 3-30MHz , 12 feet tall, and 28 foot diameter

Fully Automatic Remote Antenna Tuners

NEW!

Exclusively from "RF Communication Electronics" in Germany, fully-automatic remote tuners for both balanced and unbalanced loads. Full legal limit power capability.

Visit our Webpage for more information!

Rig Expert Antenna Analyzers

NEW!

See the full Rig Expert line including the new AA-170 on our Webpage!

BEKO VHF and UHF Amplifiers

BEKO VHF and UHF amplifiers (2m and higher) are now available from Array Solutions. These are considered the best solid state amplifiers in their categories and we have them!

New Analyzers from Array Solutions

AIM *uhf* Analyzer

NEW!

NEW!

Expanded frequency coverage to 1.4 GHz
See our web page for details

Introducing the

VNA *uhf* two-port Vector Network Analyzer

NEW!

- Frequency range from 5 kHz to 1 GHz
- Data plots include SWR, RL, R + X, series and parallel, magnitude, phase, and more
- Dual Smith charts with rotation and 20 markers
- Plots and calibration files can be saved and used anytime in cvs and dynamic formats.
- True TDR function.

NEW!

PowerMaster II

- New Larger, Sharp & Fast LCD Display
- Reduced Energy consumption
- USB and RS-232 interface built-in
- New - Both 3kW and 10kW couplers on one display - switched
- Supports 2 like couplers simultaneously (3kW & 3kW, 3kW & V/UHF, 10kW & 10kW)

Other top-quality brands represented by Array Solutions...

RCOM · AV TECHNOLOGIES · Custom Metalworks · FRITZEL · BEKO ELEKTRONIK · M² ANTENNA SYSTEMS · OM Power · OPTIBEAM · PHILLYSTRAN · Pro.Sis.Tel. · REX · SSB Passion in high frequency · hofi · W3NQN

ARRAY SOLUTIONS

www.arraysolutions.com

Check our webpage for more new products!

Sunnyvale, Texas USA
Phone 214-954-7140
sales@arraysolutions.com
Fax 214-954-7142

Array Solutions' products are in use at top DX and Contest stations worldwide as well as commercial and governmental installations. We provide RF solutions to the DoD, FEMA, Emcomm, UN, WFO, FAA and the State Dept. for products and installation of antennas systems, antenna selection, filtering, switching and grounding. We also offer RF engineering and PE consulting services.

Exciting New C4FM/FM Digital Mobile Transceiver

C4FM
Clear and Crisp Voice Technology

C4FM 144/430 MHz DUAL BAND
50 W DIGITAL/FM TRANSCEIVER

FTM-400DR

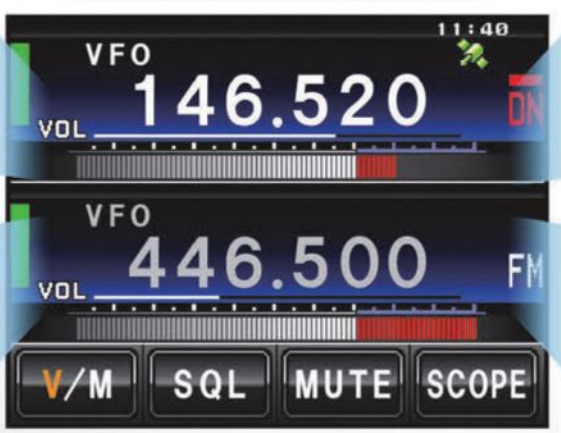
- Digital Group Monitor (GM) Function
- Smart Navigation Function
- Snapshot Function (Image Data Transmission)
- Built-in GPS with Antenna in the Controller
- Wideband Receive (108 MHz – 999.99 MHz)
- Equipped with microSD Card Slot

Advanced visibility and operability with full color touch panel Operation

Band Scope Screen

Altitude Screen

3.5-inch full color touch panel operation



The icon symbols, multi-function key display and pop-up messages are all displayed in high-resolution color thanks to the full-color, high luminance TFT liquid crystal screen.

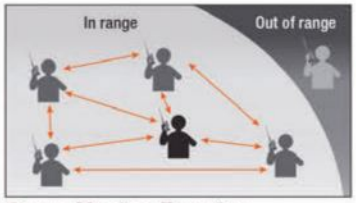
Smart Navigation Screen

Frequency Direct Input Screen

New Functions Enabled by C4FM Digital Communication

Digital Group Monitor (GM) Function

- Automatically checks whether members registered to a group are with the communication range.
- This function can be used to send messages data between group members.



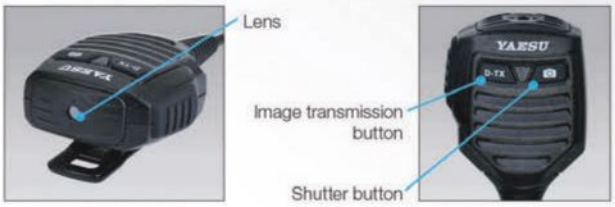
Group Monitor Function

Smart Navigation Function

- Real-time navigation function enables Location checking at any time.
- Backtrack function that starts navigation facing a registered point.

Snapshot Function (Image Data Transmission)

- Image data can be displayed on the screen.
- Image data can be sent easily to other C4FM FDMA digital transceivers.



Additional operating and support features

Wideband Receive Capability

Covers 108 MHz - 999.990 MHz (A(Main) / B(Sub) Band), VHF Marine, Aircraft, Public service channels, etc.

Hands-free operation

Hands-free operation is available by using the optional wireless Bluetooth® unit and headset.

(Optional Bluetooth® unit (BU-2) and Headset (BH-2A) are required.)

C4FM Digital Clear Voice
Clear and Crisp Voice Technology

C4FM 144/430 MHz DUAL BAND
5 W DIGITAL/FM TRANSCEIVER

FT1DR

- **Digital Group Monitor (GM) Function**
- **Smart Navigation Function**
- **Snapshot Function (Image Data Transmission)**
- **Built-in GPS with Antenna in the top**
- **Wideband Receive (504 kHz – 999.99 MHz)**
- **Equipped with microSD Card Slot**

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

YAESU
The radio

YAESU USA
6125 Phyllis Drive, Cypress, CA 90630 (714) 827-7600

zero bias – a CQ editorial

BY RICH MOSESON,* W2VU

Communications and Technology

The subtitle on our cover each month—after *CQ Amateur Radio*—is "Communications and Technology." For us, both the communications aspect of amateur radio and its technology aspect carry equal weight, and are critically interdependent. We could not *do* the communications that we do—whether DXing and contesting or public service and emergency communications—without the technology that goes along with it, and that very often, we develop or adapt to meet our needs. By the same token, our technology nearly always has a practical purpose … to communicate. Without the communication aspect, there'd be little point to our technology; without our technology, there'd be little to separate ham radio from cell phones and the internet.

How we bring together these two aspects of our hobby helps define what makes amateur radio—and radio amateurs—special. In order to be effective communicators, we need to *understand* at least the basics of our technology. We need to understand enough about how radio waves travel through space to know what band to use for what purpose at what time, or what antenna will be most effective. We need to understand enough about our radios and how they work to be adaptable to changing circumstances, whether it's a band shutting down unexpectedly during a contest or the need to build a radio network on the fly while dealing with an unfolding disaster.

This is why ham radio works "when all else fails." It's not because there's something special about our technology but because there's something special about our people. Our radios are not just tools for us. They are as important to us as what we do with them. Being able to make the best use of both our technological skills and our communications skills requires one other thing … ongoing education. The FCC's Basis and Purposes for amateur radio include "self-training," which can mean learning on your own, but most often involves getting together to share knowledge and the lessons that come with experience. Not all of us can design our own gear, or build tiny radios into weather balloons or satellites, but we all can learn from those who do. It's a part of ham radio tradition extending back more than a century. And that's where a magazine like *CQ* comes in, helping to share our collective knowledge and experience.

This issue is our annual Technology Special. But it isn't just a compilation of project articles. Our focus this time around is on understanding our technology better, whether it's new, old or in between. For example, many of us use antenna modeling software to figure out what will work best in the space we have available, or how to maximize the effectiveness of existing antennas. But how many of us really understand how that software works? Or that its history really dates back to the earliest days of radio? Read W3CRI's article on page 22 and you'll become one of those who do.

Microcontroller-based projects have been gaining in popularity among hams in recent years, starting with PICs and moving to Arduinos. XV4Y tells us about a lower-priced alternative to the Arduino called the LaunchPad, and how to put it to work in your ham projects (p. 19). W4DNN takes a somewhat tongue-in-cheek look (p. 30) at older technology and the value of keeping vintage gear in your shack and in operating condition. There's more, of course, but you get the idea. For hams, technology and communications go hand-in-hand, and each one would be much less than it is without the other.

This message was driven home to me as I toured the New York Maker Faire in September. There's no question that there was lots of really cool stuff there (see article, p. 13), but there was also a fair amount of technology for technology's sake. Yes, it can be fun to build a circuit that makes lights flash, but why? What are those flashing lights going to do for you? Likewise, some of the projects on the Arduino Playground website leave me scratching my head … such as the Poetry Reader Telephone or Vandal Spray, a digital spray paint can for automated vandalism!

Since we hams have an underlying purpose of using our technology for communicating, our projects tend to be more focused on the practical. Likewise, at *CQ*, our technology articles are designed to either help you deepen your knowledge and understanding of some subject, or to help you build a project with practical value in your ham shack. That is one thing that differentiates us from the broader community of Makers. To paraphrase the Rev. Rick Warren[1], we have a "purpose-driven" hobby. We hope you enjoy this year's Technology Special issue.

Dashing Through the Snow…

It's that time of year again … cold-weather months perfect for building new projects or doing antenna work! It's also a time when we reflect on the gifts we've been given (hopefully beyond those we may find under the tree) and whether we've used our ham radio hobby to help others and/or bring a little more purpose to our lives. From all of us at *CQ* to each of you, we wish you the very best this holiday season, whether you celebrate Christmas or another winter holiday, and the blessings of peace, good health and prosperity in the coming year.—*W2VU*

Note:

1. The Rev. Rick Warren <http://rickwarren.org>, author, *The Purpose Driven Life* <http://purposedriven.com/books/pdlbook/#purpose>.

Correction

The October issue's editorial about the Young Ham of the Year award incorrectly identified the program's newest corporate sponsor as Radio Daze instead of **RadioWavz**. Both are actual companies and both are CQ advertizers. (I wrote that on the way home from the Huntsville Hamfest and must have been in a bit of a daze, HI!) We apologize for any confusion, and welcome **RadioWavz** (<http://www.radiowavz.com/>) to the ranks of corporate sponsors of the Newsline Young Ham of the Year Award.

*e-mail: <w2vu@cq-amateur-radio.com>

hy-gain®

AV-680
$549.95
80-6 Meters

AV-680

80-6 Meters

Hy-Gain's new AV-680 adds 75/80 Meters with no radials!

Includes 40, 30, 20, 17, 15, 12, 10 and 6 Meters operation with low 17 degree radiation angle and omni-directional world-wide coverage. No ground or radials needed. Handles full 1500 Watts key down continuous for two minutes.

Highly Efficient

The AV-680 uses quarter wave stubs on 6, 10, 12 and 17 meters and very efficient end loading coil and capacity hats on 15, 20, 30, 40 and 80 Meters -- no traps. End loading allows efficient operation with a low-profile. Resonators are placed in parallel not in series.

Each band individually tunable

Extra wide low VSWR bandwidth. End fed with broadband matching unit. Single coax cable feed. Automatic bandswitching.

Sleek and low-profile

Low 2.9 sq. ft. wind surface area. Small footprint for mounting easily on decks, roofs and patios. 26 feet, 18.5 lbs.

Built-to-last

High wind survival of 65 mph. Broadband matching unit made from all *Teflon*® insulated wire. Aircraft quality aluminum tubing, stainless steel hardware.

Hy-Gain verticals are the best built, best performing and best priced multiband verticals available today.

hy-gain® warranty

Two year limited warranty. All replacement parts in stock.

ATB-75, $79.95. Tilt base for Hygain AV-680/AV-640 and AV-620 verticals.

AGK-8, $56.95. Guy Kit, three point non-conductive guy system for Hygain AV-680/AV-640 and AV-620 verticals.

AV-640, $449.95. 8 bands: 40, 30, 20, 17, 15, 12, 10, 6 Meters. 25.5 ft., 17.5 lbs.

AV-620, $349.95. 6 bands: 20, 17, 15, 12, 10, 6 Meters. 22.5 ft., 10.5 lbs.

Inside of Matching Unit

Free Hy-Gain Catalog
and Nearest Dealer . . . 800-973-6572
Call your dealer for your best price!

hy-gain®

Antennas, Rotators & Towers

308 Industrial Park Road, Starkville, MS 39759 USA
Toll-free Customer Sales Hotline: 800-973-6572
• **TECH:** 662-323-9538 • **FAX:** 662-323-6551
http://www.hy-gain.com

announcements

PLANT CITY, FLORIDA — Florida Gulf Coast Amateur Radio Council 38th Annual Tampa Bay Hamfest Friday, December 6 and Saturday, December 7 at the Evelyn & Bastista Madonia Sr. Agricultural Show Center (Strawberry Festival Grounds). Contact: FGCARC, P.O. Box 22042, Tampa, FL 33622-2042. Website: <http://www.tampabayhamfest.org>. Talk-in 146.940– (PL 146.2).

HARRISON TOWNSHIP, MICHIGAN — L'Anse Creuse Amateur Radio Club 41st Annual Swap & Shop Sunday, December 8 at the L'Anse Creuse High School. Contact: LCARC Swap, 29729 S. River Road, Harrison Township, MI 48045. Email: <n8geo@arrl.net>. Website: <http://www.qsl.net/n8lc/>. Talk-in 147.080+ (PL 100).

MINDEN, LOUISIANA — Minden Amateur Radio Association (N5RD) Annual Christmas Hamfest Saturday, December 21 at the Minden City Hall. Website: <http://www.n5rd.org>. Talk-in 147.300 (PL 186.2).

LOCUST FORK, ALABAMA — Blount County Amateur Radio Club FreezeFest 2014 Saturday, January 4, 2014 at the Locust Fork High School. Contact: Bill Pond, AE4IE, (205) 647-5705. Website: <http://freezefest.w4blt.org>. Talk-in 146.700 (PL 91.5) or 443.775.

WAUKESHA, WISCONSIN — West Allis Radio Amateur Club 42nd Annual Midwinter Swapfest Saturday, January 4 at the Waukesha County Expo Center Forum. Contact: WARAC Swapfest, P.O. Box 1072, Milwaukee, WI 53201. Phil Gural, W9NAW, (414) 425-3649. Website: <http://www.warac.org>.

GREENWOOD, SOUTH CAROLINA — Greenwood Amateur Radio Society Hamfest Saturday, January 11 at the Piedmont Technical College Multipurpose Building N. Contact: GARS, P.O. Box 2404, Greenwood, SC 29646. Email: <w4dew@arrl.net> or <ai4wn@arrl.net>. Website: <http://www.w4gwd.org>. Talk-in 147.165+ or 443.900+ (PL 107.2).

SCHERTZ, TEXAS — San Antonio Radio Club (W5SC) 2014 San Antonio Amateur Radio Fiesta and **Texas VHF Society Winter Meeting** January 11 at the Schertz Civic Center. Contact: Amateur Radio Fiesta, c/o San Antonio Radio Club, P.O. Box 34263, San Antonio, TX 78265-4263. Rowena Archer, KF5JCZ, (210) 415-6894. Website: <http://www.w5sc.org>. Talk-in 146.940- (PL 179.9).

FORT WORTH, TEXAS — Lockheed Martin Recreation Area and Amateur Radio Club (W5SJZ) Cowtown Hamfest and **ARRL North Texas Section Convention** Friday, January 17 to Saturday, January 18 at the Lockheed Martin Recreation Area. Contact: David Forbes, KC5UYR, <kc5uyr@compuserve.com>. Website: <http://www.cowtownhamfest.com>. Talk-in 147.28 (PL 110.9).

FORT MYERS, FLORIDA — Fort Myers Amateur Radio Club, Florida (W4LX) FMARC Hamfest Saturday, January 18 at 4312 Michigan Avenue. Contact: Drexel Turner, W4DHT, 7670 Eaglet Court, Fort Myers, FL 33912-1828. Phone: (239) 225-0826 or (239) 464-1350. Email: <dturner@embargmail.com>. Website: <http://www.fmarc.net>. Talk-in 147.345 (PL 136.5).

LOVELAND, COLORADO — Northern Colorado Amateur Radio Club NCARC Winter Hamfest 2014 Saturday, January 18 at the Larimer County Fairgrounds, 1st National Bank Building, Contact: NCARC, P.O. Box 272956, Fort Collins, CO 80527. Email: <hamfest@ncarc.net>. Website: <http://www.ncarc.net>.

ST. CHARLES, ILLINOIS — Wheaton Community Radio Amateurs WCRA 47th Annual Mid-Winter Hamfest Sunday, January 19 at the Kane County Fairground Expo Center. Contact: WCRA, P.O. Box QSL, Wheaton, IL 60187-1055. Phone: (630) 604-0157. Email: <info@w9ccu.org>. Website: <http://www.wheatonhamfest.org>.

JACKSON, MISSISSIPPI — Jackson Amateur Radio Club and **Jackson Mississippi Convention & Visitors Bureau Capital City Hamfest 2014** Friday, January 24 and Saturday, January 25, Mississippi State Fairgrounds, Trademart Building. Website: <http://hamfest.msham.org>.

ARCADIA, FLORIDA — DeSoto Amateur Radio Club Inc. (W4MIN) 18th Annual Hamfest in Arcadia Saturday, January 25 at the Turner Civic Center Exhibit Hall. Contact: Doug Christ, KN4YT, (863) 990-2507. Email: <kn4yt@yahoo.com>. Website: <http://desotoarc.org>. Talk-in 147.075+.

LOCKPORT, NEW YORK — Lockport Amateur Radio Association 53rd Annual Winter Hamfest Saturday, January 25 at the South Lockport Fire Company. Website: <http://www.lockportara.us/>.

MIAMI, FLORIDA — The Dade Radio Club of Miami, Inc. 48th Annual South Florida Tropical Hamboree Friday, January 31 to Saturday, February 1 at the Miami Dade Fair Expo Center. Contact: Dade Radio Club of Miami, Inc., P.O. Box 835387, Miami, FL 33283. Phone: (305) 590-8523. Email: <tropicalhamboree@gmail.com>. Website: <http://hamboree.org>.

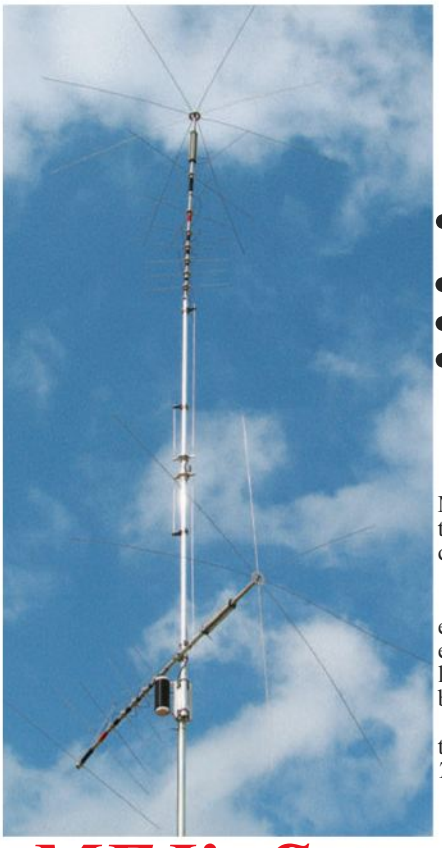
A publication of

CQ Communications, Inc.
25 Newbridge Road
Hicksville, NY 11801 USA.

CQ Amateur Radio (ISSN 0007-893X) Volume 69, No. 12. Published monthly by CQ Communications, Inc., 25 Newbridge Rd., Hicksville, NY 11801, Telephone 516-681-2922. Periodical postage paid at Hicksville, NY 11801 and additional offices. Statement of Ownership, Management and Circulation, October 8, 2013. *CQ Amateur Radio,* 25 Newbridge Road, Hicksville, NY 11801. Publication #0007-893X. Issued monthly, subscription price $38.95 per year (12 issues). Publisher: Richard A. Ross; Editor: Richard S. Moseson: owned by CQ Communications, Inc. Stockholders: Richard A. Ross. Circulation (Average of Preceding 12 Months): Net Press Run 34,484, Mail Subscriptions 21,851 Sales Through Dealers and News Agents 9,403, Other Classes Mailed 166, Total Paid 31,420 Free Distribution 240, Total Distribution 31,660, Copies Not Distributed 2,824, Total 34,484. Circulation (single issue nearest filing date): 31,727, Mail Subscriptions 20,875, Sales Through Dealers and News Agents 7,990 Other Classes Mailed 170, Total Paid 29,035, Free Distribution 244, Total Distribution 29,279, Copies Not Distributed 2,448, Total 31,727 s/Dorothy Kehrwieder, Business Manager. Entire contents copyrighted 2013 by CQ Communications, Inc.

Printed in the U.S.A.
Postmaster: Please send change of address to:
CQ Amateur Radio, 25 Newbridge Rd., Hicksville, NY 11801

10 Bands: 80-2 Meters



$349.95 MFJ-1799

- *10 Bands: 75/80, 40, 30, 20, 17, 15, 12, 10, 6, 2 Meters including 75/80M*
- *Handles 1500 Watts PEP SSB/CW*
- *No ground or ground radials needed!*
- *Low radiation angle for great DX, omni-directional, automatic bandswitching*

Only 20 feet tall! Mounts anywhere!

Self-supporting and just 20 feet tall. Mounts easily from ground level to tower top -- small lots, backyards, apartments, condos, mobile homes, roofs, tower mounts.

Highly Efficient End-Loading

No lossy traps! *End-loading*, the most efficient loading known -- gives you highly efficient performance, excellent bandwidth, low angle radiation and automatic bandswitching.

High-Q loading coils are wound on tough, low loss fiberglass forms with *Teflon*® wire where needed.

Entire Length Radiates

End-loading results in uniform current distribution and the *entire length radiates*. This puts the radiating elements up high giving you more QSOs.

No Feedline Radiation/Distorted Pattern

MFJ's center-fed *balanced* halfwave vertical dipole design is decoupled and isolated from the feedline with MFJ's *AirCore*™ high power balun. It can't saturate, no matter how high your power.

This gives you consistently high performance by killing feedline radiation, pattern distortion, SWR shifts, RFI, noise pickups.

Easy to Tune!

Tuning to your favorite part of one band does not affect other bands and is done at the *bottom* of the antenna by simply adjusting a length of the capacitive hat.

Built-to-Last!

Incredibly strong *solid* 1¼ inch diameter fiberglass center insulator and 1⅜ inch diameter 6061 T6 aircraft strength aluminum tubing will make it the only antenna you will ever need.

MFJ 6-Band Halfwave Vertical Antenna

MFJ-1796 **$229.95**

MFJ-1796, like MFJ-1799, but for 6 bands: 40, 20, 15, 10, 6 and 2 Meters. 12 foot high, 24 inch foot print, mounts anywhere. No ground, no radials, self-supporting.

MFJ's Super High-Q Loop™ Antennas

MFJ-1786 **$419.95**

MFJ's *tiny* 36 inch diameter loop antenna lets you operate 10 through 30 MHz *continuously* -- including the WARC bands!

Ideal for limited space -- apartments, small lots, motor homes, attics, or mobile homes. Enjoy DX and local contacts mounted vertically. Get both low angle radiation for excellent DX and high angle radiation for local, close-in contacts. Handles 150 watts.

Super easy-to-use! Only MFJ's super remote control has *Auto Band Selection*™. It auto tunes to desired band, then beeps to let you know. No control cable is needed. Fast/slow tune buttons and built-in two range Cross-Needle SWR/Wattmeter lets you quickly tune to your exact frequency.

All welded construction, welded butterfly capacitor with no rotating contacts, large 1.050 inch diameter round radiator -- *gives you highest possible efficiency*.

Each plate in MFJ's tuning capacitor is welded for low loss and polished to prevent high voltage arcing, welded to the radiator, has nylon bearing, anti-backlash mechanism, limit switches, continuous no-step DC motor -- smooth precision tuning. Heavy duty thick ABS plastic housing has ultraviolet inhibitor protection.

Cover 40-15 Meters. MFJ-1788, $469.95. Like MFJ-1786 but covers 40 - 15 Meters continuous. Includes remote control.

6-Band, 40-2 Meters *Rotatable* Mini-Dipole

Low profile 14 feet . . . 7 ft. turning radius . . . 40, 20, 15, 10, 6, 2 Meters . . . 1500 Watts . . .

MFJ-1775 **$249.95**

MFJ-1775 is inconspicuous and low profile -- not much bigger than a TV antenna and is easily tuned by a lightweight rotator like Hy-Gain's *AR-35*.

It's no Wimp! Its directivity reduces QRM/noise and lets you *focus* your signal in the direction you want -- work some real DX.

You can operate 6 bands -- 40, 20, 15, 10, 6 and 2 Meters -- and run *full 1500 Watts* SSB/CW on all HF bands!

Features automatic band switching and uses highly efficient end-loading with its *entire length* always radiating. With 6 and 2 Meters thrown in, you have ham radio's most versatile *rotatable* dipole!

Each HF band uses a separate, efficient end-loading coil wound on fiberglass forms with *Teflon*™ wire, and capacitance hats at each end (no lossy traps). 6 and 2 meters are *full-length* halfwave dipoles.

Built-to-last -- incredibly strong solid rod fiberglass center insulator and 6063 T6 aircraft strength aluminum tubing radiator. Assembles in an afternoon. Adjusting one band has little effect on other bands.

MFJ-1775W, $249.95. WARC band version for 12, 17, 30, 60 Meters only.

MFJ *G5RV Antenna*

MFJ-1778 **$44.95**

Covers all bands, 160-10 Meters with antenna tuner. 102 feet long. Can use as inverted vee or sloper. Use on 160 M as Marconi. 1500 Watts. Super-strong fiberglass center/feedpoint insulators. *Glazed ceramic* end insulators. All hand-soldered connections. Add coax, some rope and you're *on the air!*

MFJ-1778M, $39.95. G5RV Junior. Half-size, 52 ft. 40-10M with tuner, 1500 Watts.

Free MFJ Catalog

Visit: http://www.mfjenterprises.com or call toll-free 800-647-1800

• 1 Year *No Matter What*™ warranty • 30 day money back guarantee (less s/h) on orders direct from MFJ

MFJ ENTERPRISES, INC.
300 Industrial Pk Rd, Starkville, MS 39759 **PH:** (662) 323-5869
Tech Help: (662) 323-0549
FAX:(662)323-6551 8-4:30 CST, Mon.-Fri. ***Add shipping.***

Prices and specifications subject to change.

MFJ . . . the world leader in ham radio accessories!

HRO Holiday Specials For You!

ANAHEIM, CA
(Near Disneyland)
933 N. Euclid St., 92801
(714) 533-7373
(800) 854-6046
Janet, KL7MF, Mgr.
anaheim@hamradio.com

BURBANK, CA
1525 W. Magnolia Bl., 91506
(818) 842-1786
(877) 892-1748
Eric, K6EJC, Mgr.
Magnolia between
S. Victory & Buena Vista
burbank@hamradio.com

OAKLAND, CA
2210 Livingston St., 94606
(510) 534-5757
(877) 892-1745
Nick, AK6DX, Mgr.
I-880 at 23rd Ave. ramp
oakland@hamradio.com

SAN DIEGO, CA
5375 Kearny Villa Rd., 92123
(858) 560-4900
(877) 520-9623
Jerry, N5MCJ, Mgr.
Hwy. 163 & Claremont Mesa
sandiego@hamradio.com

SUNNYVALE, CA
510 Lawrence Exp. #102
94085
(408) 736-9496
(877) 892-1749
Jon, K6WV, Mgr.
So. from Hwy. 101
sunnyvale@hamradio.com

NEW CASTLE, DE
(Near Philadelphia)
1509 N. Dupont Hwy., 19720
(302) 322-7092
(800) 644-4476
Ken, N2OHD, Mgr.
RT.13 1/4 mi., So. I-295
delaware@hamradio.com

PORTLAND, OR
11705 S.W. Pacific Hwy.
97223
(503) 598-0555
(800) 765-4267
Leon, W7AD, Mgr.
Tigard-99W exit
from Hwy. 5 & 217
portland@hamradio.com

DENVER, CO
8400 E. Iliff Ave. #9, 80231
(303) 745-7373
(800) 444-9476
John WØIG, Mgr.
denver@hamradio.com

PHOENIX, AZ
10613 N. 43rd Ave., 85029
(602) 242-3515
(800) 559-7388
Gary, N7GJ, Mgr.
Corner of 43rd Ave. & Peoria
phoenix@hamradio.com

ATLANTA, GA
6071 Buford Hwy., 30340
(770) 263-0700
(800) 444-7927
Mark, KJ4VO, Mgr.
Doraville, 1 mi. no. of I-285
atlanta@hamradio.com

WOODBRIDGE, VA
(Near Washington D.C.)
14803 Build America Dr.
22191
(703) 643-1063
(800) 444-4799
Steve, W4SHG, Mgr.
Exit 161, I-95, So. to US 1
virginia@hamradio.com

SALEM, NH
(Near Boston)
224 N. Broadway, 03079
(603) 898-3750
(800) 444-0047
Dave, N1EDU, Mgr.
Exit 1, I-93;
28 mi. No. of Boston
salem@hamradio.com

HAM RADIO OUTLET®
WORLDWIDE DISTRIBUTION

#1 Yaesu Dealer Worldwide

YAESU
The radio

NEW

FTDX1200 100W HF + 6M Transceiver

• Triple Conversion Receiver With 32-bit Floating Point DSP • 40 MHz 1st IF with selectable 3 kHz, 6kHz & 15 kHz Roofing Filters • Optional FFT-1 Supports AF-FFT Scope, RTTY/PSK31 Encode/Decode, CW Decode/Auto Zero-In • Full Color 4.3" TFT Display

FTDX5000MP 200W HF + 6M Transceiver

• Station Monitor SM-5000 (Included) • 0.05ppm OCXO (Included) • 300Hz, 600Hz & 3KHz Roofing filters (Included)

NEW

FTDX3000 100W HF + 6M Transceiver

• 100 Watt HF/6 Meters • Large and wide color LCD display • High Speed Spectrum Scope built-in • 32 bit high speed DSP /Down Conversion 1st IF

Call For Low Pricing!

FT-450D 100W HF + 6M Transceiver

• 100W HF/6M • Auto tuner built-in • DSP built-in • 500 memories • DNR, IF Notch, IF Shift

Call Now For Pricing!

FT-897D VHF/UHF/HF Transceiver

• HF/6M/2M/70CM • DSP Built-in • HF 100W (20W battery) • Optional P.S. + Tuner • TCXO Built-in

Call Now For Our Low Pricing!

FT-857D Ultra Compact HF/VHF/UHF

• 100w HF/6M, 50W 2M, 20W UHF • DSP included • 32 color display • 200 mems • Detachable front panel (YSK-857 required)

Call For Low Price!

FT-7900R 2M/440 Mobile

• 50W 2M, 45W on 440MHz • Weather Alert • 1000+ Memories • WIRES capability • Wideband receiver (cell blocked)

Call Now For Your Low Price!

FT-8800R 2M/440 Mobile

• V+U/V+V/U+U operation • V+U full duplex • Cross Band repeater function • 50W 2M 35W UHF • 1000+ memory channels • WIRES ready

Call Now For Low Pricing!

NEW

FTM-400DR 2M/440 Mobile

• Color display-green, blue, orange, purple, gray • GPS/APRS • Packet 1200/9600 bd ready • Spectrum scope • Bluetooth • MicroSD slot • 500 mem per band

FT1DR C4FM FDMA 144/430 5W Digital Xcvr

• 1200/9600bps AX.25 APRS & GPS Recvr Built-in • Dual Band Operation w/Dual Recvrs (V+V/U+V/V+U) • Wideband Receive/AM Bar Antenna/ Aircraft Receive • 1266 Memory Channels w/16 Char Alpha Tagging

Also Available in Silver!

VX-6R 2M/220/440 HT

• Wideband RX – 900 memories • 5W 2/440, 1.5W 220 MHz TX • Li-ION Battery - EAI system • Fully submersible to 3 ft. • CW trainer built-in

New Low Price!

VX-8DR

50/144/220/440 • 5W (1W 222 MHz) • Bluetooth optional • Waterproof/ submersible (3' for 30 min) • GPS APRS operation optional • Li-ion Hi-capacity battery • Wide band Rx

FT-60R 2M/440 5W HT

• Wide receiver coverage • AM air band receive • 1000 memory channels w/alpha labels • Huge LCD display • Rugged die-cast, water resistant case • NOAA severe weather alert with alert scan

✦ **Yaesu mail-in rebates and HRO coupons expire 12/31/13. Contact HRO for promotion details.**

AZ, CA, CO, GA, VA residents add sales tax. Prices, specifications, descriptions, subject to change without notice.

Come visit us online via the Internet at http://www.hamradio.com

#1 in Customer Service

COAST TO COAST FREE SHIPPING
UPS - Most Items Over $100
Rapid Deliveries From The Store Nearest to You!

Our annual Technology Special is the perfect place to take a look at the technologies and technologists we saw at this year's World Maker Faire in New York City.

World Maker Faire 2013: Just Like Dayton, Only Different

BY RICH MOSESON,* W2VU

The flea market at the Dayton Hamvention® is roughly the same size as the outdoor exhibit area for the World Maker Faire at New York's Hall of Science (photo A). And to be fair, there is more indoor exhibit space (photo B)—much more—at Dayton.

But you won't find giant butterfly bikes (photo C) at Dayton. Or fire-breathing dragons. Or kids by the thousands. Or a "Learn to Solder" tent (photo D) with a perpetual line outside of at least two dozen people. OK, we can live without the butterfly bikes and dragons (even though kids love 'em). But I'm willing to bet that a "Learn to Solder" tent in the Dayton flea market would draw a steady stream of newer hams who are perhaps a little embarrassed to admit among their friends at home that soldering is new to them. Maybe RadioShack would sponsor that one, too!

Something else you don't see much at Dayton: young people, and particularly young women (photo E). Many college engineering programs were exhibitors here, and there seemed to be as many young women behind the booths as young men. Many of these young Makers are prospective hams … most of them just don't know it yet!

One similarity to Dayton is that it's impossible to see everything, especially in one day, and especially if you have only a few hours available, as I did. So here's a quick rundown of highlights from what I managed to see during my few hours at Maker Faire this past September.

First of all, *CQ* had excellent representation at the Faire. Digital Editor Don Rotolo, N2IRZ, joined me there on Saturday (although we went our separate ways and saw different things; check out his column elsewhere in this issue for his impressions); Makers Editor Matt Stultz, KB3TAN, was an exhibitor (photo F), and our new Advertising Manager, Jon Kummer, WA2OJK, made his own visit on Sunday.

The main ham radio presence at the fair was the Hall of Science Amateur

Photo A. The outdoor exhibit area at the World Maker Faire in New York is about the same size as the flea market at Dayton. (W2VU photos)

*Editor, CQ
e-mail: <w2vu@cq-amateur-radio.com>

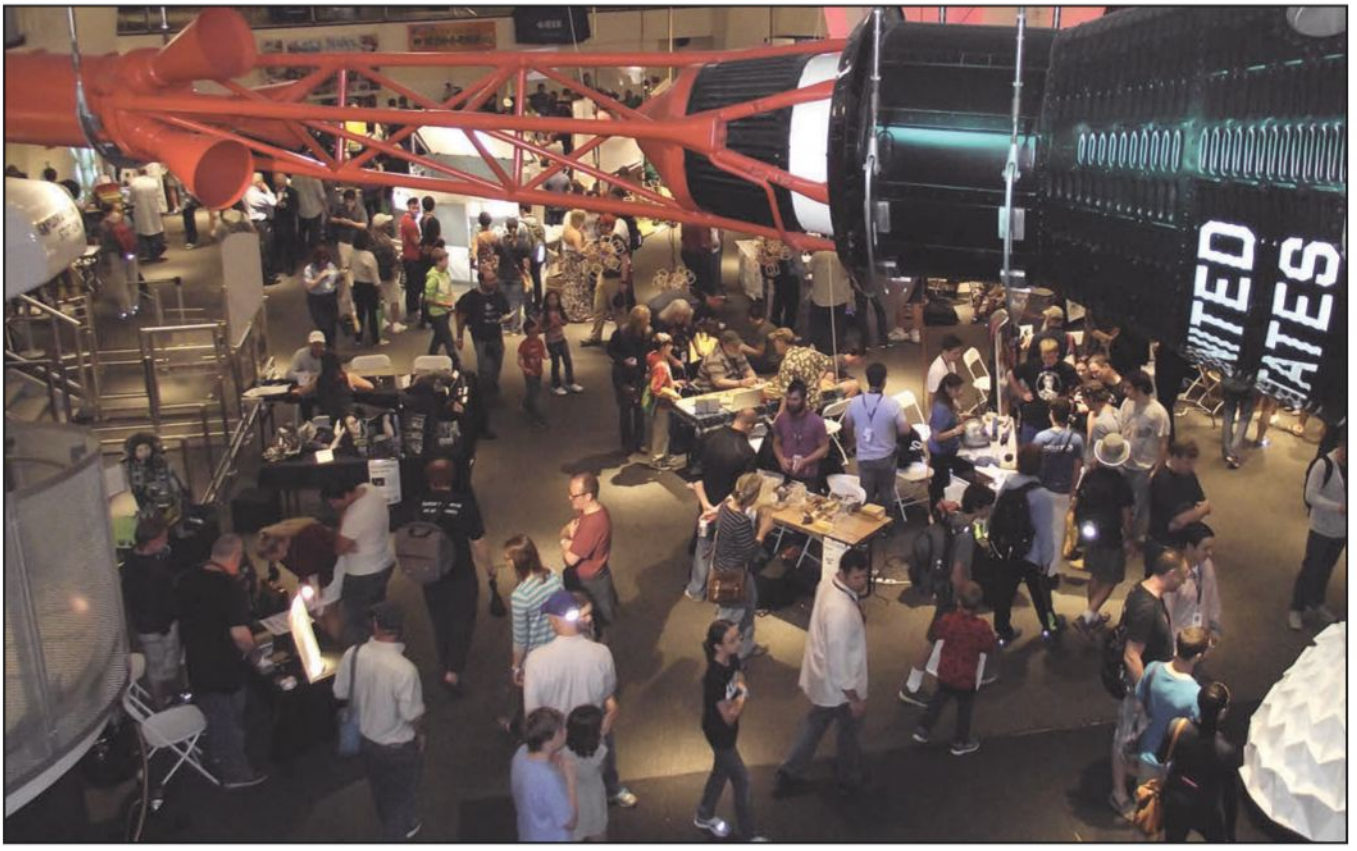


Photo B. The Maker Faire took over the inside of the Hall of Science as well as the outside areas. And yes, that's a Mercury capsule watching over the activity below.

Photo C. You won't see this at Dayton … a giant butterfly bicycle!

Photo D. There was always a line outside the "Learn to Solder" tent, which you also won't see at Dayton, but probably should.

Photo E. Most Maker Faire exhibitors and many attendees were young, and there were nearly as many women as men among them.

Photo F. CQ Makers Editor Matt Stultz, KB3TAN, at his outdoor booth.

Radio Club, which had a station on the air from the outside exhibit area. We provided magazines for the club to hand out, and I loaned the folks there my "maker-made" QRPme Tuna Tin 2 transmitter and Sudden Storm receiver to put on display (photo G).

The star of this year's show was 3D printing, with a whole section devoted to exhibits and demos by many of the companies and individuals making 3D printers and accessories (photo H). I saw one guy walking around with a handheld, battery-powered 3D printer, which kept on working even when held upside down! Another exhibitor—a family venture headed up by Scott Vader and his son, Zack—is prototyping a 3D printer that uses liquid aluminum. … I see custom-designed chassis and cabinets emerging from that venture.

The biggest 3D printer manufacturer of them all, MakerBot, had its new "Digitizer" 3D scanner on display (photo I). Priced

Photo G. W2VU's "Tuna Tin" transmitter and receiver were hits at the Hall of Science Amateur Radio Club's booth and station.

for a consumer market (retail $1400), it allows you to scan any solid object into a computer file that is fed into a 3D printer to replicate. MakerBot's CEO, Bre Pettis, who is also W2BRE, put on an excellent presentation on the process his company went through in developing the 3D scanner from idea to product (photo J). He noted that "we eat our own dog food — we prototyped them with MakerBots!" See N2IRZ's column this month for more on ham applications for 3D printing, as well as future Makers columns from KB3TAN.

Of Particular Interest to Hams…

Texas Instruments was on hand with the latest version of its "Launchpad" microcontroller platform, which, starting at $10, is competing head-to-head with Arduino. One of the add-ons that TI offers for the Launchpad is the "Sub-GHz Booster Pack" (photo K), which is basically a low-powered UHF transceiver operating on ISM (industrial, scientific, and medical) frequencies of 433, 868 and 915 MHz. Note the first and last—shared with amateur allocations. So for an initial investment of $40 ($10 each for two basic Launchpads, plus another $20 for a pack of two Sub-GHz booster packs), hams can play with these under Part 97 rules, using higher power and better antennas. This is similar to what's being done with commercial WiFi routers for Broadband Hamnet (see article in October's *CQ*). A lot of potential here for ham experimentation.

Also of interest to many hams will be Voltset's new tiny voltmeter and multimeter. These will plug into your Android smartphone and provide basic test gear with extreme portability. The multimeter (photo L) is about the size of a typical smartphone, and the voltmeter is about one third the size of the multimeter. Company co-founder Tom Wang said the devices on display were still prototypes and that he hoped to have production models shipping by next spring.

Finally, we had a nice chat with Giacomo Strollo of "Smart Jars," who has taken the concept of baby food jars for parts storage to a new level, creating a set of plastic containers that lock into holders that then attach to standard pegboards (photo M). Strollo noted that if funding permits, one of his early follow-on projects will be producing containers made of anti-static materials for storing sensitive electronic components. Both Strollo and Wang were using their presence at Maker Faire to promote Kickstarter fundraising efforts for their products.

Photo H. 3D printing was the star of this year's New York Maker Faire.

Photo I. The MakerBot "Digitizer" 3D scanner lets you make a computer model of virtually any solid object. The file can then be fed to a 3D printer for replication.

Fixers

One of the by-products of making things is breaking things. And part of the growth of the Maker movement has been a backlash against our "throwaway society," in which it's often cheaper and easier to replace something than to repair it. Along these lines, we encountered one group from Brooklyn, New York that applies the Maker movement's "hackerspace" model to fixing things! The "Fixers' Collective" calls itself "a group of folks dedicated to working together to fix things—encouraging improvisational fixing and fighting planned obsolescence." The group says it has regular "fixing sessions" where people "bring in something broken. We'll work together to try to fix it or creatively reuse it."

HF/VHF/UHF Transceiver

NEW IC-7100

Creating New Standards for HF Mobiles

*100/100/50/35 Watts Output Power**
*RX: 0.03-199.999, 400-470MHz**
1205 Alphanumeric Memory Channels
Touch Screen with Built-in Speaker
IF-DSP Controlled Digital Features
External GPS Option

Information & Downloads

AMATEUR TOOL KIT | COMIC BOOKS | VIDEOS | WWW.ICOMAMERICA.COM

Electronic advertisements feature active links.

*Frequency coverage may vary. Refer to owner's manual for exact specifications.

ICOM®

Another group of folks with whom many hams can identify…

Wrap-Up

Final observation: Compared with past years, there seemed to be fewer exhibits focused on RF devices, but that could also have been a function of not being able to go everywhere and see everything. For example, we missed—but the BBC found—a Maker named Stephanie Murray, who was part of a group that built a robot designed to "drive" amateur radio antennas up a 50-foot light pole for emergency deployments (see <http://www.bbc.co.uk/ news/magazine-24184160>, about 1:15 in).

As in the past, though, like Dayton, attending MakerFaire was once again a very worthwhile adventure. If there is a MakerFaire or miniMakerFaire near you, I encourage you to attend, or better yet, to exhibit.

Resources

Fixers' Collective: http://fixerscollective.org/
Hall of Science Amateur Radio Club: www.hosarc.org
MakerBot – Replicator 3D printer and Digitizer 3D scanner: www.makerbot.com
QRPme: www.qrpme.com
Smart Jars: www.smartjars.com
Texas Instruments Launchpad: http://bit.ly/174rkkW
SubGHz Booster Pack: http://www.ti.com/tool/430boost-cc110l
VoltSet: http://voltset.com/

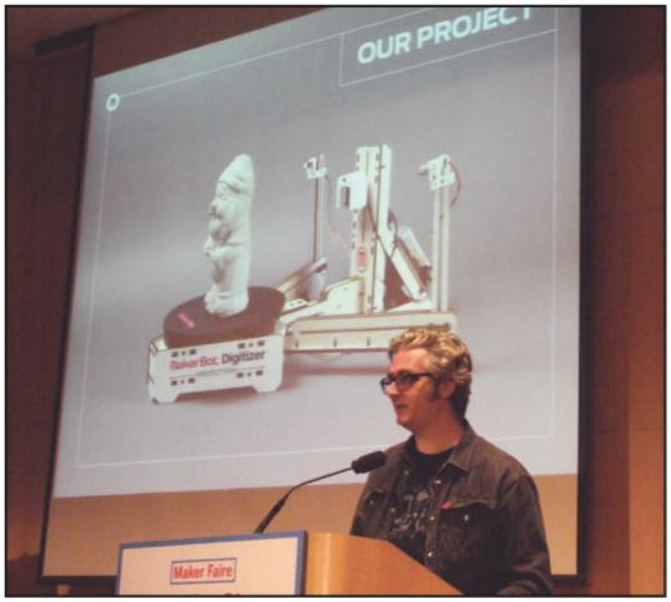


Photo J. MakerBot CEO Bre Pettis, W2BRE, explains how the company's new "Digitizer" 3D scanner went from "Project to Product."

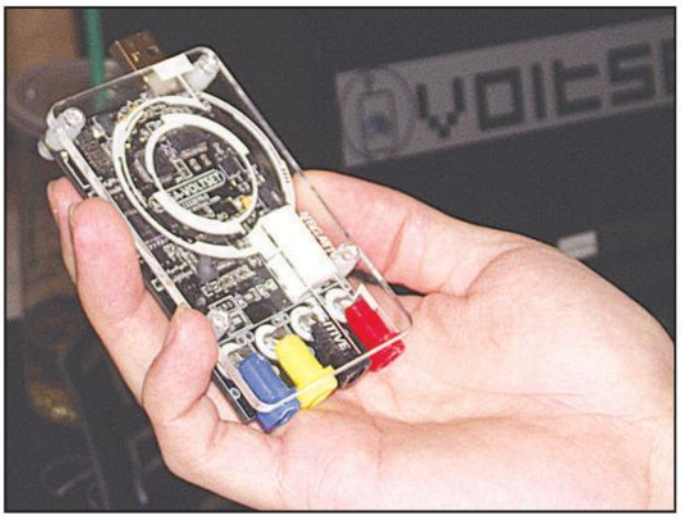


Photo L. VoltSet Megameter is a smartphone-sized multimeter that works in conjunction with an Android smartphone.

Photo K. Adrian Fernandez of Texas Instruments shows us the Launchpad microcontroller with the SubGHz Booster Pack attached. It's a QRP transceiver that operates on 433 and 915 MHz!

Photo M. Smart Jars founder Giacomo Strollo demonstrates his product, which clips into a standard pegboard for easy and well-organized storage.

If you'd like to jump into embedded electronics and microcontrollers, here is an (even cheaper) alternative to the Arduino.

MSP430 Microcontrollers the Easy Way with the Texas Instruments MSP 430 LaunchPad and Energia

BY YANNICK DEVOS,* XV4Y

Embedded computing based on microcontrollers is present everywhere in current electronics. Even the simplest devices can now include some microcontrollers since they are cheap, flexible, and able to perform a lot of functions that previously needed many discrete parts.

For ham radio, if you have been involved in a project such as building a beacon or a CW keyer, designing a digital SWR or power meter, or—for the most intrepid of you—controlling a DDS (direct digital synthesizer) such as the Si570, you probably have been thinking of using a microcontroller.

There are so many microcontroller families I cannot list them here. Among the best-represented in today's hobbyist workshops are the Microchip PIC, Atmel AVR, and Texas Instruments MSP430 families. Each has strengths and flaws

*e-mail: <xv4y@nature-mekong.com>

Photo A. The basic Texas Instruments LaunchPad kit comes with a PC board, two microcontroller chips, a USB cable, one 32-kHz crystal, and some stickers.

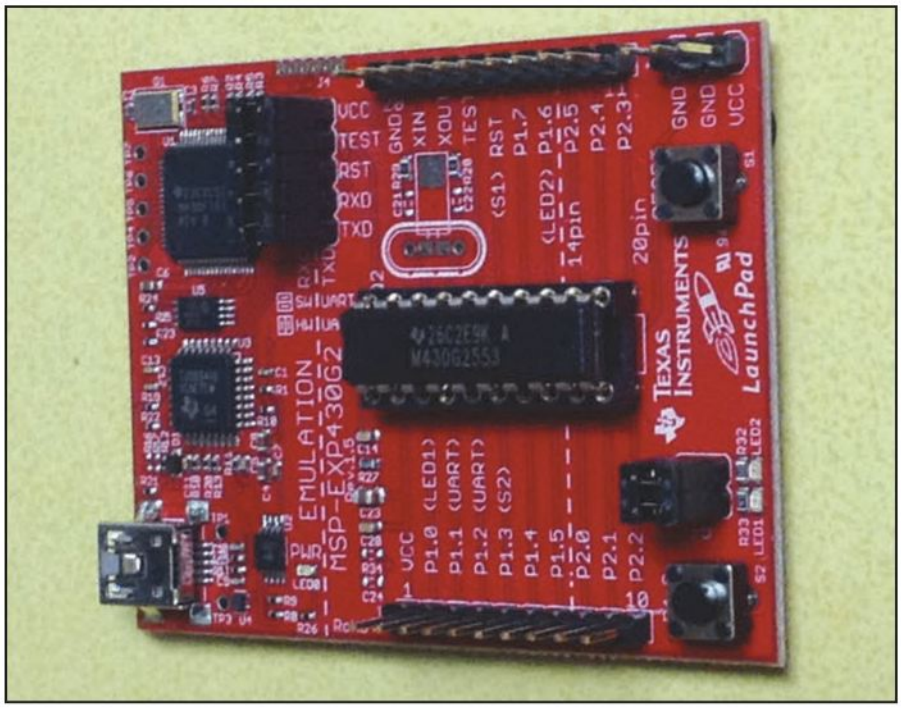


Photo B. Close-up view of the TI LaunchPad board.

depending on your needs and I will not go into the debate of choosing one.

The MSP430 and the TI LaunchPad

I have been introduced to the Texas Instruments MSP430 family by Steve Weber, KD1JV[1], who uses them in his ATS (Appalachian Trail Sprint) transceivers since they have a really low power usage and are great for battery-powered operations. As a way to easily upgrade his Mountain Topper Rig transceiver with new firmware, Steve informed us that TI offered the LaunchPad[2], an all-in-one development kit for the real bargain price of just $10US!

Enter Energia

Having received the tiny box containing the board, two MCUs, a USB cable, one 32-kHz crystal, and some stickers (photo A), I started to play with it. I soon discovered a great project aiming toward bringing the LaunchPad to the beginners: *Energia*[3].

Energia is an IDE (Integrated Development Environment) that is based on the well-known Arduino platform[4]. For now it runs under Mac OS X and Windows®, and while still under development, is fully functional for most needs.

Like Arduino with the ATMega chips (AVR family from Atmel), the goal of Energia is to offer a comprehensive application for programming the MSP430 through the LaunchPad board (photo B), using natural English programming language and featuring a broad set of libraries and examples. Energia automates a lot of tasks usually required to program microcontrollers and allows you to be really *doing* things (such as blinking a LED) in minutes. Using the same language as Arduino (specifically, a *wrapper* based on Wiring[5]), it makes it possible to write code that could compile to both Arduino/AVR and LaunchPad/MSP430. Both chips provide different hardware features (no EEPROM on the MSP430 for example), so you could have to rewrite some parts of the code, but the highest level code will remain the same. Ported libraries will further help to hide the underlying hardware differences to the user. Energia also gives you the possibility to use legacy MSP430 C or Assembler code along with the Arduino/Wiring language and have it easily compiled and uploaded, letting you reuse code available on the internet for other compilers.

Ham Projects

I would like to encourage you to really give the LaunchPad and Energia a try. For its price, it's unbeatable, and if you have already been playing with the Arduino, you will be at ease with the MSP430 in a few hours. The MSP430G2553 included in the cheapest LaunchPad kit has real goodies for

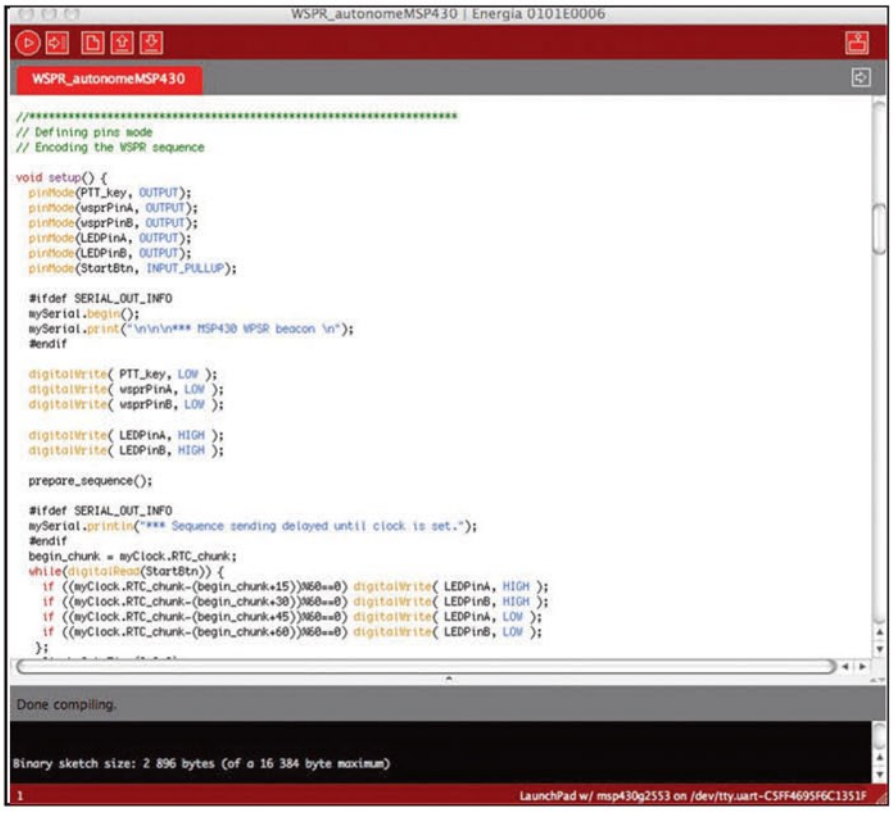


Photo C. The WSPR beacon generator program I wrote for the LaunchPad using Energia.

the ham operator and general electronics hobbyist. For example, it includes an RTC (Real-Time Clock), temperature sensor, and touch-sensitive capable inputs.

In only a few days, I wrote an RTC-synchronized standalone WSPR[6] beacon generator (photo C) that allows me to be on the air without having the computer turned on. I may soon offer this as a cheap kit for QRSS or QRPp addicts.

If you would like to see a short example of what can be done with Energia and the Launchpad, go to my blog[7] where I give the code for a small RTC clock program that prints the time on the serial port <http://bit.ly/174rkkW> (the blog is in French, but the code is not; automatic translators will make the French somewhat readable in English).

If You are Ambitious…

The first and cheapest LaunchPad is the MSP-EXP430G2 and it will empower you to do many things. However, if you'd like to play with USB devices (e.g., storage, keyboard emulator) you should have a look at the new MSP-EXP430F5529, which is much more powerful.

The LaunchPad family also counts DSP processor boards (C2000 family), ARM Cortex M4 processor boards (Tiva C family), and the Hercules board family for safety-critical applications (such as high-altitude balloons). Those boards can do I/Q signal processing for SDR applications and much more, but are still priced under $20, so your imagination is the limit.

Notes

1. http://kd1jv.qrpradio.com/
2. http://www.ti.com/launchpad
3. http://energia.nu
4. http://arduino.cc
5. Wiring is an open-source programming framework for microcontrollers: http://wiring.org.co
6. Weak Signal Propagation Reporter: http://physics.princeton.edu/pulsar/K1JT/wspr.html
7. http://xv4y.radioclub.asia/

About the Author

Yannick Devos, XV4Y, lives in Vietnam's Mekong Delta with his wife and two children and runs a small bed & breakfast and tourism business. Trained as a telecommunications engineer, he was first licensed in France as F1TUJ at age 16. After a 10-year absence from ham radio, he returned to it four years ago and enjoys HF DXing, casual contesting, antenna experimenting, and homebrewing or kit building. He also runs QScope.org, a website providing statistics and charts for contesters, DXpeditioners, and DXers.

Antenna modeling software is becoming more popular and easier for the average ham to use, thanks to the power of today's personal computers. W3CRI takes us back in time for a lesson in NEC history.

Antenna Modeling Software: A Look under the Hood

BY PETER M. LIVINGSTON,* W3CRI

As every interested ham knows, there is a wealth of information out there on antenna theory, design, and practice. For hams, the *ARRL Handbook* is a good practical source of hands-on design for most wire and beam antennas. In some ways, this very wealth of information is misleading because it gives one the impression that antenna theory is very simple, and in fact it is—but only in certain cases.

For example, both the short and half-wave dipoles are extensively illustrated in the literature because they happen to be simple solutions to a complicated problem. The reason that they are simple is because we know the current distribution on the antenna: In the short dipole it is a linear function of the distance from the feed point to the dipole end where it must be zero, and in the half-wave dipole it is a portion of a sinusoid, again with zero current flowing out the ends of the antenna. However, how do you predict the performance of more complicated antenna systems? Say you need to know the radiation pattern of a whip antenna supported on the back of a truck, or a short antenna on the side of a ship. Here the simpler tools that we know fail because they do not account for the effect on radiation patterns of the complicated *boundary conditions* that the fields must meet. Even predicting the radiation pattern of a vertical monopole over a finite conducting earth is not simple because the earth distorts the antenna "image." The radiation pattern is that of a vertical dipole with unequal currents in each leg.

This concern was very much on the minds of the radio engineers setting up AM broadcasting stations in the 1930s and '40s. Many installations required a cardioid radiation pattern to avoid interference, so vertical arrays were required. Here the ground return currents became more complicated and achieving the desired null was often a cut and try process. Since most broadcasting antennas were (and still are) monopoles, a major question was how many and how long the radials should be in order to approximate a perfect ground. Mostly by trial and error, the number of radials was established as a trade between cost and benefit. According to A. C. Alexander of the Crawford Broadcasting Company, the number of soft copper wire radials for a good antenna installation was 120, with length dependent on the operating wavelength—about 140 electrical degrees. This was common information in the early 1940s, although as Alexander admits, the old books with much of this information in it are out of print. For ham verticals, particularly at the higher frequencies, seven to twelve radials may suffice. But this question is precisely one that present-day antenna modeling software can handle—provided you know or can guess the average soil conductivity at your installation.

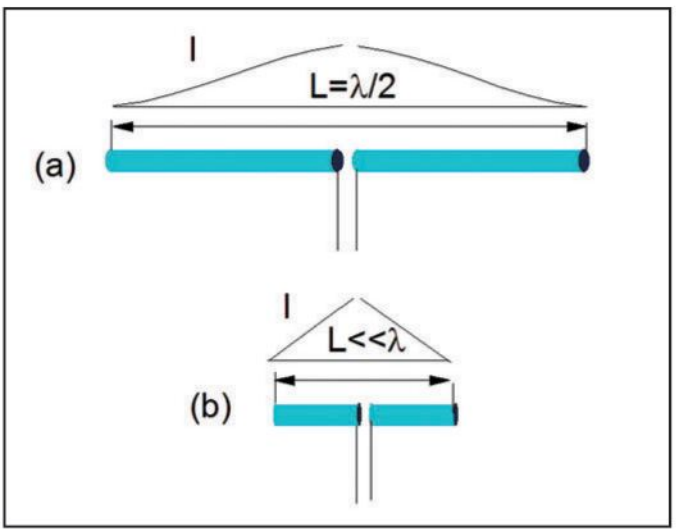


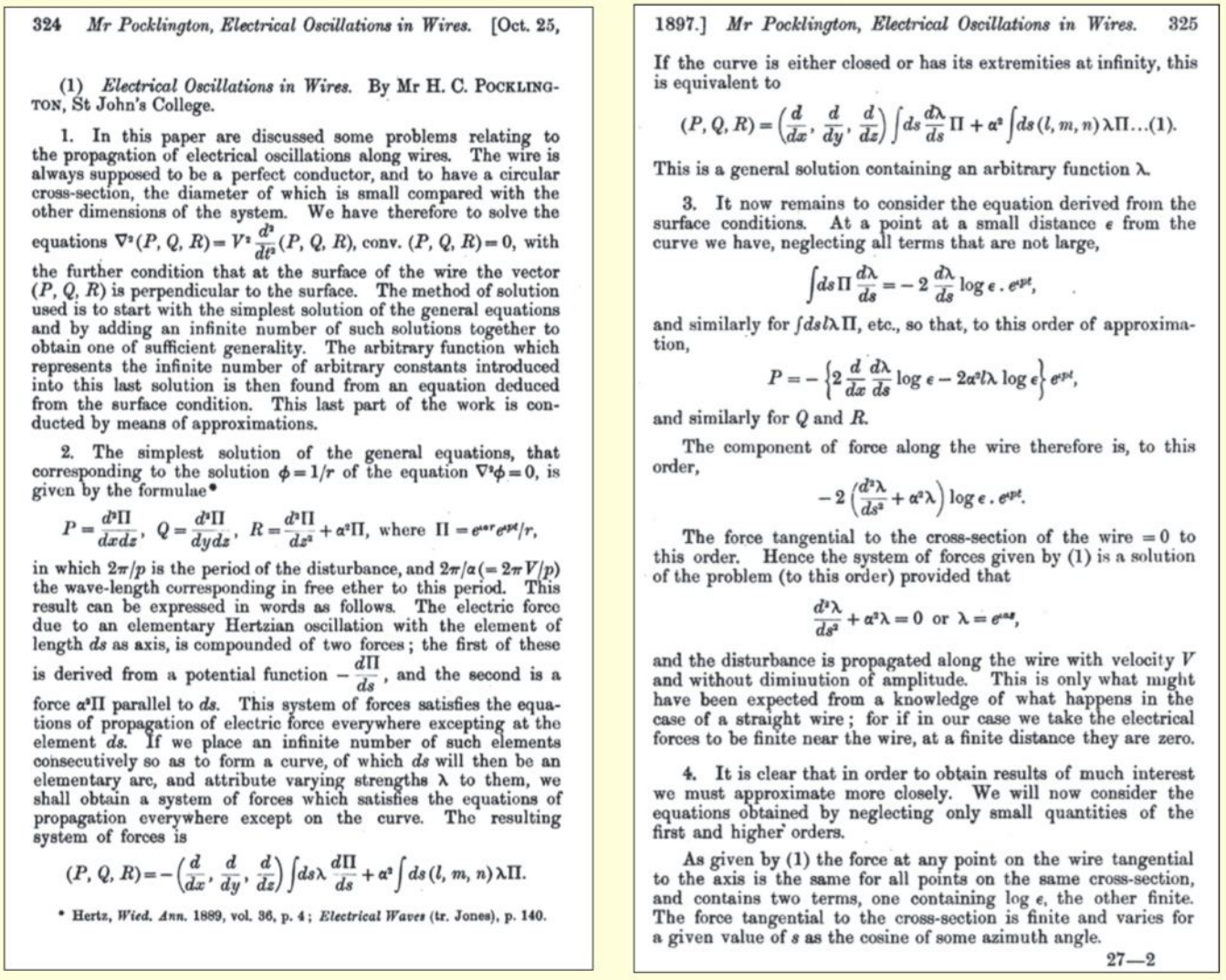
Figure 1. Depictions of the current distribution in a resonant half-wave dipole (a) and a short dipole (b). In both of these cases, the current distribution is well-known.

Thus far we have established that we can accurately predict antenna radiation patterns provided we solve Maxwell's equations (see below) with fields that satisfy the appropriate boundary conditions. However, as the truck and ship installations show, that may not be a simple process because of the complicated geometry of the metal mass around the antennas.

The two antennas depicted in figure 1 are solutions to this complicated electromagnetic problem, but adding parasitic elements or a complicated ground background makes radiation pattern guesses based upon these simple pictures a dicey proposition.

Charges and fields produced by those charges influence

*e-mail: <peterm.livingston@gmail.com>



324 *Mr Pocklington, Electrical Oscillations in Wires.* [Oct. 25,

(1) *Electrical Oscillations in Wires.* By Mr H. C. Pocklington, St John's College.

1. In this paper are discussed some problems relating to the propagation of electrical oscillations along wires. The wire is always supposed to be a perfect conductor, and to have a circular cross-section, the diameter of which is small compared with the other dimensions of the system. We have therefore to solve the equations $\nabla^2(P, Q, R) = V^2 \frac{d^2}{dt^2}(P, Q, R)$, conv. $(P, Q, R) = 0$, with the further condition that at the surface of the wire the vector (P, Q, R) is perpendicular to the surface. The method of solution used is to start with the simplest solution of the general equations and by adding an infinite number of such solutions together to obtain one of sufficient generality. The arbitrary function which represents the infinite number of arbitrary constants introduced into this last solution is then found from an equation deduced from the surface condition. This last part of the work is conducted by means of approximations.

2. The simplest solution of the general equations, that corresponding to the solution $\phi = 1/r$ of the equation $\nabla^2\phi = 0$, is given by the formulae*

$$P = \frac{d^2\Pi}{dxdz}, \quad Q = \frac{d^2\Pi}{dydz}, \quad R = \frac{d^2\Pi}{dz^2} + \alpha^2\Pi, \text{ where } \Pi = e^{\alpha r}e^{pt}/r,$$

in which $2\pi/p$ is the period of the disturbance, and $2\pi/\alpha\,(= 2\pi V/p)$ the wave-length corresponding in free ether to this period. This result can be expressed in words as follows. The electric force due to an elementary Hertzian oscillation with the element of length ds as axis, is compounded of two forces; the first of these is derived from a potential function $-\frac{d\Pi}{ds}$, and the second is a force $\alpha^2\Pi$ parallel to ds. This system of forces satisfies the equations of propagation of electric force everywhere excepting at the element ds. If we place an infinite number of such elements consecutively so as to form a curve, of which ds will then be an elementary arc, and attribute varying strengths λ to them, we shall obtain a system of forces which satisfies the equations of propagation everywhere except on the curve. The resulting system of forces is

$$(P, Q, R) = -\left(\frac{d}{dx}, \frac{d}{dy}, \frac{d}{dz}\right)\int ds\lambda\frac{d\Pi}{ds} + \alpha^2\int ds\,(l, m, n)\lambda\Pi.$$

* Hertz, *Wied. Ann.* 1889, vol. 36, p. 4; *Electrical Waves* (tr. Jones), p. 140.

1897.] *Mr Pocklington, Electrical Oscillations in Wires.* 325

If the curve is either closed or has its extremities at infinity, this is equivalent to

$$(P, Q, R) = \left(\frac{d}{dx}, \frac{d}{dy}, \frac{d}{dz}\right)\int ds\frac{d\lambda}{ds}\Pi + \alpha^2\int ds\,(l, m, n)\lambda\Pi \ldots (1).$$

This is a general solution containing an arbitrary function λ.

3. It now remains to consider the equation derived from the surface conditions. At a point at a small distance ϵ from the curve we have, neglecting all terms that are not large,

$$\int ds\,\Pi\frac{d\lambda}{ds} = -2\frac{d\lambda}{ds}\log\epsilon\,.\,e^{pt},$$

and similarly for $\int ds\,l\lambda\Pi$, etc., so that, to this order of approximation,

$$P = -\left\{2\frac{d}{dx}\frac{d\lambda}{ds}\log\epsilon - 2\alpha^2 l\lambda\log\epsilon\right\}e^{pt},$$

and similarly for Q and R.

The component of force along the wire therefore is, to this order,

$$-2\left(\frac{d^2\lambda}{ds^2} + \alpha^2\lambda\right)\log\epsilon\,.\,e^{pt}.$$

The force tangential to the cross-section of the wire $= 0$ to this order. Hence the system of forces given by (1) is a solution of the problem (to this order) provided that

$$\frac{d^2\lambda}{ds^2} + \alpha^2\lambda = 0 \text{ or } \lambda = e^{\alpha s},$$

and the disturbance is propagated along the wire with velocity V and without diminution of amplitude. This is only what might have been expected from a knowledge of what happens in the case of a straight wire; for if in our case we take the electrical forces to be finite near the wire, at a finite distance they are zero.

4. It is clear that in order to obtain results of much interest we must approximate more closely. We will now consider the equations obtained by neglecting only small quantities of the first and higher orders.

As given by (1) the force at any point on the wire tangential to the axis is the same for all points on the same cross-section, and contains two terms, one containing $\log\epsilon$, the other finite. The force tangential to the cross-section is finite and varies for a given value of s as the cosine of some azimuth angle.

27—2

Figure 2. Two pages of Pocklington's original manuscript published in the Transactions of the Cambridge Philosophical Society. The mathematics are dense and in Maxwell's original notation.

each other. You cannot ignore the effect that fields generated by charges have on the charges themselves. Sometimes, as in the examples above, the current distribution is dominated by the antenna length as in the short case, or that the solution to the full problem just happens to give the sinusoidal current distribution in the resonant case. Here are the requirements on the electric and magnetic fields at the surface of the antenna: (1) the electric field component parallel to the antenna surface is continuous with the electric field component inside; (2) the electric field component perpendicular to the antenna surface terminates on the oscillating charges, confined to the surface of the conductor by the skin effect; (3) the perpendicular component of the magnetic field is continuous through the surface, but (4) the tangential component arises from the oscillating current.

This seems like quite a load and it is, yet the remarkable thing is that the problem was solved in principle a little over a hundred years ago, and it was at that time this story begins.

Starting with Maxwell and Hertz

In 1887, Heinrich Hertz[1] demonstrated the exciting possibility of electromagnetic radiation from a spark gap driven by a large Rumkorff coil. His apparatus consisted of a spark gap at the center of a dipole loaded with sphere capacitors at the ends. The receiving apparatus was similar but larger, presumably working on the dominant wavelength of the spark gap system. It was only 26 years earlier that the young Scotsman James Clerk Maxwell (1831–1879), only 30 years old at the time, presented the complete theory of the electromagnetic field—a tour-de-force in 20 differential equations in 20 unknowns. It was a pity that he did not live long enough to see that one of his predictions—a propagating electromagnetic field—came true.

Although Maxwell's equations were formidable, Oliver Heaviside, a self-taught electrical engineer, mathematician, and physicist, simplified the notation by introducing vectors, creating just four vector differential equations in two unknowns that we still use today.

Two years after Hertz's fascinating discovery, an obscure English mathematician named Henry Cabourn Pocklington (1870–1952), using Maxwell's original notation, treated the self-interaction between field and charge in conductors, reducing the problem to an *integro-differential equation*; that is an equation that has both derivatives and integrals that involve the unknown (see figure 2). This equation is today

known as *Pocklington's Equation*[2] and forms a basis for current numerical antenna modeling. Oddly, that is the only work that Pocklington devoted to the new field of electromagnetic waves, and after this publication, he returned to the obscure world of number theory from whence he came.

Another form of the formal solution was introduced by Erik Gustav Hallén (1899–1975) in the '40s as an integral equation that bears his name[3]. It, too, is part of the modern antenna modeling tool kit, as both the Pocklington and Hallén equations seem best-suited for wire arrays or solid conducting surfaces, respectively.

From Theory to Practice

From the time of Hertz, through the Marconi years, and up to the middle 1950s, the equations of Pocklington and Hallén languished, because, except for very simple cases, it was impossible to numerically integrate them. Engineers of the time then turned to other approaches. One of the most outstanding of these was Sergei Alexandrovich Schelkunoff, a Russian emigrant from Samara employed by Bell Laboratories. He and his group were the first to theoretically analyze coaxial cables and to show they had a wide enough bandwidth to simultaneously transmit several hundred telephone calls. He proposed antenna modeling as what happens at the exit of a coax cable, among other ideas, and wrote several important books on antenna theory[4,5]. Perhaps one of his modern day exponents is John Kraus in his book *Antennas*, chapter two. I recommend the interested reader to that section for the transmission-line model for antennas.

The debate as to the best approach to antenna modeling was kept alive during the War years and after by Prof. Ronold King and his students at Harvard. They were examining various approximate solutions to Pocklington's equations that would extend the simple theory suggested above to more complicated metal boundaries. The debate between King and Shelkunoff became lively. For those interested in the duel between King and Schelkunoff, read R. W. P. King's *Theory of Linear Antennas*, Harvard University Press, 1956, and Schelkunoff, S. A., "Theory of Antennas of Arbitrary Size and Shape," Proceedings of the IRE, 29, 1941, pp. 493–521.

There's a story that Harold Henry Beverage (1899–1999), the inventor of his famous antenna first used by AT&T for transatlantic traffic (a four-element broadside/staggered Beverage array was used by AT&T at its longwave telephone receiver site in Houlton, Maine), listened to a lecture on antenna theory in England before the war. He was said to have remarked that had he known the theory was so complicated, he would never have invented his antenna!

Antenna modeling theory accommodating complex backgrounds remained pretty static until modern computers were available.

Enter the Computer

A break in this static picture happened In the early '60s when Prof. R. F. Harrington of Syracuse University published a seminal work on a solution to the Hallén and Pocklington equations by the *Method of Moments*[7]. The method itself was well-known, but extremely tedious and imprecise when done by hand. Numerical processing changed all of that and Prof. Harrington was the first to apply the method to antenna modeling with a view to computers.

Without going into mathematical details, the Method of Moments[8] converts an integro-differential equation or an integral equation into a matrix equation for which several powerful solving techniques exist. It is the method used today in

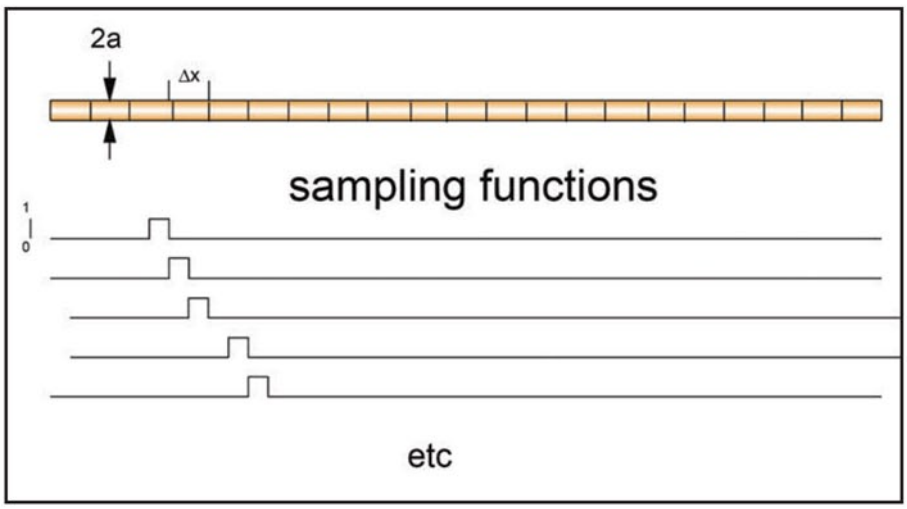


Figure 3. Wire antenna currents sampled at discrete points makes up the heart of the Method of Moments.

all numerical antenna modeling programs. A key feature of this method is how it "breaks up" a wire antenna into segments and assigns an unknown current to it. Then it computes a consistent current for all of the segments (see figure 3) given for either an impressed electric field (transmitting case) or a receive field (receiver case). Of course, the fields must satisfy the boundary conditions on the little segments and the currents modify the electromagnetic fields present so that the solution of the problem is a consistent antenna current in the presence of the electromagnetic field. The reader interested in the mathematical details will find them in ref. 8.

In the mid-1960s, MB Associates (MBA), a small firm in San Ramon, California, was building chaff dispensers for the military and needed to know the radar cross-section of the decoys. Ohio State University also was working on a Method of Moments solution to Pocklington's equation for conducting wires and was working to extend the code to cover loops and straight wires. MBA chose a simple three-term wire antenna sampling function for Hallèn's equation. The code, supported by the Air Force, became known as BRACT, and in 1967 became the main software for MBA's scattering calculations. The following year, a version known as ANTBRACT was developed for antenna calculations by introducing voltage sources on the wires and the *reflection coefficient approximation* for grounds.

The government formalized its interest in a user-friendly tool for antenna field calculations when it issued a Request for Proposal jointly supported by The Naval Research Laboratory, the Naval Ship Engineering Center, US Army ECOM/Communication Systems, the US Army Strategic Communications, and USAF Rome Air Development Center. Various companies and universities competed for the contract, which was ultimately awarded to MBA Associates. Its approach was to

refine ANTBRACT and prepare user manuals. The streamlined ANTBRACT was renamed AMP (Antenna Modeling Program) and had many supporters in all of the military services.

The success of AMP created new pressures for improved modeling of smooth structures that had been handled by assembling a wire grid as a standing for the voluminous body (figure 4). However, such modeling proved to be very computer-time intensive and so it was decided to retain the thin wire *Electric Field Integral Equation* (EFIE) for wire antennas and use a *Magnetic Field Integral Equation* (MFIE) for extensive structures. Although the EFIE is the standard in NEC-2, the usual version available to the public, there is an option for MFIE. The technique and time-savings were demonstrated by modeling a wire antenna system on a Navy Frigate (1975).

In 1977 the Air Force Weapons Laboratory was focused on Electromagnetic Pulse Effects (an effort started during my tenure at the lab and our measurements during surface atomic bomb testing in Nevada contributed to first theories). AFWL had a huge Marx bank high-voltage generator and a wire antenna system large enough to park an airplane underneath it. The discharge of the generator induced high-current pulses in the plane's wiring and electronics. The needed predictive tool was AMP.

But the Navy was also interested in antenna prediction for shipboard communication systems. Jointly with the Air Force, the Navy made improvements to AMP and it was suggested to rename the code NEC—Numerical Electromagnetics Code (see figure 5). It used the Method of Moments mentioned above for structures that were a few wavelengths in size and other elements to accommodate large structures using asymptotic techniques. A version of NEC was combined with the Ohio State Basic Scattering Code to become known as NEC-BSC that was and is widely used.

The next problem to be overcome was accurate modeling of wire antennas in close proximity to realistic grounds and for a "what-if" capability for siting studies of antennas on large ships. The Sommerfeld integral(s) then were added for these interactions through the introduction of image antennas and the complex reflection coefficient. However, the Sommerfeld integrals were and are computer-time intensive so that tables have been evaluated and table look-up with interpolation is often used to shorten computing time.

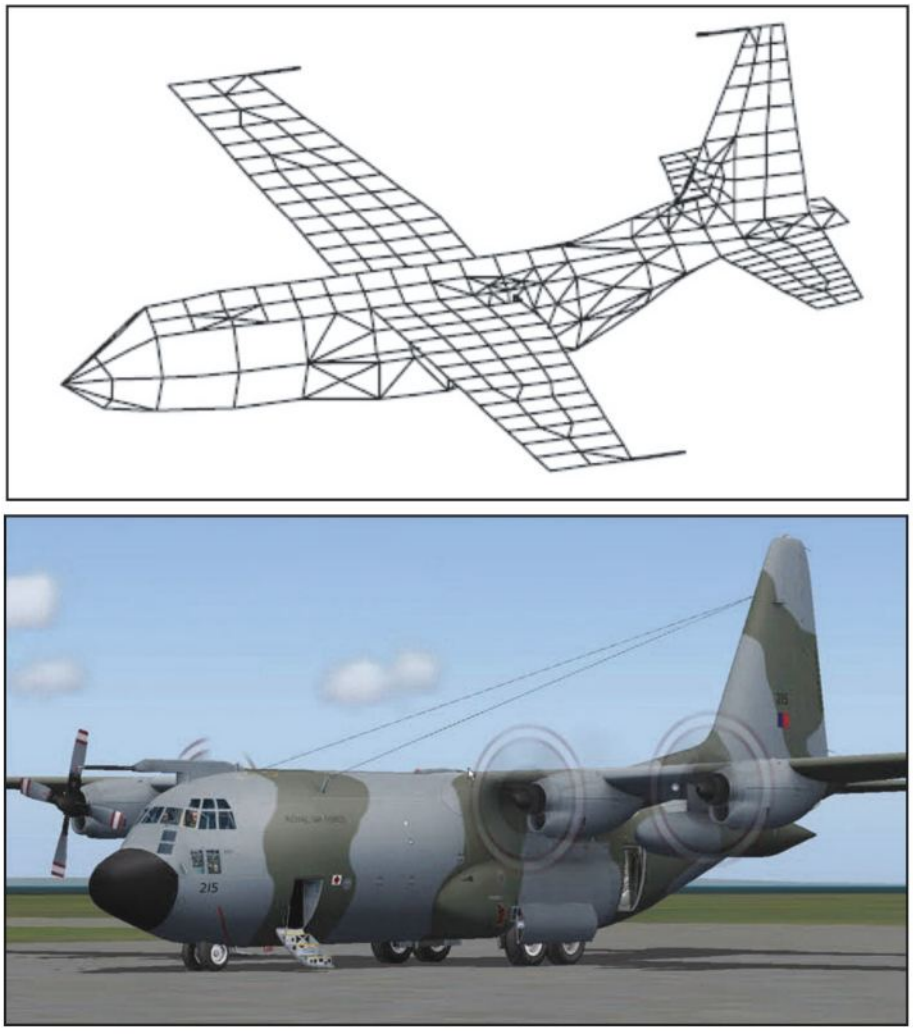


Figure 4. A "wire model" of a C-130 Hercules for antenna performance computation. Below is a photograph of the aircraft. These are from a paper by S. J. Kubinas, et al., "Modeling Multiple HF Antennas on the C-130/Hercules Aircraft—Part II," EMC Laboratory, Concordia University, Montreal, 2005.

Within a few years a critical deficiency surfaced: NEC-2 could not be used for buried wires (nor can it be used that way today), because it required the wire structure to be in free space or in the lossless half-space above a finite conducting ground.

You may well appreciate the issue here. A link to our submerged missile submarines in time of war depended on ELF communications at a few Hz. Our Navy's Seafarer system operated at a frequency of 76 Hz and the corresponding Soviet device ran at 82 Hz. Both transmitters had to be located over poorly conducting soil (just the opposite for LF and HF communications), so the Navy built a test facility over the Laurentian Shield Basalt formation in northern Wisconsin (The Wisconsin Test Facility). At these operating wavelengths, a quarter-wave was a good fraction of the Earth's radius. Therefore conventional antennas could not be used. Our side buried two giant electrodes approximately 50 kilometers apart and fed from a central transmitter with transmission lines. The fields radiated into the ground and moved along the Earth's boundary into the ocean. Communication was strictly one way at that frequency so codes were spare and the data rate very slow. When the transmitter fired, it was said that farm field fences became electrified, giving off sparks within miles of the transmitter layout. Although the radiated power was only a few watts, the transmitter was driven with megawatts of power.

Needless to say, this ELF mode represented a challenge to antenna theorists and gave rise to considering buried

CQ 2014-15 calendar

15 months of value
January 2014 through March 2015

$10.95 plus shipping

Fifteen spectacular color images of some of the biggest, most photogenic shacks and antennas from across the country and. . . new this year. . . we've included three Classic Radio and three CQ Contest pictures for good measure! These six shots, along with nine interesting and diverse Amateur Radio Operator's shacks from various locations across the country, comprise what we're sure you'll agree is our best calendar to date!

As in the past, calendars include dates of important Ham Radio events, major contests and other operating events, meteor showers, phases of the moon, and other astronomical information, plus important and popular holidays.

CQ's 15-month calendar (January 2014 - March 2015) is truly a must have!

Order yours today!

Shipping charges: USA $3; Canada/Mexico $5;
All other countries $10.

CQ Communications, Inc.

25 Newbridge Road, Hicksville, NY 11801
Call 1-800-853-9797 or FAX 516-681-2926 • http://store.cq-amateur-radio.com

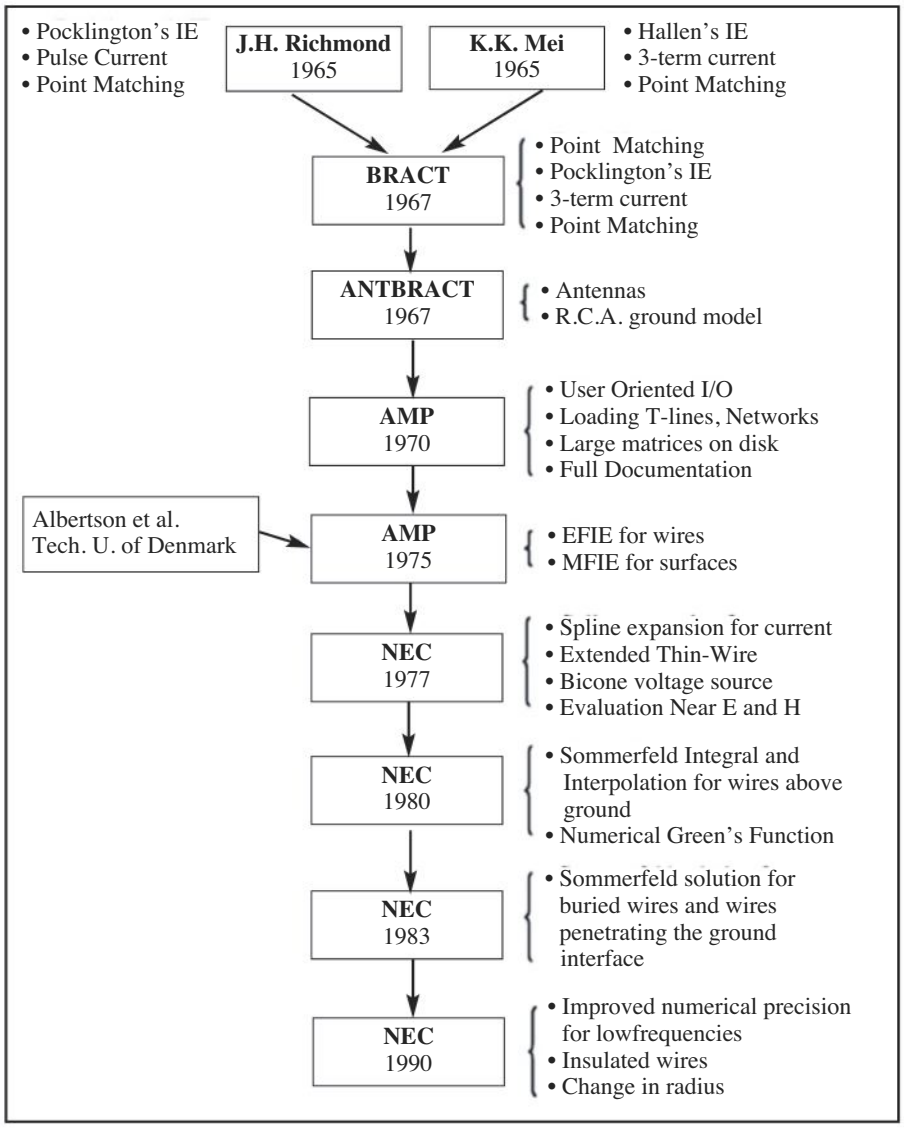


Figure 5. The NEC Genesis. This illustration is taken from the "Brief History"[9] document and handily captures the evolution of today's NEC.

antennas. Incidentally, buried antennas were used successfully by the Soviet Army in WW II because they were easy to lay and were difficult to disable. HF communications had a very high take-off angle so that the range was relatively restricted.

The US Army/ISEC combined forces with NOSC to fund a code improvement that rectifies this deficiency and the modified code became known as NEC-3. It enabled modeling of wires and surfaces (using the MFIE option) with infinite dielectric and lossy media. Our government considered this development to be sensitive so that access to NEC-3 is limited through a licensing process. About 250 copies have been distributed. Our ELF story seems also to have spurred development of NEC-4 in 1990 to treat antenna patterns at extremely low frequencies. Also added were better wire models for stepped radius and insulated wires.

NEC is a living code: user groups are still making improvements to the code even after 30 years of field experience.

NEC and You

Although it is perfectly feasible to download NEC-2 code and manuals, you likely will not do so unless you love to program. The original NEC was written in Fortran "spaghetti" code. This is a term of mild derision resulting from the number of "GOTO" statements that lead one into and out of "DO" loops with seeming randomness. This sort of easy-going code is easy to screw up so later versions have been written in a more strongly-typed code such as C. However, even then, most are not interested in the motor under the hood—only that it works efficiently.

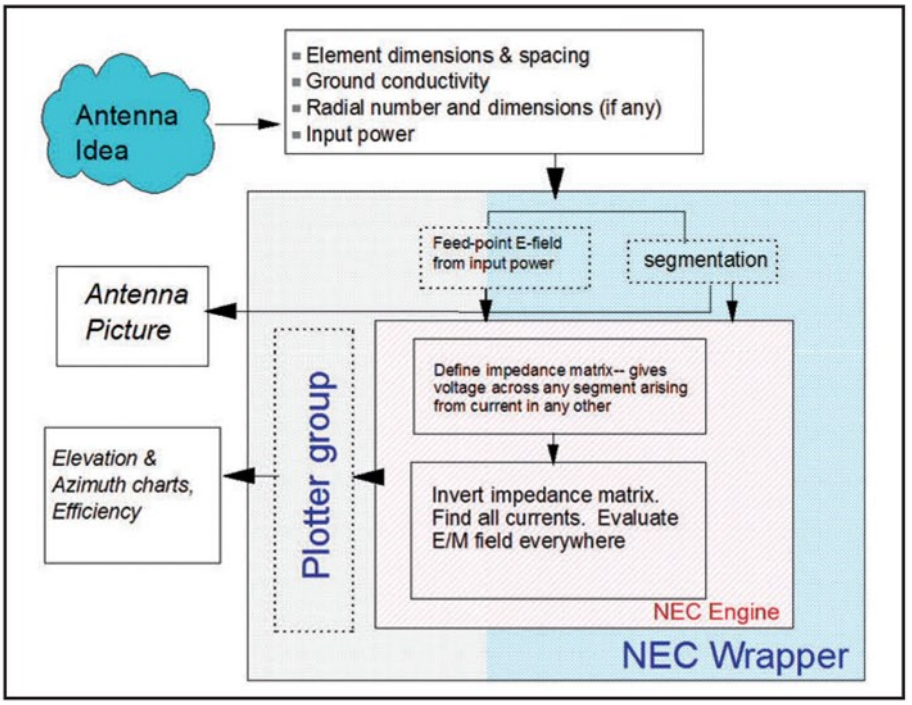


Figure 6. This illustration, while sketchy, captures the essence of NEC-2 that is available in commercial codes sold today. The current non-licensed codes are limited in number of segments to between 500 and approximately 1500, which is OK for most wire antennas. There is a provision for a table look-up feature for the Sommerfeld integral needed when computing the image of an antenna over a finite conductivity ground. Although lowering the quality of the output somewhat, the lookup feature keeps the code moving along smartly and is worth the approximation. (There are more costly versions of NEC-2 that can handle up to 20,000 segments, and if you fancy underground antenna modeling, NEC-4 is available provided you can acquire a license.)

There are several commercial products that enable a codeless user to use NEC 2 to model antennas. Here is a link to the late L. B. Cebik's article in *Antennex* on available codes: <http://www.antennex.com/shack/Nov05/resources.html>.

Roy Lewallen, W7EL, wrote a "wrapper" for NEC-2 (see figure 6) called *EZNEC*, which he markets. I asked him about that "wrapper" and he replied that it took about 70,000 lines of code. It took that much code to make NEC-2 user-friendly.

Next time you run your version of NEC-2 in some commercial product, think back on this little-known history going back to the very dawn of the Radio Age.

Notes

1. H. Hertz,"The forces of electrical oscillations, treated by Maxwell's theory," Ann. der Physik, vol. 36, pp. 1, 1888.
2. H.C. Pocklington, "Electrical oscillations in wires," Cambridge Philos. Soc. Proc., vol. 9, pp. 324–332, 1897.
3. E. Hallén, "Theoretical investigations into the transmitting and receiving qualities of antennae," Nova Acta Regiae Societatis Scientiarium Upsaliensis (Sweden), vol. IV, no. 4, pp. 1–44, 1938.
4. S. A Schelkunoff, *Advanced Antenna Theory*, New York: John Wiley & Sons, 1952.
5. Sergei A. Schelkunoff and Harald T. Friis, *Antennas: Theory and Practice,* Bell Telephone Laboratories, New York: John Wiley & Sons.
6. R. F. Harrington, "Matrix methods for Field Problems," *Proc. IEEE,* Vol. 55, pp. 136–49, Feb. 1967.
7. R. F. Harrington, *Field Computation by Moment Methods*, Wiley IEEE Press, 1993
8. Walter C. Gibson, *The Method of Moments in Electromagnetics*, Chapman and Hall/CRC 2007. Available online as a .pdf file.
9. G. J. Burke, E. K. Miller, A. J. Poggio, "The Numercial Electromagnetics Code (NEC) – A Brief History," UCRL CONF-201984 2004 IEEE AP-S International Symposium and USNC/URSI National Radio Science, Monterey, California, June 20–25, 2004.

In case of EMP—electromagnetic pulse—"low tech" vintage gear may once again become "high-tech." W4DNN explains…

Gearing Up For "The Pulse"

and Other Reasons To Keep Your Vintage Gear On the Shelf

BY DENNIS LAZAR,* W4DNN

How many times have you heard of a ham whose XYL has complained about that old, musty boat-anchor gear taking up all the space in the den, living room, or garage? Surely a compact state-of-the-art rig would not only do a better job on the air, but also would free up household real estate.

After some thought and very serious study, I have come up with a list of six reasons that make it plain that vintage gear is absolutely *essential* to life as a ham radio operator:

1. "The Big One"

Undoubtedly, the most important reason to keep vintage gear in the house and in good operating condition is "The Pulse," that catastrophic attack by a nuclear nation or rogue terrorist organization that would result in a nuclear E-bomb being detonated high above the middle of the USA. The resultant electromagnetic pulse reportedly would wipe out all solid-state gear in the nation . . . including your radios!

The pulse would take out the power grid, all communication systems, and the computer in your car or truck, to mention only a few vital areas of life. (However, I have been assured by no less than the Department of the Army that it will *not* also inactivate the OM should he have an implanted pacemaker.) This means that hams, who are largely recognized as the last source of communications in a disaster, would be equally helpless, as every semiconductor from sea to shining sea would be instantly fried. Vacuum tubes are another story. Just be sure you have a generator (without solid-state ignition).

2. Conversation-Starter

Another vital reason for taking up space with vintage gear is that it sounds nostalgic on the air. Nearly every time I tap out "RIG HR A HEATHKIT DX-40," the QSO turns to a long reminiscence of Novice days of old and a long-lost but not forgotten Heathkit, a Johnson Viking Adventurer, or even a little Lafayette, Hallicrafters, or Harvey Wells transmitter. Don't even start on all that wonderful surplus military gear or you're in for an all-nighter.

W4DNN operates the boat anchors: From the bottom, Hammarlund HQ-129X, Heathkit DX-40 and VFO, Johnson Viking Adventurer, National NC-98, and National SW-54. (Yes, that is a 1950s metal Sears AC/DC radio on top of the Adventurer.)

* e-mail: <laserstral@aim.com>

With so many hams aging, many of us are far older than our rigs. In fact, it is a real accomplishment to actually have a radio that is older than the op. I am getting close with my Hammarlund HQ-129X, which, at 68, is only three years younger than I am! Might have to shop for a rotary spark gap.

Boat anchors that can survive "The Pulse" need not be large. This Heathkit HW-29 "Sixer" and its cousins, the "Twoer" and "Tenner," are little rigs that helped many of us begin our ham careers in the 1950s and '60s.

So, having a boat anchor station is a real conversation starter. Much better than just exchanging 599 and the weather.

3. Impress Your Neighbors

Vintage gear is impressive. Having a visitor over for dinner? Show him or her a modern transceiver and the reaction may well be, "Oh, is that like a CB?" or "Why is that better than a cell phone or the internet?" Then you will have to take lots of time to try to explain why and how this little box can access the world.

However, show your visitors a 6-foot rack or a bookcase full of vintage gear with lighted tubes and dials, blue-glowing mercury vapor rectifiers, and the low hum of the high voltage power supply that just exudes extreme power, and they will be very suitably impressed. "Wow, I bet you could send a signal to the Moon or Mars with that gear," they might say. And you might answer, "Yes, I already have!"

4. Home Security

Why own 500 pounds of vintage gear instead of a $13,000 contest-grade transceiver? Home security, of course. A burglar could come in and scoop up

The "Benton Harbor Lunchboxes" were the little tube and discrete-component rigs of choice long before solid-state became the norm.

that whiz-bang radio in one arm while carting off your flat-screen TV in the other. But in a properly-equipped ham home, when he tries to carry out your Johnson Thunderbolt, he will certainly suffer either a hernia or a ruptured disk. In either case, the cops will find it easy to trace him to the nearest hospital or chiropractor.

5. Authentic Dust

Since hamming is lots more fun than housework, old gear will help you justify your objections when the XYL says, "Just look at this mess." While a sparkling new SDR transceiver and its associated up-scale computer equipment appear simply slovenly when the dust accumulates, vintage gear actually looks *better*. What is the point of 50-year-old gear without 50-year-old dust? All the more authentic, don't you think?

6. The Greater Good

Finally, there is the vital need to protect the history of ham radio. Every ham owes it to the next generation to be able to show "how we did it back in my day." As Elmers, we need to be able to show the young whippersnappers how we peaked the grid and dipped the plate and fried the finals when we forgot. We need to be able to show a son or daughter how lucky they are that we were not electrocuted at age 15 and lived long enough to have conceived them at all.

So, there you have it … just a few of the many reasons that keeping and using vintage boat anchor gear is vital to the ham radio hobby and to the nation's emergency readiness as well. In the face of all this, is there any possible argument that could justify selling even the least of these, our radios?

MFJ *Pocket size* Morse Code Reader™

Hold near your receiver -- it instantly displays CW in English! Automatic Speed Tracking . . . Instant Replay . . . 32 Character LCD . . . High-Performance Modem . . . Computer Interface . . . Battery Saver . . . More!

Is your CW rusty?

Relax and place this tiny pocket size MFJ Morse Code Reader near your receiver's speaker . . .

Then watch CW turn into solid text messages as they scroll across an easy-to-read LCD display.

No cables to hook-up, no computer, no interface, nothing else needed!

Use it as a backup in case you mis-copy a few characters - - it makes working high speed CW a breeze - - even if you're rusty.

Practice by copying along with the MFJ-461. It'll help you learn the code and increase your speed as you instantly see if you're right or wrong.

Eavesdrop on interesting Morse code QSOs from hams all over the world. It's a universal language that's understood the world over.

MFJ *AutoTrak*™ automatically locks on, tracks and displays CW speed up to 99 Words-Per-Minute.

Simply place your MFJ-461 close to your receiver speaker until the lock LED flashes in time with the CW. Digs out weak signals. Phase-Lock-Loop even tracks slightly drifting signals.

MFJ-461 **$89.95**

Of course, nothing can clean up and copy a sloppy fist, especially weak signals with lots of QRM/QRN.

The MFJ-461's serial port lets you display CW text full screen on a bright computer monitor -- just use your computer serial port and terminal program.

When it's too noisy for its microphone pickup, you can connect the MFJ-461 to your receiver with a cable. A battery saving feature puts the MFJ-461 to sleep during periods of inactivity. It wakes up and decodes when it hears CW.

Uses 9 Volt battery. Fits in your shirt pocket with room to spare - smaller than a pack of cigarettes. Tiny 2¼x3¼x1 inches. 5½ ounces.

Super easy-to-use! Just turn it on -- it starts copying instantly!

MFJ-26B, $9.95. Soft leather protective pouch. Clear plastic overlay for display, push button opening, strong, pocket/belt clip secures MFJ-461.

MFJ-5161, $16.95. MFJ-461 to computer serial port cable (DB-9).

MFJ-5162, $7.95. Receiver cable connects MFJ-461 to your radio's external speaker 3.5 mm jack.

MFJ-5163, $10.95. Cable lets you use external speaker when MFJ-461 is plugged into radio speaker jack. 3.5 mm.

MFJ Morse Code *Reader and Keyer* Combination

Plug MFJ's CW Reader with Keyer into your transceiver's phone jack and key jack.

Now you're ready to compete with the world's best hi-speed CW operators -- and *they won't even know you're still learning the code!* Sends and reads 5-99 WPM.

Automatic speed tracking. Large 2-line LCD shows send/receive messages. Use paddle or computer keyboard.

Easy menu operation. Front panel speed, volume controls. 4 message memories, type ahead buffer, read again buffer, adjustable weight/sidetone, speaker. RFI proof.

MFJ-551, $39.95. RFI suppressed keyboard, a must to avoid RFI problems.

MFJ-464 **$199.95** *(Keyboard, paddle not included.)*

MFJ Iambic Paddles

MFJ-564 Chrome
MFJ-564B Black
$69.95

MFJ *Deluxe Iambic Paddles*™ feature a full range of adjustments in tension and contact spacing. Self-adjusting nylon and steel needle bearings, contact points that almost never need cleaning, precision machined frame and non-skid feet on heavy chrome base. Works with all MFJ and other electronic keyers.

***Miniature* Travel Iambic Paddle**

MFJ-561, $24.95. 1¾Wx1¾D x¾H inches. *Formed* phosphorous bronze spring paddle, stainless steel base. 4 ft. cord, 3.5 mm plug.

MFJ Code Oscillator

MFJ-557 **$39.95**

MFJ-557 Deluxe Code Practice Oscillator has a Morse key and oscillator unit mounted together on a heavy steel base -- stays put on your table! Portable. 9-Volt battery or 110 VAC with MFJ-1312D, $15.95. Earphone jack, tone and volume controls, speaker. Adjustable key. Sturdy. 8½x2¼x3¾ inches.

MFJ-550, $14.95. Telegraph Key Only with adjustable contacts. Handsome black.

MFJ Deluxe CW Keyer

Deluxe MFJ Keyer has all controls on front panel for easy access -- speed, weight, tone, volume knobs, and tune, semi/auto, on/off push-buttons. You get all keyer modes, dot-dash memories, self completing dots/dashes, jam- proof spacing, sidetone, built-in speaker, type A /B keying. RF proof. Solid state keying. 7x2x6 inches.

MFJ-407D **$79.95**

MFJ-401D, $69.95. Econo Keyer II has front-panel volume/speed controls (8-50 wpm), tune switch. Internal adjust weight, tone. Solid state keying. Tiny 4x2x3½ inches.

Keyer/Paddle Combo

MFJ-422D **$189.95**

Best of all CW worlds -- a *deluxe MFJ Curtis*™ *keyer* that fits right on *Bencher paddle*! Adjustable weight and tone, front panel volume and speed controls (8-50 WPM), built-in dot-dash memories, speaker, sidetone, semi-automatic/tune or automatic modes. Use 9V battery or 110 VAC with MFJ-1312D, $15.95. 4½x2⅝x1¼ in.

MFJ-422DX, $99.95.

MFJ *Curtis*™ Keyer only, fits on your Bencher paddle or MFJ-564 (chrome) or MFJ-564B (black) paddles above.

MFJ*Pocket* Morse Tutor

Learn Morse code anywhere with this tiny *MFJ Pocket-sized Morse Code Tutor*™! Practice copying letters, numbers, prosigns, punctuations or any combination or words or QSOs. Follows ARRL/VEC format. Start at zero code speed and end up as a high speed *CW Pro!* LCD, built-in speaker.

MFJ-418 **$89.95**

MFJ *ClearTone*™ Speaker

MFJ-281, $12.95. Makes copying easier, enhances speech, improves intelligibility, reduces noise, static, hum. 3" speaker, 8 Watts, 8 Ohms.

MFJ 24/12 Hour Station Clock

MFJ-108B, $21.95. Dual 24/12 hour clock. Read UTC *and* local time *at-a-glance*. High-contrast 5/8" LCD, brushed aluminum frame. Batteries included. 4½Wx1Dx2H in.

Free MFJ Catalog

Visit: http://www.mfjenterprises.com or call toll-free 800-647-1800

• 1 Year *No Matter What*™ warranty • 30 day money back guarantee (less s/h) on orders direct from MFJ

MFJ ENTERPRISES, INC.
300 Industrial Pk Rd, Starkville, MS 39759 **PH:** (662) 323-5869
Tech Help: (662) 323-0549
FAX:(662)323-6551 8-4:30 CST, Mon.-Fri. ***Add shipping.***

MFJ . . . the world leader in ham radio accessories!

So … OP2A was looking for a new radio challenge … trying to contact at least one YL ham over age 100. Here's W7LR's story of how he helped Ivo meet that goal.

~~103~~ 104

BY BOB LEO,* W7LR

One day last year, 17 meters was in good shape and I had lots of nice SSB contacts with stations in Europe, such as Ivo, OP2A, in Belgium. As we got acquainted and became good friends over the air, we talked about certain radio goals. Ivo had achieved many difficult radio goals and had begun to wonder if there were any YL hams over 100 years of age to contact by ham radio for something new to achieve.

I told him that I knew of a lady ham of age 103. She is Louise Evans, KE7LSF, of Portland, Oregon (photo A). She lives in a retirement complex that has a ham station, KE7OIM. I knew of her since my wife Cobi's,brother, John Kapteyn, lives in the same complex and we had seen the club station when we visited. The station has a SteppIR beam on the roof of a 10-story building (photo B). The club trustee is Robert Hamilton, WB6RWT (photo C).

Thus, between all the hams mentioned above, and with John's help, we made arrangements for a sked with all these hams on 17 meters while conditions were still good. On June 3, 2012, we had the schedule and it went off very well, with a three-way QSO between Ivo, OP2A (photo D); Louise, KE7LSF, and Robert, WB6RWT, in Portland, and me, Bob, W7LR, in Bozeman, Montana (photo E).

Ivo was very happy to have made that goal, and perhaps set a record for contacting a 103-year (not old!) lady ham. (See photos F and G.)

*6790 South 3rd Rd., Bozeman, MT 59715
e-mail: <w7lr@aol.com>

The story doesn't quite end there. Louise must have decided she was a youngster and so purchased an iPad. She tried to register it with Apple, but its website couldn't handle her three-digit age! It allowed her to register only after she entered just "09" for her birth year. Of course, that would be 1909, not 2009! I wonder if Steve Jobs would have forseen this?

By the way, some time has passed since this story was first written. Louise is now 104 and still going strong, walking on her own without even a cane. Listen for her on the air!

Photo B. Retirement living at its finest. … the Willamette View apartment complex in Portland, Oregon, comes complete with its own ham station, KE7OIM, and a SteppIR beam 10 stories above the ground!

Photo A. Louise Evans, KE7LSF, is still going strong—in life and on the radio—at age 104! (Photos courtesy of the author)

Photo C. Robert Hamilton, WB6RWT, is the KE7OIM station trustee.

Photo D. Ivo Cleynhens, OP2A/ON5CD, set this story in motion by mentioning to W7LR that he'd like to contact a YL ham over age 100.

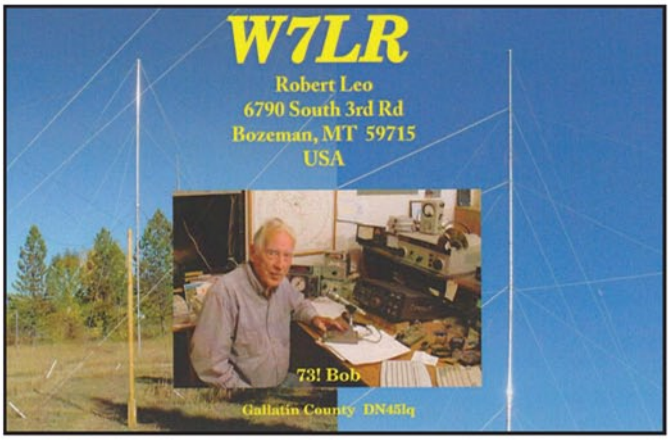
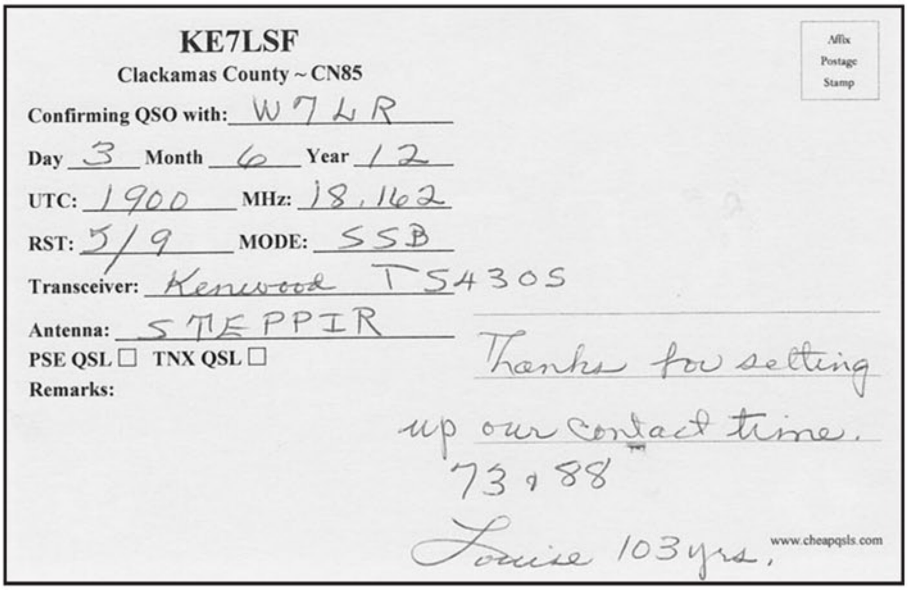
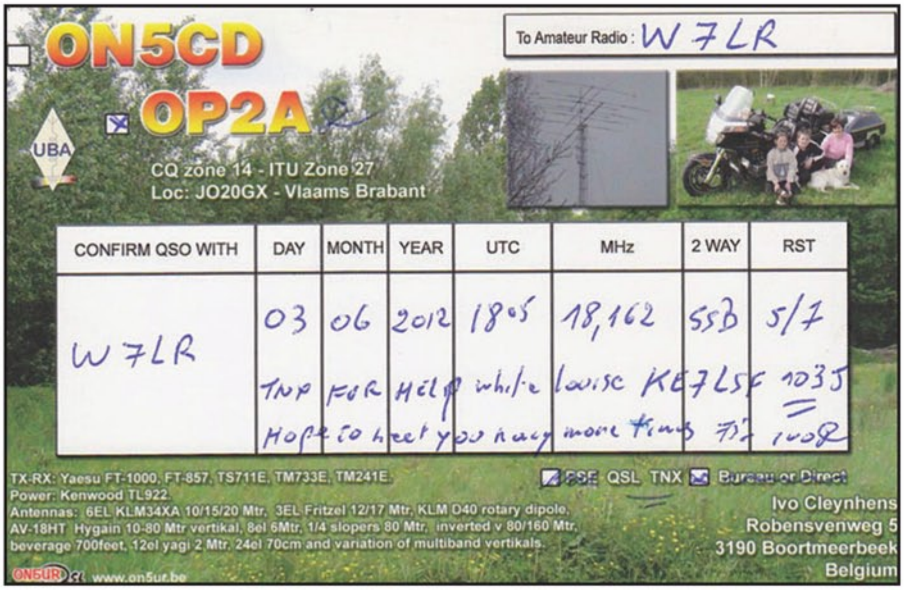


Photo E. Author Bob Leo, W7LR, helped set up a sked between OP2A and KE7LSF.





Photos F & G. QSL cards to W7LR from both KE7LSF (top) and OP2A (bottom) thank Bob for helping to set up their QSO.

Announcing:

2014 CQ DX Marathon

New Competition Class, Other Changes

Highlights of Rule Changes
2014 CQ DX Marathon

Please read these rules carefully. They incorporate several changes from previous years. Here are the highlights of the changes:

• For 2014, the CQ DX Marathon is introducing a third class of competition—*Limited Class*. The Limited Class will allow those running 100 watts and small directional antennas to participate in their own class. A plaque will be awarded to the 2014 Limited Class winner.

• Also for 2014, we have removed the restrictions on using nets and lists for all classes; and

• In the Formula low-power category, the maximum power output level is now 5 watts, to conform with generally agreed-upon definitions of QRP.

Activity period: The CQ DX Marathon is a year-long activity, beginning at 0000 UTC January 1 and ending at 2359 UTC December 31. Each year's event is separate.

Frequencies: Any authorized amateur frequency may be used. Contacts through repeaters or satellites are not allowed for credit, nor are contacts with maritime- or aeronautical-mobile stations. All contacts must be made entirely over amateur radio frequencies—i.e., Echolink-type contacts do not count.

Modes: Any authorized amateur mode may be used, but three modes will be recognized in the DX Marathon—CW, Phone, and Digital. All modes other than CW or voice modes will count as Digital.

Categories: Each entrant in the DX Marathon may submit one log each year per operating location. Participants submitting logs for single mode or single band entries must include only those contacts. Logs submitted with multiple modes or multiple bands will not be considered for mode and band awards. Entries with two or more callsigns will only count as a single entry if all contacts were made by the same (single) operator at the same station using the same antennas. Remote operation is permitted if all transmitters, receivers, and antennas are at one physical location. A remote station in a country different from the entrant's country of license must comply with all local laws and regulations. Entries that include contacts made with the assistance of remote receivers and/or transmitters in addition to contacts from a primary station are not permitted.

There are three entry classes, "Formula," "Limited," and "Unlimited."

Formula: An entrant may choose one of two options in this class: (1) All contacts must be made with a maximum output power of **5 watts**, regardless of band or mode; or (2) the operator may run a maximum of **100 watts output** to a simple antenna, such as a vertical or dipole (see the Appendix below for further rules on antennas used in either option for Formula class). An operator in Formula class must select QRP (5 watts or less) or 100 watts and limited antennas at the beginning of the year's DX Marathon, and may not switch between entry modes during the year. All contacts must be made without the use of higher power or prohibited antennas to initially secure the contact. Use of spotting nets such as a DX Cluster® is allowed. Details of antennas used in Formula Class must be included on the official submission form in order to qualify for Formula Class.

Limited: Limited Class entrants are allowed a maximum output power of **100 watts** and simple antennas, such as verticals or dipoles, plus small directional antennas such as Yagis and multi-element loop, hex, and quad type antennas for the 6-, 10-, 12-, 15-, 17- and 20-meter bands, and single-element rotatable dipoles for the 30- and 40-meter bands. See the Appendix below for further description of Limited Class antennas. All contacts must be made without the use of higher power or prohibited antennas to initially secure the contact. Use of spotting nets such as a DX Cluster® is allowed. Details of antennas used in Limited Class must be included on the official submission form in order to qualify for Limited Class.

Unlimited: Any antenna may be used, along with any power level for which the operator is licensed. Use of spotting nets such as DX Cluster® is allowed.

Scoring: Each country worked is worth one point. Each CQ zone worked is worth one point. The total score is the sum of zones and countries worked, on any mode and any authorized band. There are no multipliers of any kind. Each country and zone count only once. A single QSO may count for both a country and a zone. If in the course of the year you work 238 countries and 37 zones, your score is 275. If you work all 40 zones and 150 countries, your score is 190. The CQ DX Countries List and the CQ Zone List constitute the official lists. The lists are available on the DX Marathon website. In the case of ties, the operator whose last scoring contact was earlier chronologically will be judged the winner. Decisions of the Marathon Manager are final.

Submissions: Submissions must be made electronically, via e-mail to <scores@dxmarathon.com>. A Microsoft Excel® template into which contacts may be entered is available for download from the CQ DX Marathon website at <http://www. dxmarathon.com>. The website also provides other options for those without access to Excel®. All scores must be received by **January 10** following the close of each DX Marathon.

Verification: QSLs are not required. The operator is expected to claim contacts only from stations the operator has every reason to believe are legitimate, and only to claim contacts in which an accurate two-way exchange was clearly accomplished (see Appendix for further explanation).

2013 Logs Due by January 10, 2014

This year's CQ DX Marathon ends December 31, so it's time to go back through your log, see what you have worked, enter it onto the DX Marathon spreadsheet, and then update it with any additional contacts through the end of the year. See the main text or the DX Marathon website for details on how and where to submit your log. Remember, log submission deadlines for many CQ contests have changed. For the 2013 CQ DX Marathon, the submission deadline is **January 10, 2014.**

Scores will be adjusted by the DX Marathon committee for claimed contacts with pirates or any station not considered legitimate. Submissions may be penalized or voided in cases of fraud or poor sportsmanship. Submissions that do not provide detailed descriptions of Formula class antennas (type, height, and length, for example) to clearly demonstrate that the antennas meet the rules and the intent of Formula Class may be re-classified to Unlimited class. Decisions of the Marathon Manager are final.

Clubs: Clubs are strongly encouraged to use the framework of this contest for intramural and regional competitions.

Results: The final listing of official scores and winners will be published in *CQ* magazine and/or on the CQ website. The scores will also be posted on the DX Marathon website approximately one month after the results are published in *CQ* magazine.

Awards:

Plaques: The CQ DX Marathon Committee will award plaques as follows: Highest overall score in Unlimited Class; highest overall score in Limited Class; highest overall score in Formula Class; highest overall CW, highest overall SSB and highest overall Digital-only scores; highest overall score for single band entries for the 10, 12, 15, 17, 20, 30, 40 and 80m bands; highest overall score for each of the six continents. Plaques for CW, SSB, Band, and Continent winners are awarded regardless of class and will only be awarded if the winning scores in those categories are at least 50% of the score of the overall DX Marathon Unlimited Class winner. Entrants may receive only one plaque per year. In the case of a participant qualifying for more than one plaque, that participant will receive a plaque for the highest level based on the above order.

Certificates: Certificates are awarded to qualified participants in this order: Highest overall score in each CQ Zone; highest overall score in each country; highest overall score in the Formula Class 5 watts or less option. Plaque winners are not eligible for certificates. Only one certificate will be awarded per entrant. In the case of a participant qualifying for more than one certificate, that participant will receive a certificate for the highest level based on the above order.

In all cases, the rulings of the CQ DX Marathon Manager are final.

Appendix

Formula Class antennas, option 1: Operators selecting the 5-watt option are limited to antennas on a single tower and whose height does not exceed 65 feet or 20 meters above ground elevation. Wire antennas may also be used but must meet the criteria of the 100-watt option, and may be tower-supported at only one point.

Formula Class antennas, option 2: Antennas for operators choosing the 100-watt option must be either simple verticals or wire antennas lacking significant gain. No arrays are allowed, whether vertical or horizontal. Wire antennas, regardless of type, may not exceed 130 feet or 40 meters in length, may not be higher than 65 feet or 20 meters above ground at any point of the antenna, and may be tower-supported at only one point. The tallest point of vertical antennas used may not be higher than 65 feet or 20 meters above ground. Yagis, quads, and rotatable dipoles may not be used in this category. There is no limit on the number of antennas that may be used as long as each antenna meets the above criteria.

Limited Class Antennas: Antennas for Limited Class include all Formula Class option 2 antennas for use on all bands plus directional antennas such as Yagis and multi-element loop, hex, and quad type antennas. Directional antennas with no more than 3 elements used per band are allowed on the 20-meter through 6-meter bands. Boom length may not exceed 16 feet (5 meters) for antennas with booms. Single-element rotatable dipoles are allowed for the 30- and 40-meter bands. Directional antennas and rotatable dipoles must not be higher than 50 feet (15 meters) above ground and all antennas must be on a single tower or support.

Contacts: Each contact for a claimed country or zone must be a solid contact. The station claiming a contact with another station is expected to have had his or her callsign fully and accurately received and transmitted by the other station, and to have copied his/her own call being correctly sent by the other station. For example, K2MGA may not claim credit for a QSO with a DX station who had his call as K3MGA, even though in many cases the DX station would QSL the contact with the correction made (after receiving a card from K2MGA, realizing the error and correcting his/her log). For a contact to count, both stations must correctly copy all of both callsigns.

It is possible for hams to measure high currents and low resistances without using a fancy (and expensive) instrument?

Inexpensive Four-Wire Measurements for the Radio Amateur

BY GARY A. GEISSINGER,* WAØSPM/AAR8GI

These days, many amateurs own some kind of digital meter. While a valuable instrument by itself, it cannot measure values at the extremes. High voltages can be measured by adding a high-voltage probe, and using the methods given here, the extremes of high DC current and low resistance can be measured as well.

Measuring High Currents

Modern solid-state SSB transceivers typically draw about 20 to 25 amps from the 13.8VDC station supply. At times it would be handy to be able to measure this current either as a steady value or perhaps in transient cases as well. The key to this is to use a *four-terminal current shunt*.

As can be seen in figure 1, a current shunt is simply a low-value resistor (in this case 5 milliohms) with four connection points. However, buried inside that simplicity is some elegance. The two current sample connections are inside the current loop. This has the effect of making sure the lead resistance and connections that run to the meter have no significant effect on the accuracy of the measurement. With this value shunt, the meter reads 5 mV for every amp of current. Since modern digital meters have a high input resistance, the effects due to meter loading of the shunt can safely be ignored. Current shunts such as this may be purchased new or used (on eBay, for example).

As it turns out, current shunts can also be used to make dynamic/transient measurements by substituting an oscilloscope for the voltmeter (see figure 2).

Although there are a number of ways to make this measurement, this configuration allows the oscilloscope to still be powered using a three-prong AC plug.

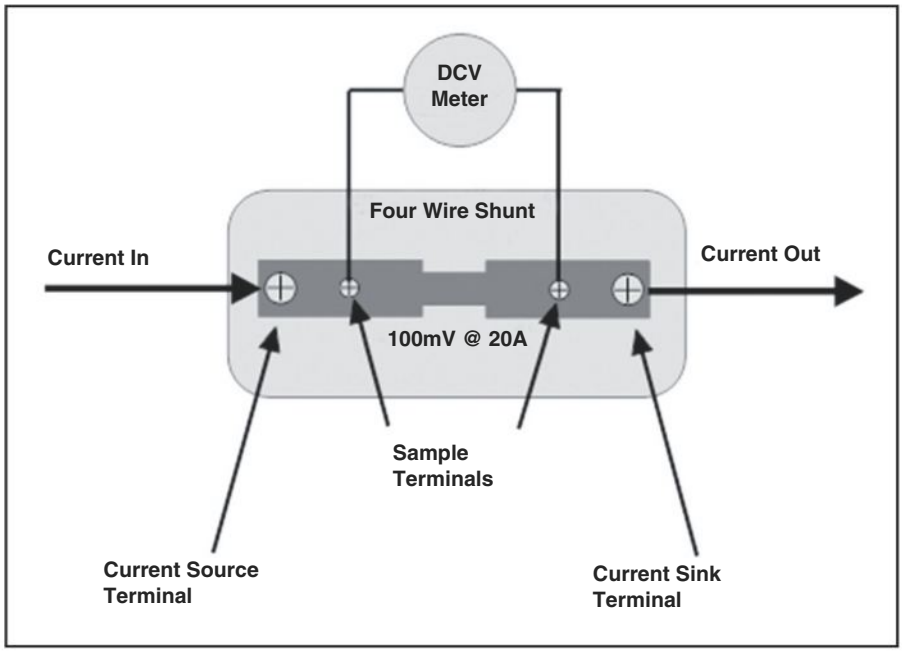


Figure 1. Typical current shunt

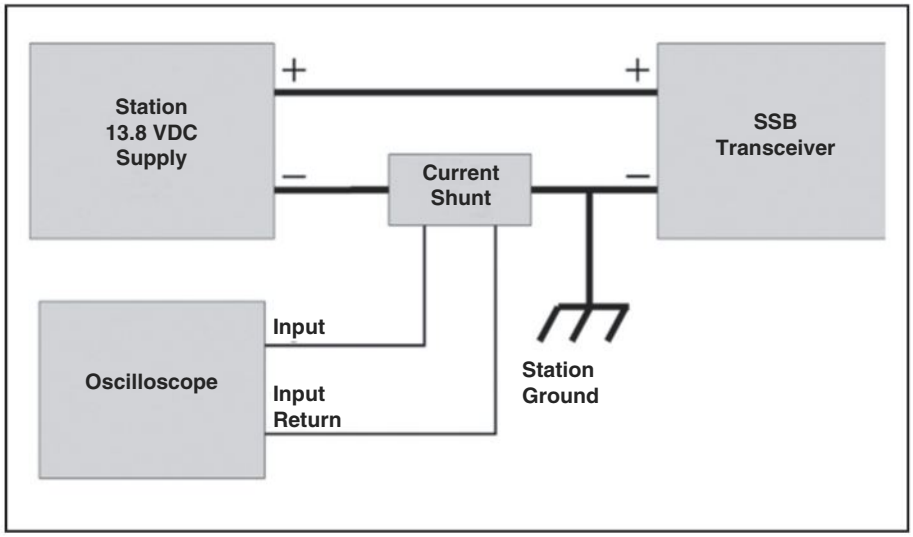


Figure 2. Transient current measurement

*e-mail:<geissingergary@yahoo.com>

Note: The current transient will read with negative polarity unless your oscilloscope has the ability to invert the vertical input. Those who have differential oscilloscope probes (or perhaps even a current probe) can be more precise and elegant with this measurement.

Homebrew Current Shunts

It is possible to easily make your own current shunts at virtually no cost. While they may not have the accuracy or thermal stability of a commercial shunt, the price is attractive.

Say, for example, you need a shunt to measure 1 amp with a voltage drop of 100mV. Ohm's Law says that would be a 100-milliohm resistance. By applying the power equation (P = IE), this shunt will dissipate 100mW when running at full current. In this case, the shunt wire can simply be wound over a high-value 2-watt resistor, as shown in figure 3. The resistor simply provides a convenient form for winding and lead wires. A resistor value of 10K ohms or higher will have no significant effect on accuracy.

The key here is to have a wire resistance chart. Table I provides several values for soft-drawn solid-copper wire. The objective is to pick a wire size that is long enough to provide reasonable precision when cutting the wire to length and yet isn't unnecessarily large and heavy. Pay attention to the amount of current and the wire gauge; this should not be an exercise in making fuses. In this case, using 30-gauge insulated wire, the shunt resistance would take $11\frac{5}{8}$ inches of wire. Be sure to add a little wire length for the solder connections.

In the figure of the homebrew shunt (figure 3), the six solder connections are spread out along the 2-watt resistor leads. In reality, the resistor leads need to be trimmed so that the connections are as close together as is practical without them touching or the solder flowing between connections.

So far this discussion has involved

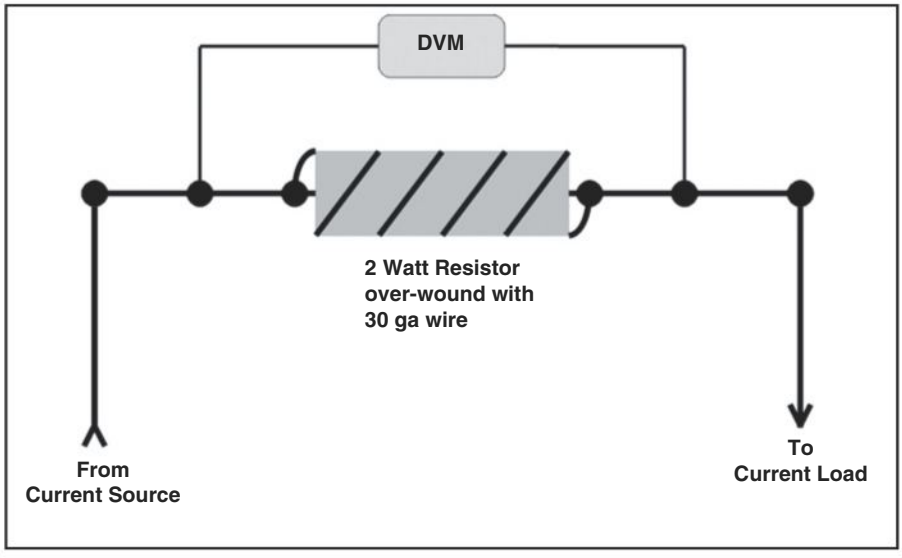


Figure 3. Homebrew current shunt

making DC current measurements. If the shunt will be used for AC measurements, then wind half the turns in one direction and then wind the rest in the other direction in order to cancel the self-inductance. In this case, it probably would be better to use a larger form so that the winds are "solenoid wound" rather than all on top of each other. This will help minimize the self-capacitance. While not creating a perfectly noninductive current shunt, this technique is more than adequate for low-frequency measurements at AC power or audio frequencies.

Measuring a Small Resistance

The techniques presented above use a known low-value resistance to measure an unknown large value of current. This approach can be "turned around" so that a known current can be used to measure a low value of resistance. The key is to make a similar four wire measurement at low cost using equipment on hand.

A typical example is measuring bonds and grounds. The connection between a large braid and a copper cold-water pipe should be on the order of a few milliohms. Unfortunately, inexpensive digital meters cannot accurately measure values of resistance below 1 ohm, even if the resistance of the meter leads is subtracted. However, many hams have on hand all that it takes to do the job.

Now consider a digital meter with a scale that reads from 000.0 to 199.9mV. If 0.1-milliohm resolution is required, then a full-scale reading of 199.9mV on the meter will correspond to a measurement of 199.9 milliohms. Ohm's Law says the current therefore required for the measurement is 1.0A.

If a regulated constant-current supply is available, the rest is easy, but assume that all that is available is the station's 13.8V supply. It is adequate for this task … with the addition of a "little" resistance.

Once again Ohm's Law is applied. This time a series resistance needs to be calculated so that the current from the 13.8V supply is limited to 1A. That's easy; it's a 13.8-ohm resistor. Of course, that assumes there is no remaining resistance in the circuit. Thinking about the other case, the measurement could drop as much as 199.9mV across the ground connection. As a result, the resistor would need to have a value of 13.8 – 0.1999 = 13.6 ohms. If a value of 13.7 ohms is chosen, the error in the measurement will be less than one percent in either limiting case. Using the power

Wire Gauge AWG	Resistance milliohms/foot
12	1.588
14	2.525
16	4.016
18	6.385
20	10.15
22	16.14
24	25.67
26	40.81
28	64.9
30	103.2

Table I. Solid soft-drawn wire resistance per foot.

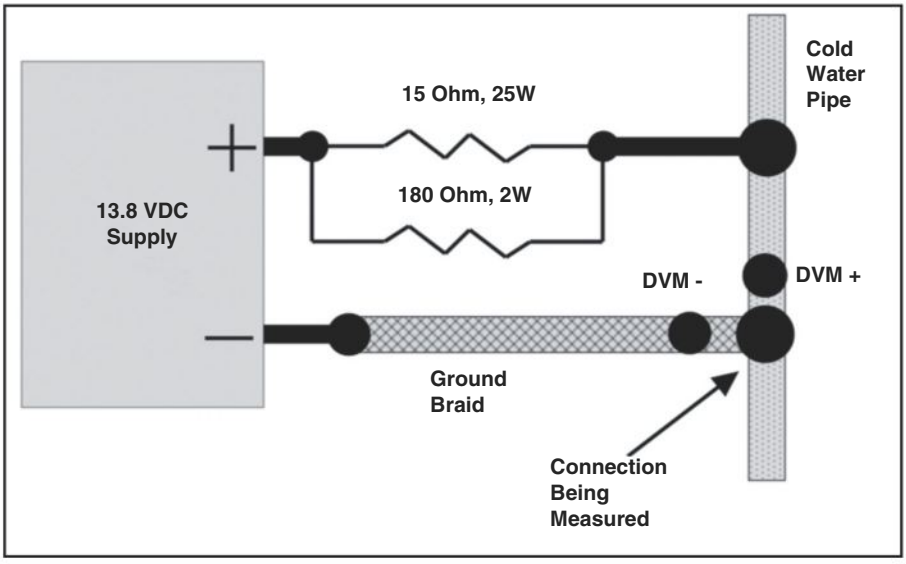


Figure 4. Measuring a bond resistance using a station supply. See text notes regarding a heatsink on the 25-watt resistor and clamping (rather than soldering) the cold-water pipe connection.

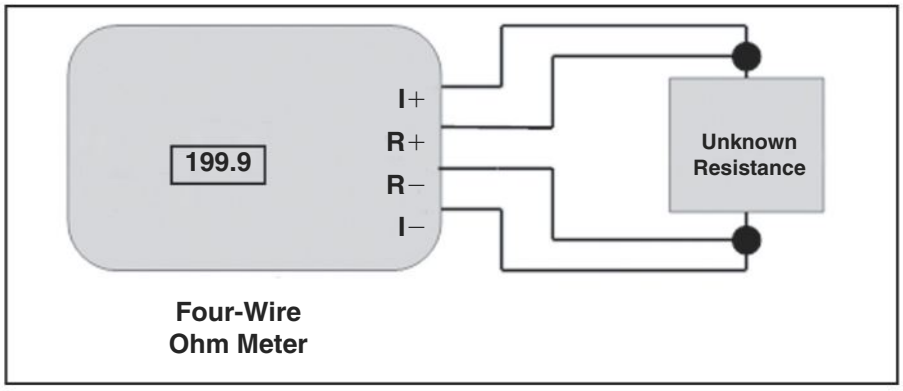


Figure 5. Best way to connect a four-wire ohmmeter. Again, see text for additional details.

formulas, this resistance could dissipate as much as 13.7 watts.

Digikey stocks 15-ohm, 1-percent, 25-watt resistors (part number KAL25FB15R0-ND) at a cost of $3.08 each. A parallel resistance of 173 ohms would be perfect to bring the two resistors in parallel to 13.7 ohms, but the standard value of 180 ohms yields a measurement error of less than one percent. A 2-watt resistor gives plenty of thermal design margin. Remember to bolt the 25-watt resistor to a heat sink or a scrap of metal. It won't safely dissipate anything close to 25 watts when suspended in free air.

As can be seen in figure 4, the connection points for the DVM are inside the current loop. In reality, they should be as close as possible to the connection being measured without contacting it. **One safety note:** The braid should be clamped to the cold-water pipe and not soldered. That's because the solder could give way should there be a lightning strike. However, it is okay to solder the pipe to the short stub of braid following the clamp. After I did that, my bond resistance at the braid-pipe connection was less than one-half milliohm.

Commercial Four-Wire Ohmmeters

Although new four-wire ohmmeters are expensive, they are valuable tools. Once again, an occasional bargain may be found on eBay. When four-wire meters are used in a measurement, the same philosophy as described above must be followed. The measurement terminals on the meter must be inside the current loop created by the two terminals that supply the current (see figure 5). As before, the resistance sense connections should be as close as possible to the unknown resistance.

The techniques presented here are just the beginning of obtaining accurate measurements. There are numerous, but more subtle, ways to improve the quality of low-resistance and high-current measurements. What is presented here will allow for reasonable first-order measurements without breaking the bank.

About the Author

Gary Geissinger has been licensed since 1968 and holds an Extra class license. His favorite aspects of amateur radio are designing circuits, restoring vintage AM gear, and working 6-meter SSB (when the band is open). Gary is also active in Army MARS as AAR8GI. His day job is being the chief electrical engineer at DigitalGlobe Incorporated.

BY IRWIN MATH,* WA2NDM

A Simple Dummy Load

Regular readers of this column may remember that in December of last year and January and September of this year we presented a few projects specifically intended to encourage you to build something. Hopefully the "lazy ones" in the hobby were stimulated! This month we will continue the effort with still another simple, useful project for your amateur radio station.

For tune-up procedures and routine testing there is nothing like a dummy load. In the "old days" many of us had a Heathkit "Cantenna," which was really nothing more than a 1-gallon paint can filled with mineral oil (for cooling), a non-inductive resistor, and an SO-239 connector. You can't believe how handy this device was and how many times we used it.

Well, Heath is no longer in business, but the old design can easily be transferred into a more modern version by means of a unique series of non-inductive thick-film resistors introduced by the Caddock company and followed up by Bourns, Ohmite, and Vishay/Dale, as well as others I am sure. These all are power resistors housed in common TO-126, TO-220, or TO-247 semiconductor packages. For those of you not familiar with this package it is similar to the ones that the 78xx series of regulators come in, and for reference a sketch of the three versions is shown in figure 1. It is very easy to heat sink these by means of the central hole in the package and common machine screws and nuts. These resistors come in 15-, 20-, 30-, 60-, and 100-watt variations, and best of all, in many of these wattages 50 ohms and 100 ohms are standard values.

To build a "modern" dummy load refer to figure 2. All that is needed is 50 ohms of resistance at the desired wattage, an SO-239 connector, and a very good heat sink. While the circuit could not be simpler, the heat sink must be able to handle the heat generated by the expected power that the resistor will dissipate. Sometimes the use of a couple of resistors (connected in series or parallel) that add up to 50 ohms can help distribute the heat over a greater area.

When building such a device be sure to use at least #14 to #20 gauge wire to connect the resistors to each other and to the RF connector. Wire from #14 household Romex cable is ideal for this purpose and quite inexpensive, since you probably can get a "free sample" from a home-improvement store. Fortunately, the actual resistance element for most of these is isolated from the actual hot surface by a ceramic coating so you can mount the device directly to a heat sink with plenty of thermal heat-sink grease to help heat flow. You can even use existing semiconductor heat sinks made expressly for the purpose, but remember, 100 watts is a great deal of heat so you will need a lot of area and in some cases possibly even a small blower when you anticipate operating for a long period of time. You might also consider building the unit in a totally enclosed metal box such as an aluminum "mini-box" for shielding.

If and when you do build such a device, the SWR by definition will be very close to 1:1. This fact can

*c/o CQ magazine

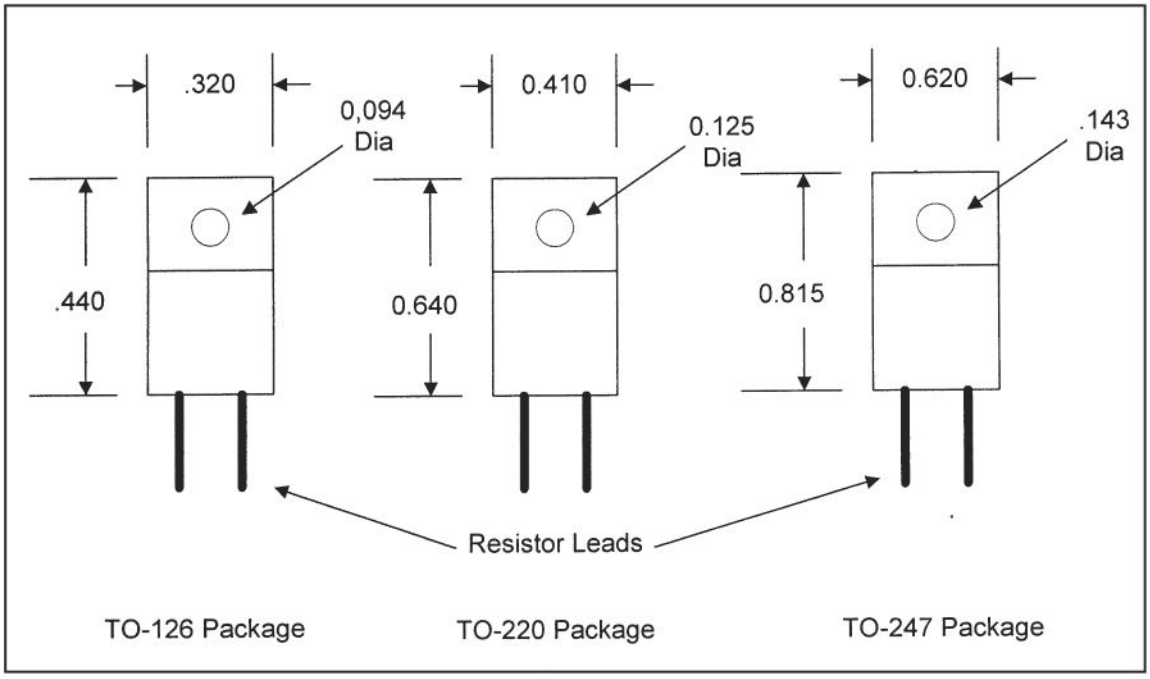


Figure 1. Thick-film non-inductive resistor packages.

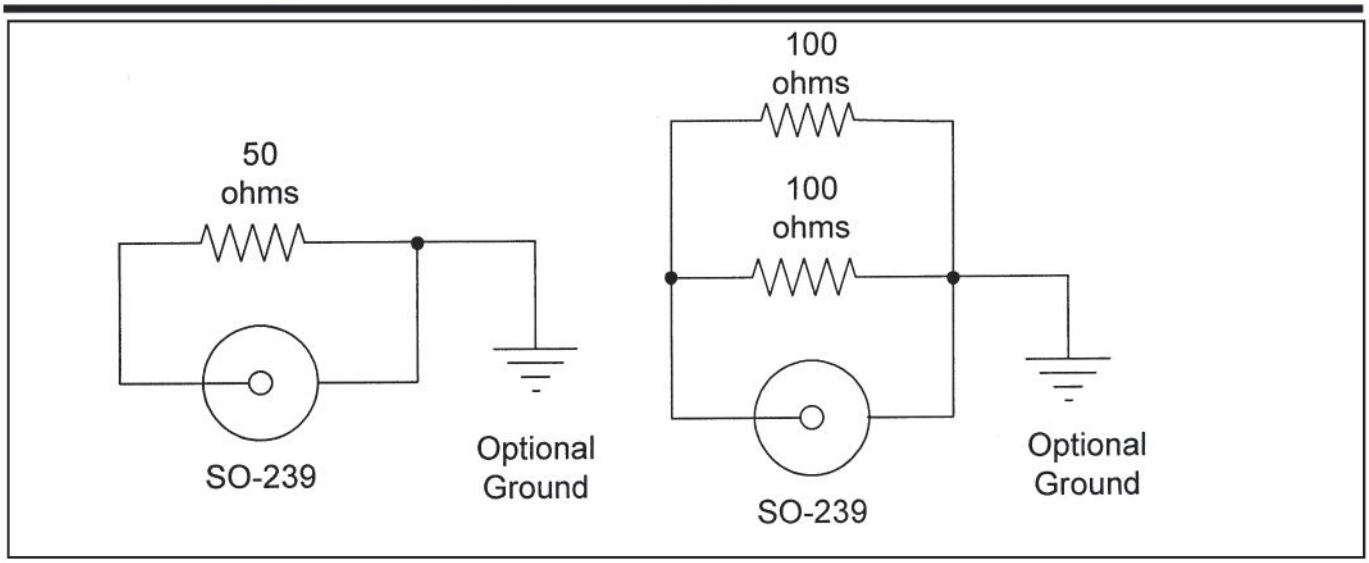


Figure 2. Two versions of a 50-ohm dummy load.

serve as a simple way to test your SWR meter or just how well the output matching/loading system of your transceiver operates if you have a so-called "modern" rig. By varying the resistance you can even test how well your rig (or automatic antenna tuner) will operate with mismatched loads. For example a resistance of 100 ohms will present a load with an SWR or 1.2, while 150 ohms will provide an SWR of 1.3.

Finally, the addition of a couple of 1/4-watt resistors connected across the load and to a BNC connector as shown in figure 3 will provide an output for an oscilloscope that can then be used to view the wave shape of your actual signal. These two resistors drop the high RF voltage across the 50-ohm load to a level that can be displayed on a common oscilloscope. The values chosen give you a dropping factor of 100 to 1, so a signal of 100 watts (70 volts) will result in an output of 0.7 volts. The 99K resistor, by the way, is obtained simply by using your ohmmeter and measuring a few 100K resistors (and the 1K resistor as well if you want a precise division ratio). In this case the output load for the oscilloscope is 1K and the voltage is an accurate representation of the actual signal. Since most oscilloscopes have an input impedance of about a megohm, a scope probe is not needed and a short

BNC patch cable can be used. The frequency response of the scope will then determine just how high a frequency can be measured.

In Closing . . .

This column completes my 41st year with *CQ* magazine.

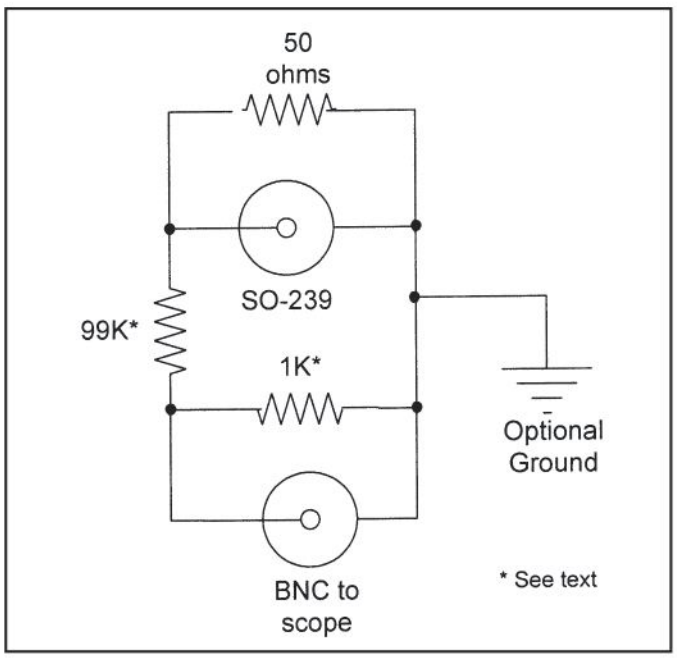


Figure 3. Adding an oscilloscope test point to the 50-ohm dummy load.

During that time I have been privileged to experience technology changes that are truly amazing. When I started, way back in April of 1972, vacuum tubes were king. Today, other than in a few specialized areas, they are almost obsolete. The transistor and its integrated circuit relatives have almost completely taken over. The CRT with its associated high-voltage supply has been replaced with the flat-screen display, operating at low voltages and in full color to boot! Commercial and amateur communications in the GHz region are routine and THz optical systems are becoming practical. The computer has evolved from a clever hand-held calculator to a tiny microprocessor-based HT to a degree we could not have imagined, and even CW is no longer required for amateur or commercial radio licenses. I ponder what wonders we will see in the next 41 years, and I hope I can continue to describe many of them to you.

I would like to thank all of my loyal readers for your thoughts, comments, and criticisms over the years. It is feedback from you that provides the fuel for this endeavor and keeps me going.

At this time, as I have said hundreds of times in the past, I would like to wish all of you a very Happy and Healthy Holiday Season and I truly hope that all of wishes come true in the coming year.

73, Irwin, WA2NDM

Correction October Column

Please note that the emitter and collector of the PNP transistor shown in figure 4 (page 58) have to be switched. The collector should go to the common lead and the emitter should go to C3.

—WA2NDM

Oh, They've Seen Fire and They've Seen Rain†

Flooding and wildfires put Colorado and California EmComm Teams to the test

BY RICHARD FISHER,* KI6SN

Extraordinary emergency communications efforts by radio amateurs and their organizations in Colorado and California are in focus this month as Public Service chronicles hams' remarkable support during widespread and deadly flooding on Colorado's Front Range and devastating wildfires that raged near the giant sequoias in California's Yosemite National Park.

Again, highly-skilled operators and solid communications systems underlined ham radio's value in preventing bad situations from becoming even worse. – *Richard Fisher, KI6SN*

*1940 Wetherly Way, Riverside, CA 92506
e-mail: <ki6sn@cq-amateur-radio.com>

†*with apologies to James Taylor*

Colorado ARES® Stands Firm During Deadly Weeklong Deluge

Sometimes to best get our arms around the gravity of a widespread disaster such as September's deadly flooding in Colorado, we turn to the snapshots of radio amateurs that make up the gallery of images telling the story, photo A.

Photo A. Don Nelson, NØYE, manages a smile after working on the Yagi antenna system in driving rain atop a building at Colorado's Boulder Municipal Airport. Amateurs provided ATV evacuation images to EOCs during massive flooding in the region in September. (Colorado photos courtesy of KB9TTI / HB9TTI)

Photo B. ARRL Colorado Section Manager Jack Ciaccia, WMØG, contacts Chris Zietkiewicz, WØDRZ, whose amateur radio was the only means of communication in Pinewood Springs – a mountain community of 650 people cut off by recent flooding. The communications center was part of a report on NBC Nightly News. (Internet screen grab <http://nbcnews.to/15RDgYV>)

Colorado Flooding Statistics

These figures were released in a report by the Denver Post newspaper <http://bit.ly/1emiZuM>:

Colorado counties flooded: 17
Homes damaged: 16,100+
Homes destroyed: 1,880+
Property damage estimate: $1.36 billion
U.S. Department of Transportation road damage estimate: $150 million
Colorado Department of Transportation road damage estimate: $500 million

Photo C. A soggy, muddy mess is left in the wake of September flooding in the town of Lyons, Colorado, where communications was cut off by flood waters. Paul Burge, KØDJV, provided the community's only communications, operating from its evacuation shelter.

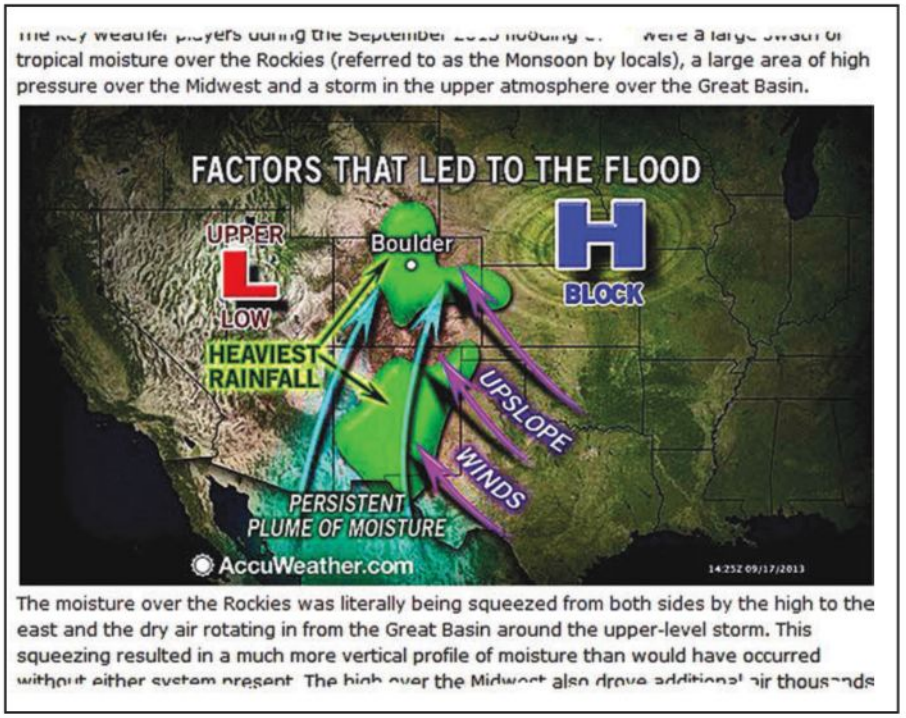


Photo D. A mini-AccuWeather tutorial explains what meteorological influences were in play that created weeklong flooding on Colorado's Front Range in September. See the full report at <http://bit.ly/1elR7a8>. (Internet screen grab <http://www.accuweather.com>)

For example, with all communications and seven miles of road washed out, the lone voice for the 650 people of Pinewood Springs was a radio amateur—Chris Zietkiewicz, WØDRZ.

"Our main concern was the availability of (fresh drinking water) to them," Joe Ciaccia, WMØG, ARRL Colorado Section Manager said (photo B). "We knew they were well stocked with food, because that's what (rural) communities do. But water was another matter."

As a result of this lone communications link to the Emergency Operations Center, staffed by Boulder County Amateur Radio Emergency Service (BCARES®) members, relief officials "were able to get exact figures from WØDRZ to coordinate evacuation efforts," Ciaccia said. "Even down to the numbers of large and small animals. This was a tremendous help to the people determining what helicopter support would be needed. WØDRZ was truly the lone voice of Pinewood Springs," northwest of Denver.

The story played out similarly in the community of Lyons (photo C), where Paul Burge, KØDJV, provided its only communications, operating from the evacuation shelter.

"We plan for a rainy day," Boulder County Commissioner Elise Jones said in broadcast reports, "not a rainy week where we got an entire year's worth of precipitation in five days."

Five EOCs were in operation during the flooding – the result of a confluence of meteorological elements that brought more than a foot of rain to the region in a short period of time. *(**IN DEPTH:** For an explanation and to view the pieces of this "perfect storm," visit the AccuWeather information page at* <http://bit.ly/1elR7a8>, photo D—*KI6SN.)*

"Three of the EOCs were open for a full week," Ciaccia said. "About 180 hams supported the emergency communications effort," operating on 2 meters and 440 MHz, point-to-point packet, ATV (amateur television), APRS (Automatic Packet Reporting System) and on HF (high-frequency amateur allocations)."

"Our 40-meter HF station operated in coordination with MARS (Military Auxiliary Radio System)," Ciaccia said, "keeping communications lines open with their sites in Arizona, Utah and Montana."

"We maintained radio connections with the state EOC and Weld/Larimer County EOC," he said. "Some of our first contacts at the EOC were with MERN operators through the Allenspark repeater, installed just one month before—

Photo E. ATV video monitoring equipment provided streaming images of evacuation efforts at Boulder Municipal Airport during and after the storm. Officials from the White House, DHS, FEMA and American Red Cross were among those monitoring the video feed.

Photo F. A BCARES® ATV camera provided video showing evacuation helicopters lined up on the runway at Boulder Municipal Airport following September's devastating floods.

and they were vital through the entire event." *(**UPCOMING:** CQ Public Service will highlight the work of the Mountain Emergency Radio Network [MERN] in a future edition. To learn about MERN, visit <http://bit.ly/GZQhUw>.—KI6SN.)*

Ciaccia estimated more than 700 hours were volunteered by radio amateurs during the flooding and its aftermath. That's about a month's worth of hours.

Boulder County ARES® provided ATV images from Boulder Airport to give EOCs a visual image of the ongoing evacuation efforts (photos E and F). Officials from the White House, Department of Homeland Security (DHS), Federal Emergency Management Agency (FEMA) and American Red Cross at various times were logged into the steaming images.

BCARES also provided ATV, mounted aboard a fixed-wing drone, for assessing damage to communities nestled along steep canyon walls. *(**WATCH and LISTEN:** To video of the drone launch carrying BCARES ATV equipment for aerial damage assessment at <http://bit.ly/GILeHX>, photo G.—KI6SN.)*

"It is very difficult for manned aircraft to get in there," Ciaccia said. ATV images were recorded on a computer memory stick and then downloaded upon the drone's return.

Allan Bishop, KØARK, had a helicopter drone readied, as well-equipped to transmit live ATV images to EOCs. Unfortunately, flight coordination and safety concerns forced the grounding of drone operations early in the disaster communications efforts, Ciaccia said.

Radio amateurs were assigned to Boulder County Land Use and American Red Cross Disaster Assessment Team vehicles on damage assessment missions. In addition to providing vital voice communications, APRS was utilized, giving agencies map references to exact locations of people and infrastructure in greatest need.

"The (Boulder) County Land Use Commission has asked for the maps" generated during these assessments, WMØG said. "The information in (the maps) is very useful to them." *(**IN DEPTH:** To see APRS tracking in action, visit < http://www.APRS.fi >.—KI6SN.)*

Ciaccia said the EmComm efforts of Colorado ARES® members are directly attributed to "saving four lives."

Photo G. A YouTube video captures the launch of a fixed-wing drone loaded with a BCARES ATV camera on its way to survey damage in hard-to-reach areas of the Colorado mountains. Watch and listen to the launch at <http://bit.ly/GILeHX>. (Internet screen grab)

Photo H. A photograph taken from space shows smoke blown northeastward from the massive Rim Fire that burned many thousands of acres in California in August—for a time threatening the giant sequoia trees in Yosemite National Park. (Courtesy of NASA)

Photo I. The Rim Fire in the Stanislaus National Forest was one of the biggest in California state history. (Courtesy of Wikimedia Commons)

A posting on the ARRL Colorado Section website noted that WMØG and Colorado Section Emergency Coordinator Robert Wareham, NØESQ, were invited to join the ARRL Executive Committee for dinner on Saturday October 5.

The committee was in Denver for its quarterly meeting and included ARRL President Kay C. Craigie, N3KN; CEO David Sumner, K1ZZ; Rocky Mountain Division Director Brian Mileshosky, N5ZGT, and six other division directors.

Ciaccia and Wareham "were invited to the dinner to recognize the efforts of Colorado ARES® members and volunteers in response to wildfires and flooding in Colorado over the past two years."

A plaque was presented to them honoring "the leaders, members and volunteers of Colorado ARES® and the entire ARRL Colorado Section Field Organization" for their "service and dedication to the communities of Colorado during and following the wildfires and flooding of 2013."

"The real credit belongs to those who spent nights in shelters and worked 12 hours-a-day for days in a row supporting the disaster response," Wareham said.

Committee members asked Wareham questions about the "Colorado Model" and "how that success might be replicated in other sections. Committee members noted that Colorado ARES® has handled more major disasters over the past year than any other ARRL section."

N3KN "also recognized the positive media coverage of Colorado ARES® and the benefit to the amateur radio community."

"'Thank you' to North Central Region ARES® and the Rocky Mountain Ham organization for the loan of two APRS units and a portable VHF repeater for Nederland," Ciaccia said. "We also borrowed three Motorola MotoTRBO Trunking Radios to use as back-up radios."

"Our extensive training has really paid off," Ciaccia said. "We have learned that being a proactive ARES® gives us the foundation for being 'ready to run' when disasters hit."

California EmComm Operators Dive into the "Rim Fire" Hot Seat

Unlike hurricanes, devastating fires—like the one that roared

Photo J. Michael McGinty, W6MVM, fields telephone calls at the Public Information desk at the height of the massive fire. (Courtesy of AE6SX)

Photo K. The staff at the Rim Fire Emergency Operations Center had its hands full as flames torched thousands of acres of woodland and threatened historic trees in Yosemite National Park. (Courtesy of AE6SX)

across central California in August—are named after the location in which they're first spotted. The Rim Fire, which grew from a hunter's illegal campfire near the Rim of the World vista point in the Stanislaus National Forest, would go on to become one of the biggest in state history.

Within two days of its August 17 start, fire prevention officials knew the fire had the potential to reach gigantic proportions, and the region's radio amateurs were alerted their assistance would likely be needed. The profile of the Rim Fire quickly gained international attention when the giant sequoia trees of Yosemite National Park were threatened.

Tuolumne County: "Members of the amateur radio community here can wear several different hats when it comes to emergency communications," said Carl Croci, NI6Z, Tuolumne County ARES® Emergency Coordinator and Assistant Radio Amateur Civil Emergency Service (RACES®) Radio Officer. "They can include those of ARES®, RACES®, Volunteers In Prevention (VIP), and Community Emergency Response Teams (CERT)," he said. "If needed, we can respond and change affiliations as conditions change," photos H through L.

By August 19 at 5 p.m., "RACES® Radio Officer Phillip Fish, WB6GGY, and I were alerted to the possible need for amateur radio assistance for what was starting to be called the Rim Fire," NI6Z said. "We were requested to assist the American Red Cross in setting up an evacuation center at Tioga High School in Groveland to assist people coming out of the fire area from the community of Buck Meadows in Mariposa County.

Grayson Rehn, KE6KYI, and NI6Z arrived at the shelter and were met by the school principal and several evacuees from the Buck Meadows area.

"Red Cross volunteers from the Sonora Chapter arrived about an hour later while KE6KYI and I were setting up communications with the Red Cross office in Sonora – where we have a VHF station," Croci said. "The shelter operators were secured on the morning of August 20 and relocated to the Tuolumne County Fairgrounds in Sonora.

NI6Z and his wife Melissa, KD6FFX, had been placed on a standby advisory evacuation notice at their Pine Mountain Lake home in Groveland. By Thursday evening "the smoke was more than we could handle" so they packed up and went to the Sonora home of Paul Hoisington, WA6AWC and his wife Dean, KG6GBZ. "We stayed there until Sunday."

A request had been made on August 20 by Tuolumne County OES for radio amateurs' help in staffing the Red Cross shelter at the Tuolumne County Fairgrounds and to staff the Community Information phone system at the Tuolumne County EOC.

WB6GGY and NI6Z "started up our *in place* phone tree / call out, and soon had a number of volunteers for both locations as well as some on standby status in case there was a need for amateur radio in other communities."

NI6Z offered his "personal thanks to those who volunteered their time at all locations."

Radio amateurs providing shelter staffing for a combined 220 hours included: WA6AWC, W6MVM, KK6EXN, KB6COZ, NI6Z, KE6KYI, AE6LAK, and KK6BNY.

A combined total of 560 hours were accrued by radio amateurs at the EOC's Public Information Office community

Photo L. One of the EmComm "go kits" used for the Rim Fire in Tuolumne County. (Courtesy of AE6SX)

information telephones by: KE6RGP, WA7MOB, WB6WFF, KJ6WHR, KF6OUT, KF6OUU, KJ6OC, AE6RN, K6MAB, KE6FEY, KK6TE, K6VMV and XYL Tina Martin.

Shelter operators were directed to stand down at 1 p.m. on August 29.

Fresno County: At the same time, Fresno County ARES® was put on alert August 19 by the Central Valley Red Cross as the fire was on its march between Mariposa and Yosemite National Park, according to a report submitted by Dan Pruitt, AE6SX, ARRL San Joaquin Valley Section Manager.

"We were asked to relay information from (the Red Cross) shelter. We had our people operating from home monitoring the Mariposa 146.745 MHz repeater at Mt. Bullion. In the event of traffic (needing) to be passed to the Red Cross Headquarters in Fresno, we would use a local landline. Mariposa County ARES® manned the shelter at Greeley Hills Community Center in Coulterville, ready to pass traffic to the Red Cross. This continued for the approximately 24 hours the shelter was in operation."

On August 25, "we were reactivated due to more evacuations and a need for a shelter. We set up as before, working from home," the Fresno County ARES® report said.

By August 26, the team was asked to set up at the Red Cross Office on Shaw Avenue in Fresno. "There we put up a mast with an Elk dual-band log periodic antenna and set up a station using a Yaesu FT-8800 and a power system consisting of a deep cycle battery power supply with a power gate to ensure no power outages. We made contact with Mariposa County ARES® which was located at the Greeley Hill shelter. We passed traffic until we were asked to shut down for the night. We returned to the station at 7 a.m."

For some time before the event, "Fresno County ARES®, as well as Mariposa County ARES®, had been practicing passing traffic with the digital modes," the report continued. "We had been using VHF FM simplex and were able to contact Mariposa with little difficulty.

"During the Rim Fire, Mariposa County ARES® asked if we would like to try to use digital modes from the shelter and the Red Cross headquarters. We would have to use a repeater and we had not tried that before. We tested, and all seemed to work—using Fldigi and Flmsg on PSK125. We found that the higher speed and wider signal had fewer errors."

The Fresno report went on to say the Red Cross "was very impressed with the ability to send and receive traffic in the ICS-213 (General Message) Form filled-out and printed copy, <http://www.ics213.com>. We used this mode for about 2-1/2 hours before we were asked to shift to standby status. We took down the station at 5:15 p.m. August 27."

Fresno County ARES® members taking part in Rim Fire EmComm included: N6HEW, AE6SX, W6GCL, KE6SHL, KI6YWX, W6TUI, WA6WTF and KI6OUI.

Season's Greetings!

As 2013 comes to a close, we'd like to thank the hundreds of radio amateurs who became part of *CQ*'s "Public Service" column this year. Your superb efforts in emergency communications have brought distinction to you, your organizations and to amateur radio at large. *Bravo!*

Here's hoping you all have a peaceful, joyous and safe holiday season and that 2014 is filled with good health and prosperity!

73, Richard, KI6SN

Tasty QRP Goodies

BY CAM HARTFORD,* N6GA

How many of us are guilty of walking into the shack and turning on the computer before turning on the radio? I'll be the first to admit to this flagrant offense, but offer this defense: The QRP Spots and SOTA Watch sites are the first to come up in my web browser so at least I can say I'm trolling for QRP-types. After that I usually hit the e-mail to see what's happening on QRP-L and the 30 or 40 other radio mail groups I try to keep an eye on. OK, second admission: It's usually about an hour before I actually get around to turning on the radio. I see a new-year's resolution coming on. . . . I resolve to turn on the radio before the computer!

As if in punishment for this bad behavior, I opened the KX3 Yahoo mail group early one morning and was greeted by a photo of a radio that, well, just didn't look right (photo A). I rubbed my eyes and tried again. The item in the photo looked like a KX3, but a little squishy, like it had been left out in the rain and had started melting. Strains of the song "MacArthur Park" started playing in my head. ...

Reading the caption under the photo, I discovered that it really was a cake, as in the song. It hadn't been left out in the rain; it was just that a KX3 rendered in cake-form ended up with slightly different proportions that the original. Thankfully, the distortion wasn't a leftover from a particularly bad night's sleep. The music stopped playing. I went on a search for the cake's maker.

The instigator turns out to be Pete Larson, WH6LE. He sent along this report:

"I recently joined the newly formed Uwharrie QRP Club (http://www.uwharrieqrp.com/p/about-uqrpc.html). For the club's inaugural function (August 17, 2013), members were asked to bring a side dish or dessert to a 'Bar-B-QRP," where we could enjoy each other's company, show off our portable QRP rigs, and dine.

"I asked Helena, my daughter, if she would make a cake for me to take to the club's Bar-B-QRP. She's a recent pastry chef graduate from Johnson & Wales University and just starting her first job with a caterer. I thought it would provide her some good practice. Helena also teaches Wilton cake decorating. She agreed. I said jokingly,'Wouldn't a cake made to look like my Elecraft KX3 look neat?' Without blinking an eye she replied, 'I'll do it.' I asked her several times if she was sure, thinking maybe she bit off more than she could chew. She stuck by her decision and the pictures tell the story. Helena describes the cake as a yellow butter cake with vanilla Swiss butter-cream filling. The cake is covered in black fondant. Buttons, knobs, wires, microphone, and display are sculpted also in fondant. Lettering is hand-painted with food coloring. The Uwharrie QRP Club logo is made entirely of fondant."

I admit to ignorance in the field of cake-making. I had to look up the word "fondant" and it turns out

*1959 Bridgeport Ave., Claremont, CA 91711
e-mail: <qrp@cq-amateur-radio.com>

Photo A. A rig that looks yummy enough to eat! (WH6LE photo)

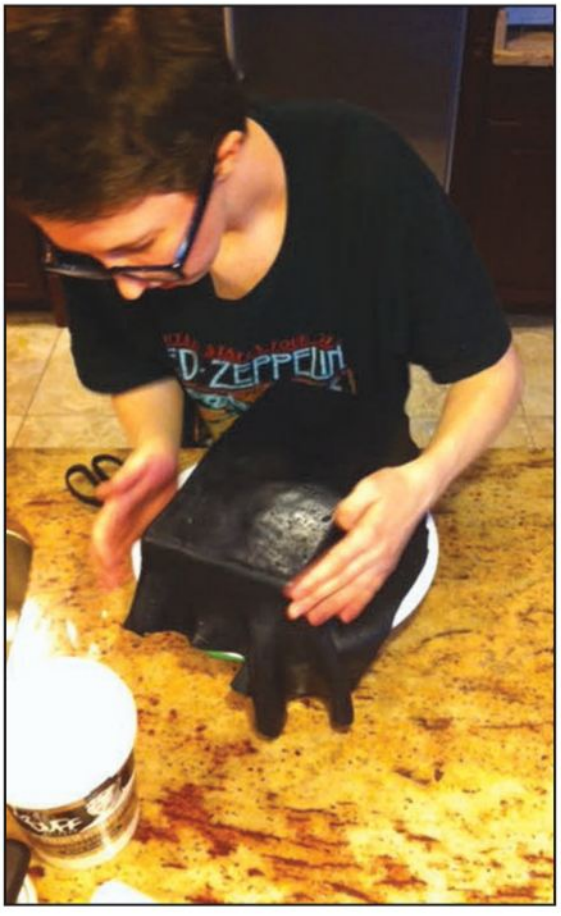


Photo B. Here, Helena is shaping the radio cake. I wonder which took longer to build, the KX3 kit or the KX3 cake? (WH6LE photo)

to be a concoction mostly of sugar and water, boiled, so the microphone is mostly a stand-up form of icing. All kinds of thoughts come to mind. Seems it would be tough to complete an SSB QSO if you took an occasional bite out of the mic. Likewise the knobs and buttons. What if Pete had asked his daughter to make a cake version of his rig, and the rig was a Johnson Viking? How many people would that feed?

Lucky for Helena that Pete's rig was a KX3. Job well done, Helena! Maybe there's a market out there for radio cakes.

Of Tuna, Lobster, and Barbeque

Whenever hams gather, radios are close at hand but food is never far away. I don't know if it's a trait more in common with QRP groups, but we do tend to eat well. This month I have reports from two tasty QRP get-togethers, one involved with seafood and the other, barbeque. Both included tuna.

Lobstercon

John Grow, VE2EQL, sent this report from the Rockbound Coast of Maine:

"It has been stated by a past attendee on his first Lobstercon visit, a few years back, that this is nothing like a ham event, but more of a family reunion. And since I have attended every year, I can attest to that comment. The event is held at Thomas Point Beach & Campground, in Brunswick, Maine in July. The campground provides all the needed items for campers or RVers. They also have tall trees for great wire antennas. The format is very relaxed, which provides a great escape for a few days. This is one event where everybody is socializing, and the wives or girlfriends are involved. Over the years they have formed the Lobstercon Ladies Auxiliary and Drinking Club, and these ladies are involved and are already planning for next year's event.

"In past years, the event started on Friday, with most of the attendees arriving in the afternoon. Due to the popularity, hams are now arriving on Wednesday, and leaving on Monday, making the best of seafood, great company, and relaxing activities such as operating or putting up antennas. This provides us with the opportunity for joint meals with other campers. Bill Richardson, NG1P, and his lovely wife, Melissa, prepared smoked briskets and a Mexican bean soup. It's amazing how good food creates a crowd! Usually, a no-host dinner for Friday evening is arranged, and many campers enjoy

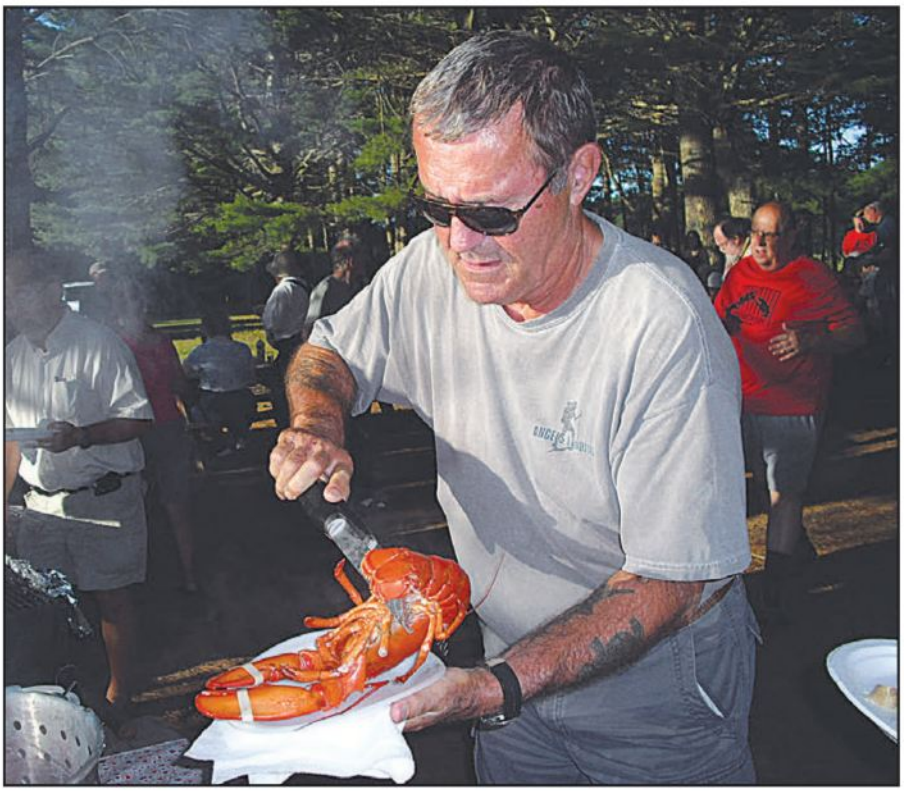


Photo C. Jim, K9JWV, journeyed from Utah to sample the bounty of Maine. (K1QO photo)

sampling Maine's finest fresh-caught seafood. The evenings provide round-table discussions of any topic, with some help of liquid beverages. Those lucky campers who venture out at sunrise are surprised to be greeted with coffee and donuts/muffins. It was decided early on that it was best to get the sugar high as early as possible. At this time, the Ladies Auxiliary and Drinking club was busy planning a precision shopping trip for provisions for the BBQ lunch and follow-up lobster supper. They prepared lists at their morning meeting and went out in teams, each armed with a task of items to purchase. Military planners would be proud.

"The ladies (and we are lucky they are involved) prepare all the foods, drinks, and other items needed for the BBQ lunch. Charlie, Rex Harper, W1REX's, university professor, was the BBQ chef, a task that he has fulfilled for many past years, and we thank him for his great service. Also, our lobster provider, Bill Legge, NT1R, is very much appreciated. The lobsters are fetched fresh from the ocean that day, and arrive ready for their hot-water bath. We usually have around 225 lobsters for the supper. There are reports of some hams helping themselves to three or five lobsters. During the supper, we are very lucky to have generous support of ham radio suppliers and individuals. Our master of ceremonies is John Grow, VE2EQL, helped by his YL, Suzanne, VE2SZN. Each prize was identified with the help of our winning ticket picker, Willie, and a young lady, Isabelle, who was taking pictures of each happy winner. Our grand prizes were provided by Elecraft, Pignology, and Sierra Radio Systems. For the complete list of sponsors/donors and the winners, please see <http://www.lobstercon.me/Lobstercon%20door%20prizes.pdf>.

"After the supper and general clean-up, many QRPers brought out their musical instruments for a sing-along jam. This went very well, with visiting campers stopping by to see what the celebrations were about. We even had a family from Norway that was traveling through North America for the summer. This was a great introduction for the family to the joys of amateur radio and its people. Our domestic DX visitors were Ken and Karen LoCasale, WA4MNT and KF4EEL, respectively, from Clarkdale, Arizona; and Jim and Jan Rodenkirch, K9JWV, from St. George, Utah.

"Our special guest was Ed Hare, W1RFI, who brought along the original 'Tuna Tin' built by Doug DeMaw, W1FB. Our Lobstercon kit was a 'Revised Edition of the Tuna Tin' which could be built for the band of your choice. Thus, we had a building session that lasted all afternoon and into the late night (photo D). We were lucky to have power for lighting and our soldering irons. Lobstercon is not done by just one orga-

nizer, but a community of helpers, too many to name, since everyone helps out to make this an unforgettable event. However, special thanks have to go to Bill, NT1R; Kayti Harper; Carl, WA1ZCQ; Bruce, N1RX; Brad, N1VWD; John, KK1X; Jim, KC1FB; Jeff, KA1OLE; Eamon, VE2EGN; Pete, VE2XPL; Howard, WA1CFX; Arn, KØZK; Bill, NG1P; Steve, KD1JV; Seab, AA1MY; Peter, W1PNS; Mike, N2HTT; Dennis, K1LGQ, and Jean, K1AVM; Ann, K1QO; Burt, W1DFU; Jim, W1PID; Mike, KB1IUI; John, VE3NFK; and Uncle Cy (The LED Guy), K1TES. Special mention goes to Robert Schmeichel, N1RXV, who has taken hundreds of Lobstercon pictures. Great weather, fantastic food, great company, time to operate and put up antennas and flowing solder. Life is good. For more information check out <www.lobsetrcon.me>."

Photo D. A nice day in Maine for building a Tuna Tin! (K1QO photo)

Two Days in Huntsville

From Maine, we went south to Alabama, where QRPers had quite a full schedule of events at the fourth "Two Days in Huntsville" gathering. Craig Behrens, NM4T, reports that there were seven forums spread over the two days along with a Saturday evening Barbeque and Buildathon.

Forum subjects included some of the current hot topics in the hobby, including "The Art of Kit Building," "Extreme QRP—Of Saltwater and Summits," "Ham Radio, Arduino and PICAXE," "Rapid Deployment Amateur Radio (RaDAR)," and "Strategies with the Reverse Beacon Network."

Seminars are all well and good, but when do we eat? Saturday evening the group gathered at Monte Sano State

SteppIR

No traps. No tricks. No compromise.

SmallIR Vertical

- 20-6m Coverage
- 18ft element
- 12lbs / 1ft^2 wind load
- Available optional coils to cover 40m/30m or 80m/40/30m bands

2 Element Yagi

- 20-6m Coverage
- 2x36ft Elements
- 57inch Boom
- 30lbs / 4.0ft^2 wind load
- 18.2ft turning radius

3 Element Yagi

- 20-6m Coverage
- 3x36ft Elements
- 16ft Boom
- 51lbs / 6.1ft^2 wind load
- 19.7ft turning radius

*shown with optional 39ft 40m/30m dipole

4 Element Yagi

- 20-6m Coverage
- 4x36ft Elements
- 32ft Boom
- 99lbs / 9.7ft^2 wind load
- 24.1ft turning radius

BigIR Vertical

- 40-6m Coverage
- 33ft element
- 15lbs / 2ft^2 wind load
- Available optional coil to cover 80m

Be sure to check out the latest information about the upcoming CrankIR Antenna and accessories!

Learn more about the ultimate in high-performance tunable yagi antennas by visiting ***www.steppir.com***

SteppIR Antennas • 2112 116th Ave NE #1-5, Bellevue, WA 98004 • Tel: 425.453.1910

SteppIR

No traps. No tricks. No compromise.

DB36 Yagi

- ◊ 40-6m Coverage
- ◊ 4 elements
  3ea 40/30m, 4ea 20-6m
- ◊ 160lbs / 17.5ft^2 wind load
- ◊ 26ft turning radius
- ◊ 80m dipole option available

DB18E Yagi

- ◊ 40-6m Coverage
- ◊ 3 Elements
  2ea 40m, 3ea 30-6m
- ◊ 19ft Boom
- ◊ 110bs / 12.1ft^2 wind load
- ◊ 21.58ft turning radius

DB18 Yagi

- ◊ 40-6m Coverage
- ◊ 3 Elements
  2ea 40/30m, 3ea 20-6m
- ◊ 19ft Boom
- ◊ 96lbs / 10.1ft^2 wind load
- ◊ 21.58ft turning radius

DB11 Yagi

- ◊ 20-6m Coverage
- ◊ 3x19ft Elements
  2ea 20m, 3ea 17-6m
- ◊ 11ft Boom
- ◊ 63lbs / 5.9ft^2 wind load
- ◊ 10.5ft turning radius

Tired of dreaming about working DX? With SteppIR Dream Beam series antennas your dreams will come true!

DB42 Yagi

- ◊ 40-6m Coverage
- ◊ 5 elements,
  3ea 40-30, 5ea 20-6m
- ◊ 238lbs / 19.9ft^2 wind load
- ◊ 29ft turning radius
- ◊ 80m dipole option available

*shown as stacked pair

*Some antennas pictured with optional equipment and/or in custom configurations.

SteppIR Antennas • 2112 116th Ave NE #1-5, Bellevue, WA 98004 • Tel: 425.453.1910

Photo E. In Huntsville, Tuna Tin builders got the "Darkside Edge." (NM4T photo)

Park for some of Ted's Southern BBQ, including banana pudding and peach cobbler. I'm getting hungry just reading about it, even though I was feeling full after all that lobster. The featured event of Saturday evening was a Buildathon hosted by Rex Harper, W1REX, of QRPMe. For Rex this was an instant replay of the Buildathon he ran at Lobstercon. This time 12 new Tuna Tin 2 transmitter kits were assembled and put on the air.

Question: If an antenna erected during inclement weather works especially well, does a Tuna Tin 2 built in the dark also work especially well? Seems the buildathon got started outdoors on picnic tables a little late and the murkiness of a moonless night soon set in. Builders had to scramble to gather enough penlights and flashlights to combat the dark while stuffing their PC boards (photo E). Then they were able to complete their soldering (and rework) on the porch and in the cabin where there was some real light. The Tuna Tin build was completed with the Magical Mojo Transfer Ceremony from the Original Tuna Tin to all the newbie units (photo F). Doug DeMaw must have packed plenty of Magical Mojo into that original Tuna Tin!

Photo F. W1REX conducting the Magical Mojo Transfer Ceremony, passing the MM from the original Tuna Tin to the newly built units. (NM4T photo)

Plans for next year include a return engagement by W1REX and an enlarged buildathon, as well as perhaps a change in the name from "Two Days in Huntsville." Possible replacements are "Three Days in Huntsville" and "DixieCon." NM4T says, "Stay tuned!"

The Cyclone 40

The Cyclone 40 is a recent kit offering from the 4 State QRP Group designed by Dave, NMØS. The Cyclone 40 is derived from Dave's entry into the QRP ARCI's 72 Part Challenge in 2010. According to the description of the kit on the 4 State website, "The transceiver designed for the design contest had 72 total parts, performed well, and won honorable mention. This improved version has fewer than 100 components and even better performance!" Skeptic that I am, I feel a boast like that needs to be investigated. Time to build the rig!

CQ magazine's kit-building guru, Joe Eisenberg, KØNEB, described the build-

Photo G. The Cyclone 40 kit from the 4 State QRP Group. All of the cabinet pieces snapped apart from one sheet of PC board material.

ing experience in the March 2013 issue, so I'll skip by that topic only to confirm that it is a weekend-length project and goes together easily. It uses all through-hole parts, contains all connectors and controls, and even includes a handsome PC-board cabinet (see photo G).

Never having laid my hands on the original, it would be tough to make observations about what improvements Dave was able to make by adding a mere 26 parts, but I must say he came up with a very nice little transceiver! The superhet receiver has a 4-crystal, 500-Hz filter in the IF. This is not a brick-wall filter like one finds in the DSP rigs of today, but it has nice gentle slopes that make it very easy on the ears for ragchewing and general listening. The specs include a claimed MDS of –125 dBm. I enlisted the lab facilities of my friend Dick, WB6JDH, where we measured an MDS of –133 using an HP8640B generator and my own ears (a dubious measurement, at best), but this rig can hear very well. Frequency is controlled by a PTO (permeability tuned oscillator) that allows it to cover everything from the low end of the band up to the frequencies around 7120 where there's lots of CW activity. The QSK is exceptionally smooth and there's even an effective AGC circuit which keeps your ears from being fried by big signals.

On the transmit side, the keyed signal sounds good at a distance. The Class E final amplifier is about 85% efficient. Running 4 watts out, the finals don't need heat sinks. In fact, after sending CQ for a couple minutes, the finals feel barely warm to the touch.

At the heart of this transceiver's design is a 74HC240 which contains eight inverting logic gates. Half of these gates are used in transmit to provide the necessary complementary push-pull drive signals to the final transistors. In receive, the second bank of four gates provides the push-pull signal at the PTO frequency to drive the gates of the finals, which then act as the front-end mixer to provide the signal to be applied to the IF. I had to do a lot of head-scratching and schematic studying to noodle out exactly what was going on here, but finally the light went on. It seems like a lot of work being done by just a few parts, and being done well! (Sharp-eyed readers will recognize the 74HC240 as a chip used in the 38 Special, but no worries, as this radio plays out of the box, no mods needed!)

The rig that I built had some serious drift problems at first. Dave, NMØS, the rig's designer, worked with me and helped find a solution. One of the benefits of having easy access to a helpful mail group and the rig's designer is that there is plenty of assistance available if it should be needed. In this case, Dave suggested a couple of solutions and suddenly there were plenty of guys ready to jump in and give the solutions a try.

Thanks to NMØS and the 4 State QRP Group for another nifty little rig that's easy to build and somehow squeezes a maximum of performance from a minimum number of parts.

Signing Off

Here's hoping you all have a Happy Holiday season! 72/73, Cam, N6GA

Holiday Gift Ideas

The NEW Shortwave Propagation Handbook

by W3ASK, N4XX & K6GKU

This authoritative book on shortwave propagation is your source for easy-to-understand information on sunspot activity, propagation predictions, unusual propagation effects and do-it-yourself forecasting tips.

8.5 X 11 Paperback $19.95
***New!* CD Version $14.95**
Buy both for only $29.95

Reflections III

by Walt Maxwell, W2DU

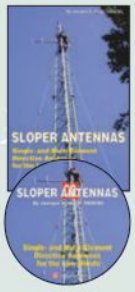
All the info in Reflections I and II and more! This completely revised and updated, 424-page 3rd edition is a must-have!

8.5 X 11 Paperback $39.95
***New!* CD Version $29.95**
Buy both for only $59.95

Sloper Antennas

By Juergen A. Weigl, OE5CWL

Single- and Multi-Element Directive Antennas for the Low Bands

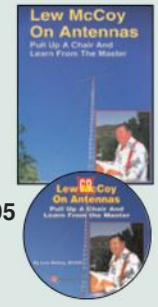


With calculations and practical experience, this book shows which basic concepts have to be considered for sloper antennas for the low bands.

6 X 9 Paperback $24.95
***New!* CD Version $18.95**
Buy both for only $36.95

Lew McCoy on Antennas

by Lew McCoy, W1ICP



Unlike many technical publications, Lew presents his invaluable antenna info in a casual, non-intimidating way for anyone!

8.5 X 11 Paperback $19.95
***New!* CD Version $14.95**
Buy both for only $29.95

W6SAI HF Antenna Handbook

by Bill Orr, W6SAI

W6SAI was known for his easy-to-understand writing style. In keeping with this tradition, this book is a thoroughly readable text for any antenna enthusiast, jam-packed with dozens of inexpensive, practical antenna projects that work!

8.5 X 11 Paperback $19.95
***New!* CD Version $14.95**
Buy both for only $29.95

2014 World Radio TV Handbook

The most up-to-date info on mediumwave, shortwave, FM broadcasts and broadcasters. Articles, reviews of the latest equipment, maps, and more. Due in mid-Dec. You will not be charged until it ships!

Order No. WRTH $35.00

The Quad Antenna

by Bob Haviland, W4MB

Comprehensive guide to the construction, design and performance of Quad Antennas. General Concepts, Circular-Loop & Arrays, Rectangular & Square Loops, Multi-Element Quads and more!

8.5 X 11 Paperback $19.95
***New!* CD Version $14.95**
Buy both for only $29.95

Understanding, Building & Using Baluns & Ununs

by Jerry Sevick, W2FMI

The successor to the popular and authoritative Baluns and Ununs. Great deal of new tutorial material, and designs not in previous book, with crystal clear explanations of how and why they work.

8.5 X 11 Paperback $19.95
***New!* CD Version $14.95**
Buy both for only $29.95

DX World Guide

by Franz Langner, DJ9ZB

This 384-page DXer's guide-book is the first edition using color throughout and the first to be entirely in English.

Includes info on well over 300 DX entities. Geographical info, WAZ and ITU zones, ITU callsign allocations, amateur prefixes and more!.

6 X 9 Paperback $42.95
***New!* CD Version $22.95**
Buy both for only $60.95

Call 1-800-853-9797 or FAX your order to 516-681-2926
You can also order on our web site: http://store.cq-amateur-radio.com

Nifty E-Z Guide to PSK31Operation

A Complete PSK31 Operation Guide!

Using DigiPan software as a basis, a detailed step-by-step approach is used for configuring your interface hardware, software and computer system for PSK31 operation
6 x 9 Paperback

Order No. NIFTY $12.95

The Vertical Antenna Handbook

by Paul Lee, N6PL
Learn basic theory and practice of the vertical antenna. Discover easy-to-build construction projects.

Order No. VAH $17.95

MIL SPEC Radio Gear

SALE!

Korean to Present Day
by Mark Francis, KIØPF

Detailed write-ups for many familiar sets: PRC-25/-77, RT-68, PRC-1099, GRC-106, GRR-5, R-392 and more. Over 230 pages of ops, mods, and maintenance tips 200+ illustrations.

Order No. MILSPEC $27.95 $15

33 Simple Weekend Projects

by Dave Ingram, K4TWJ

Do-it-yourself electronics projects from the most basic to the fairly sophisticated. Also, practical tips and techniques on creating your own projects.

Order No. 33PROJ $17.95

cds

Ham Radio Magazine on CD

SPECIAL! Save $5 on each CD set.

Enjoy access to every issue of this popular magazine, broken down by years!

1968-1976
Order No. HRCD1 ~~$59.95~~

1977-1983
Order No. HRCD2 ~~$59.95~~

1984-1990
Order No. HRCD3 ~~$59.95~~

ON SALE - only $54.95 ea.

Buy All 3 Sets and Save $49.90!

Order No. HRCD Set

$129.95 (Reg. $149.95)

CQ 2014-15 calendar

15 months of value
January 2014 through March 2015

Fifteen spectacular color images of some of the biggest, most photogenic shacks and antennas from across the country and...*new this year*... a number of DXpedition and classic radio shots thrown in for good measure!

Calendars include dates of important Ham Radio events, major contests and other operating events, meteor showers, phases of the moon, and other astronomical information, plus important and popular holidays. CQ's 15-month calendar (January 2014 through March 2015) is truly a must have!

$10.95 plus shipping

Order yours today!

Shipping & Handling: U.S - .add $7 for the first item, $3.50 for the second and $2 for each additional. FREE shipping on orders over $100 to one U.S. address. CN/MX - $15 for 1st item, $7 for 2nd and $3 for each add'l. All Other Countries-$25 for 1st item, $10 for 2nd and $5 for each add'l. Single Calendar: USA $3, CN/MX $5, All other countries $10

*Spend $100 and get FREE shipping!

... more great gifts!

A Year of DX

by Bob Locher, W9KNI

Look over the shoulder as the author works country after country, in pursuit of the Holy Grail – winning the CQ DX Marathon.

Order No. YDX $19.95

The Complete DXer

Third Edition

The joy of the chase, the agony of defeat, the thrill of victory are the stuff of The Complete DXer, a book that is almost as seductive as the DX chase it describes. It excites, it entertains, it teaches!

Order No. COMPDXer $19.95

VHF Propagation

Practical Guide for Radio Amateurs

by WB2AMU& WB6NOA

Tropo Ducting, Sporadic-E, Auror, Meteor Scatter, F2 Propagation, TEP, Combo Modes - it's all right here!

Order No. VHFProp $15.95

Mouse Code

by Joel Thurtell, K8PSV

A great book for the kids in your life! When humans start plowing up North Field and cutting down trees, two field mice (re-)invent radio to warn the animals of danger, using a form of Morse code that can only be called... Mouse Code!

Order No. Mouse $12.95

Nifty E-Z Guide to D-STAR Operation

2nd Edition

A comprehensive guide to D-STAR operating! Ideal for those getting into D-STAR.Written for both the beginning and experienced D-STAR users. Straight forward and simple explanations.

Order No. NIFDS $13.95

"Getting Started" DVD Paks

Our renowned "Getting Started" videos grouped together on DVDs!

On SALE!

CQ Ham Radio Welcome Pak
1 DVD contains 3 programs:
Ham Radio Horizons
Getting Started in Ham Radio
Getting Started in VHF
Order # HAMDVD $24.95 $16.00

CQ VHF Specialty Pak
1 DVD contains 3 programs:
Getting Started in Satellites
Getting Started in VHF
Getting Started in Packet
Order # VHFDVD $24.95 $16.00

CQ HF Specialty Pak
1 DVD contains 2 programs:
Getting Started in DXing
Getting Started in Contesting
Order # HFDVD $24.95 $16.00

Buy any combination of DVDs and SAVE!

1 Pak for $24.95 - $16.00
2 Paks for $45.95 - $30.00
3 Paks for $65.95 - $42.00

The Short Vertical Antenna and Ground Radial

by Sevick, W2FMI

This small but solid guide walks you through the design and installation of inexpensive, yet effective short HF vertical antennas. With antenna restrictions becoming a problem, it could keep you on the air!

Order No. SVERT $10.00

HR Anthologies

$19.95

Sale $16 ea.

Buy all 4 for only $60

Enjoy collections of the best material published in *Ham Radio magazine*, conveniently arranged by subject and original publication date. Choose your interest, your time period and choose your anthology!

Homebrewing Techniques.....*Order # AHOME*
Test Eqpt & Repair Techniques.....*Order # ATEST*
Antennas - 1968 - 1972.....*Order # ANTS1*
Antennas - 1973 - 1975.....*Order # ANTS 2*
All 4 for $60 .....*Order # ASET*

Collins Radio Repair & Tune-Up DVD Guides

From Hi-Res Communications, Inc., these well-produced, authoritative DVDs cover all the most common repair and tune-up subjects on these classic radios. It's like having an experienced professional right next to you!

Collins KWM-2
4 hours
Order No. C-KWM
$89.95

Collins 75S-3/32S-3
4 hours
Order No. C-75S
$89.95

Collins 30L-1
61 minutes
Order No. C-30L
$39.95

Collins 75A
4 hours
Order C-75A
$89.95

Collins KWS-1
2 hours
Order C-KWS-1
2 hours $39.95

R-390A
7 hours
Order C-390A
Only $109.95!

R-390A Addendum*
4 hours
Order C-R390AAdd
Only $49.95!

*The addendum disc is an another four full hours of detailed info. This video is meant to supplement, not replace, the original video above.

Call 1-800-853-9797 or FAX your order to 516-681-2926
You can also order on our web site: http://store.cq-amateur-radio.com

BY JOE EISENBERG,* KØNEB

A Cold Night with the "Survivor"

With the cold weather months upon us, a kit for 75M SSB is just the ticket for wintertime fun. The low bands are hopping, and the Hendricks Kits KD1JV "Survivor" is a fun way to build your own SSB and CW rig. I always enjoy featuring kits that are fun to build and have unique characteristics that set them apart. This kit is one of those!

The Survivor first and foremost is a 75M SSB transceiver. So, for those of you who do not operate CW, this is the kit for you. However, the Survivor does allow you to use CW, albeit a tone-modulated CW mode often known as MCW. This feature all comes about through the use of a Tiny 13 8-pin microprocessor that generates a steady 600-Hz tone for use in tuning your antenna tuner and checking your SWR. Through using different PTT key sequences, the Survivor can be placed in a Tune or CW mode. The output power is 10 watts PEP on SSB and 5 watts on CW, making it a great QRP rig.

With the top 400 kHz of the 75-meter band available for phone use in the USA, this kit covers approximately 350 kHz of the phone band, giving you most of the available spectrum. Tuning the receiver involves using two controls, one for the main VFO tuning and the other for fine tuning. The reason for this is that the main tuning control covers as much as 350 kHz of spectrum, making it difficult to fine-tune SSB signals. That is where the fine-tuning control comes into play. The fine-tuning control only covers about 30 kHz, allowing for easier tuning of SSB signals.

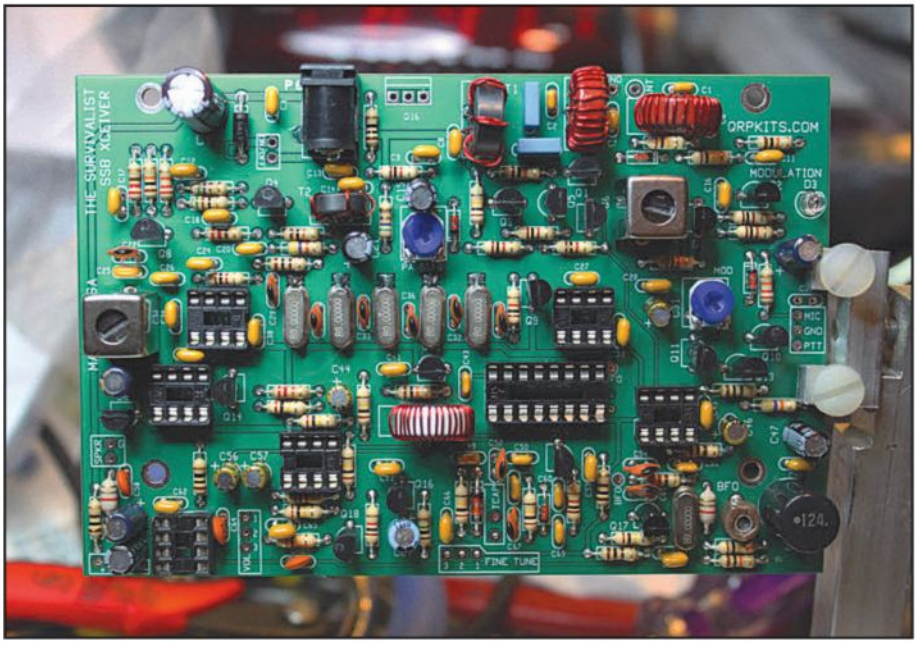
*7133 Yosemite Drive, Lincoln, NE 68507
e-mail: <k0neb@cq-amateur-radio.com>

The name "Survivor" also applies as this radio draws only 50 mA from a 12V supply on receive, including lighting up the optional digital dial display. With such a low current draw, it is possible to save battery power and use this radio in portable operation for long periods of time on batteries or other portable power sources, such as solar. In transmit mode, it can draw up to 2 amps on peaks, so be sure to have the ability to supply at least 2 amps for transmitting.

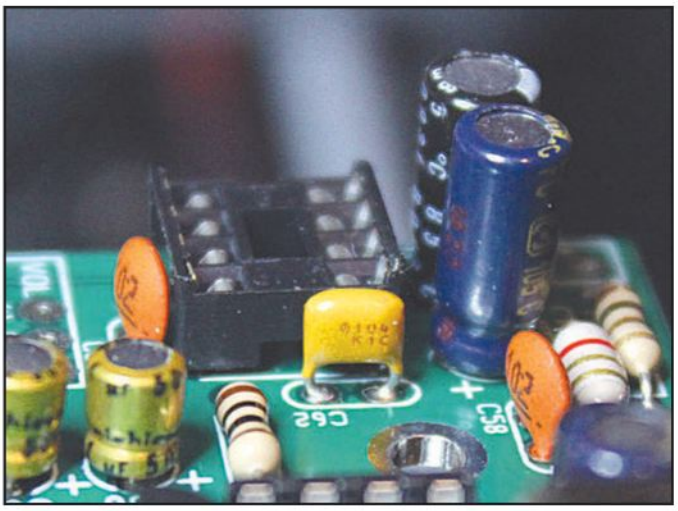
Construction by Component Groups

Construction of the Survivor is done by component groups, not stages, so be sure to double-check your parts identification and positioning to be sure you do not place components where they do not belong. The board is well-marked to ease that process and there are full-color parts diagrams in the manual to help you along the way. I highly recommend printing the manual PDF file on a color printer to take the best advantage of the color-coded diagrams. The two kits I mentioned last month—the Hendricks Kits two-tone generator and the microphone—are designed to work with the Survivor, and I recommend building them before you get started on this kit if you do not have a tone generator or a mic handy. If you bought the kit with the digital dial option, building and calibrating it first is also recommended in order to use the digital dial to help in calibration and final assembly of the rest of the kit.

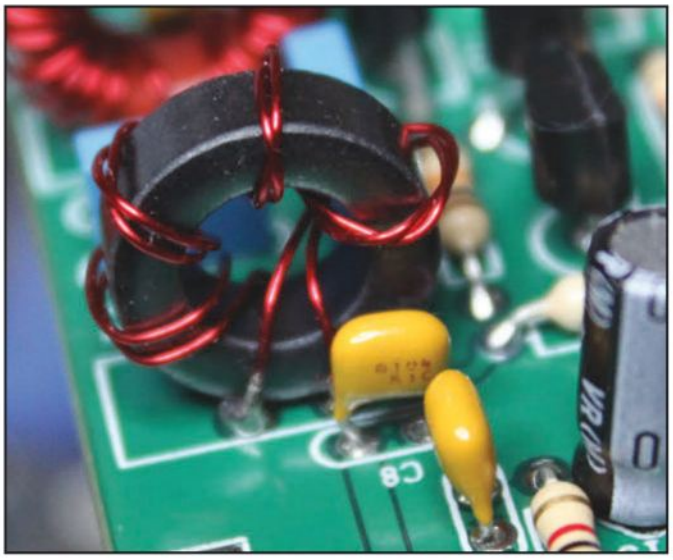
Assembly begins with the placement of 51 resistors, followed by 7 diodes and a pair of RF chokes that resemble resistors. With that many resistors, it is a good idea to sort them by values to be sure



Survivor board ready for integration into the case.



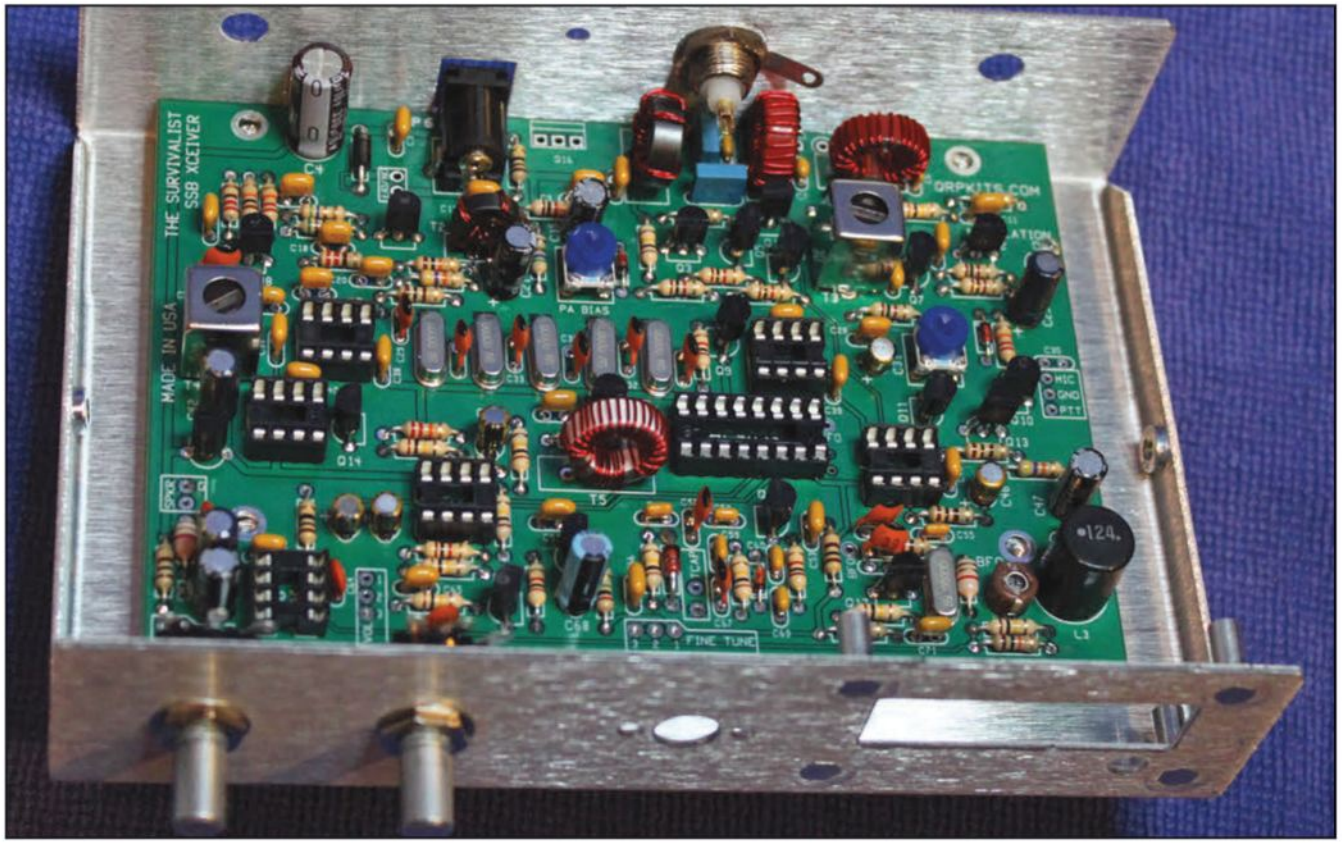
A good tip is to install non-polarized disk capacitors facing away from anything that might block the view of their value markings.



A look at a bifilar toroid with adjacent disk capacitor.

your inventory matches each value as it is used up. The leads on the supplied RF chokes are slightly thinner than those on the resistors, and they are shaped slightly differently than resistors. Be sure to double-check the RF choke and resistor color codes to be extra sure that you do not accidentally place a choke where a resistor belongs. The manual has the color codes printed next to each component in the list as they are installed to make extra sure you select the correct ones. After the first group of components is installed, the crystals and IC sockets, as well as the trimpots and power connector, come next. I found that I needed to turn up the heat on my soldering iron to properly and quickly solder the case of the crystals to the adjacent square pads for grounding. Be sure those crystals are first soldered flush to the board to prevent the solder used to ground the cases from going underneath the crystal and causing a short.

The next large group of parts is the capacitors, numbering 71 in all (C30 is not used). This is a good time to talk about a great hint to keep in mind when installing non-polarized disk capacitors. I try to install disk capacitors so that their markings all face in a uniform direction, making it easy to identify



Checking the board in position in the case before mounting and wiring it in place.

them when troubleshooting. The only time I do not do that is when there is another component that obstructs the view of the value markings. In that case, I install the capacitor so the markings are clearly visible. In the case of back-to-back capacitors, I have the markings facing outward so that both can easily be read. Of course, polarized electrolytic capacitors as well as any polarized part *must* be mounted with the leads in their proper place. The transistors are installed next, followed by the miscellaneous parts.

Final Assembly and Initial Testing

The initial testing of the VFO is accomplished without any of the ICs plugged in, so the ICs are plugged into their sockets later. There are five toroids to wind, two of which are single conductor and only 22 turns each. Two more toroids are bifilar, but very easy to wind and install. Just be sure to use an ohmmeter or continuity checker to determine the wire pairs after the leads are dressed. The last toroid is a transformer that is also very easy to wind using two different gauges of wire, which makes it easy to identify the leads. It is important to remember that wire gauges are numbered higher for thinner wire and lower numbers for thicker wire. Therefore, the supplied #24 wire is the thicker of the two enameled wires supplied with the kit and the #28 wire is the thinner of the two. Be sure to choose the proper color of toroid cores for the correct inductance. With toroids, there are different densities and materials used to form the ferrite cores, making it very important to pay attention to choosing the correct core for each toroid.

The last thing to be done before initial testing is the wiring of the board to the case-mounted controls and connectors. The wire supplied is a very high-quality wire, but can be tough to strip unless you have a good-quality wire stripper. The amazing thing about this kit is the frequency alignment is done without any of the ICs installed. Strictly the VFO and BFO oscillators themselves are used in this part of the procedures. Next month I'll finish the assembly and tune it up!

The KD1JV Survivor kit is available from Hendricks Kits at <http://www.qrpkits.com> for $100, including the case. For $140, you can get the kit as well as the mic and the digital dial kits as a package. Until next time . . .

73 de Joe, KØNEB

BY RON OCHU,* KOØZ

Christmas Acessories for the Shack

December is that wonderful month when family and friends gather together to enjoy the serenity that winter can offer and to enjoy the holidays. Perhaps in keeping with that sentiment, the New England poet Robert Frost penned a poem entitled, "Stopping by Woods on a Snowy Evening." Here are two verses from that poem:

He gives his harness bells a shake
To ask if there is some mistake.
The only other sound's the sweep
Of easy wind and downy flake.

The woods are lovely, dark and deep.
But I have promises to keep,
And miles to go before I sleep,
And miles to go before I sleep.

Like most of Frost's poems, what first appears to be a simple theme really contains a much deeper and profound one. In "Stopping by Woods on a Snowy Evening," a first reading of the poem reveals a quaint, beautiful (albeit bone-chilling), winter evening. Upon closer inspection, some literary scholars suggest that Robert Frost is describing Santa Claus taking a breather from his hectic schedule of delivering Christmas gifts.

Like the poem's character, it is a good idea to take a few moments from our hectic lives to enjoy the majestic splendor of winter. Newly fallen snow looks good draped on the antennas (provided that it's not too heavy) and it's a nice, warm feeling to know that you can still reach out and communicate with friends without having to brave the cold and frigid driving conditions outside. Furthermore, that feeling can be intensified while walking past the family Christmas tree on the way towards the shack with a piping hot cup of coffee.

While at the operating desk, and in between QSOs, when I have a few minutes to reflect on upcoming holiday season . . . don't know about you, but even at my age it is still fun to anticipate what surprises may await under the tree! However, it is possible that maybe, just maybe, that special someone in your life isn't quite sure what to get a ham radio operator to place under that tree for Christmas, while at the same time not wrecking the family budget.

Of course, the fine art of dropping helpful clues is a wonderful skill that needs to be cultivated, much like learning how to successfully break up a DX pileup on the low bands, but that is another topic for another day. In my household, Debbie, KC9ULA, and I agree that we will limit our gifts to each other to no less than two dollars and no more than five-thousand dollars. This self-imposed limit already eliminates major HF transceivers; self-supporting, crank-up towers; most continuous-duty HF amplifiers, and EME (Earth-Moon-Earth) antenna arrays. I'll bet you can guess which end of our spending spectrum we both tend to gravitate towards in our Christmas lists!

Now, the not-so-unpleasant problem of just what to suggest for the gift list arises. Here are some suggestions and I'd like to point out that your author in no way, shape or form has any financial connections with these manufacturers except to say that I personally own their products and I enjoy using them on a regular basis in my own shack!

Although I previously wrote that the art of dropping clues is up to you, may I also suggest that leaving this issue of *CQ* open to this column with a big circle drawn around a particular item is not

*e-mail: <ko0z@cq-amateur-radio.com>

Photo A. Peet Brothers' "The Weather Picture"

Photo B. Bencher mechanical iambic paddles

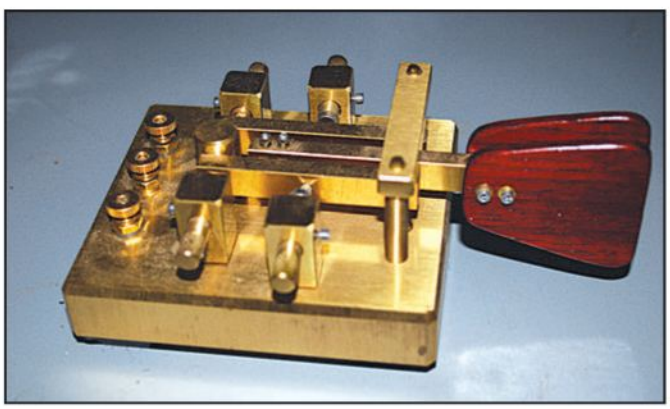


Photo C. K8RA magnetic paddles for CW

such a bad way to drop a "subtle" hint to that special someone who may be in search of some much needed gift ideas…

With apologies to David Letterman's "Top 10" list, let's start off with my top ten suggestions:

#10: *The Weather Picture from Peet Brothers:* This, according to Peet Brothers, is the ultimate accessory for your Ultimeter weather station (photo A). It is highly visible up-to-the second look at your local weather conditions. Please note that this instrument needs to have the Ultimeter weather station before it is operational. So if you don't already have a Peet Brothers WX station, then you'll need to get one to make this product work. The Weather Picture takes the data from the Ultimeter weather station and displays all of the information at once which makes it easier to get the data. It also adds a very nice "cool factor" to your shack. I bought one a few years ago and it does make looking at weather data easier to get the "big picture." It lists for $389.00 and its URL is <http://www.peetbros.com/shop/category.aspx?catid=20>.

#9: *CW paddles.* CW (Morse code) is still very popular on all the ham bands, from 160 meters all the way up to the microwave frequencies and beyond! The most important thing to consider when getting a paddle is whether it feels comfortable between your fingers. Plus, is the contact spacing easily adjustable to assist you with properly sending dits and dahs? Another big factor to consider is the paddle base. You will want it to be heavy enough so as to not scoot around on the desk while you are sending code.

Paddles come in two flavors, mechanical and magnetic. Mechanical paddles use a spring or other mechanical tension device with the paddles. Magnetic paddles, as the name suggests, use magnetism with the paddles. Both work fine and I use both just to mix things up from time to time. There are a lot of fine brands, but my favorite is the Bencher paddle. My Bencher BY-2 (photo B) has a very nice mechanical feel to the dits and dahs and I've worked a lot of stations with it. The URL for Bencher is <http://www.bencher.com/ham/index.php?main_page=index&cPath=1>.

A few years ago at the Dayton Hamvention™, I wandered by Jerry Pittenger, K8RA's, booth and I really liked his line of iambic paddles. I purchased one and I've been happy with it ever since (photo C). His paddle is magnetic, but he includes a kit to convert it over to mechanic/spring action if you choose. Unfortunately, according to Jerry's website, he will not be able to continue making his excellent line of paddles. However, the good news is that his friends Mike, NT8O, and Fred, N8BX, have agreed to continue producing Jerry's product line. For more information on availability and pricing check out: <http://www.k8ra.com>.

Looking Ahead in CQ

Here are some of the articles we're working on for upcoming issues of *CQ*:

- Something About Filters…
- Updating a Boatanchor: DDS-VFO Version 2.0
- Boosting VHF & UHF Yagi Gain

Upcoming Special Issues

February: QRP
June: Take it to the Field
October: Emergency Communications

Do you have a ham radio story to tell? Something for one of our specials? See our writers' guidelines on the CQ website at <http://www.cq-amateur-radio.com/cq_writers_guide/ cq_writers_guide.html>.

Photo D. Weller soldering station

Photo E. Inexpensive soldering station

#8: *Soldering station.* I am partial to Weller. This company makes fine, long-lasting products and you can therefore expect to pay a little more for them, but it is well worth the extra few dollars. I would suggest a 40- to 50-watt iron for starters (photo D). This iron will be good for most ham radio workbench projects and, depending on where you shop, the price can range from $100 to $150.

At local hamfests and on line, some good deals can be found on imported Chinese soldering stations (photo E) for around $25 to $40. So far I've had good luck with mine, but I am glad that I have my tried-and-true Weller close at hand. Most likely your iron will come equipped with a needle-point tip. This a great tip. Another good choice is the chisel tip and I use that one frequently in my shack. Weller has a great assortment of tips for its irons.

#7:*MFJ -269 Antenna Analyzer.* This piece of equipment has to be, by far, one of my most useful test bench purchases. MFJ's analyzer makes testing antennas and coax a whole lot easier! The 269 covers 1.8 to 170 MHz as well as the UHF band from 415 to 470 MHz. This unit (photo F) comes equipped with a signal generator, a frequency counter and an SWR bridge all in one. Nearly every ham loves to work with antennas and this device will allow you to make field measurements before erecting the antenna. Over the years, I suppose what I like the most is when I am trying to find the right impedance point on the driven element with some type of a matching device such as a gamma match, or where to

solder the center lead on a J-pole; the MFJ-269 takes the guesswork out of these projects. It lists for around $390.00 and may be less from some MFJ dealers. See <http:// www.mfjenterprises.com/Product.php?productid=MFJ-269>.

MFJ also sells the 259B, which is the same as the 269 but without the UHF portion and it is about $80.00 less expensive.

Photo F. MFJ antenna analyzer Model 269

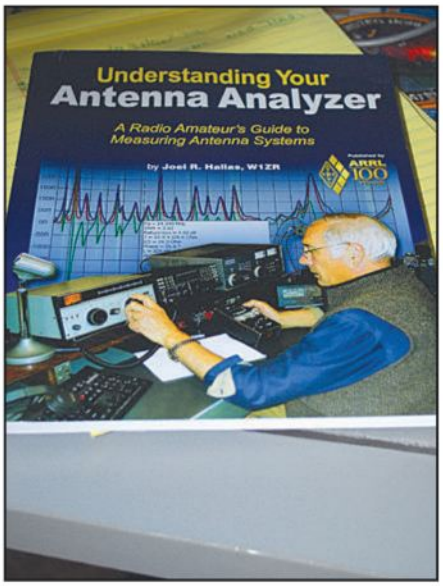


Photo G. Understanding Your Antenna Analyzer *from the ARRL*

#6: *Understanding Your Antenna Analyzer* by Joel Hallas, W1ZR, and published by the ARRL (photo G). This book contains nine informative chapters that will help you get the most out of your analyzer. With the aid of this book your analyzer will soon become one of your most important pieces of test bench equipment. This book can be ordered through the ARRL <http:// www.arrl.org> for $22.95 and it is a great addition to your shack library.

#5: *A digital multi-meter.* This is a must-have item for every ham shack test bench. Multimeters range in complexity and in price from a low of just a few dollars to hundreds of dollars. A basic multimeter should measure voltage, resistance and current. Higher-priced meters also measure capacitance, inductance, transistor functions and even frequency. I have an Elenco LCM 1950 (photo H) and it will act as a frequency counter up to 4 MHz, measure capacitance up to 400 µF inductance to 40 H and resistance up to 4000 Mohm. A digital multimeter makes for a great stocking stuffer, it is one of the most versatile pieces of test gear, and there is one priced to fit any budget.

Photo H. Every shack needs a multimeter!

#4: ***A clock for the shack.*** MFJ makes some very nice timepieces. The MFJ-108B (photo I) is a digital dual clock. One clock keeps local time and the other is set in Coordinated Universal Time (UTC), also known as Zulu time or GMT. Its dimensions are only 4.5 by 2 inches, so it is small enough to be placed near your rig for quick and easy reference. The MFJ-108B retails for $21.95 from MFJ.

If you prefer a larger clock, MFJ makes the MFJ-105C (photo J), which

Photo J. MFJ 105C 24-hour wall clock

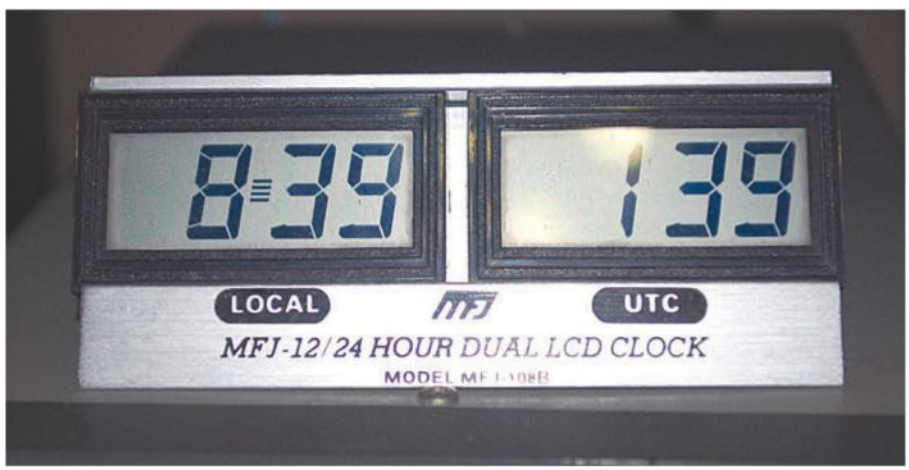


Photo I. MFJ 108B dual clocks—a real nice shack accessory

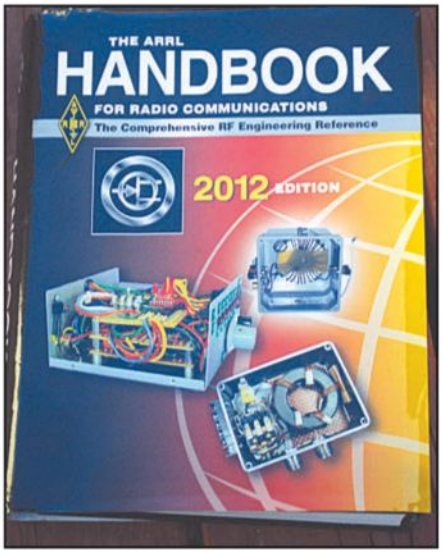


Photo K. The ARRL Radio Amateur Handbook 2012*; I am hoping that my 2014 edition will be under the tree.*

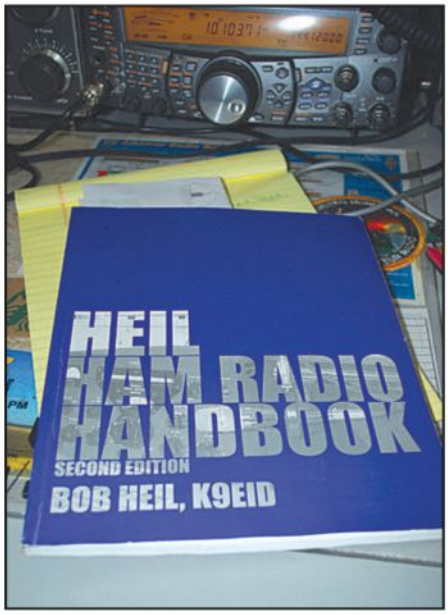


Photo L. Heil Ham Radio Handbook.

is a wall clock that keeps UTC time. It sells for $24.95 from MFJ, <http://www.mfjenterprises.com>.

#3: *ARRL Handbook For Radio Communications*. The ARRL is publishing its centennial edition of this time-honored classic (photo K). No ham shack should be without this handbook. It covers everything ham radio from A-Z, Antennas to Zulu time. The handbook is an excellent reference book that explains and illustrates Ohm's Law to putting on coax connectors. Interested in a new operating mode? Then the handbook is a great place from where to start. The ARRL Handbook hardback edition is listed at $59.95 and it can be personalized with your name and call sign! The softback edition is listed for $49.95. The URL for the handbook is <http://www.arrl.org/shop/What-s New/>.

#2: *Heil Ham Radio Handbook*, *Second edition,* by Bob Heil, K9EID. I am fortunate enough to know Bob Heil personally and Bob has given so much of himself to our hobby. One of K9EID's greatest pleasures in life is to see the "light bulb of recognition" go off in someone who just learned a new ham radio concept. Towards that end, Bob just released a second edition of his famous *Heil Ham Radio Handbook* (photo L). Bob's handbook contains 15 chapters that explore band characteristics, shack layout, antennas, VHF antennas, mobile operations, dB & Hz, microphones, homebrewing techniques, proper grounding and simple electronic projects.

If you've ever heard Bob speak, you know that he can make a complex concept easy to understand. K9EID uses the same style with his handbook. It is fun to read and is a great place to start to learn more about our hobby. Bob pays particular attention to the newcomers in ham radio and he offers many practical hints that not only benefit newbies, but the seasoned ham operator as well.

For example, how many times have you wanted to know the height of a tree for an antenna or tower project? On page 50 of his handbook, Bob suggests waiting for a sunny day and then measuring the shadow of the tree. Next, take a known length of TV mast or a piece of wood and measure its shadow as well. Now take the TV mast length times the tree's shadow length and divide that number by the length of the TV mast shadow! The handbook is published by Heil Sound Ltd. Universal Radio offers the handbook for $14.95 and the URL is <http://www.universalradio.com/catalog/books/6061.html>.

#1: *The CQ 2014–15 Amateur Radio Calendar*! This is a must-have for my shack! I enjoy the great pictures each month of hams in their shacks or next to their antenna farms (photo M). In the past, CQ also offered a vintage radio version of the calendar. This year, CQ is combining the two formats, mixing six classic radio/contesting shots along with nine amateur radio operator shacks from across the country (it's a 15-month calendar, covering January 2014–March 2015). Best of all, meteor showers, lunar cycles and ham radio contests are included in the calendar along with the normal holidays. This calendar is a great stocking stuffer and it can't be beat at only $13.95 which includes US shipping. To order one, go to <http://store.cq-amateur-radio.com/Categories.bok?category=CQ+Calendars>.

Happy Holidays

That's my "top ten" gift suggestion list and I hope you found it useful! Hopefully, you will find some of these items under your tree or in a stocking hanging on your fireplace mantel. I'll bet that you'll be able to make good use of them in your shack. In conclusion, unlike the character in Frost's poem, I hope that you will have ample time in which to relax and to take pause before once again being in the position of "miles to go before I sleep." I wish everyone the happiest of holidays and for a truly wonderful New Year. I hope to hear you on the air in 2014.

73, Ron, KØZ

Photo M.
CQ Amateur Radio Calendar—no shack should be without one!

3D Printers—Part II

BY DON ROTOLO,* N2IRZ

In my last column (October 2013), I wrote a little about the technology behind hobbyist-grade 3D printers. Not long after sending that column in to *CQ*, I had the opportunity to visit the New York City World Maker Faire, held at the New York Hall of Science in Queens (which also happens to be the home of the Hall of Science Amateur Radio Club [HOSARC], WB2JSM). At the Faire I had the opportunity to see, touch, and photograph dozens of 3D printers. This month—just in time for the holidays! —I'll show you some of the more interesting products I saw.

3D Printing for the Ham Shack

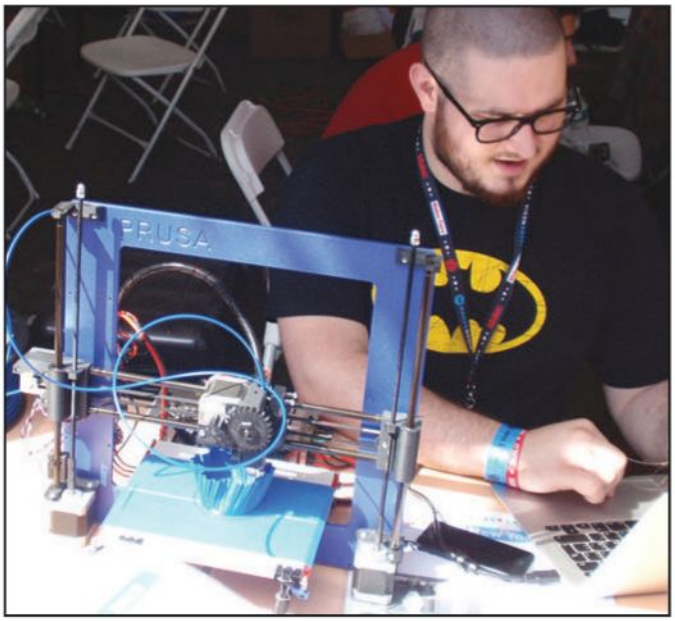
Before we get to the details, let's take a quick look at what you, as a ham, can do with 3D printing. I asked several hams who own 3D printers what they used them for and found that none used them exclusively for amateur radio. Many told me that they were making hard-to-find parts for older radios, such as knobs, pushbutton covers, and even specialty tube sockets. Lots of brackets, both for older radios and for new projects, are being made to hold components in stable positions.

*P.O. Box 114, Park Ridge, NJ 07656
e-mail: <n2irz@cq-amateur-radio.com>

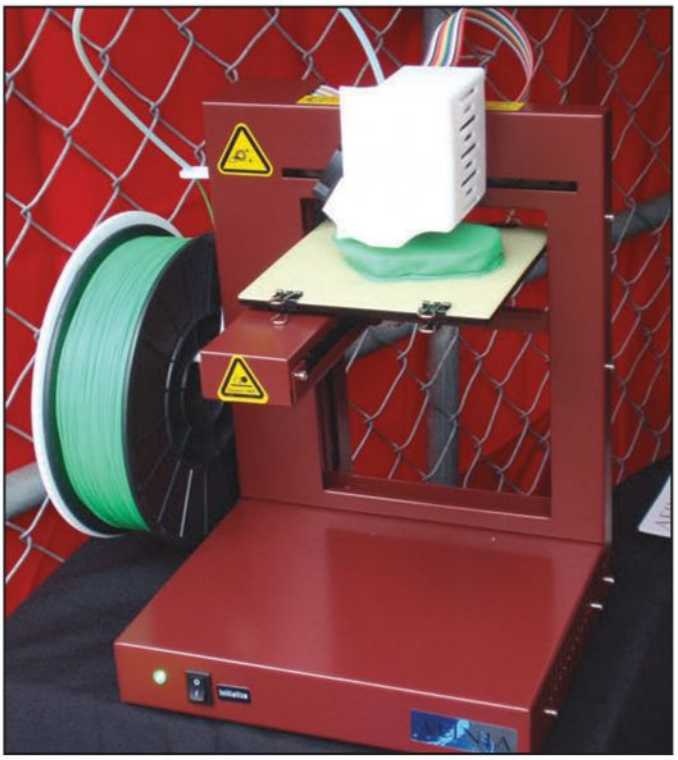
The Litto, from Tinkerine Studio in Vancouver <http://www.tinkerines.com/>, is a smaller printer made from laser-cut plywood. You can get it as a kit for just under $1000, or fully assembled for $300 more. Weighing only about 13 pounds, it redefines "portable." Print resolution is a reasonable 100 microns, and the print volume is a moderate 5.3" × 4.7" × 7.9". Tinkerine also offers its larger Ditto+, essentially the same printer but with a larger print volume.

The Replicator2 from MakerBot <http://www.makerbot.com/>, one of the biggest names in 3D printing. Fully-assembled, the Rep2 runs about $2200, features a build volume of about 11" × 6" × 6", but lacks a heated bed, so it can only print PLA (polyactic acid) plastic. The Replicator2X ($2800) is available, but "only for true daredevils and experimenters," per MakerBot. The bundled software runs under Windows®, Linux, and Mac, and the support team is top notch.

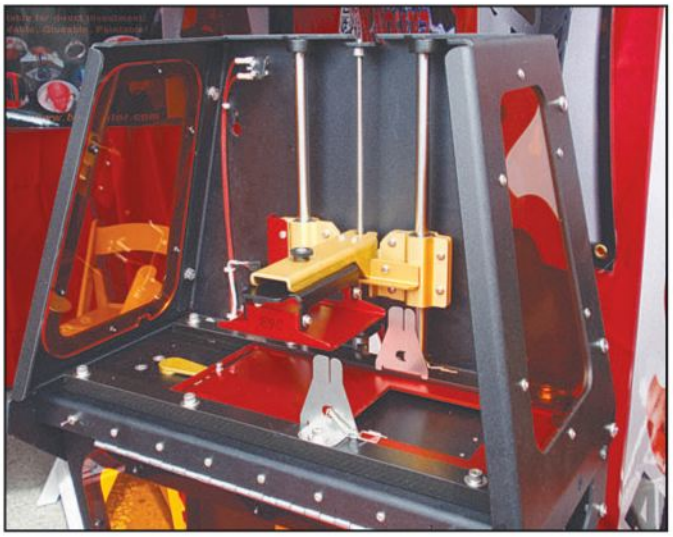
The Cube by Cubify 3D Systems <http://cubify.com>. This is a truly plug-n-play product, targeted toward users who just want to design and print, rather than tweak and experiment. Printing in both ABS (acrylonitrile butadiene styrene) and PLA, its 5.5-inch cubical print volume is large enough for most things you'll ever want to print. This printer has built-in WiFi, so you don't even need to use a cable. The base machine starts at around $1300. Cubify also sells the CubeX, which features higher resolution, up to three print heads and a larger print volume.



Josef Prusa and his Prusa i3 RepRap printer. Although there are several vendors worldwide that sell most or all the components needed to build this third-generation printer, the designs for all of the pieces are freely available, allowing you to build one for about $550. Part of the RepRap community, which specializes in self-replicating machines (I suppose they need some human intervention, HI), this is a real build-it-yourself project, albeit with a lot of support from a large worldwide community.



The Afinia H-series 3D printer <http://www.afinia.com/>, which comes with its own software for printing. One of the smallest 3D printers, with a 5-inch cubical print volume, it also happens to deliver some of the best quality 3D prints for an extrusion-type printer. Delivered fully assembled for about $1600, it prints in ABS and PLA. The included printing software accepts standard .STL files and has numerous features to simplify printing, such as generating its own support structures. One of the lightest printers on the market (11 lbs.), it is easy to transport.



The B9Creator DLP printer <http://b9creator.com> uses a computer-type video projector and a vat of liquid photopolymer to print 3D objects. Able to print very fine details (0.002 inch, thinner than printer paper), the prints are also quite strong and can also have overhangs without support material, unlike those from extruded plastic. With a cost of almost $3000 as a kit ($5000 assembled), it is one of the more expensive printers I saw, but the resolution and speed are truly spectacular. Support is through an online forum and a small but passionate and experienced group of users.

TIMEWAVE TECHNOLOGY INC.

Available at:
- Universal Radio
- AES
- HRO
- Radio City
- R&L Electronics

The *Navigator* Sound Card Modem - New at Timewave!

Available November 2013!!

- Single USB connection to computer
- USB Sound Card built-in
- USB Powered
- Universal Rig Control built-in - logic level +/-, CI-V, CAT, & RS-232!
- Software Configuration - No jumpers!
- FSK Controller for Precision RTTY
- K1EL Paddle & Keyboard Precision CW
- Separate COM ports for PTT, FSK, CW, CI-V & RS-232

The *Navigator* joins the PK-232SC+ Multimode Data Controller in Timewave's versatile line of data controllers, TNCs and and sound card modems.

The *Navigator* is a complete USB sound card modem featuring a proven USB audio sound card chip, six FTDI USB serial COM ports, a K1EL WinKey keyer, True FSK and rig control connections for every radio. It has a built-in USB sound card with isolated audio I/O to your radio to prevent ground loops. A second audio input lets you use both receivers in a dual receiver radio. The logic level and RS-232 rig control ports support your Icom CI-V, Yaesu CAT, Kenwood and other radios. Front panel controls set both RX audio levels, TX audio ouput level, audio monitor level and the CW speed. There are no internal configuration jumpers - just conveniently set the software-controlled configuration settings from your PC.

Need Software? Check the new Ham Radio Deluxe & Radio Operating Center bundle!
Optimized for the Navigator, PK-232SC+ and other Timewave/AEA TNCs *www.ham-radio-deluxe.com*

PK-232SC+ with New Dual Port Option!

- **Dual Port - two radios at same time!**
- Single USB connection to computer
- USB Sound Card built-in
- 3-Way Rig Control built-in - logic level, RS-232 & USB!
- Computer isolated from radio
- Real FSK and high-speed keyboard CW

PK-232SC+ Multimode Data Controller*

Sound Card, Rig Control, USB, Pactor, RTTY, CW Packet, Dual Port Option & more!

100,000 sold - All-time top selling data controller!

For the first time in 23 years, we tweaked the PK-232's main PC board! Now with a dual port option, the incredible PK-232SC+ again expands its role in your radio station. The new PK-232SC+ can operate legacy modes on one port and sound card modes on the other - simultaneously! The SC+ connects to your computer with a single USB cable - no audio cables, no RS-232 cables! It has a built-in USB sound card with isolated audio I/O to your radio to prevent ground loops. The logic level and RS-232 rig control is optically isolated for your Icom CI-V, Yaesu CAT, Kenwood and other radios. A new optically isolated DTR PTT option works with legacy sound card software and radios. We even added a pair of USB ports for that new radio with USB rig control and other accessories.

**Upgrade any PK-232 to the PK-232SC with New Lower SC & DSP Upgrade Combo Pricing!*

Customize your PK-232 installation with our complete line of upgrades, accessories and cables.

- **HamLinkUSB™ Rig Control+**
  C-IV, CAT, RTS (PTT, FSK or CW) for sound card software
  Perfect for HRD owners with simple sound card adapters
- **HamLinkUSB™ USB-to-RS-232 Adapter**
  Proven FTDI Chip. 9 and 25 pins for all radios and TNCs!

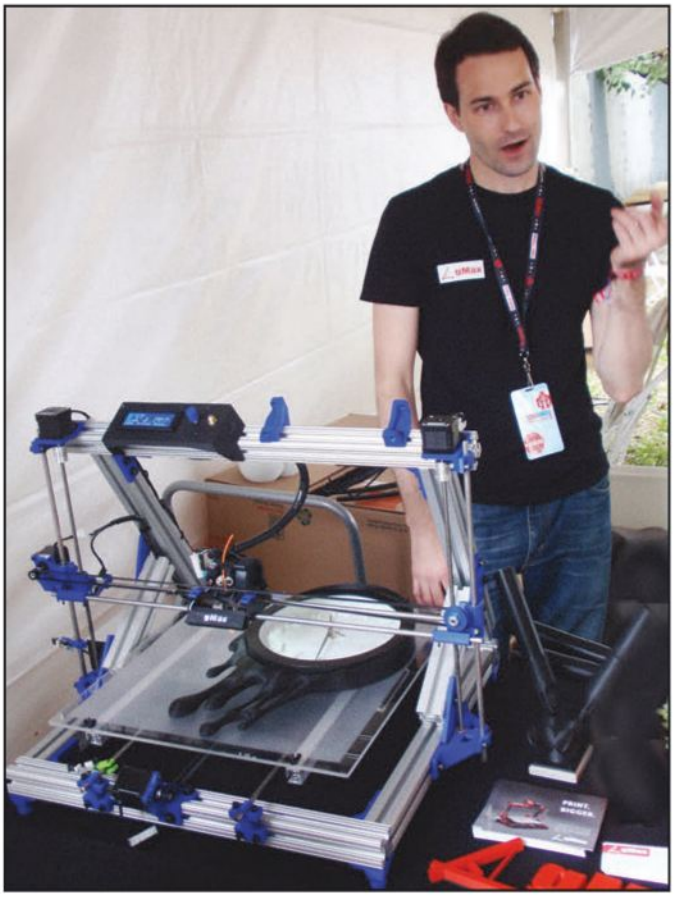
Timewave Technology Inc.
23 Empire Drive
St. Paul, MN 55103 USA

www.timewave.com
sales@timewave.com

651-489-5080
Fax 651-489-5066

Some mentioned making dipole antenna end insulators. While the ABS plastic is more than strong enough for this, I wonder if printing a plain insulator that can be had for $4 is really worth the effort, not to mention the cost of the filament. On the other hand, printing an insulator means I can have one in several minutes, instead waiting a few days for shipping. Of course, the other kind of insulator, which is used to insulate an antenna element from the boom (for example) might be a bit more expensive, and waiting for a replacement *with the CQ WW RTTY WPX Contest starting tomorrow* might be a good case for having the ability to print a new one yourself.

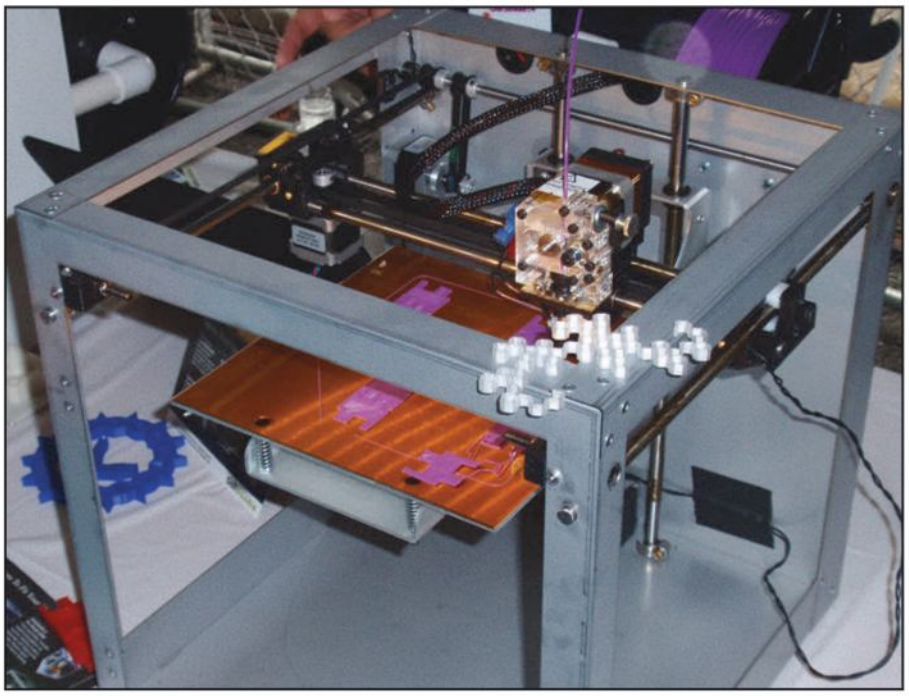
Aside from the metal contacts, printing a whole CW key or custom bug paddle might be a nice capability. Simple things, like a clip to hold a heat sink to a transistor, a nice name



gMax president and founder Gordon LaPlante speaking about the gMax printer prototype <http://www.gmaxprinter.com/> he showed at Maker Faire 2013. As a Kickstarter campaign, supporters pledge a certain amount of money to be on the list to receive one from the first batch of kits. The large (16"× 16"× 9") print volume is one of the attractions of this model, as is the extensive use of off-the-shelf parts and its ability to make prints directly from an SD memory card, without a computer. A pledge of just under $1200 gets you a complete kit when they start shipping in early 2014.

No, his name is not Darth. Born well before Episode IV: A New Hope, Scott Vader <http://www.vadersystems.com/> shows his prototype 3D printer that uses molten aluminum in an ink-jet-like process. This won't be available anytime soon, and it'll cost up to about $100k, but just the fact that it prints solid aluminum was reason enough for the Vader booth to be crowded the whole day.

The Ulitmaker2 <https://www.ultimaker.com/>, with an original Ultimaker in the background. Based in The Netherlands, this 1900Euro (about US$2550) fully-assembled printer features a very rigid frame, some of the finest detail available (20 microns) and a build volume of about 9"× 9"× 8". The original Ultimaker is still available for about 1200Euro (about US$1600), as a kit or assembled.



A third-generation Solidoodle <http://www.solidoodle.com/>, which costs under $800 and comes fully assembled and ready to print. With a good-size (8"× 8"× 6") print volume and ABS capability out of the box (it can also print PLA), the strong and rigid frame helps keep prints smooth and stable. Solidoodle also offers its second-generation printer, with a slightly smaller print volume, for under $500 assembled.

badge for club members, or even a light-but-rigid frame for a balloon launch payload, become almost trivial to produce. How about that plastic pulley for the tuning mechanism? Or even a hard-to-find belt? You can even print a mold to make a part from materials not normally "printable."

Anyway, although a 3D printer isn't for everyone (yet), I don't think you'll have a hard time thinking of things you can make with one, whether amateur radio-related or not. Thus, let's have a look at some of the 3D printers I saw at Maker Faire. Basic information is in the caption for each photo. In each case, I've included a web URL so you can go find more information. While this is not even *close* to a comprehensive list (which wouldn't fit in a dozen pages), it's a small sampling of the printers that caught my eye.

3D Printing Services

If you don't feel the need to get a 3D printer this month, you can still get in on the fun. There are several 3D printing service companies out there. For a reasonable price they'll print whatever you can design (or whichever design you buy) in an astounding variety of materials. Shapeways <http://www.shapeways.com/> is one such service, able to print in a variety of plastics as well as brass, sterling silver, stainless steel, ceramics, and even sandstone (a gypsum-based, clay-like material). Kraftwurx <http://www.kraftwurx.com/> is another 3D print supplier, offering gold, nylon, polycarbonate, and even paper along with dozens of other materials and colors. Also check out MakerBot's Thingiverse <http://www.thingiverse.com/>, where you can download (for free) some really nice design files to be printed.

It's a short column this month to leave space for all the photos. At the moment, I am working to get a cheap (under $30) and widely available DVB-T dongle to work as a wideband software defined receiver, with a range of about 50 MHz to 2 GHz, and if you drop another $50 or so on a frequency up-converter, you can expand the receiver's range down to DC. Assuming everything goes as planned, you'll read about it in February's issue.

As is my custom this time of year, I wish you and your family and friends the very best for the holiday season, and hope you enjoy a happy, healthy, and prosperous New Year. This time of year seems to cause the whole world to think more about peace, and regardless of your personal, political, and religious beliefs, I think most of us can agree that living in peace and freedom is one of the best ways to live. 73, Don, N2IRZ

BY MATT STULTZ,* KB3TAN

Maker Faire Behind the Scenes

We've written in the past about how great it is to attend Maker Faire. The hundreds of projects and characters are more than you can fit into the tiny weekend timeframe you get to see it all. But there is a great way to get even more out of Maker Faire: Be an exhibitor!

This year for World Maker Faire, I organized a group of my 3D Printing Providence teammates and a few of our AS220 Labs members to show as a group. This was a great opportunity for us to get more exposure for some of the projects we have been working on and to make new contacts to enable future projects. We showed a half dozen projects from art to electronics, 3D printing to 3D painting. Some of our grander plans didn't work out, but our overall showing was a home run.

The best part of Maker Faire is something that most people never get to experience, the day *before* the faire. For the big faires, the day before is load-in day. All the makers who have big projects or want to ensure that they have plenty of time to set up their displays can come in and set up early. This is a great time to walk around and get a sneak peak of everything that will be on display the rest of the weekend.

Setup

When the crowds arrive over the weekend, it becomes hard to get time to speak with the project creators on a one-on-one basis. Friday becomes your best chance to find the projects that really catch your eye, speak with the creators and question them about their inspiration and techniques. Of course, the makers are all too excited to share their work with a fellow maker who is excited about their project.

*3567 West Shore Rd., Warwick, RI 02886
e-mail: <kb3tan@cq-amateur-radio.com>

This year, the Sketchup team collaborated with a group called Wiki House to construct a small all-plywood building onsite at World Maker Faire. The entire building and furniture inside were cut from plywood sheets using a large CNC router. The individual components could then be fit together using precision joinery and required only a small number of screws to keep the entire structure together. Those of us who were onsite early on Friday were treated to a show of how quickly and efficiently the building came together. You read the Sketchup team's coverage of this project on their blog at <http://bit.ly/14gZT6n>.

Our booth (photo A) was tucked in behind the power wheels track. While we were working on last-minute projects and planning out our booth for the weekend, we had the chance to watch as the power wheels racing teams began unloading their cars and setting up their pits. Soon the drivers began taking to the track to see how their newly-improved rides would be able to handle this year's track. This was a great opportunity for me to catch up with members of my old hackerspace, HackPittsburgh. Their 006-power wheels racer took third for the weekend when all the racing was done. While the teams setup on Friday, others also took advantage of the open track. Soon, Star Wars Storm Troopers on mini-bikes were racing around the track beside other creative contraptions.

Maker Meetup

As all the setup began to wind down and the makers finalized their booths for the night, the smell of paella began to waft over the crowd. One of the most popular food vendors each year is the Gerard's Paella booth. *Make:* magazine (the show's sponsor) knows the popularity of this delightful rice dish and that even with Gerard's multiple 4+ foot-wide pans, they can't keep up with the

Photo A. The 3DP PVD and AS220 members including Mandy Stultz, KB3UGX (far left), staffing the booth at World Maker Faire in New York. (Photos by Amy Buser)

demand from the crowds. *Make:* takes care of its makers, though, and on Friday night, the paella was on them for all the makers. Oh, and so was the beer!

Soon all the makers began emerging from their booths and gathering around the food. This is the best time to catch up with old friends that have been made over the years of attending faires around the country and of course, to make new friends for the years to come.

I had the chance to catch up with past coworkers and other 3D printing experts to discuss which of the new machines that were on display that weekend had piqued our interest (*see N2IRZ's "Digital Connection" column in this issue for a look at some of the 3D printers displayed at the faire—ed.*). Soon many of us were heading back into the booths to get an up-close look at things others had spotted and were interested in sharing.

Fun In The Dark

As we wandered around the mostly-deserted booths, some began to come to life as makers continued to put last-minute tweaks on their projects. Some projects just have to be experienced in the dark. This year, the fire art was nearly non-existent but in years past, flames would light up the faire. This year, we were drawn like moths to the electronic flame of LEDs.

The Hoboken Maker Bar team had created the Orbital Rendersphere for this year's Red Bull Creation contest. This mammoth LED project is a globe of spinning LED strips. At around seven feet tall, the Orbital Rendersphere uses the phenomenon known as *persistence of vision* or POV to create animations in the spinning sphere. Unfortunately, this project was too large and not well-suited for the indoor dark room. Sadly, the daylight environment prevented this project from being seen in all its glory the rest of the weekend but on Friday night, it shone like a lighthouse in the night. The weekend was just getting started, though, so we soon retired to our hotels to rest up.

Show Time

Coming into the faire on the morning of the show, the excitement is palpable as makers hustle around to get everything set before the gates open and the crowds arrive. Members of the *Make:* staff scoot around on bikes, gathering volunteers to help makers with their last-minute needs.

Before we knew it, the gates opened and the show had started. As attendees

began flooding in, we could watch as the grounds began quickly filling up with kids young and old, anxious to see what makers from around the world had brought to show them this year. It wasn't long before we started getting our first visitors, all eager to see our projects.

For many members of our crew, this was either their first time showing at a Maker Faire or even their fist time attending a faire. Not knowing what to expect, they were soon pleased to hear the quality of questions they received from attendees and were excited by the level of enthusiasm that was shown to them for their works.

Hitting The Stage

Another great way to participate in a Maker Faire is to sign up to give a presentation on a topic in which you have some expertise. This year, on top of showing in my booth, I presented a talk entitled "Advanced Materials For 3D Printing" (Photo B) and joined five other 3D printing experts for the "3D Design Practice" panel (photo C and <http://bit.ly/14gZT6n>).

Presenting may actually be the best way to participate in Maker Faire because it frees the presenter to be able to go out and enjoy the rest of the faire while still providing exposure. Sadly, I didn't have this luxury, though, and had to split my time between the three talks, the panel and our booth. However, my presentations helped bring other attendees to our booth who may have missed us, tucked back in the corner. This, of course, helped provide exposure to the other members of my team who were showing in our group booth.

Photo B. Matt Stultz, KB3TAN, on the 3D Printing stage on the first day of World Maker Faire presenting "Advanced Materials For 3D Printing."

One group that sought us out was the writers from Hack A Day (http://hackaday.com) a popular tech blog, who interviewed us about two of the projects that we brought to Maker Faire. You can read their coverage and view their interview at <http://bit.ly/1h1E9hd>.

All Good Things …

Sadly though, Maker Faire has to come to an end. As quickly as it arrives, it is done, and leaves you exhausted but inspired for the next year. Our booth was quickly torn down, leaving behind as little trace as we could, within an hour of the close of the show. Goodbyes were made and we were all packed up in our cars heading back to Rhode Island.

No sooner were we on the road then we began making plans for next year's Maker Faire—how to be better-organized, what projects should we create and show. Every year is a new opportunity to make your experience better than the last and the best way to do it is to jump in the deep end as an exhibitor and truly experience all the fun that is Maker Faire!

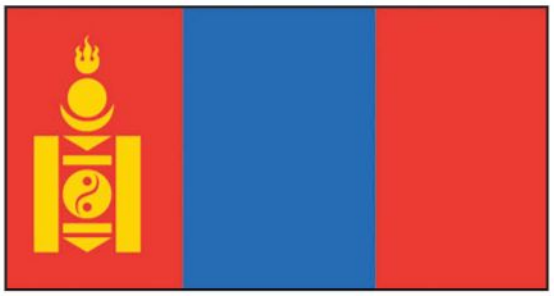
73, Matt, KB3TAN

Photo C. The panelists (from left to right Tony Buser, Matt Stultz, Todd Blatt, Kacie Hultgren, Fred Kahl, Matt Griffin) begin the "3D Design Practice" talk at World Maker Faire.

Mongolian National Team Brings Home ARDF Gold

BY TOM SMERK,* AA6TS

As interest and participation in amateur radio direction finding (ARDF) continue to grow, the 9th International Amateur Radio Union (IARU) Region 3 ARDF Championships were held in Hongcheon, Korea, from September 1 to 6.



Courtesy CIA World Factbook

The team from the Mongolian Radio Sports Federation (MRSF) made a good showing with gold and bronze medals in team competition.

In the M21 category of individual competition, N. Munkh Erdene earned a gold medal and D. Batzayal was awarded a prize winning place. M. Nyamdorj participated in the over-40 age category and stood in sixth place in the overall results.

The Amateur Radio Direction Finding Championship is organized annually in each of the IARU's three regions. The MRSF is the national member society representing Mongolia in IARU Region 3, which includes the member societies representing amateur radio operators in Australia, most of Asia, and the Pacific Islands. The championship was organized in categories by gender and age group.

[Mongol News UB Post]

Amateur Radio Activity Building in Kosovo

The newly established Amateur Radio Association of Kosovo (SHRAK) is making efforts to revitalize the amateur radio service after decades of inactivity. An Amateur Radio Examination Commission, with representatives from SHRAK and the Kosovo Telecommunications Administration, is working to develop course material and establish a reasonable license exam structure additional on this page.

Courtesy CIA World Factbook

An initial training course, with material provided by the Croatian IARU Member Society (HRS) and the British Member Society (RSGB), was conducted in cooperation with the Technical University of Pristina and drew some 65 students. Administered under the supervision of IARU Region 1 represented by Hans, PB2T, and Nicola, 9A5W, ten students completed the course and were ready to take their final exam as soon as SHRAK was able to finalize the overall process.

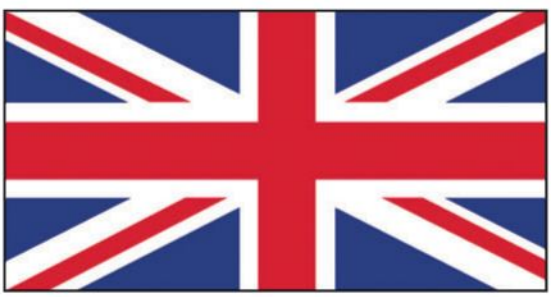
During the weekend of September 14-15, 2013 a Field Day operation using a generator and temporary antennas was conducted outside Pristina. The station participated in the DARC European DX Contest with Kosovo's first entry as a multiplier in the "Hero" category.

[IARU Region 1 website]

Are Amateur Radio Licenses on the Rise?

The Office of Communications (Ofcom), the independent regulator and competition authority for the UK communications industries, recently released the amateur radio license statistics for September and October 2013. The number of UK amateur radio licenses appeared to hit a record high at the end of September. The October figures released by Ofcom show that at the end of September there was a grand total of 82,040 licenses, an increase of 152 over the previous month. The September figure shows an increase of 87 over the August figure.

Although they look good, the statistics may be deceiving. In the UK, amateur licenses need to be revalidated (renewed) every five years; otherwise Ofcom says it will revoke the license. However, it appears that few or no licenses are being cancelled. Since 2006, possibly as many as 3,500 UK



Courtesy CIA World Factbook

*17986 Highway 94, Dulzura, CA 91917
e-mail: <aa6ts@cq-amateur-radio.com>

radio amateurs have died and would have been expected to drop out of the statistics, but month after month the numbers that Ofcom reports show a steady rise. There is no way of telling how many amateurs have simply given up the hobby in the past seven years or how many active amateurs there really are in the UK today.

Meanwhile, Vijayawada, India reports that about 92 candidates, trainees of the "Academy of Ham Radio," have qualified in the recent ham examination which was held in two prominent engineering colleges of Vijayawada, *VR Siddhartha and Dhanekula Institute,* and are undergoing the process of police verification. A previous group of 45 qualified candidates who sat for the ham radio examination in Regional Science Center in Vijayawada and who have completed all the requirements are beginning to receive their tickets. Some of them have already received their "life time Ham Radio licenses."

Courtesy CIA World Factbook

With the increasing strength of 137 new entrants to the existing total of hams in Vijayawada," the city in Andhra Pradesh is being called a "hub of ham radio operators."

Amateur radio operators are considered in India to be a national resource and a potential source of communicators whose services are quite useful in supplementing the emergency communication network at state and national level disasters.

[SouthGATE Amateur Radio News]

New Zealand and Japan reach Reciprocal Licensing Agreement

New Zealand and Japan have signed a reciprocal licensing agreement, although no date has been announced when the new agreement will take effect. According to the terms of the agreement, the New Zealand General Amateur Operators Certificate will be recognized as equivalent to the Japanese First Class Radio Operator's qualification and a New Zealand Amateur will be will be permitted to establish and operate a station as an amateur radio operator in Japan.

Since the Japanese First and Second Class Radio Operator's qualification will be recognized as holding the equivalent to the New Zealand General Amateur Operators Certificate, the holder of a Japanese First or Second Class Radio Operator's qualification visiting New Zealand may operate for up to 90 days using his/her Japanese assigned call sign, with the addition of the ZL prefix.

The agreement does not cover Japan's Third and Fourth Class amateur license holders because there appear to be no New Zealand licenses with equivalent levels of qualification.

Gloucester Special Event Stations Operate Unusual Dipole Setup

While special event stations are common world-wide and are usually held at interesting or historic locations, what made the September 14 and October 15 events operated by the Gloucester Amateur Radio and Electronics Society (GARES) in the UK is the location of the antenna for both events.

A 132-foot dipole was suspended from the tower right over the length of the nave roof and was fed by ladder line to the gazebo just outside the main entrance to the Gloucester Cathedral, the most historic building in Gloucester.

The September special event station operated with the call sign GB4GC during the Churches and Chapels on the Air (ChOTA) event, and the October event operated as G100RSGB as part of the celebrations of the centenary of the Radio Society of Great Britain (RSGB).

[Gloucester Amateur Radio and Electronics Society (GARES) website]

Right around the corner from Gloucester, we hear about **CQ from a haunted house.**

Beginning on Friday the 13th (September 13, 2013), the South Eastern Amateur Radio Group operated from Loftus Hall on the Hook Peninsula, County Wexford, "Ireland's most haunted house" as CASHOTA (Castles and Stately Homes On The Air) activation EI025/SH, mainly on HF (SSB & CW).

Loftus Hall is a large mansion house on the Hook peninsula, County Wexford, Ireland that is said to have been haunted by the devil and by the ghost of a young woman. The Redmond family built the original building in about 1350 during the time of the Black Death. The Hall became the property of the Loftus family in the 1650s.

[South Eastern Amateur Radio Group web site]

For our final story this month, we go "down under" to The University of New South Wales.

Australia's Ham Radio BLUEsat Ready for Launch

The University of New South Wales (UNSW) has declared its undergraduate student amateur radio satellite project BLUEsat is complete and ready to be launched into space. Talks continue on a launch date.

It is hoped BLUEsat will be placed in circular orbit at an altitude of around 750 km that will take it over the poles. At this altitude, the satellite will travel around the Earth at a rate of around once every 90 minutes.

Once in orbit BLUEsat will be a digital amateur radio satellite, which means that voice and data files can be uploaded to it by any amateur radio operator in the world over whom the satellite passes.

Students from UNSW will continue to be the primary operators of the satellite while it is in orbit and continue the educational focus throughout the full satellite lifecycle.

Through sponsors helping to pay the bills the student-led project has given a space experience that includes VK2UNS the ground control station.[UNSW BLUEsat website]

In closing, to all of our readers who are celebrating the Christmas Holiday (and even to those who are not), I want to extend my sincere holiday wishes as we optimistically look forward to a wonderful new year that is almost upon us. May you all prosper and continue to enjoy our wonderful hobby known to many as "ham radio!"

Best wishes from Tom, AA6TS.

BY JOE LYNCH,* N6CL

Lunar Dust Experiment Under Way

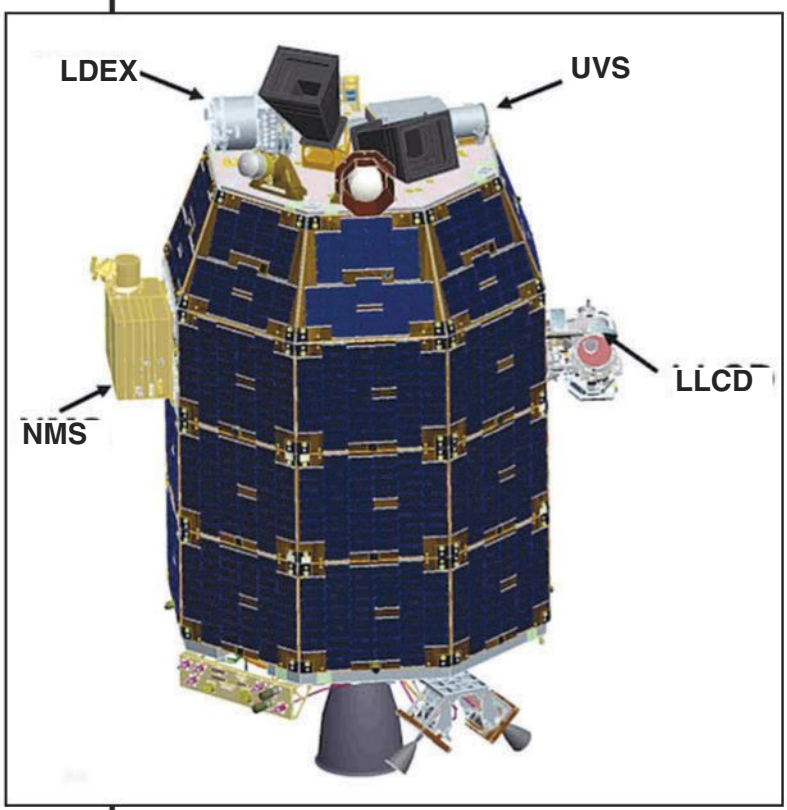
"Among a select few allowed to work during the US government shutdown, controllers for NASA's Lunar Atmosphere and Dust Environment Explorer (LADEE) fired the spacecraft's engines Sunday morning, October 6th, slowing it enough to be captured by lunar gravity."

Thus read the NASA press release concerning the LADEE spacecraft/satellite that is now orbiting the Moon during the 100 days of the Science Phase (see: <http://www.nasa.gov/mission_pages/ladee/main/#.UmFoJretgcs> and <http://www. youtube.com/watch?v=qLpLa32fA9w>). During this phase several experiments will be conducted, among them is the Lunar Dust Experiment. From the LADEE Press Kit (http://www.nasa. gov/sites/default/files/files/LADEE-Press-Kit-08292013.pdf) is the following information:

The Lunar Dust Experiment is located on the upper deck of the spacecraft and will detect lunar dust particles in the tenuous atmosphere. These measurements will help scientists address longstanding mysteries, including: was lunar dust, electrically charged by solar ultraviolet light, responsible for the pre-sunrise horizon glow that the Apollo astronauts saw? The Principal Investigator is Mihaly Horanyi, at the Laboratory for Atmospheric and Space Physics, University of Colorado at Boulder.

LDEX senses dust impacts using the impact-generated plasma in a charge detection assembly. Dust particles impact a large hemi-spherical target and create clouds of electron and ion pairs. The latter are focused and accelerated in an electric field and detected at a micro-channel plate. LDEX is designed to operate even at the relatively low LADEE orbital speed of 1.6 km/s, and will detect single impacts of individual particles with radii approximately 1 micrometer (The diameter, or thickness of the average human hair is 100 micrometers). In addition, LDEX can also identify the collective signal of the simultaneous hits of particles with radii bigger than 0.1 micrometer. If present at the predicted levels, these tiny grains will be measured through their impact generated current in LDEX.

*e-mail: <n6cl@sbcglobal.net>



NASA's LADEE spacecraft/satellite now orbiting the Moon. (Courtesy NASA)

VHF Plus Calendar

December 2	New Moon
December 4	Moon perigee
December 9	First quarter Moon
December 13	*Geminids* meteor shower
December 17	Full Moon
December 19	Moon apogee
December 22	*Ursids* meteor shower
December 25	Last quarter Moon
January 1, 2014	New Moon
January 1	Moon perigee
January 3	*Quadrantids* meteor shower
January 8	First quarter Moon.
January 16	Full Moon
January 16	Moon apogee
January 18-20	January VHF QSO Party
January 24	Last quarter Moon
January 30	New Moon
January 30	Moon perigee

—EME conditions courtesy W5LUU

This experiment is of particular interest to me, because in the Fall 2010 issue of *CQ VHF* magazine I published this article: "The Meteor Shower Nobody Saw—Revisited." In the article I hypothesized that a June 1975 seismometers-detected event that was categorized as a large meteoroid storm was in fact a series of sandstorm events that were caused by the influence of the Earth's magnetotail.

I established my hypothesis by quoting from a NASA article entitled: "Earth's Magnetic Field Does Strange Things to the Moon" (http://science1.nasa.gov/science-news/science-at-nasa/2008/17apr_magnetotail/), in particular, this statement: "There is compelling evidence that fine particles of moondust, when sufficiently charged-up, actually float above the lunar surface."

Of particular interest to the article's author was how the full Moon was affected by the Earth's magnetotail. Quoting Tim Stubbs, a scientist at the University of Maryland working at the Goodard Space Flight Center, "The Moon enters the magnetotail three days before it is full and takes about six days to cross and exit on the other side." The author adds: "It is during those six days that strange things can happen." Those 'strange things' happening are charged-up moondust floating above the Moon's surface.

It is my hypothesis that because the Moon was full during the June 1975 event that it was more likely sandstorms generated by the moondust being hyper-charged by the Earth's magnetotail. Concerning hyper-charged moondust, in my article I cite Mike Hapgood of the Rutherford Appleton Laboratory of Chilton, Didcot, Oxfordshire, UK and his paper "Modeling long-term trends in lunar exposure to the Earth's plasmasheet."

In Hapgood's paper he discussed how the magnetotail affects the Moon during its crossing the magnetotail at solstices—in particular the peaks and valleys associated with the Moon's approximate 18.6 year nodal period precessional orbit. At the vernal equinox of the precessional orbit, the lunar declination can reach 28° north or south each month. Around 9.3 years later (the next time being 2015) the declination reaches only 18° north or south each month.

Concerning the June 20–30, 1975 events, the summer solstice for 1975 was on June 22 at 0027 UTC. As it turns out, this particular crossing was during that time of the Moon's precessional orbit was at the peak of the narrower (18°) declination.

I conclude my article by making these predictions:

Regarding the possibility of a repeat of the possible magnetotail-caused sandstorms, during the dates June 20–21, 2016, as well as the dates of June 20–21, 2035, the Moon's phase will be full the day before the summer solstice during the peak of the Moon's nodal period precessional orbit—such as was a very similar alignment of the Moon's phase, summer solstice, and the Moon's nodal period precessional orbit for the dates of June 20–30, 1975.

Currently, LADEE is in 100 days of the Science Phase of its mission. During this time the Moon will be full three times. It will be very interesting to see the data that are collected during these timeframes.

Another Miniature Satellite Project on Kickstarter

It seems that every month I am reporting on another minisatellite project seeking funding via Kickstarter. This time it is the PocketQube, a concept that Bob Twiggs, KE6QMD, of Morehead State University, conceived.

The following is from Southgate Amateur Radio News:

PocketQube Shop is a small satellite startup based in Glasgow that has just launched a Kickstarter project. They believe small satellites are on the cusp of a major breakthrough much like personal computers were in the late 70s/early 80s.PocketQube Shop say they wish to facilitate as many PocketQube builders as possible and see huge potential in lowering the barriers to entry for budding 'Homebrew Satellite Builders.'

PocketQube massively lowers the barriers to entry for small satellite teams. Despite the small size of CubeSats, 10×10×10 cm, they can still cost up to $100,000 to launch. PocketQubes are just 5×5×5 cm and may be launched for a significantly lower price, under $20,000.

PocketQube Shop will not be offering to provide any launch facility but they have teamed up with an Italian company called GAUSS which has brokered launch opportunities with a Russian rocket called Dnepr, operated by ISC Kosmotras.

Several satellites built to the PocketQube standard will be launched in November. These include Wren, which has a camera and pulsed plasma thrusters; Morehead State University's BeakerSat; the University of Maryland's QubeScout-S1 and the 50DollarSat.

Websites:

PocketQube Shop on Kickstarter: http://www.kickstarter.com/projects/pocketqube/want-to-build-a-satellite-but-dont-have-a-nasa-siz

Wired article on PocketQube Shop: http://www.wired.co.uk/news/archive/2013-09/23/pocketqube

The Wired article mentions that a number of satellites built to the PocketQube standard were scheduled to be launched in November. "These include Wren, which has a camera and pulsed plasma thrusters; Morehead State University's BearkerSat; the University of Maryland's QubeScout-S1 and the 50-Dollarsat, for Ham Radio enthusiasts."

Websites:

BearkerSat: http://www.kyacademyofscience.org/members/abstracts/engineering/2012-361.docx

50-Dollarsat: http://www.50dollarsat. info/

Three Satellites of Amateur Radio Interest Launched from Vandenberg AFB

The following is from Southgate Amateur Radio News:

Satellite of interest to Amateur Radio Operators launch from Vandenberg AFB

Two satellites, DANDE and CUSat, carrying amateur radio payloads and one of interest to amateur radio operators were launched on Sunday, September 29, 2013.

The SpaceX Falcon 9 rocket launch from California's Vandenberg Air Force Base marks several firsts for the commercial space transportation company, including the maiden launch of an upgraded version of the Falcon 9 rocket with stretched fuel tanks, more powerful engines and a 5.2-meter payload fairing to enshroud satellites.

It is also the first SpaceX mission from Vandenberg Air Force Base, a launch site on California's Central Coast, where engineers modified an existing facility used by the U.S. Air Force Titan 4 rocket to be the West Coast home of the Falcon 9.

Canada's Cassiope space weather research and communications demonstration satellite is riding the Falcon 9 rocket into an elliptical near-polar orbit at an altitude of between 325 km and 1500 km. Secondary passengers aboard include POPACS, DANDE and CUSat.

POPACS

The second P in POPACS (Polar Orbiting Passive Atmospheric Calibration Spheres) stands for Passive, meaning that the three spheres do not carry radios on board. They are simple, polished 10-cm-diameter hollow aluminum spheres, weighing 1kg, 1.5 kg, and 2 kg, respectively, that will be radar tracked by the Space Surveillance Network of the U.S. Strategic Command and optically tracked by an international network of students with Go To telescopes.

The purpose of the mission is to measure the way in which the total density of Earth's upper atmosphere above 325 km varies in response to solar stimuli during the descending phase of solar Cycle 24 and all of solar Cycle 25. The spheres' expected lifetimes, after deployment into the initial 325 km × 1500 km 80-degree orbit that they will hopefully soon share with DANDE and CUSat, are 10, 12.5, and 15 years, depending, of course, on solar activity.

More on POPACS

The experiment that is of interest to us amateurs concerns the drag on three spheres that were deployed from the satellite. From the article entitled: "Counting Sown to the Launch of POPACS (Polar Orbiting Passive Atmospheric Calibration Sphere) by Walter Holemans, R. Gilbert Moore, and Jim Kang (http://digitalcommons. usu.edu/cgi/viewcontent.cgi?article=1082&context=smallsat) is the following information:

The apogee of each sphere's orbit will shrink a slight amount each time the sphere passes through perigee of its orbit, due to atmos-

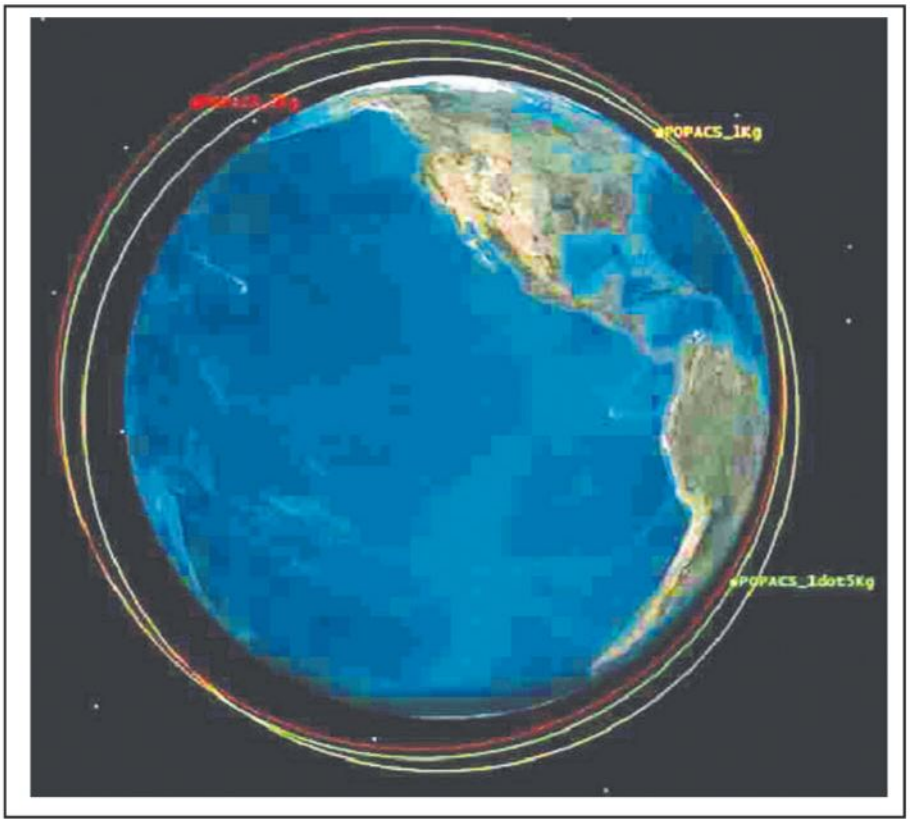


Figure 1: Computer simulation of the orbital decay of the POPACS orbits three years after launch (Courtesy Analytical Graphics, Inc.).

pheric drag, with the lightest sphere experiencing the greatest rate of orbit decay. This orbit decay can be interpreted as a direct measure of atmospheric density above 325 km. The drag will also cause the three spheres to spread out in right ascension because of their different ballistic coefficients. At the same time, apsidal regression will slowly cause the perigees of the spheres to separate from each other in azimuth. The result of these effects will be that the sphere's perigee passes will occur at approximately 100 minute intervals at three different times and three different geographic locations in the earth's upper atmosphere, thus increasing the breadth and frequency of the density measurements. Figure 1 shows a computer simulation of the orbital decay of the POPACS spheres three years after launch.

Approximately ten years after launch, depending on the way the sun behaves during solar cycles 24 and 25, the orbit of the 1 kg sphere will become circular at an altitude of 325 km and will shortly thereafter deorbit and be consumed, while the 1.5 kg sphere will deorbit in 12.5 years, and the 2 kg sphere will deorbit in 15 years.

Tracking: The U.S. Space Command will radar track the metallic spheres throughout their lifetimes and periodically publish their TLEs (Two-Line orbital Element sets). Student groups in participating universities around the world will use these element sets to optically track the spheres with "Go To" telescopes and calculate their own orbits of the spheres, measure the way in which the orbits decay, and thereby determine the density of Earth's atmosphere at the location of each sphere's perigee passage. The students will pay particular attention to the way in which the density of Earth's upper atmosphere in its northern and southern auroral regions responds to solar flares and CMEs (Coronal Mass Ejections) and the way that those effects propagate equatorward. Software for computing these effects will be provided to the students by the Center for Space Standards and Innovation of Analytical Graphics, Inc. in Colorado Springs.

The E.O. Hulburt Center for Space Research at the NRL (Naval Research Laboratory) in Washington DC will make their own computations of atmospheric density from the Space Command's tracking data, and will provide their results to the students for comparison purposes. Prizes will be awarded by the POPACS project to the student groups whose results most closely match those of NRL.

DANDE

DANDE stands for "Drag and Atmospheric Neutral Density Explorer." Measuring drag and neutral particles in the lower atmosphere between 325-400 kilometers, DANDE will be measuring real time density, quantifying variations in altitude and over time, as well as providing in-situ model calibration data. The satellite is a low-cost density, wind, and composition measuring instruments that will provide data for the calibration and validation of operational models and improve our understanding of the thermosphere. Weighing approximately 45 kg, DANDE is classified as a nano-satellite that is about 18 inches in diameter.

The Colorado Space Grant Consortium (COSGC) has housed the project for approximately seven years, in which about 150 students have been a part of the project through initial concept and design, to the current team of mission operators. There are two instruments on board which allow DANDE to make in-situ measurements rather than being passive or only carrying accelerometers. The subsystem ACC (Accelerometers) contains 6 accelerometer heads arranged in a circle which were built in-house. The NMS subsystem (Neutral Mass Spectrometer) also known as Wind and Temperature Spectrometer will survey the variety and quantity of numerous neutral particles in the Thermosphere. This data will be particularly interesting during periods of high solar activity do to atmospheric effects seen at these times in the polar regions of Earth.

DANDE Telemetry System Information:

- Beacon Downlink Frequency: 436.75 MHz FM
- Callsign: dandecosgc
- Data Rate: 9600 baud
- Modulation: FSK
- Transmit Interval: every 15 seconds
- RF Power Output: 0.75 W
- Antenna Polarization: linear

Websites:

DANDE: http://dande.colorado.edu/

DANDE Beacon Portal: http://space-grant.colorado.edu/beacon/index.php

CUSat

CUSat is a multi-year effort to design, build, and launch an autonomous in-orbit inspection satellite system. The satellite will allow us to test the accuracy and viability of the carrier-phase differential GPS (CDGPS) algorithm. We hope to prove the algorithm accurate to less than 10 cm by comparing the CDGPS navigation solution to the known distance between GPS antennas. CUSat will use this relative GPS information to help determine and control its attitude. This is the first step toward having a multi-satellite system use the CDGPS algorithm to aid in

autonomous inspection. CUSat is the winner of the University Nanosat-4 Program which aims to educate the future aerospace workforce and develop new space technologies.

CUSat Telemetry Information:

- Beacon Downlink Frequency: 437.405 MHz FM
- Callsign: BOTTOM
- Data Rate: 1200 baud
- Modulation: AFSK
- Transmit Interval: every 1 minute
- RF Power Output: 2.2 W
- Antenna Polarization: circular

Websites:

CUSat: http://cusat.cornell.edu/

CUSat docs: http://cusat.cornell. edu/docs/IARU/

CUSat Pulse Plasma Thruster Satellites Video: http://amsat-uk.org/ 2013/05/29/cusat-ppt-satellites/

New UK 76 GHz 102 km Record

The following is from: <http://microwaves.zxq.net/76GHz/76GHz.html>:

The 14th September saw a new distance record made (until challenged) on 76GHz from G to GW. Also its thought to be a first G to GW contact on 76 GHz.Locations, IO80RT59 Batcombe Hill, Dorset to IO81IO36 Eglwysilan, Glamorgan Distance 102Km.

Operating on three band, 24, 47 and 76GHz were G8BKE/P and G8ACE/P at Batcombe and also on the three bands at Eglwysilan were GW8KQW/P and with valuable assistance from GW3TKH.

All three bands were worked using FM with duplex FM operation on 76GHz between G8KQW and G8ACE with one way FM between G8BKE and G8KQW. Signals on 76G were exchanged for over two hours with a very gradual increase in average signal strength with some qsb initially. Both Tx and Rx were locked using RDDS PLLs at G8ACE. Rx only locked at G8BKE and the G8KQW Tx was RDDS locked.

This was the first time locking was used at both ends and meant the 76GHz signal was acquired within seconds due to the accurate frequency control. References used for the PLLs were 10MHz double ovened OCXO. It has been very difficult to improve on the previous record distances primarily due to the earth being curved. So far if the path is not optical then it doesn't work, none of this K=1.33 stuff on 76G with the tiny power levels used.

We are indepted to Keith GW3TKH for the suggestion of this path which is LOS and for his assistance in guiding Ian G8KQW up the Welsh mountain.

New UK Red Light LASER 105 km Record

Insofar as VHF-Plus record breaking is concerned, September 14, 2013 was a busy day. The following is from Southgate Amateur Radio News:

On September 14, 2013, Barry G8AGN and Richard G0RPH with Monica G0VCS successfully passed SSTV pictures both ways over the 66 km path between High Bradfield near Sheffield and Manton near Kirton in Lindsey, Lincs.

Taking advantage of the continuing good (for optics) weather they had a further contact on Sunday, September 22. Barry G8AGN and Gordon G0EWN set up at 20.00 BST at Holme Moss (SE097038), while Monica G0VCS and Richard G0RPH set up at Walesby Hill (TF147933) to test out a new path of length 105.3 km. They had tried this path much earlier in the year, but were beaten then by poorer weather conditions.

Visibility was good with a slight mist, though at Holme Moss they reported some condensation problems on the lenses as the temperatures fell. At Walesby, temperatures held steady and the initial winds died to give a calm night, with a bright enough Harvest moon to work by!

Using their usual Phlatlight rigs, contact was quickly established and voice exchanges resulted in reports of 5/7 (Barry's transmission) and 5/6 (Richard/Monica). There was moderately severe scintillation on the link resulting in signals dipping to 3 at times.

Encouraged by the good conditions, they tried an exchange of SSTV pictures and achieved good images of about P4 quality. The FM modulation inherent in the SSTV mode coped brilliantly with the scintillation effects.

The transmitters used Luminus Phlatlight PT39 or CBT40 high power LEDs. These run at a standing current of typically 5-6 amps and are amplitude modulated with up to 15 amps on modulation peaks. These devices illuminate an A4 size Fresnel lens via an intermediate lens which increases the amount of light from the LED passing through the Fresnel to form a collimated beam probably 0.5-1 degree wide. The transmitters can cope with MCW, Speech or Data such as Hell, SSTV, WSJT.

Barry G8AGN's receiver is based on Clint KA7OEI's front end which uses a photodiode fed from another A4 size Fresnel lens. The front end feeds a LM386 audio amp. He also has a KA7OEI designed PIC based hum filter which can take out harmonics of the mains frequency (50 or 60Hz) since there is lots of optical QRM from streetlights.

It's essential to have a good tripod with fine az/el adjustment for the rig. A telescopic sight with adjustable cross hairs is also very useful.

Websites:

Nanowave Slow Scan TV: http:// www.southgatearc.org/news/september2013/nanowave_slow_scan_tv.htm

Radio hams 83 km red LED daylight DX: http://www.southgatearc.org/news/august2013/radio_hams_83_km_red_led_daylight_dx.htm

UK Nanowaves Yahoo Group: http://groups.yahoo.com/group/uknanowaves/

Current Contests

January: The ARRL VHF Sweepstakes is scheduled for the weekend of January 18–20, 2014. For ARRL contest rules, see the issue of *QST* prior to the month of the contest or : <http://www.arrl.org>.

Current Meteor Showers

December: Two showers occur this month. The first, the *Geminids*, is predicted to peak around 0545 UTC on December 13. The actual peak can occur 2.5 hours before or after the predicted peak. It has a broad peak and is a good north-south shower producing an average of 60 meteors per hour at its peak.

The second, the *Ursids*, is predicted to peak around 1400 UTC on December 22. It is an east-west shower, producing an average of no greater than 10 meteors per hour, with the very rare possibility of upwards of 90 meteors at its peak.

January: The *Quadrantids,* or *Quads*, is a brief, but very active meteor shower. The expected peak is around 1930 UTC on January 3, 2014, with up to 40 meteors per hour at its peaks. The actual peak can occur three hours before or after the predicted peak. The best paths are north-south. Long duration meteors can be expected about one hour after the predicted peak.

For more information on the above meteor shower predictions see Tomas Hood, NW7US's propagation column elsewhere in this issue. Also visit the International Meteor Organization's website: <http://www.imo.net>.

Calls for Papers

Calls for papers are issued in advance of forthcoming conferences either for presenters to be speakers, or for papers to be published in the conferences' *Proceedings*, or both. For more information, questions about format, media, hardcopy, email, etc., please contact the person listed with the announcement. The following organization or conference organizer has announced a call for papers for its forthcoming conference:

The **Society of Amateur Radio Astronomers** (SARA, <http://www.radio-astronomy.org/>) is seeking papers for its 2014 Western Regional Conference. The event takes place March 22–23, 2014, in Bishop, California, and at the Owens Valley Radio Observatory (http://www.ovro.caltech.edu/).

Papers are welcome on subjects directly related to radio astronomy, including hardware, software, education and tutorials, research strategies, observations, space weather, geomagnetism and solar radio, data collection, and philosophy.

SARA members and supporters wishing to present a paper should e-mail a letter of intent to the conference coordinator, including a proposed title and abstract no later than December 31, 2013. Include full name, affiliation, postal address, and e-mail address, and indicate whether you are willing to attend the conference to present your paper. Formal printed *Proceedings* will be published for this conference, and all presentations can be made available on CD. Additional information is on the SARA website: <http://www.radio-astronomy.org/>.

And Finally . . .

Thank you very much for your support for this your column. As we conclude another year, I wish you and yours a Happy Holiday season and a great New Year.

By the time you read this editorial, I will be at work at my new job, Director of Religious Education at the U.S. Military Academy, West Point in New York. I expect to be living in Highland Falls, New York, just outside of the academy.

I plan on continuing my editing this, your column, as well as editing *CQ VHF* magazine. From my new QTH I look forward to making new friends in the New York/New Jersey/New England part of the country.

Until next time . . .

What You've Told Us…

Our August survey asked for your opinions regarding the current state of FCC amateur radio regulations. The majority of readers who responded—nearly 60%—are basically satisfied, while 28% feel the current rules are too restrictive and 13% feel they are too loose.

Next, nearly 70% of readers said the FCC's amateur rules should provide "clear guidance as to acceptable practices while permitting hams enough flexibility to adapt to changing times and technologies without needing specific FCC approval," while 19 % said the rules should provide "a highly-structured framework of permitted and prohibited frequency and mode privileges to prevent anarchy and assure that certain privileges are reserved for those who have earned them," and just over 13% are looking for "a broad framework of regulation with specifics left to the amateur community to develop and update as needed."

Do FCC rules promote or impede technological development? Nearly half of you - 44% - say the current rules impede development, while 25% think the rules have little impact and 22% feel the current rules promote technological development.

Our readers are about evenly split over the question of whether segmentation of certain ham bands for various modes should continue to be set by FCC rules, as 34% said the status quo is necessary to protect less-popular modes; 31% would prefer subbands based on signal bandwidths rather than mode, and 28% feel the FCC should back out and let hams subdivide the bands by informal agreements (band plans).

Finally, over 70% of you believe the incentive model on which U.S. amateur licensing has been based for the past half century is still valid, while the other nearly 30% feel it's time to change the model and open up all band and all modes to all amateurs.

This month's free subscription winner is Bill Stott, W4XK, of Hixon, Tennessee.

Reader Survey December 2013

We'd like to know more about you … and especially what's important to you in ham radio and how we at *CQ* can help serve you better. If you're a regular reader of these surveys, you'll notice that **there is no longer a pull-out card** to fill in and return. Instead, you may:

*** Respond to the survey online** at <www.surveymonkey.com/s/CQDec13> [From the digital edition, just click on the link].

- OR -

*** Cut out or photocopy** this page

*** Circle the numbers** that correspond to your answers

*** Mail your completed survey to:** December Reader Survey, CQ magazine, 25 Newbridge Rd., Hicksville, NY 11801.

We will continue to select one respondent to each survey to receive a free one-year subscription (or extension) to *CQ*. This month, in line with our Technology Special, we'd like to know about the role that technology plays in your work life.

1. Which statement best describes your current employment?

I work in a technology-focused business or industry 18
I have a technical position in a non-technical business or industry 19
I have a non-technical position in a non-technical business or industry 20
I am retired from a technical/engineering position 21
I am retired from a non-technical position 22
I am currently unemployed 23
Other 24

2. What type of business or industry do/did you most recently work in?

Agriculture / Forestry 25
Construction /Manufacturing 26
Education 27
Energy production / Mining 28
Federal Govt—Military 29
Federal Govt—Other 30
Media / Publishing 31
Retail / Wholesale trade 32
Service industry (e.g., banking, real estate) 33
State/Local Govt.—Public Safety 34
State/Local Govt.—Other 35
Technology (including computers, software & telecom) 36
Transportation 37
Utility 38
Other 39

3. What is your current (or most recent) level within your organization? (Select only one)

Owner / Executive 40
Senior manager 41
Middle manager 42
Engineer 43
Technician 44
Factory / warehouse worker 45
Field worker 46
Office worker 47
Other 48

4. In the course of your job, do you (currently) recommend, specify, authorize or approve the purchase of electronics/communications equipment for your employer?

Yes 49
No 50

5. If you answered yes to Question 4, to what extent does the knowledge you gain through amateur radio influence your recommendations or decisions?

Frequently 51
Occasionally 52
Rarely 53
Never 54
Do not recommend or approve purchases 55

6. If you answered yes to Question 4, to what extent do the products you see in amateur radio magazines (such as *CQ*) influence your recommendations or decisions?

Frequently 56
Occasionally 57
Rarely 58
Never 59
Do not recommend or approve purchases 60

Thank you for your responses. We'll be back with more questions in upcoming issues.

Survey Response for Issue: _____

Name _____ **Call Sign** _____

Address _____

City _____ **St/Prov** _____ **Zip/PC** _____

Country _____

E-mail _____

BY TED MELINOSKY,* K1BV

Pennant Awards

Many years ago, it was simple. If you wanted to apply for the USA-CA award, you purchased the *CQ Counties Award Record Book* and laboriously made written entries into the booklet, and then if you wanted a record for yourself, copied the information or order two booklets) and mailed one to the award manager. The booklet was your guide, and since it didn't require signal reports or dates or times, it was a shorter task than it might seem. Those booklets were often on your desk or operating position for years at a time, a handy reference to look at to see it you needed the county. Ah, the good old days. And even today, believe it or not, about a third of US requests, and over 50% of foreign award requests, come to me using the little booklets. However, there now are other options, such as spreadsheets, word-processing lists, and eQSL data to keep track of the 3077 counties of the USA.

We want to provide the greatest flexibility possible so that you can find and use the record-keeping tool that best suits your needs. As such, I have written an online guide that lists each of the four approaches to making a good application. It covers:

a. All of your county QSOs are on eQSL.

b. All county QSOs are listed in the "official" *CQ* booklet.

c. QSOs are a combination "official booklet" and eQSL.

d. QSOs are a computer-prepared list.

Here's the link to the file, and I hope it will make the job of applying just a little less daunting for you: <http://www.dxawards.com/usaca/applying.htm>.

Some Pennants for Your Award Collection

Most awards are in the form of a paper document, printed by the sponsor, or nowadays, as a file printed by you. Plaques are a second form of the award, generally available for heavy-duty achievement.

There's a third variety of award called a "pennant," which is similar to a small decorative flag, made of cloth, to be displayed. It seems to be restricted to a small number of European awards that are not extremely hard to earn. They are somewhat rare, but not that difficult to earn. They are a great way to dress up the shack wall.

Get out your box of German cards. Contact stations in the German districts D, C, T, and U. You can find the stations in these districts by looking at the "DOK" code, shown on just about all German QSL cards. The ones you want will show: DOK D-01, T-30, etc. This is the designation of a club by the DARC, the German national organization.

Bavaria B-39 Ortsverband Helmbrechts Award Series

General Requirements: Contact stations in DARC districts D, C, T and U DOKs on or after 1 January 1984. SWL OK. Contacts may be made on HF or UHF/VHF/SHF, but not mixed. Cross-band contacts are valid, but only the lower value of the contact may be claimed. The same station may be worked on each band and mode. See each individual award for fee, as they differ. The fees are slightly higher than usual because the award is an elaborately embroidered pennant. Apply to: DARC-Ortsverband Helmbrechts, Award Manager

The Bavaria 1000 Award pennant.

USA-CA Honor Roll

500

HB9BQR	3613
K4LRX	3614
W7JET	3615

1000

HB9BQR	1845
IK2DZN	1846
K4LRX	1847

1500

K4LRX	1551

2000

K4LRX	1435

2500

K4LRX	1352

The total number of counties for credit for the United States of America Counties Award is 3077. The basic award fee for subscribers is $6.00. For nonsubscribers it is $12.00. To qualify for the special subscriber rate, please send a recent CQ mailing label with your application. Initial application may be submitted in the USA-CA Record Book, which may be obtained from CQ Magazine, 25 Newbridge Road, Hicksville, NY 11801 USA for $2.50, or by a PC-printed computer listing which is in alphabetical order by state and county within the state. To be eligible for the USA-CA Award, applicants must comply with the rules of the program as set forth in the revised USA-CA Rules and Program dated June 1, 2000. A complete copy of the rules may be obtained by sending an SASE to Ted Melinosky, K1BV, 12 Wells Woods Road, Columbia, CT 06237 USA. DX stations must include extra postage for airmail reply.

*12 Wells Woods Rd., Columbia, CT 06237
e-mail: <k1bv@charter.net>

Ferdinand Muller DL8NBJ, Waldweg 24, D-96369 Weissenbrunn, Germany..

Internet: <http://www.ov-b39.de/>

Bavaria 1000 Award. From each of the four Bavarian DARC Districts (all B, C, T, and U DOKs), work a minimum of 8 DOKs. SWL OK. Missing DOKs may be replaced by up to five Bavarian "Z" DOKs. These are Z13, 15, 16, 30, 42, 44, 51, 52, 57, 61, 64, 67, and 76.

Earn a total of 1000 points by the following values in this table:

Mode	VHF	UHF/SHF	HF
SSB	6	12	6
CW	10	20	10

For stations outside of Germany, the values in the above table should be doubled.

Fees: German stations send 17 Euros or $US19. Europeans send 18 Euros or $US20. All others send 19 Euros or $US21. Send appropriate fee plus a self-addressed label. Endorsement fee for single mode is 4 Euros, or $US5.

Note: The award is available in several levels, and only the first one, requiring 1000 points is shown. The other ones are similar, requiring 1500, 2000, and 5000 points. Details on the higher levels are found on the website shown above.

Sea of Peace Pennant (SOP)

The Sea of Peace Pennant award is one of those very rare awards that has been issued for at least 50 years. Very few awards last that long, and those usually are ones offered by the major clubs or national organizations. Basically, it requires QSOs during the month of July with those countries and parts of countries that border the Baltic Sea.

The DARC Sea of Peace pennant.

This is an interesting award that may be earned each year. Contacts must be made during the period 0000 UTC July 1 to 2400 UTC July 31 of each year. Year stickers are available since 1992. SWL OK.

Europeans need 15 points, 3 of which must be DL; DX need 10 points, 3 of which are DL. On VHF, 5 points are needed and a DL contact is *not* compulsory.

Point values:

a. each station in DARC District Mecklenburg-Vorpommern (all V-DOKs, Z87, Z89, "MCM", "MVP", "SOP") = 3 points,

b. all contacts with DL stations and stations in the following countries or districts count 1 point each: ES, LA, LY, OH1, OH2, OH5, OH6, OH8, OH9, OHØ (Aland Isl.), OHØM (Market reef), OJØ, OZ, R1/MV1, RA1, RA2, SM1, SM2, SM3, SM5, SM6, SM7, SMØ, SP1, SP2, YL.

All bands and modes. A special endorsement is available if you earn the award in each of 5 or 10 years.

GCR list and fees: DL 10 Euros or $US15, EU 12 Euros or $US17, all others: 15 Euros or $US20.

Endorsements: 4 Euros or $US6.

Apply to: Georg Tretow DL4SVA, Postfach 1114, D-23931 Grevesmuhlen, Germany.

E-mail: <DL4SVA@darc.de>

Internet: <http://www.mydarc.de/dl0sop/>

Lithuania VYTIS Radio Club, Pennant "VYTIS"

Back in August 2013, I provided the rules for a number of the VYTIS R.C. awards. Valery, LY2QT has just provided me with a sample of the only pennant in the club series, and it is a stunning work of art that is reasonably priced and a handsome example of this type of award. It is worth checking your Lithuanian QSLs for Siauliai. LY2ZZ and LY2QT have been active using special prefixes for several years now.

Contact (SWL OK) different LY stations located in the Siauliai Region (Siauliai city, Siauliai district, Radvilskis district, Pakruojis district, Kelme district, Joniskis district, Akmene district).

LY stations need 30, other EU need 20, DX need 7. Contacts on or after 1 January 1990 are valid. Cards not needed, just a GCR list. Fee is 5 Euros, $US7 or 6 IRCs (for LY stations, it is 10 Lt). Apply to: Valerijus Simulik LY2QT, PO Box 131, LT-78008 äiauliai-10, Lithuania.

Internet: <http://www.hamradio.lt/ dipl/dipl-vytis-rk.pdf>

We are always interested in learning of new awards for this column. Please contact me with any details; a URL on the internet would be fine. 73, Ted, K1BV

BY WAYNE MILLS,* N7NG

Working DX with a Modest Station

One of the great things about amateur radio is its diversity; there are so many different activities to keep us occupied. Many hams engage in public service and emergency communications (EmComm). Others revel in being able to make QSOs that reach out beyond the usual with equipment and antennas they built for their own stations—DXing. Sometimes DXing allows us to reach across many grid locators, and sometimes it enables us to reach across continents to the far corners of the Earth.

In this column and in this article, I am talking about *HF DXing*. What does it take to become an HF DXer? Although some of the same principles apply to DXing in other parts of the spectrum, *the premise here is how a casual operator can build a modest station capable of communication around the world.*

Of course, a question immediately arises: What is a modest station? Many of "us" who have been chasing DX for decades have built up our country totals *and* our stations as time has progressed. Many of us old-timers started with low power, 100 watts, and dipoles in the late 1950s, during sunspot Cycle 19. At that time, we didn't need much in the way of power or an antenna. When the sunspots disappeared, things changed. We opted for more radio power and more antenna power. The dipoles gave way to Yagis higher up in the air. As some of us began to work in contests, even bigger antennas and more power were necessary. Often we purchased new homes with antennas (and antenna restrictions) in mind. "Get a letter from the architectural committee" (HOA), we were warned by our real estate agents. As time went on, our interests and our desires grew.

My definition of a modest station is going to be oriented toward where I started: 100 watts, a dipole and tuner, or maybe a small beam at 30 feet. Indeed, many hams continue DXing with the same type of equipment they used when they started. They are often experimenters rather than the more common "appliance operators," and in time, some of these DXers have reached very respectable DX totals despite minimal stations. In the process, they often became "expert class" operators. Why? Out of necessity! They are true DXers, capable of working almost anything given time.

What is a Modest Station?

A modest station probably consists of something available for a relatively low cash outlay—perhaps used equipment—and a small antenna. Antenna size might be restricted by a homeowners' association or by property limitations. The station might consist of a 100-watt transceiver and a trap verti-

Jim Reisert, AD1C, of Brighton, Colorado, has worked over 280 countries since August 2008 using 100 watts, a half-size (indoor) G5RV, and his Hy-Gain AV-640 vertical.

*P.O. Box 1945, Jackson, WY 83001-1945
e-mail: <n7ng@cq-amateur-radio.com>

More Brands, More Products, Expert Advice

DX ENGINEERING®

Active Magnetic Loop HF Receiving Antenna

This 38 inch diameter loop antenna is designed for reception of MF and HF signals and includes a very high dynamic-range low-noise preamplifier. It can be mounted to a pole, mast, or any flat surface.

The magnetic loop responds primarily to the magnetic field while ensuring high rejection of nearby electrostatic field noise. Interference reduction is further enhanced by the deep nulls of the antenna's directivity pattern that can be used to null out or reduce interference coming from a specific localized direction. For permanent installation, you can use an inexpensive light duty antenna rotator to maximize the null.

- Very low IMD: works in both strong and weak signal environments
- Up to 30 dB rejection over electrostatic field antennas
- Primary Range: 100 kHz to 30 MHz
- Rejects power line noise
- Rugged construction
- No tuning necessary
- No HOA problems: low profile and works at ground level
- Adjustable output level to optimize output for your radio

PXL-RF-PRO-1B Magnetic Loop Antenna **$499.99**

MARK II Hexx 5-Band HF Beam Antenna Kits

- Pre-slit fiberglass—easy assembly
- Low noise results—approaches performance of closed loop antennas
- Patented, balanced weatherproof feeder system
- 11 foot turning radius, weighs less than 25 pounds
- Full gain on 20, 17, 15, 12, 10 meter bands
- Can be turned with a light duty rotor—save money
- Has full length elements
- Requires no matching network—direct single 50 Ω coax feed
- Good results at 20 to 30 feet above ground

DXE-HEXX-1HBP	Hub and Hardware	**$99.95**
DXE-HEXX-1SCP-2	Spreader & Center Post	**$199.95**
DXE-HEXX-1WRP-2	1-Band Element and Wire Guide	**$75.95**
DXE-HEXX-5WRP-2	5-Band Element and Wire Guide	**$149.95**
DXE-HEXX-5FFP	5-Band Rigid Feeder	**$194.95**
DXE-HEXX-1TAP-2	1-Band Total Antenna	**$367.95**
DXE-HEXX-5TAP-2	5-Band Total Antenna	**$599.95**

DX Engineering Ultra-Grip Crimp Connector Hand Tool Kit

Made precisely for coaxial and Powerpole® connectors, this kit is filled with the exact prep tools and dies you'll need to make full-ferrule connections. The kit comes with the Ultra-Crimp Tool, shears, braid trimmer, Allen wrench and case. It also includes crimp dies for RG-8U, RG-8X, LMR-400, and LMR-240 type cables, plus a crimp die for Powerpole 15A, 30A and 45A connectors.

The Ultra-Crimp Tool, interchangeable dies and specialized carrying case are also available separately.

DXE-UT-KIT-CRIMP	Complete Kit, 3 Die Sets	**$113.95**
DXE-UT-CRIMP	Crimp Tool for RG-8U/ LMR-400 Size Cable	**$38.95**
DXE-UT-CRIMP-8X	Crimp Tool for RG-8X/ LMR-240 Size Cable	**$38.95**
DXE-UT-CRIMP-PWR	Crimp Tool for Powerpole® 15, 30, 45A	**$38.95**

See DXEngineering.com for more accessories.

Amphenol® Connex

Crimp Connector	Connector	For Cable Type	Price
AMP-112116	BNC Male	RG-58/LMR-195	**$1.59**
AMP-112533	BNC Male	RG-8X/LMR-240	**$1.78**
AMP-172100	Type N Male	RG-58/LMR-195	**$4.01**
AMP-172102	Type N Male	RG-8/RG-213/RG-393	**$4.35**
AMP-172102H243	Type N Male	DXE-8U/DXE-400MAX/LMR-400	**$3.91**
AMP-172135	Type N Male	RG-8X/LMR-240	**$4.38**
AMP-182100	PL-259	RG-58/LMR-240	**$4.14**
AMP-182102	PL-259	RG-8/RG-213/RG-393	**$3.95**
AMP-182115-10	PL-259	RG-8X/LMR-240	**$4.50**
AMP-182130-10	PL-259	DXE-8U/DXE-400MAX/LMR-400	**$4.50**

Anderson Powerpole® Connectors

DXE-PP30	For 12-16 AWG, 30 Amps, 10 Pairs	**$12.95**
DXE-PP45	For 10-14 AWG, 45 Amps, 10 Pairs	**$17.95**

Remote Antenna Switches

- Best SWR and port isolation on the market
- 8-position switch and controller included
- Better than 1.1:1 SWR below 30 MHz

5 kW Key-Down RF Switch

- Better than 70 dB of port-to-port isolation
- High impact, copper coated thermoplastic housing

DXE-RR8B-HP-P2.....**$415.00**

10 kW Key-Down RF Switch

- Better than 60 dB of port-to-port isolation
- Weatherproof, RF shielded stainless steel housing

DXE-RR8B-SD-P2.....**$505.00**

COMTEK W2FMI Series Baluns

- Design inspired by Jerry Sevick W2FMI with modern improvements from DX Engineering's in-depth balun R&D
- Unique high voltage compensating capacitors for unequalled SWR bandwidth
- Typical insertion loss is less than 0.2 dB
- Power handling from 3 kW continuous to 7 kW intermittent, depending on model may be used to 54 MHz with reduced ratings
- All hardware is Stainless Steel. Studs are 1/4"-20
- COMTEK Baluns are sealed in a weatherproof 4" x 4" x 2" NEMA box which makes an excellent outdoor enclosure

COMTEK W2FMI Series Balun..... starting at **$56.95**

World-Class Products Shipped Worldwide, Every Day!

FREE STANDARD SHIPPING on orders over $99!
Limited-Time Offer! Details at DXEngineering.com

8:30 am to 4:30 pm ET Monday–Friday
1230 to 2030 UTC (March-October)
1330 to 2130 UTC (November-February)
Tech/International: **330.572.3200** Country Code: **+1**
Fax: **330.572.3279** Sale Code: **1312CQ**
Prices & specifications subject to change without notice.

DXENGINEERING.COM
800-777-0703

cal. It might even include a "stealth" antenna, invisible to the HOA investigators.

Such a station might also reflect a somewhat casual level of interest by the operator. Some years ago, I learned that one of the most popular types of HF antenna is the easy-to-erect trap vertical. To me, this suggests that there may be many more casual—or restricted—DX-interested operators in DX pileups than we might expect. This antenna won't make you first in line for a rare DX country, but with modest skill and perseverance, it will will get you in the log.

While still in school (on the West Coast) I worked quite a few new ones on 40-meter CW with the trap vertical on the roof of our apartment. (Our college professor neighbor was polite, but his AM radio wasn't too happy about that antenna on the roof right over his apartment.) For several years after grad school, I chased DX with that same old reliable 10–40 meter trap vertical, sometimes with no radials at all—whatever I could manage.

While we generally don't build transmitters and receivers as in days past, we often construct our own antenna systems. Verticals are good for working DX and they occupy little space in the backyard or "garden." Large systems of radials for a vertical can be a challenge to configure, but even many short radials can work effectively. If you have trees, there are even more possibilities. With trees, wire antennas are possible without having to erect supports. Of course, the higher the antenna, the better. Inverted-Vs, Inverted-Ls, and good old dipoles are very popular and effective. With directional wire antennas it can be very useful to have pairs of antennas oriented at right angles to each other. (It's no fun trying to work Africa from the East Coast with an antenna that is oriented toward Europe.)

How to Do It

In order to be successful at working DX, you first need goals. What are you trying to do? If you wish to chat with like-

The WPX Program

CW

3445.....UA9CNX	3457.....CT7/RC2A
3447.....JA4DNC	3458.....K4JKB
3451.....NY4G	3459.....AC4CA
3456.....I1FQH	3461.....HB9FBG

SSB

3371.....KG4HUF	3378.....YCØQR
3372.....VE3VTG	3379.....XE1AC
3375.....N8IL	3380.....N6PAT
3376.....W2GPS	

Mixed

2582.....GMØFSV	2589.....WVØQ
2583.....KG4HUF	2590.....KD6FW
2584.....WU9D	2593.....N8IL
2585.....KK4FYV	2595.....K4LRX
2586.....VE3VTG	2597.....HB9FBG
2587.....N4FNB	2598.....IZ2SVW
2588.....K7FRY	

Digital

233.....PY2RN	240.....NE3K
236.....DL6ZBN	241.....IZ2SVW
237.....GMØFSV	

CW: 350 JA4DNC, NY4G. 400 W2GPS. 500 DL6ZBN, LZ1MDU, AB7RW. 550 HB9FBG. 950 JE2UFF. 1100 AC4CA. 1700 KØARS. 4700 N6JV. 6350 K2VV.

SSB: 350 IW8QIE, W4MHA, W2GPS, YCØQR, N6PAT. 400 N4FNB, KD6FW. 450 PY5VC, K6VXI, GØMMI. 650 KG4HUF, K5BUD. 550 K2VV.

Mixed: 450 IW8QIE, VE3VTG, W4MHA, KD6FW, K6VXI. 500 PY5VC, WVØQ. 550 WU9D, GMØFSV. 600 HB9FBG. 650 KG4HUF. 700 NE3K. 750 DL6ZBN, W2GPS. 850 K5BUD. 1100 F4GTB. 1350 N7QU. 1500 K4HB. 1700 JE2UFF. 1750 K4LRX. 4700 N6JV. 7300 K2VV.

Digital: 350 IZ2SVW. 400 K5BUD. 650 KH6SAT. 1000 JE2UFF, F4GTB.

160 Meters: I1FQH, JE2UFF, W2GPS
30 Meters: F4GTB
20 Meters: KG4HUF, W2GPS, F4GTB
15 Meters: K5BUD
12 Meters: JJ2LPV

Asia: LZ1MDU
Europe: CT7/RC2A, KG4HUF, IW8QIE, VE3VTG, PY5VC, N4FNB, GMØFSV, W2GPS, N8IL, K5BUD, HB9FBG, IZ2SVW
North America: KG4HUF, PY5VC, N4FNB, NY4G, AB7RW, JE2UFF, W4MHA, KD6FW, K4LRX, NE3K

Award of Excellence Holders: N4MM, W4CRW, K5UR, K2VV, VE3XN, DL1MDD, DJ7CX, DL3RK, WB4SIJ, DL7AA, ON4QX, 9A2AA, OK3EA, OK1MP, N4NO, ZL3GO, W4BQY, IØJX, WA1JMP, KØJN, W4VQ, KF2O, WB8CNL, W1JR, F9RM, W5UR, CT1FL, WA4QMQ, W8ILC, VE7DP, K9BG, W1CU, G4BUE, N3ED, LU3YL/W4, NN4Q, KA3A, VE7WJ, VE7IG, N2AC, W9NUF, N4NX, SMØDJZ, DK5AD, WD9IIC, W3ARK, LA7JO, VK4SS, I8YRK, SMØAJU, N5TV, W6OUL, WB8ZRL, WA8YTM, SM6DHU, N4KE, I2UIY, I4EAT, VK9NS, DEØDXM, DK4SY, UR2QD, AB9O, FM5WD, I2DMK, SM6CST, VE1NG, I1JQJ, PY2DBU, HI8LC, KA5W, K3UA, HA8UB, HA8XX, K7LJ, SM3EVR, K2SHZ, UP1BZZ, EA7OH, K2POA, N6JV, W2HG, ONL-4003, W5AWT, N3XX, HB9CSA, F6BVB, YU7SF, DF1SD, K7CU, I1POR, K9LJN, YBØTK, K9QFR, 9A2NA, W4UW, NXØI, WB4RUA, I6DQE, I1EEW, I8RFD, I3CRW, VE3MS, NE4F, KC8PG, F1HWB, ZP5JCY, KA5RNH, IV3PVD, CT1YH, ZS6EZ, KC7EM, YU1AB, IK2ILH, DEØDAQ, I1WXY, LU1DOW, N1IR, IK4GME, VE9RJ, NN1N, HB9AUT, KC6X, N6IBF, W5ODD, IØRIZ, I2MQP, F6HMJ, HB9DDZ, WØULU, K9XR, JAØSU, I5ZJK, I2EOW, IK2MRZ, KS4S, KA1CLV, WZ1R, CT4UW, KØIFL, WT3W, IN3NJB, S50A, IK1GPG, AA6WJ, W3AP, OE1EMN, W9IL, I7PXV, S53EO, DF7GK, S57J, EA5BM, DL1EY, DJ1YH, KUØA, VE2UW, 9A9R, UAØFZ, DJ3JSW, OE6CLE, HB9BIN, N1KC, SM5DAC, RW9SG, WA3GNW, S51U, W4MS, I2EAY, RAØFU, CT4NH, EA7TV, W9IAL, LY3BA, K1NU, W1TE, UA3AP, EA5AT, OK1DWC, KX1A, IZ5BAM, K4LQ, KØKG, DL6ATM, VE9FX, DL2CHN, W2OO, AI6Z, RU3DX, WB9IHH, CT1EEN, G4PWA, OK1FED, EU1TT, S53MJ, DL2KQ, RA1AOB, KT2C, UA9CGL, AE5B, KØDEQ, DKØPM, SV1EOS, UAØFAI, N4GG, UA4RZ, 7K3QPL, EW1CQ., UA4LY, RZ3DX, UA3AIO, UA4RC, N8BJQ, UA3BS, UA9FGR, UT3UY, WA5VGI, UT9FJ, UT4EK, K9UQN, UR5FEO, LY2MM, N3RC, OH3MKH, RA3CQ, UT3IZ, S55SL, RU3ZX, YO9HP, RA3DNC, K8ZT, KE5K, JH8BOE, TF8GX, S58MU, UX1AA, AB1J, DM3FZN, AG4W, UA3QNS, RX3AGD, WB5JID, LY3W, LY5W, RW4WZ, VO1CV, VE1YX, DK8MCT, HB9DDO, DL4CW, W9RPM, IZ3ENH, DM2DXA, EY8MM, K4HB, K6ND, TF3Y, K4CN, W1RM, W3LL, 4Z1UF, W3UA, N8VV, HA8QC, LU5OM, US3IZ, RV9CX, K6UM, RWØLT, 4L1MA, UR1MI, IV3ARJ.

160 Meter Endorsements: N4MM, W4CRW, K5UR, VE3XN, DL3RK, OK1MP, N4NO, W4BQY, W4VQ, KF2O, W8CNL, W1JR, W5UR, W8ILC, K9BG, W1CU, G4BUE, LU3YL/W4, NN4Q, VE7WJ, VE7IG, W9NUF, N4NX, SMØDJZ, DK5AD, W3ARK, LA7JO, SMØAJU, N5TV, W6OUL, N4KE, I2UIY, I4EAT, VK9NS, DEØDXM, UR2QD, AB9O, FM5WD, SM6CST, I1JQJ, PY2DBU, HI8LC, KA5W, K3UA, K7LJ, SM3EVR, UP1BZZ, K2POF, IT9TQH, N6JV, ONL-4003, W5AWT, N3XX, F6BVB, YU7SF, DF1SD, K7CU, I1POR, K9LJN, YBØTK, K9QFR, W4UW, NXØI, WB4RUA, I1EEW, ZP5JCY, KA5RNH, IV3PVD, CT1YH, ZS6EZ, YU1AB, IK4GME, NN1N, W5ODD, IØRIZ, I2MQP, F6HMJ, HB9DDZ, K9XR, JAØSU, I5ZJK, I2EOW, KS4S, KA1CLV, KØIFL, WT3W, IN3NJB, S50A, IK1GPG, AA6WJ, W3AP, S53EO, S57J, DL1EY, DJ1YH, KUØA, VR2UW, UAØFZ, DJ3JSW, OE6CLD, HB9BIN, N1KC, SM5DAC, S51U, RAØFU, CT4NH, EA7TV, LY3BA, K1NU, W1TE, UA3AP, OK1DWC, KX1A, IZ5BAM, DL6ATM, W2OO, RU3DX, WB9IHH, G4PWA, OK1FED, EU1TT, S53MJ, DL2KQ, RA1AOB, UA9CGL, SM6DHU, KØDEQ, DKØPM, SV1EOS, N4GG, UA4RZ, 7K3QPL, EW1CQ, UA4LY, RZ3DX, UA3AIO, UA4RC, N8BJQ, UA3BS, UA9FGR, UT3UY, WA5VGI, UT9FJ, UR5FEO, N3RC, UT3IZ RU3ZX, YO9HP, RA3DNC, K8ZT, KE5K, JH8BOE, S58MU, UX1AA, DM3FZN, AG4W, UA3QNS, RX3AGD, LY3W, LY5W, VO1CV, HB9DDO, DL4CW, W9RPM, IZ3ENH, DM2DXA, EY8MM, K4HB, K6ND, W1RM, W3LL, 4Z1UF, W3UA, RV9CX, K6UM, UR1MI, IV3ARJ.

Complete rules and application forms may be obtained by sending a business-size, self-addressed, stamped envelope (foreign stations send extra postage for airmail) to "CQ WPX Awards," P.O. Box 355, New Carlisle, OH 45344 USA. Note: WPX will now accept prefixes/calls which have been confirmed by eQSL.cc. and the ARRL Logbook of The World (LoTW).

*Please Note: The price of the 160, 30, 17, 12, 6, and Digital bars for the Award of Excellence are $6.50 each.

The WAZ Program

12 Meters SSB
46.....K9EU

17 Meters SSB
54.....AG9S

12 Meters CW
77.....AG9S

15 Meters CW
354.....4Z5SG

17 Meters CW
101.....AG9S

160 Meters
430.....K9PPY (30 zones)
431.....UT9FJ (34 zones)
432.....W1FJ (31 zones)
433.....)E1TKW (31 zones)

All Band WAZ Mixed

9048.....W1EEB	9051.....K7EV
9049.....ES4RX	9052.....AAØAW
9050.....WX2S	9053.....OZ1BXM

SSB

5271.....IT9VNO	5272.....N9ISN

RTTY
242.....RW3LB

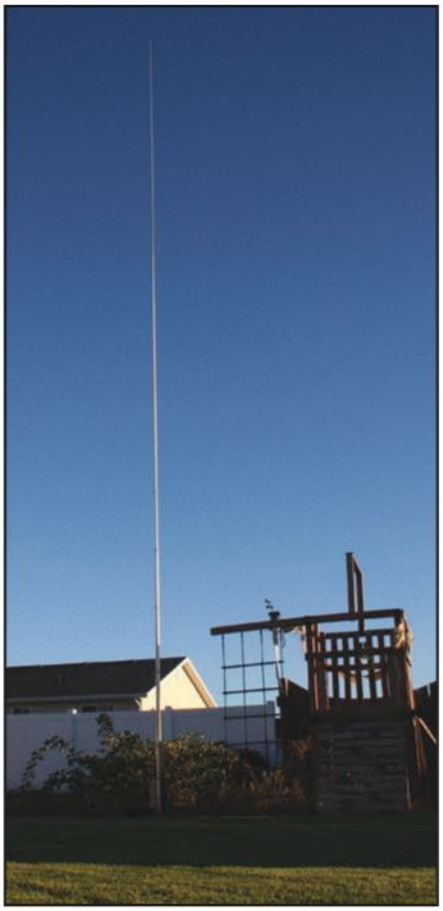
Rules and applications for the WAZ program may be obtained by sending a large SAE with two units of postage or an address label and $1.00 to: WAZ Award Manager, Floyd Gerald, N5FG, P.O. Box 449, Wiggins, MS 39577-0449. The processing fee for all *CQ* awards is $6.00 for subscribers (please include your most recent *CQ* mailing label or a copy) and $12.00 for nonsubscribers. Please make all checks payable to Floyd Gerald. Applicants sending QSL cards to a *CQ* checkpoint or the Award Manager must include return postage. N5FG may also be reached via e-mail: <n5fg@cq-amateur-radio.com>.

minded amateur radio operators in far-off lands, you won't need the efficient station that you would need if you were interested in more competitive DXing. For chatting, even with the most modest station, being patient and waiting for adequate band openings will usually bring success. If you wish to work for some of the various operating achievement awards, you will need to pay more attention to station design and operating ability.

DXers, especially casual DXers, should understand that most DX-capable stations need not be in "the competitive class." Charlie Mellen, W1FH, was the holder of the first postwar DXCC certificate, both 'phone and CW. Charlie ran "high" but not excessive power, and I was surprised that his antenna was a small three-element 20-meter Yagi on a modest tower near his house. Charlie was on a bit of a hill, and he was on the East Coast, yet he was on the top of the DXCC Honor Roll for many years. It was the same for Joe Horvath, W6GPB, in Marin County, California, north of San Francisco. During my early DXing years, Joe was on the Honor Roll using a not-too-high tribander and barely legal power. Today, you probably won't beat a successful contester in a pileup, but working DX isn't like contesting. You don't need to be first or second in the pileup. You just need to get in the log. Yes, it's fun to outsmart the big guns from time to time, but fortunately that doesn't always require a big station.

Note: Many rare and semi-rare countries are activated by DXpeditions. DXpeditions often work "by the [call area] numbers." This is one technique that DXpeditioners use to accommodate operators with modest stations. Many big-gun DXers don't like DXpeditions working by numbers, preferring to slug it out with their high-power competition, but for a DXpedition to a really rare place—if time is available—the DX ops will often work by the numbers. Continents are probably better, but the numbers can be very successful in getting right down to the 100-watt and indoor dipole guys.

Thus, the success of a modest station can be assisted by the DX stations. And why not? Many of these DXers might be in their early years of DXing. Some have spent a number of years working on their first 100 countries or are *still* working at it. We should encourage them. While many new DXers may have built up their stations quickly, many others cannot. Either for cost reasons or aesthetic reasons, they often



Gary Roberts, AG1T, uses this clean DX Engineering 43 foot MBVE-1 vertical. Gary has worked over 100 countries from his quarter acre lot in Nibley, Utah.

Bryon Densley, W7RIV, just replaced his vertical loop with this K4KIO hexagonal beam at 42 feet on a Force 12 LPT 1242 tower.

are restricted to small and more modest setups. That should not be a deterrent to becoming a DXer.

"Your Novice Accent—What To Do About It"

A second important aspect of being able to work DX with a modest station is being able to operate effectively. Simply put, the best way to be successful with a small station is to learn to be a good—or better—operator. In 1956, early in the life of the Novice Class license, there was an article in *QST* magazine called "Your Novice Accent—and What To Do About It," by Keith S. Williams, W6DTY. This article pointed out the "correct" procedures to be used by amateur radio operators. Though well-intended, this type of article tends to be a bit preachy.

First, the word "Novice" is a bad word. The Novice license is gone, so the connotation has changed. Articles such as Williams' also tend to be intimidating. How much should new or casual operators worry about their in-the-air procedure and others telling them how to operate? However, procedures should be of some concern, particularly in DXing. After all, rare DX on the bands will attract many operators to the same bit of spectrum. A high density of operators can, and often does, lead to difficulties. Many of the issues are different now, but there are a few procedures for DXers that are critical. DXing tends to bring together in a common venue operators with widely varying skills. Competitive activities such as golfing, groups competitors with others of like ability, while DXing tosses all DXers together into the same arena. Before one begins to get serious about DXing, it is a good idea to learn at least the basic skills that will "keep you out of trouble." Once you accomplish that, you will be free to learn the rest on your own.

Before you ever call a DX station—before you ever transmit—you need to know a few things. Where is the DX station transmitting? Of course, you need to hear the DX station. Once you hear the DX station, you must determine where (on what frequency) he is likely to be listening. Is he working split (transmitting on one frequency, listening on another)? You also need to guess where he is likely to hear you. Having answers to these questions, you have set the scene for making a QSO with the DX station. There is really only one critical directive here: *NEVER* transmit on the DX station's transmit frequency unless he is listening there. *Know where he is listening before you ever transmit.* In order not to transmit on the DX frequency, learn how to configure your radio's split operation. Everyone makes mistakes, but try to minimize them.

Other than not transmitting on the DX frequency, you don't have to worry about too much. Check the propagation; be active when it favors your area. Learn timing, when to call and when to listen. Perhaps the most important element in the DXers toolkit is listening: "Listen more, transmit less" is good advice. There are many aspects to good operating, many more than I can describe here.

These are all fertile areas to study. Much has been written on the topics, and I can recommend a couple of great books. One of the best is *The Complete DXer*, by Bob Locher, W9KNI. Another is Locher's *A Year of DX*. These two books describe a classic and modern style of DXing in a clear, tutorial way. They are excellent references for learning how to work DX effectively. (*Both are available from the CQ Bookstore—ed.*)

Once you have a station that is capable of putting at least some signal into the far reaches of the world, and you have a clear knowledge of how to put that signal to use, you will be able to work plenty of DX with your modest station. Knowing propagation, knowing which band to be on, knowing when to call—and when *not* to call—are all part of being a successful DXer. Be sure to be active when the conditions are good for your interests. Some of the best DXers in the world operate using low power and small antennas.

The DX University at the W9DXCC Convention and Banquet

Another DX University session was conducted at the W9DXCC bash in Chicago on September 20, 2013. The classes were attended by about 75 DXers who spent most of the day lis-

5 Band WAZ

As of October 1, 2013 1840 stations have attained at least the 150-zone level, and 908 stations have attained the 200-zone level.

The top contenders for 5 Band WAZ (zones needed on 80 or other if indicated): CHANGES shown in BOLD.

N4NX, 199 (26)
KØQC, 199 (26)
W4DC, 199 (24)
N4WW, 199 (26)
W4LI, 199 (26)
K7UR, 199 (34)
IK8BQE, 199 (31)
JA2IVK, 199 (34 on 40)
IK1AOD, 199 (1)
VO1FB, 199 (19)
KZ4V, 199 (26)
W6DN, 199 (17)
W3NO, 199 (26)
RU3FM, 199 (1)
N3UN, 199 (18)
W1FZ, 199 (26)
SM7BI, 199 (31)
LU4OM, 199 (34)
EA7GF, 199 (1)
JA5IU, 199 (2)
RU3DX, 199 (6)
N4XR, 199 (27)
HA5AGS, 199 (1)
JH7CFX, 199 (2)
W6OUL, 198 (37,40)
EA5RM, 198 (1,19)
N8LJ, 198 (17,24)
EA5BCX, 198 (27,39)
G3KDB, 198 (1,12)
JA1DM, 198 (2,40)
9A5I, 198 (1,16)
G3KMQ, 198 (1, 27)
N2QT, 198 (23,24)
OK1DWC, 198 (6, 31)
W4UM, 198 (18,23)
US7MM, 198 (2,6)
K2TK, 198 (23, 24)
K3JGJ, 198 (24,26)
F5NBU, 198 (19,31)
W9XY, 198 (22,26)
KZ2I, 198 (24,26)
W9RN, 198 (26,19 on 40)
W5CWQ, 198 (17,18)
UA4LY, 198 (6 and 2 on 10)
JA7XBG, 198 (2 on 80 & 10)
JA3GN, 198 (2 on 80 & 40)
N4GG, 198 (18,24)
K4JLD, 198 (18,24)
RA6AX, 199 (6 on 10)
RX4HZ, 199 (13)
S58Q, 199 (31)
K8PT, 199 (26)
N8AA, 199 (23)
IZ1ANU, 199 (1)
IN3ZNR, 199 (1)
JK1BSM, 199 (2)
RWØLT, 199 (2 on 40)
JA1CMD, 199 (2)
I5REA, 199 (31)
RZ3EC, 199 (1 on 40)
W1FJ, 199 (24)

The following have qualified for the basic 5 Band WAZ Award:

W6ENZ (194 zones)
NS6C (198 zones)
K7LY (180 zones)
KBØEO (195 zones)

5 Band WAZ updates:

None

***Please note: Cost of the 5 Band WAZ Plaque is $100 shipped within the U.S.; $120 all foreign (sent airmail).**

Rules and applications for the WAZ program may be obtained by sending a large SAE with two units of postage or an address label and $1.00 to: WAZ Award Manager, Floyd Gerald, N5FG, P.O. Box 449, Wiggins, MS 39577-0449. The processing fee for the 5BWAZ award is $10.00 for subscribers (please include your most recent *CQ* mailing label or a copy) and $15.00 for nonsubscribers. An endorsement fee of $2.00 for subscribers and $5.00 for nonsubscribers is charged for each additional 10 zones confirmed. Please make all checks payable to Floyd Gerald. Applicants sending QSL cards to a *CQ* checkpoint or the Award Manager must include return postage. N5FG may also be reached via e-mail: <n5fg@cq-amateur-radio.com>.

CQ DX Awards Program

CW

1147 .....US8UA 1148.....PY2KP

SSB

2614 .....US8UA 2615.....PY2KP

RTTY

65 .....US8UA 66.....PY2KP

The basic award fee for subscribers to *CQ* is $6. For non-subscribers, it is $12. In order to qualify for the reduced subscriber rate, please enclose your latest *CQ* mailing label with your application. Endorsement stickers are $1.00 each plus SASE. Updates not involving the issuance of a sticker are free. All updates and correspondence must include an SASE. Rules and application forms for the CQ DX Awards may be found on the <www.cq-amateur-radio.com> website, or may be obtained by sending a business-size, self-addressed, stamped envelope to CQ DX Awards Manager, Please make checks payable to the Award Manager, Keith Gilbertson. Mail all updates to Keith Gilbertson, KØKG, 21688 Sandy Beach Lane, Rochert, MN 56578-9604 USA. We recognize 341 active countries. Please make all checks payable to the award manager. Photocopies of documentation issued by recognized national Amateur Radio associations that sponsor international awards may be acceptable for CQ DX award credit in lieu of having QSL cards checked. Documentation must list (itemize) countries that have been credited to an applicant. Screen printouts from eQSL.cc that list countries confirmed through their system are also acceptable. Screen printouts listing countries credited to an applicant through an electronic logging system offered by a national Amateur Radio organization also may be acceptable. Contact the CQ DX Award Manager for specific details.

CQ DX Marathon Manager John Sweeney, K9EL talks to 75 DXers about "Station Software and DX Information" at a recent DX University Session at the W9DXCC Convention and Banquet in Chicago.

tening and watching six DXers present topics from antenna modeling to being DX. A spirited Q&A session finished up the day.

The W9DXCC Convention and Banquet is a great gathering. Of particular interest to me is its manageable size. Although attendance was up this year, it's still possible to meet and talk with all of your friends and acquaintances. The banquet speaker was Nobel laureate Joe Taylor, K1JT.

Items of Interest from Early October

Despite difficulties on Topband from the West Coast (!), the Italian DXpedition Team has again done an excellent job as TO2TT from Mayotte. See their website <http://www.i2ysb.com/idt/> for QSL information.

Calendar

Jan–Feb 2014: FT5ZM, Amsterdam Island (AF-002)
Mar–Apr 2014: VK9MT, Mellish Reef (OC-072)

Happy Holidays to all, and I hope the above information brings you good DX in the coming year.

73, Wayne, N7NG

CQ DX Honor Roll

The CQ DX Honor Roll recognizes those DXers who have submitted proof of confirmation with 275 or more ACTIVE countries. With few exceptions, the ARRL DXCC Countries List is used as the country standard. The CQ DX Award currently recognizes 341 countries. Honor Roll listing is automatic when an application is received and approved for 275 or more active countries. Deleted countries do not count and all totals are adjusted as deletions occur. To remain on the CQ DX Honor Roll, annual updates are required. All updates must be accompanied by an SASE if confirmation of total is required. The fee for endorsement stickers is $1.00 each plus SASE. (Stickers for the 340 level are available.) Please make checks payable to the Award Manager, Keith Gilbertson. Mail all updates to Keith Gilbertson, KØKG, 21688 Sandy Beach Lane, Rochert, MN 56578-9604 USA.

CW

OH2BN.....341
NØFW.....340
K2TQC.....340
WB4UBD.....340
K3UA.....340
N4JF.....340
K2FL.....340
WK3N.....340
W4OEL.....340
EA2IA.....340
N7FU.....340
K4IQJ.....340
K4MQG.....340
W8XD.....340
N7RO.....340
N5FG.....340
K4CN.....340
K9IW.....340
OK1MP.....340
N4AH.....340
F3TH.....340
DL3DXX.....340
K9MM.....340
K4CN.....340
K9BWQ.....340
WSSJLC.....340
W7CNL.....340
N4MM.....340
K9IW.....340
K5RT.....340
W5BOS.....340
N4NX.....339
K4JLD.....339
N5ZM.....339
K9IW.....339
W7OM.....339
YU1AB.....339
N4CH.....339
K7LAY.....339
K3JGJ.....339
K8LJG.....338
KA7T.....338
W7IIT.....337
K8SIX.....337
G3KMQ.....337
W6OUL.....336
PY2YP.....334
K9OW.....334
K1FK..... 334
K2OWE.....333
W4MPY.....333
K5UO.....333
N6AW.....333
HB9DDZ.....333
K7VV.....333
F6HMJ.....332
K6LEB.....331
N7WO.....331
W1DF.....331
WG5G/QRPp 330
JA7XBG.....329
K6YK.....329
IKSSADY.....328
W9IL.....327
KE3A.....326
K6CU.....326
KA3S.....325
EA5BY.....325
OZ5UR.....325
K8ME.....323
WD9DZV.....323
ON4CAS.....322
KSSKG.....320
W6YQ.....319
CT1YH.....317
EA3ALV.....316
RA1AOB.....314
WA4DOU.....313
YO9HP.....313
N2LM.....313
HB9DAX/QRP/p.....311
KT2C..... 306
K7ZM.....304
HA5LQ.....301
K8IHQ.....301
K4IE.....295
N3RC.....295
HA1ZH.....292
WA2VQV.....285
K7CU.....282
N2VW.....280
K4EQ.....280
4Z5SG.....276

SSB

XE1AE.....341
NØFW.....341
K6YRA.....341
IK1GPG.....341
K2TQC.....341
K4MZU.....341
DJ9ZB.....341
WB4UBD.....341
N4JF.....341
WK3N.....341
K4JLD.....341
N7BK.....341
EA2IA.....341
K4MQG.....341
K9MM.....341
K3JGJ.....341
N5ZM.....341
N7RO.....341
K4IQJ.....341
N5FG.....341
K4CN.....341
OZ3SK.....341
OK1MP.....341
N4CH.....341
DL3DXX.....341
OZ5EV.....341
DU9RG.....341
N4MM.....341
KE5K.....341
IN3DEI.....341
EA4DO.....341
YU3AA.....341
K9BWQ.....341
KZ2P.....341
W9SS.....341
VE2GHZ.....341
W7BJN.....341
AB4IQ.....341
VE1YX.....341
K8SIX.....341
W8ILC.....341
K5TVC.....341
I8KCI.....341
W5BOS.....341
K5RT.....341
K5OVC.....340
K3UA.....340
VE2PJ.....340
N4NX.....340
VE3XN.....340
W6BCQ.....340
K2FL.....340
W6DPD.....340
W7OM.....340
K9HQM.....340
KØKG.....340
YU1AB.....340
VE3MR.....340
VE3MRS.....340
K7LAY.....340
K7VV.....340
W4UNP.....340
K9IW.....340
K8LJG.....339
4Z4DX.....339
W7FP.....339
N7WR.....339
W2FKF..... 339
W3AZD.....339
K1UO.....339
F6HMJ.....339
W2CC.....339
W9IL.....338
K3LC.....337
VK2HV.....336
W4WX.....336
IØZV.....337
OE2EGL.....336
W4ABW.....336
EA3BMT.....336
IKØAZG.....336
W8AXI.....335
VK4LC.....335
WS9V.....335
AA4S.....335
PY2YP.....335
K9OW.....335
EA5BY.....335
XE1J.....335
OE3WWB.....334
N6AW.....334
IK8CNT.....334
CT3BM.....334
K8LJG.....334
HB9DDZ.....334
KE3A.....333
N2VW.....333
JA7XBG.....333
N5YY..... 333
K5UO.....332
K8ME.....332
WØYDB.....331
WA4WTG.....331
ZL1BOQ.....331
SV3AQR.....331
W6OUL.....331
CT1AHU.....329
N1ALR.....329
WØROB.....329
K7HG.....328
KD5ZD.....328
W1DF.....327
KE4SCY.....327
K6GFJ.....327
W9GD.....326
VE7SMP.....326
N2LM.....326
VE7EDZ.....325
F6BFI.....324
ON4CAS.....324
W4MPY.....323
TI8II.....321
YO9HP.....321
KW3W.....321
XE1RBV.....318
AD7J.....317
WD9DZV.....315
HB9DQD.....314
N8SHZ.....313
IV3GOW.....313
W6NW.....311
KU4BP.....311
AE9DX.....311
I3ZSX.....310
KA1LMR.....309
RA1AOB.....309
G3KMQ.....309
XE1MEX.....309
IØYKN.....307
XE1MW.....306
AA1VX.....305
W5GT.....305
K4IE.....305
K4ZZR.....305
K7ZM.....304
4Z5FL/M.....303
K7SAM.....302
KA8YYZ.....302
4X6DK.....298
N3RC.....298
K2HJB.....295
VE6MRT.....296
W9ACE.....291
W6MAC.....289
N3KV.....289
K7CU.....287
WD8EOL.....281
IZ1JLG.....282
IWØHOU.....277
WA5UA.....276
SQ7B.....275

RTTY

WB4UBD.....339
NI4H.....339
N5FG.....337
N5ZM.....336
OK1MP.....335
K4CN.....334
WK3N.....334
K3UA.....332
K8SIX.....325

BY GEORGE TRANOS,* N2GA

All Together Now

Integration is a hot buzzword today. In the business world, it refers to the process of getting people, ideas, processes, and machines working together toward a common goal. In society, it is the blending of disparate groups into one common whole. This can create a "melting pot" where different ideas can come together and create brand new, unexpected results. In amateur radio, we try to integrate the elements of our stations so they work together cohesively as a unit. In contesting, as in most things, the sum of your station's parts should exceed the value of the individual components. This should create a vibrant working station that can be used as a tool in the contesting battles on the air.

An important part of integration is the ability of the different pieces to be able to communicate with each other. Communication means exchanging information, having a rapport, or providing access. We do this routinely as hams through such things as this magazine article, e-mail, or speaking over the radio to someone across the world. When we try to integrate discrete components together into one working whole, those items must physically connect or be put together in a way that enhances the operating experience.

A simple example of this is the ability of your radio to connect to your computer. Two-way exchange is important because your logging program should be able to both read and change the radio's frequency and mode. This allows "clicking" on a DX-cluster spot and automatically setting the frequency in the current radio VFO while simultaneously putting the spotted callsign into the logging window. In order for all of this to occur seamlessly, your radio must be connected to your computer and it must be connected to the internet (or another DX-spotting network such as packet radio). (*Ed. note: Don't trust the callsign posted on a Cluster spot. Listen and confirm! A huge number of logging errors trace directly back to errors made in Cluster spot postings.*)

To the new ham or someone not familiar with setting up a contesting station, the process of what to do and how to do it can seem intimidating. Many top-notch contesting stations have extremely complicated switching, filtering, and accessories integrated in a way that provides fairly easy access to all of the station's capabilities. The connections, cabling, hardware, and software needed to make all of this work may come about from an ambitious plan or simple trial-and-error after years of development.

Goals

It all should start with asking yourself what your basic goals are. Will you be competing in a specific category such as single operator assisted or multi-multi? Is your interest primarily in DX con-

*P.O. Box 657, Copiague, NY 11726
e-mail: <n2ga@cq-amateur-radio.com>

Calendar of Events

All year	**CQ DX Marathon**	**http://bit.ly/vEKMWD**
Nov. 23-24	**CQ WW DX CW Contest**	**http://www.cqww.com/rules.htm**
Dec. 1	SARL Digital Contest	http://bit.ly/H0lqQf
Dec. 6–8	ARRL 160M Contest	http://www.arrl.org/160-meter
Dec. 7	TARA RTTY Melee	http://www.n2ty.org/seasons/tara_melee_rules.html
Dec. 7–8	Tops Activity Contest	http://www.yo2rr.ro/TAC%20Rules.html
Dec. 8	Ten-Meter RTTY Contest	http://bit.ly/16dB5MP
Dec. 7–8	AWA Bruce Kelley 1929 Memorial QSO Party	http://bit.ly/1dqJ5yQ
Dec 14–15	AWA Bruce Kelley 1929 Memorial QSO Party	http://bit.ly/1dqJ5yQ
Dec. 14–15	ARRL 10M Contest	http://www.arrl.org/10-meter
Dec. 15	QRP ARCI Holiday Spirits Homebrew Sprint	http://bit.ly/PH1goU
Dec. 20	AGB Party Contest	http://ev5agb.com/contest/agb_party.htm
Dec. 21	OK DX RTTY Contest	http://www.crk.cz/ENG/DXCONTE
Dec. 21–22	Croatian CW Contest	http://bit.ly/17oXd5t
Dec. 22	ARRL Rookie Roundup, CW	http://www.arrl.org/rookie-roundup
Dec. 26	DARC Christmas Contest	http://bit.ly/PGRHAT
Dec. 28	RAC Winter Contest	http://www.rac.ca/en/rac/programmes/contests/
Dec. 29	RAEM Contest	http://bit.ly/PGRWMg
Dec. 28–29	Original QRP Contest	http://bit.ly/17oXFRq
Dec. 28–29	Stew Perry Topband Challenge	http://bit.ly/1fm8UN1
Jan. 1	SARTG New Year RTTY Contest	http://www.sartg.com/contest/nyrules.htm
Jan. 1	AGCW Happy New Year Contest	http://bit.ly/PAcDvl
Jan. 4–5	ARRL RTTY Roundup	http://www.arrl.org/rtty-roundup
Jan. 4–5	EUCW 160m Contest	http://www.eucw.org/eu160.html
Jan. 24-26	**CQ WW 160M CW Contest**	**http://cq160.com/rules.htm**
Feb. 8-9	**CQ WW RTTY WPX Contest**	**http://bit.ly/uYC0gp**
Feb. 21-23	**CQ WW 160M SSB Contest**	**http://cq160.com/rules.htm**

Here's the finished operating table at N4UA. Everything fits and, so far, the layout seems about right. The ability to unlock the front two casters and roll the table out a few feet has come in handy one or two (dozen) times, and it does provide for a clean installation. "While I do not expect anyone to duplicate this table," says George, "I hope a few of the features will appeal to others. One non-radio accessory visible in this picture is the Ergotron dual-monitor arm. It's not inexpensive, but I highly recommend it; it's stable and it allows fingertip relocation of the monitors." (N4UA photos courtesy of George Dubovsky, N4UA)

N4UA's table features more horizontal equipment location and less vertical "stacking." The table is 8 feet wide and 30 inches deep, with one full-width 18-inch shelf above the radios. Notice the total-locking casters. These casters lock not only the wheel on the axle; they also lock the vertical axis of rotation. The table can be rolled away from the wall for access to the cables and backs of the equipment. Also, note the two small shelves underneath for power supplies and such.

what's new

HRD SOFTWARE LLC

Ham Radio Deluxe 6.1 Released

HRDSoftware, LLC has released version 6.1 of the Ham Radio Deluxe software suite. Ham Radio Deluxe is a multifunction software package for rig and antenna control, logging, digital modes, and more (see review of version 6.0, October *CQ*, page 46). Version 6.1 has added MMSSTV to its lineup of supported digital modes, expanded the "SuperSweeper" feature to include CW as well as RTTY and PSK, enhanced award-tracking functions and eliminated over 80 bugs from the previous version. The upgrade also includes added support for several new radios and accessories.

HRD Version 6.1 is free to purchasers of version 6.0 and $99.95 for everyone else. The price includes a year of support and additional upgrades. Continued support and upgrade services may be purchased after the first year for $49.95 per year. A free 30-day trial is available, with all features active.

The software may be downloaded directly from the company website—<http://www.ham-radio-deluxe.com>—or purchased from HRD dealers, including Ham Radio Outlet, GigaParts, Array Solutions, and Hub City.

Note: *"What's New" is not a product review and does not constitute a product endorsement by CQ. Information is primarily provided by manufacturers/vendors and has not necessarily been independently verified. The purpose of "What's New" is to inform readers about new products in the marketplace. We encourage you to do additional research on products of interest to you.*

testing? Will you be using two radios simultaneously (in a single-operator, two-radio [SO2R] setup)? These and other considerations should guide your station design and integration strategy.

Station Design

Your station should be designed around your stated goals. Obviously, if you are planning a big multi-operator, multi-transmitter operation, then you will need a large space that can fit many stations that all will be on the air at the same time. There will be other concerns besides the sheer number of operating positions. These include access to specific antennas, filters, and stubs to prevent interstation interference, sound reduction measures to keep the stations from disturbing each other, operator eating and sleeping facilities, etc.

For most contesters, these concerns are only for the big guns. Most little pistols can start out with a much smaller but still important set of considerations. The physical setup of your operating station could be a key factor in your easy access to commonly used functions. Two main pieces of that station are the operating table itself and the chair that you use. Both must be designed to maximize ease of use and time in the chair.

Speaking of which, sitting for long periods of time can be fatiguing and even painful. Having the right chair can mean the difference between winning and losing. You want something that is comfortable for long stretches and can be tailored to your specific ergonomic requirements. The seat should be of a material that feels good to sit on. You also should make sure that it is cool enough and provides enough airflow to avoid "monkey butt." As a motorcycle rider, I can tell you that I've sat on enough seats to know what's comfortable and what's not. While a soft seat may initially feel good, if it doesn't have enough support it may leave you sitting on its pan and after a while that can be quite painful. Try out a couple of different chairs and pick the one that feels best to you. See if you can adjust its height, seat angle, back angle, and arms (if any).

Even with the right seat, you might find that you want to shift position or even stand to operate for a bit. If your station is designed with this in mind, then changing position can provide relief to allow you to keep operating. Simply being able to adjust the monitor angle and keyboard height might be all you need to stand and type. An adjustable desk or shelf or a

The back wall has dedicated power outlets and a mains filter, all controlled by one master switch on the front leg. In addition, Dubovsky fabricated some wide aluminum hooks to aid in cable management.

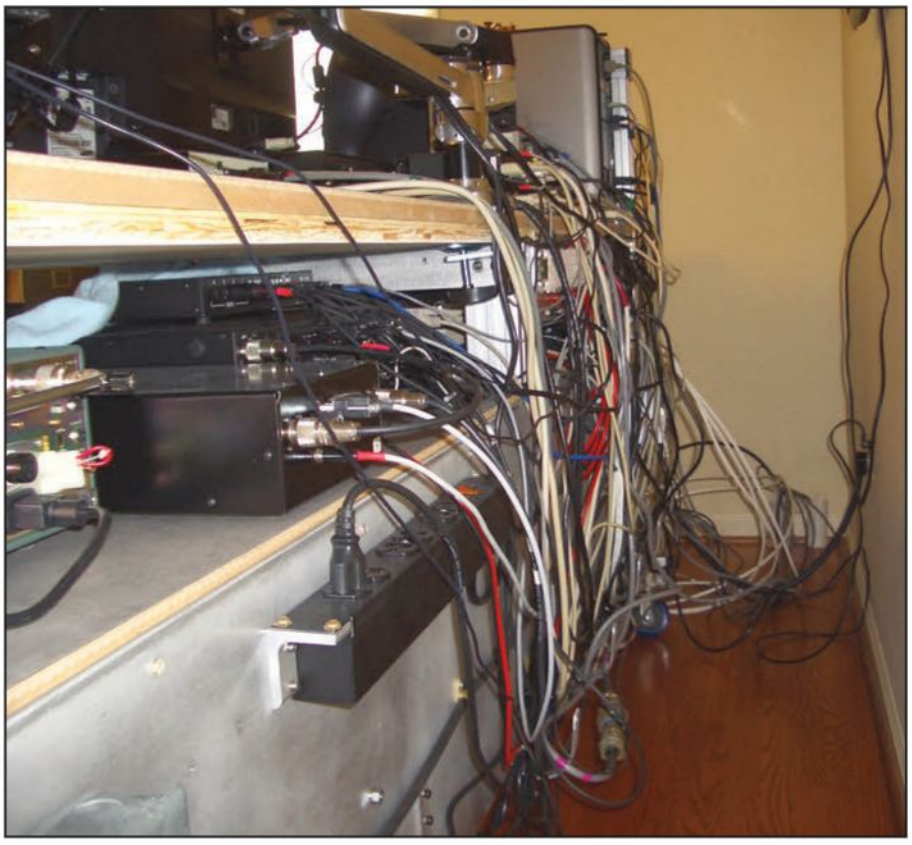
nearby higher table could also provide a good keyboard support.

Operating Table

The actual desk or operating table is an important component of your integrated contesting station. Determine what elements are important to you before setting up your station. Many of us just use the best available piece of furniture that we have and set up our station using it. This works fine on a temporary basis but may not be the best foundation for an optimal configuration. If you can, think long-term. What would you want your operating table to be able to do? What height should it be? What functions will it serve? Here are some things you might want to consider:

• What height should your table be? Most desks are 30 inches off the floor. Is this a comfortable height for you? You will spend many hours with your arms on the table, either tuning the radio or typing on a keyboard. Determine what your ideal height is and design your table to be most comfortable. If your computer monitor and keyboard are to be an important part of the station, you should also decide where they should be located. Proper ergonomics are an important part of comfort. Having the keyboard and monitor at the correct height allows comfortable sitting without neck or wrist strain.

• What things do you want at operating desk height? Most people have their transceiver readily accessible and at a comfortable height for tuning. Your computer monitor may be placed on the table or on a shelf that allows direct viewing. Consider a keyboard drawer as an option to sit under the operating



Here's the finished product with the cables and power management. The table can be pushed back against the wall when in use or away from the wall for servicing.

Here's a simple shack setup at N2MUN. Note the equipment stacking and close-in location of the important controls such as his rotator controller. (Photo courtesy Phil Lewis, N2MUN)

table. If you plan on operating SO2R, the positions of the two transceivers is important. Consider placing one on the left and one on the right with your monitor directly in between.

• How deep should the table be? The answer depends on what you will be putting on the table and how large your equipment physically is. Older radios and top-of-the-line transceivers just take up more room. Size your table accordingly.

• How many shelves should the table have and what is the height of each of them above the table? What accessories do you want located close to you and where should you put them? The answer to this question should help you determine the number of vertical shelves. You should have the most used accessories closest to you. Your antenna rotator, manual switches, and filters should be within arm's reach. An SO2R control box should also fall readily to hand. You also might consider adding a second computer monitor to display additional information or for multiple bandmaps when running SO2R or SO2V (single-operator, two VFOs).

• How to handle cables and wires? Access to these items can be difficult. Is there a way your new operating table can provide easier access and eliminate the "rat's nest" of wires that sometimes occurs? Hiding the cables behind the workbench is an option. A wiring loom or hooks can be hidden there or under the table.

• Where will the new table be placed? This will be a primary determinant of table size and shape. If you put the table against a wall, access to the wires, cables, and backs to the equipment becomes more difficult. You might want to leave room behind the table for access or put the table on wheels (or casters) to allow it to be rolled away from the wall to provide access to the back.

• What material will you use for the table? Wood, metal, or laminates all are good choices. The table edges should be rounded so that you don't chafe your arms when they are resting on the table. You might also want to put a soft mousepad-type material on the table top. There have also been instances in which operators have used glass on top of the table under which they can display operating aids such as country prefixes, band plans, multiplier lists, etc.

• Is there room for expansion? As your needs change, so will your table requirements. Have you allowed for future alterations? Your plan should be flexible so you can add or move shelves,

Here's the author's temporary operating table. The tabletop is handmade from red oak that was routed and then coated with polyurethane so the front edge is rounded not to chafe the arms. Note the keyboard drawer to allow typing at the correct height and the computer monitor located at an ergonomically correct eye level. Antenna selection is via an Array Solutions Six Pack with the controller mounted close to the operating position and the cable connection box mounted under the table. The antenna rotator is also within easy arm's reach. (Photo courtesy of N2GA)

This is the operating table at W2LK. Les operates SO2R using two Elecraft K3 radios. The empty space on the right is for the second K3 but the radio is at Elecraft at the moment. Also, the SPE 1K amp on the left will be on the right and an Alpha 9500 will be in that spot when the K3 gets back. (Photo Courtesy of Les Kalmus W2LK)

reposition equipment, and change things up if desired.

Making It All Work Together

After designing, building, and assembling your station, your first big test is operating that initial contest. If all goes as planned, your station will now feel more like a cohesive whole that works with you during the event. After the contest, take some time to analyze how everything worked together. Were you able to reach all of the equipment without straining? Was everything in optimal position? Could you change anything to make it better? Constant analysis and continual improvement will further your ability to stay in the chair, be less fatigued, and genuinely have more fun while contesting.

Today it seems that software glitches and computer hardware that stops performing its function create more problems than the actual RF side of the ham radio equation. Proper integration and placement of equipment, testing, and analysis will help you execute better. Good ergonomics, a comfortable working table and chair, plus good operator focus can lead to higher performance, better scores, and tangible results.

73, George, N2GA

propagation

BY TOMAS HOOD,* NW7US

Where Did She Go?

CQ WW DX CW Contest Conditions Look Great!

Good to Excellent Conditions Expected

Since this issue of *CQ* should reach most subscribers prior to the start of the 2013 CQ World-Wide DX CW Contest weekend of November 23–24, here is an updated forecast made at press time for the general propagation conditions expected. Based on the 27-day recurrence tendencies of solar and geomagnetic conditions, it continues to look like conditions Δ2 will be good to excellent on both days.

Daily 10.7cm solar flux levels are expected to be around 100 during the contest weekend. This is not the greatest news, if it holds true. The geomagnetic planetary *A*-index is expected to be about 5 on the both contest days, which will make the lower frequencies more productive.

Remember that at any time during the contest, if there are sunspots present, a flare may occur. When flares erupt, it could cause a radio blackout on the Sun-facing side of the Earth. These last between 10 to 60 minutes, depending on the strength and location of the flare. We don't expect any significant geomagnetic activity, however.

You finally have a few moments and decide to sit at your operating station. You're ready to try calling a general CQ, or maybe you're even more energetic and have decided to tap out your "CQ" on your favorite straight key. You have the radio nicely tuned, and the band has activity. You are tuning around, looking for a clear frequency, and you hear someone else calling, "CQ…"

You decide to answer. The other operator's signal is clear, and strong. When it is time to answer the call, you send your callsign several times and then turn it back over. Excellent! The other operator answers you, and tells you that she hears you very well. Now it is your turn, again.

You start by telling her your name, then your location, and then you tell her a bit about your weather and station. You then sign with your callsign and turn it back over for her to respond. And, you wait. You hear hiss. You wait a bit longer. Now you are wondering if you might have somehow offended her, or that perhaps she doesn't like the way you operate. You wait a bit longer. Then you call her and ask if she is still there. There's no reply. Just hiss.

What could have happened? You might think that the other operator was just being rude. It makes you wonder why you even bothered getting on the radio. The operators, these days!

However, could it be possible that she was called away by a family emergency? Perhaps her power went out. Or the antenna was cut!

I remember operating one Saturday, carrying on a nice conversation. The bands were solid, and the

*PO Box 27654, Omaha, NE 68127
e-mail: <nw7us@nw7us.us>

A Quick Look at Current Cycle 24 Conditions

(Data rounded to nearest whole number)

Sunspots
Observed Monthly, September 2013: 37
Twelve-month smoothed, March 2013: 58

10.7 cm Flux
Observed Monthly, September 2013: 103
Twelve-month smoothed, March 2013: 117

***Ap* Index**
Observed Monthly, September 2013: 5
Twelve-month smoothed, March 2013: 7

One Year Ago: A Quick Look at Solar Cycle Conditions

(Data rounded to nearest whole number)

Sunspots
Observed Monthly, September 2012: 62
Twelve-month smoothed, March 2012: 67

10.7 cm Flux
Observed Monthly, September 2012: 123
Twelve-month smoothed, March 2012: 127

***Ap* Index**
Observed Monthly, September 2012: 8
Twelve-month smoothed, March 2012: 8

LAST-MINUTE FORECAST

Day-to-Day Conditions Expected for December 2013

	Expected Signal Quality			
Propagation Index……	(4)	(3)	(2)	(1)
Above Normal: 1, 5-7, 12-14, 16-22, 24-28	A	A	B	C
High Normal: 4, 8-11, 15, 31	A	B	C	C-D
Low Normal: 2, 29	B	C-B	C-D	D-E
Below Normal: 3, 30	C	C-D	D-E	E
Disturbed: N/A	C-D	D	E	E

Where expected signal quality is:

A—Excellent opening, exceptionally strong, steady signals greater than S9.
B—Good opening, moderately strong signals varying between S6 and S9, with little fading or noise.
C—Fair opening, signals between moderately strong and weak, varying between S3 and S6, with some fading and noise.
D—Poor opening, with weak signals varying between S1 and S3, with considerable fading and noise.
E—No opening expected.

HOW TO USE THIS FORECAST

1. Find the *propagation index* associated with the particular path opening from the Propagation Charts appearing in *The New Shortwave Propagation Handbook* by George Jacobs, W3ASK; Theodore J. Cohen, N4XX; and Robert B. Rose, K6GKU.

2. With the *propagation index*, use the above table to find the expected signal quality associated with the path opening for any given day of the month. For example, an opening shown in the Propagation Charts with a *propagation index* of 3 will be excellent (A) on Dec 1, fair (C) to good (B) on the 2nd, poor (D) to fair (C) on the 3rd, etc.

3. As an alternative, the Last-Minute Forecast may be used as a general guide to space weather and geomagnetic conditions through the month. When conditions are Above Normal, for example, the geomagnetic field should be quiet and space weather should be mild. On the other hand, days marked as Disturbed will be riddled with geomagnetic storms. Propagation of radio signals in the HF spectrum will be affected by these conditions. In general, when conditions are High Normal to Above Normal, signals will be more reliable on a given path, when the path is ionospherically supported.

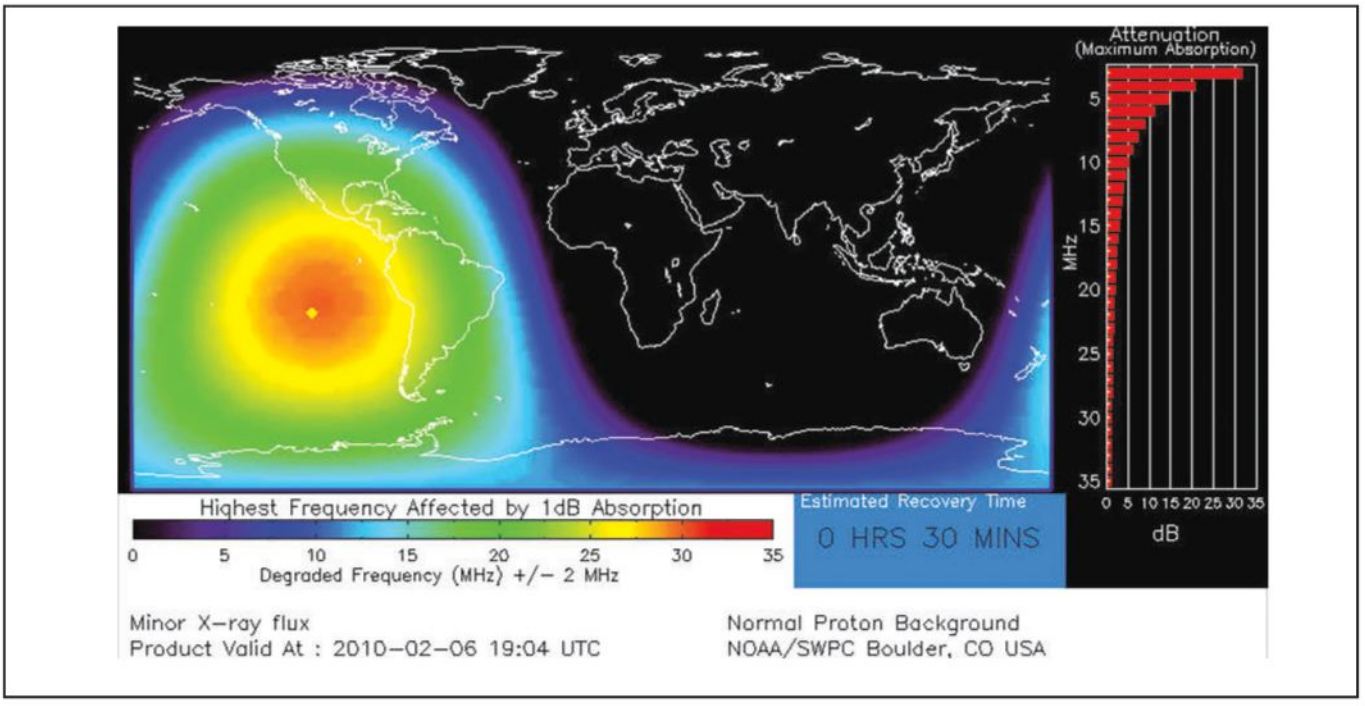


Figure 1. When X-ray flares occur, the D-region of the ionosphere becomes energized, causing radio blackouts. This is more pronounced on lower frequencies. The stronger the flare, the higher the frequency absorbed in the D-region. This graphic maps the sunlit region where such a blackout is occurring. The right scale indicates the severity of the blackout throughout the HF spectrum. This particular map corresponds to the M-class flare erupting at 1900 UTC on February 6, 2010. (Credit: Space Weather Prediction Center [SWPC]/The National Oceanic and Atmospheric Administration (NOAA)

conversation was already over a half of an hour long. All of the sudden everything went dead—no signal from the other operator. My radio was still working. I glanced out the window, and looking down from the second floor "radio shack," I glanced at my antenna. Amazingly, a moving truck that arrived at the neighbor's house was being driven between the houses,and had cut my antenna down! Snap! There was no way for me to let the other operator know that I was down for the count.

There could be another reason, however, why that another operator simply disappears in the middle of a conversation. If the radio signal is being propagated by way of the ionosphere, a number of conditions might occur that would effectively end a two-way radio communication.

Sudden Ionospheric Disturbances and Other Nuisances

Radio signals are susceptible to a variety of ionospheric disturbances. Some are well understood and can even be predicted with reasonable accuracy. Others occur in a more random nature and are harder to predict with any accuracy.

One of the most basic forms of ionospheric disturbances is driven by the solar flare. As you know from previous months when we explored solar flares, these X-ray flares produce enormous amounts of radiation. While most solar flares do not impact the state of the Earth's ionosphere with enough energy to cause wide-spread communications blockages, some flares with enough energy do cause short periods where communications via the ionosphere is impossible. When such a flare occurs, and the ionosphere no longer propagates a radio signal, this condition is known as a "shortwave fadeout," but more scientifically, a "Sudden Ionospheric Disturbance," or SID. SIDs may last anywhere from a few minutes to over an hour and are directly tied to the intensity of the flare, as well as how quickly the flare energy rises, peaks, and then fades.

Solar flare effects on the ionosphere are limited to the daytime only. When the Sun sets on the ionospheric *D*-region, the source of x-ray ionization disappears, which allows the *D*-region to return to normal conditions. For this reason, only radio signal paths that are illuminated by the Sun are susceptible to short wave fadeouts.

Radio signals are less susceptible to shortwave fadeouts on higher frequencies, because signal absorption is inversely proportional to the square of the radio frequency. Therefore, absorption on 1.8 MHZ is much higher for a signal that passes through the *D*-region than for a signal that has a frequency of 18 MHz.

If you want to monitor a world-wide map (see figure 1) that graphically illustrates the minute-by-minute *D*-region absorption condition as a function of a solar flare (in real-time), visit <http://SunSpotWatch.com> (it is about half-way down the main page). I have watched this map during large flares and confirmed the shortwave fadeout that was being displayed.

HF Propagation

The autumn DX season is in full swing! DXers throughout the Northern Hemisphere are actively chasing DX on 160 meters from all over North, Central, and South America, and from Europe and Asia. This is the season when it is easier to catch such difficult signals, because it is during this season when conditions are most favorable to propagation of this spectrum of the radio frequencies. High-frequency (HF) DX is hot, too, especially on the mid- to low-HF bands from early evening until late at night, and then again from early morning through high noon.

In the Northern Hemisphere, December 21 marks the start of winter, with the Sun sitting at its yearly southern-most point in the sky. This is the day with the shortest daylight period of the year for observers situated north of the equator. This is the Winter Solstice <http://en.wikipedia.org/wiki/Solstice>.

Long hours of darkness make for a less-energized ionosphere. Since the *D*-region of the ionosphere is less ionized during the winter, medium wave and the lower shortwave frequencies are less absorbed than during the summer season, so they can be better propagated by the *E*- and *F*-regions. Additionally, the seasonal decrease in weather-related noise makes it easier to hear the weaker DX signals on the lower frequencies. With thunderstorms few and far between, storm-related static and noise is greatly reduced.

Seasonally, the geomagnetic activity tends to quiet down during the winter months. The most active geomagnetic seasons are centered on the two equinoxes, in the spring and autumn. We are also in an apparent decline of the current solar cycle, and that means fewer flares may occur, and therefore, fewer if any SIDs—shortwave fadeouts. This results in more stable and reliable propagation on the shortwave spectrum, especially on the lower frequencies.

December is well enough past the autumnal equinox and the associated peak auroral activity to support transpolar propagation. With this overall reduction of geomagnetic activity and the decrease of radio signal absorption comes more stable high-latitude propagation. Mediumwave DXers (those on 160 meters) enjoy catching DX from all over North and South America, Europe, and Asia, perhaps even from locations that are situated in locations from where radio signals must propagate over paths that cross over the North Pole. For that matter, all HF DXing over high-latitude paths becomes exciting, even if the higher frequency bands might be marginal due to lower sunspot activity.

Fairly good DX openings are expected on 20 and 17 meters, remaining open

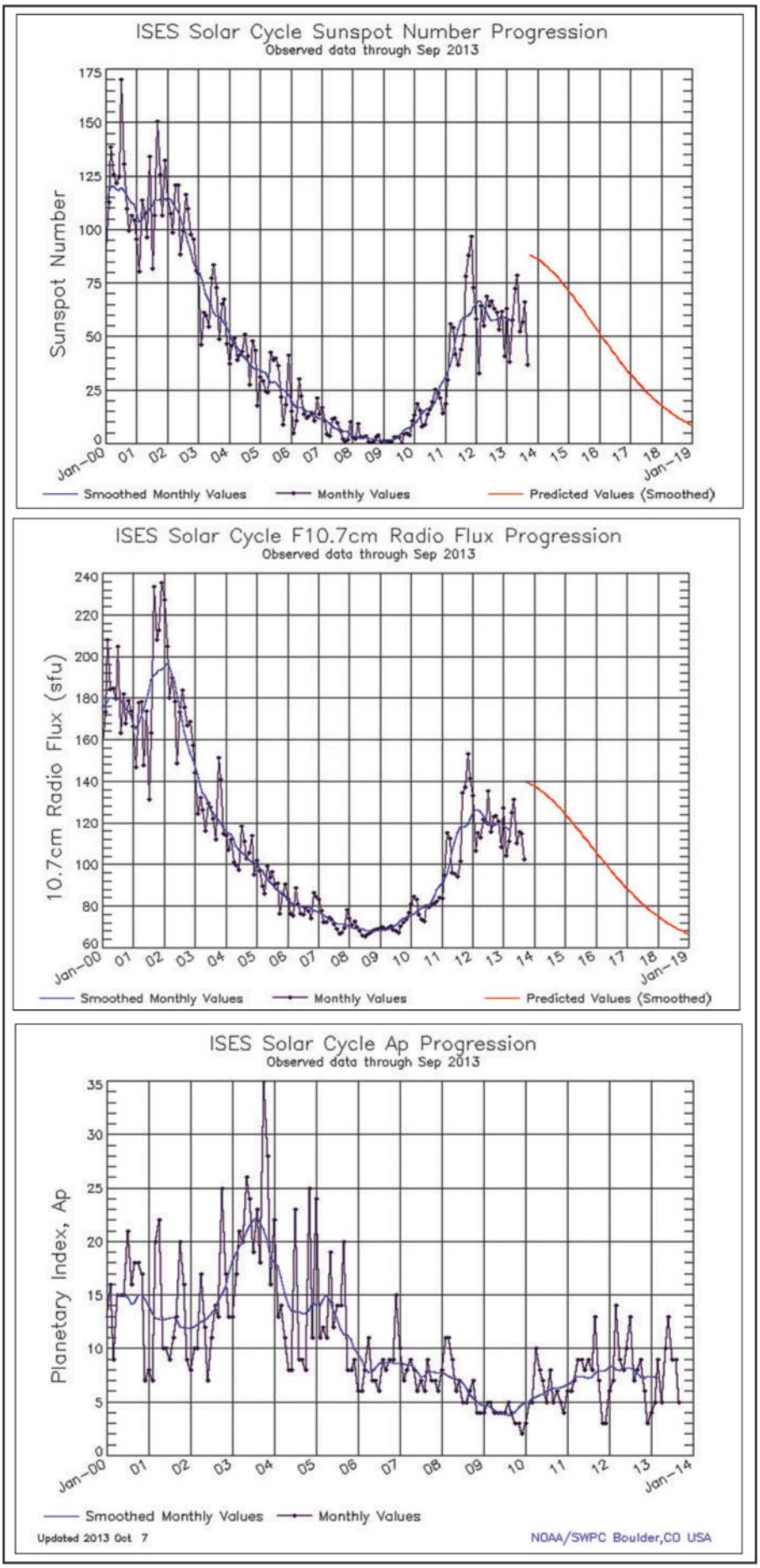


Figure 2. The plots of current Sunspot Cycle 24, as of September, 2013. A significant decrease in solar activity is seen in these charts. So far this cycle seems to be much weaker than a number of past solar cycles. One might postulate that the peak of this cycle has already passed. Magnetically, the Sun is showing signs of reversing polarity (where the North and South solar poles are reversed). (Credit: SWPC/NOAA)

toward the west during the early evening. Twenty meters will be the hottest daytime band, while 30 meters will become a close second for those using modes other than SSB. These openings start with early morning openings in all directions until about an hour or two after sunrise, and then remain open into one place or another through the day until early evening. When conditions are good (days with low geomagnetic activity, and higher sunspot activity), 20 and 17 meters are likely to remain open towards the south and west from early evening until about midnight.

Twenty meters will be an excellent band for medium distance (500 to 1500 miles) reception during the daylight hours, and longer distance reception (up to 2000 to 3000 miles) should be possible for an hour or two after local sunrise, and again during the late afternoon and early evening.

From midnight to sunrise, 40 and 30 meters promise some of the hottest nighttime DX during December. The first DX openings should be toward Europe and the east during the late afternoon, then move across the south through the hours of darkness, while remaining open into most parts of the world. Just after sunrise, openings will be more in a westerly direction. Low seasonal noise will make DXing a pleasurable endeavor.

For short-skip openings during December, try 80 through 40 meters during the day for paths less than 250 miles, and 80 meters as well as 160 meters at night for these distances. For openings between 250 and 750 miles, try 40 meters during the day, and both 80 and 160 at night. For distances between 750 and 1300 miles, 20 and 30 should provide daytime openings, while 40 meters as well as 80 meters remaining open for these distances from sunset to midnight. After midnight, 80 meters will remain open out to 1300 miles until sunrise. Try 30 and 40 meters again for about an hour or so after sunrise. For openings between 1300 and 2300 miles, openings will occur on 20 through 15 meters, with fewer on higher bands, during the daylight hours. During sundown to midnight, check 20 through 40 meters for these long-distance openings, and then check 40 down to 80 meters after midnight until sunrise. Try 40 and 30 meters again for an hour or so after sunrise.

DX openings on 160 and 80 meters during the hours of darkness and into the sunrise period, with considerably decreased static levels, are a sure bet during the longer hours of darkness in the northern latitudes. Look for openings toward Europe and the south from the eastern half of the United States and towards the south, the Far East, Australasia, and the South Pacific from the western half of the country. Eighty meters should peak toward Europe and in a generally easterly direction around midnight, and then open in a generally western direction with a peak just after sunrise. The band should remain open towards the south throughout most of the night.

Propagation on VHF and Above

Quite a bit of meteor shower activity is expected this month, and this should result in improved conditions for meteor-scatter openings on the VHF bands for distances up to about 1000 miles. When a meteor burns up in the atmosphere, its intense heat creates an ionized trail, making it possible for radio signals to propagate off the ionized trail much like they would off of the ionosphere. The annual *Geminids* meteor shower, which will appear from December 4 to December 17, will peak on December 14 at 0545 UTC. The maximum hourly rate typically reaches 80. However, this year, we are expecting 120 per hour.

Geminids is a great shower for those trying the meteor-scatter mode of propagation, since one doesn't have to wait until after midnight to catch this shower. The radiant rises early, but the best operating time will be after midnight local time. This shower also boasts a broad maximum, lasting nearly one whole day, so no matter where you live, you stand a decent chance of working some VHF/UHF signals off of a meteor trail. For a complete list of meteor showers in December, visit <http://www.imo.net/calendar/2013>.

A secondary seasonal peak in sporadic-*E* ionization should also result in some short-skip openings on low VHF between distances of about 800 and 1300 miles. A rare occurrence of aurora during days of stormy geomagnetic activity is possible, providing some unusual short-skip openings on low VHF.

There is considerably less likelihood for transequatorial (TE) VHF openings during December, but look for a possible opening between the southern states and locations deep in South America. The best time to look for these is between about 8 and 11 PM local time.

Don't forget to check out *CQ VHF* magazine for more details on VHF propagation and conditions. If you use Twitter.com you can follow @hfradiospacewx for hourly updates that include the *K*-index numbers. You can also check <http://sunspotwatch.com> for the latest numbers.

Current Solar Cycle Progress

The Royal Observatory of Belgium, the world's official keeper of sunspot records, reports a monthly mean sunspot number of 36.9 for September 2013, a large dip from 66.0 in August, the weakest month since February 2013 (32.9). The low for the month was 9 on both September 9 and 15. The high of 61 occurred on both September 2 and 20. The mean value for September results in a 12-month running smoothed sunspot number of 57.5 centered on March 2013. Following the curve of the 13-month running smoothed values, a smoothed sunspot level of 76 is expected for December 2013, plus or minus 14 points.

Canada's Dominion Radio Astrophysical Observatory at Penticton, British Columbia reports a 10.7-cm observed monthly mean solar flux of 102.7 for September 2013, also a large dip from 114.7 for August, and the lowest since August 2011 (101.7). The twelve-month smoothed 10.7-cm flux centered on March 2013 is 117.1. A smoothed 10.7-cm solar flux of about 130 is predicted for December 2013.

The geomagnetic activity as measured by the planetary *A*-index (*Ap*) for September 2013 is 5, a bit more quiet that 9 for August. The 12-month smoothed *Ap* index centered on March 2013 is a steady 7.4. Geomagnetic activity should be much the same as we have had during November. Refer to the Last-Minute Forecast for the outlook on what days that this might occur (remember that you can get an up-to-the-day Last-Minute Forecast at <http://sunspotwatch.com> on the main page).

I welcome your thoughts, questions, and experiences regarding this fascinating science of propagation. You may e-mail me, write me a letter, or catch me on the HF amateur bands. Please come and participate in my online propagation discussion forum at <http://forums.hfradio.org/>. If you are on Facebook, check out <http://www.facebook.com/spacewx.hfradio> and <http://www.facebook.com/NW7US>. Speaking of Facebook, check out the CQ Amateur Radio Magazine fan page at <http://www.facebook.com/CQMag>.

I'll be keeping my ears to the radio, hoping to hear you on the air. Happy DX! 73, Tomas, NW7US

CQ Index 2013

advertisers' index

including website addresses

ham shop

Advertising Rates: Non-commercial ads are 20 cents per word including abbreviations and addresses. Commercial and organization ads are $1.00 per word. Boldface words are $1.50 each (specify which words). Minimum charge $2.00. No ad will be printed unless accompanied by full remittance. All ads must be typewritten double-spaced.
Closing Date: The 10th day in the third month preceding date of publication (example: Jan. 10th for the March issue). Because the advertisers and equipment contained in Ham Shop have not been investigated, the Publisher of *CQ* cannot vouch for the merchandise listed therein. The publisher reserves the right to reject any advertisement. Direct all correspondence and ad copy to: CQ Ham Shop, 25 Newbridge Road, Hicksville, NY 11801 (fax: 516-681-2926; e-mail: <hamshop@cq-amateur-radio.com>.

"QRZ DX"—since 1979: Available as an **Adobe PDF file** each Wednesday or by regular mail. Your best source for weekly DX information. Send #10 SASE for sample/rates. **"The DX Magazine"—since 1989:** Bi-monthly – Full of DXpedition reports, QSL Information, Awards, DX news, technical articles, and more. Send $3.00 for sample/rates. DX Publishing, Inc., P.O. Box DX, Leicester, NC 28748-0249. Phone/Fax: 828-683-0709; e-mail: <DX@dxpub. com>; <http://www.dxpub.com>.

At **www.HamRadioExpress.com** we know you can't afford to waste time looking for Ham Radio Antennas & Accessories. With **over 3,000 products in our four warehouses**, you can rely on **Ham Radio Express** to have the parts you need, in stock, especially those special, hard-to-find parts, fixed station antennas, baluns, mobile antennas, mobile antenna mounts, accessories, and RF connectors. **Custom Built Cable Assemblies** for your Packet TNC/KPC to radio interface devices. We stock interface cables for all amateur radio makes and models: AEA, Kantronics, MFJ, PacComm, and more Packet Controllers. All cables are in stock or can be built in one day. All cable assemblies are double-checked before they are shipped. Toll-Free Order Lines: M–F 9 AM to 4 PM: **1-800-726-2919** or **1-866-300-1969**; Fax **1-434-525-4919**. **Help and Tech Support:** *Not sure what model you need?* At **www.HamRadioExpress.com** our Technical Support staff (1-434-632-7028, 9 AM to 4 PM weekdays) can help you decide what you need, and all available for same-day shipment. Online visit: **www.HamRadioExpress.com**

MAUI, HAWAII: vacation with a ham. Since 1990. <www.seaqmaui.com>, telephone 808-572-7914, or <kh6sq@seaqmaui.com>.

REAL HAMS DO CODE: Move up to CW with **CW Mental Block Buster III.** Succeed with hypnosis and NLP. Includes two (2) CDs and Manual. Only $29.95 plus $7.00 s/h US. FL add $2.14 tax. Success Easy, 568 SE Maple Terrace, Port St. Lucie, FL 34983, phone 561-302-7731, <www.success-is-easy.com>.

TWO NEW NOVELS involving ham radio: *Full Circle*, and *Frozen in Time,* by N4XX. Visit <http://www.theodore-cohen-novels.com/>.

QSLing SUPPLIES. e-mail: <plumdx@msn.com>.

WWW.PEIDXLODGE.COM

CASH FOR COLLINS, HALLICRAFTERS SX-88, & DRAKE TR-6. Buy any Collins equipment. Leo, KJ6HI, phone/fax 310-670-6969, e-mail: <radioleo@earthlink.net>.

www.SecondHandRadio.com

MicroLog by WAØH
Free download . . . www.wa0h.com

LOOKING GREAT on the wall behind your equipment. <www.hamradioprints.com>

OVERSEAS AIRMAIL POSTAGE plus complete line of airmail envelopes. Order directly from our website. James E. Mackey, proprietor. website: <www.airmailpostage. com>

ARUBA RADIO RENTAL: www.p49v.com

TOWER ACCESSORIES Gin Pole Kits – stand off brackets – antenna mounts – vehicle radio mounts – for 30 years. IIX Equipment Ltd., 708-337-8172, <http://www.w9iix.com/>.

HOMEBREW! "Recollections of a Radio Receiver" a 565 page book on HBR homebrew receivers. $10 delivered (eBook on CD-ROM). Details <www.w6hht.com>

WANTED: VACUUM TUBES – Commercial, industrial, amateur. Radio Daze, LLC, 7620 Omnitech Place, Victor, NY 14506 USA (phone 585-742-2020; fax 800-456-6494; e-mail: <info@radiodaze.com>).

ARMS – Amateur Radio Missionary Net. Christian Fellowship Net, Everyone Welcome. 14.3075 Daily except Sunday 1500–1700Z, –1 Hr DST. Website: www.qsl.net/arms

NEAT STUFF! DWM Communications: <http:// qth.com/dwm>

VORTEX ANTENNA SYSTEMS specialist in HF and VHF high performance antennas. Yagis and Delta Loops. Linear Loaded 30 and 40m Arrays. OWA Arrays, bespoke individual design solutions. Antenna related hardware. We ship worldwide including North America. <www.vortexantennas.co.uk/>. or by e-mail to <enquiries@vortexantennas.co.uk>.

WANTED: HAM EQUIPMENT AND RELATED ITEMS. Donate your excess gear—new, old, in any condition—to the Radio Club of Junior High School 22, the Nation's only full time non-profit organization working to get Ham Radio into schools around the country as a teaching tool using our EDUCOM—Education Thru Communication—program. Send your radio to school. Your donated material will be picked up ANYWHERE or shipping arranged, and this means a tax deduction to the full extent of the law for you as we are an IRS 501(c)(3) charity in our 32nd year of service. It is always easier to donate and usually more financially rewarding, BUT MOST IMPORTANT your gift will mean a whole new world of educational opportunity for children nationwide. Radios you can write off; kids you can't. Make 2013 the year to help a child and yourself. Write, phone, or FAX the WB2JKJ "22 Crew" today: The RC of JHS 22, P.O. Box 1052, New York, NY 10002. Twenty-four hours call 516-674-4072; fax 516-674-9600; or e-mail <crew@wb2jkj.org>. Join us on the WB2JKJ Classroom Net, 7.238 MHz, 1200–1330 UTC daily and 21.395 MHz from 1400 to 2000 UTC.

IMRA-International Mission Radio Assn. helps missioners—equipment loaned; weekday net, 14.280 MHz, 1:00–3:00 PM Eastern. Sr. Noreen Perelli, KE2LT, 2755 Woodhull Ave., Bronx, NY 10469.

"World of Keys – Keys III" book features highly detailed views and photos of keys, bugs, and paddles like few people have ever seen ($18)!. Also still available, **"Keys II"** ($16) and **"QRP Romps!"** ($18), plus **"Your Guide to HF Fun"** ($16). Available from dealers nationwide.

PACKET RADIO AND MORE! Join TAPR, connect with the largest amateur radio digital group in the U.S. Creators of the TNC-2 standard, working on Software Defined Radio technology. Benefits: newsletter, software, discounts on kits and publications. For membership prices see the TAPR website: <http://www.tapr.org>).

www.oldqslcards.com

DXPEDITION DVD VIDEOS: For full description and how to order . . . <www.k4uee.com/dvd/>.

www.isotronantennas.com FOR HF. CHECK IT OUT! Call: 719-687-0650; **<wd0eja@isotronantennas. com>**

HAWAII DX VACATION: SteppIR antennas, amplifiers, private. KH6RC, <www.leilanibedandbreakfast.com>.

SMART BATTERY CHARGERS: 5A model for larger deep cycle down to 1/4A model for smaller QRP lead acid batteries. <www.a-aengineering.com>

HONDURAS DX VACATION: K3, Alpha 86, SteppIR, Meals, Private Facilities. HR2J, (206) 259-9688.

HY POWER ANTENNA COMPANY <http://www.freewebs.com/hypower> Multiband dipoles, delta loops, half squares and QRP antennas.

NEW AMATEUR RADIO MAP with DXCC list updates. Full color 22 x 34" – $10. Free shipping on club orders. **http://www.hamradiomap.qth.com/**

COLLINS . . . Owners of Collins 30S-1 amplifiers. Very rare. K201, K202, and K203 relays now available. Newly manufactured – not NOS. We ship overseas. More info on **www.collinsradioactive.com**

DISPLAY YOUR CALL SIGN IN NEON. To order call 1-401-846-0294, Duncan DeSigns

YAGIS DESIGNED BY WA3FET/K3LR: Bust pileups using these proven DX and Contest winning "Ultimate OWA Yagis"! Learn more and request free PDF catalog at www.SuperBertha.com or call 814-881-9258.

<http://www.vintagehamshack.com>

ROTATING MONOPOLE TOWERS: SuperBertha . . . BudgetBertha . . . No guy wires, Entire pole rotates, Ground level rotor. Stack and rotate all your antennas at optimum heights on one monopole. The Ultimate antenna system! Learn more and request free PDF catalog at www.SuperBertha.com or call 814-881-9258.

WWW.KM5KG.COM

HAM TRAVELERS Discount travel, tours, cruises, more. **www.GreatExpectationTravel.com**

PROMOTIONAL VIDEO: 15-minute DVD describes amateur radio's fun and public service. Details: <www.neoham.org>.

WANTED: OLD QSL CARD COLLECTIONS. Collector seeks US & DX cards. W2VRK, 9 Laird Terrace, Somerset, NJ 08873; e-mail: <tpllrs@comcast.net>.

TELEGRAPH KEY INFORMATION AND HISTORY MUSEUM: <http://w1tp.com>

HAM RADIO GIFTS: <www.mainestore.com>

FT243 AND HC6U CRYSTALS: www.af4k.com

ROTATING GUYED TOWERS AND ORBITAL RING ROTORS: Rotating bases, Rotating guy rings, Orbital ring rotors. For 45G, 55G, or Custom. Learn more and request free PDF catalog at www.SuperBertha.com or call 814-881-9258.

FREE 2-meter Repeater Frequencies for Travelers by Western Trucker: **USREPEATERS.ORG**

CHECK SPOTS; log contacts; manage QSLs, LoTW with DXtreme Station Log: <http://www.dxtreme.com/>.

FUTURE TIMES: Dreams and visions of Disasters. Great guide book for Hams. www.xlibris.com/futuretimes.html

OLD QSLs Available. 50's and 60's, DX and USA. Specify call, send SASE. W5SQA@arrl.net

HAM RADIO PARADISE in the Pacific (NA-072) for sale. See www.qsl.net/hp1vxh and e-mail to contadora@gmx.de

RFI Filters <www.RFchoke.com>

QRP KITS: <www.breadboardradio.com>

SOTA BEAMS: <http://www.sotabeams.co.uk>. G3CW

CRANK-A-WATT Power & More via KE5NYS. Visit <www.FactorReady.com>

HAM RADIO CLUB WEBSITES & NEWSLETTERS: Domain names, websites, email, newsletters, logos and club marketing aids. Newsletters customized for your club. So affordable any size club can now have a professional newsletter. http://www.HamRadioWebsites.Net (503-717-3484)

FMTV ARTICLES: Comprehensive transmitter and receiver deviation calibration, standards, intermodulation, power amplifier calculations. WB9OQM, http://mathison.freeshell.org

advertiser's index

including website addresses

HamTestOnline	28	www.hamtestonline.com
Hy-Gain	9	www.hy-gain.com
ICOM America, Inc	17	www.icomamerica.com
Impulse Electronics.com	53	www.ImpulseElectronics.com
J-Tron, LLC	101	www.j-tron.com
Jim's Engraving	20	www.jimsengraving.com
KIØBK	75	http://ki0bk.no-ip.com
KJI Electronics	59	www.kjielectronics.com
Kenwood U.S.A. Corporation	Cov. II	www.kenwoodusa.com
LDG Electronics, Inc.	85	www.ldgelectronics.com
LightBeam Antenna	99	www.LightBeamAntenna.com
M² Antenna Systems, Inc.	51	www.m2inc.com
MFJ Enterprises, Inc.	11,33	www.mfjenterprises.com
Morse X-Press	28	www.MorseX.com
Orlando Hamcation	77	www.hamcation.com
PowerPort	35	www.powerportstore.com
QCWA	109	www.qcwa.org
R.F. Connection	101	www.therfc.com
RF Parts	21	www.rfparts.com
RT Systems	43	www.rtsystems.com
RemoteHamRadio	53	www.remotehamradio.com
SteppIR Antennas Inc.	56,57	www.steppir.com
TG Electronics	59	www.tgelectronics.org
Tac-Comm	41	www.tac-comm.com
Ten-Tec, Inc.	65	www.tentec.com
Ten-Ten International Net, Inc.	65	www.ten-ten.org
Tropical Hamboree	54	http://hamboree.org
XTAL SET SOCIETY, THE	109	www.midnightscience.com
Timewave Technology, Inc.	73	www.timewave.com
Vibroplex	41	www.vibroplex.com
W&W Mfg	32	ww-manufacturing.com
W2IHY Technologies	77	www.w2ihy.com
W4RT Electronics	55	www.w4rt.com
W5YI Group	25,67	www.w5yi.org
West Mountain Radio	37	www.westmountainradio.com
Wireman, The	75	www.thewireman.com
Yaesu	6,7,Cov IV	www.yaesu.com

Let CQ help you get the most for your advertising dollar.
contact Jonathan Kummer at 516-883-1641, Fax 516-883-1077
e-mail: Jon.Kummer@cqcomm.com
Please direct editorial and subscription questions to (516) 681-2922

Sale Ends 12/31/13

Magazines at holiday prices!

CQ Amateur Radio

CQ's editorial content is aimed squarely at the active ham. Within each issue, *CQ's* features and columns cover the broad and varied landscape of the amateur radio hobby from contesting and DXing to satellites and the latest digital modes. *CQ* includes equipment reviews, projects, articles on the science as well as the art of radio communication and much, much more.

Holiday Special! ***Print Edition***

Domestic Rates: 1 year ~~$39.95~~ ***$36.95*** - 2 yrs ~~$79.95~~ ***$66.95*** - 3 yrs ~~$109.95~~ ***$96.95***

Canada/Mexico: 1 year ~~$54.95~~ ***$49.95*** - 2 yrs ~~$99.95~~ ***$92.95*** - 3 yrs ~~$149.95~~ ***$135.95***

Foreign: 1 year ~~$69.95~~ ***$61.95*** - 2 yrs ~~$129.95~~ ***$116.95*** - 3 yrs ~~$179.95~~ ***$171.95***

Add a CQ DIGITAL Edition sub to your Print sub at a special rate: ***1 yr $16; 2 yrs $30; 3 yrs $43***

Purchase a CQ DIGITAL Edition Subscription ONLY ***- 1 yr $26; 2 yrs $50; 3 yrs $69***

Popular Communications

The world's most authoritative monthly magazine for shortwave listening and scanner monitoring. Features scanner monitoring of police; fire, utility and aircraft communications; international shortwave listening; CB radio; amateur radio; FRS and more.

Holiday Special!

Domestic Rates: 1 year ~~$34.95~~ ***$32.95*** - 2 yrs ~~$62.95~~ ***$58.95*** - 3 yrs ~~$97.95~~ ***$85.95***

Canada/Mexico: 1 year ~~$44.95~~ ***$42.95*** - 2 yrs ~~$82.95~~ ***$78.95*** - 3 yrs ~~$121.95~~ ***$115.95***

Foreign: 1 year ~~$54.95~~ ***$52.95*** - 2 yrs ~~$102.95~~ ***$98.95*** - 3 yrs ~~$151.95~~ ***$145.95***

Add a Pop'Comm DIGITAL sub to your Print sub at a special rate: ***1 yr $14; 2 yrs $26; 3 yrs $37***

Purchase a Pop Comm DIGITAL Edition Subscription ONLY ***- 1 yr $23; 2 yrs $44; 3 yrs $64***

CQ VHF

The all-time favorite magazine for the VHF/UHF enthusiast is better than ever. This quarterly magazine focuses on Ham radio above 50 MHz. Regular columns include: Antennas, OpEd, Satellites, VHF Propagation, & FM.

Holiday Special!

Domestic Rates: 1 year ~~$28.00~~ ***$26.00*** - 2 yrs ~~$56.00~~ ***$52.00*** - 3 yrs ~~$84.00~~ ***$78.00***

Canada/Mexico: 1 year ~~$38.00~~ ***$36.00*** - 2 yrs ~~$76.00~~ ***$72.00*** - 3 yrs ~~$114.00~~ ***$108.00***

Foreign: 1 year ~~$41.00~~ ***$39.00*** - 2 yrs ~~$82.00~~ ***$78.00*** - 3 yrs ~~$123.00~~ ***$117.00***

Add a CQ VHF DIGITAL sub to your Print sub at a special rate: ***1 yr $10; 2 yrs $18; 3 yrs $25***

Purchase a CQ VHF DIGITAL Edition Subscription ONLY ***- 1 yr $17; 2 yrs $32; 3 yrs $46***

WorldRadio Online

A general interest online only ham magazine with a special focus on the human side of amateur radio and on projects and activities accessible to the average ham. Regular topics include DXing, emergency communications, and "trail-friendly radio."

Holiday Special! 1 year ~~$19.95~~ ***$18.00*** - 2 years ~~$29.95~~ ***$28.00*** - 3 years ~~$39.95~~ ***$37.00***

Call 1-800-853-9797 or FAX your order to 516-681-2926
You can also order on our web site: http://store.cq-amateur-radio.com

AMERITRON . . . 800 Watts . . . $949!

More hams use Ameritron AL-811/H amplifiers than any other amplifier in the world!

Only the Ameritron AL-811H gives you four *fully neutralized* 811A transmitting tubes. You get absolute stability and superb performance on higher bands that can't be matched by un-neutralized tubes.

AL-811H
$949
Suggested Retail
4-Tubes, 800 Watts

AL-811
$799
Suggested Retail
3-Tubes, 600 Watts

You get a quiet desktop linear that's so compact it'll slide right into your operating position -- you'll hardly know it's there . . . until QRM sets in. And you can conveniently plug it into your nearest 120 VAC outlet -- no special wiring needed.

You get all HF band coverage (with license) -- including WARC and most MARS bands at 100% rated output. Ameritron's *Adapt-A-Volt*™ hi-silicon core power transformer has a special buck-boost winding that lets you compensate for high/low power line voltages.

You also get efficient full size heavy duty tank coils, slug tuned input coils, operate/standby switch, transmit LED, ALC, dual illuminated meters, QSK with optional QSK-5, pressurized cooling that you can hardly hear, full height computer grade filter capacitors and more. 13¾Wx8Hx16D inches.

AL-811, $799. Like AL-811H, but has three 811A tubes and 600 Watts output.

AMERITRON *no tune* Solid State Amplifiers

ALS-500M 500 Watt Mobile Amp

ALS-500M
$899
Suggested Retail

500 Watts
PEP/400W CW output, 1.5-22 MHz, instant bandswitching, no tuning, no warm-up. SWR, load fault, thermal overload protected. On/Off/Bypass switch. Re-mote on/off control. DC current meter. Extremely quiet fan. 13.8 VDC. 9Wx3½Hx15D in., 7 lbs. **ALS-500RC, $49,** Remote Head.

ALS-600 Station 600 Watt FET Amp

ALS-600
$1499
Suggested Retail

***No tuning**, no fuss, no worries -- just turn on and operate.* 600 Watts PEP/500W CW, 1.5-22 MHz, instant bandswitching, SWR protected, extremely quiet, SWR/Wattmeter, ALC control. 120/220 VAC. Inrush protected. 9½Wx6Hx12D in. **ALS-600S, $1599,** ALS-600 with 10 lb. switching power supply.

Desktop Kilowatt Amplifier

AL-80B
$1495
Suggested Retail

Whisper quiet *desktop* amp plugs into 120 VAC to give *full* kilowatt SSB PEP output. Ameritron's exclusive *DynamicALC*™ doubles average SSB power out and *Instantaneous RF Bias*™ gives cooler operation. All HF bands. 850 Watts CW out, 500 Watts RTTY out, extra heavy duty power supply, 3-500G tube, 70% efficiency, tuned input, Pi/Pi-L output, inrush current protection, dual Cross-Needle meters, QSK compatible, 48 lbs. 14Wx8½Hx15½D in. **Two-year warranty.**

ALS-1300 Solid State 1200 Watt Amp

ALS-1300
$2899
Suggested Retail

Ameritron's *highest power* solid state FET no-tune amplifier gives you instant bandswitching, no tuning, no warm-up, no tubes to baby and no fuss! Outstanding reliability is insured by using eight rugged MRF-150 power FET's mounted on the dual heavy duty heat sink. Run up to 1200 Watts of clean SSB output power (just 100 Watts drive gives full rated power) for continuous coverage between 1.5-22 MHz. Compact 10Wx6½Hx18D in.

Near Legal Limit ™ Amplifier

AL-572
$1795
Suggested Retail

New class of *Near Legal Limit*™ amplifier gives you 1300 Watt PEP SSB power output for *60%* of price of a full legal limit amp! 4 rugged 572B tubes. Instant 3-second warm-up, plugs into 120 VAC. Compact 14½Wx 8½Hx15½D inches fits on desktop. 160-15 Meters. 1000 Watt CW output. Tuned input, instantaneous RF Bias, dynamic ALC, parasitic killer, inrush protection, two lighted cross-needle meters, multi-voltage transformer.

HF Amps with *3CX800A7 tube*

Suggested Retail
AL-800F
$1995
1 tube, 1250 Watts
AL-800HF
$2745
2 tubes, 1.5 kW *Plus*
AL-800, $2795
AL-800H, $4295
with *Eimac*(R) tubes

These *compact* desktop amplifiers with 3CX800A7 tubes cover 160-15 Meters including WARC bands. Adjustable slug tuned input circuit, grid protection, front panel ALC control, vernier reduction drives, heavy duty 32 lb. silicone steel core transformer, high capacitance computer grade filter capacitors. Multi-voltage operation, dual lighted cross-needle meters. 14¼Wx8½Hx16½D in.

AMERITRON *full legal limit* amplifiers

AMERITRON legal limit amps use a super heavy duty Peter Dahl Hypersil(R) power transformer capable of 2.5 kW!

Most powerful -- *3CX1500/8877*

AL-1500F
$3295
3CX1500/8877 Tube
Suggested Retail

AL-1500
$4195
Eimac(R) tube

Ameritron's *most powerful* amplifier uses the herculean 3CX1500/8877 ceramic tube. 65 watts drive gives you full legal output -- it's just loafing with a 2500 Watts power supply.

Toughest -- *3CX1200Z7*

AL-1200
$3995
Suggested Retail

Get ham radio's *toughest* tube with the Ameritron AL-1200 -- the *Eimac*(R) 3CX1200Z7. It has a 50 Watt control grid dissipation. What makes the Ameritron AL-1200 stand out from other legal limit amplifiers? The answer: A super heavy duty power supply that loafs at full legal power -- it can deliver the power of more than 2500 Watts PEP two tone output for a half hour.

Classic -- *Dual 3-500Gs*

AL-82
$2745
Suggested Retail

This linear gives you full legal output using a *pair* of *genuine* 3-500Gs. Competing linears using 3-500Gs *can't* give you 1500 Watts because their lightweight power supplies *can't* use these tubes to their full potential.

Call your dealer for your best price!

Free Catalog: 800-713-3550

Ameritron brings you the finest high power accessories!

ARB-704 amp-to-rig interface. . . $59.95

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

RCS-4 Remote Coax Switch…$159.95

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

RCS-8V Remote Coax Switch…$169.95

Replace **5** coax with 1! 1.2 SWR at 250 MHz. Useable to 450 MHz. < .1 dB loss, 1kW@ 150MHz.

RCS-10 Remote Coax Switch…$179.95

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

AMERITRON®

. . . the world's high power leader!

116 Willow Road, Starkville, MS 39759
TECH (662) 323-8211 • **FAX** (662) 323-6551
8 a.m. - 4:30 p.m. CST Monday - Friday
For power amplifier components call (662) 323-8211
http://www.ameritron.com

AMERITRON . . . the world's high power leader! Visit www.ameritron.com

The radio... YAESU

HF/50MHz 100W Transceiver

FT DX 1200

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

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

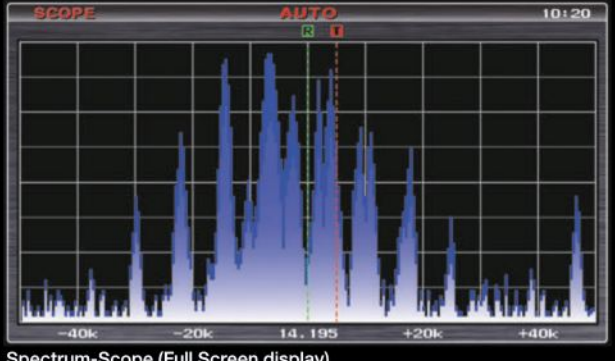
The 1st IF frequency is set at 40 MHz and is protected by selectable 3 kHz, 6 kHz and 15 kHz roofing filters, which effectively attenuate interfering signals.

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

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

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

The Full Color 4.3 inch TFT display



Spectrum-Scope (Full Screen display)

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

YAESU
The radio

YAESU USA
6125 Phyllis Drive, Cypress, CA 90630 (714) 827-7600