SPECIAL DXING ISSUE

QST

DEVOTED ENTIRELY TO AMATEUR RADIO

October 2013 WWW.ARRL.ORG

The Joy of DX

QST reviews:

Inside:

Page 72

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Official Journal of ARRL The national association for AMATEUR RADIO®

OCTOBER 2013 QST Vol 97 No 10

New Functions Enabled by the

The Choice of C4FM Digital

Compared to other digital modulation schemes within FDMA, C4FM has excellent communication quality (BER: Bit Error Rate characteristics). C4FM is the standard method for professional communication devices in FDMA, and is therefore considered to be the main stream digital communication mode in the future.

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

The FT1DR/FTM-400DR operates in three digital modes and an analog mode.
Enjoy communication in the mode that suits each purpose.

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

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

2. Voice FR Mode (Voice Full Rate Mode)

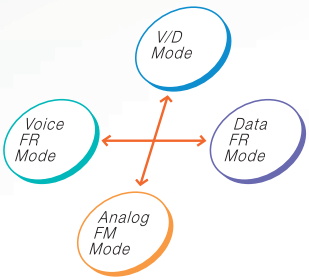
Half of the bandwidth is used for voice signal with error correction. The very effective error correction code provides benefits such as minimal interruption of communication.

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

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

4. Analog FM Mode

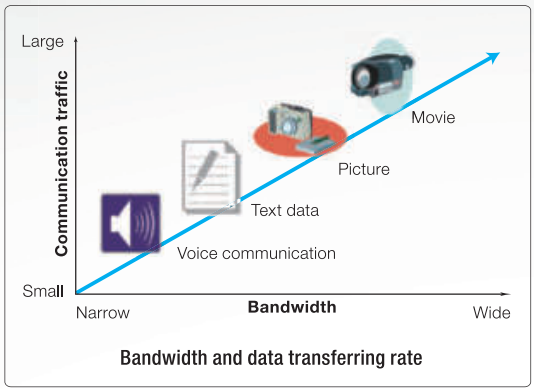
Analog FM is effective for communication with a weak signal that causes voices to break up in the digital modes. The analog mode allows communication even at distances where noise and weak signals make communication almost impossible.



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

FT1DR

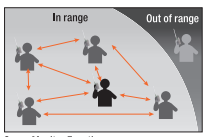
7.4V 1100 mAh Lithium Ion Battery FNB-101LI and battery charger PA-48 / SAD-11B(USA version), PC Connection Cable SCU-18 included



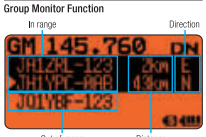
Bandwidth and data transferring rate

Digital Group Monitor (GM) Function

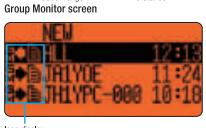
The digital GM function automatically checks whether members registered in a group are within communication range, and displays information such as distance and direction for each call sign on the screen. This convenient function makes it possible not only to see whether any friends are in communication range, but also to instantaneously determines the location and relationship between all members of the group. This function can also be used to send messages and data such as images between members of a group, permitting convenient and fun communication between friends when out for a drive or hike. Sent and received messages and images can be checked on the LOG List screen, with icons making them easy to distinguish.



Group Monitor Function



Group Monitor screen

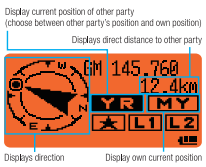


Icon display
LOG list screen

Smart Navigation Function

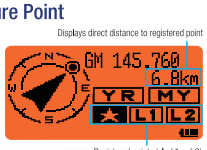
A real-time navigation function that records the location and direction of Group Monitor (GM) stations

Digital V/D Mode communicates information such as position data at the same time as the voice signal, allowing you to view the distance and direction of the other party in real time while communicating. This makes it possible to confirm your position and the other party's in situations such as hiking and driving where your positions are constantly changing, providing an easy way to meet up or join routes.



Backtrack Function to Return to Departure Point

This function allows navigation back to the departure point, or a point previously added to the memory.
When hiking or camping, just register the starting point or the position of your tent and then you can constantly check the direction and distance from your current position. The arrow of the compass display constantly shows the direction to the registered point, making it extremely convenient in finding your way back to the registered place – just move in the direction so that the arrow in the heading-up display points straight upward.



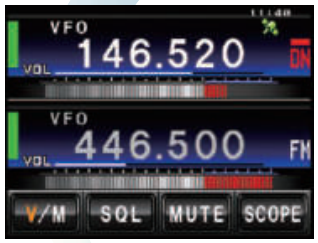
C4FM FDMA Digital Transceiver

Digital Group Monitor

Smart Navigation Screen

APRS® Screen

* APRS® is a registered trademark of Bob Bruninga, WB4APR.

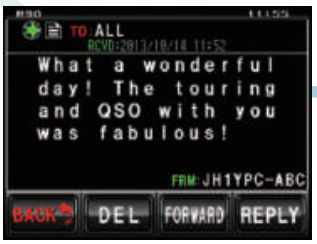


Dual Band Screen

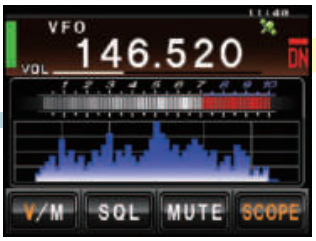
3.5-inch full color touch panel operation

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. The settings and status of the wireless devices are displayed in an easy-to-understand format. You can perform various operations simply and easily by gently touching the screen.

Clock / Timer Screen



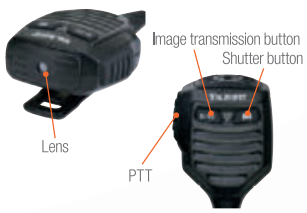
Message Screen



Band Scope Screen

Snapshot Function (Image Data Transmission)

Simply connect an MH-85A11U (option) microphone with camera.
Press the microphone shutter button to take snapshots, and then the image data can be displayed on the screen and easily sent to other C4FM FDMA digital transceivers.



* micro SD card is required by the snapshot function.

Image data which was sent from a group member is displayed on the full-color screen. This image data also retains a time record and the GPS location data of the snapshot. It is easy to navigate to that pictured location by using back track function.
In addition, you can observe on the screen, whether or not transmitted data was successfully received by the member station. The snapshot image or received data is stored in a high capacity micro SD card. You can recall and send that image data from the SD card anytime. The pictures and data files may be easily viewed and edited by using a personal computer.

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

FTM-400DR

DTMF Microphone MH-48A6JA, Mounting Bracket, Bracket for Controller, Control Cable 10ft (3m), PC Connection Cable SCU-20, and DC Power Cable included

YAESU
The radio

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

New! Cushcraft R9 . . . *80-6 Meters*

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

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

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

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

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

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

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

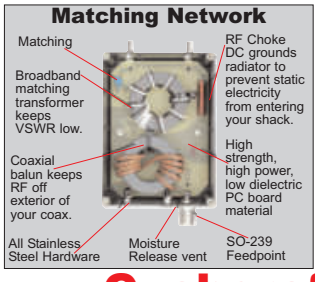
Rugged Construction: Thick fiberglass insulators, all-stainless steel hardware and 6063 aircraft-aluminum tubing is double or triple walled at key stress points to handle anything Mother Nature can dish out.

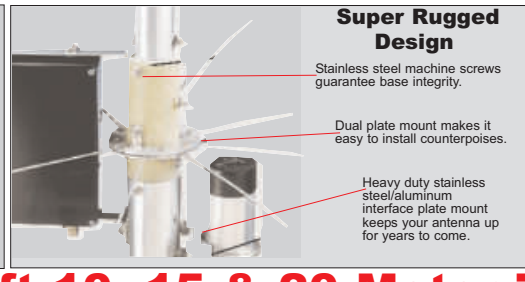
31.5 feet tall, 25 lbs. Mounting mast 1.25 to 2 inches. Wind surface area is 4 square feet.

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

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

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





MA-5B *5-Band* Beam

Small Footprint -- Big Signal

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

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

Cushcraft 10, 15 & 20 Meter Tribander Beams

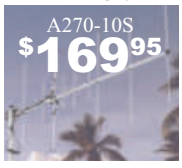
Only the best tri-band antennas become DX classics, which is why the Cushcraft World-Ranger A4S, A3S, and A3WS go to the head of the class. For more than 30 years, these pace-setting performers have taken on the world's most demanding operating conditions and proven themselves every time. The key to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

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

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

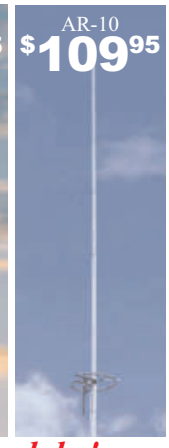
Cushcraft Dual Band Yagis

One Yagi for Dual-Band FM Radios



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

Cushcraft Famous *Ringo* Compact FM Verticals



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

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

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Amateur Radio Antennas
308 Industrial Park Road, Starkville, MS 39759 USA
Open: 8-4:30 CST, Mon.-Fri. ***Add Shipping.***
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http://www.cushcraftamateur.com

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Visit www.cushcraftamateur.com

Life is a JOURNEY. Enjoy the ride!

MINI COOPER SHOWN WITH CP-5M UNIVERSAL LIP MOUNT ON THE DOOR EDGE.

All the mounts attach to van doors, truck side doors, SUV doors, etc... and require no holes. Includes 16' 6" deluxe cable assy w/18" mini RG-1888A/U type coax for weather seal entry.

Choose a mount depending on the antenna size and vehicle mounting location space.

For Small Antennas & Limited Space

MODEL / ANT CONN / COAX CONN

Maldol **EM-5M** SO-239 / PL-259
Footprint: 1.1"x .75"
Max Antenna: 40"

For Medium Size Antennas

MODEL / ANT CONN / COAX CONN

COMET **CP-5M** SO-239 / PL-259
COMET **CP-5NMO** NMO / PL-259
Footprint: 3.4" x 1.25"
Max Antenna: 60"

For Tall or Multi-band HF Antennas

MODEL / ANT CONN / COAX CONN

COMET **HD-5M** SO-239 / PL-259
COMET **HD- 5 3/8-24** 3/8-24 / PL-259
Footprint: 3.75" x 1.1 "
Max antenna: 80"

COMET **BNC-24** **DUAL-BAND 2M/70CM HT ANTENNA** RX range: 100-1200MHz
• Wavelength: 2M 1/4 wave • 440MHz 1/2 wave • Length: 17" • Conn: BNC Super flexible featherweight whip

COMET **SMA-24** **DUAL-BAND 2M/70CM HT ANTENNA** RX range: 100-1200MHz
• Wavelength: 2M 1/4 wave • 440MHz 1/2 wave • Length: 17" • Conn: SMA Super flexible featherweight whip

COMET **SMA-503** **DUAL-BAND 2M/70CM HT ANTENNA** RX range: 100-1200MHz
• Length: 8.75" • Conn: SMA

Maldol **MH-209** *(BNC Conn)* **MH-209SMA** *(SMA Conn)* **2M/70CM DUAL-BAND HT ANTENNAS**
3" length, soft rubber cover. Good performance in a small package!

COMET **NEW! CSB750A** **DUAL-BAND 2M/440MHZ W/FOLD-OVER**
Wavelength: 2M 1/2 wave, 70cm 5/8 wave x 2 • VSWR: 1.5:1 or less • Length: 42" • Conn: PL-259 • Max Pwr: 150W

COMET **NEW! CSB770A** **DUAL-BAND 2M/440MHZ W/FOLD-OVER**
Wavelength: 2M 5/8 wave center load, 70cm 5/8 wave x 2 center load • VSWR: 1.5:1 or less • Length: 51" • Conn: PL-259 • Max Pwr: 150W

COMET **NEW! CSB790A** **DUAL-BAND 2M/440MHZ W/FOLD-OVER**
Wavelength: 2M 7/8 wave center load, 70cm 5/8 wave x 3 center load • VSWR: 1.5:1 or less • Length: 62" • Conn: PL-259 • Max Pwr: 150W

Maldol **AX-50** **DUAL-BAND 2M/440MHz**
Wavelength: 2M 1/4 wave • 70cm 9/8 wave • Length: 21" • Conn: PL-259 • Max Power: 60W

Maldol **AX-75** **DUAL-BAND 2M/440MHz W/FOLD-OVER**
Wavelength: 2M 1/2 wave center load • 70cm 5/8 wave x 2 • Length: 30" • Conn: PL-259 • Max Power: 60W

Maldol **AX-95** **DUAL-BAND 2M/440MHz W/FOLD-OVER**
Wavelength: 2M 1/2 wave • 70cm 5/8 wave x 2 • Length: 38" • Conn: PL-259 • Max Power: 60W

COMET **B-10 / B-10NMO** **DUAL-BAND 2M/440MHz**
Wavelength: 146MHz 1/4 wave • 446MHz 1/2 wave • Length: 12"
• Conn: B-10 PL-259 ,B-10NMO - NMO style • Max Pwr: 50W

COMET **SBB-2 / SBB-2NMO** **DUAL-BAND 2M/440MHz**
Wavelength: 146MHz 1/4 wave • 446MHz 5/8 wave center load • VSWR: 1.5:1 or less • Length: 18"
• Conn: SBB-2 PL-259 • SBB-2NMO NMO style • Max Pwr: 60W

Maldol **EX-107RB / EX-107RBNMO** **DUAL-BAND 2M/440MHz**
Wavelength: 146MHz 1/2 wave • 446MHz 5/8 wave x 2 • VSWR: 1.5:1 or less • Length:29"
• Conn: EX-107RB PL-259 • Ex-107RBNMO NMO style • Max Pwr: 100W

COMET **SBB-5 / SBB-5NMO** **DUAL-BAND 2M/440MHz W/FOLD-OVER**
Wavelength: 146MHz 1/2 wave • 446MHz 5/8 wave x 2 • Length: 39"
• Conn: SBB-5 PL-259, SBB-5NMO - NMO style • Max Pwr: 120W

COMET **SBB-7 / SBB-7NMO** **DUAL-BAND 2M/440MHz W/FOLD-OVER**
Wavelength: 146MHz 6/8 wave • 446MHz 5/8 wave x 3 • Length: 58"
• Conn: SBB-7 PL-259, SBB-7NMO - NMO style • Max Pwr: 70W

COMET and Maldol Mobile

For a complete catalog, call or visit your local dealer.
Or contact NCG Company. 15036 Sierra Bonita Lane, Chino, CA 91710
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In This Issue

October 2013 Volume 97 Number 10

Technical

News and Features

Our Cover
As with most DXpeditions to remote places, good will is an important piece of equipment to take along. On their trip to Rotuma, Bill Vanderheide, N7OU, and Bob Norin, W7YAQ, heard that the local school's station, 3D2RI, had gone off the air with rig and antenna problems. They were happy to return the Rotumans' hospitality. Here Bob helps to repair their A3S beam to help get 3D2RI back on the air. [Bill Vanderheide, N7OU, photo]

Radiosport

Columns

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Field Gear That Goes The Distance!

FT-450D
HF/50 MHz 100 W Easy to Operate All Mode Transceiver

- Illuminated Key Buttons
- 300Hz / 500Hz / 2.4 kHz CW IF Filter
- Foot Stand
- Classically Designed Main Dial and Knobs
- Dynamic Microphone MH-31 A8J Included

FT-857D
The World's Smallest HF/VHF/UHF Mobile Transceiver

- Ultra-Compact Package
- Ideal for Mobile or External Battery Portable Work
- Wide Frequency Coverage
- Optional Remote-Head
- High-Performance Mobile Operation

FT-897D
HF/VHF/UHF Portable Operation Powerful Transceiver

- The Ultimate Emergency Communications Radio
- Rugged, Innovative Multi-Band
- Operates on the SSB, CW, AM, FM, and Digital Modes
- Wide Frequency Coverage
- 20-Watt Portable Operation Using Internal Batteries
- 100 Watts When Using an External 13.8-Volt DC Power Source

FT-817ND
The Ultimate Backpack, Multi-Mode Portable Transceiver

- Self-Contained
- Battery-Powered
- Covering the HF, VHF, and UHF Bands
- Provides up to Five Watts of Power Output
- SSB, CW, AM, FM, Packet, or SSB-based Digital Modes like PSK31

YAESU
The radio

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

http://www.yaesu.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.

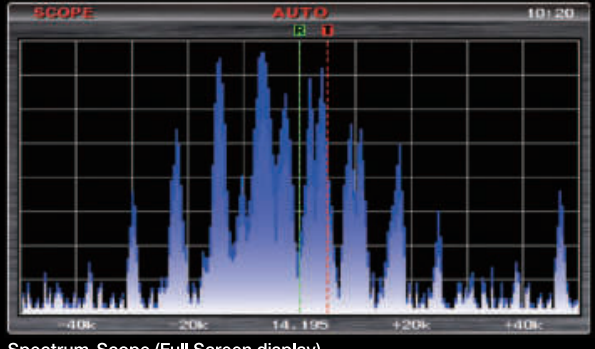
Similar to the high end series Yaesu transceivers, it uses the 32-bit high speed floating point DSP, TMS320C6727B by Texas Instruments, for its IF DSP.
The acclaimed superior Yaesu DSP algorithm is highly effective in weak signal processing and enhancement.

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.

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

The Full Color 4.3 inch TFT display



Spectrum-Scope (Full Screen display)

YAESU
The radio

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

The radio...YAESU

HF/50 MHz 100 W Transceiver

FT DX 3000

New Crystal Roofing Filters provide ultimate weak signal receiver performance in crowded, strong signal environments

The amazing Crystal Roofing Filter performance

The Down conversion 9 MHz 1st IF frequency receiver construction, can realize narrow 300 Hz (optional), 600 Hz and 3 kHz bandwidth roofing filters.

Outstanding receiver performance, the heritage of the FT DX 5000!

The high dynamic range IP3 performance that was realized and proven in the FTDX5000.

IF DSP provides effective and optimized QRM rejection

Independent Frequency display

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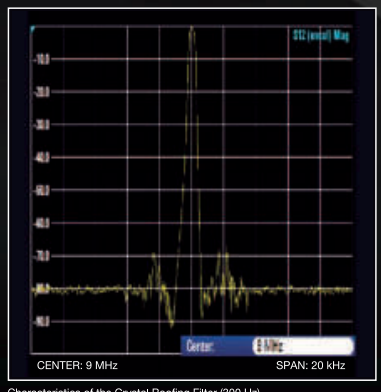
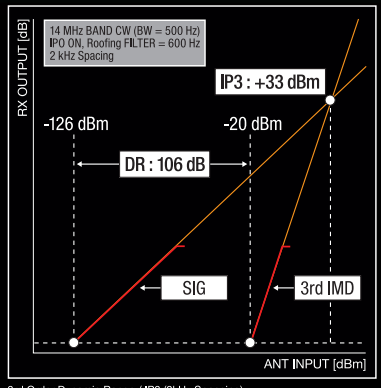


Characteristics of the Crystal Roofing Filter (300 Hz)



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It Seems to Us

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

Privacy

"The issue of privacy — or the lack thereof — in electronic communication has been much in the news recently. It may be worth a reminder that there is no expectation of privacy *in Amateur Radio communication."*

From its earliest days radio has been used to transmit sensitive information — yet by their very nature, radio transmissions are subject to unauthorized interception. Any emission of radio frequency energy can be detected and its information content, if any, extracted.

The International Radiotelegraph Convention signed in Washington in 1927 obligated the participating governments to take steps to prevent unauthorized reception and transmission of "correspondence of a private nature" as well as the "unauthorized divulging of the contents, or simply of the existence, of correspondence which may have been intercepted by means of radio installations" as well as the "unauthorized publication or use" of such correspondence. Today's Radio Regulations of the International Telecommunication Union (ITU) contain a similar obligation with regard to "radiocommunications not intended for the general use of the public."

The Communications Act of 1934 implemented this obligation but with a specific exception for radio communication "transmitted by amateurs or others for the use of the general public." In 1982 this was amended to exempt all radio communication "transmitted by an amateur radio station operator or by a citizens band radio operator." As explained in the October 1982 issue of *QST* the reason for the amendment was "to facilitate the use of volunteers by the Commission to monitor for violations of the Commission's rules." Prior to that time it could have been argued that someone hearing a violation could not report it to the FCC or to anyone else unless the transmission was intended for the general public, which in itself would have been a violation of the rule against broadcasting. Thus, at least in the United States there can be no expectation of privacy in Amateur Radio communication. Some drug smugglers found that out the hard way when their efforts to suppress evidence gathered through interception of their radio transmissions failed to win judicial favor.

But there's more. The ITU Radio Regulations used to require that international communications by amateur stations "be made in plain language." The FCC's amateur rules of that era contained an entire section prohibiting "codes and ciphers in domestic and international communications." Since then a substitute for the "plain language" reference has been adopted: In 2003 the ITU rule was changed to "Transmissions between amateur stations in different countries shall not be encoded for the purpose of obscuring their meaning." The FCC rules were amended in 2006 to conform to the new international text but the prohibition still applies to domestic communications as well as international. So, not only are Amateur Radio transmissions not protected by law against divulgence or use by others; amateurs are also prohibited from taking steps to cloak their meaning.

In general, the principles on which these rules are based are broadly supported by amateurs — or at least, not objected to. Amateurs are very protective of the non-commercial nature of our radio service and appreciate the fact that the FCC is equally so. The ability to decipher transmissions in the amateur bands is important to guard against abuse, either by amateur licensees or by interlopers. There are limited circumstances in which the FCC rules permit encryption, either explicitly (in the case of telecommands to amateur satellites, telemetry from satellites and signals to control model craft) or implicitly (to authenticate the identity of stations in a message forwarding system). Otherwise, amateur communications must be an "open book" to listeners.

Are there additional situations when the encryption of message contents might be sufficiently desirable to outweigh our strong preference for transparency? The FCC report to Congress in response to Public Law 112-96 noted that some commenters in the proceeding, GN Docket 12-91, argued that "transmission of sensitive data, such as medical information that is subject to privacy requirements, is often a necessary aspect of emergency response, and therefore the use of encryption should be permitted under appropriate circumstances, such as by credentialed operators." The report went on to observe that this issue could be addressed through the Commission's rulemaking process.

At its March 9, 2013 meeting the ARRL Executive Committee requested that a briefing paper be prepared detailing the significant aspects of the encryption issue, particularly with respect to privacy concerns and the Health Insurance Portability and Accountability Act (HIPAA). Soon thereafter Don Rolph, AB1PH submitted a well-crafted Petition for Rulemaking to the FCC seeking an additional exception in emergency operations or related training exercises. In June the FCC assigned it a file number, RM-11699, and opened a 30-day window for public comment.

In preparing the briefing paper for the Executive Committee the ARRL General Counsel and staff confirmed that the HIPAA regulations do not require encryption of radio transmissions of medical patient information. Therefore, HIPAA is not by itself a sufficient rationale for such an exception. After consulting with the rest of the ARRL Board the Executive Committee concluded that there is insufficient justification for the proposed change and instructed that comments on behalf of the ARRL be filed accordingly. This was done, as reported in "Happenings" in last month's *QST*.

While HIPAA may not require encryption of radio transmissions it is clear that medical care providers are very protective of patient privacy. Information identifying a patient is seldom transmitted anyway. Our served agencies may well prefer that the messages we send on their behalf not be intercepted by unknown listeners. If so there are steps we can take such as using less-popular frequencies, directional antennas, minimum power and voice modes other than FM that will greatly reduce the likelihood of eavesdropping.

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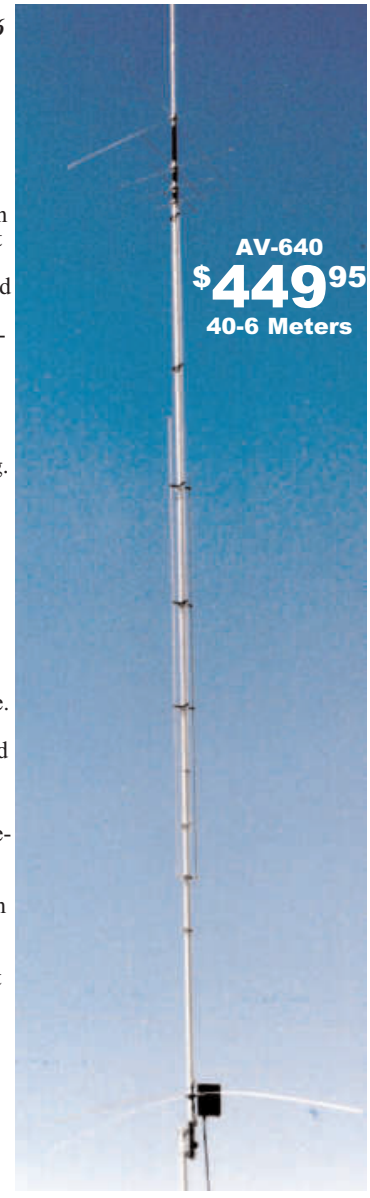

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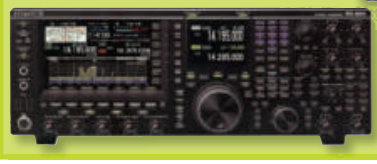

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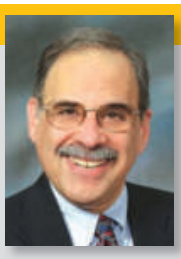


Inside HQ

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

Mid-Year Report

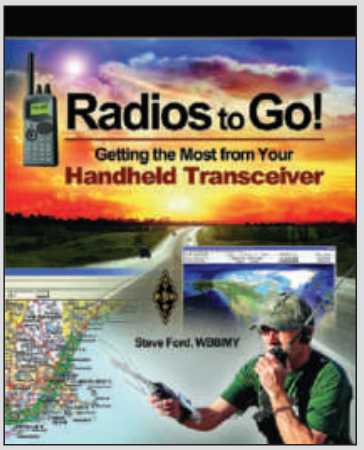
It was a busy first half of 2013 at ARRL Headquarters. Here are some highlights of the programs and services that we provided to our members during the first six months of 2013.

- Logbook of The World exceeded half a *billion* QSO records. We launched an improved LoTW client installation program, *TQSL 1.14,* with many new features that streamline installation for the user. The ARRL Board of Director's Ad Hoc Logbook of The World Committee approved additional Information Technology resources to improve LoTW's performance and implementation.

- The Online DX Century Club Application at **https://p1k.arrl.org/onlinedxcc/** continues to provide an alternative to filling out and submitting paper DXCC application forms. It now accounts for almost 25% of all DXCC applications. DXCC paper processing times averaged four weeks, while DXCC applications submitted via Logbook of The World averaged three to five business days. Overall award application levels are about even with 2012.

- ARRL membership increased by more than 1000 members during the first six months of 2013. Who said that Amateur Radio is dying? Not us!

- New books published the first half of the year include *Radios to Go!, Radio Science for the Radio Amateur, Ham Radio for Arduino and PICAXE, Understanding Your Antenna Analyzer, Morse Code Operating for Amateur Radio* and *Hands-On Radio Experiments, Volume 2.*



Radios to Go!, a new book that explains how to get the most out of your handheld FM transceiver, was published early this year.

- Contest participation, as measured by the number of individual logs received, increased a few percentage points from 2012 for the following events: ARRL DX CW, ARRL DX Phone Contests and the ARRL RTTY Roundup.

- The number of ARRL Affiliated clubs has increased to a total of 2385, including the addition of 38 new clubs during the first six months of 2013. There was a slight uptick in the number of school clubs.

- There were 66 sanctioned ARRL Conventions and more than 300 sanctioned hamfests that we supported with materials and speakers from Headquarters. To find a hamfest in your area, go to **www.arrl.org/hamfests/search**.

- At mid year the ARRL Field Organization had 7722 appointees. Eight new Section Managers came on board in the following sections: Arizona, Iowa, Nebraska, New Hampshire, New York City-Long Island, North Texas, Wisconsin and Western Washington.

- Members continue to enjoy the iOS (Apple operating system) app version of Digital *QST* (**www.arrl.org/qst**). We will be introducing a dedicated *QST* Android app soon, which will allow Android users to download *QST* to their devices.

- The ARRL Lab tested 19 devices for Product Review, which continues to be one of the most popular sections of *QST*. The Lab staff, through our Technical Information Service, answered more than 2000 member questions and Lab Engineer Mike Gruber, W1MG, fielded more than 100 inquiries from members about RFI problems.

- In the first half of 2013, 188 students enrolled in the online version of Introduction to Emergency Communication course, EC-001 (**www.arrl.org/online-course-catalog**). We ran three Teachers Institute sessions in July. This included a new "Teachers Institute 2" on the topic of "Remote Sensing and Data Gathering," sponsored by the Dayton Amateur Radio Association (DARA).

- The ARRL Education Services department, working with the ARISS (Amateur Radio on the International Space Station) international program team, successfully executed 12 US and 33 international school contacts with the ISS.

- Through July 1, the ARRL VEC reports that the total number of US Amateurs in the FCC database reached a high of 712,922. The VEC itself served 19,119 exam applicants, up slightly from 2012 during the same period. The number of new licensees increased by 3% during the first six months of 2012. However, there is some concern about the fact that in the first half of 2013, upgrade license activity *decreased* by 19% compared with the same period last year. We added 1088 new Volunteer Examiners (VEs) bringing the number of ARRL Accredited VEs to more than 37,000, a new high.

- Planning for the ARRL Centennial Convention (**www.arrl.org/centennial**), to be held July 2014 in Hartford, and plans for other Centennial activities, publications and events continue to move ahead. We'll provide more details as they become available.

Thanks to all of our members, staff and volunteers for making the first half of 2013 very productive!

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

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

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

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National Centennial Convention, July 17-20, 2014 – **ARRL2014.org**

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Quick Links and Resources

QST – ARRL members' journal – **www.arrl.org/qst**
QEX – *A Forum for Communications Experimenters* – **www.arrl.org/qex**
NCJ – *National Contest Journal* – **www.arrl.org/ncj**
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ARRL Volunteer Examiner Coordinator (ARRL VEC) – **www.arrl.org/vec**
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The American Radio Relay League, Inc. is a noncommercial association of radio amateurs, organized for the promotion of interest in Amateur Radio communication and experimentation, for the establishment of networks to provide communication in the event of disasters or other emergencies, for the advancement of the radio art and of the public welfare, for the representation of the radio amateur in legislative matters, and for the maintenance of fraternalism and a high standard of conduct.

ARRL is an incorporated association without capital stock chartered under the laws of the State of Connecticut, and is an exempt organization under Section 501(c)(3) of the Internal Revenue Code of 1986. Its affairs are governed by a Board of Directors, whose voting members are elected every three years by the general membership. The officers are elected or appointed by the directors. The League is noncommercial, and no one with a pervasive and continuing conflict of interest is eligible for membership on its Board.

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

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

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

Officers, Division Directors and Staff

As an ARRL member, you elect the Director and Vice Director who represent your division on ARRL policy matters. If you have a question or comment about ARRL policies, contact your representatives at the addresses shown.

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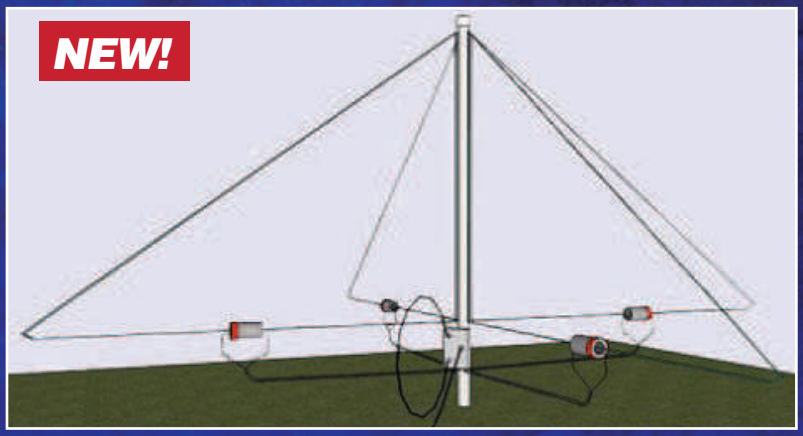

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Steve Ford, WB8IMY, upfront@arrl.org

Solar Cooper

Eddie Castillanes, KJ6JAY
castillanes@sbcglobal.net

I commute — *a lot*. At times, even my lunch hours are spent in my car. So, one day I thought about how I could turn the abundance of available Southern California sunshine into something useful and combine it with Amateur Radio — all within the tight confines of my Mini Cooper S car.

If you hold your hands about 6 inches apart as though you were handling a large softball, you can envision the size of the battery that comes standard in a Mini Cooper. Knowing that I would be transmitting about 50 W at UHF/VHF, I realized that if I sat in my car without the motor running, I might be unable to start my car after just a few minutes of ham radio enjoyment!

To solve the dilemma, I decided to "solarize" my Mini by mounting a solar panel on the roof. Fortunately, the Mini has a cool roof rack that suits this purpose perfectly. To mount the panels to the roof rack, I used a thin sheet of aluminum. I also used aluminum for the solar panel lock-down strips, which were easy to create using some aluminum L-brackets. Since the solar panels generate much more power than I need to run my radio, I use the excess energy to run a marine fan in my car that helps keep the air circulating and the interior cool.

My solar/electrical system consists of the following components:

- A 30 W mono-crystalline solar panel
- A 15 W mono-crystalline solar panel
- An aluminum mounting plate
- Two Sears deep cycle marine batteries (connected in parallel)
- A Morningstar 12 V, 20 A solar charge controller
- A Flexcharge eight-event programmable 12 V timer
- A Powerwerx four-way power-splitter
- Two Watts Up? power meters
- A marine-grade three-speed dc fan

I considered (and fretted over the thought of) putting a hole in the roof of my car to bring the solar panel power to the interior, but then I realized that the wires could snake down through the rain gutter at the rear hatch. Despite the wires entering the car this way, I've never experienced a leak.

My VHF/UHF transceiver is an Icom IC-208H. My antenna is a Larsen KG2/70CXPL window-mount model.

I got into welding a few years back, so I made some custom mounts for the 208H control head unit and the Watt's Up? meters. Because I might actually want to carry something securely on the roof, I put holes into the aluminum mounting plate so I can tie something to it, like a suitcase or duffel bag. I just have to be careful not to exceed the weight rating for the rack with the combined weight of the panels and any luggage!

The finished installation works great, looks great and it's "green" to boot!

A close-up view of the solar panels with the wiring snaking into the rear hatch.

Custom mounts for the transceiver control head and speaker.

Two deep cycle marine batteries and other gear in the trunk.

The finished installation. Stylish and environmentally friendly!

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Letters from Our Members

Missing the Novice Bands

I miss the Novice license and the community of beginners that existed on the Novice bands. My nostalgia has nothing to do with CW; it's about the loss of a special "place" where new hams and experienced old timers could connect.

I learned a lot from the old timers by operating on those Novice bands with reduced power before I was given full access to all ham bands and full power. Most of us earned our stripes on the Novice bands and learned to listen and to operate correctly.

I wish we could go back to a true entry-level license. It could include phone operation if you like, but it should limit power and frequency privileges for a mandatory year. I'd suggest a 100 W limit and use of the old Novice bands, as well as a set of phone subbands on 80, 40 and 15 meters. Yes, there would have to be tolerance and Elmering by those of us who are now old timers. That's what we had on the old Novice bands.

We've dumbed down our tests and opened a whole new world to those who may not be ready for it. In this environment, when things go awry, it's not the fault of the new guy. He hasn't had the chance to be properly mentored because the FCC took away our old training grounds.

Dave Warnick, WA3F
Dover, Pennsylvania

NTS Message Formatting Still Needed

I read the comments of Robert Griffin, K6YR, in the June "Public Service" column with interest ["State of the National Traffic System: A View from Within," page 77]. I must say what Robert notes under the subhead "Taking a Measure of NTS" is, in many ways, the same as I observe.

However, he encourages us to believe that shifting to free-form e-mail type messages is a positive step for Amateur Radio and NTS. My experience has been otherwise.

A free-form e-mail message doesn't provide the template for stations to apply proper emergency message formatting, as was established long ago by the NTS. Without such formatting, vital information may accidentally be deleted (such as the routing back to the originator) as the message is relayed.

The one ray of hope is that many local CERT group leaders are training their members in how to use the NTS message format. These CERT leaders recognize that this format carries in its "envelope" plain English data that allows the recipient to send a return message efficiently to the sender no matter what mode is used.

The national ARES® leadership needs to emphasize the need for all members to routinely practice NTS traffic handling by participating in Section-level NTS nets, both in sending messages and delivering messages. In the Connecticut Section, for example, the local nets meet every night and start times are staggered from 8:30 through 9:30 seven days a week.

One change that might help encourage ARES members to use the NTS message format is for the ARRL to do away with the minimum reportable Public Service Honor Roll score.

While it is good for ARES members to know how to use a Winlink RMS for message handling, they should understand that in an emergency the NTS message system and format provide both the message-moving structure and the template for internationally accepted formal emergency messages.

If ARES members participate in NTS nets even once a week, they will be better prepared to provide our served agencies with messaging capability when commercial services like the Internet fail. After all, public service is one of the missions of the Amateur Radio Service — the one ARES was designed to meet.

Larry Buck, K1HEJ
New Britain, Connecticut

A Repeater with Four Decades of Public Service

I read with much interest the "Inside HQ" column by Harold Kramer, WJ1B, in the July issue, regarding the Boston Marathon attack. I noted the use of the 146.67 MHz repeater in Quincy, Massachusetts — a repeater with which I was involved when it was established in the early 1970s.

At the time I was the Communications and Radio Officer for Quincy Civil Defense. The proposed repeater site was atop a municipal building in Quincy and I endorsed the repeater association's application, which offered the use of the repeater to Civil Defense in the event of any emergency. The request was granted and the city was repaid in spades during the great blizzard of 1978. All vehicular traffic was banned in the Common-wealth for the most of a week and Civil Defense took over the repeater 24/7. It provided invaluable communications during that week, possibly saving some lives during medical emergencies that were handled via the repeater. Members of the repeater association stood by at home, equipped with tools and spare parts kits to make repairs in the event of a failure. Needless to say, the repeater operated flawlessly throughout the period.

I am now retired from such activities, 60 years after I got my first license. I'm gratified to see the repeater is still outstanding in its public service role and I am proud to have been associated with all those fine people who helped put it on the air so long ago.

Tony Shalna, W1BFZ
South Weymouth, Massachusetts

Fond Memories

The "Vintage Radio" column in the June issue of *QST* brought back many fond memories of my Heathkit HW-30 "Twoer" transceiver. I received my Novice license (WNØTML) in January 1968 when Novices still had 2 meter voice privileges. My Elmer, WØTW (SK) had a Twoer and I just had to have one, too.

I participated in the ARRL June VHF QSO Party that year and submitted my results to the ARRL along with a picture of me using my Twoer. I was shocked when I read the December 1968 issue of *QST* and saw my picture in the contest results, but what really surprised me was the fact that I was the one and only Novice entrant west of the Mississippi!

Trent Hays, WBØHZL/DW5HT
Eastern Samar, Philippines

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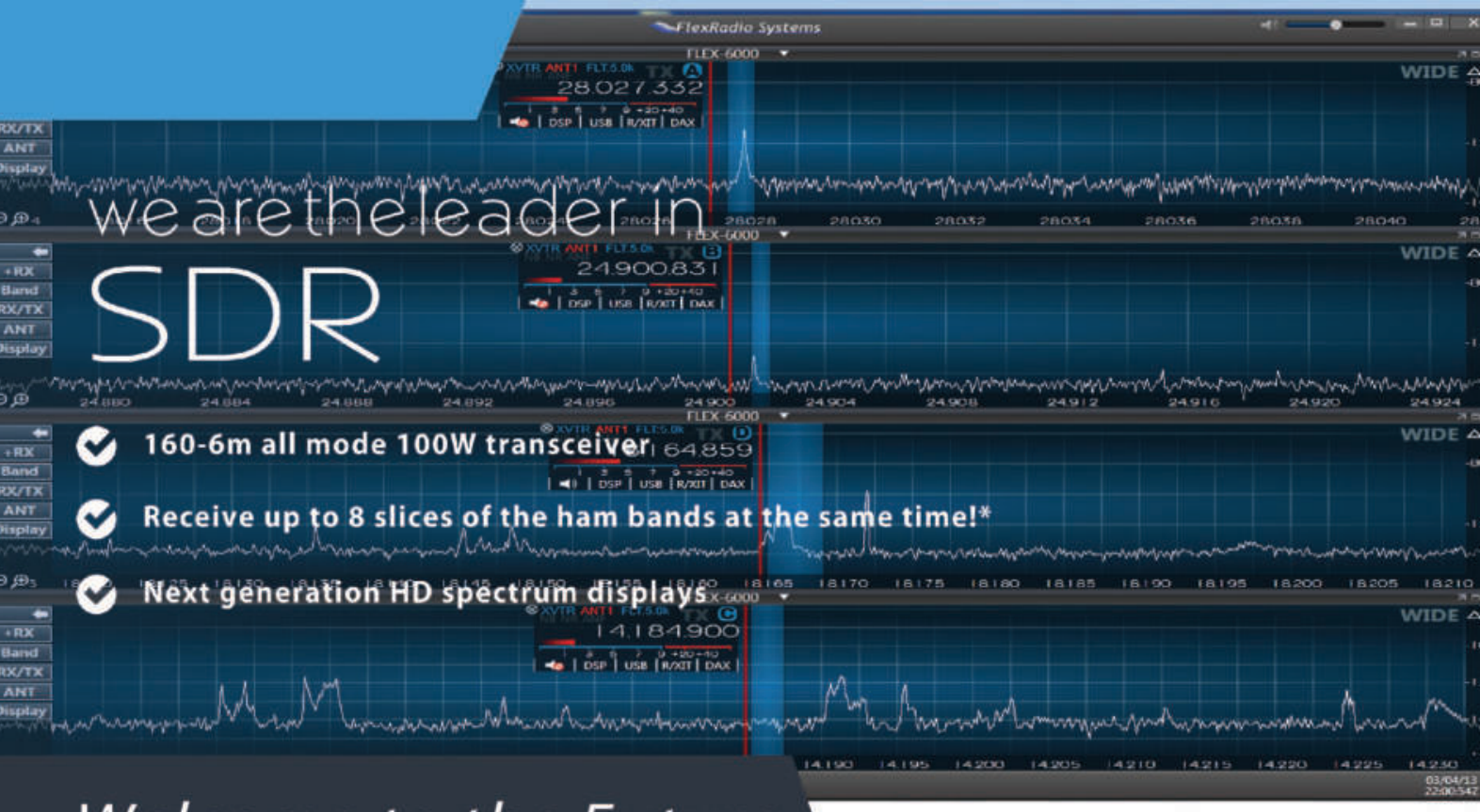

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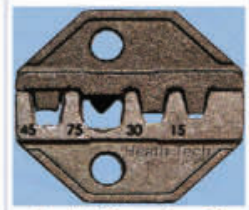

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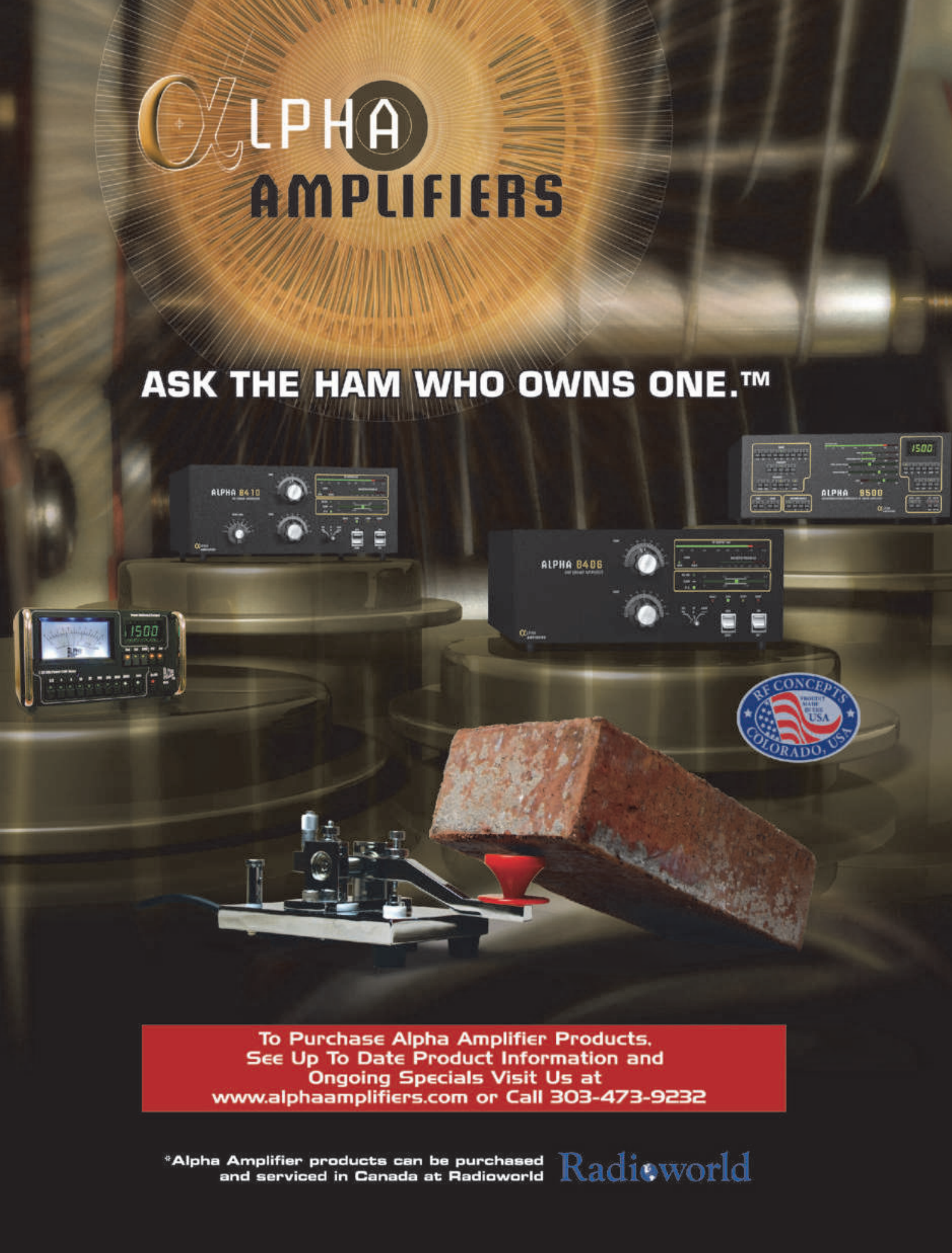
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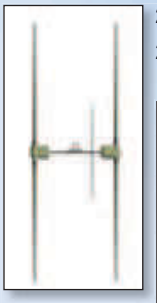
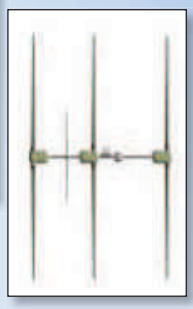


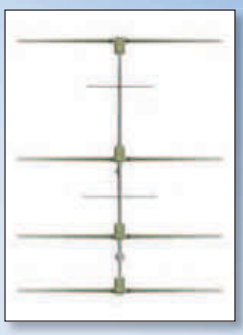
2 Element 20m-6m Yagi

2 element Yagi, 20m-6m continuous coverage; 57" boom, 36 ft longest element, 18.2 ft turning radius, 6 sq ft wind load, 30 lb; SDA 100 controller included.



3 Element Yagi 20m-6m

3 element Yagi, 20m-6m continuous coverage; 16 foot boom, 36 ft longest element, 19.7 ft turning radius, 6.1 sq ft wind load, 51 lb; SDA 100 controller included.



4 Element Yagi 20m-6m

4 element Yagi, 20m-6m continuous coverage; 36 ft longest element, 24.1 ft turning radius, 9.7 sq ft wind load, 99 lb; SDA 100 controller included.

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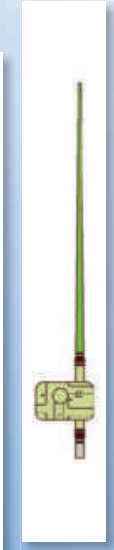
For the ham who may not have a tower, but a tree or two for a dipole. SteppIR verticals work great when there are no tall structures around to hang some wire. And, the low take-off angle can be your friend.

BigIR Vertical Antenna, 40m-6m
BigIR vertical antenna, 40m-6m continuous coverage, 32 ft length, 15 lb total weight, 2 sq ft wind load; EIA 222C wind rating when guyed; Comes with SDA 100 controller and 1.5"mounting pole ; Does not include optional 80m coil.

SmallIR Vertical Antenna 20m-6m
20m-6m continuous coverage, 18 ft total length, 12 lb weight, 1 sq ft wind load; EIA-222C wind rating without guys.



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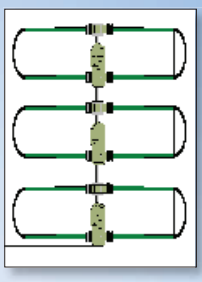
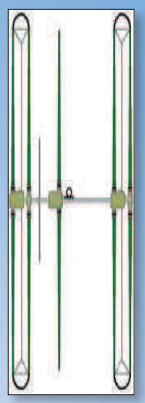
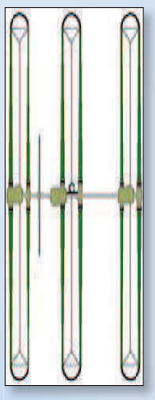


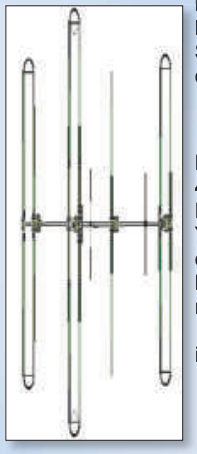
DB11 Yagi Antenna
DB11 Yagi, 18.5 ft element length, 11 ft boom, 10.8 ft turning radius, 61 lb, 5.9 sq ft wind load; 2 active elements on 20m; 3 active elements on 17, 15, 12, 10, 6m.

DB18 YAGI
Dreambeam DB18 yagi, 3 el on 20m-6m, 2 el on 40/30m, 18 ft boom; Does not include optional 6m passive element kit; Includes SDA100 controller.

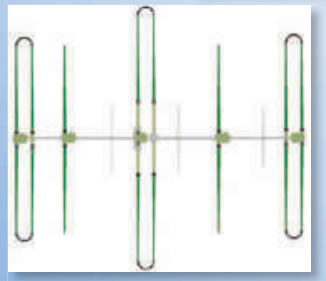




DB18E YAGI
Dreambeam DB18E, 3 el 30m-6m, 2 el 40m, three looped elements, does not include optional 6m passive element kit, 18 foot boom; Includes SDA 100 controller.



DB36 DreamBeam Yagi, 40m-6m
DreamBeam DB36 4 element Yagi, 40m-6m continuous coverage; 36ft boom, 48 ft longest element, 26 ft turning radius, 17.5 sq ft wind load, 160 lb; SDA 100 controller included.



DB46 DreamBeam Pro Yagi
5 elements on 20m-6m and 3 elements on 40/30. DB42 provides coverage from 80m through 6m (with optional 80m dipole kit). The DB42 has a 49 ft looped driven element. End loop elements only 39 feet long, yet the performance is as if all 3 of the loop elements are 49 feet long. 29 ft turning radius, 19.9 ft wind load. Includes basic SDA100 electronic controller, connector junction box and Astron LS3 power supply with cable.

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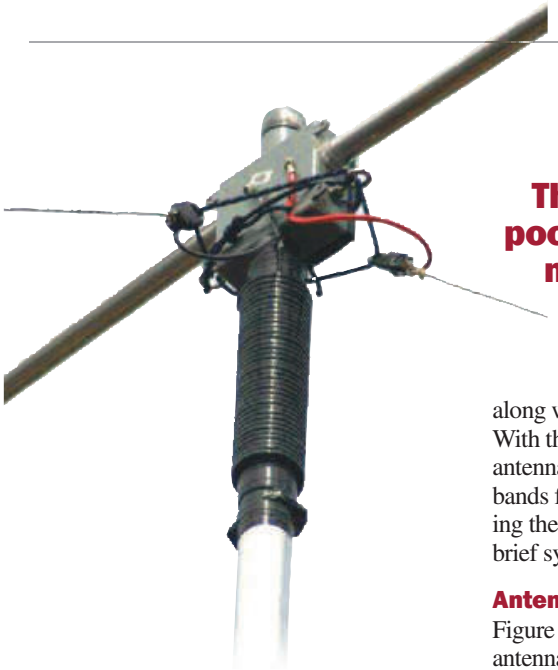

Dipoles Atop a Vertical

The popular 43 foot vertical antennas tend to be poor performers above 20 meters. Here's a creative multiband solution that enhances DX potential.

Frank Fahrlander, N7FF

My homebrewed 43 foot vertical, though a source of pride, left a few things to be desired. Its performance on the higher bands left me unsatisfied — 20 and 15 meters was mediocre and operation on 10 meters was not practical. On that band, the vertical was a challenge to tune and it had a poor radiation angle. I addressed these issues by using my vertical to support a three band trap dipole along with an 80 meter resonant wire dipole. With the exception of 60 and 12 meters, this antenna system covers all Amateur Radio bands from 80 to 10 meters. Before describing the antennas in detail, I'll first give a brief system overview.

Antenna System Overview

Figure 1 is a schematic sketch of the entire antenna system. Starting in the shack, an MFJ-998 automatic antenna tuner matches both the dipoles and the 43 foot vertical. The output of the antenna tuner can be switched to either a dummy load or a bias T, which is used to send a control signal to select either the vertical or the dipoles as the operable antenna.[1] The output of the bias T passes through a grounded bulkhead to the outside of the shack.

The coax from the bulkhead connects to a second bias T located in a utility box at the base of the 43 foot vertical. The control signal from the bias T operates a relay to connect the coax signal to either the vertical or the dipoles. The absence of 12 V on the control signal leaves the center conductor of the coax connected to the vertical through an MFJ 1:4 unun. The shield of the coax is connected to a ground plate that serves as the junction for 32 radials, each 30 feet long. The vertical is mounted to the ground plate by a Delrin insulator that is pivoted, allowing the antenna to be rotated down for maintenance.

A 12 V control signal from the bias T operates the relay and switches the coax center conductor and shield to a coax that travels to the top of the vertical through its center. At the top of the vertical the coax is attached to

[1] P. Salas, AD5X, "Remote DC Power Through Your Coax," *QST*, Jul 2004, pp 35-37.

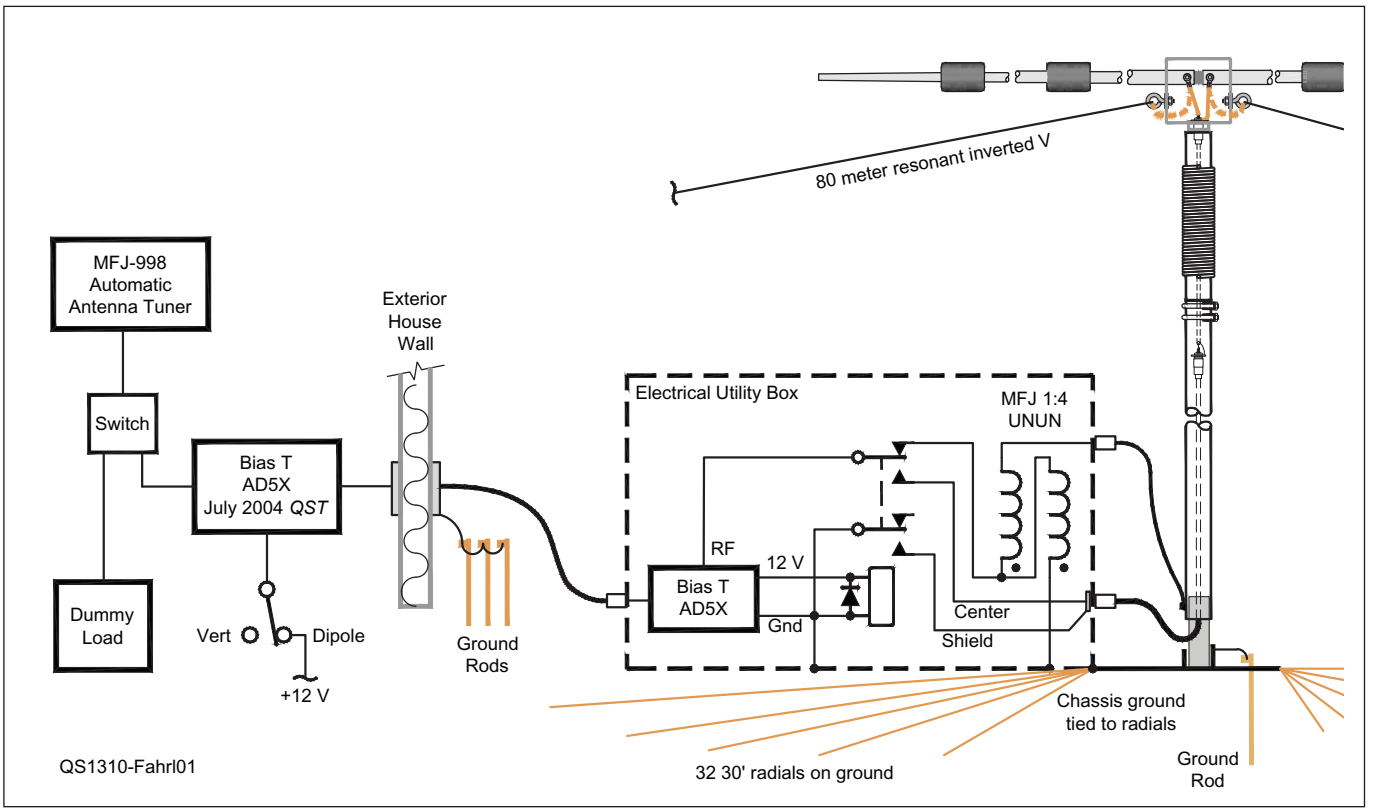

Figure 1 — Antenna system schematic overview.

a balun made by coiling 35 turns of smaller coax around a short PVC extension tube.

The top of the extension tube supports a plastic junction box that in turn supports each end of a three band trap dipole along with the two center ends of the 80 meter resonant wire dipole. The center of the coax from the balun is connected to both one end of the trap dipole and one of the center ends from the 80 meter wire dipole. The shield of the coax is similarly connected to the other trap dipole end along with the other 80 meter dipole center end.

The Vertical

I built my 43 foot vertical using 6063-T832 drawn aluminum tubing. Table 1 lists the tubing in assembly sequence. It shows the lengths and amount of overlap between adjacent tubes. The four bottom tubes are joined end to end using internal 2 foot sections of 2 inch tubing. The next four tubes all overlap 18 inches into the tube below them. The top tube is a special case and it slips over the previous tube and overlaps 12 inches. I used electrical joint compound in each of these joints and pop rivets to secure the tubes together.

The ground mount for the vertical is comprised of two pieces of metal. On the bottom is a 5 × 8 × ¼ inch steel base plate with a 12 inch piece of rebar welded vertically to the center of the bottom. It's anchored to the ground by the rebar and a ground rod so it doesn't move when the antenna is raised or lowered. On the top base are two small steel plates welded vertically to form a mounting fork. Holes in the fork hold a 3 inch long ¼-20 stainless machine screw and nut.

On top of the base is a 10 inch square ⅛ inch thick aluminum plate. Slots were cut to allow it to slip over the fork and be screwed to the base. A hole was also provided that matched the hole in the base for the ground rod. Figure 2 shows the mount with the vertical in the raised position.

The white piece sticking out of the vertical is the visible portion of an 8 inch long 1.5 inch diameter Delrin rod. The rod was cut in half along its length to minimize obstruction of the end of the vertical. It is attached to the inside of the vertical with two ¼-20 stainless steel machine screws. I recessed the connecting nuts in the Delrin and trimmed the screws flush to the surface of the Delrin so they didn't interfere with the dipole's coax.

The aluminum plate electrically connects the ground rod, the ground side of a 1:4 unun and the ends of my 32 radials. The radials are 30 foot lengths of #17 gauge enameled copper wire I happened to have on hand. I held the radials in place with 7 inch gutter nails and covered them all with the pine bark I use for my "retirement lawn."

The Dipoles

Since my highest priority was getting better performance on 10, 15 and 20 meters, I decided to use the vertical as an antenna mast to support a trap dipole for those bands. I also made provisions to add other dipoles to the family in the future. Presently, I have one additional dipole attached — a wire dipole resonant in the center of the 80 meter band.

The trap dipole is made from 6063-T832 drawn aluminum tubing and four homebrew coaxial traps. Table 2 lists the tubing and traps in assembly sequence for one half of the finished (tuned) dipole. The tubing connections are made by cutting slots in the ends of the outer tube and tightening it to the inner tube with stainless steel hose clamps. Electrical joint compound was used in each of these joints. The two halves of the dipole are joined inside an electrical box, described later. The total length of the assembled dipole is 24.5 feet.

The inner traps resonate at 28.85 MHz. and the outer traps are tuned to 21.23 MHz. The trap designs were adapted from those described by John DeGood, NU3E, in his fine article on his attic trap dipole. You can find this article on John's website at **degood.org/coaxtrap/**. Also, I used the very helpful coax

Figure 2 — The 43 foot vertical antenna attached to its insulated swivel base. The dipole's coax feed enters through the hollow Delrin rod that forms the base insulator. The gray electrical box contains an MFJ 10-10989D wired as a 1:4 unun.

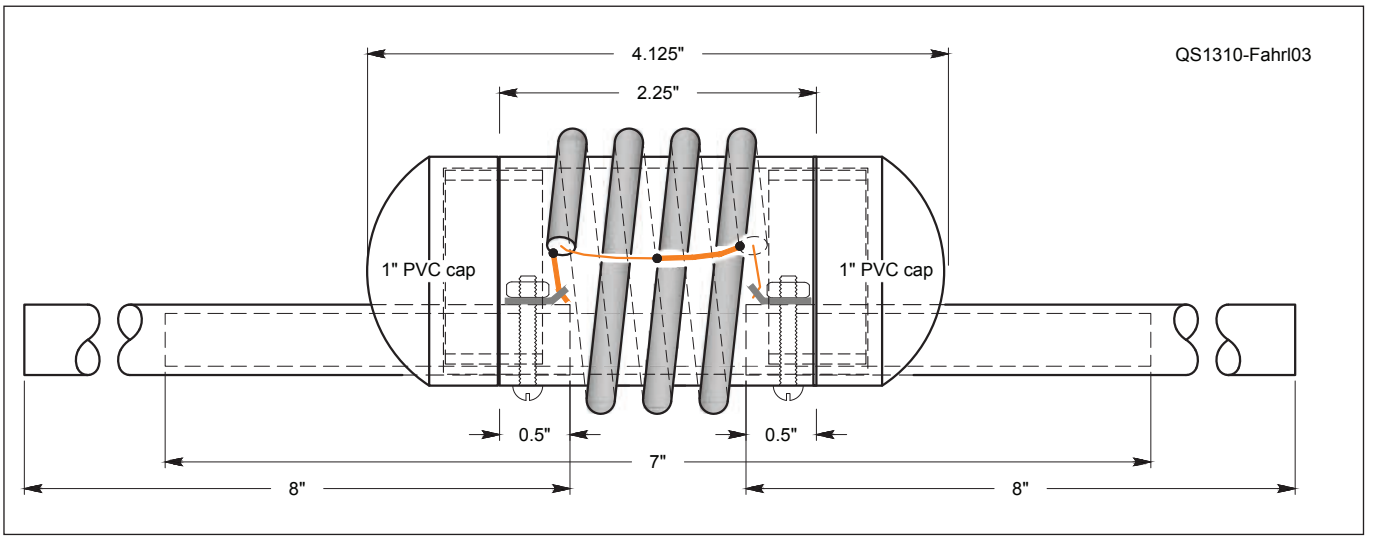

Figure 3 — Dipole trap construction details.

Table 1
Vertical Antenna Composition

Tube #	Length (feet)	Overlap (inches)	Outside Diameter (inches)	Cumulative Length (feet)
1	6	0*	2⅛	6
2	6	0	2⅛	12
3	6	0	2⅛	18
4	6	0	2⅛	24
5	6	18	2	28½
6	6	18	1⅞	33
7	6	18	1¾	37½
8	6	18	1⅝	42
9	2	12	1¾	43

*see text

Table 2
Dipole Tuned Dimensions (Single Element)

Tube #	Length (inches)	Overlap (inches)	Outside Diameter (inches)	Cumulative Length (inches)
1	36	0	1	36
2	36	5 15/16	⅞	66 1/16
3	36	5 15/16	¾	96⅛
4	12	6⅛	⅝	102
5	6 9/16	5⅜	½	103 3/16
10 m Trap	4⅛	0	–	107 5/16
6	6 9/16	5⅜	½	108½
7	11⅜	0	⅝	119⅞
8	6 9/16	5⅜	½	121 1/16
15 m Trap	4⅛	0	–	125 3/16
9	6 9/16	6 3/16	½	125 9/16
10	12	0	⅝	137 9/16
11	14	4¾	½	146 13/16

trap design tool developed by Tony Field, VE6YP, available at **www.qsl.net/ve6yp/index.html**.

All the traps are built by winding calculated lengths of coax onto 1 inch schedule 40 PVC couplings. My couplings were 2¼ inches long and 1⅝ inches in diameter. These dimensions can vary by manufacturer so be sure to measure them or factor whatever size you use into the trap calculations.

Figure 3 shows the construction details for a typical trap. Two 8 inch lengths of ½ inch aluminum tubing are fitted equally over each end of a 7 inch piece of ⅜ inch fiberglass rod leaving a 1¼ inch gap of bare fiberglass in the middle. The assembly is attached snugly to the inside surface of a pipe coupling with two 1 inch long 10-24 stainless machine screws and nuts. Drilling the holes properly for these screws is a little challenging. I suggest you first tape the aluminum and fiberglass gap with electrical tape to maintain its proper size and position between the tubes. Then clamp the taped assembly in position at one end of the coupling (perhaps with a small C-clamp) while you drill the first hole through the coupling, tubing and rod. Attach a screw through this hole and tighten it and then drill the other hole. As you remove the tubing, tape and rod, mark everything to assure that you can reassemble it the way it was drilled.

Use the VE6YP coax trap design tool to calculate the lengths of coax for any diameter coil form or type of coax. I used a good quality RG-59/U (95% braid) 75 Ω coax. My 10 meter trap design required 22 inches of it, which is about 3.4 turns. The 15 meter trap required 29 inches, which is about 4.8 turns. Note that these calculated lengths are for the non-stripped lengths of coax. You also must add about 3 inches on each end of this and prepare it so that the shield and inner conductors are separate leads. Cut the center conductors on each end to be 1¼ inches long and strip the ends for soldering. It is hard to do this once the coax is inside the coupling.

Figure 4 shows an early attempt at constructing the 10 meter trap using solder lugs. I found later that crimping and soldering on terminals made the job easier and worked better.

The coax is wound around the coupling and ends are pushed into coax-sized holes. There should be about ½ inch of unstripped coax inside the coupling on each end.

Although the VE6YP calculations are for close wound coils, I opened the windings a tiny bit so I could have more tuning opportunity. With the tubing/rod screwed in place, make some trial wraps of the prepared coax around the coupling to see where the holes should be drilled. You'll want the holes to be equally distant from the aluminum tube so you have room to make the connections. After you have decided where the coax will go, you might benefit from drilling the first hole, inserting the coax until ½ inch of jacketed coax is inside the coupling and then rewrapping it to mark the second hole.

Figure 4 — Looking into the end of my first attempt at a 10 meter trap. I later went to crimped terminals rather than solder lugs.

After you have the coax wrapped and inserted into the coupling, slip 1½ inches of insulating tubing over one of the braids. Then pull this braid to the other end of the coupling alongside the center conductor on this side. Trim the excess braid and solder them together. Then tuck the braid back into the middle of the coupling making sure it stays away from the aluminum tubing.

The unconnected braid is trimmed and terminals are crimped and soldered to it and the unconnected center conductor. The terminals are manipulated onto the screws and oriented to nicely dress the leads away from the ends of the coupling. Now you are ready to tune the trap.

About ⅝ inch was removed from 1 inch PVC end caps and ½ inch lengths of 1 inch PVC were cemented in, leaving about ¼ inch sticking out of each cap. A spare coupling was placed in the drill press vice and the inner surface of the coupling was positioned to touch the side of the ½ inch drill bit. The end caps were placed on top of this coupling one at a time and drilled to accept the ½ inch aluminum tubing.

The end covers are taped to the trap using electrical tape. The finished trap is then protected using a length of 3 inch diameter thick wall heat shrink tubing, which does a great job covering up all those extra holes I put in the couplings.

Tuning the Traps

I tuned my traps using a 5 inch diameter pickup loop connected to an AIM-4170 antenna analyzer using a short length of coax. Both the main part of the trap and the pickup coil were positioned in the air using a simple wooden test fixture. The trap could be posi-

tioned easily and tested quickly and I found the tests were repeatable and unaffected of nearby objects. I also found that flipping the trap end to end didn't significantly change the measurements.

The analyzer, in this setup, functions like a grid dip meter. I tuned the traps to minimum SWR in the centers of the 10 and 15 meter bands. Every time I watched the SWR plot being drawn I was a bit anxious. Don't get discouraged if your first attempts at the trap construction produce something outside the band or too far off the goal. I ended up with about six lengths of coax on the bench before mine were all completed.

Just a little bit of movement in the coil spacing makes a big difference. Once I had a trap that I knew could be tuned to the proper frequency by manipulating the turns, I progressively applied electrical tape to commit turns and retested, moving the remaining free turns if needed. I repeated this process until I had all the turns tightly taped and the frequency where I wanted it.

Joining the Dipoles to the Vertical

Figure 5 shows the three construction items that affect the connection of the dipoles and the vertical. The top of the figure shows the junction box. It is made from a non-metallic conduit two gang switch box. These boxes accept a standard cover, which has a rubber gasket to keep it water tight.

Holes were drilled in opposing sides of the junction box to fit the 1 inch tubing from each half of the dipole. They are joined in the box using a ⅞ inch diameter Delrin or fiberglass rod. A half inch of bare rod is left between the two dipole halves. Each half of the dipole is secured in the box using 10-32 nuts, screws and washers. Washers are placed between the tubing and the back of the box to support the tubing and keep its parallel to the back of the box. Solder lugs on the same screws but on the outside back of the box permit future expansion. These plus the screw eyes that are mounted on the side of the box below the antenna legs provide an easy means to add other dipoles in parallel to the trap dipole in the future (presently, I have a 80 meter resonant wire dipole connected). Figure 6 shows the junction box open for inspection.

Below the junction box in Figure 5 is the extension tube. This is an 11¾ inch piece of 1.5 inch schedule 40 PVC. It serves as the coil form for the 35 turn coax choke balun and provides some insulation from the top of the vertical. The extension tube has 1 inch PVC couplings cemented inside each end. If you can't find couplings that fit the 1.5 inch inner diameter of the tube, you can scrape off the PVC from larger ones with a utility knife to make them fit. The extension tube connects to the junction box using a short length of 1 inch schedule PVC pipe.

The extension tube connects to the top of the vertical using an adapter made from 1 inch schedule 40 pipe and two 1 inch couplings. The couplings are reamed so that 1 inch pipe will go all the way through them. They are then cemented next to each other onto one end of a 7¾ inch length of 1 inch pipe. Since these couplings will be fitted into the top of the vertical which has a 1⅝ inch inside diameter, you may have to scrape these couplings

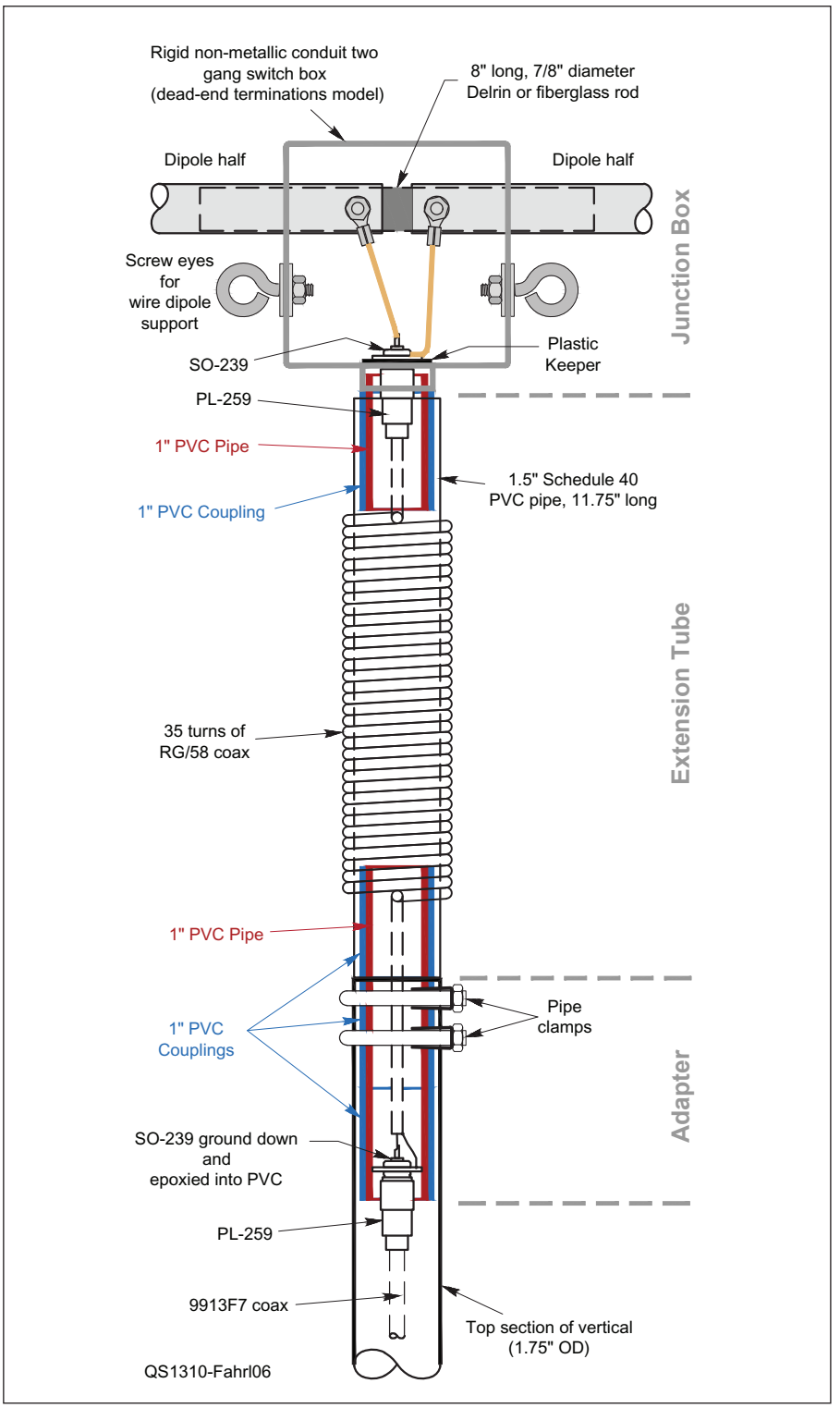

Figure 5 — The junction box, extension tube and adapter join the two antennas.

to get them to fit. After they are made to fit the vertical the adapter is glued into the extension tube.

Final assembly of the vertical to the dipole is done by first raising the vertical's top end off the ground four feet or so with about 3 feet of coax coming out of the top end of the vertical. I used a 50 foot fish tape to pull the coax through the vertical.

At this point it is probably good to get a helper. As the assembly progresses, you will want someone to be at the base of the vertical to pull the coax snug as the adapter is inserted into the vertical.

The coax is attached to the choke balun and taped for weatherproofing. The adapter is then inserted into the top of the vertical while your assistant pulls the coax taut. After the vertical is attached to the adapter and secured with pipe clamps, tightly wrap both joints at the ends of the extension tube with electrical tape.

Tuning the Trap Dipole and Raising the Antenna

To tune the trap dipole it has to be elevated to eliminate the effects of the ground. To make the process of raising and lowering the antenna system easy, I guyed the vertical at 90° points: east, west, north and south. I raise it to the north and lower it to the south without ever loosening the east and west guys. That makes it very stable in those directions. There are two guy ropes in each direction, connected respectively at 20 feet and 40 feet from the bottom.

I can quickly raise the dipole to over 16 feet using a push stick made from four 4-foot surplus fiberglass mast sections. The first section has a two pronged fork made from PVC inserted in the end and taped so it doesn't twist. I place the fork just under the 40 foot guys so it doesn't slip towards the end of the vertical, push it up and sit it on the ground. I then repeatedly raise the mast and insert the next section into the bottom of the mast. Adding some tape around the mast sections at a few points can help prevent the mast from slipping in your hands as you lift. Figure 7 shows the dipole in this tuning position. I was happy to see that the dipole's measurements at this height matched the measurements for the dipole at full height.

Performance of the Dipoles

After I got the trap dipole tuned, I decided to take advantage of my built-in expansion feature. I connected the legs of an 80 meter wire dipole to the junction box just to see how it affects the trap dipole settings. Figure 8 compares the SWR for the 43 foot vertical with the dipoles (three band trap in parallel with the 80 meter wire). The measurements were made at the shack end of the coax. A total of 94 feet of 9913F7 low loss coax was used. The last 44 feet of this is inside the vertical. As you can see, the trap dipoles cover their entire bands with SWR less than 2.5:1 and the 80 meter wire antenna is usable across its band with a good tuner. I was happy to see that the hard work of tuning the trap dipole wasn't affected much by the addition of this 80 meter wire antenna.

I have used the dipoles for several months now and I find them delightful. My amplifier and tuner never complain. I run 600 W and from all that I have read the traps in the dipole should handle this power level with no problem.

At 45 feet high, the dipoles have relatively low angles of radiation and they seem to work well for DX. I also find that they are less noisy than the vertical in many cases. Although I do get somewhat stronger reports from stations off the front and back of the dipole, it works reasonably well in most directions.

Vertical Performance

One significant question this project was to answer was "What is the effect of coax running up through the vertical?" To help find the answer, I measured the vertical by itself, with coax inside and with the dipole system connected.

In my first measurements, I used separate feed lines for the dipole and the vertical. It didn't take me long to find out that the capacitive effect between the vertical and the dipole coax had significant impacts on the vertical just when the dipole's coax was lying on the ground. After I saw such dramatic impacts, I actually calculated the capacitance and found it to be about 0.001 μF which is only 11.2 Ω of reactance at 20 meters. To eliminate the capacitance effect, I

Figure 6 — The junction box. The end of the choke balun is at the top with the keeper in place. The black coating on the Delrin in the gap makes the connection more weather resistant. Silicon sealant is also used liberally on the box and on the trap ends where the tubing exits.

Figure 7 — Rotating the antenna upward using a surplus mast push stick. Note that the wire dipole for 80 meters is not yet connected.

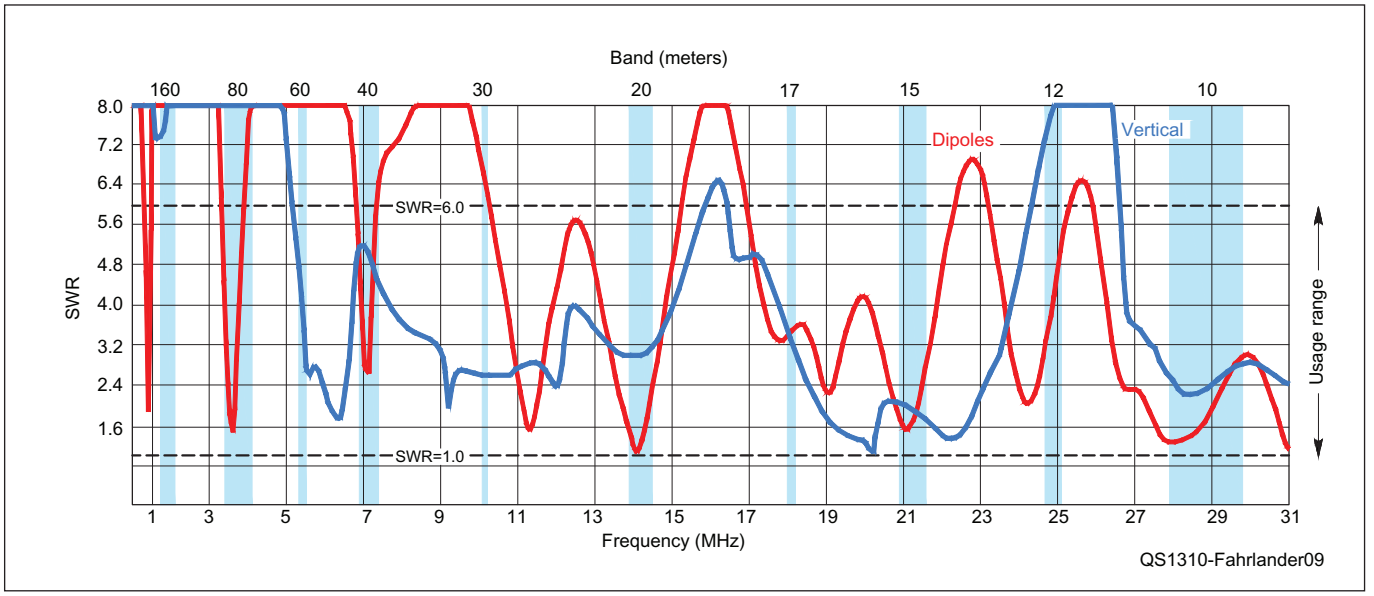

Figure 8 — SWR plots of the dipoles and vertical across the HF bands.

decided to cut the dipole coax a couple of feet from the bottom of the vertical and use a remote relay to switch a single feed line between the dipole and the vertical. When using the vertical, the switch isolates both the shield and the center conductor of the dipole's coax.

Future Work

While I am gratified that the addition of the dipoles resulted in an antenna system where at least one of the two elements was usable and effective on all Amateur Radio bands from 80 to 10 meters. I am afraid that I am unable to leave well enough alone. To that end, given the good results with the 80 meter wire dipole, I'm planning to experiment with 40-80-160 meter trap dipoles. Also, I have some ideas for simplifying and improving things by making changes at both ends of the vertical.

These are just a few ideas. All indications are that this will be a work in progress for some time to come.

ARRL member Frank Fahrlander was first licensed at age 12 in 1955 in Hamilton, Ohio and received call sign WN8CGF. He earned his Amateur Extra class license in 1959 and acquired the call W7DNF and later N7FF when living in Phoenix, Arizona. Frank was the third operator who joined the BASH-HAL-NE-AE Radio Club that operated Barry Goldwater's MARS station, AFA7UGA, during the Vietnam War. His interest in ham radio came from his father who owned both a radio store (The Radio Company) and a commercial radio station (WEBO and later WSRO) in the 1920s in Hamilton, Ohio. Various members of the then-Fort Hamilton Amateur Radio Association were also a very positive influence as well. Frank received his Electrical Engineering degree from University of Dayton in 1963. He worked as an individual contributor and manager for computer companies in Phoenix and Cupertino, California. He retired from HP in 2005. He and his wife, Phyllis, have been married 48 years and have four children. Frank can be reached at 29 Hartura Way, Hot Springs Village, AR 71909 or **n7ff@arrl.net**.

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New Products

MFJ 80/160 Meter Matching Network for 43 Foot Verticals

The MFJ-2910 matching network is said to improve efficiency for 43 foot verticals operating on 160 and 80 meters. These antennas are normally fed with a broadband unun, providing a reasonable match on the 60 through 10 meter bands. At 160/80 meters, the low radiation resistance makes it difficult to match the antenna without high feed line loss. Installed at the base of the 43 foot vertical, the MFJ- 2910 is said to significantly limit losses and put 160 and 80 meters back within the tuning range of the tuner inside the shack. MFJ-2910 includes a high-voltage insulated base tube, remote power injector and switch with 160 meter, 80 meter and OFF positions. Power rating is 1.5 kW. Price: MFJ-2910, $299.95; MFJ-2908 (600 W power rating), $249.95. For more information, to order, or for your nearest dealer, call 800-647-1800 or see **www.mfjenterprises.com**.

NHRC-2.1 Repeater Controller

The NHRC-2.1 repeater controller, an updated version of the NHRC-2, adds several new features, including four 10 second stored speech messages and DTMF over-the-air programming and control. A store-and-forward simplex repeater mode is available with messages up to 40 seconds. The controller supports European ID and access rules, including tone burst input. It has a fan control output, jumper selectable receiver deemphasis and five status LEDs. Price: $59 for a partial kit, $159 assembled and tested. For more information, or to order, visit **www.nhrc.net**.

EME — A New DXCC Challenge

Moonbounce your way to 2 meter DXCC using *WSJT* software.

Robert Ramsaur, WA6MQF

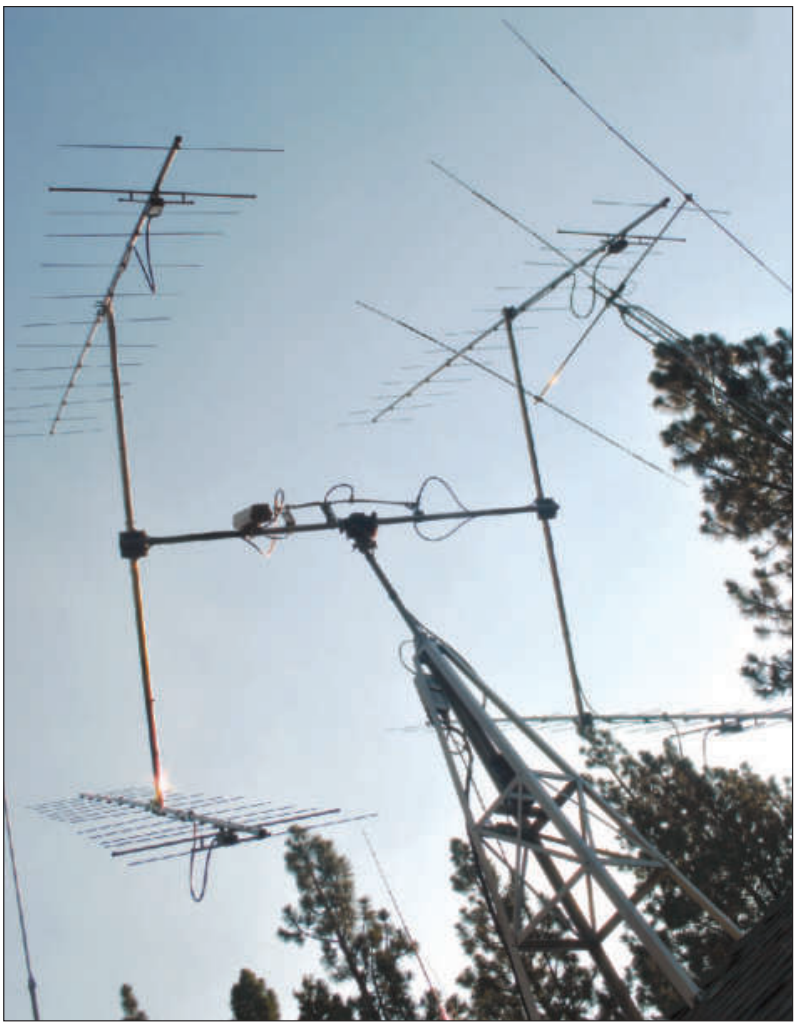
Ever since my Novice days I've wanted to work DX on 2 meters. I remember reading a *QST* article from several years ago that told about the first DXCC award earned on the 2 meter band, so I know it can be done [W5UN earned the first 2 meter band DXCC on Jan 11, 1991 — *Ed.*]. The feat was achieved using the Moon as a reflector. After earning over 300 confirmed countries on HF and a 5 Band DXCC plaque, I've decided that my new challenge is DXCC on 2 meters using the Moon as a reflector. Here's how I put together the EME station that I'm using to work toward this goal.

Up on the Tower

My quest for DXCC on the 2 meter band started with a rooftop tower and the four 13 element Yagi antennas seen in the lead photo. You can also see a weatherproof CCD camera left of center on the boom. The 10 foot long horizontal boom, made of 1.25 inch diameter galvanized pipe, provides 114 inches horizontal center to center separation between Yagis. The H-frame legs, constructed from two concentric thicknesses (1.375 inch and 1.5 inch diameter) of aluminum tubing for extra strength, separate the Yagis vertically by 110 inches.

An elevation rotator mounts at the center of the horizontal boom just below the four-port power divider. Four equal lengths of LMR400 coax cable connect the power divider to the four Cushcraft 13B2 Yagi antennas. LMR400 cable also connects the power divider to the tower mounted pre-amp box. I installed the receiver pre-amp inside a box along with the coaxial relays that steer the transmit and receive signals to their proper destinations and in the proper sequence. An azimuth rotator mounts at the bottom of the vertical mast on the rooftop tower.

Figure 1 shows the inside of the box containing the pre-amp and two relays. The large relay connects the antenna array to the Heliax and the smaller relay connects the array to the pre-amp input. During TX mode the small relay switches a 50 Ω termination to the pre-amp input. The pre-amp output connects to the transceiver in the shack using RG8X coaxial cable. Figure 2 shows a schematic diagram of the pre-amp / relay box connections. The relays default to TX mode if power fails



The 2 meter band EME antenna array consists of four 13 element Yagis, a power divider, rotator system and a weatherproof CCD camera.

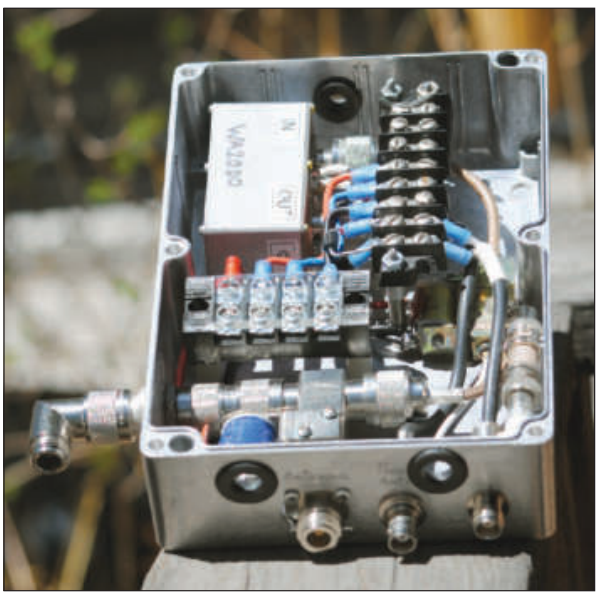


Figure 1 — An internal view of the mast-mounted box shows the pre-amp and two relays.

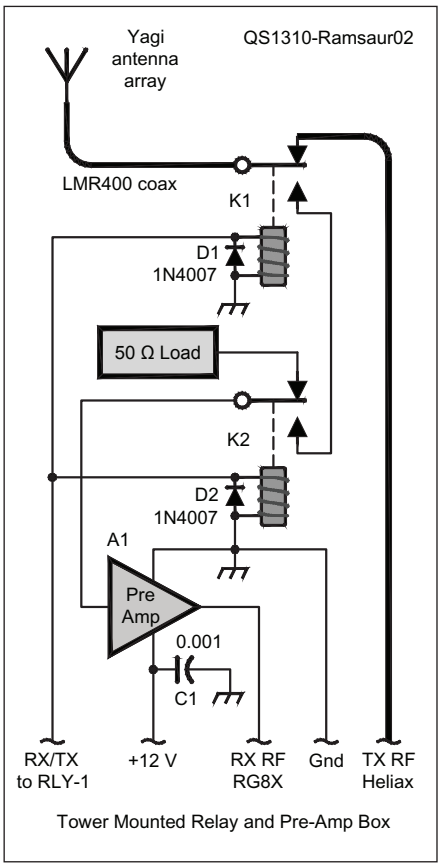


Figure 2 — Schematic diagram of the relay and pre-amp circuit. The relays default to TX mode if the power supply is switched off or fails.

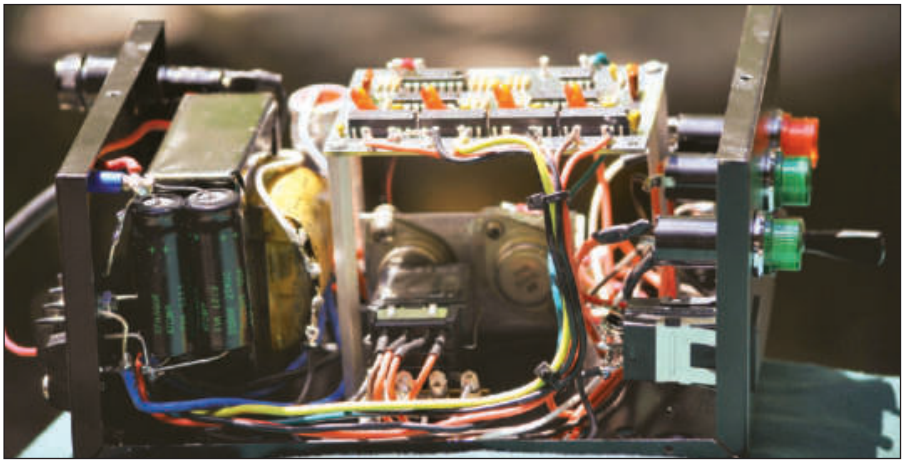


Figure 3 — The control box located in the shack houses a 12 V / 24 V power supply, the RX/TX sequencer and a manual TX mode switch.

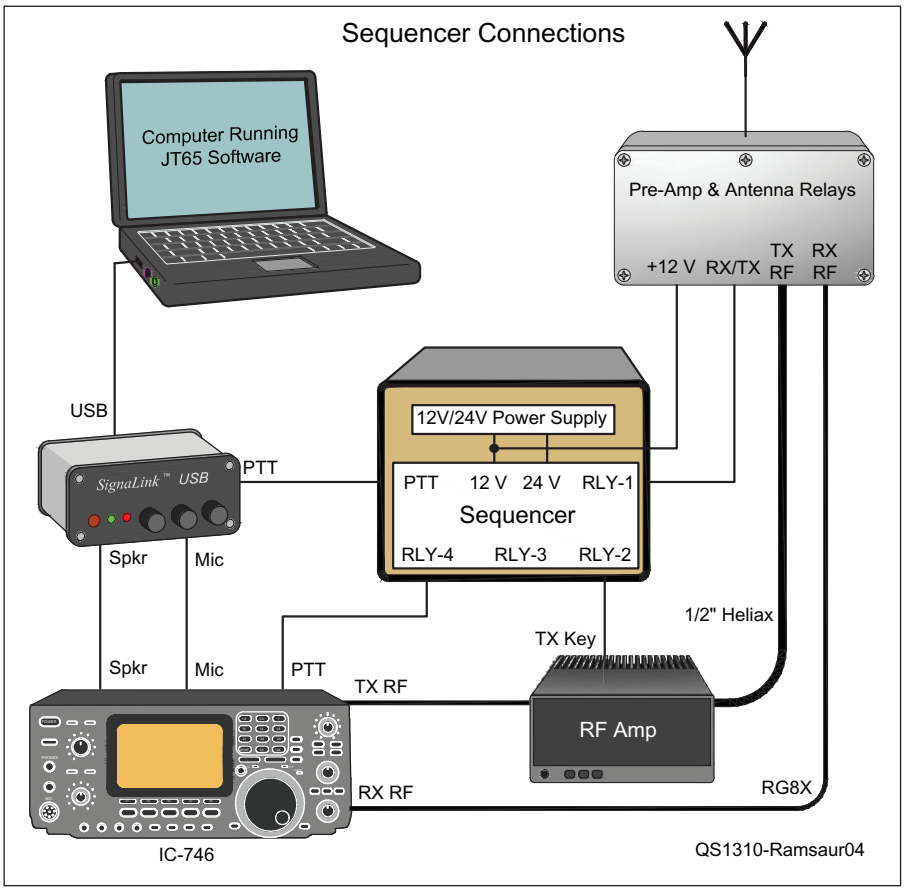


Figure 4 — The sequencer is configured to make sure that the antenna and pre-amp relays change first then the RF power amplifier is biased on and finally the transceiver PTT command is issued.

or is switched off. Relay K1 switches the antenna between RX and TX modes. Relay K2 connects the receiver pre-amp input to a 50 Ω load during TX mode to reduce RF entering the pre-amp. Diodes D1 and D2 help suppress transients across the relay coils. Capacitor C1 bypasses the pre-amp 12 V dc supply. A 24 V dc source energizes relays K1 and K2 during TX mode operation. I used half-inch Heliax to connect the relay box to the transceiver in the shack. The CCD camera on the antenna boom lets me see the Moon when the antenna is aimed correctly.

Sequencing the Relays

Figure 3 shows an inside view of the control box located in the shack. This unit includes a 12 V and 24 V dc power supply, the RX/TX sequencer and a manual TX mode switch. The 12 V supply powers the mast mounted receiver pre-amp, the CCD video camera and the RX/TX sequencer. The 24 V supply powers the tower mounted coaxial relays for switching between transmit and receive. The sequencer, an Advanced Receiver Research model TRS04VD transmit/receive control circuit, adds time delays to a series of relay closures so that all the RF system relays are switched to the transmit position before keying the RF power amplifier and then the transmitter to produce RF power. This protects the pre-amp from RF transmitter power damage. My sequencer cost less than one pre-amp.

Figure 4 shows how the sequencer connects with the station equipment. When TX mode is keyed at the shack, signal RLY-1 closes followed by RLY-2, RLY-3 and finally RLY-4, each at 30 ms intervals, before the transmitter is keyed with the PTT signal. In RX mode (un-keyed) RLY-4 opens first then RLY-3, RLY-2 and finally RLY-1. In my case signal RLY-3 is not used. This un-keys the transmitter 30 ms before any other switching occurs. The main antenna or pre-amp input relay requires the application of 24 V for RX

Figure 5 — The author's EME station equipment.

mode. This prevents a power supply failure or intermittent connection from inadvertently putting the RF switching relay into RX mode during a TX mode. I highly recommend a sequencer for anyone who plans an EME system — it can save you the cost of a damaged pre-amp.

Equipment in the Shack

My EME station, in Figure 5, shows — from top to bottom — the 7 inch LCD video monitor that displays the CCD camera image, a Tigertronics Signalink-USB sound card and a Bird watt meter on top of the Yaesu FT-736R transceiver that I use to monitor my transmit signal. Below that you can see the Yaesu 800SA azimuth rotator controller, a Yaesu G-550 elevation rotator controller and an Alinco 12 V power supply for the Icom IC-746 Pro seen at the bottom. A second USB Signalink sound card resting on top of the transceiver creates and decodes JT-65 audio for transmitting and receiving. I modified this transceiver to have separate receive and transmit antenna connections, and installed a high stability reference oscillator. To the right of the transceiver you can see the sequencer box, which also houses the 12 and 24 V dc power supplies.

A New Modulation for My New Mode

I use JT65B, popular on 2 meter EME, for my EME modulation.[1] JT65B software, created by Joe Taylor, K1JT, controls the transmission and reception of digital information and can recover data buried way down in the noise of the audio passband of the transceiver. I benefitted from Internet spotted EME stations while monitoring EME activity. After a few weeks of listening and decoding line fragments I began to recognize what a JT65B signal looked like on the computer software waterfall display. Then it all came together! I heard/saw a Russian ham calling CQ and confirmed what had just displayed on my computer screen by finding the Russian on the very frequency that was posted on the Internet spotting program. My EME system actually worked!

Final Words

I've nearly finished building an 800 W amplifier. The extra 9 dB of transmitter signal will allow a larger number of prospective contacts to decode my Moon reflected JT65B signals, leading to more completed QSOs. There seems to be no end to the fun. You can find extra details and photos on the *QST* in Depth web page.[2] I'd like to acknowledge my friends from the Big Bear ARC, Bud Wyatt, KCØITA; Tom Fry, KF6Q; Mike Bode, WB6CLZ and Cindy Bode, WB6CIN, who helped me construct and install the entire antenna system and rooftop tower using only hand tools and a ladder. I hope my story encourages others to pursue new modes.

Notes

[1]Steve Ford, WB8IMY, "JT65 — The 'Musical' Mode", *QST*, Apr 2011, p 45.
[2]**www.arrl.org/qst-in-depth**

Robert Ramsaur, WA6MQF, is an ARRL Life Member and an Amateur Extra class operator who was first licensed in 1961 at age15 as WV6MQF. He upgraded to a General class license, WA6MQF, the very next year. Robert earned a BS degree in 1970 from Brigham Young University in Provo, Utah and a Masters degree in 1971 from Miami University, Oxford, Ohio. He taught Broadcast Engineering at BYU and was head of the KBYU-TV Production Engineering Department. After university work he became an RF Field Engineer for Harris Broadcast, installing TV transmitters in 25 states and 20 foreign countries. You can reach Robert at **rramsaur@jps.net**.

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

The Cookie Tin Antenna — Making it Work

This familiar makeshift antenna may surprise you when it's configured properly.

John Portune, W6NBC

My ham buddy, Ernie, W6ND, loves to "kluge" together projects from baling wire, wooden dowels and PVC pipe. He and I are constantly at loggerheads over his makeshift designs (in fun, of course). Our latest dustup was over a 2 meter portable antenna he made from a 7½ inch cookie tin (see Figure 1). When I first saw it, I delivered the classic ham squelch: "The ground plane is too small!" But after seriously looking at cookie tin portables with *EZNEC* antenna modeling software and doing some live field tests, I discovered that an antenna that looks like a mechanical kluge can still be a decent electrical performer. You just need to know how to configure it.

An *EZNEC* Model

Thinking that I could defeat Ernie with technical bluster, I organized my frontal attack around an *EZNEC* wire frame model of his antenna (see Figure 2). Actually, to gather the comprehensive data here, I made seven models: for 2½, 5, 7½, 10, 20, 40 and 80 inch diameter cans, all 2 inches thick. Some were theoretical, as you can imagine. I modeled them all at 146 MHz, 2½ feet (picnic table height) over average soil, and for a wave angle of 15°. I added an eighth model as a reference: a half wavelength vertical with no cookie tin.

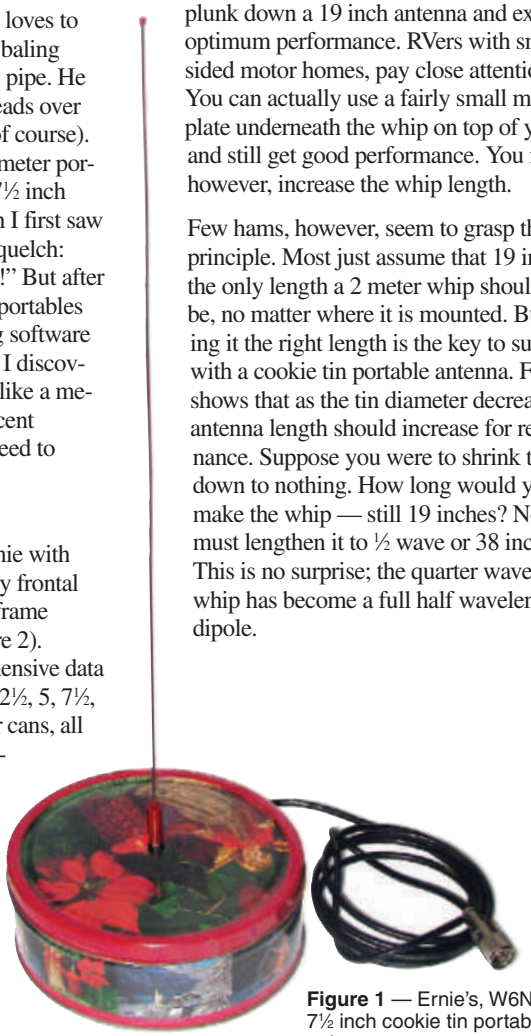


Figure 1 — Ernie's, W6ND, 7½ inch cookie tin portable antenna.

I thought I was ready to show Ernie that his 7½ inch cookie tin antenna wouldn't work well, but the data shown in Table 1 and Figures 3 and 4 surprised me. All three figures use the same *EZNEC* modeling data. Note the variation in the optimum whip length determined for each tin.

The data made it clear to me that an efficient cookie tin portable *must have a longer whip* if the tin is smaller. It's the same if you put the whip on any surface smaller than half a wavelength in extent (40 inches). Don't just plunk down a 19 inch antenna and expect optimum performance. RVers with smooth-sided motor homes, pay close attention here. You can actually use a fairly small metal plate underneath the whip on top of your rig and still get good performance. You must, however, increase the whip length.

Few hams, however, seem to grasp this principle. Most just assume that 19 inches is the only length a 2 meter whip should ever be, no matter where it is mounted. But making it the right length is the key to success with a cookie tin portable antenna. Figure 3 shows that as the tin diameter decreases, the antenna length should increase for resonance. Suppose you were to shrink the tin down to nothing. How long would you make the whip — still 19 inches? No! You must lengthen it to ½ wave or 38 inches. This is no surprise; the quarter wavelength whip has become a full half wavelength dipole.

Table 1
***EZNEC* Predicted Performance versus Tin Diameter**

Tin Diameter (inches)	Antenna Length (inches)	Gain (dBi)
0	38.5	1.66
2.5	28.5	1.61
5	25.5	1.51
7.5*	23.4	1.27
10	22.5	1.02
20	20.5	0.89
40	19.1	0.64
80	19.0	0.14

*W6ND's antenna

Figure 4 further shows the gain of a cookie tin antenna with the correct whip length. Interestingly, it actually improves slightly for smaller tins. This is because the radiating part of the antenna is longer. The difference though is minor, just over 1 dB. If you don't increase the whip length, however, the performance will degrade. I have even seen hams surprised that a 19 inch antenna on a wooden bookshelf or on a smooth-sided motor home with no metal plate or ground plane didn't work well.

Why This Works

You may still be thinking, "I don't believe this; you can't make the ground plane so

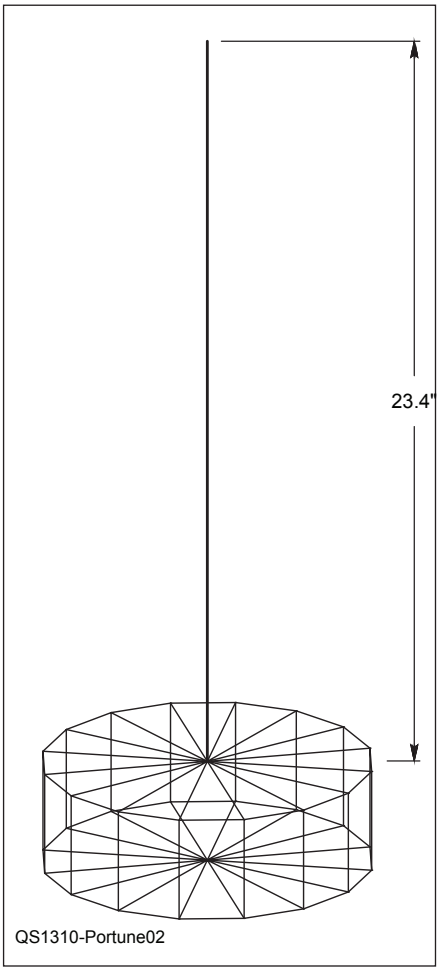


Figure 2 — *EZNEC* wire frame model.

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

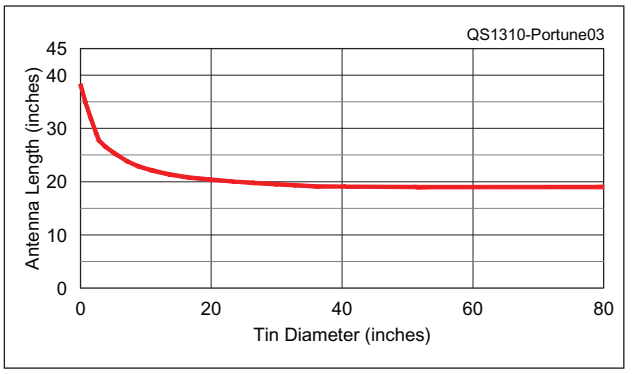


Figure 3 — Whip length to achieve resonance.

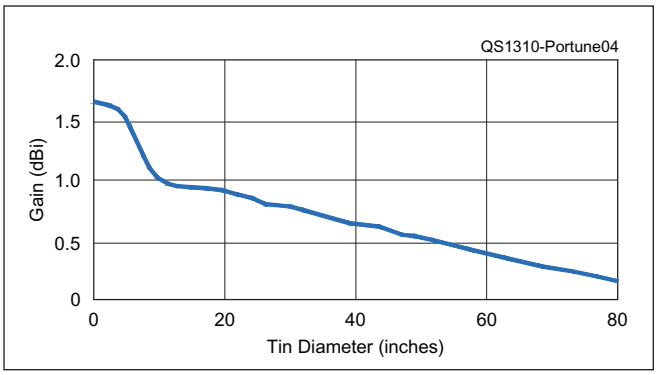


Figure 4 — Gain versus tin size at a 15° wave angle with whips of the correct length.

small." Not so! A tin less than 40 inches in diameter (half a wavelength) is actually no longer a ground. Plane rules don't apply for small tins. At that point the tin is a capacitive hat. It has become end loading for a shortened half wavelength dipole rather than a reflective surface to provide a virtual image of the antenna.

I implement a 2 meter cookie tin antenna like this: First I replace the 19 inch whip with something a lot longer. An adjustable whip antenna is ideal. Otherwise I just temporarily twist or solder some solid wire onto the top of the antenna. Then I begin trimming in small increments, using an antenna analyzer to let me know when I have achieved a low SWR. When the lowest SWR has been found, the assembly is *on frequency* and it will radiate well. I also use a choke balun while tuning. Without the balun, the feed coax will become part of the antenna. I usually just wind several feet of the coax into a small multi-turn bundle near the tin or place ferrite beads on the coax (connectors permitting). I am also careful to keep the antenna away from metal objects, such as the supports for my workbench.

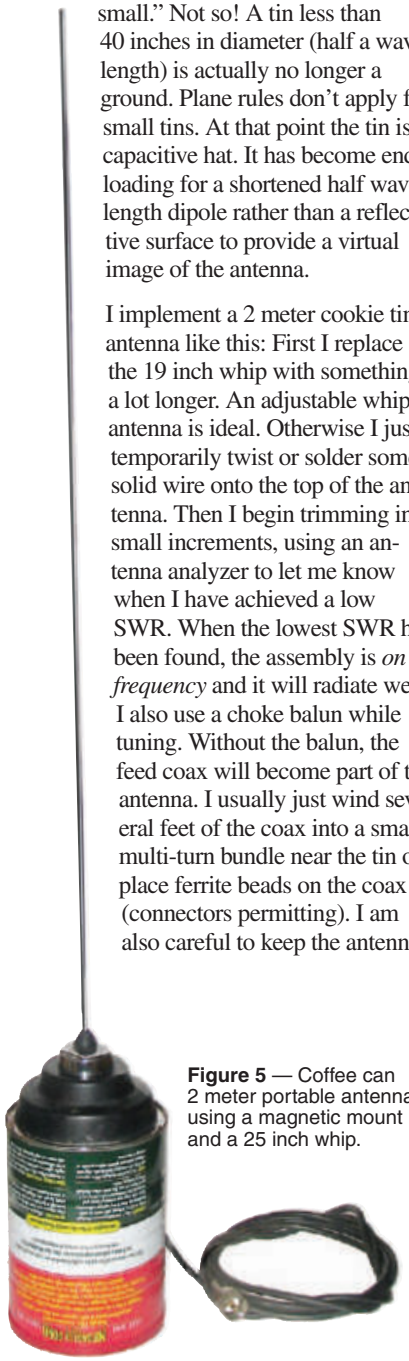


Figure 5 — Coffee can 2 meter portable antenna using a magnetic mount and a 25 inch whip.

A Coffee Can Portable

After recovering from Ernie's gentle scorn, I reasoned, "Shouldn't I now be able to make an effective portable from any can?" Figure 5 shows what I "brewed up" from a coffee can and a magnetic mount.

Again, I first replaced the original 19 inch whip with 30 inches of #10 AWG solid copper wire, which is an adequate length for trimming. Then on a wooden TV tray 2½ feet off the ground, and with an MFJ-259B antenna analyzer, I shortened the whip in small increments until I reached the 2 meter band. At that point, the top was 25 inches above the coffee can — a full six inches longer than the original 19 inch antenna. I then I replaced the copper wire with a stainless steel whip of the same length.

A Deluxe Version

For a fancier version I made a cookie tin portable from a 10 inch diameter can, a UHF plug and jack and a small telescopic whip from a portable broadcast receiver (see Figure 6). This is my "use anywhere" antenna that I keep in my RV. I cut a slot in the side of the bottom of the tin so that I can roll up the coax and put it inside along with the whip when not in use.

Figure 6 — Deluxe 10 inch cookie tin with telescopic whip in a UHF connector. Whip and coax are put inside the can for storage.

If I'm using the antenna on a large metal surface I simply adjust the whip length to 19 inches. On a non-metallic surface it needs to be extended to roughly 22 inches. On other surfaces, the length is in between 19 and 22 inches and I use an SWR bridge or antenna analyzer to make the adjustment.

If you lack a cookie tin, just use a magnetic mount directly on top of a rig with a steel case. As with any metal mounting surface, the length of the whip is easily tuned to a proper length.

Proof of Concept

To be sure that I wasn't just fooling myself with antenna modeling software, I decided to

Figure 7 — Coffee can antenna with 19 inch antenna and 4 drooping 21 inch radials.

perform field tests. I have a 2 meter FM receiver calibrated in dBm. I connected it to a half wavelength vertical coaxial dipole at 20 feet. The test transmitter was a low-power transmitter with a 20 dB pad to ensure a 50 Ω source. It also kept the input signal below receiver saturation. The receiver was roughly 200 yards away from the transmitter, on the wooden TV tray 2½ feet above the ground.

I chose the coffee can magnetic-mount antenna for the tests. A cookie tin antenna would have been very similar. It was configured in three ways: (1) with only the original 19 inch antenna; (2) with the retuned 25 inch antenna; and (3) with the original 19 inch antenna, but this time with four added drooping radials of #10 AWG solid copper wire. The latter was an improvised ground plane antenna. It had essentially the same radiation pattern and gain as a vertical half wavelength dipole or a J-pole. I pruned the radials to bring the whole antenna to tune. The radials were roughly 21 inches long (see Figure 7).

Table 2 compares the three. Both the ground plane antenna and the coffee can with the correct antenna length were within ½ dB. The coffee can with the original 19 inch antenna was 1½ dB weaker. Lengthening and retuning definitely restores the performance.

Table 2
Field Test Results

Antenna	Length (inches)	Signal at Receiver (dBm)
Can	19	–80
Can	25	–80
Can with radials	19	–78

What About Matching?

Matching was a surprise. The SWR actually changed little when I lengthened the whip on a smaller can. For example, the feed points in these simulations were dictated by the base mount. They were all at the bottom of the whip, just above the can. Even so, the SWR changed little. In fact, the smaller tins had better SWR. The reason, I believe, is as the whip gets longer, the feed point essentially moves away from the electrical center of the antenna. This raises the feed impedance, thereby compensating for the change of length.

Never again will I think of grandma's cookie tin as a ground plane unless it is larger than 40 inches in diameter. (I wonder how many cookies such a tin would hold!)

Photos by the author.

ARRL member and Amateur Extra class licensee John Portune, W6NBC, received a BS in physics from Oregon State University in 1960 and a BA in liberal arts and communications from Ambassador College in Pasadena, California in 1963. He has also earned an FCC Commercial General Radiotelephone license and an FCC radiotelegraph license. John retired as a broadcast television engineer and technical instructor at KNBC in Burbank and then from Sony Electronics in San Jose, California.

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

In The September/October 2013 Issue:

■ Garth Swanson, G3NPC, gives us the design details for his "21 MHz Four-Square Beam Antenna." This is a companion article to the September *QST* article of the same name. In the *QEX* article, Garth shows us how to calculate the mutual impedance of the array elements as well as calculations for the feed system. Both the *QST* and *QEX* articles are available at **www.arrl.org/this-month-in-qex**.

■ Flavio Egano, IK3XTV, presents a "A Model for Sporadic E: Meteors + Wind Shear + Lorentz Force." Flavio describes one possible explanation for the formation of sporadic E enhanced propagation.

■ Sam Green, WØPCE, discusses "Frequency Dependence of Equivalent Series Resistance Measurement" and describes a modification to typical ESR meters that will provide a more reliable way to identify capacitors with too high ESR.

■ Cornell Drentea, KW7CD, has been designing receivers and transceivers professionally for many years. In this issue he describes a number of choices to consider for modern transceiver designs in "Frequency Synthesis and Impacts on Receiver Performance — Reciprocal Mixing and Blocking Dynamic Range." Cornell analyzes various ways that phase noise is produced in several types of local oscillators, and how that noise impacts the overall receiver performance characteristics. Anyone interested in state of the art radio performance will want to read this article.

■ Dr. Erich Siegfried Heinzle, VK5HSE, presents some data he collected from members of two Amateur Radio clubs concerning the "Blood Lead Levels in Australian Amateur Radio Operators." With restrictions on the use of lead/tin solder in mind, Dr. Heinzle became curious about the levels of lead in the blood of Amateur Radio operators who actively pursue home construction using tin/lead solder. Homebrewers will be interested in his pilot study, and his results.

■ Jim McCullers, WA4CWI, describes a powerful tool for estimating the coverage area of a VHF/UHF repeater or your simplex signals. He shows us how to use Keyhole Markup Language (KML) to perform "Line of Sight Signal Path Analysis Using Google Earth." With the latest 3D display capabilities of this fascinating Internet application, Jim will have you drawing radio signal ray paths in no time.

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Light Bulbs and RFI — A Closer Look

New high efficiency light bulbs put out plenty of light, but hams wonder what else.

Mike Gruber, W1MG

Since its invention by Thomas Edison in 1879, the light bulb has had a truly dramatic and profound impact on modern society. Despite its effect on our daily lives, most of us probably take the light bulb for granted. But as many of us already know, Mr. Edison's incandescent light bulb is now being phased out in favor of more energy efficient alternatives, in part driven by new government requirements. These changes have sparked particular interest among some amateurs who are concerned about the potential for interference that the new bulbs may cause.

The US government's new energy efficiency standards, which were implemented in 2012, require a lighting technology that is roughly 30% more efficient than the incandescent light bulb. Modern energy saving bulbs, however, typically contain electronic circuitry. This circuitry has the potential to generate RF, and with it, the possibility of interference to nearby radio receivers, including amateur receivers.

So far, most energy saving *drop-in replacement* bulbs have been one of two types — compact fluorescent lights (CFLs) and light emitting diode (LED) bulbs. While the newer LED bulbs seem to be gaining in market popularity, both types of bulbs can contain electronics capable of causing RFI.

What The FCC Says

Two sets of rules apply for these new bulbs in a residential environment. LED bulbs operate under Part 15 of the FCC rules. Typically, they are classified as an *unintentional radiator*, if their internal circuitry is operating at greater than 9 kHz. See Table 1A for the specified FCC limits. If at less than 9 kHz, the bulb would still operate under Part 15 but as an *incidental radiator*. In this case, there would be no specified emissions limits, just a requirement not to cause harmful interference. Since incandescent bulbs do not intentionally generate RF, they are also classified as incidental radiators.

Rules of Many Parts

Many people are surprised to learn that CFL bulbs, and electronic ballasts for fluorescent light ballasts for that matter, do not operate under Part 15. Rather, these devices typically operate under Part 18, which addresses *Industrial, Scientific and Medical* (ISM) devices. Some household and consumer devices, however, also fall under Part 18. These devices convert RF energy above 9 kHz directly into some other form of energy such as light, heat or ultrasonic sound. While CFL bulbs and electronic fluorescent light ballasts are two common examples, there are others, including microwave ovens and some ultrasonic jewelry cleaners.

Part 18 has two sets of limits for bulbs — consumer and non-consumer RF lighting devices. The emissions limits are considerably lower for consumer rated bulbs. Consumer rated bulbs are the only bulbs that should be used for residential applications. See Tables 1B and 2B as well as the sidebar "Part 18 Consumer versus Non Consumer Ballasts" for the applicable Part 18 limits.

While manufacturers are required to meet the applicable limits for a bulb, it's important to understand that these limits are high enough that interference can still occur to nearby receivers in some cases. Should this occur, however, both Parts 15 and 18 have an additional provision against harmful interference. The burden in this case then falls on the operator of the device, in this case the light fixture *operator* — not the manufacturer — to correct the problem.

What the Rules Mean

In a nutshell, manufactures of these new bulbs are required to meet certain specified emissions limits. Bulb *operators* must correct any interference that the device might cause, including a provision to cease using the device upon notification by an agent of the FCC. Typically, this means the ham who uses these bulbs, or a nearby neighbor with a noisy bulb, is ultimately responsible for fixing any interference problems caused by the bulb. The applicable rules are perhaps best summarized by the ubiquitous Part 15 label that comes with all unintentional radiators, including LED bulbs. Part 18 also has a requirement for similar labeling:

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this de-

The FCC Conducted Emissions Limits

Radio frequency voltage conducted back onto the ac power line (on any frequency or frequencies) by lighting equipment designed to be connected to the public utility (ac) power line shall not exceed the limits in the following tables.

These limits are based on the measurement of the radio frequency voltage between each power line and ground at the power terminal using a 50 µH/50 Ω line impedance stabilization network (LISN).

Table 1A

Part 15B Conducted Emissions Limits (For Unintentional Radiators, such as LED Lighting)

Frequency of emission (MHz)	Conducted limit ($dB_{\mu V}$)	
	Quasi-peak	*Average*
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

Table 1B

Part 18 Conducted Emissions Limits (For RF Lighting Devices, such as CFLs and Electronic Fluorescent Light Ballasts)

Frequency (MHz)	Maximum RF line voltage measured with a 50 uH/50 ohm LISN (µV)	Conducted limit ($dB_{\mu V}$)
Consumer Equipment		
0.45 to 2.51	250	48
2.51 to 3.0	3000	70
3.0 to 30	250	48
Nonconsumer Equipment		
0.45-1.6	1000	60
1.6-30	3000	70

vice must accept any interference received, including interference that may cause undesired operation.

One notable exception to this rule involves interference from a Part 18 device (such as a CFL) in an ISM band. When amateur spectrum falls in an ISM band, such as the entire 902 MHz band, and parts of the 2.4 GHz band, interference from a Part 18 device must be tolerated. Amateur Radio is not protected under the rules in this case. Fortunately, in the case of light bulbs, this has not been an issue, at least not one that has so far been reported to the ARRL.

Conducted Emissions Testing

Both Part 15 and 18 specify two types of emissions limits. Above 30 MHz, they specify a field strength limit for direct radiation from the bulb itself. Below 30 MHz, however, they only specify conducted emissions limits. At HF and lower frequencies, bulbs (and most consumer devices) are simply too small to act as an efficient antenna. In this case, the device generates the RF, which is then conducted by the power cord, or the connection to the house wiring. The house wiring then acts as an antenna to radiate the RF. The RF can also be conducted by power lines out to the street, resulting in the power distribution wires also radiating the unwanted noise. Based on practical real world experience, most HF interference problems to Amateur Radio are caused by conducted emissions.

As shown by Table 1A, the Part 15 limits for conducted emissions are expressed in $dB_{\mu V}$, or dB relative to 1 µV. The FCC also specifies that these measurements be made between each power line and ground at the power terminal using a 50 µH / 50 Ω line impedance stabilization network, commonly referred to as a LISN. A LISN is essentially a filter that separates the RF voltage to be measured from the 60 Hz power frequency. The FCC also specifies that measurements be made using quasi-peak detection.[1] See the April 2009 issue of *QST*, page 48 for additional discussion concerning Part 15 conducted emission level limits.

The ARRL Lab Test Facility

Several years ago, the ARRL Lab constructed a room for conducted emissions testing per ANSI Standard C63.4-2003. In order to make such measurements to ANSI standard specifications, a LISN and special receiver are required and, in addition, a ground plane on the floor and back wall of specified dimensions are required. The standard also specifies dimensions for a non-conducting test bench, plus detail on product configuration, test layout and so forth. This level of detail ensures test repeatability with uniform and universal results. It was a lot of work, but it gave the ARRL Lab the ability to reasonably measure some consumer products, including light bulbs, for conducted emissions compliance.

Gathering the Samples

Our objective was to select a wide variety of bulbs, including CFL and LED products from a number of manufacturers. In the end, we tested 40 different bulbs from many different sources, including local retail outlets, online sources and hamfests. If applicable, we also tested each bulb in an insulated porcelain fixture and a grounded recessed metal fixture, for comparison.

As part of this program, we tested 7 CFL bulbs, 30 LED bulbs, a self-contained outdoor light — LED lantern fixture and two traffic lights that we purchased at the Dayton Hamvention® flea market.

Test Results

We found that most brand name bulbs substantially met their limits within our measurement uncertainty. Most of the issues that we found were below 500 kHz, and most of them were probably within our measurement uncertainty. We did see obvious problems associated with those bulbs purchased online directly from an overseas source. These bulbs clearly did not meet FCC specifications, and did not have the proper FCC labeling. See the test data on the *QST* in Depth web page for all of our results.[2] Figures 1-4 show representative samples of LED and CFL bulbs tested that both passed and failed.

What About the Real World?

We tested a random sample of the bulbs in a variety of fixtures in the home and shack of Senior ARRL Lab Engineer Bob Allison, WB1GCM. These tests included the fixtures we used for conducted emissions testing. In each case, we listened for noise with the station's ham receiver and a portable battery powered Sony ICF-2010 shortwave receiver. The portable radio allowed us to listen

[1]Notes appear on page 45.

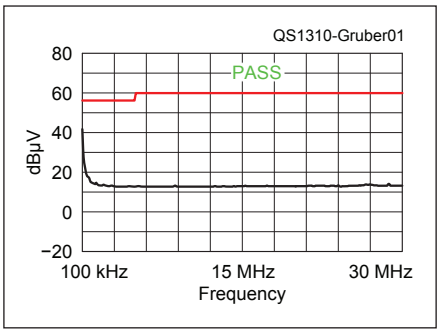


Figure 1 — Conducted emission spectrum from 0 to 30 MHz of an LED night light bulb of unknown manufacture purchased from an Internet auction site. This bulb passed nicely.

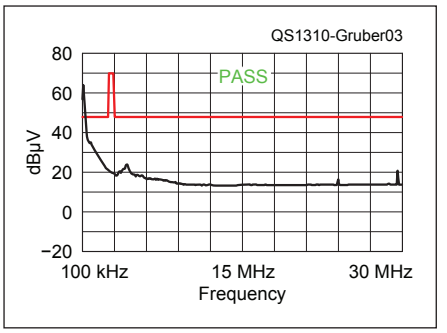


Figure 3 — Conducted emission spectrum from 0 to 30 MHz of an Ecosmart 41314 14/60 W pear shaped CFL light bulb purchased from a home supply store. This bulb passed nicely.

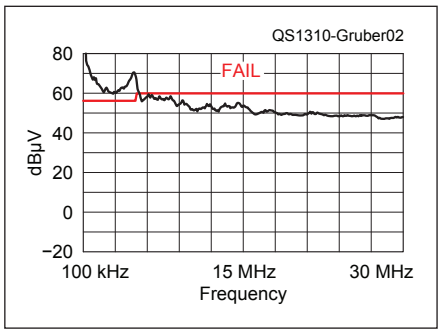


Figure 2 — Conducted emission spectrum of an LED flood light bulb of unknown manufacture purchased from an Internet auction site. Note the difference from Figure 1 for this failed bulb.

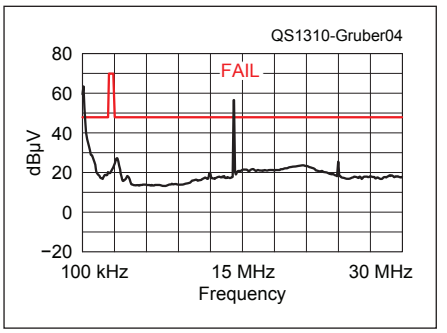


Figure 4 — Conducted emission spectrum from 0 to 30 MHz of an Phillips 13/60 W "twist" CFL light bulb purchased from a home supply store. This test, measured on the neutral wire had a nasty spike near 20 meters and failed. If only the line lead were measured, it would have looked as if this bulb had passed.

Part 18 Consumer versus Nonconsumer Ballasts

As the tables show, the emissions limits for consumer RF lighting devices are considerably lower than for nonconsumer devices. In fact, the range for both conducted and radiated emissions varies by 10 dB ±1 dB. Only consumer rated CFLs and fluorescent light ballasts should be used in a home or residence. We have noticed, however, that nonconsumer devices, particularly ballasts, are being marketed and sold at many home and hardware stores. In some cases, these may be labeled as Part 18A devices. Whenever purchasing an electronic ballast, or a fluorescent light with an electronic ballast, it is important to verify that it is rated as a *consumer* device. In some cases, the label may indicate that it is a *Part 18B* device. If the label is not on the outside of the box, you may need to open it. The Part 18 rating must either appear on the ballast or the documentation inside the box. *Verify before you buy.* Any device marketed or being sold as *heavy duty* or *industrial grade* is particularly suspect, be sure to go by the FCC label.

throughout the house, yard, adjacent properties and other neighborhood areas.

We also looked at interference from a number of these bulbs at frequencies below 500 kHz. Specifically, we looked for interference in the areas of the proposed new amateur bands at 137 kHz and 472-479 kHz. In addition, we looked in the area of 160-190 kHz, a popular band for Part 15 experimenters. In each case, we tuned considerably above and below the band limits looking for noise peaks. These peaks may vary with a particular bulb sample, or potentially drift into a ham band over time.

The antenna that we used for this testing was an 88 foot inverted L operated against a ground system. Bob reports that he's been using this setup for LF and MF reception with adequate results for a number of years. It consists of a homebrew loading coil 10 inches in diameter, and nearly two feet long, located in the shack. Bob made it by wrapping an old roll of insulated doorbell wire around a "concrete form" cardboard tube. It has a number of taps for tuning. Simply select the tap that provides the loudest signal. Bob also placed it in line with clip leads for the coil taps and a knife switch at the window sill.

What We Found

In most cases we found that there is minimal noise potential from these bulbs. Noise issues are possible in some cases, however, especially from nearby bulbs. The 160 meter band was the most likely of our current bands to receive noticeable interference, followed by 80 meters. In some cases, it may be possible to hear bulbs from a nearby residence, depending on neighborhood density, wiring and other factors.

Special mention should be made about LED light dimmers. Some LED bulbs are capable of being used with a special dimmer, and the dimmer itself can create noise. While our LED dimmer represented only a sample of one, the noise could be severe with every bulb we tried. In some cases, it was S-9 throughout the house. No bulb we tested with a dimmer had a completely acceptable noise level. The noise level did, however, vary with the dimmer level and band of interest. Although not all LED dimmers may be this noisy, it's important to at least be aware of this interference potential.

For light fixtures, we again used the hanging fixture in the shack. This fixture is within several feet of the loading coil and the antenna wire. We also used the two conductor porcelain fixture and a grounded metal fixture in an adjacent room. For bulb tests, we selected a sample of several bulbs including some of the best and worst bulbs based on our test data.

The results generally were pretty much as expected. With some power line noise in the area, the noise increased by several S-units in some cases when in the shack fixture. The interference from the worst bulbs would clearly be considered harmful. Some of the better bulbs tested in this configuration were far less problematic. Some produced minimal interference. Others were inaudible or almost inaudible. In all cases, however, interference from even the worst bulbs was dramatically reduced when operated from either fixture in the adjacent room. I was also a bit surprised to see that there often seemed little difference between the metal and porcelain fixture in this configuration.

The FCC Radiated Emissions Limits

(a) Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Table 2A — § 15.109 Radiated Emission Limits

Frequency of Emission (MHz)	Field Strength (μV/meter)
30-88	100
88-216	150
216-960	200
Above 960	500

(b) In the emission tables above, the tighter limit applies at the band edges. Sections 15.33 and 15.35 which specify the frequency range over which radiated emissions are to be measured and the detector functions and other measurement standards apply.

Table 2B — Part 18 Radiated Emissions Limits for RF Lighting Devices

Frequency of Emission (MHz)	Field Strength Limit (μV/meter)
Nonconsumer Equipment:	
30-88	30
88-216	50
216-1000	70
Consumer Equipment:	
30-88	10
88-216	15
216-1000	20

As a final check, I took the ICF-2010 receiver outside the house. Although this radio only goes down to 150 kHz, I listened across the spectrum up to about 500 kHz. Not surprisingly, the noise was very strong in proximity to the power meter. The worst case name brand bulbs, however, quickly became inaudible as I walked along the power lines coming in from the street.

Obviously I was using a compromise antenna, but the noise diminished dramatically with distance by the time I reached the street. I continued walking along the lines toward the transformer located several poles from the house. The noise was weak enough that it simply dropped down to the level of normal background noise. With some power line noise in the neighborhood, I could no longer accurately assess the noise level beyond 25 feet or so from the power meter.

Conclusion

Based on the number of interference reports that we've received so far, bulbs have generally not proven to be a significant source of RFI. Based on our testing, however, it pays to be cautious and informed. Remember that bulbs can meet the regulatory limits and still cause RFI. Should this happen, the bulb operator is responsible for fixing the problem. In many cases, this is the ham dealing with a bulb in the house, but it could also come from a neighbor. There are simply no guarantees with any bulb, regardless of the FCC limits!

Summary and Some Additional Guidelines

Some bulbs are better than others. Generally look for recognizable brand name products.

Avoid bulbs without proper FCC labeling, such as those from direct overseas sources.

Based on our testing, the 160 meter band is the most likely to be affected. Next is the 80 meter band. Operators in these bands should wish to exercise extra caution when purchasing bulbs. The proposed amateur bands at 137 kHz and 472-479 kHz may also be problematic.

Consumer type CFL bulbs operating under Part 18 have significantly lower FCC emissions limits than LED Part 15 bulbs. Any LED bulb when used with a dimmer can create problems — regardless of how quiet that same bulb is without the dimmer.

It's important to understand that we really can't tell you what kind of bulbs to buy. Even if our test data shows a low potential for RFI, bulbs can vary. Bulbs that look similar and are labeled in the same way may not actually be the same. Even if a particular bulb purchased today doesn't cause RFI, the same brand and bulb type may cause interference if purchased 6 months later.

Your mileage may also vary based on such factors as the configuration of your home's wiring. Remember — these are conducted emissions that are being radiated by the wires powering the bulb. The interference can also be conducted to other wires both inside and outside your home. Obviously, your antenna and its proximity to these wires can be a significant factor toward the impact and level of the noise at your station.

Our best recommendation, therefore, is to *try before you buy*. Start with a sample or purchase one bulb. If you observe no RFI, buy a suitable quantity of that same bulb, preferably from the same store.

For the most part, based on noise reports received at the ARRL, these new energy saving bulbs have not proven to be a widespread epidemic of RFI. Nonetheless, it pays to be cautious and informed. I hope this article has helped in that regard.

Notes

[1]Quasi-peak detection is a measurement technique specified by the FCC for its conducted emissions limits. CISPR quasi-peak measurements are made using AM and a 9 kHz bandwidth. The tests are designed to assess the effect of interference of a received signal to the human ear. CISPR is the International Special Committee on Radio Interference of the International Electrotechnical Commission.

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

Before joining the ARRL, EMC Engineer Mike Gruber was an electrical engineer in the aerospace industry. He holds a B.S.E.E. degree from the University of Bridgeport and an A.S.E.T. from Hartford State Technical Institute. First licensed in 1974 as WN1SVF, Mike now holds an Amateur Extra class license and enjoys ragchewing, portable operation and project building. While at the ARRL, Mike served as the Product Review Test Engineer for seven years. He's been at the ARRL RFI desk since 2002, primarily assisting in power line noise and other Part 15 interference cases, writing articles and editing ARRL books pertaining to RFI. He can be reached at **w1mg@arrl.org**.

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

The Mixing Bowl Special

Ham ingenuity finds a ground plane amid the kitchen gadgets.

Ed Toal, N9MW

Despite my best defenses, every now and again I find myself on a shopping trip with my wife Sharon, W9RNF. During one of these "adventures" a few years ago, I found myself bored in the kitchen utensils section of a housewares store. Just as my eyes were glazing over, I spotted a stack of stainless steel mixing bowls — on sale, no less.

Picking one up, I noted the diameter was about 12 inches and the distance from the center to the rim on the outside appeared to be a little more than 8½ inches, which is about a quarter wavelength at 446 MHz. I also noticed the flat spot on the bottom was about four inches in diameter. Minutes later I was at the checkout, bowl in hand.

The Transformation

At home, I rounded up an unused 3 foot dual band mobile antenna. This particular antenna mounted on a SO-239 connector, although with a few modifications to my approach I could have used a mobile antenna with a different mount (such as a 3/8-24 stud). I also located a long threaded female coupler (83-1F), a 1¼ inch pipe flange and a piece of 1¼ inch galvanized water pipe.

As you can see in the photos, the assembly was straightforward. The water pipe was cut to 19 inches. I chose that length because it was long enough to mount the unit to a side arm on my tower and because it might possibly act as a decoupling stage for the coax and/or provide a ground side for the 146 MHz element. Of course, your mounting requirements will likely differ.

To my delight and amazement the indicated SWR was almost flat on both bands — but that was as far as my project went. Distractions intervened and I never got around to actually installing my Mixing Bowl Special. A friend in need of a UHF/VHF antenna saw it lying in my shop and wanted to put it up at his house. I gave it to him on indefinite loan and by all reports he was quite pleased with the antenna's performance. The antenna returned to me years later and was once again relegated to my shop, where it was little more than a dusty curiosity.

A Home at Last

Recently, I decided to put up an antenna for simplex and repeater communication at our cottage. That's when my gaze fell upon the lonely Mixing Bowl Special.

The Mixing Bowl Special with its gleaming steel ground plane.

The best I could do was mount it to a 10 foot TV mast attached to the deck railing. The 19 inch pipe and flange were removed because it was difficult to mount and too heavy for the TV mast. Instead, I installed a stainless steel L bracket that I secured to the mast with hose clamps. To my amazement, the SWR on 146 MHz was still nearly 1:1 and the antenna seemed to work like a champ.

More Exploration

I've since learned a few basics in using antenna analysis programs, but analyzing the Mixing Bowl Special may be a bit tricky. Perhaps with *EZNEC* using many radials with many sections (so a curve could be approximated) one could at least get a sense of why it works on 146 as well as 446 MHz despite having only the mixing bowl as a ground plane.

Regardless, further testing was in order. I purchased a similar bowl and again used a fully threaded female-to-female UHF coupler mounted in the center of the bowl. My antenna test site was atop a firewood pile about four feet high. In this environment the 19 inch pipe was not used and there were no other metallic objects within several feet.

I used a banana plug in the center conductor and lengths of number 12 solid tinned wire trimmed to ¼ wavelengths on 146 and 446 MHz. The 2 meter ¼ wavelength proved to be a bit longer (21 inches) than expected, but measured in at <1:1.05 SWR on my MFJ269 analyzer.

Using a 5 W handheld transceiver I readily accessed repeaters 25 and 50 miles away with full scale readings (no claim to a quantified signal strength intended). On 440 MHz an SWR of <1:1.2 was achieved with an element about 7 inches long. I was able to access a repeater 25 miles distant at full scale as well. As far as I could tell, the stain-

An underside view with the mounting details.

less steel bowl was doing a terrific job as a ground plane on both bands.

Next, I mounted the "real" Mixing Bowl Special at our cottage on a TV tower. I wanted to compare it to a commercial dual-band antenna, so I obtained a Diamond X-30 and a 100 foot length of LMR-400 coaxial cable. I hung the Diamond antenna from a wood board at the same elevation as the Mixing Bowl Special in such a way as to maintain the same orientation.

Using a Bird 43 wattmeter with the appropriate sensors, I measured and calculated the feed line losses to both antennas on both bands so the test values could be corrected to reflect only antenna performance. In the shack I connected the two feed lines to an A/B switch, a Waters step attenuator and my dual-band radio.

Bill Hanold, N9CHN, provided the signals from his location about 3 miles away (the path between us was mostly over water). I then adjusted the attenuator and recorded the received signal strengths. Adding the 0.97 dB feed line loss differential between the two antennas, the Mixing Bowl Special came in dead even with the X-30 on 146.52 MHz. On 446.600 MHz, after factoring in the 1.6 dB feed line difference, the Mixing Bowl Special was 2.6 dB better.

Of course, this wasn't a scientifically rigorous test. We didn't use laboratory grade test equipment and we didn't conduct our test on a calibrated antenna test range. It would be a stretch to speculate that the ground plane created by the mixing bowl was superior to one constructed of radials (as in the Diamond antenna). But it is obvious that this odd kitchenware construction provides similar results!

The Mixing Bowl Special is a very durable antenna and might even be usable in some mobile applications. It should easily survive winds in excess of 100 MPH. The mounting system is very strong and the coax connection is well protected within the pipe. The use of an NMO mount may provide slightly better results on 440 MHz and facilitate a larger variety of mobile antennas.

My positive experience notwithstanding, however, I still avoid shopping trips as best I can!

Ed was originally licensed as KN9QXY with the help of the Madison East High School Radio Club (W9HIH) in January 1959. He upgraded to Technician as K9QXY and General the following year. He upgraded to Advanced in 1980 and Amateur Extra in 1981. In 1989 he changed his call to WI9L and again to N9MW in 1996. He held a second class commercial radio license in 1981. He was employed by Wisconsin Bell in 1963 and retired in 1994.

Ed has achieved and maintained DXCC #1 and holds DXCC-CW and DXCC-Phone. Presently he has worked DXCC on eight bands. N9MW has hosted several multi-multi DX contest efforts. He also likes building equipment, particularly antennas.

You can contact Ed at W8471 State Road 39, Blanchardville, WI 53516-9663; **ed@n9mw.com**.

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

New Products

DX Engineering Deburring Kit

The DX Engineering DXE-UT-KIT-DBR is designed for reaming and deburring rough-cut tubing edges. It is usable on all tubing and pipe sizes from ⅜ to 3.5 inches OD, including aluminum, copper, steel, fiberglass and PVC. The kit includes 2¼ inch DXE-UT-2125 and 3½ inch DXE-UT-3500 cylindrical deburring tools (also available separately), a DXE-22600 adjustable deburring tool and a half-round file. The tools are housed in a case with pre-cut high density foam. Both cylindrical tools are reversible for deburring both inside and outside edges of aluminum antenna tubing prior to telescoping sections together. The adjustable deburring tool features a variable length blade holder that extends from ½ inch to 5 inches to reach deep inside tubing or other difficult places. Blades can be inserted at 90° for deburring cross holes. It includes one blade for aluminum and steel and one blade for cast iron and brass. Made from heat-treated carbon steel, the half-round file is useful for helping deburr the inside of cut tubing ends. Price: $69.95. For more information, or to order, visit **www.dxengineering.com**.

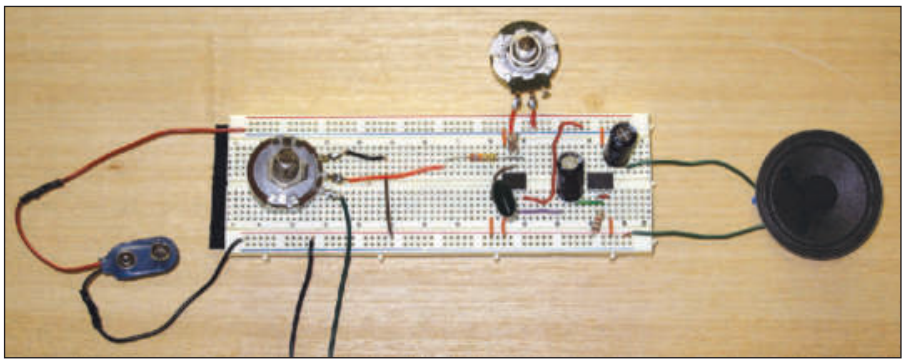
Done In One: Voltage-Controlled Audio Oscillator

Adjusting a circuit gets easier when you can listen for audio tones that indicate whether voltage is increasing or decreasing.

Paul Danzer, N1II

Digital meters often give more accurate readings of voltage than analog meters. However, digital meters can also make adjustments difficult. When the voltage is adjusted, the digits on the meter fly by so quickly that it can be hard to tell if they are going up or down. Here's one solution: use your ears.

The circuit in Figure 1 is a voltage controlled audio oscillator. When the input terminals are connected to a voltage (0 to 8 V) and you make a change that varies the voltage, the tone will go up or down. Connect the oscillator to your circuit and make your adjustment by listening for the highest or lowest tone.



U1 generates the audio and U2 amplifies it. If it is too loud for your ears, substitute a 1 kΩ potentiometer for R5 and connect Pin 3 of U2 to the center terminal of the pot.

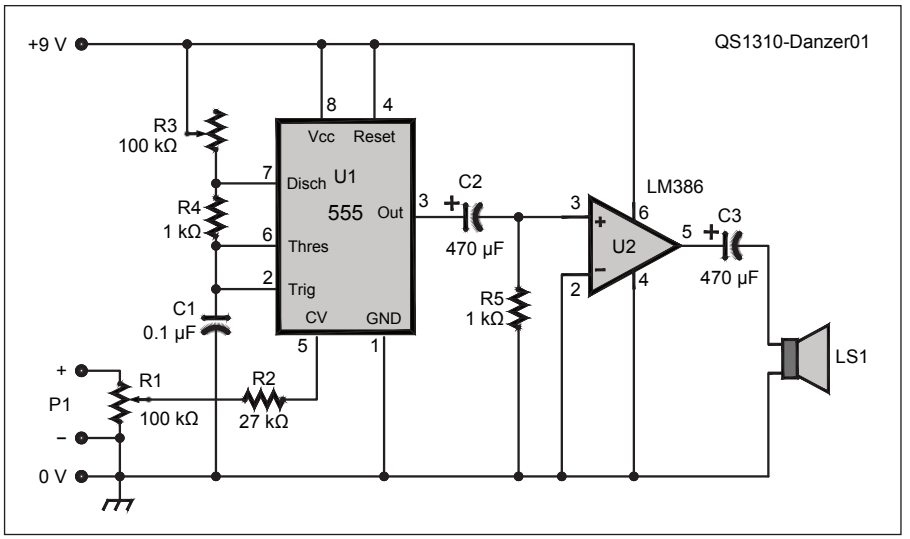


Figure 1 — Resistor R1 is on the left side of the circuit board and R3 at the top. The green wire is the positive voltage probe and the corresponding black wire the negative lead. The red and black wires to the left are attached to the 9 V battery connector. You might want to add a power on/off switch in series with either the red or black battery lead.

C1 — 0.1 µF 25 V dc or more (RadioShack 272-135)
C2, C3 — 470 µF 25 V dc or more (RadioShack 272-1030). Any value of 100 µF or more is okay.
LS1 — 8 Ω loudspeaker such as RadioShack 273-092
P1 — 9 V battery connector such as RadioShack 270-325
R1, R3 — 100 kΩ pot Radio Shack 271-092
R2 — 27 kΩ ¼ W (red purple orange)
R4, R5 — 1 kΩ ¼ W (brown black red)
U1 — any eight-pin 555 integrated circuit such as RadioShack 276-1718
U2 — any eight-pin 386 integrated circuit such as RadioShack 276-1731

How It Works

The circuit is based on a 555 timer chip as the oscillator and a 386 audio chip to amplify the audio. As a reminder, the dot or cutout on the integrated circuit is near Pin 1 or between Pin 1 and Pin 8 (on the chip's left edge in this layout). The 9 V battery connector is on the left and the speaker is on the right. Coming out of the bottom is the measurement ground (black wire) and the "hot" probe (green wire) on its right. The sensitivity control, R1, is on the left of the layout and the tone adjustment, R3, is on the top right. The circuit uses a 9 V battery to isolate it from the equipment being measured.

How To Use It

Set R1 to mid position. Connect the battery and then connect the positive voltage you want to measure to the green wire and the return (negative) to the black wire. Adjust R3 until you hear a tone. If there is no tone, change R1 and R3 alternately until a tone is heard. Then make your circuit adjustments and listen for the tone changes.

Photos by the author.

ARRL Member Paul Danzer, N1II, was first licensed in 1953 and now holds an Amateur Extra class license. Paul has been operating 40 meter CW since he first started. He uses his years of experience as an electronic engineer to design and build small, one-night ham radio projects. He is a Professor of Computer Science at Housatonic Community College in Connecticut.

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

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

Rigol DS1052E and Tektronix TBS1042 Oscilloscopes

Smaller, lighter and less expensive test equipment for the amateur experimenter.

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

Most hams have basic test equipment consisting of at least a digital multimeter, SWR meter and dummy load. These three instruments provide the ability to do basic troubleshooting. Additional equipment often includes an accurate RF power meter, a frequency counter and an oscilloscope. Of these, historically the oscilloscope has been the most expensive, leading hams to explore the surplus equipment market. Used analog oscilloscopes can be quite good, but they are also large and inconvenient for recording data. If something goes wrong, they may be difficult and expensive to repair.

Digital sampling oscilloscopes (DSOs) have become available at prices justifiable for many ham experimenters. The two reviewed here provide features and capabilities that will satisfy most home users.

The Oscilloscope Decision Process

In the past, factors to be considered when choosing an oscilloscope included the number of simultaneous signals that you might need to measure, the bandwidth necessary, on-screen digital data readouts along with the waveform display, and spectrum analysis capability. With today's DSOs, the only decision you really need to make is the bandwidth required. As you increase the bandwidth requirement, though, the cost of the oscilloscope can increase significantly.

With these factors in mind, this review focuses on Rigol and Tektronix DSOs with a 40 to 50 MHz bandwidth, as this is sufficient to permit most measurements desired at the lowest cost. As you can see in Table 1, these two instruments have very similar basic specifications. Detailed specifications can be found on the manufacturers' websites.

Let's Make a Few Tests

To see how the oscilloscopes perform, I selected several tests that I thought hams would find useful and interesting. For the first test, I looked at the measured frequency response of the oscilloscopes. I measured RF power with a calibrated setup and then checked the amplitude of the frequency on 7, 28 and 50 MHz. The Rigol has a 50 MHz bandwidth and the Tektronix has a 40 MHz bandwidth, so I would expect to see some rolloff on 10 and 6 meters. This doesn't mean you can't look at signals, just that the amplitude of higher frequency signals may not be completely accurate.

My next test involved measuring transmitter overshoot. When a transceiver's output power is reduced, often the transceiver output will overshoot (be higher than) the set power on the first CW character or speech syllable. This happens because a finite time is required for the transceiver's ALC to control the signal. If overshoot is high enough, it can trip protection circuitry in an external RF power amplifier or even damage it. For this test I set my Icom IC-706MKIIG transceiver to 25 W output, as this is the approximate drive power needed for full output from my Elecraft KPA500 amplifier.

Next I wanted to look at the amplifier enable/disable timing versus the RF signal output. This timing is important when driving an amplifier to ensure that no hot switching of the amplifier or transceiver takes place. (Hot switching means transmitting a signal before relay contacts have closed.) The amp key-to-RF signal and RF signal-to-amp unkey timings are both important because you want to make sure that there is no chance of hot switching on either amplifier keying or amplifier unkeying. I fed the IC-706MKIIG transceiver's HSEND output to channel 2 on the oscilloscope and set the oscilloscope to trigger on channel 2. A falling edge trigger shows the amp-enable timing, and a rising edge trigger shows the amp-disable timing. I could have fed HSEND into the EXTERNAL TRIGGER input on the oscilloscope, but I wanted to display HSEND along with the RF signal to better clarify the timing.

My final test involved two-tone testing of my transceiver. A two-tone test is a standard test of a transceiver's linearity that normally requires a spectrum analyzer. However, both oscilloscopes have a fast fourier transform (FFT) math feature that should permit display of signals in the frequency domain. For

Table 1
Rigol DS1052E and Tektronix TDS1042 Basic Specifications

	Rigol DS1052E	Tektronix TBS1042
Bandwidth	50 MHz	40 MHz
Analog channels	2	2
Vertical sensitivity	2 mV/div – 10 V/div	2 mV/div – 5 V/div
Real-time sample rate	1 GSa/s (1 ch), 500 MSa/s (2 ch)	500 MSa/s
Vertical resolution	8 bits	8 bits
Max input voltage(RMS)	300 V @ 30 kHz, 60 V @ 50 MHz	300 V @ 100 kHz, 13 V pk @3 MHz and above
Probe impedance	1:1 — 1 MΩ//100 pF 10:1 — 10 MΩ//17 pF	10:1 only — 10 MΩ//20 pF
Math	+, –, ×, FFT	+, –, ×, FFT
Standard interface	USB (front and rear), RS232	USB (front and rear)
Price	$329	$680

Bottom Line

The two oscilloscopes reviewed here are ideal for hams interested in more serious experimenting. They both deliver excellent performance at a price comparable to popular station accessories.

this test, a two-tone audio signal is fed into the transceiver's microphone input, and the composite level adjusted for 25 W peak output. After displaying the normal modulated RF signal on the oscilloscope, select the FFT mode and make sure you are displaying in the dB scale. Use the vertical knob to select dB/division, the horizontal timing knob to select the Hz/division, and center the signal on your display with the horizontal position control.

Tektronix TBS1042

As with many computers and test instruments today, only a condensed version of the manual was enclosed with the TBS1042. The full manual (159 pages) is downloadable online. The only accessories provided with the oscilloscope are the 120 V ac power cord and a pair of 10:1 probes (not switchable to 1:1). For most measurements, you'll want to use a 10:1 probe because the capacitive loading of a 1:1 probe will be a problem for higher frequency RF signals. Also, a 10:1 probe provides better overload protection should you accidentally connect to a high voltage source. A 1:1 probe is most usable for audio measurements at very low signal levels.

An important feature of any instrument is its ease of use. Therefore I attempted to use the TBS1042 without reading the manual, other than reading about how to compensate the probes. As it turned out, I was able to quickly set up and measure everything in all the tests without cracking the book! What makes this easy is the AUTOSET button that sets up the unit for you. Just apply a signal and press AUTOSET. Within a few seconds you'll have a display that will be very close to what you want. From this point, you can simply change the vertical sensitivity and horizontal timing to refine the display to your liking.

The USB port on the front of the unit provides either print or save functions. The TBS1042 determines if the connected device is a printer or memory stick, and will either print or save the screen data when the PRINT button is pushed.

The frequency response test resulted in a measured rolloff of 0.57 dB on 10 meters, and 1.67 dB on 6 meters, much better than the manufacturer's 3 dB specification for the 40 MHz bandwidth.

For the overshoot test, I set my transceiver output to a nominal 25 W output level and triggered the TBS1042 on the channel 1

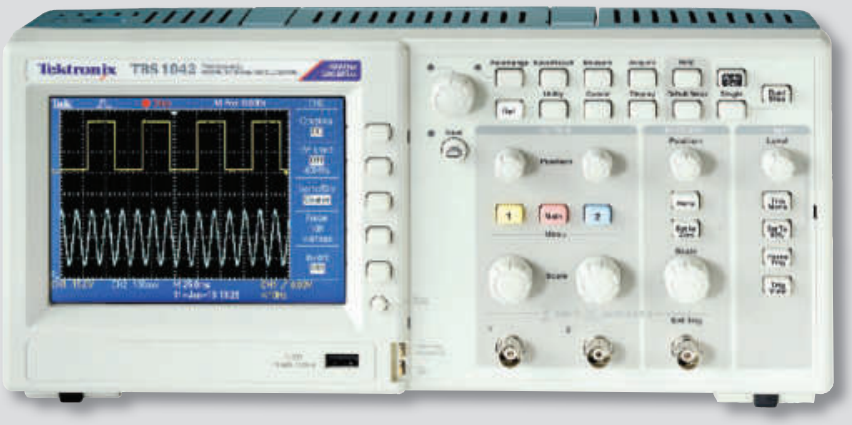
Table 2
Tektronix Storage Oscilloscope, Model TBS1042, s/n C010148

General Specifications:

Display type: 5.6 inch diagonal color TFT LCD.
Display resolution: 320 horizontal × 240 vertical pixels.
Power consumption: 100-240 V ac, 50/60 Hz, 115 V RMS, 400 Hz.
Operating environment: 32 to 104 °F, 5 to 85% relative humidity; 32 to 122 °F, 5 to 45% relative humidity, at <10,000 feet above sea level.
Input coupling: DC, AC, GND.
Input impedance 1 MΩ ±2%.
Size (HWD), weight: 6.2 × 12.9 × 4.9 inches, 4.4 pounds.

The following specifications have been determined to be "as specified" by Essco Laboratories, of Chelmsford, Massachusetts

Sample rate range: 5 samples/second – 500 M samples/second.
Scanning speed: 5 ns/div – 50 s/div.
Analog bandwidth: ≥30 MHz, (checked at 40 MHz).
Maximum input voltage: 300 V RMS.
DC gain accuracy: 5 mV/div – 10 mV/div.
Internal trigger sensitivity: 0.01 div – 5.0 div.
Trigger level range: ±8 divisions from center of screen (internal), ±1.6 V (external).



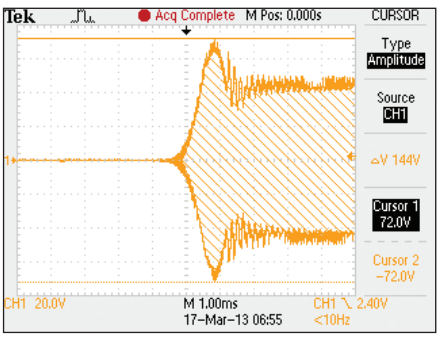


Figure 1 — Transceiver overshoot measurement with the Tektronix TBS1042.

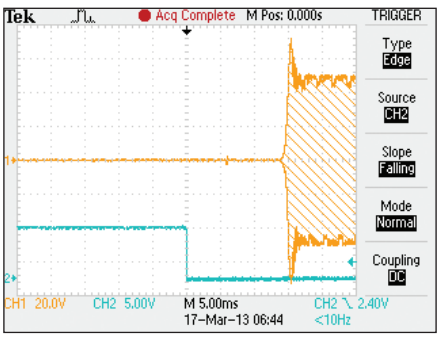


Figure 2 — Transceiver amp-key-to-RF-output timing measurement with the Tektronix TBS1042.

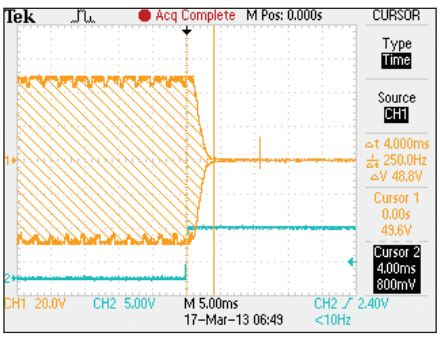


Figure 3 — Transceiver un-key/RF output timing measurement with the Tektronix TBS1042.

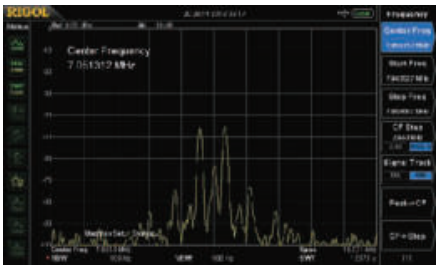


Figure 4 — Spectrum analyzer display of an SSB transceiver two-tone test.

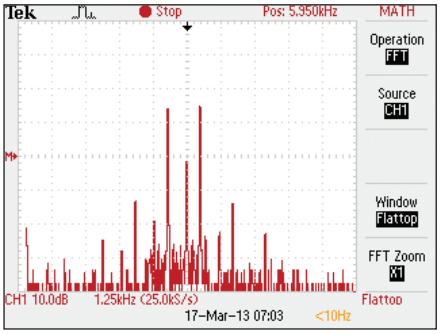


Figure 5 — Tektronix TBS1042 two-tone test FFT display using the same test setup as for Figure 4.

input. You have a choice of enabling either two horizontal cursors to measure amplitude, or two vertical cursors to measure time. I enabled the horizontal cursors to display the overshoot amplitude. The results are shown in Figure 1. Note that with a set output power of 25 W, the output peaks at 72 V peak (100 W) on the first dit.

Next I looked at the amp-key enable (Figure 2) timing with the transceiver set for full break-in. The blue trace is the amp-enable HSEND line from the radio. The results are interesting. The amp-enable-to-RF output time of 15 ms is fine for vacuum relays and PIN diodes. It is probably okay for open frame relays used on many amps not designed for full break-in (QSK) operation, but it is marginal. A typical enable time for open-frame relays is 12-20 ms.

The amp disable timing (Figure 3) shows a problem with QSK-switched amplifiers. The amp disable line goes high about 4 ms *before* RF drops to zero (the vertical cursors were enabled to better show this). So you may hot switch an amplifier that is operating in QSK. To be on the safe side, IC-706MKIIG users should only operate semi break-in.

My last test was a two-tone test of the transceiver output. Figures 4 and 5 compare the display of a spectrum analyzer (a Rigol DSA815-TG) with the FFT display on the TBS1042. As you can see, the TBS1042 frequency display is virtually identical to the spectrum analyzer, very useful for this type of measurement.

Manufacturer: Tektronix Inc, 14150 SW Karl Braun Dr, PO Box 500, Beaverton, OR 97077; **www.tek.com**.

Rigol DS1052E

The DS1052 did not include abbreviated instructions, but the full manual (166 pages) is downloadable online. The DS1052E includes a 120 V ac line cord, a pair of switchable 10:1/1:1 oscilloscope probes, and a USB cable for interfacing to your computer.

Again, I attempted to use the oscilloscope without reading the manual, other than the section on probe compensation. And again I had no problems. The AUTO button on the Rigol oscilloscope is equivalent to the AUTOSET button on the Tektronix oscilloscope. After applying a signal, press AUTO and then adjust the vertical sensitivity and horizontal timing to refine the display.

The only thing I had problems with was saving the display to a USB memory stick. The SAVE procedure is very flexible, permitting you to save different formats and even permitting you to name the files. The SAVE process wasn't intuitive, requiring me to refer to the manual.

The frequency response test was interesting. The specification is for a 3 dB rolloff at 50 MHz, but I found no rolloff at all on 6 meters.

For the overshoot and amp-key/unkey timing tests, I found I could display everything at the same time. When I went to the TRIGGER menu I found that one of the options was triggering on both negative and positive going slopes of the triggering signal. This let

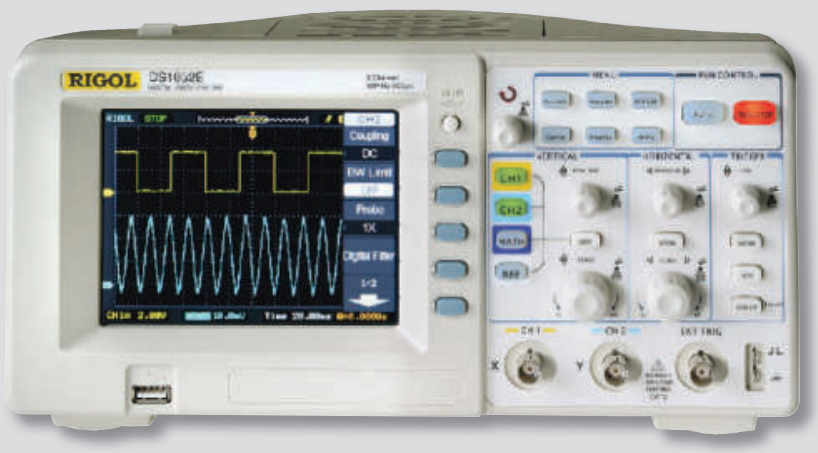
Table 3
Rigol Storage Oscilloscope, Model DS1052E, s/n DS1ED142306733

General Specifications:

Display type: 5.6 inch diagonal color TFT LCD.
Display resolution: 320 horizontal × 240 vertical pixels.
Power consumption: 100-240 V ac, 45-440 Hz.
Operating environment: 50 to 104 °F, ≤60% relative humidity; 50 to 95 °F, ≤90% relative humidity, at <10,000 feet above sea level.
Input coupling: DC, AC, GND.
Input impedance 1 MΩ ±2%.
Size (HWD), weight: 6.1 × 11.9 × 5.2 inches, 5.1 pounds.

The following specifications have been determined to be "as specified" by Essco Laboratories, of Chelmsford, Massachusetts

Sample rate range: 13.65 samples/second – 1 G samples/second.
Scanning speed: 5 ns/div – 50 s/div.
Analog bandwidth: 50 MHz.
Maximum input voltage: 300 V RMS.
DC gain accuracy: 2 mV/div – 5 mV/div.
Internal trigger sensitivity: 0.1 div – 1.0 div (adjustable).
Trigger level range: ±6 divisions from center of screen (internal), ±1.2 V (external).



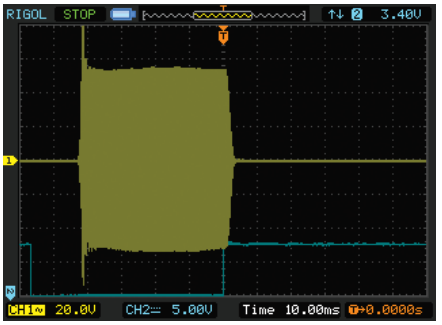


Figure 6 — Amp-key-to-RF-to-amp-disable timing using the Rigol DS1052E. Again, note the first dit overshoot.

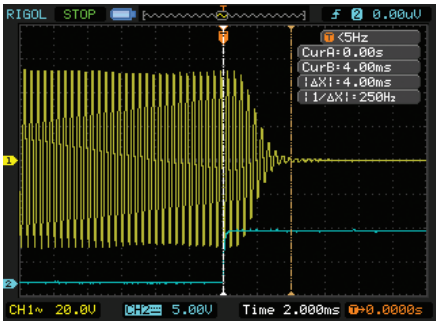


Figure 8 —Transceiver un-key/RF output timing detail viewed on the Rigol DS1052E.

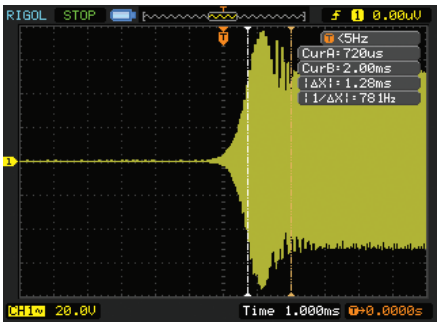


Figure 7 — A close-in view of the transceiver overshoot duration using the Rigol DS1052E.

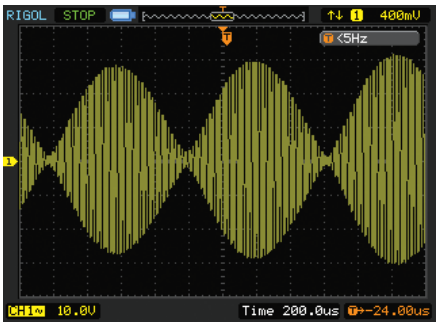


Figure 9 — Two-tone RF-modulated transceiver output measurement with the Rigol DS1052E using the same test setup as for Figures 4 and 5.

me look at the amp-key HSEND going low on transmit and high on un-key, and the resultant RF signal — including overshoot. The resulting timing waveform is shown in Figure 6. The blue trace is the amp-enable/disable (HSEND) line out of the IC-706MKIIG.

I also tested the overshoot and amp-disable timing separately so as to provide detail similar with the Tektronix TBS1042 tests. I enabled the vertical cursors in both cases so as to more easily display the time. From the detailed view, I found that the first dit over-shoot lasts less than 2 ms (Figure 7) and on un-key, RF is still being output about 4 ms after the amp key line has gone high (Figure 8).

For the final test I attempted a two-tone test as I'd done with the Tektronix unit. Figure 9 shows the time-domain two-tone RF-modulated signal. Apparently the Rigol DS1052E doesn't have enough buffer memory depth for the necessary resolution for two-tone testing (the buffer memory is where the captured samples are stored). There is plenty of resolution to show the main signal and its harmonics, but close-in signal resolution is not practical.

Manufacturer: Rigol Technologies Inc, 7401 First Place, Suite N, Oakwood Village, OH 44146; **www.rigolna.com**.

Some Final Observations

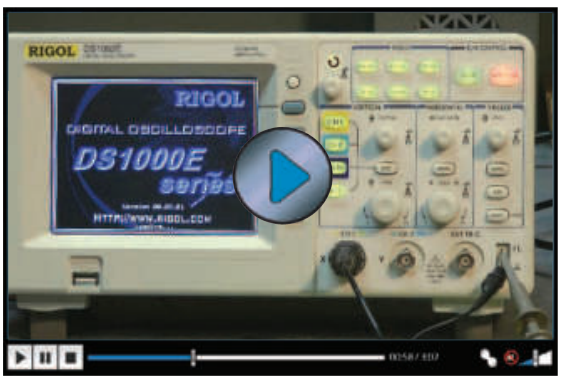
I did notice a few other differences between these two oscilloscopes that are worthwhile to point out.

Both oscilloscopes have a 5.7 inch diagonal color display. However, you can turn off the right-side menu on the Rigol, which provides a little more display area than on the Tektronix. The Tektronix oscilloscope takes about 30 seconds to boot up, whereas the Rigol is up and running in less than 10 seconds. Also, the Tektronix takes about 30 seconds to save a file to a USB memory stick, whereas the Rigol takes about 1 second. And I did like the Rigol's ability to trigger on both a positive and negative trigger on the same display. However, the Tektronix oscilloscope's ability to display a frequency domain two-tone test spectrum is important to me.

Somewhat off-topic, I would like to encourage the ARRL Lab to include transceiver overshoot and transceiver amplifier enable/disable output timing measurements with reviews of HF transceivers. These parameters are becoming increasingly important when interfacing a transceiver to an amplifier — especially when the amplifier is solid-state.

Conclusion

For hams who want to step up to the next level of testing, troubleshooting and understanding equipment performance, an oscilloscope becomes more of a necessity. Fortunately, digital sampling oscilloscopes have become surprisingly affordable. The two oscilloscopes discussed here will provide most of the capabilities desired by the more sophisticated ham at a price that is easily justifiable.



See the Digital Edition of *QST* for a video overview of the Rigol DS1052E and Tektronix TBS1042 oscilloscopes.

Anytone AT-5888UV Dual Band FM Transceiver

Reviewed by Gary Pearce, KN4AQ,
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We know that China is capable of manufacturing high quality consumer electronics such as Apple's various iPhones and iPads. It's been widely reported that some Chinese manufacturers have also been making knock-offs of name brand products, right down to those same "Apple" devices.[1] Those products have largely been for internal consumption in China, or at least don't have much of an American market.

The Anytone AT-5888UV dual-band mobile — one of the first "Amateur Radio" mobiles to arrive from China following a wave of inexpensive handhelds is remarkably similar in both physical appearance and operation to Yaesu's FT-8800 and FT-8900 mobiles. Most of the front-panel buttons and knobs have the same position and function, and identical labeling. And while the radio isn't as dirt cheap as some of the handhelds have been, it can be a couple of hundred dollars less than its Yaesu counterpart.

The Yaesu radios are known for high quality and generally excellent operation, though the '8800 and '8900 are now senior citizens. Their firmware is behind the latest radios from Yaesu and other long-time manufacturers of ham radio gear. How close is the Anytone to the current radios from the established brands?

Bottom line: not close enough. The sample the ARRL bought has a flaw that will at least have the radio going back to the dealer for repair or replacement, and more than a few firmware glitches. It's missing the 9600 baud data port, something that I won't do without. The manual is terrible and I ran into problems with the programming software (more on these topics later). My overall impression is that the AT-5888UV works, but is not comparable with radios from the Japanese brands.

Out of the Box

I've got three Yaesu FT-8900s, and I almost thought the ARRL had just sent me another. Not really — the box clearly says Anytone. But the picture made me walk over to the Yaesu and compare. Are all those buttons *exactly* the same? Yes, they are.

Out of the box, there's one immediate difference — the Anytone has big heat-sink fins across the top that extend a couple of inches off of the back. Yaesu has some narrow fins on the bottom and tiny fins on the back. Both radios have a fan on the back. Yaesu's fan comes on immediately when you transmit, but it's fairly quiet. Anytone takes advantage of those big fins by holding off the fan until the radio heats up. Good thing…the fan is pretty noisy.

Inside the box, along with the radio and accessories, was a basically unlabeled mini-CD. Well, it did have a cartoon picture of a panda. Come to notice, the *radio* is kind of unlabeled, too. No "Anytone" or model number anywhere except the sticker on the back. The manual said "Anytone", but there was no model number anywhere. It gave me the impression of a generic radio, still waiting for somebody's nameplate and model to be glued on. The CD contained *Windows* and *Mac OS* drivers for the programming cable. Old *Windows* drivers. More on that later.

I wondered if the AT-5888UV's operation was as similar to the FT-8900's as the front panel. The power connector is the same as everybody's, so it was easy to plug in for the first run. Yes, operation was similar enough that I was able to program repeaters, navigate the SET menu, add tones, offsets and such, and store a few memories. There are plenty of unfamiliar labels in the SET menu, so I knew it wasn't an exact copy.

Bottom Line

The Anytone AT-5888UV will get you on 2 meter and 70 centimeter FM inexpensively. It has some good features, but some significant drawbacks as well.

The ARRL Lab's test engineer, Bob Allison, WB1GCM, emailed to ask about one of those unfamiliar SET items. The radio has a voice-scrambler, a legacy of the radio's roots in Chinese Land Mobile service. Scrambling (codes and ciphers) is illegal in FCC-regulated Amateur Radio. The item was in the menu, but it had been disabled. The radio *did* transmit outside the ham bands…*way* outside on both VHF and UHF, even though the manual listed TX on the ham bands only. That's not illegal, as discussed in the review of the Chinese Part 90 certified handheld several years ago.[2] The radio is Part 90 (Land Mobile/Public Safety) certified, so with a business or public-safety radio license, you could use it there, but not with just a ham license. And that's why I put quotes around "Amateur Radio" up in the second paragraph.

Halfway Home

A deeper investigation would have to wait at least a few days. My wife Cyndi, KD4ACW, and I were headed to Hawaii for a couple weeks. I found room in my luggage to pack the radio and take it halfway home to continue the test.

When I got out there, I discovered I had forgotten the power cord. If I'd been in Honolulu, I might have found a replacement with the right connectors. But I was in tiny Hilo, on the Big Island. Hams to the rescue! Fred Honnold, KH7Y, who was meeting me to give me a tour of the KH6HME VHF/UHF beacon, had a Yaesu power cable he could loan.[3] He slapped an Anderson Powerpole on

[1] **www.cultofmac.com/219184/notorious-chinese-company-releases-the-iphone-5s-before-apple-does/**

[2] C. Imlay, W3KD, "Is This Legal?" Product Review, Nov 2010 *QST*, p 54.

[3] **www.HamRadioNow.tv/HRN_Episode_0076.html**

the other end to match my "automotive power connector" (cigarette-lighter plug), and I was good to go. Halfway up the Mauna Loa volcano where the beacon sits, I programmed a dozen Hawaiian repeaters by hand and started making contacts. It wasn't hard to hit a repeater 100 miles away when it was at 10,000 feet and I was at 8500, line-of-sight.

My first impression, operating in the rental car with a magnet-mount antenna, was that the radio was okay. It worked, people said I sounded good. But there was a lot to learn.

Good News and Bad News

Let's start with the good news: the microphone is functionally similar to everybody else's with a 16-key DTMF pad that doubles for programming frequencies into the VFO. It has four programmable buttons that can take on a limited subset of the SET menu items, such as toggling through tone settings, listening "reverse" on a repeater input, and opening the squelch. The buttons are all big and well-lit. There is a *big*, bright A/B button that switches control between the "sides" of the radio (by the way, it's a TWOBAAT — that's Two Bands At A Time — my way of saying that the radio displays and receives two frequencies in the same or different bands, at the same time). Anytone's mic also has two little lights that tell you which side is active for control, and two more that tell you which side is currently receiving a signal. Finally, there's a little speaker built in. Turning it on doesn't disable the internal (or external) speaker, and it doesn't get loud, but it does let you hold the mic to your ear and hear better in a temporarily noisy environment.

Those are nice additions, but on the negative side of the ledger, Anytone's programming is old. There are lots of alphanumeric memories (758 of them), but no "memory banks" to conveniently group memories for special operations. And there's no data connector for packet. You can still do 1200 bps packet by connection to the speaker and mic. Unfortunately, 9600 bps packet is off the table, and the manual doesn't mention data at all.

Physically the radio feels solid and heavy, but the "fit and finish" is a little off. The front panel wiggles a little when snapped to the body. The boot on the mic connector leaves a gap where it contacts the radio's case. Some of the labels on the buttons are a little warped and poorly printed. Quibbles, to be sure, but they make you wonder about the overall construction quality.

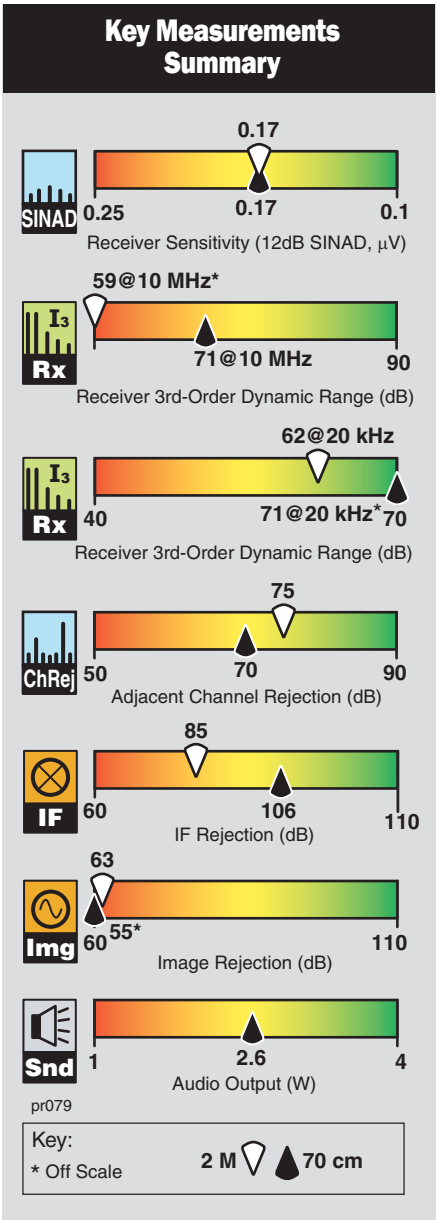
More serious was the operation of the volume control(s). As I rotated the control toward the bottom, the audio cut off abruptly with about ⅛ turn of rotation just "dead." This is on *both* the left and right volume controls. The audio level just above that cutoff point is soft, but too loud to be the minimum level you'd want in a quiet room. An odd thing is that I didn't notice this, or at least I didn't make a note of it, until I'd used the radio for a few days. If it had been happening the first time I turned it on, I'm pretty sure I would have noted it. Suddenly it was just *there*. I wondered if I'd caused it while playing with settings, but a full reset didn't "fix" it. Some other users have noted it in comments on one of the Yahoo! groups dedicated to the radio, but it's not in every radio.

Another audio complaint echoed in the Yahoo! groups is some hiss and whine audible in the speaker when receiving a signal. It's not loud, but again, too loud for a quiet room. It wouldn't be a problem in a mobile. The whine — a tone around 10 kHz — cuts through, even though it's not very loud. The volume control has no effect on the level of either the hiss or whine. I take it from the Yahoo! groups that not all the radios share this problem, either.

Internal speaker audio is good and gets plenty loud. But when I plugged in a 4 Ω external speaker the audio got very distorted and wouldn't get loud at all. When I use that

Table 4
Qixiang Electronics Anytone AT-5888UV, serial number 0790A121200172

Manufacturer's Specifications	Measured in ARRL Lab
Frequency Coverage: Receive, 108-180 MHz (AM, FM), 220-226, 350-490 MHz (FM); transmit, 136-174, 400-490 MHz.	Receive, 108-180 MHz (AM, FM), 400-523 MHz (FM); transmit, as specified.
Modes: FM, NFM, AM (receive only)	As specified.
Power requirements: 13.8 V dc ± 15% transmit, ≤14 A.	Receive: 655 mA (max volume, max colors, no signal), 367 mA (standby), 20 mA (power switch off). Operation confirmed at 11.4 V dc (37 W output) Transmit (H/M1/M2/L): 146 MHz, 9.35/5.65/3.63/2.74 A; 440 MHz, 9.05/6.13/3.92/2.90 A.
Receiver	**Receiver Dynamic Testing**
FM sensitivity: 12 dB SINAD, 0.25 µV (wide), 0.35 µV (narrow).	For 12 dB SINAD, 146 and 440 MHz, 0.17 µV (wide), 0.16 µV (narrow). 10 dB S+N/N, 120 MHz, 0.6 µV.
FM two-tone, third-order IMD dynamic range: Not specified.	20 kHz offset: 146 MHz, 62 dB; 440 MHz, 71 dB. 10 MHz offset: 146 MHz, 59 dB; 440 MHz, 71 dB.
FM two-tone, second-order IMD dynamic range: Not specified.	146 MHz, 72 dB; 440 MHz, 97 dB.
Adjacent-channel rejection: ≥70 dB.	20 kHz offset: 146 MHz, 75 dB, 440 MHz, 70 dB.
Spurious response: Not specified.	IF rejection, 146 MHz, 85 dB; 440 MHz, 106 dB. Image rejection, 146 MHz, 63 dB; 440 MHz, 55 dB.
Squelch sensitivity: Not specified.	At threshold, 146 MHz, 0.14 µV (min), 0.788 µV (max). 440 MHz, 0.62 µV (min), 0.68 µV (max).
S meter sensitivity: Not specified.	Full scale: 146 MHz, 2.52 µV, 440 MHz 2.57 µV.
Audio output: 2 W at 10% THD.	2.6 W at 10% THD into 8 Ω. THD at 1 V RMS: 2.6%.
Transmitter	**Transmitter Dynamic Testing**
Power output: Not specified.	At 13.8 V dc: 146 MHz, 55/25/9/5 W; 440 MHz, 44/26/9/5 W.
Spurious signal and harmonic suppression: ≥ 70 dB.	146 MHz, 65 dB, 440 MHz, 66 dB. Meets FCC requirements.
Transmit-receive turnaround time (PTT release to 50% of full audio output): Not specified.	Squelch on, S9 signal, 190 ms.
Receive-transmit turnaround time ("tx delay"): Not specified.	50 ms.
Size (height, width, depth): 1.6 × 5.5 × 8.3 inches, including protrusions; weight, 2.5 lb.	
Price: Anytone AT-5888UV, $300; USB programming cable, $19.	



speaker on other radios, it reaches ear-splitting volumes.

Plug and Pray (or "Driv-er-ing Me Crazy")

While I'm in the complaint department, let's talk programming with a computer. Most radios with this many features and memories are a lot easier to fill up by entering all the data in a software program on your PC, then transferring it to the radio. Programming software on the CD and the USB interface cable are listed as an option, but most of the dealers seem to be bundling them free, and they came with this unit.

The CD didn't have programming software. It had a lot of drivers. Fortunately, programming software was easy to find and download from several dealer websites. And thus began hours of attempting to get things working that ended in failure.

Once again I'll note that other people have had success installing and using the supplied software, but the Yahoo! groups have extensive threads on the trials of getting it working. I'll boil it down to note that the software and USB cable seem to need an *older* version of the Prolific drivers than what will install automatically when you plug the cable into a PC. All my PCs are running *Windows 7*, so I can't comment on how it will work on a Mac or on older versions of *Windows*. One post noted it worked on a PC running *XP*, but not *Windows 7*. Others reported success with *Win 7* once the right drivers were loaded. The CD contained a Microsoft *Word* file with instructions on setting up the software on a PC running…*Windows 2000!*

I spent hours uninstalling and reinstalling drivers on two different computers, unplugging and replugging the radio, and rebooting the PC. I tried the drivers on the CD, and other drivers I got on the web. I'm reasonably sure I had the "correct" set of old drivers loaded. Yet every time I tried to make the software talk to the radio, I got a "Communications Error," and could go no further. The software won't run without a connection to the radio, though I came across a patch for the .ini file that lets it run on its own. So I got a peek at it, and it looks like the standard fare, but no dice connecting to the radio.

Prolific, the company that makes chip sets and drivers for many USB interfaces, warns that it's come across Chinese clones of its products that require older drivers and "generally are of poor quality and cause *Windows* driver compatibility issues." I can't tell if the Anytone USB cable uses one of these clone chip sets or not.

If I owned this radio, I'd probably have kept beating on the software until I made it work. Or I might have taken the easy way out and picked up the RT Systems version. I've got their programs for several other radios, and I like them a lot.

Land Mobile

Many of the new wave of Chinese "amateur" radios have their roots in Land Mobile — business and public-safety two-way radio. Check that…they have their *entire identity* in Land Mobile. They are FCC certified for operation under Part 90, and they can be used on the amateur bands by licensed hams provided that hams follow the Part 97 rules. That sets them apart from ham equipment from Yaesu, Kenwood, Icom and Alinco. Those radios are designed for the amateur service and Part 97 compliance. They can be modified to transmit outside the ham bands, and some first-responders and business people use them on those frequencies, but they are not legal there. The Part 90 Chinese radios *are* legal, though keep in mind that I'm not an expert on the fine points of Part 90.

Echoes of Part 90 can be found in several functions of the AT-5888UV, functions that I couldn't get to work fully. First is the scrambler I mentioned earlier. Dial through the SET menu and you'll find SCR, the scrambler settings, but SCR OFF is the only option. The manual doesn't mention that SCR is disabled. It gives instructions on how to use it, but they don't work.

It's possible that scrambling *can* be activated using the programming software. There are a couple of other selective-calling features that I could only partially use, but it appears they can be fully implemented with software. Two of these are called 2TONE and 5TONE. Trying to figure these out illustrated the deficiencies of the manual. What they were, or what they could be used for, was never explained. *How* to use them was poorly explained, and pieces of that explanation were scattered among several sections. In order to understand page 12, you have to read page 33 first. The manual is full of bad translations that would be quaint if they didn't inhibit understanding of the radio's functions.

I did a little research and learned that 2TONE is the old signaling method used by pagers for decades. You've probably heard it: Booooooop-Beeeeeeeep. A local ARES group got a bunch of surplus pagers and used them on their repeater until everyone either lost theirs or they stopped working. 5TONE is a faster version, sending 5 (or more) single tones in quick sequence: BoodelOodelBeedelBeedelBeep. (Bet you'll never read *that* again in *QST*.)

Mixed in with the 2TONE and 5TONE features are some DTMF (Touch-Tone) paging options. After going back and forth, and back again, through some obscure instructions in the manual, I finally figured out how to initiate the type of page I wanted, triggered by keying the PTT and hitting the UP button on the side of the mic. But I could never figure out how to program a specific sequence, or put the radio in a mode to decode those sequences. As with the scrambler, I'd get to the function in the SET menu, but it wouldn't let me set or select any options.

Standard CTCSS and Digital Code Squelch (DCS) worked fine. The other stuff will mostly interest the Part 90 crowd, and will only work with radios that have the same

functions. Touch-tone paging — programming a radio to respond to a specific sequence of touch-tones — has come and gone as a feature set in ham equipment over the years, and never gained any traction with hams.

Another odd function for a ham radio is the COMPANDER. It's designed to reduce background noise by COMPressing select audio frequencies on transmit and exPANDING them on receive. A compandered audio signal is legible on a non-compandered receiver, but it sounds funny. So the function is useful only between two radios with the same companding system.

Speaking of transmit audio (which reports said sounded good), there is a NARROW-WIDE option in the SET menu. If there are any ham repeaters using NARROW today (2.5 kHz deviation), I'm not aware of them. Hams have stuck to WIDE (5 kHz deviation), while the FCC has required our commercial and public-safety neighbors to switch to NARROW so they can squeeze more channels into their band. I'll repeat, because there has been some confusion on the issue among hams, that the FCC does *not* require hams to switch to NARROW. Good thing, because inside the ham bands, that SET item was stuck on WIDE, and couldn't be switched to NARROW. Outside the ham bands, NARROW worked.

Color My World

The last quirky feature I'll detail is the color of the display. This is set with *three separate adjustments* in the SET menu, one each for red, green and blue. The radio came with the display set dark red. By trial and error, I was able to approximate the amber of the Yaesu display. Other ham radios offer just one color, with adjustable contrast, or maybe a dial that rocks through the rainbow. But three interactive adjustments? By the way, amber is Red 32, Green 13, Blue 2.

And the last firmware anomaly I'll mention involves the transmit OFFSET setting (called SHIFT in the SET menu). It has a wide range, from 0 to 100 MHz. An AUTO option locks it to the standard 600 kHz on VHF and 5 MHz on UHF. But set the channel STEP to 5 kHz, manually dial the SHIFT amount a bit, and suddenly it's limited to a very narrow range just above or below 600 kHz, depending on whether you dialed up or down. It *won't go back* to the standard 600 kHz until you change the STEP to anything else, and then SHIFT works normally again.

When I was taking some pictures of the Anytone, I noticed that the left side of the display showing 146.52 had a "–" offset icon. Of course 146.52 is a simplex channel, and as I took the picture, I wanted to set the radio to simplex. Couldn't do it. It was "stuck" in minus-offset. OK, I give up. I know when I'm beat.

Final Thoughts

There are some hams out there who are perfectly happy with their AT-5888UVs and the money they saved, and they may consider my comments too harsh. The established amateur transceiver manufacturers have been serving our market for a long time and have fine-tuned their radios with each generation. The years of incremental improvements are evident in the polished way they look, feel and operate.

Some of the larger dealers who specialize in the various Chinese lines have gone to some trouble to establish their bona fides as a reliable source for advice and service. The Chinese manufacturers themselves are a distant lot, at least for now. I didn't see any of them at Dayton this year.

But if this radio missed the mark this time, that won't always be the case. I expect that sooner or later, we'll be seeing more and better radios from China. Maybe they'll even come to a hamfest!

Manufacturer: Qixiang Electron Science & Techology Co, Ltd, Fujanm, China; **www.qxdz.cn**. Available from several US dealers. (Note that there is another "Anytone" company in China at **www.anytone.com.cn/en** that is not in the ham radio business.)

See the Digital Edition of *QST* for a video overview of the Anytone AT-5888UV Dual Band FM Transceiver.

New Products

DESpole Multiband Antenna from InnovAntennas

DESpole multiband rotatable dipoles from InnovAntennas are lightweight and require less space than a conventional dipole. The antennas use a bent element design and open sleeve techniques to enable operation on two or three bands without using coils or capacitors. Impedance is 50 Ω and only one feed line is needed. Aluminum and stainless steel materials are employed throughout, and UV protected Kevlar guy support cables are used if needed. Several DESpole models are currently available with prices starting at $295.95 for the 15/10/6 meter version. For more information, or to order, visit **www.despole.com.**

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

It Takes More than Two Antennas to Make an Omnidirectional Antenna

Q Dave, W9WEL, has a follow-up question to one asked in the March 2013 column about combining power amplifiers to obtain additional power.[1] Instead of trying to combine multiple outputs into a single output in phase, what would happen if I took two 100 W transceivers, keyed them at the same time, and ran each 100 W output to one of a pair of perpendicular center fed dipole wire antennas? Would I have an omnidirectional 200 W system?

A First we need to talk about the antennas. If you are considering half-wave dipole antennas, the main beams of perpendicular antennas are also perpendicular, but that's not the case for all antennas. So let's assume you meant that kind of antenna.

If you keyed two 100 W transmitters, one into each antenna, you would radiate about 100 W from each antenna. It would look somewhat like an omnidirectional setup, in that within the peak of each of the four beams it would seem like a 100 W signal, since the peak of one is in the null of the other, but that's just one part of being omnidirectional.

The limitation will occur as you move from the peaks into the regions between the peaks, especially at the diagonals. Since two independent transmitters will be of random phase, the power will be as likely to cancel as to add in the regions in which you have significant signals from both antennas. If the transmitters were phase locked and had identical phase delay through the transmitters and transmission lines, then the signals would tend to add in between the two lobes and you would have significant signals at all azimuths. It would not be a smooth (circular) pattern, but would work in all directions to a certain extent, and stay the same over time.

The use of a single transmitter to drive two dipoles that are fed through a 90° delay line between them (called a turnstile antenna, see Figure 1) optimizes the omnidirectional pattern, and that could be done here as well if the transmitters were in the same (or at least a known) phase to start with.

[1]J. Hallas, W1ZR, "The Doctor is In," *QST* Mar 2013, pp 61-62. Also see the note at the end of the April 2013 column, *QST* Apr 2013, pp 54-55.

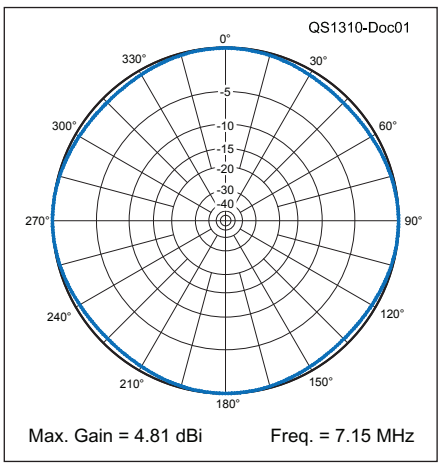


Figure 1 — The azimuth pattern of two perpendicular ½ wave 40 meter dipoles at 65 feet fed with a 90° phase difference. This forms the "turnstile" antenna.

Q Phil, K6MUG, asks: My HF radio has a built-in antenna tuner, which isn't adequate to handle my G5RV junior antenna. I have an external tuner between the radio and antenna, but sometimes I can only get the SWR down to about 2:1. It occurred to me that using the internal tuner as well would let the radio see a lower SWR. If I used both tuners, would I be gaining anything?

A The first question is how does your radio do with the 2:1 mismatch? Some radio's "foldback" circuitry will start to reduce transmitter output at an SWR of 2:1 or less to avoid component stress from excessive SWR. If that's the case, the internal tuner might be beneficial to keep the radio operating at full output.

If the transmitter can handle the 2:1, the use of a second tuner will introduce some unneeded loss in the system. Each tuner could easily be losing 10% of your transmit (and receive) power.

In terms of loss, the real question you should be asking is, how much loss is there in the coax between your second tuner and the antenna. The fact that you can't tune it below 2:1 may be because it has a very high SWR and that will be where your major losses are, depending on how much and what type of coax you have.

I suggest that you measure the SWR at the antenna side of the external tuner and then determine the loss in that coax. Keep in mind that the SWR seen at the bottom of a lossy coax run may look much better than it really is. If in doubt, take a look at the *QST* article "I Know What's Happening at the Shack — What's Happening at the Other End of My Feed Line?"[2]

I was faced with a similar quandary with a full size G5RV at my station. I eliminated the coax run and used window line from the antenna to the balun at the tuner. The results were much better on all bands, with significantly less loss. Since a tuner is needed anyway, there is not a big advantage in the traditional G5RV feed.

Q George, N9AUP, says: I really liked AA7JV's "Garden Beam" article in a recent issue of *QST*.[3] Unfortunately, I don't have the room to put an antenna of that size in my back yard. It did, however, get me thinking about something that I haven't found a definitive comment about in any of my antenna references. That is, what are the implications of using center loaded radials with a similarly center loaded vertical element in an elevated antenna with, say, four radials?

[2]J. Hallas, W1ZR, "I Know What's Happening at the Shack — What's Happening at the Other End of My Feed Line?" *QST* Feb 2007, pp 63-64.

[3]G. Wallner, AA7JV, "The Garden Beam," *QST* Apr 2013, pp 34-38.

Where I'm headed with this is the speculation that one could shorten all but the boom length for a more compact version of the "Garden Beam" configuration.

A It is certainly feasible. I modeled a 20 meter ground plane elevated at 8 feet. If full size, with four radials, it gave an intensity of 0.06 dBi with a peak at 21° elevation. Making it half size, loaded with inductors with a Q of 100, the intensity was –2.84 dBi at 23° elevation. With a loaded monopole and full size radials, the intensity was –2.4 dBi at 22° elevation, so the radials don't seem to make as much of a difference as loading the monopole. If I made the Q of all five inductors 200, it is about 1 dB better at –1.8 dBi.

Q Howard, KM5PG, asks: Due to the layout of my antenna space and my shack location, it is necessary to feed my 40 meter dipole from one end instead of the usual center. What is the best way to match the coax transmission line to the antenna using home built or commercial components?

A End fed half waves are a bit of a challenge for two reasons. One is that the impedance is high — perhaps 2000 Ω, the other is that most solutions result in common mode current on the transmission line.

The solution is easiest if you are only using the antenna on a single band. Then you can use the end-fed Zepp configuration (see Figure 2). This is the same as the popular J-pole that is used on 2 meters, except that in this configuration, the dipole is horizontal and the feed line is usually vertical.

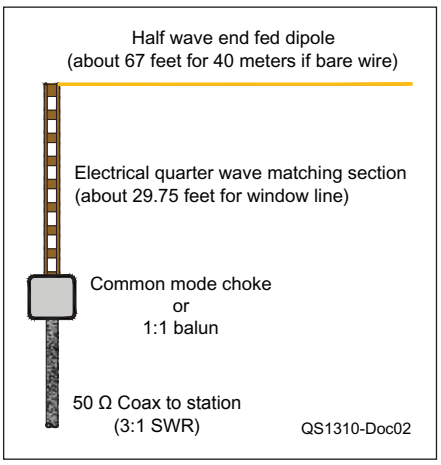


Figure 2 — An end fed Zepp antenna for 40 meters. This makes an effective solution for those who can't feed their antenna in the center.

You would have a horizontal ½ wave wire (about 67 feet long for #14 AWG bare wire) and end feed it with ¼ wave (29.75 feet) of 450 Ω window line. Note that one side of the window line isn't connected to anything at the antenna end. The coax connects to the bottom of the window line and should see an SWR of around 3:1 across the band at an impedance centered on 23 Ω, depending on the actual antenna Z. This can usually be matched by the internal tuner of most radios. If a closer match is needed, 600 Ω open wire line will provide close to a 1:1 SWR, but the length will need to be a bit longer because of the higher relative propagation velocity.

There usually are common mode currents on the line that can cause problems in the shack, as well as radiate. The currents in the shack can be minimized by multiple turns of the coax on a ferrite toroid near the connection to the window line. The usually vertically polarized radiation from the feed line can actually be beneficial — helping to fill in the nulls in the horizontal pattern.

This antenna can also be used on other bands, but the SWR will be high and a wide range tuner will be needed. In that case make the coax section as short as possible and use whatever length of window line is needed. You won't have the ¼ wave transformer section, but the wide range tuner should be able to match on 40 meters or higher frequencies.

The other approach is to feed the antenna a few feet from the end and use a transformer to match the high Z and then use coax. This will strictly be a single band operation and probably won't have as good a match. There are commercial antennas that are fed this way. See the *QST* Short Take review of the PAR end fed 20 meter dipole.[4] They are also offered for other bands.

Noted VHF and above operator and developer Dick Knadle, K2RIW, raised a good point about my response to Tom, N8EUL, about the sequence to connect equipment as described in the July 2013 column.[5]

While he didn't disagree that the place for the wattmeter for antenna tuner adjustment is as shown, he did disagree that a true forward and reflected power meter would only work in a 50 Ω system. In fact the only time it will read reflected power is if the load is not matched to 50 Ω!

The results at the antenna side of the antenna tuner can be quite useful. For example, if the amplifier puts out 1500 W, the power meter on the antenna side of the tuner might read 2500 W forward power and 1000 W reflected power. This doesn't mean that you are operating illegally — the net power to the antenna would be the forward minus the reflected power, 2500 – 1000 or the 1500 W you started with (less any tuner loss). The SWR of the unmatched antenna system would be $\{(1 + \sqrt{\rho}) / (1 - \sqrt{\rho})\}$, *where the reflection coefficient* $\rho = PR/PF$. *The resulting uncorrected SWR is thus 4.4:1 — always good to know.*

[4]S. Ford, WB8IMY, "Short Take — The Par Electronics 20-Meter End-Fed Dipole Antenna (EF-20)," *QST*, Feb 2007, p 58.
[5]J. Hallas, W1ZR, "The Doctor is In," *QST* Jul 2013, pp 54-55.

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

New Products

DX Engineering Clamps

DX Engineering offers a wide variety of saddle, block and band clamps for dozens of applications. DX Engineering U-Bolt Saddle Clamps are designed for a good fit with round tubing. U-bolts are formed from stainless steel, and saddles are cast aluminum. The V-Bolt Saddle Clamps are long enough to fit a range of tubing sizes. Saddle material is cast aluminum, and U-bolts are fabricated using stainless steel. Super Duty Saddle Clamps are designed for applications where maximum clamping capability is needed. These clamp kits are made from two corrosion-resistant cast aluminum saddles with a cast stainless reinforcement plate. Accessory bolt and nut sets (sold separately) allow for a customized fit. The DX Engineering Resin Block Support Clamp is ideal for securing mounting brackets or plates to tubing, while also providing electrical insulation. Optional stainless steel reinforcing plates provide additional stiffness and act as hole-drilling templates. Marine-grade stainless band clamps secure telescoping tubing in place for antenna applications. The ECLS series adds threaded studs for electrical connections, mechanical assembly of components, or attachment of brackets. Price: $2.65 to $49.90 depending on size, composition and configuration. For more information, or to order, visit **www.dxengineering.com**.

Steve Ford, WB8IMY, wb8imy@arrl.org

Hamcrafters WinKeyer USB Memory Keyer

While a number of transceivers include CW keyers, this feature isn't universal quite yet. And among those rigs that do include keyers, fewer still offer *memory keyers* — keyers with the ability to store and transmit specific character strings on command.

Memory keyers are extremely handy for DXing and contesting because they eliminate the drudgery of sending the same information over and over. Instead, you simply press a button and the keyer automatically transmits the "canned" message of your choice.

You can certainly do this with computer software. There are free memory keyer programs such as *CWType* (**www.dxsoft.com/en/products/cwtype/**) and memory keying is provided by many logging applications. Even so, there are times when you don't want to rely on a computer, particularly when operating away from home. That's where a compact device like the WinKeyer USB comes into play.

Small but Powerful

At only 4 × 3 × 1.75 inches, the WinKeyer USB is a full-featured keyer that can store and send up to four separate messages. It can key almost any rig, including those with grid-block keying.

Keying speed is adjustable from 5 to 99 WPM via a front panel potentiometer. Weighting is adjustable through software (more about the software later).

The WinKeyer USB is ideal for portable operating because it includes a battery pack that holds three AAA cells. When you're not using the WinKeyer, the device "goes to sleep" to conserve power.

If your CW transceiver lacks a sidetone (as many QRP kit rigs do), this isn't a problem. The WinKeyer includes a tiny, yet surprisingly loud, piezoelectric speaker.

All this functionality comes with a price tag well below $100. There is only one catch: the WinKeyer is a *kit*.

Building the WinKeyer USB

The WinKeyer kit includes all parts with the exception of the two 7-inch lengths of insulated wire you'll need to connect the speed potentiometer to the circuit board. Along with the electronic components you'll find a nicely silkscreened enclosure complete with pushbutton caps, a speed control knob and even a set of rubber feet. The assembly instructions are included on an accompanying mini-CD-ROM and can also be downloaded online.

The instructions are well written, but you still need to proceed carefully. Some of the resistors are tiny and it is easy to confuse their color bands without a magnifier and a strong light source. Fortunately, there is only one surface-mount component and it has already been soldered onto the board for you.

I needed about two hours to assemble the WinKeyer. After the last component was soldered into place, I snapped the batteries into the holder and heard a Morse "R" from the piezo speaker — a sure sign that my new WinKeyer was alive and healthy.

Up and Running

One of the very cool things about the WinKeyer is that you can manage the memories and other functions through *Windows* software. You simply connect the WinKeyer to your computer through the supplied USB cable and use the WinKeyer software to "talk" to the device (see Figure 1). Storing messages is a matter of typing text into the appropriate boxes and then writing everything back to the WinKeyer's memory.

Of course, you can also use your CW key to command the WinKeyer and write new text to the message memories. By pressing and holding the red pushbutton, the WinKeyer enters the *command* mode and will respond accordingly.

Although I've described the WinKeyer as being a tool for portable operating, it works just as well in a permanent station. It is fully compatible with virtually all logging and contesting applications that support external keyers. In the software menus, look for mentions of "K1EL" or "WinKeyer" keying. When the WinKeyer is plugged into a computer's USB port, it automatically takes power from the computer rather than the internal batteries.

My first operating experience with the WinKeyer was during Field Day 2013. I was using a Yaesu FT-817 transceiver and although the rig had a built-in keyer, it didn't include keyer memories. With the WinKeyer I was able to program my call sign and the Field Day exchanges in advance, sending them as needed with single button taps.

The WinKeyer's performance is flawless, the price is right and, of course, there is the added pleasure of building it yourself.

Manufacturer: Hamcrafters, 95 Guys Ln, Weare, NH 03281; **www.hamcrafters.com**. *$79.*

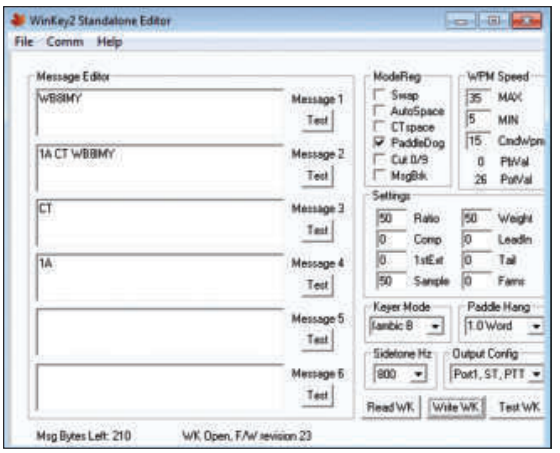


Figure 1 — You can manage the WinKeyer USB memories and other functions with the included *Windows* software.

Paul Wade, W1GHZ, w1ghz@arrl.org

EME — Easier Than You Think

Recent technical advances bring EME within reach of the serious 50 MHz+ ham.

Moonbounce, or EME (Earth-Moon-Earth) communication, is the ultimate DX — all contacts travel more than 400,000 miles! Until recently, EME was limited to superstations, with very large antennas and maximum legal power. Occasional exceptions were operations from large commercial dishes, like the Arecibo Observatory.

In the last few years, two factors have made EME accessible, if not to the average ham, at least to serious VHF and up operators. The first is preamplifiers with extremely low noise figures, less than 0.5 dB (35 K), which allow for the detection of much weaker signals. The background noise for EME at microwave frequencies is as low as 3K, so the receiver noise is what limits weak signal detection.

The second factor is digital techniques, particularly the WSJT programs by Joe Taylor, K1JT. These programs use signal processing to narrow the effective bandwidth and error correction techniques that allow communication with inaudible signals below the noise level. The improvement can be as much as 20 dB over CW, though the trained ears of an experienced EME operator can copy amazingly weak CW signals.

Each 3 dB improvement in weak signal detection means that half as much transmitter power or antenna gain is required for EME communications, so the combination of low-noise preamps and digital techniques has made EME accessible to much smaller stations. On 2 meters, a long Yagi and a brick amplifier can be enough to get started and make some contacts. Contacts may be made with the antenna on the horizon when the Moon is rising or setting. Elevation capability greatly increases the operating periods, up to 12 hours each day. The ease of getting started has made 2 meter EME very popular — in 2012, K1JT had worked more than 800 stations, and a few dozen stations have achieved DXCC.

For microwave EME, 1296 MHz is the most popular and most accessible band. An 8 foot dish, like an old TVRO dish [Television Receive-Only; these are the large C-band (4-8 GHz) dishes used with the early analog satellite TV systems. — *Ed.*], is quite adequate with 100 W or so of transmitter power. The preamp must be right at the feed horn — any feed line loss adds directly to the noise figure, so the signal-to-noise ratio quickly deteriorates. Even smaller antennas might be enough to make contacts with some of the larger EME stations.

What about higher microwave bands? The same size dish is also adequate for higher bands, but it becomes more difficult to generate sufficient transmit power. A greater difficulty is pointing the antenna at the Moon — beamwidth for a given dish size decreases as frequency increases, so tracking the Moon becomes more difficult. At 10 GHz, an 8 foot dish would have a 3 dB beamwidth of about one degree, so pointing accuracy must be better than ½°. Finally, better dish surface accuracy is required at higher frequencies; most TVRO dishes were designed to work only at 4 GHz, so their surface may not be accurate enough for 10 GHz.

Can I Do It?

EME may not be easy, but it doesn't take a superstation. With some ham ingenuity, it can be done.

You can certainly give it a try and work some of the big guns with only modest equipment. Go to **www.HB9Q.ch** and see how little is needed to work them — a modest satellite station can do it. As another example, here is what we did after I came back from the 2012 EME Conference in Cambridge, England, inspired to try some moonbounce.

Large dishes can be acquired for nothing. Often, just as a result of offering to remove "that big ugly dish," I have been given several. My neighbor, Chip Taylor, W1AIM, was given a nice 16 foot dish on a trailer a few years ago and I towed it home for him. Chip has been slowly renovating the dish, so I convinced him to get W1AIM on the air for the 2012 ARRL® EME Contest.

The dish and trailer were originally designed to provide portable temporary satellite links, so no tracking capability was required. Chip has been working on adding tracking capability, but it is not finished yet, so *armstrong rotation* would have to do. [armstrong rotation refers to rotating an antenna using only your "strong arms." — *Ed.*] The long pole in Figure 1 provided enough leverage for rotation. For elevation, Chip tried an old TVRO actuator and found that it would move the dish slowly, but the Moon also moves slowly. Then we added a feed horn of the popular VE4MA design.

I provided my 1296 MHz transverter and amplifier, with an output of only about 60 W. We added an excellent preamp made by AD6IW right at the receive port of the feed horn, with a coax relay to protect it while transmitting. Then we measured sun noise and plugged the numbers into the VK3UM EME Calculator, as described in the last

Figure 1 — Ready to go for EME on 1296 MHz. The equipment is on a moving cart to minimize feed line length. Rotation by W1AIM.

Figure 2 — W1AIM operating CW on EME. The laptop in the foreground calculates the Moon's position; the laptop in the rear displays the bandscope waterfall.

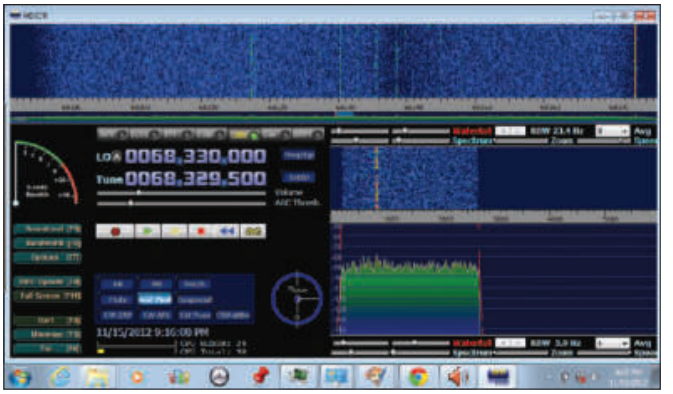


Figure 3 — This is the waterfall display of the CW section of the 1296 MHz band during the 2012 ARRL EME Contest. I counted 11 signals; the leftmost one is the ONØEME beacon at 1296.000 MHz.

"Microwavelengths."[1] The measured sun noise matched the calculator predictions, so it looked like everything was working well. Then we followed the sun across the sky, marking the azimuth headings on the base of the dish support with a dry marker as it rotated. For elevation readout, we attached a digital level to the dish frame with cable ties.

The final test was to wait for the Moon to rise and look for the ONØEME beacon (**www.ON0EME.org**) at 1296.000 MHz. Nothing heard! Most microwave EME operation uses circular polarization, transmitting on right-hand circular and receiving on the opposite polarization, left-hand, (reflection off the Moon reverses the circular polarity), so perhaps we were using the wrong polarization.[2] We moved the preamp from the feed horn port marked "R" to the port marked "T," and were able to copy the beacon CW signal through the speaker.

The ARRL EME Contest weekend was a few days later, in late October. Naturally, the weather became much colder. We mounted the gear on a cart next to the dish (see Figure 1) so it could follow the rotation without an excessive length of heliax to the transmit port of the feed horn. We moved into Chip's small remote shack next to the dish, but a small space heater wasn't keeping us warm, especially since I had to run out and move the dish every few minutes. Figure 2 shows the setup — an FT-817 transceiver for the IF radio, augmented by a FUNcube Dongle (**www.funcubedongle.com**) tapped off the IF to provide a bandscope and waterfall display on a laptop. A second laptop, in the foreground, provided Moon coordinates for manual tracking. To keep things simple, we operated only CW.

During this weekend, the Moon declination was very high and the TVRO elevation actuator had only a limited elevation range, restricting our Moon "window." We watched the Moon rise behind some trees and waited for a clear view. Once we were clear, we found a number of signals on the waterfall display, shown in Figure 3. The leftmost one is the ONØEME beacon, providing our frequency reference.

The final hurdle was to find someone calling CQ and make a contact. The normal protocol is to zero-beat your own echo to the calling station, correcting for the frequency offset caused by Doppler shift. The Doppler shift is predictable; with accurate frequency calibration, Doppler correction is easy, but we had a temporary setup and the cold temperature was moving the local oscillator in the transverter. The alternative was to look for the echo on the waterfall display and move it near zero-beat. At the same time, one of us was moving the dish to track the Moon. We finally got our act together and made a contact with Nando Pellegrini, I1NDP, who has a huge signal. Unfortunately we came to the end of our small Moon window before we could make another contact.

The next night was even colder and the elevation actuator wasn't moving at all. Chip heated it with a propane torch and it finally moved very slowly. We just had time to make one more contact, with Dominique Faessler, HB9BBD, another huge signal, before our Moon window closed. At least we had worked two DX stations and still had another weekend to go.

During the following week, we arranged some scheduled contacts and worked several more stations, improving our operating technique. We also made some adjustments to the dish elevation to give us a bit more Moon window.

By late November, the weather was really cold — below 0° F in Vermont. The first night of the contest weekend was too cold for the operators, but the second night was a bit less frigid, so we got out the propane torch and went to work.

We had to shovel a foot of snow off of the dish and then warm up the actuator with the torch. But we were able to work five more stations and get "QRZ" [Literally "Who is calling me?" Used in a noisy environment by a receiving station who is unsure if he is being called. — *Ed.*] from a couple more. One problem seemed to be libration — rapid fading caused by the rotation of the Earth and Moon and the rough surface of the Moon. We were able to copy CW from higher power stations, but they had difficulty with our lower power signal. Using digital modes would have helped, but we were trying to limit complexity.

We were successful with EME and improvements are in the works. Mainly, we had fun, and learned a lot more by doing it than we would have just by surfing the Internet. The next time will be better. Trying something new is a great way to learn, especially the practical rather than theoretical lessons. But some background reading is also important. I recommend the EME chapter by K1JT in the *ARRL Handbook*.[3] Then give EME a try — or try something else new.

Microwave Update

The Microwave Update conference is a good place to get new ideas. It's not too late to sign up for October 18-19, 2013 at Morehead State University in Kentucky. See **www.microwaveupdate.org** for details.

All photos by the author.

[1] P.Wade, W1GHZ, "Microwavelengths," *QST*, July 2013, pp 57-58.
[2] P. Wade, W1GHZ, "Microwavelengths," *QST*, Aug 2011, pp 98-99.

[3] Available from your ARRL dealer or from the ARRL store, ARRL order no 4197. Telephone toll-free in the US 888-277-5289 or 860-594-0355, fax 860-594-0303; **www.arrl.org/shop**; **pubsales@arrl.org**.

H. Ward Silver, NØAX, n0ax@arrl.org

Experiment #129

Wye-Delta and Pi-T Circuits

I didn't realize Hands-On Radio had so many electricians and power engineers as readers! Experiment #127's hypothetical example of three-phase power to explain how phasors operate (combined with a sloppy math error) was not intended to be a tutorial on ac wiring practices, but the references cited in the article and on the Hands-On Radio web page should clear up any confusion I unintentionally generated on this important topic.[1] During the post-column post-mortem, I realized that I'd been given a golden opportunity to dig deeper into some important supporting circuit concepts and get us back to radio at the same time.

Why a Delta?

When studying three-phase power systems, you'll soon encounter the terms *wye* (pronounced "why") and *delta*. These refer to how the three individual phases are connected with respect to a neutral reference. Figure 1 illustrates the basic idea. The coils shown here — typical of motor or transformer windings — could also be voltage or current sources, resistors, capacitors, or generic impedances. The origin of the names for each type of system is clear — the schematics for each system take the shape of a Y or a Δ.

In a wye system, the three phases (a, b and c) all share a common neutral point, so there are four connections: Phase A, B and C (also commonly labeled Line 1, 2 and 3) and neutral. In a delta system, there is no common neutral connection because the sources or loads are connected together in a loop. That means there are only three connections and the voltages between them. (A neutral reference point can be created in a delta network through various techniques discussed in the reference articles.)

The angle between the phase voltages is always 120°, but whether the angle is positive or negative depends on the *phase sequence* which can be a-b-c or a-c-b in order of increasing angle. In Figure 1A, the phase sequence is a-b-c, which is positive rotation.

Say — how can three voltages be connected together in a loop that doesn't contain any

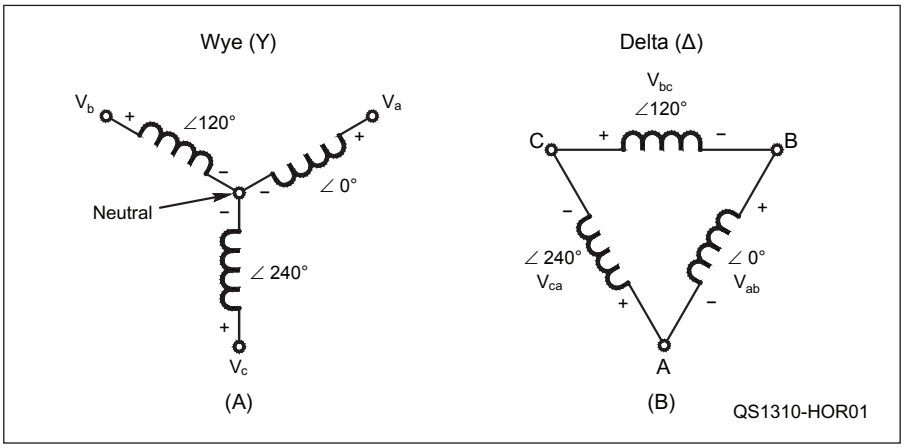


Figure 1 — Schematics for circuits connected in wye (A) and delta (B) configurations.

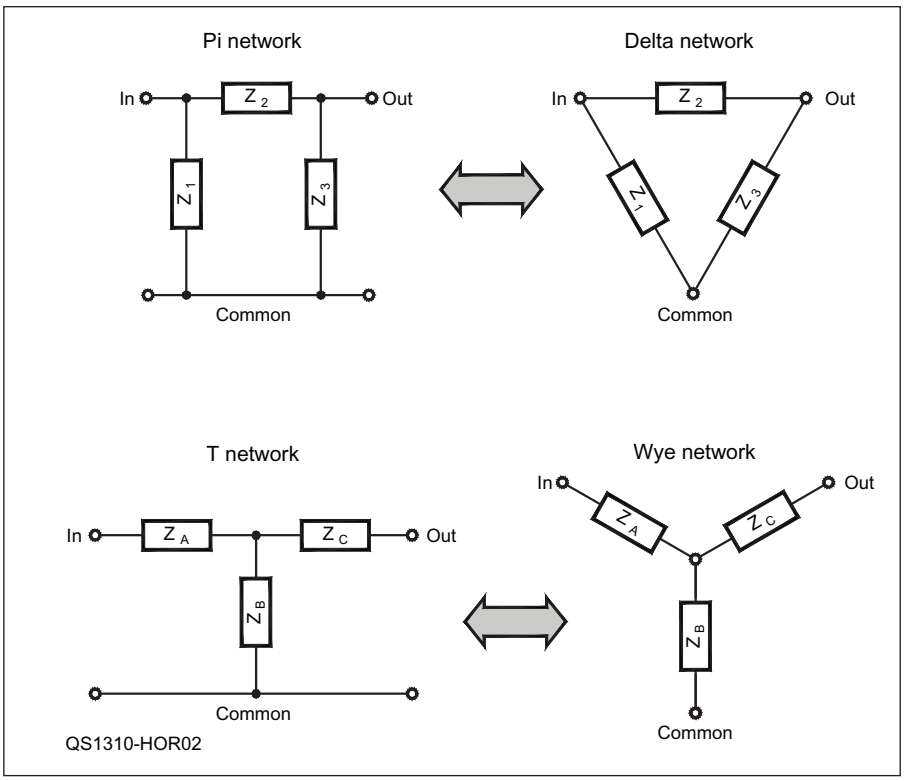


Figure 2 — A Pi network is equivalent to a delta network and a T network is equivalent to a wye network.

resistance and not have the current go to infinity? If the voltages were dc, we would indeed have a problem! Instead, these are ac sine waves with the same voltage magnitude (V) but different phase angles. Adding up the voltages around the circuit gives us $V\angle 0° + V\angle 120° + V\angle 240°$. Changing the phasors to rectangular coordinates allows us to calculate the sum: $(V + j0) + (–0.5V + j0.866V) + (–0.5V – j0.866V) = 0$. So the net voltage around the loop is zero and no circulating current flows at all!

In both wye and delta systems the loads can be connected between phase or line voltages. In a wye system, a load can also be connected between a phase voltage and neutral. Imbalanced loads in either type of system can cause substantial *error currents* to flow. Non-linear loads such as switchmode supplies and loads controlled by SCRs and TRIACs create harmonic currents. Both of these cause problems, too. Obviously, generating, transferring, and using multiphase power is a complex subject. You can learn more about it in the references mentioned earlier and at **www.allaboutcircuits.com/vol_2/chpt_10/1.html**.

But what do wye and delta power systems have to do with radio? From the standpoint of ac power, not much — unless you happen to need a *really* big power supply. However, we use wye and delta all the time in our circuits — we just refer to them as *Pi* and *T*!

Having T with Pi

Figure 2 shows two circuits made of generic impedances — one is a Pi network like you'll find in nearly every tube-type amplifier and the other takes the shape of a T network that you'll find in most antenna tuners. Figure 2 also shows how a Pi network is the same as a delta network and a T network is a wye network. Who knew?

That's handy to know, but there is another neat trick to apply. You can turn a circuit of one type (Pi or T) into its exact equivalent circuit of the other type (T or Pi) by using some math called the *wye-delta transformation*. From the perspective of the input and output connections, the equivalent circuit will behave *exactly* the same (with a caveat explained later). The following equations show the math, although you can use an online calculator such as this one at **www.elektro-energetika.cz/calculations/transfigurace.php?language=english**[2]

Pi (Delta) to T (Wye)

$Z_A = Z_1Z_2 / \Sigma Z$; $Z_B = Z_1Z_3 / \Sigma Z$; $Z_C = Z_1Z_3 / \Sigma Z$

Where $\Sigma Z = Z_1 + Z_2 + Z_3$

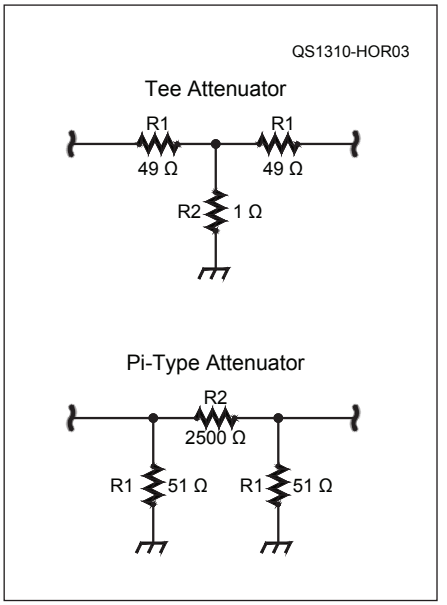


Figure 3 — A resistive 40 dB T attenuator and its equivalent Pi attenuator. The Pi attenuator's 2500-Ω resistor is less affected by wiring resistance than the T attenuator's 1 Ω resistor.

T (Wye) to Pi (Delta)

$Z_1 = Z_P / Z_C$, $Z_2 = Z_P / Z_B$, $Z_3 = Z_P / Z_C$

Where $Z_P = Z_AZ_B + Z_AZ_C + Z_BZ_C$

Using the Transformation

More than just math sleight-of-hand, transforming the circuits from one form to the other can be quite useful. Let's say the circuit you start with has component values that are hard to make work well — maybe they are very large or very small values. By changing the circuit from one form to another, the component values also change and may become more reasonable. Let's try an example:

The circuit in Figure 3A is a 40 dB T network attenuator with symmetrical input and output impedances of 50 Ω. The 49 Ω series resistors aren't an issue, but the 1 Ω parallel resistance could be significantly affected by extra wiring resistance in the common connection. Transforming the circuit into its Pi equivalent in Figure 3B changes the resistors to 51 and 2500 Ω. The 2500 Ω resistance is much less affected by wiring resistance and other small variations. You can use an online calculator such as **www.microwaves101.com/encyclopedia/calcattenuator.cfm** or tables of resistor values for Pi and T attenuators allow you to pick the form that makes the most sense.[3]

This can also work with circuits made out of reactances (Ls and Cs). Let's try an example in which we are transforming an output impedance of 800 Ω to 50 Ω at a frequency of 7 MHz and with a circuit Q of 6. If we use a typical antenna tuner's T network with series capacitors and a parallel inductor, the component values are C_{IN} = 76 pF, L = 5.9 µH, and C_{OUT} = 25 pF (calculated with the T match calculator at **www.eeweb.com/toolbox/t-match**). The value of L is fine but the values for C_{IN} and C_{OUT} are small enough that it would not take much stray capacitance to upset the tuning of the network which makes the settings "touchy." In addition, the higher the reactances of the series capacitors ($–j300$ and $–j910$ Ω, respectively) the higher the voltages across them for a given current.

What happens if the T (wye) network is transformed to a Pi (delta) network? The resulting reactances are arranged with a shunt (parallel) inductor at the input (j 44 Ω or 1 µH) and output (j 132 Ω or 3 µH) and a larger series capacitor ($–j155$ Ω or 147 pF) which would reduce the effect of stray capacitance and lowers series reactance, too. The online calculator can also change the Pi network to a series-L form if that's more convenient.[4]

Here's the caveat mentioned earlier: When using LC networks it's important to remember that when using LC networks, the transformation works *only* at the frequency for which the components have the reactances you specify. As frequency changes, so do the reactances, and you'll have to re-calculate the component values to get an exactly equivalent circuit. Using variable components allows you to use the circuit at different frequencies.

Putting the transformation calculators in your software toolbox is very helpful when you are trying to select and design an impedance matching circuit. This is particularly true at QRO power levels where heavy-duty (i.e. expensive) components are required to stand up to the high voltages and currents. A few iterations of your design over the range of frequencies and impedances you want helps avoid extreme component values and the high voltages and currents that often go with them.

References

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

[2]Step 1 of the calculator asks for the "Shape of the complex numbers," meaning that you should select either rectangular ($R + jX$) or phasor ($Z\angle\theta$) form for the impedances. Use a comma for the decimal in the European convention. i.e. 1.0 becomes 1,0.

[3]See the Component Data and References chapter of the *ARRL Handbook*, available from your ARRL dealer, or from the ARRL Store, ARRL order no. 6948. Telephone toll-free in the US 888-277-5289, or 860-594-0355; fax 860-594-0303; **www.arrl.org/shop/; pubsales@arrl.org**.

[4]The calculator can switch between series-C (block dc current) and series-L (pass dc current) forms of the network.

Steve Ford, WB8IMY, wb8imy@arrl.org

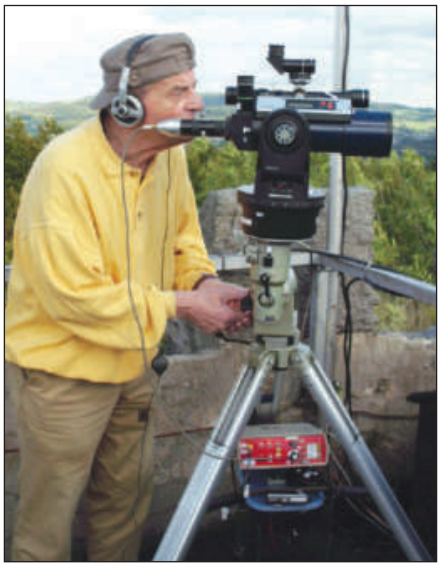
Amateur TV…by Laser!

Not all Amateur Radio activity is confined to RF. Hams have been experimenting with laser communication for decades, modulating beams of light in an effort to span greater distances. The current record holders are Terry Wilkinson, WA7LYI (now W7NS) and Bruce Wilson, KY7B, who made contact over a 154 mile path using visible light lasers in 1991.

On October 3, 2012, Martin Straka, DL8TP and Norbert Wetzel, DF6IY, did something very different. Over a 62.7 mile path they not only communicated, they sent *video* using a near-infrared laser. This may be a world record for amateur TV over a laser link.

Martin's transmitting station was atop a 90-foot tower in Odenwald, Germany. The receiver was at Norbert's home in the Gaggenau district of the Black Forest about 1500 feet above sea level.

Martin used the near-infrared laser at 780 nanometers, or approximately 384 THz, with a power of about 20 mW. Aiming the laser was a challenge since the light was invisible to human eyes. Fortunately, the beam was detectable by a video camera at the receiving end. (Many consumer-grade video cameras can detect infrared light; they can be pressed into service as handy tools for diagnosing misbehaving TV remote controls!) Of course, both stations were equipped with telescopes to transmit and receive the light.



Martin Straka, DL8TP, at the laser transmitter.

At the beginning of the transmission Norbert reported seeing flashes in his monitor, but wasn't certain if he was detecting the laser or some other infrared source. Since the beam would spread considerably over 62 miles, you'd assume that aiming wasn't critical — not true. To be properly demodulated, the beam had to form a precise line from the laser diode at the transmitting telescope to the photodiode at the receiving telescope. This was made more difficult by occasional blasts of wind that shook DL8TP's tripod. Despite the challenges, they finally made contact and you can see the result in Figure 1.

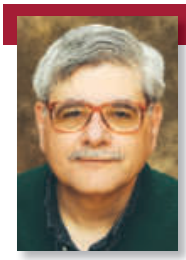
The transmit signal was created by applying a 36 MHz FM video signal to the laser diode. At the receiving station, the light was focused on the photodiode and the 36 MHz video signal was demodulated and amplified before being mixed with a signal from a 920 MHz oscillator. The mixer output was then fed to an analog satellite receiver for final demodulation and viewing.

My thanks to Elmar Ohrnberger, DG2EKO, for sharing the report.

The transmitter site was atop this 90-foot tower in Odenwald, Germany.

Figure 1 — The received test pattern video signal.

Norbert Wetzel, DF6IY, at the receiving station.



Steve Sant Andrea, AG1YK, hk@arrl.org

Swapping Batteries, Remote Control and Trimming a Dipole

Battery Replacement in the Yaesu DVS-2

The Yaesu DVS-2 plug-in Digital Voice Keyer accessory has a button cell that's tab welded and soldered onto one of the internal PC boards. In mine it was a 2032 lithium cell. Its purpose is to retain the information in memory after shutdown or loss of power. The factory cell, and subsequent cells, should last about 10 years after installation.

While some information is available on the Internet, I couldn't find a procedure on how to get the DVS-2 open to replace the cell. Here's a detailed approach that works.

You'll need a small soldering iron, appropriate flux, solder wick, good eyes or a magnifier, shrink sleeve and the usual ham tools for detailed work.

A note of caution: Do not short the button cell, even for a second, or it can be ruined. When installing the new cell, remember it's hot, so don't let it, or the leads, touch any of the surrounding circuitry or you may damage components.

Making the Swap

You'll need several small, flat bladed, screwdrivers in order to separate the unit. There are three hold points for the halves of the case. One is the Phillips screw near the cable. The other two points are internal plastic snap catches. One is across from the screw at the cable end on the side, below the "foot;" the other is in the center at the bottom. With the screw removed, carefully pry open and press in on the catch at the bottom. Then, separate the catch opposite the screw position hole.

Carefully separate the two small PC boards via the hard mounted connectors (see Figure 1). Note: The factory cell at the lower left has a yellow isolation ring to prevent shorts between + and – terminals.

Flip the PC board over and find the holes where the cell's tabs are soldered to the board. You'll have to carefully use solder wick (or solder sucker) to remove the solder, taking care not to overheat the copper lands on the board. Don't be in a hurry. If you don't reuse the welded tabs on the cell, you may want to cut one tab to ease access to the dead cell for removal. See Figure 1 to help reference the points for solder removal.

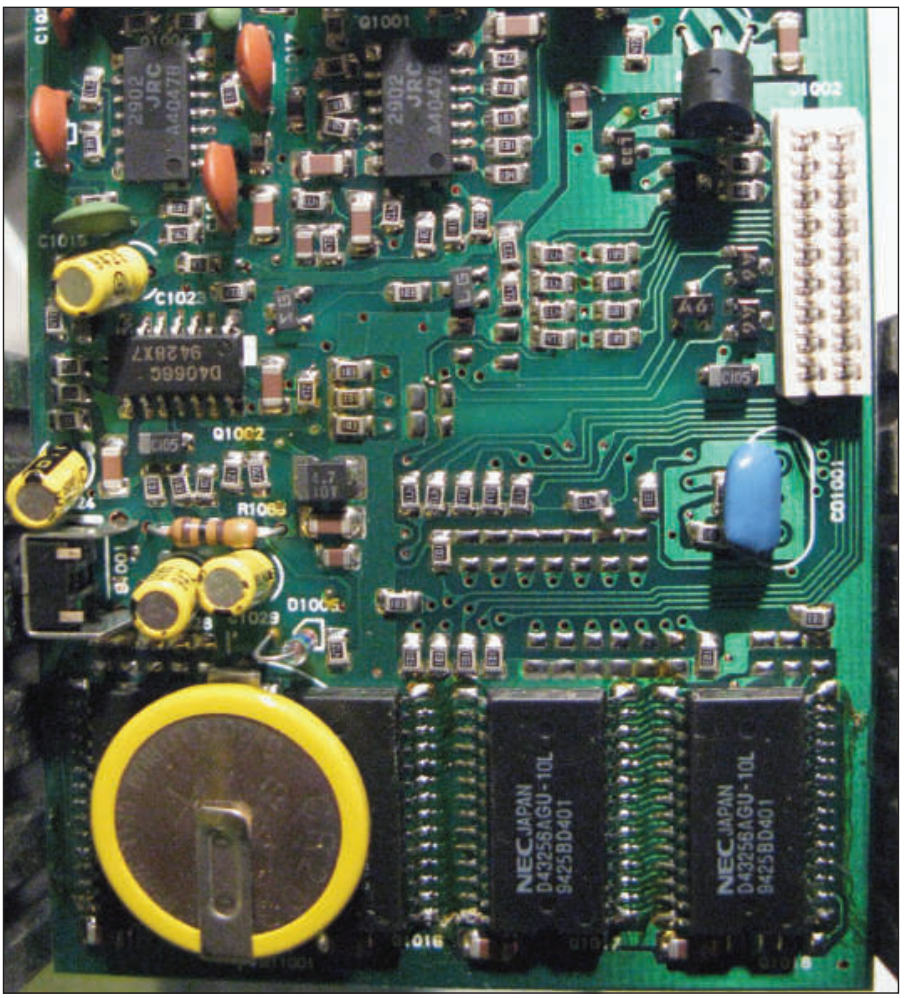


Figure 1 — This is the component side of the cell board. At the center right is the connector that mates to the upper board and at the lower left is the original battery. [John Grout, KT4AD, photo]

After removal of the original cell, you'll note the factory tape used to hold the battery in place. I didn't utilize tape in my replacement method.

On the solder side of the board, locate where the cell's tabs were unsoldered. This will help in the wicking and removal process. Clean the area and ensure the holes are open to accept the new cell's leads later. You will install a replacement cell that is wired and encapsulated in a shrink sleeve. There is plenty of room.

After the holes are clean, select red and black pieces of wire that will fit in the holes. Since the current draw is minimal, a stiff, small gauge wire is adequate.

Figure 2 is a view of the area, ready to accept the new assembly. A nearby Batteries Plus store spot welded tabs on a new cell. [Both Batteries America and Mouser sell 2032 cells with solder tabs. — *Ed.*] Use something to isolate the tabs so they can't short to the opposite side of the cell or anything else before installation. Solder on your wires and add shrink sleeve to the contacts. Then shrink sleeve the

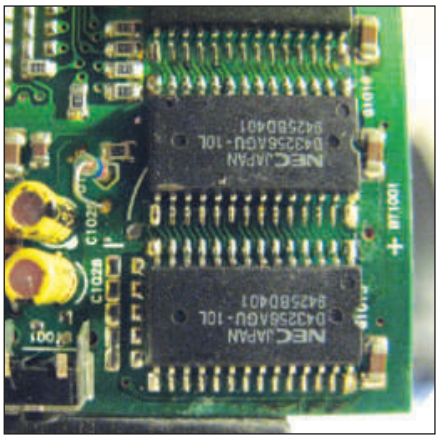


Figure 2 — After the old cell is removed and the holes cleaned, the board should look like this. The battery + and – connections are marked on the board. [John Grout, KT4AD, photo]

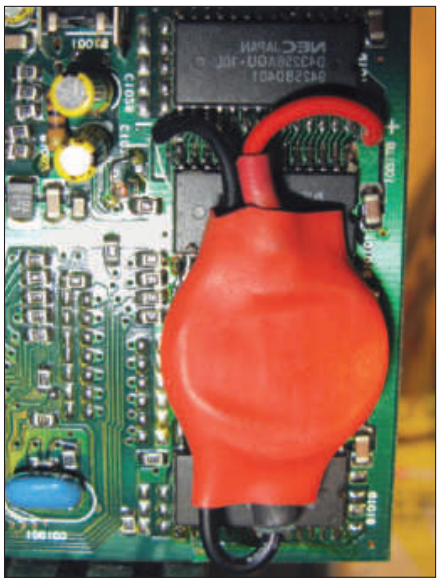


Figure 3 — The new cell, double insulated and installed on the DVR-2 board. [John Grout, KT4AD, photo]

whole assembly so it's isolated from the board. Strip the wires enough to clear the holes on the board's solder side and temporarily sleeve the exposed ends to prevent any erroneous contact with the PC board.

I used a wooden clothespin to hold the cell in place while soldering on the reverse side of the board, though you could use tape. It's critical to keep the exposed lead ends from shorting or touching any contacts during soldering. Check the cell voltage one last time before final installation to ensure it is still good. When complete (see Figure 3), secure the new cell in place if need be (I found the wire stiffness adequate to hold it) and reassemble the unit.

Before connecting the DVR-2 to your rig, push the unit reset button through the unit side access hole. It should now work for another 10 years of contesting fun. As a side note, there have been a lot of Internet comments about the excess audio drive when using this unit. Keep the microphone gain and drive down to minimum when recording and speak in a normal voice — don't shout. A lot depends upon the microphone or contest headset being used. — *73, John Grout, KT4AD, 15798 Fawn Pl, Montclair, VA 22025-1427*, **kt4ad@aol.com**

Low Hassle Remote Control

For those who are interested in remotely controlling their rig over the Internet, you might want to give *TeamViewer* a try. It is available at **Teamviewer.com** and is free for noncommercial use. It has a several advantages over other available interfaces. First, you don't need to know your IP address (it doesn't require tools like *No-IP* or *DnsDynamic*) and it also includes Voice over IP (VoIP), so you don't need applications like *Skype*. Note that to use VoIP you need to unmute the audio on both the local and remote sessions. Add some hardware and some ingenuity and you can make an interface for easy control and operation of your station.

For the hardware, review the April *QST* article that describes a remote control switch box.[1] This allows remote control of the power to your rig and other accessories using a PC interface. An Internet search for "USB relay" will yield some other inexpensive options for computer control of relays. One important consideration is a setup where the station will automatically be powered off after some period of time. You should employ a PTT relay that has a 10 minute timeout in case you lose your remote control Internet connection.

You don't need to have remote access to *Ham Radio Deluxe* or *TRX Manager*, as long as you can operate you radio from the station PC. I have an Elecraft K3 and found that the *CQ/X* client software available at **www.no5w.com** is easier to learn and use since the interface is a display of the K3 front panel with most controls working.

Whatever you can run locally on your station control computer, you can run remotely from the remote computer through *TeamViewer*. If you have a rotator that has a serial port interface, you can control it remotely as well. All programs that are on your station PC will show up on your remote desktop through *TeamViewer*.

Create a folder on your station PC that contains all of the applications you need for operating the remote station. When you first connect to your station control desktop through *TeamViewer*, open that folder. All of the applications that you need should be available, such as power for the rig, rig interface, rotator control, web camera, etc. If you need refresher instructions, include a text file with a list of what you need to operate.

If you have a web camera, just start up the local application for the camera on the PC and point it at your rig for nearly instant feedback of your rig's display. This is especially useful for the spectrum analyzer display available on many of today's rigs. The web camera gives you a little more confidence in the remote operation as you can see exactly what is going on in your station, even though it's a thousand miles away. *TeamViewer* does include a video interface, but I find it easier and less confusing to just run the web viewer application on the station desktop.

Before going remote, spend some time with your station setup and learn both ends. Learn how to operate everything from the station PC and then log in using *TeamViewer* using a laptop or other computer and practice.

Don't forget to make yourself a checklist of the changes you need to make to the station to set it up for remote operation. You may need to consider antenna changes, microphone and speaker interface to the computer, webcam and any other setup that may be required.

Using *TeamViewer* to operate between Denver and my home station in Minnesota, the audio reports have been great. Now you can travel the country and keep in touch with your friends on 75 meters. — *73, Michael Foerster, WØIH, 1403 Foxcroft Place Dr, Winona, MN 55987-4845*, **w0ih@arrl.net**

Installing Coax Boots

I like to put waterproof boots on all my coax connectors but the boots have tiny openings at the coax end, making them a real chore to install. Last time I installed a boot I thought there must be an easier way. I remembered that I had used a cone shaped tool to install O-rings without nicking them and thought that there must be a similar way to slide the boot over the coax.

I looked on my workbench and saw one of the tips that come with tubes of silicone sealer — the long, pointy type that you use to apply the sealant. The tip has a nice taper with a large threaded knob at one end to screw onto the tube. I cut the threaded portion off with some tin snips (most anything sharp would work) and filed the cut to remove any burrs.

The tip fit perfectly over the coax. I applied some of the silicone grease that came with the boot onto the coax and the boot easily slid on (see Figure 4). A job that could take several minutes was over in seconds. It has the added advantage of keeping the silicone grease used

[1] J. Crisman, WØJEC, "Remote Control of Accessories via the Internet," *QST*, Apr 2013, pp 30-32.

Figure 4 — The conical applicator tip from a tube of glue or sealant can be converted to a handy tool that makes fitting weather seal boots onto coax a simple job. [Michael Buck, K6BUK, photo]

to install the boot off the end of the coax, so as not to interfere with a clean solder joint. You just have to remember to put the boot on before you install the connector. — *73, Michael Buck, K6BUK, 203 Brockman Ct, Lincoln, CA 95648*, **mrbuck@pacbell.net**

A One Trim Dipole

Simple wire dipoles are among the easiest and cheapest antennas to make, but getting the length and resonant frequency exactly right is often left to trial and error. It is well known that, due to various factors, the formula for the length of a dipole, Length = 468 / *Frequency*, is often inaccurate. However, there is a way, using an antenna analyzer, that you can resonate the dipole at the desired frequency while trimming the length only once.

First, use the standard formula. For example, for a center frequency of 14.2 MHz, the length comes out to 32.96 feet or about 16.5 feet per side of the half wave dipole. Then, add about 6 inches to that length on each side and raise the antenna to its permanent location.

From your ham shack, attach the antenna analyzer to the end of the coax and find the resonant frequency (lowest SWR). Now, solve for the *real* constant, by multiplying the total length you initially used (in our case 34 feet), times the resonant frequency you found on the antenna analyzer (Constant = *Frequency* × Length). For example, if the antenna analyzer showed resonance at 14.4 MHz, the real constant of your antenna would be 34 × 14.4 or 489.6. Now, replacing the 468 in the formula with the real antenna's constant, we have Length = 489.6/14.2, which equals 34.48 feet or about 17¼ feet on each side (17 feet 3 inches). Since you used 17 feet 6 inches to start with, just trim 3 inches off each end and *voila*! The antenna analyzer should now show a resonant frequency of 14.2 MHz. — *73, Paul Voorhees, W7PV, 10090 Misery Point Rd NW, Seabeck, WA 98380-9784*, **w7pv@arrl.net**

Powerpole Clip

Anderson Powerpole connectors (**www.andersonpower.com**) have become ubiquitous in the ham shack. Almost all the station accessories you purchase use them or can be purchased with them as an option. I even go as far as putting a Powerpole connector on the end of OEM supplied power cables with a new rig. As good as Powerpoles are, there are two things I dislike about them. First, there are those tiny, hard to insert, easily lost, roll pins. The other is that a slight tug can disconnect them.

I have found a solution to both those problems and I even went a step further. Anderson offers a small retention clip (pn 110G68) to insert into the holes where the roll pin would normally go. The clip keeps two connectors together; no longer will a tug on a cable separate the connector and there is no need for roll pins.

The ones shipping today have a small hole, which is a good place for a small piece of twine to tie it to the cable. I prefer to tie the clip to the power source side of the wire. Since I also use dual wall heat-shrinkable tubing to form a strain relief on the connector, I tied the twine to it and, with a small dab of glue, I can keep everything neat and in place. — *73, James Philopena, KB1NXE, 265 Frost Hill Rd, Marlborough, NH 03455*, **kb1nxe@arrl.net**

Mobile Mic Holder

I have tried everything I can think of to keep my mobile microphone off the floor. As you are probably aware, many microphones no longer have a button on their back for a holder. I needed a convenient way to mount the microphone that didn't require me to drill holes in the dash of a pickup truck that cost as much as my house.

What I came up with made my wife chuckle but works quite well. I purchased a 3 inch piece of ¾-inch PVC pipe, a pipe cap and a small brass screw in hook. The pipe is 0.848 inches and the cigarette lighter is 0.818 so a little sanding on the end of the pipe was needed. I inserted the finished product into my cigarette lighter socket (see Figure 5). It works quite well for parts from the junk drawer. — *73, Ted Pirolli, KD8HYT, 143 E Walnut St, Petersburg, MI 49270*, **tedpirolli@yahoo.com**

Figure 5 — A few pieces of PVC, some junk box parts and some sandpaper comes together to make a mobile mic holder. [Ted Pirolli, KD8HYT, photo]

Altoids Mini Tins

Hams have been using the large Altoids tins for projects since they first appeared, but the small tins don't appear to be as popular. I have found that they're great for holding small parts when you're in the disassembly phase of a repair. Since I've got upwards of a hundred of these things, why should I buy a pill organizer?

Small parts can include flash drives of rather respectable size that tend to get lost if you're not careful. The drives and other small or delicate parts don't get lost and the metal case of the tin protects them from damage. — *73, Frank Ney, N4ZHG, 146 Adams St #2, Delmar, NY 12054*, **n4zhg@intergate.com**

Oversized Punches

Need to punch some holes? Greenlee punches are one size, of course, but what if you need a hole that doesn't match any of the Greenlee punches? Conduit punches may fit the bill. They easily punch through the ⅛ inch aluminum sheet used for 19 inch rack panels and also the steel and aluminum used in chassis construction, but their hole sizes are somewhat larger than the Greenlee equivalent. Note that conduit punches use a ¾ inch draw bolt. See Table 1 for a list of the various conduit punch sizes. [An alternative to punches worth considering are stepdrills. — *Ed.*] — *73, Edward Barbacow, K3ZCY, 149 Geary Dr, Connellsville, PA 15425*, **k3zcy@arrl.net**

Table 1
Conduit Punch Sizes

Punch (inches)	Hole Size (inches)
½	0.880 (⅞)
¾	1.115
1	1.36
1¼	1.68
1½	1.933
2	2.42

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

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

Pioneers of Wireless

Over the course of less than half a century, these pivotal figures in the history of radio made discoveries that would change the world forever.

Michael W. Marinaro, WN1M

Prior to the 1860s, our planet was a relatively quiet place, electromagnetically speaking. The only signals were those provided by Mother Nature. If you traveled back in time with a receiver in your pocket, your would hear the hiss of static on every frequency and nothing more.

Scientists at that time hadn't even considered the possibility of wireless communication. On the contrary, the big idea of the day was transferring information and energy over wires. The fundamentals of electricity were becoming known and applications abounded with the most conspicuous being the telegraph. By 1862 telegraph lines spanned the American continent and the first undersea telegraph cables soon linked America to Europe. So revolutionary and successful was this mode of communication that little thought was given to alternative means. It would be almost 40 years before wireless communication was demonstrated and its practicality accepted. Even then, signals were rare and weak.

Those early days of wireless history are clouded by disputes over who did what first and how. Some people stand out and are clearly recognized as contributors; others are mentioned as facilitators or accomplices. Let's take a brief look at some of the individuals history recognizes as the most accomplished wireless pioneers.

Michael Faraday

One of the earliest recognized contributors to the scientific knowledge that formed the basis for electromagnetic theory was Michael Faraday (1791-1867). Known today as "the physicist's physicist," his experiments, beginning in 1821, established the existence of magnetic fields and the phenomenon of magnetic induction. He applied these concepts to invent the electric motor, dynamo and transformer.

James Clerk Maxwell

James Clerk Maxwell (1831-1879) a Scottish professor of physics at Cambridge University is considered one of the greatest scientists of the 19th century. In 1865 he published his concept of an alternative means of transmission by electromagnetic waves of radiation. Dr Maxwell synthesized all previous scientific thought concerning electricity and magnetism into the now famous equations that revolutionized modern wireless communications.

Maxwell's equations established that electric and magnetic fields can be generated and propagated through space at the speed of light. This is considered one of the breakthrough theories of physics. As word spread throughout the world, experimenters and inventors were driven to apply his equations. The race to practical wireless was accelerating.

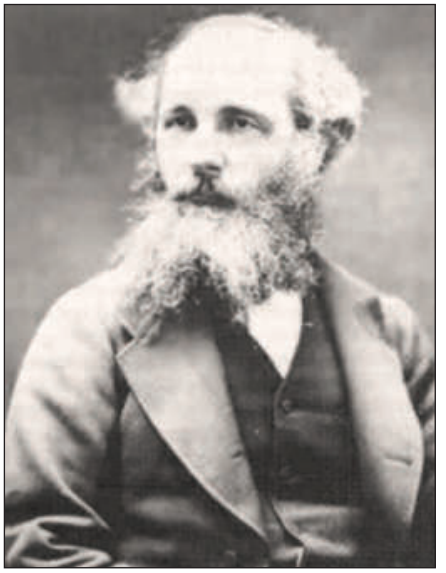
Mahlon Loomis

In 1872 Loomis (1826-1886), a Washington, DC dentist and experimenter, was granted a patent for what was claimed to be "a system to telegraph without wires through the atmosphere." He demonstrated his system by transmitting ciphers 18 miles or so between two mountain peaks using kites to support copper "antenna" wires connected to ground through galvanometers. Due to poor prevailing financial conditions and other hindrances, he was never able to put his system to practical use. Even so, historians often credit Loomis as being the first to actually transmit information wirelessly.

David Edward Hughes

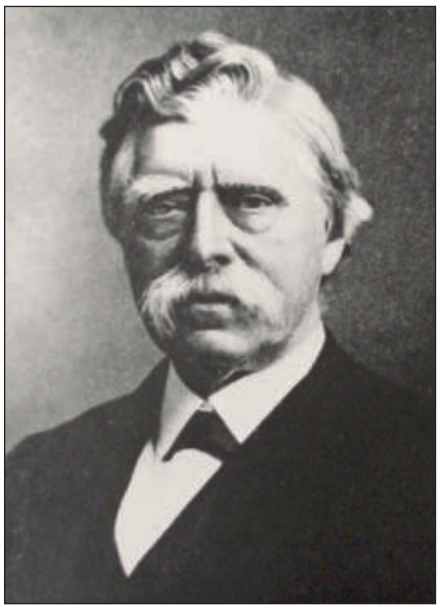
The curtain of silence was about to be lifted as more scientists and inventors began sending the first signals into the ether. Prominent among them is David Edward Hughes (1831-1890), the American experimental physicist who constructed a spark gap transmitter and

One of the earliest existing photographs of Michael Faraday, taken in 1844.



James Clerk Maxwell, best known for his famous equations, is considered to be one of the greatest scientists of the 19th century.

A practicing dentist, Mahlon Loomis was possibly the first individual to transmit and receive wireless signals.



David Edward Hughes developed several important devices including the carbon microphone (which was to become the key component of the telephone) and the coherer.

Heinrich Hertz proved the existence of electromagnetic waves and lent his name to our modern unit of frequency.

detected its output by listening to a carbon microphone of his own design. He sent a Morse code signal 500 yards. Hughes improved this system and developed several important devices including the carbon microphone (which was to become a key component of the telephone) and the coherer. The invention of the coherer, so critical to the development of wireless, is also credited to two other physicists: France's Edouard Branly (1844-1940), and Britain's Sir Oliver Lodge (1851-1940). The dispute over who was truly first to invent the coherer rages among historians to this day.

Heinrich Hertz

The work of Maxwell and Hughes inspired German physicist Heinrich Hertz (1857-1894), who conclusively proved the existence of electromagnetic waves. In his laboratory, the professor's signals traversed space as a spark gap emission generated by a high voltage induction coil and condenser. The receiving antenna was a simple dipole and reception consisted of little more than visible sparks.

Hertz extended the distances of his transmissions as he refined his techniques. In the process he proved that electromagnetic radiation traveled at the same velocity as light and could be reflected and refracted like light. Hertz not only proved the existence of electromagnetic waves, he also introduced the concept of the waves varying by wavelength.

In 1960 the General Conference on Weights and Measures honored Hertz by designating his surname as the unit of frequency, replacing "cycles per second." By the 1970s, expressing frequencies in "Hertz" had become commonplace.

While Faraday, Maxwell, Hughes, Loomis and Hertz were the luminaries of their time, they weren't alone. Scientific historians include the following men, among others, in their consideration of the advancement of wireless communications technology:

- Joseph Henry (1797-1878), an American scientist who independently discovered electromagnetic self induction.
- Berend Wilhelm Feddersen (1832-1918), the German physicist who proved that oscillating electric sparks could be produced by a coil, capacitor and resistor in combination.
- Wilhelm von Bezold (1837-1907), a German physicist who experimented with the oscillations produced in conductors.
- Temistocle Calzecchi-Onesti (1922-1853), an Italian physicist who demonstrated the basic concept of an electromagnetic wave detector by placing iron filings in a glass tube that conducted an electric current when exposed to an wave source.
- Edouard Branly (1844-1940), the French physicist who built on the work of Temistocle Calzecchi-Onesti and demonstrated a more sophisticated and sensitive version of the electromagnetic wave detector.
- Oliver Lodge (1851-1940), a British physicist who coined the term "coherer." He improved on the device by adding a vibrator that broke up bunched filings to maintain uniform detection sensitivity.

Wireless Made Practical

The discoveries surrounding electromagnetic radiation spread slowly, at least by today's standards, through academic journals and other publications. Several years passed before the revelations attracted the attentions of the men who would bridge the gulf that separated the theoretical from the practical.

As the new century approached, a Russian, a Serbian and an Italian applied themselves independently and almost simultaneously to developing the methods and apparatus that would give birth to the modern wireless age. As was the case with other great inventions of the time, there is controversy about who did what first. However, what is clear is that these three inventors succeeded in designing practical equipment capable of transmitting and receiving electromagnetic waves over increasingly greater distances — from mere feet or yards to *miles*.

It is reasonable to conclude that no single individual invented radio as we know it. History considers this a shared honor. Distinctions lie not so much in the apparatus used, but in the inventor's motivations and personal objectives, and in the proliferation of their inventions.

Alexander Stepanovich Popov

What little is known of Professor Popov (1859-1906) comes to us filtered by pre-revolutionary Russian historians, inflated by nationalism and imbued with an aura of religious mysticism. We know that Popov concluded his education with studies of physics and mathematics at the Faculty of Physics at Saint Petersburg University where he earned his professorship in 1882. Subsequently, he taught at the Russian Navy's Torpedo School. Due to this affiliation, the publication of his work was limited and his sophisticated work with wireless was kept secret.

Professor Popov sought a method of detecting the lightning within approaching thunder-

Alexander Stepanovich Popov established the first ship-to-shore radio link, among other inventions.

storms. He assembled a receiver consisting of a coherer of Branly-Lodge design with the addition of a device that automatically tapped the glass tube to keep the filings loose. Integrating a Hertz-design transmitter, he demonstrated his system to the Russian Physics-Chemistry Society at Saint Petersburg University on May 7, 1895. Later, this date came to be celebrated in the Russian Federation as "Radio Day."

Professor Popov later designed and installed a two-way signaling system between radio stations at the Hogland Island naval base and aboard the battleship *General-Admiral Apraksin.* The system played a key role in the ship's rescue after it became grounded and icebound in 1900.

Nikola Tesla

Serbian-American Nikola Tesla (1856-1943) was a master of many professions and the genius behind numerous inventions, including patented designs for equipment that generated electromagnetic waves. His principal achievement was the concept of ac power transmission and the invention of the ac induction motor and transformer. Tesla's interest in electromagnetic wave technology emanated from his preoccupation with the idea of wireless transmission of power — a power grid without wires.

As early as 1893 Tesla lectured on the principles of radio and demonstrated wireless communication utilizing a unique spark gap transmitter and coherer receiver that included an antenna working against ground. He was later granted patents on the system and its components. These grants were the basis for Tesla later contesting some of Marconi's patents. A 1904 court decision favored Marconi, but in 1943 the US Supreme Court reversed the decision and upheld Tesla's patents.

Tesla dreamed big, and among his dreams was a high-powered (200 kW) wireless facility for transatlantic commercial communication. In 1904 he published the concept and stated that the station would not only transmit and receive radio waves, but also transmit electric power. Tesla began work on the station near Shoreham on Long Island, New York, but it never became fully operational. He went on to build a wireless communication facility for Telefunken in West Sayville, Long Island in 1911-1912.

Tesla was commercially oriented and highly entrepreneurial. He is credited with some 278 patents issued in 26 countries. Among the pioneers of radio, Tesla was surely the most colorful and remains an icon in popular culture.

Guglielmo Marconi

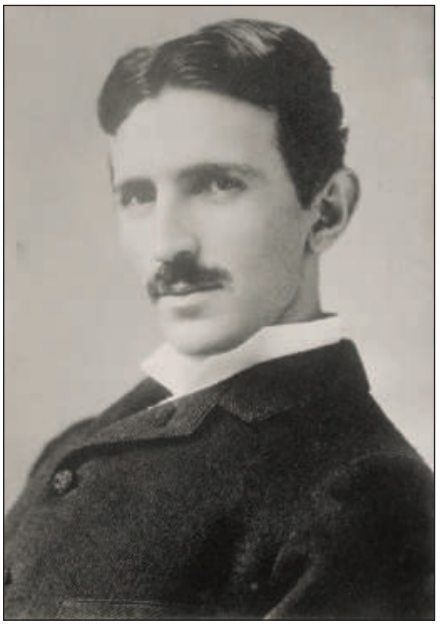
Guglielmo Marconi (1874-1937) used the Morse code letter "S" to preface and identify his experimental transmissions. By continually improving his apparatus, starting with a basic spark gap transmitter, coherer receiver and grounded antenna, he was able to complete transmissions at substantial distances from 1895 onward.

In 1901 he shocked the world by claiming that he had spanned the Atlantic with signals sent from Poldhu, in Britain's Cornwall to St John's, Newfoundland, Canada (2200 miles) at a wavelength of 366 meters. This accomplishment remains contested today because at this frequency, during daylight hours, any such signals would be absorbed by the atmosphere.

Regardless, he crowned this feat in 1902 with verified transmissions from Glace Bay, Nova Scotia to Poldhu, and in 1903 from South Wellfleet (Cape Cod), Massachusetts to Poldhu. Marconi's breakthrough quickly captured the imagination of the world. In 1909, Marconi shared the Nobel Prize in Physics with Karl Ferdinand Braun for their work in the development of wireless telegraphy.

The entrepreneurial young man had long envisioned the commercial application of his wireless apparatus. Even before his transatlantic triumphs, Marconi had founded the Wireless Telegraph & Signal Company in Britain. In the wake of his successes, the company grew into a communications empire. It became the Marconi Wireless and Telegraph Company with branches in many countries, some of which still exist today. Perhaps the best known branch, American Marconi, evolved into the Radio Corporation of America, better known as simply RCA.

Marconi continued his research throughout his life, extending the distances of his transmissions at shorter wavelengths until they reached around the world. Many of his discoveries at shorter wavelengths laid the foundations for radar and microwave.



Nikola Tesla was a genius with an extraordinary range of interests. His pioneering work in radio was an offshoot of his goal to transmit electric power wirelessly.

Guglielmo Marconi achieved the first transatlantic radio communication and went on to build a wireless business empire.

Building and Refining

Popov, Tesla and Marconi tend to occupy the historical spotlight, but there were a number of other inventors who refined techniques and made important contributions during this era:

- Roberto Landell de Moura (1861-1928), a Brazilian scientist and priest who conducted wireless telephony transmissions at distances of 8 kilometers in Sao Paulo, Brazil in 1900. He was awarded US patents, including one for a "wave transmitter," which was the forerunner of today's transceiver.
- Karl Ferdinand Braun (1850-1918), a German physicist who improved on existing wireless devices by introducing tuned circuitry, crystal diode rectification and inductive coupling. Mostly known as the inventor of the cathode ray tube, he shared the Nobel Prize in Physics with Marconi in 1909.
- Jagadish Chandra Bose (1858-1937), was a multitalented Indian physicist who in 1895 demonstrated electromagnetic wave generation and transmission at 60 GHz through solid walls at distances of 75 feet. Professor

Bose developed all the components for his microwave system many decades in advance of today's technology.

The Explosive Growth of Wireless

The first decades of the 20th century saw a phenomenal level of discovery and invention.

The art of radio has progressed and performance improved with thanks to:

- John Ambrose Fleming (1849-1945), an English electrical engineer and physicist who in 1904 invented the two-electrode vacuum tube rectifier — the first vacuum tube.
- Lee de Forest (1873-1961), an American inventor who added a controlling grid to the Fleming tube in 1906 and created the vacuum tube RF detector known as the *Audion.* A few years later, researchers discovered that the Audion triode could also amplify signals. This was a major technical breakthrough.
- Edwin Howard Armstrong (1890-1954), the American electrical engineer and prolific inventor who created the regenerative circuit in 1914, the superheterodyne receiver in 1918 and the super-regenerative circuit in 1922. Armstrong was also the inventor of frequency modulation (FM).
- Reginald Fessenden (1866-1922), a Canadian-American inventor of an alternative to the rotary-spark transmitter utilizing a high-speed alternator invented by Ernst Alexanderson (1878-1975). The transmitter produced a steady radio signal when connected to an aerial. He placed a carbon microphone in the transmission line to impress audio on the radio frequency carrier wave and is often credited as being the first person to transmit amplitude-modulated voice.

The Emergence of Amateur Radio

At this point radio grew from infancy to adolescence. New developments were applied daily and usage was expanding rapidly. The technology quickly became available to almost anyone with sufficient funds and curiosity. At long last, the radio silence had been breached.

In the unregulated radio environment of the time, it was every man, and company, for himself. New uses for radio were being discovered and the parties were staking their claims to what was thought to be a very narrow spectrum. Governments and their military components (particularly the navies), the commercial communications organizations and the maritime industry all had protectionist concerns. And it was during this time that another group was suddenly heard on the airwaves: *amateurs*.

Marconi is purported to have said, "We are all amateurs." He likely would have identified the inquisitive, ingenious individuals who were anxious to explore the new world of wireless on their own. These new amateurs were encouraged by do-it-yourself articles in books, magazines and journals.

It wasn't long before amateur signals were competing with commercial and military stations, causing some operators to criticize the amateurs for their clumsy techniques. They referred to amateurs as "hams," a derogatory term of the day for an obnoxious showoff. Amateurs responded by embracing the label!

By 1914 hams were organizing and the American Radio Relay League would soon become their voice on the national stage. This was the beginning of a new era and a discussion you can look forward to in 2014 issues of *QST*. In the meantime, I'd highly recommend the works of Clinton B. Desoto, W1CBD,[1] and those of my preservationist predecessor Jim Maxwell, W6CF.[2] They wrote well of the circumstances and events surrounding the establishment of the League and Amateur Radio's subsequent years of development.

[1]DeSoto, Clinton B, *200 Meters & Down: The Story of Amateur Radio* (West Hartford, Connecticut: The American Radio Relay League, 1936).
[2]Maxwell, Jim, W6CF, "Amateur Radio: 100 Years of Discovery," *QST*, January 2000.

Michael W. Marinaro, WN1M, an ARRL member, was first licensed in 1952 as KN2CRH and has been licensed continuously ever since. He now holds an Amateur Extra class license.

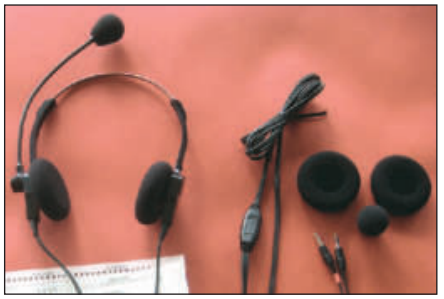
Mike graduated from the City University of New York and worked in the financial industry until his retirement. He also completed a Master's degree in History from Central Connecticut State University.

Mike is currently the volunteer curator working to organize and preserve the history of ham radio as told by the League's extensive collection. You can reach Mike at PO Box 404, 250 Cold Brook Rd, South Glastonbury, CT 06073-0404 or by e-mail at **wn1m@arrl.net**.

New Products

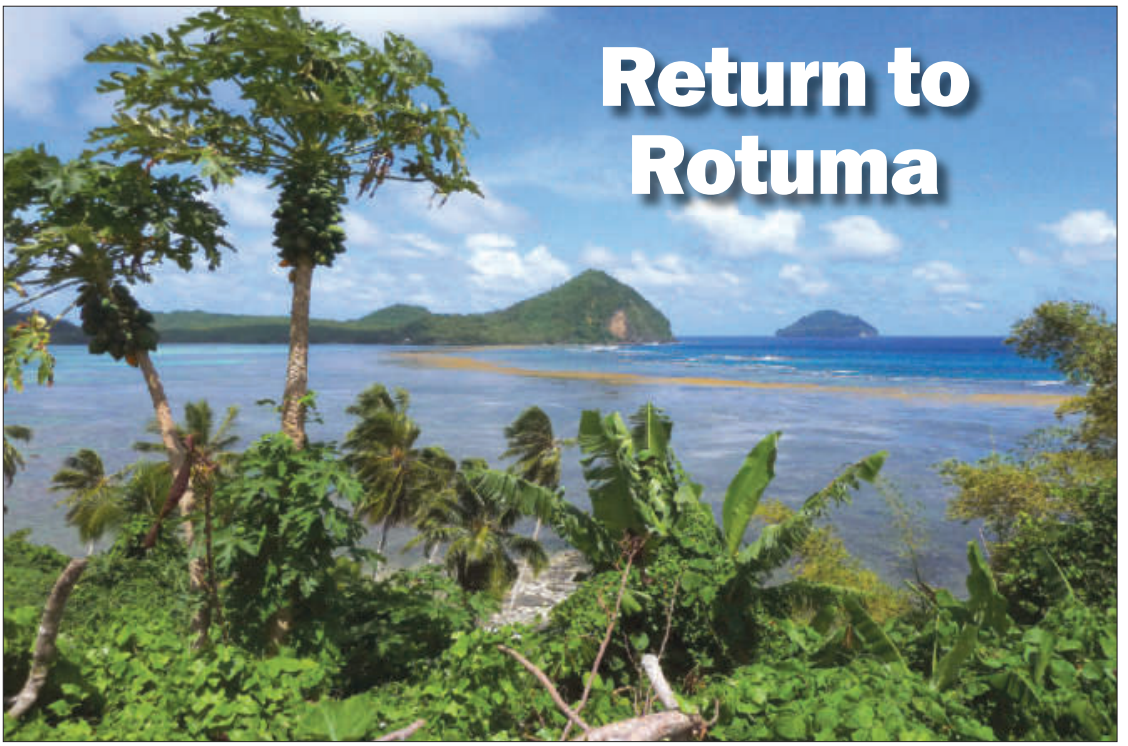
2Q-lite Headset from Kolin Industries

The 2Q-lite is a lightweight headset used primarily in the field of commercial broadcast. The headset alone is 2.5 ounces; with all wiring and plugs, 3.7 ounces. It comes with stereo headphones and a gooseneck microphone with either electret or dynamic elements. The boom swivels 280°, allowing use of the microphone on either side of your head. Suitable for use with most amateur transceivers, the microphone elements feature a wide frequency response and cushioned earphones rest on the surface of your ears so that external sounds of sufficient volume can be heard. Price: $389.95. For more information, or to order, visit **www.2qlite.com**.



MacLoggerDX Version 5.48 from Dog Park Software

MacLoggerDX Version 5.48 logging software for the Mac incorporates a number of new features: added "Look Up Previous;" added Icom IC-7100 driver; Auto Rotate beam improved; added SetRCVD AppleScript command; added GS-232 rotator read-back; logged First Name overrides call book data; detached Map window floats within app; remove 60 meter QSOs from awards totals; fixed Contest panel power report. *MacLoggerDX* supports nearly 100 different radio models, organizes and filters DX spots, tracks awards and displays maps, generates QSL labels and supports ARRL's Logbook of The World. Price: $95 to register. This is a free upgrade for all *MacLoggerDX* Version 5 registered users. For more information, to download a demo version, or to purchase and register, visit **www.dogparksoftware.com**.



Return to Rotuma

An idyllic South Seas island draws a pair of DXers back to paradise.

Bill Vanderheide, N7OU

It's fun to visit someplace new, but it's equally fun returning to a place you've enjoyed before. In 2006, Bob Norin, W7YAQ, and I made our first DXpedition to the South Pacific; we visited the South Cook Islands and Fiji before winding up on Rotuma Island. Our Rotuman hosts put us up in a picturesque thatch-roofed cottage, roasted a pig as part of a welcoming ceremony in our honor and took us on an octopus hunt. It was an unforgettable 10 days in an island paradise.

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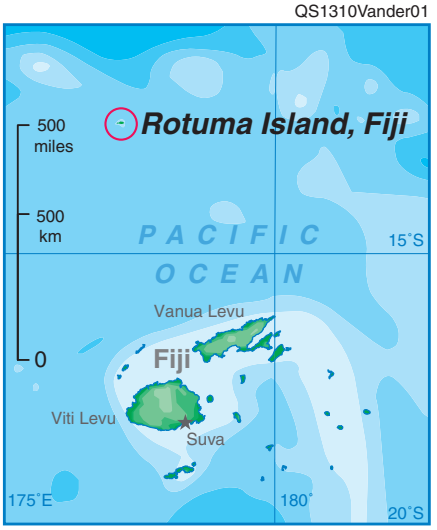


Map of Rotuma Island.

That trip became the first in a series of annual DXpeditions that have taken Bob and me to the North Cooks, East and West Kiribati, Tuvalu, Samoa and Tokelau. With the high bands now opening up, we decided that we would return to the South Pacific again and revisit Fiji and isolated Rotuma.

Geography

Rotuma lies 310 miles north of the Fijian archipelago, 12° south of the equator. Volcanic in origin, it's shaped like a human figure, with a head, neck and torso. The island is about 10 miles long and 2 miles wide, and is surround-ed by a coral reef. Its Polynesian population numbers 2000.

Getting to Rotuma meant flying from our homes in Oregon to Los Angeles, then to Nadi, Fiji, and finally taking the small Twin Otter plane that makes a weekly flight to Rotuma. There we would operate from February 8-21, 2013. Since we had to pass through Fiji anyway, we decided to operate first from there February 2-7.

Planning

In the summer of 2012, I contacted John Bennett, an American living on Rotuma, to work out the details of our stay. The shack for our 2006 trip had been less than ideal for our radio activities, as it had been situated on a south-facing shore and tucked behind a steep hill to the north. Toward the end of that trip, we'd met John and his wife, Harieta, who expressed interest in hosting ham operators.

In talking with John, it became clear that his location presented one problem: although his house is on the north side of the island, it faces east on Maka Bay and huge Solroroa Bluff (see Figure 1) blocks the radio view to the north.

John suggested that we set up our shack in a nearby abandoned house on a small north-facing beach. The house checked out when we pinpointed it on *Google Earth* in terms of location, beach access and short coax runs. John secured the approval of the house's owner and also that of the village chief, a protocol doubly important because our shack turned out to be right next to the chief's house.

Meanwhile, Bob began the application process for getting our licenses and call signs for Fiji and Rotuma. We thought this would be a routine matter since we had been licensed in Fiji twice before and were asking only for renewals. Dutifully we sent our fees by bank wire transfer. After many weeks, the telecom official in charge told us that the Fijian Ministry

Figure 1 (above) — From the Bennetts' home on Rotuma, Solroroa Bluff created an RF shadow toward the north. For this reason, we located our station in an abandoned house with a better path toward North America and Europe.

Figure 2 — In Fiji, two men came riding along the beach and one of their horses almost brought down one of our antennas.

Figure 4 — Bill, N7OU, in the shack on Rotuma. The abandoned house was in a state of serious disrepair, but the kitchen was dry and made a good station location.

of Defense would now require a full FBI background check on each of us before our licenses could be renewed. In a spirited e-mail, Bob pointed out that this would take several months and ruin our plans for a February visit. With time running short, we decided to submit to a speedier FBI check attesting that we had no prior arrests. This seemed to do the trick and we received our licenses just in time. On Fiji Bob signed 3D2NB and I was 3D2OU; on Rotuma our call signs were 3D2RX and 3D2RO, respectively.

A month before our departure, we met to consolidate our gear and pack it up. Our two Butternut HF9V verticals, along with a power supply, went into a golf club case. Two 6 foot PVC tubes taped together carried our Cushcraft MA160V top-loaded vertical for the Top Band and some Dunestar bandpass filters. Our coax, ground radials, guy ropes, sandals and clothes went into a duffle bag. A hard clamshell suitcase contained an Elecraft K2/100 transceiver as a spare rig, a spare power supply, my small laptop and cables. Each of us had a K3 transceiver as a carry-on and I lugged aboard a KPA-500 amplifier for the overhead bin. Charges for excess baggage are always in our budget.

Fiji

We arrived in Nadi, Fiji, just before sunrise on a Saturday morning, in plenty of time to set up our antennas and be ready for most of the European weekend. As we had in 2006 and again in 2009, we stayed at Club Fiji on Nadi Bay. From this ham-friendly place, signals have a perfect saltwater launch to the north. We moved into a bungalow at the far end of the resort with plenty of space for our antennas. We set up the Butternut verticals at the high tide line and fanned out 32 radials, each 30 feet long, in a semicircle behind them. Tuning the Top Band vertical the next day took a little improvisation with a hairpin coil and replacing one of its loading spokes with a shorter piece of stiff wire.

Figure 3 — Upon entering our Rotuma shack we found that it wasn't quite deserted.

When we got on the air, our shack proved once again to be a radio hotspot. A few CQs usually led to a pileup, with strong signals from all over the world, depending on the band and time of day. In 5 days of operation on CW I made over 5000 contacts, averaging 112 per hour, with 54% going to Europe. Always a tireless night owl, Bob handed out 1056 contacts on RTTY and still made more than 4000 contacts on CW, including 144 on 160 meters.

As we were setting up our antennas we were visited by our friend Rocky Peters, 3D2DD, who lives nearby. We met Rocky during our 2006 visit to Fiji; we had turned to him for advice a few weeks before this trip when our licenses were held up. Later in the week Rocky and his hospitable wife, Saverina, had us over for a delicious dinner of authentic Fijian food.

Even though we were set up at the far end of the resort, away from most activity, we had a scare one day when two men came riding along the beach on horseback. While passing by one of our HF9V verticals, a horse got caught up in the radial wires. There was an anxious moment before the horse managed to disentangle its hooves without bringing our whole setup crashing down (see Figure 2).

On to Rotuma

Rocky kindly drove us to the airport for our flight to Rotuma and helped ensure that all our gear got on the plane with us. As we were waiting in the departure area, a young woman introduced herself as Kimberly Bennett, a daughter of our hosts John and Harieta, who was returning to Rotuma with her fiancé for her grandfather's 90th birthday. On landing we were welcomed at the airstrip by Harieta, and what was now a houseful of guests and family were transported in the back of a truck to the Bennetts' place in the tiny village of Maftoa.

Bob and I got right to work setting up our station. The abandoned house was uninhabited — except for some big yellow spiders (see Figure 3). The kitchen had solid walls and a dry roof, so that's where we set up our shack (see Figure 4). The small beach below the house was magnificent, with white coral sand framed by black volcanic rock, but of course for us its best feature was that it faced north. We put our Butternut verticals just above the high tide line, right up against a slope with thick vegetation, which made it hard to spread out our radials. Eventually the surging tide pushed most of the radials of one antenna into a big clump, but that didn't seem to make much difference in its performance. The 160 meter antenna went alongside the shack overlooking the beach.

Figure 5 — The Bennetts were gracious enough to allow us to stay at their house, which was near the abandoned house where we set up our shack.

On Rotuma we had new pileups to work down, although the Solar Flux Index (SFI) had begun to decline and band openings were later and closings earlier. Beginning shortly after sunset, bands would open to Europe for several hours until the terminator began passing over the Atlantic. Solroroa Bluff to the northwest meant that JA signals were not as strong as usual, and signals from EU had no problem competing. In the middle of the night North American signals had the edge on the low bands; several hours before our sunrise we focused on Europeans calling at their sunset. Shortly after our sunrise the high bands came to life with activity from the Americas and Western Europe. For a complete rundown of our DXpedition results for both Fiji and Rotuma, see Tables 1 and 2.

Most days we began operation at 0500Z and went through the night until 2100Z the next day. The reason for the big gap in the middle of the day was that we didn't have our own generator and were dependent on a 15 kW unit that serviced the whole village. Usually this generator was in use for only 3 hours each night. The villagers generously allowed us to use the generator 16 hours a day during our stay, provided we paid for the two extra drums of diesel fuel that were needed.

Even without much of a load the generator put out only about 210 V. When the villagers began to turn on their lights and appliances, however, the voltage would sink much lower. Even when we used the low voltage tap in our KPA-500 amplifier, sometimes the voltage would sag so low the amplifier would automatically shut down. Barefoot, our rigs tolerated the low voltage, but we were able to use the amplifier only from about 11 PM to about 5 AM local time, when people got up and turned on their lights and electric teakettles. Of course the amplifier was most useful on the low bands at night, so this wasn't really a handicap.

Sometimes the power would go off unexpectedly. Toward the end of our stay, Bob would explain that he might go off the air suddenly at any moment, resulting in even more pileup frenzy.

Table 1
Contacts by Band

Band	Contacts
160	347
80	2000
40	5148
30	4489
20	4657
17	2833
15	4739
12	3468
10	2605
Total	30,286

Table 2
Contacts by Continent

Continent	Percent
Africa	0.3%
Asia	21.3%
Europe	45.3%
N America	31.3%
Oceania	1.4%
S America	0.4%

3D2RI

In 2011, Hrane Milosevic, YT1AD, and David Collingham, K3LP, led a large 3D2R DXpedition to Rotuma that operated at the wharf on the opposite side of the island. During their stay they set up a ham station at the island's high school, 3D2RI, and trained a number of students and staff on how to use it. After our trip was publicized, Hrane wrote to me explaining that the station had been off the air for a long time and asking us to check it out.

The teacher in charge of 3D2RI, George Solomone, showed us the shack and antennas. We quickly determined that the TS-570 transceiver had no power output on any band or mode. Two dipole antennas checked out on our antenna analyzer, but the A3S beam showed no resonance on any of its bands. We decided we couldn't do anything about the transceiver, but we might be able to fix the Yagi.

George assembled a student crew that, with great teamwork and resourcefulness, lowered the antenna. Once it was down, the only obvious problem we saw was corrosion on the connections for the driven element. We cleaned and retightened these, and for good measure we also replaced the antenna's coax with a brand-new length of our own. When it was back up, the antenna showed improved resonance on 20 meters but not on the other bands. By that time the school day was almost over, so that was as far as we got with our troubleshooting.

In talking with the school's leaders and students it became clear that the radio station meant a lot to them. Bob had an identical TS-570 sitting on a shelf at home as a back-up rig and decided to donate and ship it to the school when he got home. Bringing the Yagi up to snuff might have to wait, but at least they could get back on the air with their dipoles.

Some Extra Time in Paradise

As in 2006, our flight leaving Rotuma was canceled, this time because of bad weather, and we were delayed several days. It was hard to feel too upset! Bob and I are both retired and there are worse places to spend a few extra days than a tropical island. With our gear packed up and locked away at the airstrip, we had plenty of time to catch up on our sleep, hike to a pristine beach on the other side of the island and chat with our neighbors. Most of all we enjoyed a feeling of satisfaction after another successful trip and having put over 30,000 contacts in the log.

All photos by the author.

Bill Vanderheide, N7OU, an ARRL member, was first licensed in 1959 at the age of 13 and still enjoys every contact he makes. Bill's current ham radio interests are portable operation, DXpeditioning, contesting and CW. Since retiring from teaching, Bill has been a frequent visitor to the South Pacific. In addition to DXpeditioning with Bob, W7YAQ, for the last 7 years he has served with the Global Volunteers organization on Rarotonga, South Cook Islands, helping out in classrooms and operating as E51NOU in his spare time. Bill can be reached at 333 NW 9th Ave, Unit 913, Portland, OR 97209, **n7ou@arrl.net**.

Adventure Portable, Part II

The journey on the Arkansas River continues, with Murphy's Law in full force!

Max McCoy, KCØMAX

I'm upside down in the shockingly cold water of the upper Arkansas River above Granite, Colorado, and I'm worried about the radio gear stored in my kayak. It's not that I'm unconcerned about my safety — I expected to be swimming at some point and I reflexively perform a wet exit by kicking free of the cockpit — but I have a nagging feeling about the little QRP rig stored in the aft hold of the boat.

In a moment, I'm standing in the swift but shallow water, one hand on my flooded kayak and the other clutching my paddle. It's 10 o'clock on a morning in late July and the sun is shining. There are grassy banks on each side of the river, which meanders through a glacial valley 9000 feet above sea level. To the west is a breathtaking view of Mt Elbert, Colorado's highest peak, which still has a bit of snow showing above the timber line.

About a hundred yards downstream a fly fisherman is watching my folly. I pat the top of my helmet. It's the universal river signal for, "I'm okay," because a wave can be interpreted as a call for help.

Stepping slowly and surely, not wanting to compound my trouble by snagging my foot on a rock and dunking myself again in the swift current, I start dragging my kayak to the nearest rocky bar. The air temperature is 70, but the water is 10 degrees colder, and I'm glad there's a set of dry clothes in the hold of the kayak. I'm not cold, not yet, but I soon will be. My plan is to dry off, change clothes, have water and a handful of nuts to calm my nerves, and check the radio gear.

It's not my best moment on the river.

Immersive Research

I've embarked on a long project that will take me from the headwaters of the Arkansas near the Continental Divide north of Leadville, following the river down to the plains and beyond. My goal is to write a story about a river's journey through America, and to operate Amateur Radio when time and conditions allow. As an author and a professor of journalism at Emporia State in east central Kansas, I'm accustomed to what is commonly called "immersive journalism," an intensely researched form of nonfiction narrative. This project, however, has allowed me to immerse myself in my subject in a way that is uncommonly literal.

So far, I've plunged my hands into the snow on a high pass from which the river is born, hiked the Arkansas when it was still narrow enough to step across and dragged my kayak over barbed wire to find access to bigger water. And that's not counting my baptism in the Arkansas by way of a capsized kayak.

As for Amateur Radio, I've strung dipoles between trees and planted verticals on a mountainside. I've had PSK31 contacts from my tent in the middle of the night and operated SSB from trailside during the afternoon and evening. Now I'm looking forward to some riverside CW contacts.

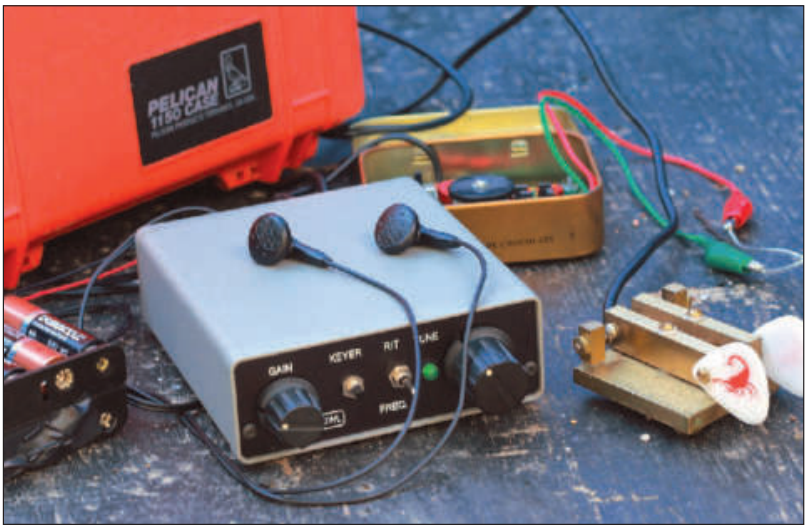
But it all has taken me longer than expected. After completing the initial section of the journey, near Leadville and the Continental Divide, I fell victim to a particularly vicious bacterial infection. At first, I thought I had an ordinary stomach virus, but became alarmed when I didn't feel better after a week. It took an emergency room visit back home in Kansas, a few units of IV fluids, a round of antibiotics and nearly three weeks of rest. All the while, I was thinking of the river project and how much time I had lost. There is a window of a few weeks when there is enough snowmelt to meaningfully float the upper reaches, and I was spending much of that time in bed, fighting a sickness that left me in what can be kindly described as a weak and ignoble state.

Unseasonable

When I was finally strong enough to return to the river, I had a bit of luck: a week of unseasonable thunderstorms had kept the river at near optimal levels. There was plenty of water to float down to Granite. In fact, the storms were continuing, so much so that sunny skies were rare — and brief. While the storms provided rain for the river, they created a problem for my Amateur Radio plans. Putting up any kind of antenna when there was nearby lightning was a risk I was unwilling to take. But I planned to operate, when weather allowed, from the grassy bank.

In a dry box in the hold of the kayak was a Small Wonder Labs DSW-II transceiver, a

The author in his kayak on the Arkansas River. [Karl R. Gregory, photo]



The Small Wonder Labs DSW-II transceiver is the centerpiece of the author's kayak QRP portable station.

pair of miniature CW paddles, earbuds and a longwire antenna tuner in a candy tin, which I had built from a kit. There was also a AA battery pack loaded with alkalines and a longwire antenna made of 22 gauge speaker wire.

The DSW-II, designed by Dave Benson, K1SWL, was built from a kit and is a classic (and now sadly discontinued) rig that operates from 8 to 15 V; at 13.8 V it puts out about 4 W. The tuner is an ALT, designed by Steve Weber, KD1JV, and offered by Hendricks QRP Kits, meant to fit in the ubiquitous Altoids tin and to tune longwires from 10 to 40 meters (the ALT is now retired and has been replaced by the SLT).

It is the kind of kind of setup that you could take to the park, sling the antenna into a nearby tree, and be operating within five minutes. And it all fits into a space about the size of a cigar box.

But the river had other plans.

Sprung

The boulder that turned my scenic cruise on this rapid, high altitude water into a brisk swim was a mossy just-below-the-surface monster perched in the middle of a narrow channel beneath a willow. The force of the water slammed my boat broadside against the rock, and there was little room to roll or even maneuver, so the wet exit was my only option. I felt a little foolish, having opted not to wear my wetsuit jacket, which was back in the gear trailer behind my Jeep. The wetsuit would be necessary below Granite, where I had arranged for a guide to help me run the wilder rapids, but I thought it would be overkill on the shallow stretch of water here, so I opted for Capilene layers beneath a PDF — a personal flotation device, otherwise known as a life jacket.

Once on the bank, I found myself breathing a bit heavier than normal and my hands trembled a bit. For the past couple of days, I had been reminded of how much of a flatlander I am by a case of aching sinuses and a vague hangover-like feeling; the back deck of my home in Emporia, some 650 road miles away, has an elevation of just 1198 feet. I've never had altitude sickness before, but perhaps the recent illness had made me a bit more susceptible.

After changing into dry clothes and having a snack and half a bottle of water, my hands stopped shaking. It was a good time to find a spot on the grassy bank, throw the long wire antenna up into the tallest nearby tree and operate some CW.

I rummaged in the hold of the kayak, bring out the radio gear dry box, and unpacked the DSW-II and the tuner. Not a drop of water to be seen — what a relief. Then came the antenna, battery pack and the small brass paddles. But the paddles felt odd. I flipped them over to check the nuts on the pivot screws, thinking the arms had loosened during the trip. But I must have snagged the paddles on my sleeve, or on the zipper on my PDF, because the tiny spring that provides the tension between the arms suddenly shot skyward and landed somewhere in the water or among the rocks at my feet.

I looked, but after a few minutes gave up in despair. Even if the spring hadn't landed in the water, it was about the same color as the rocks. I tried to think of what I could use to make an emergency repair. What I needed was a spring from an old-fashioned ballpoint pen, and all I had in the kayak was a rollerball.

Without the paddle, I couldn't operate.

I resigned myself to my fate, cursed my clumsiness, and packed things away for the trip downriver to the takeout.

A couple of hours later, I finished the day's run and my friend Karl met me with the Jeep and gear trailer at the planned takeout spot, a county bridge over the river. The sky had turned dark and we were in for another sudden storm. As soon as we got the kayak secured to the Thule bars on top of the trailer, it began to pour. Lightning arced from cloud to cloud. Then it started to hail, marble-sized stones bouncing from the top of the Jeep and the plastic hull of the kayak.

Attitude Readjustment

Later, when the storm stopped and the sun briefly returned, I quickly planted a vertical in the sandy soil near the gear trailer to operate a little SSB with my Icom IC-703 transceiver, powered by an SLA battery. I knew from experience that these kinds of contacts can be tricky, given how inefficient phone is compared to PSK31 and CW, but I just wanted to do some operating. After half an hour, I had only one weak response to my call, not even solid enough copy to declare it a contact.

As I packed the radio into the Jeep, I made a mental note to find a convenience store to look for a ballpoint pen. And I resolved to be more careful when packing and unpacking gear at the water's edge, to take more time, to not push myself when I'm not feeling a hundred percent. The material loss was a spring worth a few cents, at most. But the real loss was in time and opportunity, which had become the theme for this leg of the journey. A mental readjustment was needed.

For the remainder of that section of river, there would be no more capsizes. The only water inside the boat would come from the soles of my shoes. And I would repair the paddles with a spring from an auto parts store giveaway pen.

Max McCoy, KCØMAX, is an associate professor of journalism at Emporia State University in Emporia, Kansas. He can be reached at **max@maxmccoy.com**.

Dominica — DXpedition to a Caribbean Jewel

This unspoiled paradise has plenty to offer the holiday DXpeditioner.

Rick Creager, KK4GV

I hesitate to share this with you since this island is so pristine. Let's keep it our secret. Due to mountainous terrain and ocean-side cliffs, Dominica has been largely spared from plantation farming and large scale development. Many Caribbean islands were stripped of their rainforest hundreds of years ago to create large sugar cane plantations. Some now have megaresorts and gated communities. But Dominica is called the "Nature Island of the Caribbean" for its unspoiled beauty.

Those lucky enough to contact J79GV received this very inviting QSL card showing one of the beaches along Dominica's rugged coastline. The northeastern coast provides good propagation to the US and Europe.

Overview

Dominica was discovered by Columbus, who claimed the island for Spain. It is said that his discovery occurred on a Sunday so he decided to name the island Dominica, which is said means Sunday. It was actually first colonized by the French, changed hands a few times, and eventually ended up as an English colony, so it is now a predominantly English-speaking country. Independence was granted in 1978.

Dominica, pronounced "Dom-i-nee-ka," is not to be confused with the Dominican Republic, which shares the island of Hispaniola with Haiti. Dominica is located in the Windward Islands of the West Indies near the French-owned islands Guadalupe and Martinique. It is about 30 miles long in the north/south direction and 10 miles wide. Dominica has the tallest mountains in the Caribbean, and the island consists mostly of mountain peaks covered with lush rain forest, banana farms and seaside villages. The mountains were formed by volcanic activity and, although there have been no recent eruptions, there is Boiling Lake, the world's second-largest hot spring. The interior boasts other geothermal features as well as many beautiful waterfalls.

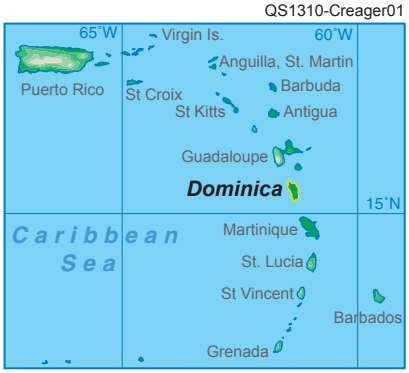
The Plan

In March 2013 our family was looking for a vacation to a nice place that was not too far away, less crowded, less developed, with beautiful mountains and ocean views. Additionally, I was looking for a place that was semi-rare DX. Dominica fit these goals perfectly. So we formulated a plan. My wife, Jennifer, N3MDS, worked out all the air travel, lodging and car rental. I handled the plans for radios, antennas, electricity and the license.

Getting There

For us, getting there involved three flights. From our home in Baltimore we would have to go through New York or Miami, then to San Juan, Puerto Rico. The Melville Hall Airport in Dominica can accept only small turbo-prop aircraft. Since we weren't able to arrive in San Juan in time for that day's flight to Dominica, we had to stay overnight.

QS1310-Creager01



Recently, American Eagle has discontinued the flight we used, but the Caribbean-based Liat Airlines has flights from San Juan. With a little research and planning, this island can be easily and affordably reached from the US or Europe.

After a nice flight over the islands and water, we caught sight of the lush and mountainous Dominica. The plane made a sharp turn in front of a lush volcanic mountain and then practically dove to the runway below. It nearly brushed the tops of palm trees, taking care not to overshoot the runway and end up in the Atlantic Ocean. Once we were on the ground, we were eager to clear customs to start our adventure.

The Fine Print

Getting the license was relatively simple. Using the ARRL® website, I was able to find the requirements for a J7 license and download the application form. The form required information about my FCC license and equipment, purpose for the trip, local address in Dominica, length of stay. Along with the form I needed to submit copies of my ham license, driver's license and passport. Two months in advance of the trip, I sent the application and a small fee via FedEx to the National Telecommunications Regulatory Commission in Roseau, the capital city of Dominica.

Soon thereafter I e-mailed to see if the application had been received, and the Minister of Telecommunications assured me that the application was being processed and that I would be issued the call sign J79GV. The license was e-mailed to me as a PDF a few weeks later with instructions to pick up the original at the airport customs office.

Equipment

Now I needed to ensure that the radios and antennas would be transportable and reliable. The main radio I brought was a Flex-3000 Software Defined Radio. I needed a portable computer that could run it, since bringing my

desktop machine was not practical. My son Cody, KB3POM, would be with us and on spring break from electrical engineering school; he agreed to let me use his laptop. (It is a major commitment for a 20-year-old to part with his computer for any length of time.)

We made sure we had a working radio using his laptop and a PCI Express card for the required IEEE 1394 interface connection. An Astron 20 A switching power supply, some powered speakers and a Heil HM-12 microphone would round out the station.

I also carried an IC-706 and LDG autotuner as a backup. The radios were in my carry-on bag and the rest of the gear was in our suitcases.

The primary station was a Flex-3000 Software Defined Radio, an Astron 20 A switching power supply, some powered speakers, and a Heil HM-12 microphone.

For antennas, I was sure that I wanted resonant dipoles on 10-40 meters. This would allow me to string up whatever I could get away with outside the apartment we had rented. I made three center-fed antennas. The feed lines were RG-8X with clamp-on ferrites at the feed point. The elements of two of the antennas were made from 450 Ω ladder line. Ladder line is a very convenient way to make a dual band dipole because you can cut the wires for two bands and have them remain parallel and not get tangled. They can be supported with a single pair of ropes.

This method was used for a 10/12 meter dipole and a 17/20 meter dipole. The other antenna was a standard dipole made with easy-to-handle 14 gauge multistrand wire cut for 40 meters. This also loads up well on 15 meters at the third harmonic. This resulted in six bands on three feed lines that could hear well and were easy to tweak up a tad with the tuner in the Flex. Also in the suitcase was 750 feet of ⅛ inch diameter rope and part of an old surf-casting rod and reel. I had no idea what the antenna hanging opportunities would be, but I would have a way to get some wire in the air.

The next issue was the 240 V electric service on Dominica. It is easy enough to look up the plug configuration for most any country and obtain the appropriate adapter. How-ever, these plug adapters only adapt the shape of the plug and not the voltage. Many laptops, tablets, phone chargers, etc, have a universal input that will accept from 100-250 V, so all you need is the adapter. The Astron power supply I took along had a switch on the back to allow a choice of input voltages. I also took a 500 W step-down transformer so we could run items that would work only on 120 V ac. Note that your US cell phone may not work on the foreign system and if it does, will be very expensive to use. Phones can be rented locally for the duration of your stay.

Palm trees and balconies make raising an antenna (or two) easy.

On the Island

We cleared customs and picked up the IARP. Our next stop was the car rental office to rent a car and obtain a temporary driving permit. You can take a cab or use a tour guide, but having a car allows a lot of freedom to explore. Those chores done, we were off to find our lodging.

Driving on Dominica is an adventure in itself. The reason the island is so unspoiled is that there is not enough flat land for a plantation; there is barely room for an airstrip. The roads are almost entirely mountainous switchbacks with sharp drop-offs and deep ditches on the sides. You drive on the left and the oncoming traffic is often a speeding truck load of bananas with friendly but machete-wielding farm workers clinging to it. You start to get the feel of the island.

The funniest thing about driving a right hand drive vehicle is that the controls are reversed. Try to signal a right turn and you activate the windshield wipers. Most of all, be careful not to turn right in front of oncoming traffic! Expect it to take more than an hour to go 10 miles on these roads at tourist speed.

Many ham radio operators stay on the northeast coast in an area called Calibishie. It is only about a half-hour drive north from the airport and affords incredible ocean views as well as good radio signals into the US, Europe and beyond. From there you can branch out farther each day as you become increasingly comfortable with driving the island's roads. Dominica offers waterfalls, historic forts, parrot reserve, Caribe Indian village, snorkeling and SCUBA diving, rainforest hikes, and many other sights and activities.

Trafalgar Falls is only one of many falls dotting the island, which features lush rainforests and the world's second-largest hot spring known as Boiling Lake.

Operating

Typically J7 does get activated several times per year on CW, SSB and digital modes but my operation was entirely SSB. It is not terribly rare but the pileups I generated were huge. All you have to do is pick an active band and call CQ. A few stations will answer and one will "spot" you. Then look out! Here they come!

On the days when 10 meters was open, I would hear Japanese, Russian, European, US and South American stations all calling at once. As propagation changed I would move down in frequency and the pileups would change to one or two areas of the world but they would still be huge. Imagine my excitement when Thailand, UAE and Qatar called me!

Results

Operating holiday style for 9 days was a lot of fun. I worked 91 countries and 49 states. I guess we will just have to go back to Dominica for nine more countries and Montana. [The author had the opportunity to return to Dominica in July and made another 1350 contacts, enough for DXCC and WAS. — *Ed.*] Ten meters was wide open almost every day. You can see in Table 1 more than half of the contacts were made on 10.

Table 1
Dominica Contact Summary

Band	Contacts
10 Meters	1004
12 Meters	192
15 Meters	130
17 Meters	5
20 Meters	275
40 Meters	350
Total Contacts	1956

Conclusion

Being on the DX end of a pileup was the highlight of my 30-year ham radio experience. I also gained a lot of respect for those DX operators who try to be fair when deciding who to work based on what they can hear. Next time I lose out to a call sign close to mine or even one who called out of turn, I'll know what the DX operator was up against.

Now it's your turn to pick a fine destination, plan a trip, get a license and take some portable radios along. You will have the time of your life! Just remember that operating holiday style means turning off the radio and going somewhere nice with your family each day.

Driving yourself is more convenient but right-hand drive vehicles and treacherous mountain roads make travel an interesting expedience.

Photos by the author except as indicated.

Rick Creager, KK4GV, an ARRL member, has been a ham since 1983. Rick lives near the Chesapeake Bay about 20 miles south of Annapolis. He holds an Amateur Extra class license and a degree from the University of Maryland in Computer Science. He works as a manufacturing engineer for a company that makes antennas for military and scientific applications. Rick enjoys HF Mobile, DXing, contesting, conversing on the local repeaters, and scanning local emergency services.

Sometimes he activates Cape Hatteras Island (IOTA NA-067), Hatteras Lighthouse (USA-119) and the somewhat rare Dare County, North Carolina, all from a Jeep on an Atlantic Ocean beach. Also he works other portable and fixed operations such as the Maryland QSO Party from Eastern Shore counties. Rick can be reached at 24 Scrivner Dr, Friendship, MD 20758-9778, **kk4gv@arrl.net**.

Scouts Snare Spacecraft

Mix some barbed wire with a little Scouting ingenuity for a high-flying contact.

Doug Cook, KD5PDN

Jamboree on the Air (JOTA) is Boy Scouting's annual Amateur Radio event, which enables Scouts around the world to communicate with each other. For more than 50 years, this event has allowed Scouts to participate in a fellowship so large that it outnumbers attendance even at some of the world Jamborees. It is the most efficient way to provide an international Scouting event from one's local ham shack, campout or Field Day event.

I have been a Scout leader for 18 years — 5 as a Scoutmaster. In the early 1990s I got my Technician license after my fellow Scout leader, John Dronberger, N5YZA, showed me how radios could improve our communications during Scout activities. Amateur Radio has enabled our troop to connect with others and has been integrated as part of our emergency preparedness plan for the troop.

Because our troop gained a greater number of hams than the average troop, JOTA became a natural fit and we have continued to use it in our program. John (see Figure 1) and Mark Hamblin, AE5MH (see Figure 2), helped JOTA to become an annual council event at the John Nichols Scout Ranch, one of our Scout camps in Oklahoma. As volunteer campmasters, they reserve the third weekend of October each year for JOTA (see Figure 3).

For the 2011 event, in addition to the traditional Amateur Radio station setup, we enhanced the Jamboree with a few new programs related to the Radio merit badge.

Figure 3 — Scouters with WB5BSA included Doug Cook, KD5PDN; Larry Holden, W5MPA; Mark Hamblin, AE5MH; Matt Ford, KF5JRP; Mike Campbell, W5KSU, and John Dronberger, N5YZA.

The Fox and the Pickle

One of the new activities was an electronic foxhunt. A small transmitter was hidden in a nearby grove of woods. Scouts used radio direction finding gear to narrow in on the hidden "fox." Larry Holden, W5MPA, built a low-powered transmitter to repeat our troop's club call sign (WB5BSA) as the Scouts zeroed in on its location. They got a sample of how naturalists in the wild use similar gear to locate animals with radio-tracking collars.

Another popular activity was radiosurgery. I brought a radiosurgical unit used to remove skin lesions such as skin tags and warts. As an optometric physician, I use this instrument for minor procedures on the delicate skin adjacent to the eyelid. For the activity, I had Scouts remove the "warts" from a pickle (see Figure 4).

Another successful new activity was contacting other JOTA stations via Amateur Radio satellites. We successfully communicated with station K2BSA, the call sign of the Boy Scouts of America's national headquarters, via the AO-51 satellite during an afternoon pass. [AO-51 ceased operating in November 2011. — *Ed.*]

Figure 1 — John Dronberger, N5YZA, demonstrates ham radio to a group of Scouts.

Figure 2 — Mark Hamblin, AE5MH, brings the world to the John Nichols Scout Ranch for members of Troop 117.

Figure 4 — Doug Cook, KD5PDN, supervises Cub Scouts removing the "warts" from a pickle using the Ellman Surgitron, a radiosurgery device that operates on 3.8 MHz. [Bill Wilburn, N5NUK, photo]

Figure 5 — The completed barbed wire beam on an Adirondack-style display stand.

The Barbed Wire Beam

Prior to the event, the world Scout organization's JOTA website (**www.scouting.org/jota.aspx**) announced that astronaut Mike Fossum, KF5AQG, would be working the event from orbit, using the International Space Station's Amateur Radio station. Mike is an Eagle Scout and Scout leader who was on Expedition 29, which completed the final build of the station. Mike had gained a reputation as an astronaut who would work the ISS ham station, NA1SS, in his off-duty time. Amateurs around the world get excited to hear a voice instead of the usual APRS (Automatic Packet Reporting System) beacon coming from the station during a pass.

In order to contact Mike, we could have used any standard equipment. However, this was an opportunity for us to create equipment that would instead be symbolic. I brainstormed a design for a "barbed wire beam" satellite communications antenna, which would both fulfill our goal of contacting Mike and would be unique to us as Scouts and Radio Amateurs. In considering what to use for the antenna elements, I decided on barbed wire since it is a well-known symbol of the western plains, which includes Oklahoma.

I sketched out the design, which is based on Joe Leggio's, WB2HOL, tape measure antenna design. The elements were joined together with proper pioneering lashings including the shear, diagonal and square lashings. (Tips on tying these lashings can be found in the Scout Handbook or at **www.pioneeringprojects.org/resources/ebooks/sceng.pdf**.) It was a zero budget project — the parts were debris from a tornado that struck our community just months earlier. I found plenty of good cedar branches and 10 feet of usable barbed wire amidst the debris, which was plenty for my design.

Figure 6 — This screenshot taken from *ProSatHD* shows the ISS and the JNSR Scout camp. The surrounding yellow circles indicate their respective communications ranges.

While the tape measure beam design has a soldered hairpin, I decided to make the driven element one piece and cut it longer to incorporate the hairpin bends. I used zip ties to temporarily secure the elements while tuning them, and then I secured the elements with lashings after tuning was complete. I cut ¼ inch nibs from each end of the driven element to tune it down to the intended 145.800-145.825 MHz frequency range used for satellite communications. Traditional radio component technology begins with a soldered coax connection; I used an RG-174A cable to connect the driven element to my radio via an SMA connector. Using a shear lashing, I lashed the finished beam to a tripod to use it as a display when not operating (see Figure 5).

I used an antenna analyzer to tune the beam to 145.825 MHz. This is the frequency the ISS's digipeater uses when in APRS mode. The SWR was excellent at the design frequency and acceptable for use over much of the 2 meter band.

As shown in the antenna analyzer display view, the SWR at 1.12 was very efficient for the intended frequency. The ISS North American voice frequency of 145.800 is close enough to enjoy optimized voice use with the antenna as well.

I used a Yaesu VX-8R handheld transceiver to test the arrangement for the upcoming contact. The VX-8R has a maximum output of 5 W. NA1SS is usually set in an APRS digipeater mode when not in use for voice contacts. I was able to send and receive my APRS beacons from more than 1000 miles away.

Contact on the Fly

I used **www.heavens-above.com** to get pre-

Figure 7 — A little radio, a little Scout ingenuity and you have handheld space communications system.

Figure 8 — Eagle Scout Carey McCachern, N5RM, demonstrates ham radio to another Scout.

dictions of the overpasses of the ISS during our JOTA weekend. During a satellite overpass in the field I like to use *ProSatHD* for the iPad or iPhone [available in the iTunes store — *Ed.*] to get up-to-the-second predictions.

On Saturday evening the ISS was due for a very peripheral pass at 6:30 PM local time. For our main attempt, I planned to contact Mike, KF5AQG, at 8:00 PM. For the 6:30 attempt the software predicted an elevation of less than 10° off the horizon. Most satellites would not be worth the bother for such a peripheral and narrow window of opportunity.

"I've used walkie talkies in Scouts but the handheld radios shown to me are able to reach much farther. This would be great for backpacking and makes me want to get my license now."
— Scout Glenn Herrick

Figure 6 is a screen capture from *ProSatHD* used to predict satellite passes. The blue dot labeled JNSR (John Nichols Scout Ranch) mapped our location. The illustration showed an ISS test might work, so I decided to test my radio gear to be ready for the 8:00 pass.

At 6:30 in the evening, I pointed my antenna to the southwest and quickly heard a booming signal. Mike was talking to Mexican Scouts from Baja California. He was approaching the Yucatan Peninsula.

He spoke quickly in order to make as many contacts with as many JOTA stations as he could. The ISS travels 17,000 miles per hour and the window for making a contact is short. As we were on the peripheral edge of the window, our opportunity would last only a few seconds.

We heard Mike call "CQ JOTA." I gave my call sign the first time and Mike didn't reply, instead responding to another station. On my second attempt, he replied with our call sign. I held up the microphone and, on cue, the Scouts around me on cue said "Hello Mike!" Mike acknowledged and quickly went on to CQ the next station. The whole contact lasted about 7 seconds.

The ISS at the moment of our contact was over the Yucatan Peninsula 1200 miles away. The station was just 2.2° above my horizon. While contacts may be futile at this distance and angle, in many cases our barbed wire antenna showed surprising performance with a VX-8R running 5 W (see Figure 7).

We scored what felt like the equivalent of an Amateur Radio hole in one by contacting Mike aboard the ISS. For me, it felt like a mountaintop experience. I am not an antenna engineer, just an optometrist. It was with immense satisfaction that I was able to design and build an antenna that symbolized Scouting, ham radio in space and Oklahoma in one pioneering project that was a successful satellite communications system.

Extra! Extra! Read All About It!

The success of the ISS contact was picked up by the media. The *Oklahoman* published a good article. The staff photographer wired me for sound as he video recorded our contact. An enhanced multimedia presentation is available online. Go to **newsok.com** and search for 3616398 to see news, pictures and a video of our contact.

Our ISS contact was also the subject of an Amateur Radio podcast for Twit TV (**twit.tv/show/ham-nation/22**). In it, recently licensed Eagle Scout Carey McCachern, N5RM, and I were interviewed about our contact with the ISS. Carey worked the event and loved having access to our great collection of gear. I wanted him to appear to show that some Scouts really get into the hobby (see Figure 8).

All photos by the author except as noted.

Doug Cook, KD5PDN, an ARRL® member, works as an optometric physician in Guthrie, Oklahoma. He's been licensed since 2001 and is active in Scouting as well as Amateur Radio. Doug can be reached at 1217 Mockingbird Rd, Guthrie, OK 73044, **twoeyedox@gmail.com**.

Strays

Southern Cooking and Ham Radio

Wade's Restaurant in Spartanburg, South Carolina, invites the public to offer suggestions for their advertising billboards. Cale Nelson, K4CDN, and Wayne Davis, K4SPA, of the Spartanburg Amateur Radio Club submitted an idea for a ham-centric billboard and Wade's accepted!

Rick Lindquist, WW1ME, ww1me@arrl.org

ARRL to FCC: Receiver Immunity Standards Unnecessary, Impractical for Amateur Service

ARRL response to FCC regarding receiver immunity standards; Educators attend the ARRL Teachers Institute to help integrate ham radio into classrooms; ARRL President's Award and West Gulf Division honorees; ham radio assists oldest woman to circumnavigate the globe.

In July, the ARRL responded to an FCC call for comments — based in part on recommendations in a Technological Advisory Council (TAC) white paper — telling the Commission that establishing so-called "harm claim threshold" (HCT) standards for receivers would not work in the Amateur Service. HCTs, expressed in field strength or power flux density, would specify the level of radio interference that receivers should be expected to tolerate before a radio service could claim harmful interference. Limits would be established throughout a service's assigned frequency range as well as within certain frequencies outside that range. The ARRL argued that there *is* a need for minimum, perhaps even mandatory, receiver performance standards for home electronic devices, but the Amateur Service should not be subject to receiver immunity standards.

"Any performance standards for Amateur receivers would be purely arbitrary, and would compromise the experimental purposes of the Service," the ARRL told the Commission, "Amateurs have the technical knowledge to differentiate between interference from spurious or out-of-band emissions from nearby transmitters and that caused by receiver deficiencies."

In the Amateur Service, the League continued, station-to-station interference issues are typically resolved cooperatively without FCC intervention and are, "essentially not a problem." The issue for radio amateurs, the League said, is, "protection from spurious and out-of-band emissions from other services."

The ARRL told the FCC that the HF environment is not conducive to fixed receiver standards and that it would be impossible to establish reasonable HCTs for HF radio equipment. "The most pressing need," the League said, "is for improved immunity of consumer electronic devices and systems. The Commission has had the authority to require this for many years, and has failed repeatedly to exercise it."

The HF environment is not conducive to fixed receiver standards, and it would be impossible to establish reasonable "harm claim threshold" standards for HF radio equipment, the ARRL told the FCC.

FCC Should Retain Oversight of Equipment Certification Process, ARRL Says

In reply comments filed July 31 on an FCC proposal to alter its Part 2 equipment certification process, the ARRL suggested that the Commission not be so quick to delegate greater authority to private telecommunication certification bodies (TCBs). The FCC's equipment authorization program aims in part to ensure that RF devices, such as scanning receivers, imported, marketed and used in the US comply with Commission rules and not cause harmful interference. The ARRL said it concurred with the National Association of Broadcasters (NAB), which expressed concern about the current level of TCB performance and advised against outsourcing all equipment authorization functions to TCBs. At present, the FCC still conducts evaluations for initial approval of devices requiring certification. It also approves certain "exempt" equipment, including devices that operate in UHF bands on which Amateur Radio is secondary.

"This is not a docket proceeding that *directly* affects the Amateur Service," the ARRL reply comments said, "However, the track record for TCB certification of RF devices in terms of errors and ill-advised grants of certification is abysmal. FCC lab staff constantly has to review and set aside TCB grants of RF equipment."

As an example, the League cited the TCB grant of the ReconRobotics licensed, non-broadcast video transmitter. "The inadequacies of the TCB's evaluation of this device were visited on the Amateur Service," the ARRL told the FCC. The ARRL reminded the FCC that the League subsequently discovered several errors in the authorization application and the TCB grant of certification. The Commission is still reviewing the League's complaint, three years after it was filed.

The League also said it agreed with the NAB that the TCB certification process is less transparent than it should be. "The public is not informed about TCB equipment authorization grants until after the fact, at which time an equipment manufacturer may have already sold large numbers of a non-conforming product if a TCB made an error in the grant," the League said. Further, the League said, the public should be informed regarding TCBs' level of accuracy and reliability.

The League said that, as a general matter, Commission enforcement of equipment authorization rules, "is the proper task of the

Commission's staff," and urged that the FCC, not a TCB, resolve complaints. "ARRL is concerned that the reliability of TCBs exhibited heretofore is not sufficiently high to justify the proposed extensive delegation of the evaluation of more complex types of equipment authorizations, where interference potential is significant or where RF exposure is an issue," the League concluded.

ARRL Renews Call to Evaluate Interference Potential of 5 GHz U-NII Devices

In reply comments filed July 24 with the FCC, the ARRL reiterated its argument that any decision to authorize unlicensed National Information Infrastructure (U-NII) devices at 5 GHz, "should await a full and complete evaluation of interference potential and interference mitigation techniques among the varied and incumbent users." The Amateur Service has a secondary allocation at 5650-5925 MHz in the US. Earlier this year the FCC released a *Notice of Proposed Rule Making* (*NPRM*) in ET Docket 13-49, seeking comments on making available an additional 195 megahertz of spectrum in the 5.35-5.47 GHz and 5.85-5.925 GHz bands for U-NII use. Reply comments are responses to comments already filed in the proceeding.

"The comments of the National Telecommunications & Information Administration (NTIA) indicate that NTIA shares the same concern that ARRL has raised repeatedly in earlier proceedings concerning the 5 GHz band: that the *aggregate* interference potential of ubiquitous U-NII devices to incumbent radio services…is currently unknown," the League told the FCC.

U-NII devices use "wideband digital modulation techniques to provide a wide array of high data rate mobile and fixed communications for individuals, businesses, and institutions," the FCC explained in its *NPRM*.

Teachers Get Hands-On Technology Training via Robots and Ham Radio

Educators from across the US who attend the ARRL's Teachers Institutes on Wireless Technology enjoy the challenge and camaraderie of these professional development workshops. More important, they acquire knowledge and skills to help their students grasp the essentials of radio science, basic electronics, robotics, space and satellite communication technology and, of course, Amateur Radio. Funded through the generosity of donors, the ARRL Education & Technology Program (ETP) created the Teachers Institutes to offer educators hands-on training and experience with wireless technology fundamentals — enabling them to integrate wireless technology instruction into their classrooms. According to the teachers attending, the workshops fulfilled those goals.

"[Until now,] I have never come away from a professional development feeling like the course was designed to actually get us to use what was taught," said workshop participant Glen Hanneman, KJ6BQK, "The amount of training, resources, and networking opportunities the TI workshop afforded me was astounding!"

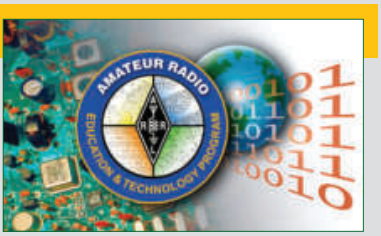
ARRL Headquarters in Newington, Connecticut, and Parallax Inc in Rocklin, California hosted "Introduction to Wireless Technology" sessions this year, and two dozen teachers from 14 states took advantage of the opportunity. Nine participants at the California workshop already had Amateur Radio licenses, but a ham ticket is not a requirement for enrollment.

Tommy Gober, N5DUX, an instructional technologist at LeTourneau University in Longview, Texas, taught the California workshop, held July 15-18. He demonstrated a ham radio "fox hunt" and a successful ham radio contact with the SaudiSat-1C (SO-50) satellite. Workshop participants also got a bird's eye view of Earth via the NOAA-19 (NOAA-N Prime) satellite.

ARRL Education & Technology Program Director Mark Spencer, WA8SME, instructed the TI session at ARRL Headquarters July 8-11. Eight participants were already hams. In the workshop's robotics section teachers built and programmed a Parallax Boe-Bot®. On the floor of ARRL Headquarters' main hallway, Spencer created a black electrical

ARRL Education & Technology Program Director Mark Spencer, WA8SME, shows his class a cubesat. [Beverly Matheson, KJ6RSX, photo]

ETP Announces Grants



What started out in 2000 as "The Big Project," an initiative of past ARRL President Jim Haynie, W5JBP, the ETP continues to grow. With the addition of three new ETP station grants and one progress grant to schools this summer, the program now boasts 535 schools.

Receiving ETP school station grants were Westside Elementary School, in Roanoke, Virginia — a current ETP school with a Teachers Institute graduate on staff; Midland High School in Midland, Michigan, and Norwood School in Hulbert, Oklahoma. Each school must formally accept the grant. The total station grants package was approximately $3,600. Schools will receive basic equipment and an antenna system to establish an Amateur Radio station at their facilities. Schools are encouraged to partner with a local Amateur Radio club.

Receiving an ETP progress grant is Liberal Arts and Science Academy (on the campus of Lyndon B. Johnson Early College High School) in Austin, Texas. A fixture in the ETP, the school is a frequent top scorer in the ARRL School Club Roundup. The school requested an az/el rotator and controller. Its grant is estimated at $800.

Your support of the ARRL Education & Technology Program will help ARRL to continue this important educational initiative.

Instructor Tommy Gober, N5DUX, demonstrates Amateur Radio satellite communication at an ARRL Teachers Institute workshop in California. (Suzanne Robinson, KF5ECX, photo)

tape maze in the shape of the letter "E." Teachers practiced programming the BoeBots to stay within the lines, learning in the process the fundamentals of *BASIC* programming.

Teacher Elizabeth Frank called the California TI workshop one of the best experiences of her life. "I signed up in order to learn more about the science behind wireless communications and to gain confidence in introducing ham radio into my classroom," she said, "The Institute has surpassed my expectations for both of these goals."

Gordon Romney, AG2G, said he learned new concepts in many areas as a result of the TI session. "Please thank the donors, ARRL and Parallax for making this program possible," he said. — *Thanks to Allison Barbieri*

WB4RHQ Named as Delta Division Vice Director

Following the August 1 resignation of ARRL Delta Division Vice Director Glen Clayton, W4BDB, due to health issues, ARRL President Kay Craigie, N3KN, appointed Ed Hudgens, WB4RHQ, of Nashville, Tennessee, to fill the remainder of Clayton's term, which expires January 1, 2015. Hudgens recently retired after a career in electrical engineering. Delta Division Director David Norris, K5UZ, praised Clayton's service to the Division: "Glen has been a tremendous help to us in his capacity as Vice Director since January 2012 and will continue as part of the Delta Division Leadership in a more localized role."

WRTC 2014 Station Test "A Valuable Experience," Organizers Say

World Radiosport Team Championship 2014 (WRTC-2014) organizers say the 2013 station test held during the IARU HF World Championship July 13-14 went very well. The 25-station trial run was the second such test in advance of next summer's international competition in New England, and WRTC-2014 has posted the results of the unofficial competition on its website.

"We accomplished our main objectives of exercising our processes around building and operating the stations," said WRTC-2014 Board Vice President Randy Thompson, K5ZD.

The periodic WRTCs run concurrently with the IARU HF World Championship, and the 2014 event will see 65 stations on the air from various New England locations. The goals of the 2013 station test, organizers said, were to expand the pool of experienced teams for station setup, evaluate proposed site locations, confirm logistics and procedures and gather log data under competition conditions. A similar test was conducted in 2012, and organizers say that the just-completed test will be the final one before WRTC-2014 next July. All of the test stations were in Eastern Massachusetts.

The test stations were active on CW and SSB on 80, 40, 20, 15 and 10 meters, many of them following the equipment configuration and scoring rules that will prevail for the actual event.

Thompson noted that the exercise relied heavily upon more than 100 volunteers, who were able to construct, operate, and take down all 25 stations over the 3 day test period. "We will need more help for next year with 65 stations to construct," he stressed.

"It will be a fantastic event next year," Thompson predicted, "just one week before the ARRL National Convention — a double treat for anyone who can come to New England next July."

WRTC-2014 is a competition among two-operator teams, and 54 team leaders will be selected this fall from the top qualifiers in 29 regions from around the world. Each team leader then selects a teammate for the competition. The team leader qualification formula considers 12 scores selected from 55 qualifying events between October 2010 and March 2013.

Michael Sigelman, KØBUD, Receives ARRL President's Award

ARRL Dakota Division Director Greg Widin, KØGW, on July 31 invited his Division to join him in honoring Michael Sigelman, KØBUD, of Golden Valley, Minnesota, as recipient of the ARRL President's Award. The award cites Sigelman for, "decades of service as an ARRL volunteer, club president, hamfest founder and organizer, and irrepressible ambassador and promoter of Amateur Radio in the finest traditions of the Founding President of the ARRL, Hiram Percy Maxim."

As ARRL President Kay Craigie, N3KN, explained in a letter accompanying the award, "The award is presented to ARRL members who have shown long-term dedication to the goals and objectives of ARRL and Amateur Radio, and whose support of individual programs and/or goals has been above and beyond the normal efforts of ARRL members. It is presented only to those whose truly outstanding efforts have benefited ARRL and/or Amateur Radio operators in the state, the region, or the nation."

The presentation took place following the Twin Cities FM Club's summer picnic. Among those on hand to honor the recipient were former Dakota Division Directors Jay Bellows, KØQB, Tod Olson, KØTO, and

Fred Hopengarten, K1VR, was among the operators for the WRTC-2014 station test. [K6ND photo]

ARRL Dakota Division Director Greg Widin, KØGW (L) presents Mike Sigelman, KØBUD, with the President's Award. [Al Dewey, KØAD, photo]

Howard Mark, K3HM, as well as other prominent members of the Twin Cities ham radio community.

Past ARRL President Haynie Among West Gulf Division Honorees

At its First Annual West Gulf Division Awards presentation at HamCom in early June, ARRL President Emeritus Jim Haynie, W5JBP, was honored with a Lifetime Achievement Award. Haynie, who once served as West Gulf Division Director, was the League's president from 2000 until 2006. Named as Ham of the Year was Bill Supulveda, K5LN, while Luke Leel, KC5LSL, was designated Young Ham of the Year. The Excellence Award (EmComm) went to Stuart Rohre II, K5KVH.

West Gulf Division Director Dr David Woolweaver, K5RAV, who called volunteers "the crucial element of any organization." Woolweaver said that as Director, he identifies and congratulates ARRL volunteers at the start of every ARRL forum and reminds members to recognize their club officers. Woolweaver is accepting nominations for the 2014 WGD awards. The submission deadline is April 15, 2014.

Ham Radio Provides Reliable Link for Solo-Circumnavigating Grandmother

Jeanne Socrates, KC2IOV, a 70-year-old sailor and retired math teacher, completed an around-the-world, nonstop, solo sail on July 8. Socrates took off October 22 from Victoria, British Columbia, in her 38 foot sailboat *Nereida*. Ham radio was her link to *terra firma* during her voyage. A coterie of ham radio regulars, including WA1RKT, N5TW, WB2REM and VE7TK kept her company.

Socrates used *Winlink* e-mail via HF ham radio, but in May her remaining onboard computer failed, bringing the e-mail traffic and blog to a halt. "Word of Jeanne's difficulties made it through to the ham radio community," reports Rick Williams, VE7TK, and within days her onshore ham friends had set up an e-mail reflector and were handling messages to and from KC2IOV using SSB.

Socrates also took along a satellite telephone, but it quit a couple of months into the voyage, and ham radio remained her only reliable link. During her marathon sail, Socrates raised funds for Marie Curie Cancer Care, a United Kingdom non-profit society that provides free home care for terminally ill patients. — *Thanks to Rick Williams, VE7TK*

FCC News

FCC Sets Higher Vanity Call Sign Fee Than Initially Proposed

A new FCC regulatory fee of $16.10 to apply for an Amateur Radio vanity call sign was set to become effective in mid-September (the exact date was unavailable as *QST* went to press). Earlier this year the FCC had proposed upping the vanity call sign fee from its current $15 to $15.20. The vanity call sign fee has fluctuated over the 17 years of the current program — from a high of $50 when the program debuted in 1996 to a low of $11.70 in 2007.

In a *Report and Order* in MD Docket 13-140, released August 12, the FCC ordered a broad schedule of new fees for all services and waived the usual 30-day waiting period following *Federal Register* publication, because there would not be time for new fees to become effective before the start of the new federal fiscal year on October 1, 2013. The FCC says it expects $230,230 in revenue to cover the costs of administering the vanity call sign program. It anticipates 14,300 vanity call sign applications.

Applicants must pay the regulatory fee not only when applying for a new vanity call sign, but also when renewing a vanity call sign (those holding "heritage" vanity call signs issued prior to 1993 are exempt). The ARRL VEC will process license renewals for vanity call sign holders for a modest fee.

Former Nevada SM Janet Welsh, NK7N, SK

Former ARRL Nevada Section Manager and Emergency Coordinator Janet Welsh, NK7N, died July 22 in Dallas, Texas. She was 77. Janet and her late husband Lee, KI7EY, lived for some time in Henderson, Nevada, and were involved in virtually every aspect of Amateur Radio in Southern Nevada. She volunteered for public service events, was active in the Red Cross and with ARES/RACES, and served as an ARRL Emergency Coordinator for 10 years. She also served as Assistant Nevada Section Manager, and in March 2001, she was appointed as Nevada Section Manager following the death of Bob Davis, K7IY. She served until January 2003. — *The Nevada Amateur Radio Newswire*

Section Manager Nomination Notice

To all ARRL members in Eastern New York, Eastern Pennsylvania, Louisiana, North Carolina, Pacific, San Diego, South Dakota and Virginia. You are hereby solicited for nominating petitions pursuant to an election for Section Manager (SM). Incumbents are listed on page 16 of this issue.

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

We suggest the following format:

(Place and Date)

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

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

(Signature____ Call Sign____ City__ ZIP__)

Any candidate for the office of Section Manager must be a resident of the Section, an Amateur Radio licensee of Technician class or higher and a full member of the League for a continuous term of at least two years immediately preceding receipt of a nominating petition. Petitions must be received at Headquarters by 4 PM Eastern Time on December 6, 2013. If more than one member is nominated in a single section, ballots will be mailed from Headquarters on or before January 2, 2014, to full members of record as December 6, 2013, which is the closing date for nominations. Returns will be counted February 18, 2014. Section Managers elected as a result of the above procedure will take office April 1, 2014.

If only one valid petition is received from a section, that nominee shall be declared elected without opposition for a two-year term beginning April 1, 2014. If no petitions are received from a section by the specified closing date, such section will be resolicited in the April 2014 *QST*. A Section Manager elected through the resolicitation will serve a term of 18 months. Vacancies in any Section Manager's office between elections are filled by the Membership and Volunteer Programs Manager. — *David Patton, NN1N, Membership and Volunteer Programs Manager*

Rick Palm, K1CE, k1ce@arrl.org

Search and Rescue

SAR has been and will remain a longstanding function of Amateur Radio as long as dangerous situations exist.

San Gabriel Mountains, July 2009

It was a quiet afternoon on July 11 and Rich Lippucci, KI6RRQ, of Vista, California was monitoring the Catalina Amateur Radio Association repeater on his base station. Lippucci reports, "I heard someone come over the repeater, calling: 'Is there anybody listening?' I responded and the caller said he was on his handheld transceiver hiking around the Mt Baldy area. He was about 2.5 miles off road and resting at the wilderness San Antonio Ski Hut. A few hikers had arrived from farther in the backcountry — they believed one of their friends had broken an ankle and was a mile or more up the trail and they needed help." Mt Baldy is the highest peak in the San Gabriel Mountains and the highest point in Los Angeles County.

Lippucci asked the caller for his call sign and name. "He told me he was Kirk Gustafson, KE6MTF, and I asked Kirk if he had a cell phone, but he replied there was no cell service where they were. I told him I would coordinate emergency services over my landline and asked for his exact location. He did an excellent job; he had a good idea of where he was and wasn't sure which county he was in, but he did have GPS coordinates."

Using his landline, Lippucci called 911 and was transferred three times until he was connected to Chelsea in the San Bernardino County Sheriff's dispatch center. "Chelsea coordinated the rescue with the San Bernardino Fire Department who sent a foot patrol to the area" he said. "The Sherriff's office dispatched a helicopter to meet someone at the ski hut to take them to where the hiker was down. It took a little less than an hour for emergency services to get above the location in a helicopter, but they were not able to land due to the rocky terrain at the ski hut."

Lippucci said that while the foot patrol and helicopter were on their way, the group of hikers had brought the injured hiker down the trail to the ski hut, stabilized her leg and determined it was probably not broken. They still did not feel they could carry her out as the trail down from the wilderness ski lift was so steep. The ski hut can only be reached via a steep 3 mile hike that rises 2200 feet.

The dispatcher told Lippucci that the helicopter would perform a type of rescue in which a crew member and the injured hiker are strapped together and pulled up to the helicopter on a tether. "After about 15 minutes from arriving on site, the helicopter and its crew got the victim airlifted out successfully without further complications" Lippucci said. Gustafson took a video of the rescue with his cell phone, which you can see here: **marlene.zimage.com/ke6mtf/hike/rescue/iPhone/IMG_0408.MOV**.

Vaughn, New Mexico, June 2013

A Search and Rescue (SAR) mission was conducted June 27-28 for a 64 year old man. The subject had been missing since 1500 on June 27; an initial search/operational period throughout that evening and night had not yielded any results. The last known point was his home, a farmhouse where he and his wife lived with some relatives, located 13 miles east of Vaughn and 9 miles off of Route 60 on a dirt road. The terrain in that area was mostly dry grazing land on gently rolling hills.

The next day, the Bernalillo County ARES® (BC ARES) communications van was situated at Incident Base with Charles Hayes, KC5KH, as the communicator. He had been there since 2100 the previous night. Santa Fe ARES was also consulted since it is listed in the New Mexico SAR Resource Directory. In addition to Hinsman, a new Incident Commander, the Guadalupe Incident Command Post van, a new Operations Section Chief and a New Mexico National Guard helicopter (Lobos 449) arrived on the scene at approximately the same time. Donald Hinsman, N4VIP, supported the effort.

The Incident Command Post was positioned at a site away from the BC ARES communications van, so the Incident Commander indicated she wanted the N4VIP communication vehicle to be colocated with the Command Post. Hinsman complied and immediately established communication links identical to those previously established in the BC ARES van. Hayes meanwhile continued as communicator and established communications with the National Guard helicopter on channel SAR 1. In addition to establishing mission communi-

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Emergency Support Function (ESF) #9
Search and Rescue

Issued this 28th Day of July, 2013

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Tony Russell
Superintendent
Emergency Management Institute

In order to remain a valuable asset for SAR work, a radio amateur must maintain his or her training in current professional methods and procedures. [Rick Palm, K1CE, photo]

cation links with the objective of relieving Hayes, Hinsman served as a runner for orders from the Incident Commander to the BC ARES communications van operator.

At approximately 1100, the helicopter crew reported they had found the missing man and were landing. Unfortunately the subject was not found in time. It was decided that the state Office of the Medical Investigator (OMI) would come to the site to conduct an investigation and remove the body. At that point a recall of all inbound SAR resources was initiated. Hayes and the BC ARES van departed at approximately 1200. Hinsman completed the mission and was released by the Incident Commander at approximately 1230.
— ARRL® New Mexico Section Emergency Coordinator Michael A. Scales, K5SCA

Search and Rescue Protocols

Search and Rescue (SAR) is an old but ever evolving and critical function that is recognized by the federal government as Emergency Support Function #9 in the National Response Framework (NRF). On the local level, many SAR missions are the responsibility of law enforcement personnel. They are often supported by civilian volunteers — regular citizens who are willing to sacrifice their time and sometimes their safety to help find a missing loved one, a neighbor or even a total stranger. SAR missions are often supported by hams.

In every instance when a person is missing, time is of the essence and in general the more "boots on the ground" searching that takes place, the more efficient and effective the effort will be. The key to success, however, lies with the *controlled* integration of civilian resources, both trained and untrained, including Amateur Radio. For radio amateurs, this means embracing related communications protocols so that we are assets and not liabilities to these missions.

Many subjects of lost person search operations are disoriented or unable to identify their location and have no means of reorienting themselves. People often go missing as the result of a tornado, hurricane, flood or earthquake. Some lost or missing people may be ill or injured.

SAR duty can be hazardous and risk factors, and their complementary skill sets, are specific to the environment. Urban SAR missions undertaken in buildings rendered unstable by an earthquake are life-threatening. Wilderness searches and rescue missions for victims in wildfire situations are also fraught with risk for obvious reasons. Operators supporting field SAR missions should be physically *and mentally* prepared for the work.[1]

Protocols for contemporary SAR have evolved significantly beyond the old protocol of "keeping in sight of the next searcher in a line of searchers sweeping a grid."[2] Significantly enhanced efficiencies have been accomplished with GPS applications, broadband and other technologies, along with new interoperability achieved through the advent of the Incident Command System (ICS) covering multidisciplined, multijurisdictional responses.

FEMA divides the SAR functions according to environment. The federal SAR Response System is composed of the primary agencies that provide specialized SAR operations during incidents or potential incidents requiring a coordinated federal response. These include:

- Structural Collapse (Urban) Search and Rescue (US&R)
- Waterborne Search and Rescue
- Inland/Wilderness Search and Rescue
- Aeronautical Search and Rescue

SAR services are performed with the use of public and private resources in order to assist persons/property in potential or actual distress. These services include distress monitoring, communications, the locating of distressed personnel and provisioning of medical assistance or other civilian services. SAR can also cover the coordination and execution of rescue operations, including extrication or evacuation.

SAR Communications Protocols

ARES and other radio operators are now part and parcel of SAR missions; agencies have recognized us as critical elements in their planning and operations. Of priority for us is the need to understand and work within the ICS, which is now the ubiquitous template for public safety operations. If we do not know how to respond from the inside, we'll be left outside looking in. For radio communications, this also means embracing ICS standards such as the use of common terminology and plain language.

...this means embracing related communications protocols so that we are assets and not liabilities to these missions.

It is also important for us as radio amateurs to handle information with sensitivity when working in conjunction with the ICS. All communications are subject to the authorization of the Incident Commander or his/her Section Chiefs under delegated authority.

Environment-specific training is also essential for us as radio amateurs because operations and risks vary greatly by environment. In this country, Urban SAR is managed by FEMA, a Memorandum of Understanding (MoU) partner of the ARRL (**www.arrl.org/served-agencies-and-partners**), through its National Urban Search and Rescue Response System, which has been deployed for searches of collapsed or damaged buildings in incidents nationwide including the Oklahoma City bombing and the collapse of the World Trade Center and in rescue efforts after Hurricane Katrina.

Aeronautical SAR is managed by the US Air Force, through its auxiliary the Civil Air Patrol (CAP), which is also an MoU partner of the ARRL. Many operators hold both ARRL and CAP memberships and are authorized to operate on both Amateur Radio and US Government frequencies assigned to CAP. Cross-training is mandated by ARRL/CAP agreement.

The US Coast Guard serves as the primary agency in waterborne SAR missions. Also, the US Power Squadrons, a safe boating organization as old as the ARRL, works with ARES under an MoU for emergency communications and cross-training between Amateur Radio and Marine VHF communication systems and protocols. The Maritime Mobile Service Net has a long history of assisting with SAR missions on the high seas and has been lauded for doing so by the USCG (**www.mmsn.org**).

The Department of the Interior (National Park Service) serves as the primary agency for inland/wilderness SAR missions, which range from searching for lost hikers to performing complex technical rescues in high altitude, mountainous environments. The use of small handheld radios by radio amateurs renders the Amateur Service an effective resource for SAR missions in the backcountry.

Again, it is the local, county and state law enforcement entities that must handle SAR in their jurisdictions, and it is incumbent upon us as radio amateurs to take their training and participate according to their protocols. SAR is a longstanding public service function of Amateur Radio and will remain so as long as people go missing under the rubble of a collapsed building, disappear from a nursing home, or become lost in the woods or at sea. We must maintain our training so we can serve as assets and not become liabilities to the mission managers.

[1]R. Palm, K1CE, "ARES, EmComm and Mental Health Risks," *QST*, July 2012, pp 75-76.
[2]See note 1.

Contest Corral – October 2013

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

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

Start - Finish Date-Time				Bands HF / VHF+	Contest Title	Mode	Exchange	Sponsor's Website
1	7 PM	1	11 PM	- / 222	222 MHz Fall VHF Sprint	Ph CW Dig	4-character grid square	www.svhfs.org
4	0230Z	4	0300Z	1.8-14 / -	NS Weekly Sprint	CW	Serial, name and S/P/C	www.ncccsprint.com
4	1400Z	6	0200Z	1.8-28 / -	DX/NA YLRL Anniversary Party	Ph CW Dig	Serial, RST and section/province/country	www.ylrl.org
5	0000Z	5	2400Z	1.8-28 / 50	TARA PSK Rumble	Dig	Name and call area (see website)	www.n2ty.org
5	0400Z	6	0359Z	1.8-28 / -	EPC Russia DX Contest	Dig	EPC member nr or serial and grid square	www.epc-ru.ru
5	0800Z	6	0800Z	1.8-28 / -	Oceania DX Phone Contest	Ph	RS and serial	www.oceaniadxcontest.com
5	1200Z	6	1200Z	14-28 / -	Worked All Britain HF Contest	Ph	RS, serial, DXCC entity or WAB area	www.worked-all-britain.co.uk
5	1600Z	6	2200Z	1.8-28 / 50,144	California QSO Party	Ph CW	Serial and state/prov/"DX" or CA county	www.cqp.org
5	1600Z	5	1959Z	3.5-14 / -	EU Autumn Phone Sprint	Ph	Both call signs, serial, name	www.eu-sprint.com
6	0700Z	6	1900Z	21, 28 / -	RSGB 21/28 MHz Contest	Ph CW	Serial and UK district	www.rsgbcc.org
7	1600Z	7	See website	3.5 / 50, 144	OK1WC Memorial Contest	Ph CW	RS(T) and serial	www.hamradio.cz/ok1wc
8	0200Z	8	0400Z	3.5-28 / -	ARS Spartan Sprint	CW	RST, S/P/C and power	www.arsqrp.blogspot.com
9	7 PM	9	11 PM	- / 432	432 MHz Fall VHF Sprint	Ph CW Dig	4-character grid square	www.svhfs.org
9	1300Z	10	See website	1.8-28 / -	CWops Monthly Mini-CWT Test	CW	Name and member number or S/P/C	www.cwops.org/onair.html
10	0001Z	10	2359Z	28 / -	10-10 Sprint	Ph CW Dig	Call, name, 10-10 number, S/P/C	www.ten-ten.org
10	0030Z	10	0230Z	3.5-14 / -	NAQCC Monthly QRP Sprint	CW	RST, S/P/C and NAQCC mbr nr or power	naqcc.info
12	7 AM	12	1 PM	- / 902+	902+ MHz Fall VHF Sprint	Ph CW Dig	6-character grid locator	www.svhfs.org
12	8 PM	13	2 AM	1.8 / -	Great Pumpkin Sprint	Dig	RST and S/P/C	www.podxs070.com
12	0000Z	13	1600Z	3.5-28 / -	Makrothen RTTY Contest	Dig	4-character grid square	home.arcor.de/waldemar.kebsch
12	0800Z	13	0800Z	1.8-28 / -	Oceania DX CW Contest	CW	RST and serial	www.oceaniadxcontest.com
12	1200Z	13	1200Z	3.5-28 / -	Scandinavian Activity Contest	Ph	RS and serial	www.sactest.net
12	1200Z	13	2359Z	1.8-28 / -	QRP ARCI Fall QSO Party	CW	RS(T), S/P/C, QRP ARCI number or pwr	www.qrparci.org/contests
12	1200Z	13	2359Z	1.8-28 / 50	Straight Key Weekend Sprintathon	CW	RST, QTH, name, SKCC nr or "none"	www.skccgroup.com
12	1600Z	13	See website	3.5-28 / 50,144	Arizona QSO Party	Ph CW Dig	Serial and S/P/C	www.azqsoparty.org
12	1600Z	12	2000Z	3.5-14 / -	EU Autumn CW Sprint	CW	Both call signs, serial, name	www.eu-sprint.com
12	1600Z	12	See website	1.8-28 / 50,144	Pennsylvania QSO Party	Ph CW Dig	Serial and ARRL/RAC section	www.nittany-arc.net
12	1700Z	12	2100Z	3.5-28 / -	FISTS Fall Sprint	CW	RST, S/P/C, name, FISTS number or pwr	www.fists.org/operating.html#sprints
13	**0000Z**	**13**	**0400Z**	**3.5-14 / -**	**North American RTTY Sprint**	**Dig**	**Both call signs, serial, QTH, name**	**www.ncjweb.com**
19	0000Z	20	1600Z	- / 50,144	Arucaria VHF Contest	Ph CW	RS(T) and 4-char grid square	www.avhfc.com
19	0000Z	20	2400Z	3.5-28 / -	JARTS WW RTTY Contest	Dig	RST and age (YL may send "00")	www.jarts.jp
19	0001Z	20	2359Z	28 / -	10-10 Fall CW QSO Party	CW	Call, name, 10-10 number, S/P/C	www.ten-ten.org
19	1000Z	20	1000Z	3.5-28 / -	Scandinavian YLRA Contest	Ph CW Dig	RS(T) and "88" (YLs) or "73" (OMs)	www.sylra.is
19	1400Z	19	2300Z	1.8-28 / 50+	Iowa QSO Party	Ph CW Dig	RS(T) and IA county, state/prov, or "DX"	www.wa0dx.org
19	1400Z	20	0200Z	1.8-28 / 50+	New York QSO Party	Ph CW Dig	RS(T), NY county, state/prov, or "DX"	www.nyqp.org
19	1500Z	20	1459Z	3.5-28 / -	Worked All Germany	Ph CW	RS(T) and serial or DOK code	www.darc.de/referate/dx/contest/wag/en
19	1500Z	20	1500Z	1.8 / -	Stew Perry Warmup Contest	CW	4-char grid square	www.kkn.net/stew
19	1600Z	20	2359Z	1.8-28 / 50	W/VE Islands QSO Party	Ph CW Dig	RS(T) and S/P/C or island designator	www.usislands.org
19	1900Z	20	See website	1.8-28 / 50-432	Telephone Pioneer QSO Party	Ph CW Dig	Year of membership and chapter	www.tpqso.com
19	2000Z	19	2200Z	3.5-7, 21-28 / -	Spooky Feld-Hell Sprint	Dig	RST, S/P/C, Feld-Hell member nr	www.feldhellclub.org
20	0000Z	20	0200Z	14-21 / -	Asia-Pacific Sprint	CW	RST and serial	jsfc.org/apsprint/aprule.txt
20	1700Z	21	0100Z	1.8-28 / 50,144	Illinois QSO Party	Ph CW	RS(T) and IL county or S/P/C	www.w9awe.org/ILQP.html
21	0200Z	21	0400Z	1.8-28 / -	Run For the Bacon	CW	RST, S/P/C, Flying Pig nr or power	www.fpqrp.org
21	**1300Z**	**25**	**2359Z**	**1.8-28 / 50+**	**School Club Roundup**	**Ph CW Dig**	**RST, class and S/P/C**	**www.arrl.org/school-club-roundup-scr**
23	0000Z	23	0200Z	1.8-28 / 50	SKCC Weekday Sprint	CW	RST, S/P/C, name, SKCC number	www.skccgroup.com
26	0000Z	27	2359Z	1.8-28 / -	CQ World Wide SSB Contest	Ph	RS and CQ zone	www.cqww.com
31	0000Z	31	2359Z	1.8-28 / 50,144	Haunted Lighthouse QSO Party	Ph CW Dig	Serial or ARLHS number	arlhs.com

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

2012-2013 School Club Roundup Results

Students worldwide — including the first-ever entry from Africa — took to the airwaves.

Lew Malchick, N2RQ

Just as the Long Island Mobile Amateur Radio Club (LIMARC) was beginning to work with a new system of electronic entry submission last October, Hurricane Sandy wreaked havoc on our communities. It was not until after the February session that we were able to refocus on scoring the School Club Roundup. Now that the results have finally been released, we are pleased to report that a new system of score entry and results publication will be in place for this year's School Club Roundup (see the sidebar "School Club Roundup — Instant Results"). We hope this new system will be effective in maintaining student interest. If you have additional comments and observations, contact the author. Even though score submission will be handled by the web page, it is still important to make sure you are using the latest version of your logging software as described on the SCR web page. And don't forget to submit your photos and Soapbox comments at **www.arrl.org/soapbox**!

The number of entries in October returned to 48, up 20%, after a dip last year. Total QSOs rebounded to more than 7600, surpassing both 2010 and 2011. The number of reported operators, 410, was higher than 2011. The February session continued its upward trend with more entries from colleges and individuals. Total entries went from 61 to 70. Total QSOs increased by more than 10%, from 9763 to 10,831. The number of reported operators, 892, was impressive. For the first time ever, there were entries from Europe, Africa, and South America in the same session. These included the first entry from 9G5MS as a school in Ghana.

KB3BRT took the top elementary school spot in October, while W3NCS led in February. Crenshaw Middle School, KC5CRF, topped the SCR session in the middle school category with all 50 states, as well as 900 QSOs in October and 800 QSOs in February. N4HVH topped the high school category in October, despite having more than 100 less QSOs than either K5LBJ or K9SOU, due to a higher proportion of non-phone contacts. In February, the high school lead went to K1BBS.

As with all on air competitions, there are more participants than entries received. We like to commend some of the low scoring entries for fulfilling the purpose of the SCR. The following stations had more reported operators than QSOs: KG4DTM, W2CXN, W7O and W4ADX.

Be an On-the-Air Mentor

An important part of School Club Roundup is your participation. Can you get on the air and tune for students calling CQ? Call "CQ School Club Roundup" yourself! Most operation takes place after school during weekday afternoons — see you then!

Soapbox — October 2012

"Our first time at Rau School and the kids really liked talking to the other schools. They also enjoyed plugging the call signs into QRZ.com and then using Google Maps to figure out how far away the contacts were. The biggest highlight was working W1AW on voice." KF7PVF

"It was great to contact so many schools, including my alma mater, W1MX, at the Massachusetts Institute of Technology." K3TW

Soapbox — February 2013

"Activated the AvTech Academy in Ghana as the first ever SCR School Entity in West Africa! We had a very busy week with a field trip for the second half of the week and only got a few hours in operating with poor band conditions and an untested station. Lots of smiles for the DX we made, sadly no US or school contacts." AI6MS/9G5MS

"It pays to have access to multiple bands! This SCR, it seemed that 20 meters was up/down. K5LBJ found that 15 meters was often 'wide open.' This allowed our students to get into pileups which was quite fun. As always, the DX stations created buzz, especially the Falkland Islands. Great to hear so many new schools on the air." KC5EES (Sponsor, K5LBJ)

"Fantastic time was had by all. Alaskan station that was 150 miles south of the North Pole was really cool, as was our first aeronautical mobile, and contacts with Australia and Japan. Just two states short of WAS — Hawaii and Oregon." K5LMS

"What an exciting group of contacts! I enjoyed joining N2WG to support his work with a middle school by working these stations from home. I talked with elementary, middle and high school clubs. I encouraged them to take up the hobby, telling of young hams who have helped with air shows, weather situations, etc. As a university professor, I also enjoyed talking with a group at a university in Michigan. " KG4BUK

"We had a great time. The kids became more comfortable at the microphone as the week went on. We taught some Q signals and I was proud when I told one student, 'Ask him his state' during a QSO, and he immediately said, 'What is your QTH?' By the end of the week they could write the phonetic alphabet from memory. We used N1MM *software. The other Elmer, KQ4KK, came up with awards for the top three students with the most contacts." N4SMS/NC8N*

"Great SCR again this year. I had a few students rise to the occasion and embrace radio communications. I was so happy that these students had the opportunity to make our first DX contact with CO6LC from the school. As a result of the SCR activity Oakview is gaining an after school Amateur Radio program as part of the district STEM enhancements." W7O (K7LOP)

School Club Roundup — Instant Results

Beginning with the October event, School Club Roundup participants can enter their scores using an online form. (E-mail and paper forms will still be offered.) Once the submission deadline passes, the results will be compiled and presented immediately online. The ARRL thanks Bruce Horn, WA7BNM, for providing this new capability. For more information, see the School Club Roundup web page at **www.arrl.org/school-club-roundup**.

Contact info: e-mail **SCR@limarc.org**. US mail: SCR c/o LIMARC, PO Box 392, Levittown, NY 11756-0392. Donations for SCR may be made via PayPal to **LIMARC@optonline.net**. Join our Yahoo! group, **SCR-L@yahoogroups.com**. *Please update your logging software to the latest versions.*

The next SCR sessions are scheduled for October 21-25, 2013 and February 10-14, 2014.

More info is available at **www.arrl.org/school-club-roundup-scr** and **scr.limarc.org**.

Lew Malchick, N2RQ, has been licensed since 1959. He taught chemistry at Brooklyn Technical High School and is now retired. Since 1977 he has served as an advisor and/or trustee for W2CXN in Brooklyn, New York.

The 2013 ARRL November Sweepstakes

CW: 2100 UTC Saturday, November 2 – 0300 UTC Monday, November 4

Phone: 2100 UTC Saturday, November 16 – 0300 UTC Monday, November 18

This year marks the 80th running of the ARRL November Sweepstakes. Often regarded as the premier domestic event of the contesting year, Sweepstakes offers something for amateurs of all experience levels. The 2013 event will represent a historic milestone — don't miss your chance to be a part of the Sweepstakes tradition.

- Last year, the Ontario (ON) section was split into four sections. Please be sure your logging software is updated to reflect the new sections. If you are unsure as to how to go about this, contact your logging software author or support group.
- SS CW logs must be e-mailed or post-marked by 0300 UTC Tuesday, November 19 and phone logs by 0300 UTC Tuesday, December 3. E-mail Cabrillo-formatted logs to **sscw@arrl.org** or **ssphone@arrl.org**. Paper logs can be sent to ARRL November Sweepstakes, 225 Main St, Newington, CT 06111

Matt, KFØQ, operates his station in the 2012 November Phone Sweepstakes. Matt completed the sweep with only stealth antennas. [Photo courtesy KFØQ]

For more information, including a guide for first time operators, visit

www.arrl.org/sweepstakes

Strays

The "Thank You" Quilt

Many served organizations often present T-shirts to ham operators at public service events as a "thank you" for their efforts. Over the years, this can grow to quite a collection, but what does one do with all those shirts? Paul Bruski, KF2AA, came up with a novel solution. He had the shirts assembled into a quilt, preserving them as mementos for years to come.

Paul Bruski, KF2AA (left), and Gene Kremzier, N2OBW, Assistant Emergency Coordinator for Erie County ARES and Radio Operator for Erie County RACES (right), display Paul's quilted T-shirt collection at an Erie County ARES/ RACES meeting. [Vince Harzewski, N2JRS, photo]

Hams Where You Least Expect Them

Late last year Ron Blessin, AF7A, was aboard a cruise ship. He placed an advertisement in the ship's daily newspaper inviting any other Amateur Radio operators on board to join him for an informal get-together. To Ron's surprise, a number of hams showed up and a crewperson was more than happy to capture a photo of the scene.

Left to right: Bob Blessin, KCØQF; LarryAlt, KR4LX; Gary Perkins, K2OU; Dick Boswell, K4CUE; (kneeling); Paul Watkins, W4FDK and Ron Blessin, AF7A.

Bernie McClenny, W3UR, w3ur@arrl.org

Sunset on Pitcairn Island

Pitcairn Island has lost its "voice."

Many of our readers have probably already heard the sad news of the passing of Tom Christian, VP6TC (ex VR6TC), on July 7 of this year. Tom was the great-great-great-grandson of Fletcher Christian, who is famous for having led the mutiny on the HMS Bounty *back in 1789. Many of you who are regular readers of this column have no doubt worked Tom, perhaps even as your first contact with the Pitcairn Islands. Although Tom was not my first contact with Pitcairn Island (that contact was Ron Wright, ZL1AMO/VR6HI, SK), I did work Tom on both CW and SSB when he was VR6TC and later as VP6TC. This month I'm presenting a tribute to "the voice of Pitcairn."*

A Tribute to Thomas Coleman Christian MBE, VP6TC (ex VR6TC)

Thomas Coleman Christian was born on November 1, 1935, the son of Frederick Martin and Flora Clarice Christian. He had an older sister, Thelma, and a younger sister, Valda. During World War II young Tom enjoyed visiting Pitcairn's radio station, located some 870 feet above sea level at Taro Ground, which was then manned by servicemen from New Zealand. Jacqueline Christian, VK4CDC, Tom's daughter, remembers, "Dad was fascinated by Morse code and the fact that people could communicate with each other and other countries by a series of dots and dashes, and decided way back then that one day he too would learn to communicate this way."

Tom began school at the age of 6 at the Down Niger School, eventually advancing to the Pulau School, where he remained until he was 16. Upon completion of school he was asked if he would be willing to leave Pitcairn to go to New Zealand to train as a radio operator/technician, then to return to serve on Pitcairn as its radio officer.

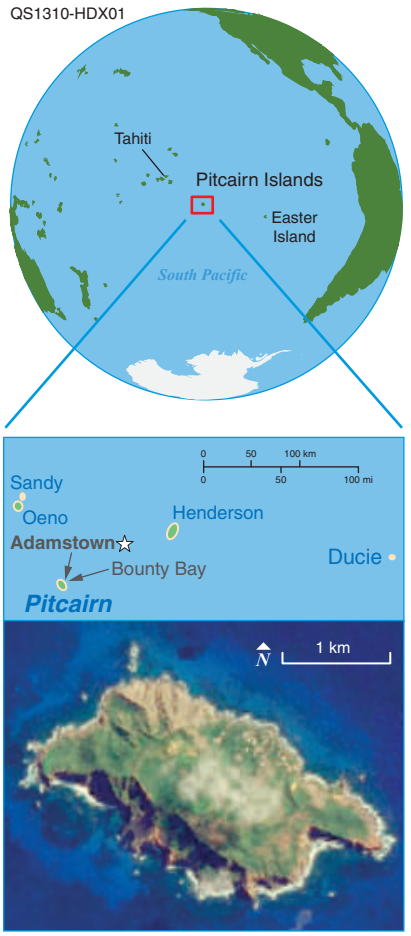
Excited by the offer, he agreed to it and left the island in 1952 at the age of 17. He departed on the New Zealand Shipping Company's RMS *Rangitoto*, a passenger vessel. On the 8 day voyage from VR6 (now VP6) to ZL, the teenager shared a cabin with three other men. Once he arrived in Wellington, New Zealand, arrangements were made for him to live with a family from Pitcairn.

He began his training to be a radio operator by learning Morse code, followed by radio theory and technical maintenance studies at the Trentham Training Centre, which was part of the Post Office Accommodation Centre. He was there for 3 years and along with radio courses, he studied meteorology.

First Ticket

"On March 23, 1955, Tom received his first Amateur Radio license in Wellington in the form of a New Zealand certificate."[1] He also obtained his First Class Radio Telegraph Operator Certificate. Later that year he returned to Pitcairn Island and on November 1, 1955, at the age of 20, he began what may have been one of his boyhood dreams of working at the island radio station (ZBP). In 1957 Tom received his Pitcairn Amateur Radio license, VR6TC.

[1]J. Seidel, WA6FEI, "Pitcairn Island — an inside look at VR6TC" *73 Magazine*, Mar 1977, pp 28-34.



During his first few years at ZBP, Tom got to know Anderson Warren, another Pitcairn Islander. Anderson already knew Morse code and Tom taught him basic theory and how to do weather observations. This association turned out to be fortuitous when in 1959 Tom developed appendicitis and required emergency evacuation to New Zealand, leaving ZBP in Anderson's capable care.

Some Time at Sea

After he recovered, Tom joined New Zealand's Union Steam Ship Company and worked on a passenger ferry between Wellington and Picton, New Zealand for a time. Then his father became ill and he focused on heading back home to Pitcairn, but before doing so he went to Fiji for 3 months to work on plans for a new radio installation that would be located back at Taro Ground.

He arrived back home in late 1960 and began work overseeing the construction of the new installation, which took several months to complete. The new station required more radio operators and meteorologists over the coming years. As Jacqueline remembers it: "Six trainees passed the required 20 WPM test and joined the radio staff over the next several years," including Tom's then-future wife Betty, VR6YL.

Tom married Betty in May 1966 and they soon found themselves in Glendale, California for a 6 week training course at the Voice of Prophecy Broadcasting Studio. After their training, they worked at VOP for 6 months before returning home. While they were in California he made lifelong friends with whom he stayed in contact with via ham radio for the rest of his life.

Over the course of Tom's marriage to Betty, they would have four daughters: Jacqueline, VK4CDC, Raelene, ZL2RAE, Sherilene and Darilene.

Dangerous Waves

June 23, 1972 was a fateful day in Tom's life.

Figure 1 — One of Tom's QSL cards shortly before he changed calls from VR6TC to VP6TC.

Figure 3 — Your editor had the pleasure of meeting Tom during the 2002 Ham-Com, which was sponsored by the Lone Star DX Association. [Photo courtesy of Bernie McClenny, W3UR]

He was on board the diesel-powered, whaler-type longboat *Reid Cowell*, which was on its way out to a waiting ship with outgoing mail (including many QSL cards) in heavy seas. The boat capsized and Tom was tossed out onto the rocks by a series of huge waves. Before he could get out of the way the boat crushed and broke his leg. Locals put his leg in a cast, but there were complications and an emergency call was given for any ship in the vicinity to transport him to New Zealand. The *Southland Star* heard the call and a week later took Tom to the hospital in Auckland. There a new cast was made covering him from hip to foot, and he would be on crutches for 6 weeks. Four months later the family returned to the island via the *Megantic* and Tom resumed his duties as the communications officer at Taro Ground.

In 1983 Tom and Betty went to New Zealand, leaving behind the four girls to take care of Tom's parents. The reason for the trip was to assist with finding sources of new equipment for Radio ZBP. While there he was awarded the MBE (Member of the British Empire, a British order of chivalry) by the Governor of Pitcairn, at his residence in Homewood, Karori, Wellington.

Satellites Land on Pitcairn

In early 1985 the new radio equipment arrived on Pitcairn Island, along with a technician to help with the installation, which included setting up a telephone booth in the Public Hall. For the first time, ZBP switched to radio telephone in addition to CW. It was now possible for the islanders to make telephone calls to family and friends overseas from the radio station or telephone booth. This was the case until 1992 when Inmarsat [a satellite-based communications service — *Ed.*] was installed, but it was too expensive for the locals. As a result of Inmarsat, Radio Station ZBP closed down in October 1993. This saddened Tom as he never was enthused about the satellite system that he helped to operate up until he retired on his birthday in November 2000.

The Longest Log

Tom boasted about making somewhere around 100,000 contacts as VR6TC (see Figure 1) and later as VP6TC. He was involved in his church and was an elder for many years. He also served on the Island Council as the Governor's appointed member.

In 2001, Tom, along with Kan Mizoguchi, JA1BK, founded the Pitcairn Island Amateur Radio Association (PIARA), which seceded from the Radio Society of Great Britain (RSGB). This led the way for Ducie Island to be added to the ARRL DXCC list. Tom, Kan and a team from Pitcairn, Japan and the United States put Ducie Island on the air in March 2002 (see Figure 2).

Your editor was fortunate enough to meet Tom and his daughter Sheri at the 2002 Ham-Com in Arlington, Texas, thanks to the support of the Lone Star DX Association (see Figure 3). Tom had a great sense of humor and was very ingenious at bringing many firsts to the island, including electric fridges, battery lights and motorbikes.

Tom was diagnosed with possible Parkinson's and early signs of Alzheimer's/dementia in December 2009 while on a family visit in New Zealand. He passed away peacefully on July 7, 2013 and was buried on Pitcairn Island. Our thoughts and prayers go out to the Christian family on their loss as we remember all the good Tom Christian did for Amateur Radio over his many years of service.

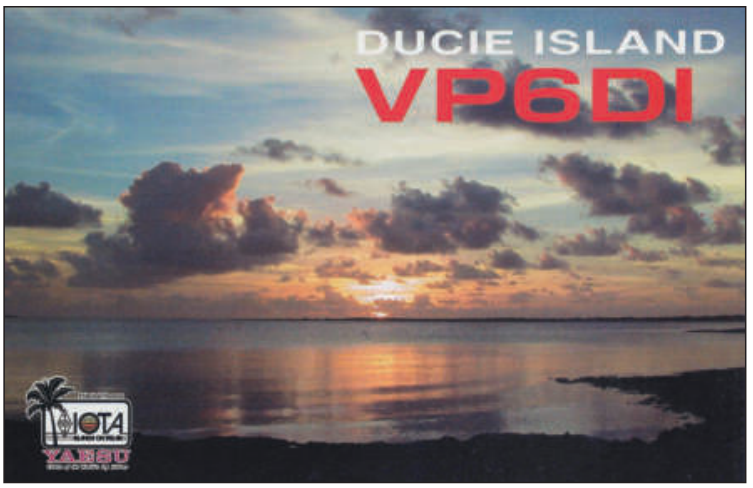


Figure 2 — Tom Christian, VP6TC, was part of the first DXpedition to Ducie Island in March 2002.

Wrap Up

That's all for this month, with a special thanks to KØBJ, VK4CDC, VP6YL and *The Daily DX* for helping to making this month's column possible. Don't forget to send your DX news, photos, club newsletters and other items to **w3ur@arrl.org**. Until next month, see you in the pileups! — *Bernie, W3UR*

Special Event Stations

Maty Weinberg, KB1EIB, events@arrl.org; www.arrl.org/special-event-stations

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

Sep 13-Sep 14, 0001Z-0700Z, W1E, Burley, WA. Burley Amateur Radio Club. **Friday the 13th Special Event Operation**. 14.313 7.233 28.313. Certificate & QSL.* W1E BARC W7JQ, PO Box 639, Burley, WA 98322. **www.qrz.com/db/w7jq**

Sep 15-Sep 16, 1600Z-0000Z, KØZFK, Saint Louis, MO. Jefferson Barracks Amateur Radio Club. **West Point of the West**. 7.194 7.182. QSL. Arlo Gittings, 6755 Alabama, Saint Louis, MO 63111. *Celebrating the importance of this post to the region and to the club.* **k0zfk@arrl.net**

Sep 19-Sep 29, 0000Z-2359Z, XE3IARU, Cancun, Quintana Roo, Mexico. **IARU Region 2. General Assembly IARU Region 2**. 40, 20, 15 and 10 meters. QSL. Christian Buenger, DL6KAC, Im Schiefengarten 3, Koenigswinter 53639, Germany. *All QSOs will receive a QSL via the Bureau. Direct QSL via DL6KAC. The delegates attending this event may operate SSB, CW and RTTY from that station. IARU Region 2 and the FMRE thank Radio Club Cancun for the coordination of this station and obtaining the special call sign.* **cancun2013.info**

Sep 28, 1330Z-1730Z, NC4AR, Thomasville, NC. Tri-County Amateur Radio Club. **Everybody's Day**. 7.210. Certificate. NC4AR, PO Box 747, Trinity, NC 27370. *Instructions for certificate at* **www.qrz.com/db/nc4ar**. **www.nc4ar.net**

Sep 28-Sep 29, 0001Z-2359Z, W6T, Essex, CA. Volunteers in Parks Amateur Radio Society. **National Public Lands Day**. 21.395 18.165 14.310 7.204. Certificate. W3VIP, 514 Americas Way #3889, Box Elder, SD 57719. **w3vip@amsat.org**

Jan 1-Dec 31, 0000Z-2359Z, EI13CLAN, Dublin, Ireland. Irish Radio Transmitters Society. **The Gathering**. 28.050 21.320 18.080 14.220. Certificate & QSL. David, O'Connor, Silver Howe, Sydenham Mews, Corrig Avenue Dunlaoghaire Co Dublin, Ireland. *Full details at* **irts.ie/clancq** *or* **www.qrz.com/db/ei13clan**

Oct 4-Oct 6, 1000Z-1600Z, W8R, Beckley, WV. Black Diamond Amateur Radio Club. **October Sky: Rocket Boys Festival**. 14.280 7.280. Certificate. John Hymes, W8HY, PO Box 472, Beaver, WV 25813. **www.qsl.net/wv8bd/Events.html**

Oct 4-Oct 10, 0000Z-0400Z, N6D, Healdsburg, CA. William Pattullo. **Dedication Anniversary of Mission Dolores, San Francisco, Oct 9, 1776**. 21.265 14.265 7.265. QSL. N6D — William Pattullo, 161 Presidential Cir, Healdsburg, CA 95448. **ae6yb.jigsy.com**

Oct 4-Oct 14, 0600Z-1200Z, W5B, Albuquerque, NM. High Desert Amateur Radio Club of New Mexico. **Albuquerque International Balloon Fiesta**. 28.320 21.300 14.245 7.205. Certificate & QSL. eQSL or John Scott, 8012 Fieldstone Ave NW, Albuquerque, NM 87120. **www.nm5hd.com**

Oct 4-Oct 14, 1400Z-0900Z, N6MD, Julian, CA. Julian CERT Amateur Radio Club. **Julian Apple Days**. 146.550 7.180. QSL. Julian Apple Days QSL, PO Box 1553, Julian, CA 92036. **www.julianca.com/events/index.htm**

Oct 5, 1000Z-1500Z, W9JOZ, North Judson, IN. Starke County Amateur Radio Club. **Radioville Special Event**. 28.350 21.300 14.250 7.250. QSL. Starke County Amateur Radio Club, 7495 S 500 W, North Judson, IN 46366. **www.w9joz.org**

Oct 5-Oct 6, 1600Z-0400Z, K4C, Toccoa, GA. Toccoa Stephens COC. **Currahee Challenge/Band of Brothers/Camp Toccoa**. 14.325 14.308 14.256 7.256 147.330+ PL 127.3. QSL. Bruce Perry, 102 Clearwater Dr, Dawsonville, GA 30534.

Oct 6, 0000Z-2300Z, K4W, Glasgow, KY. Mammoth Cave Amateur Radio Club. **Battle of Fort Williams**. 28.475 14.245 7.275 3.810. QSL. Mammoth Cave ARC, PO Box 1092, Glasgow, KY 42142. **www.ky4x.org**

Oct 6-Oct 12, 0000Z-2359Z, N2F, Kingston, NJ. Siemens Fire Safety. **National Fire Prevention Week Special Event**. 28.351 21.351 14.251 7.251. QSL. N2F Special Event Station, PO Box 357, Kingston, NJ 08528. *Contact us at* ***n2f.event@gmail.com*** *if you would like to run an NFPW station in 2014.* **www.qrz.com/db/n2f**

Oct 6-Nov 5, 0000Z-2359Z, VX31763, Mississauga, ON, Canada. VE3RHE. **250th Anniversary of the Royal Proclamation of 1763**. All HF bands, 6, 10, 15 and 20 meters. QSL. Robert Emerson, VE3RHE, 6950 Summer Heights Dr, Mississauga, ON L5N 7E9, Canada. QSL via bureau or LoTW. *If sending direct, please include Canadian stamps or green stamps. (Links available about Oct 1.)* **www.qrz.com/db/vx31763** *or* **events.ve3rhe.ca/sx31763**

Oct 10-Oct 11, 1400Z-1800Z, NC9N, Rockford, IL. Rockford University. **Rockford University Celebration**. 28.450 21.300 14.250 7.200. QSL. Glen Moss, 1265 Deer Trail Ln, Libertyville, IL 60048. **www.rockford.edu**

Oct 12, 0900Z-1500Z, W4BUG, Pompano Beach, FL. Gold Coast Amateur Radio Association. **Hillsboro Lighthouse**. 14.325 14.200. QSL. W4BUG, PO Box 773, Pompano Beach, FL 33061. **w4bug.org**

Oct 12, 1159Z-2000Z, W4T, Unicoi, TN. Unicoi County Amateur Radio Association. **Run for the Pinnacle**. 21.300 14.275 7.225 3.900. Certificate. UCARA, PO Box 456, Erwin, TN 37650.

Oct 12, 1400Z-2000Z, W5QX, San Angelo, TX. San Angelo Amateur Radio Club. **89th Anniversary Celebration**. 14.230 7.230 146.940 PL 103.5. Certificate. SAARC, PO Box 4002, San Angelo, TX 76902. **w5qx.org**

Oct 12, 1400Z-2100Z, KF4L, Clarksville, TN. Clarksville Amateur Transmitting Society. **Aviation Day, Outlaw Airport, CKV**. 14.255 7.225. QSL. John Freed, 216 Maplewood Dr, Clarksville, TN 37042. **clarksvilleairport.com** *or* **www.kf4l.org**

Oct 12, 1400Z-2200Z, W8VP, Cambridge, OH. Cambridge Amateur Radio Association. **Site of 1st Bridge Authorized by Northwest Territory**. 14.260 7.235. Certificate & QSL. Cambridge Amateur Radio Association, PO Box 1804, Cambridge, OH 43725. *10th Special Event in CARA's year-long 100th Birthday Celebration. QSL. Certificate available for anyone who works all 12 of CARA's monthly 2013 Special Events.* **www.w8vp.org**

Oct 12-Oct 13, 1000Z-1600Z, W1W, New Milford, CT. Northville Amateur Radio Association. **Warren Fall Festival**. 14.250. QSL. Via LoTW or NA1RA, PO Box 354, New Milford, CT 06776. **www.na1ra.org**

Oct 12-Oct 13, 1200Z-2300Z, N1D, Auburn, ME. Androscoggin Amateur Radio Club. **Dempsey Challenge**. 28.460 14.260 14.100 7.200. Certificate & QSL. Androscoggin ARC W1NPP, PO Box 1, Auburn, ME 04212. **www.w1npp.org**

Oct 12-Oct 13, 1500Z-1700Z, WØW, Alexandria, MN. Runestone Radio Club. **Discovery of America: Kensington Runestone**. 21.070 14.240 3.930. Certificate. Bill Klundt, 509 Pine St S, Sauk Centre, MN 56378. **www.w0alx.org**

Oct 12-Oct 13, 1500Z-2100Z, WØD, La Plata, MO. Macon County Amateur Radio Club. **Lester Dent — Doc Savage Mystery Special Event**. 28.370 14.270 7.270 3.970. Certificate. Macon County Amateur Radio Club, PO Box 13, Macon, MO 63552. **www.maconcountyarc.net**

Oct 13-Oct 19, 0001Z-1959Z, W8W, Paradise, MI. Lake Effect Amateur Radio Club. **National Wildlife Refuge Week 2013 at Whitefish Point**. 14.240 7.070. QSL. Lake Effect ARC/NWR, 36 Southfork St, Marquette, MI 49855. *Check website for band/sked changes. Extremely rare grid — EN76ms.* **www.qsl.net/kd8dku/Event-NWRWeek/BandOpsPlanWP2013.htm**

Oct 13-Oct 19, 1300Z-2000Z, N8W, Seney, MI. Lake Effect Amateur Radio Club/Luce Amateur Radio Society. **National Wildlife Refuge Week 2013**. 14.070 7.240. QSL. Lake Effect ARC, 36 Southfork St, Marquette, MI 49855. **www.qsl.net/kd8dku/Event-NWRWeek/BandOpsPlan2013.htm**

Oct 15-Oct 17, 0800Z-0500Z, KØW, Moultrie, GA. Colquitt County Ham Radio Society and the Moultrie Technical College Amateur Radio Club. **Sunbelt Ag Expo**. 14.230 7.180 146.790. QSL. Andrew T. Clark, 800 Veterans Pky N, Moultrie, GA 31788. **www.wd4kow.org**

Oct 16-Oct 21, 1700Z-0400Z, W8P, Circleville, OH. Teays Amateur Radio Club. **107th Annual Circleville Pumpkin Show**. 28.350 14.250 7.250 3.850. Certificate. Roy Ulko, 132 W Main St, Circleville, OH 43113.

Oct 18-Oct 20, 1800Z-1800Z, N3G, Augustine Beach, DE. US Coast Guard Auxiliary District 5-NR. **Commemorating the USCG Auxiliary 74th Anniversary**. 50.150 28.308 14.070 7.028. QSL. Robin Begley, 3 Pancoast Ave, Aston, PA 19014. *Also activating USA-548 Old Reedy Island light ARLHS activation rules. Air Mobile on 146.52 and HF SSB QRM permitting.* **nd3e@comcast.net**

Oct 18-Oct 21, 0000Z-2359Z, K2B, Saugerties, NY. Kaaterskill Basin Amateur Radio Club/Kristofer Landell. **Rip Van Winkle Council JOTA**. 146.400 14.230 7.190 3.905. QSL. Kristofer Landell, 72 Highwoods Rd, Saugerties, NY 12477. **www.kaaterskillbasinarc.org**

Oct 19, 1200Z-2300Z, W4T, Unicoi, TN. Unicoi County Amateur Radio Association. **Heritage Day**. 21.300 14.275 7.225 3.900. Certificate. UCARA, PO Box 456, Erwin, TN 37650. **w3gfmkj@gmail.com**

Oct 19, 1300Z-1700Z, NC4AR, Trinity, NC. Tri-County Amateur Radio Club. **Trinity Car Show & Chili Cookoff**. 7.211. Certificate. NC4AR, PO Box 747, Trinity, NC 27370. **www.qrz.com/db/nc4ar** *or* **www.nc4ar.net**

Oct 19, 1300Z-2200Z, W2K, New York, NY. USCG Auxiliary 014-05**. US Coast Guard Auxiliary 74th Anniversary**. 14.280 7.260. QSL. John Kiernan, 110 Cabrini Blvd, Apt A, New York, NY 10033. **ke2un@msn.com**

Oct 19, 1300Z-2300Z, W5T, Three States, TX. Amateur Radio Operators. **Three States Special Event**. 28.450 21.275 14.250 7.225. QSL.* Woodrow Morton, PO Box 130, Nash, TX 75569.

Oct 19, 1400Z-2100Z, W3C, Carnegie, PA. Steel City Amateur Radio Club. **Allegheny County Courthouse 125th Anniversary Celebration**. 17.260 7.260 147.03 PL 123 Echolink Node 14703. Certificate. Bob Mente, 305 Ewing Rd, Carnegie, PA 15106. **nu3q@nu3q.us**

Oct 19, 1400Z-2200Z, N4Z, Jackson, TN. USCG Aux District 8ER. **USCG Auxiliary 74th Anniversary**. 28.425 21.325 14.280. QSL. Kenny Johns, 52 Buttonwood Dr, Jackson, TN 38305. *Possible RTTY on 20 meters and JT65 on 14.076*. **ab4eg@eplus.net**

Oct 19, 1400Z-2200Z, W1H, Owl's Head, ME. US Coast Guard Auxiliary District D1N. **Commemorating the USCG Auxiliary 74th Anniversary**. 28.425 21.325 14.265 7.184. QSL. Bill Hopwood, KB1QXJ, PO Box 272, Elkins, NH 03233.

Oct 19, 1400Z-2300Z, N7Z, Apache Junction, AZ. USCG Auxiliary District 11SR Flotilla 10-8. **Commemorating USCG Auxiliary 74th Anniversary**. 21.310 14.310 14.070 7.290. QSL. Paul Swietek, AE7VA, 5427 E Broadway Ave, Apache Junction, AZ 85119. SASE required for QSL card. **www.qrz.com/db/AE7VA**

Oct 19, 1400Z-2300Z, N4U, Benton, KY. USCG Auxiliary. **74th Anniversary of USCG Auxiliary**. 21.070 14.070. QSL. Mary Husfield, 4156 Barge Island Rd, Benton, KY 42025. *Will operate mostly PSK31 with some phone.*

Oct 19, 1400Z-2300Z, N1A, East Freetown, MA. USCG Auxiliary Flotilla 65. **USCG Auxiliary 74th Anniversary**. 28.490 21.290 14.230 7.180. QSL. Paul G. Sadeck, K1PGS/N1A, 90 Doctor Braley Rd, East Freetown, MA 02717.

Oct 19, 1400Z-2300Z, N4A, Inverness, FL. US Coast Guard Auxiliary. **Commemorate 74th Anniversary of USCG Auxiliary**. 14.280 14.270 14.260 14.250. QSL. Frank Nusso, 6225 E Malverne St, Inverness, FL 34452.

Oct 19, 1600Z-2100Z, WE7GV, Tubac, AZ. Green Valley Amateur Radio Club. **38th Annual Juan Bautista de Anza Days**. 14.246 14.244 14.242. Certificate & QSL. Green Valley Amateur Radio Club, 601 N La Canada Dr (SAV), Green Valley, AZ 85614. **gvarc.us**

Oct 19-Oct 20, 1318Z-1518Z, K4K, Jefferson City, TN. Jefferson County Amateur Radio Emergency Service. **Jamboree On The Air**. 21.360 14.290 7.190 3.940. QSL. Jefferson County Amateur Radio Emergency Service, K4K/KN4EM, 581 W Old AJ Hwy, New Market, TN 37820. **w4dod@arrl.net**

Certificates and QSL cards: To obtain a certificate from any of the special event stations offering them, send your QSO information along with a 9 × 12 inch self-addressed, stamped envelope to the address listed in the announcement. To receive a special event QSL card (when offered), be sure to include a self-addressed, stamped business envelope along with your QSL card and QSO information. *Note: Some clubs may ask for a nominal fee to cover the cost of the certificate or QSL. Request will be made on air during the event or on the club's website.

Special Events Announcements: For items to be listed in this column, use the ARRL Special Events Listing Form at **www.arrl.org/special-events-application**. A plain text version of the form is available at that site. You may also request a copy by mail or e-mail. Offline completed forms can be mailed, faxed (Attn: Special Events) or e-mailed.

Submissions must be received by ARRL HQ no later than the 1st of the second month preceding the publication date; a special event listing for **Dec** *QST* would have to be received by **Oct 1**. In addition to being listed in *QST*, your event will be listed on the ARRL Web Special Event page. Note: All received events are acknowledged. If you do not receive an acknowledgment within a few days, please contact us.

Special Events listed in this issue include current events received through Aug 10. You can view all received Special Events at **www.arrl.org/special-event-stations**.

Oct 26, 1330Z-1730Z, NC4AR, Randleman, NC. Tri-County Amateur Radio Club. **NASCAR Days**. 7.211. Certificate. NC4AR, PO Box 747, Trinity, NC 27370. *Info on receiving certificate at* **www.qrz.com/db/nc4ar** *or* **www.nc4ar.net**

Oct 26-Oct 27, 1600Z-1600Z, K8LGN, Zaleski, OH. Hocking Valley Amateur Radio Club. **Moonville Tunnel Special Event**. 28.405 14.225 7.275 3.810. QSL. Richard Martin, 1255 New York Ave, Logan, OH 43138. **n8rhjrich@yahoo.com**

Oct 26-Oct 27, 1600Z-2359Z, W7A, Fallon, NV. Amateur Radio of Churchill County. **Navy Day Celebration from NAS Fallon**. 14.260 7.260 3.960. Certificate & QSL. Rick Bischoff, 5900 Railraod St, Silver Springs, NV 89429. **qsl.net/nv7cc**

October 2013 W1AW Qualifying Runs

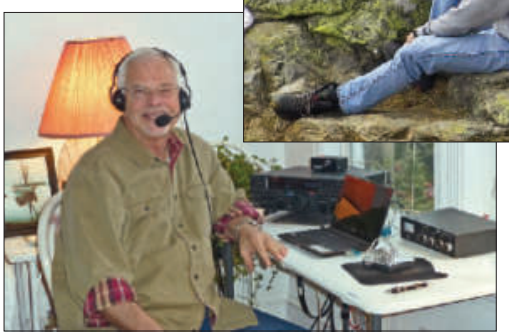
W1AW Qualifying Runs are held at 10 PM EDST on Monday, October 7 (0200 Z, October 8) and at 4 PM EDST (2000Z) on Wednesday, October 23. The West Coast Qualifying Runs will be transmitted by station K9JM at 3590 and 7047.5 at 9 PM PDST on Wednesday, October 16 (0400Z October 17). Unless indicated otherwise, sending speeds are from 10 to 35 WPM.

Strays

Two for One!

During the 2013 North Carolina QSO Party, at exactly 1500 UTC, contact was made between Special Event Station W4C, operated by Marc Sullivan, W4MPS, and an expedition station operated by Tommy Mitchell, W4TZM. Tommy was at the summit of Wesser Bald mountain in far western North Carolina. The brief exchange counted as a Summits On The Air contact for W4C and a North Carolina QSO Party bonus point for W4TZM — two for the price of one contact!

Tommy Mitchell, W4TZM, was atop the summit of Wesser Bald mountain. [Tom Mitchell, photo]



Marc Sullivan, W4MPS, operated special event station W4C. [Eileen Sullivan, photo]

Jon Jones, NØJK, n0jk@arrl.org

Remote Stations

Remote stations bring ethical operating concerns into the shack.

Operating via remote radio stations has become increasingly popular in recent years. It is a way for those living in areas with covenants, conditions and restrictions (CC&Rs), or in apartments or condos to operate using a station better than what would normally be available to them. Some remote stations allow you to log in via the Internet to operate the remote from another state or country. As with many technological advances, new ethical situations may arise. One such situation came to the forefront during the July, 2013 CQ VHF Contest.

During the contest there were "two apparent openings" from the Pacific Northwest to the Ukraine on 6 meters. VE7JH, KB7DQH, KD7UO, KE7V and others reported hearing or working Ukraine stations on 6 meters. While WFWL (Work First, Worry Later) is a DXer's first reflex, later, some worrisome concerns arose. The signals did not peak on the great circle bearing to Eastern Europe. Dave, N7DB, investigated the "openings" and felt it was unlikely ionospheric propagation was present from the Pacific Northwest to Eastern Europe at these times on 50 MHz. No VE4/VA5 beacons were heard and neither were 48/49 MHz Eastern European TV carriers. Dave and others wondered if the contacts had been made through remote stations located in the Puget Sound area.

Remote radio via the Internet has become common with advances in hardware and software. An example is the ARRL® book *Remote Operating for Amateur Radio*.[1] It guides you through the process of establishing your own Internet-controlled station.

It is important, when using a remote station, to be aware of the "unique issues of remote operating," and to sign your call correctly, both for legal and ethical reasons. For example, a station using a Seattle, Washington area remote would sign /W7 and the grid square is the grid the remote station is located in. That way there is no question of what is going on.

[1]Available from your ARRL dealer or from the ARRL Store, ARRL order no. 0922. Telephone toll-free in the US 888-277-5289 or 860-594-0355, fax 860-594-0303; **www.arrl.org/shop/**; **pubsales@arrl.org**.

K4N (EL84) "A FFMA home run!"

EL84 was one of the rarest grids needed for the FFMA "Fred Fish Memorial Award." The K4N group was on the air from Dry Tortugas in the west Florida Keys July 12-15. This is Marshall's, K5QE, account of their trip:

> We logged 1401 contacts on 6 meters with only a few dupes. We worked Lance, W7GJ; Hal, N7NW; Paul, K7CW; Frank, W6BBS, and Mark, W7MEM, via 6 meter EME (moonbounce). We also worked Brad, WQ5S, and Bud, N7CW, using JT65A when we were trying EME. These last two contacts were terrestrial in nature. Maybe something like sporadic E (E_s) and a bit of tropo?
>
> We operated 6 meters with two stations. Station 1 was an IC-756PROII with an M² 6M1K2 amplifier and a 6M5XHP Yagi with a rotator. This station was on the air continuously.
>
> Station 2 was an IC-756PROII with a Lunar-Link LA-62 amplifier and a DEMI preamp. The antenna was a 6M7JHV Yagi with armstrong (manual) rotation (see Figure 1).
>
> K4N had the M² 6M5XHP and the 6M7JHV up on the boat. They were about 20 feet apart. The 6M7JHV was very noticeably quieter than the 6M5XP. We made most all of our contacts with the 6M7JHV. I asked Matt at M² if there could be any reason for this, but he did not have a definitive answer. Remember we were many miles from any other human activity, so the noise we heard was 1) natural or 2) on the boat with us.
>
> On 2 meters, Bill, K5YG, made 50 contacts, one of which was a 2 meter EME contact with Joop, PAØJMV.
>
> The 2 meter station was an ICOM-7000 with a M² 2M12 antenna and about 350 W of power.
>
> Several of our group have wondered if a VHF Grid DXpedition has ever made 1400+ contacts before? Our previous DXpeditions worked 300-400 contacts, so this one was really special for us. Everyone involved wants to thank all the dedicated amateurs out there who spent time listening to the white noise trying to find us on the air. We really do appreciate all those who worked us.

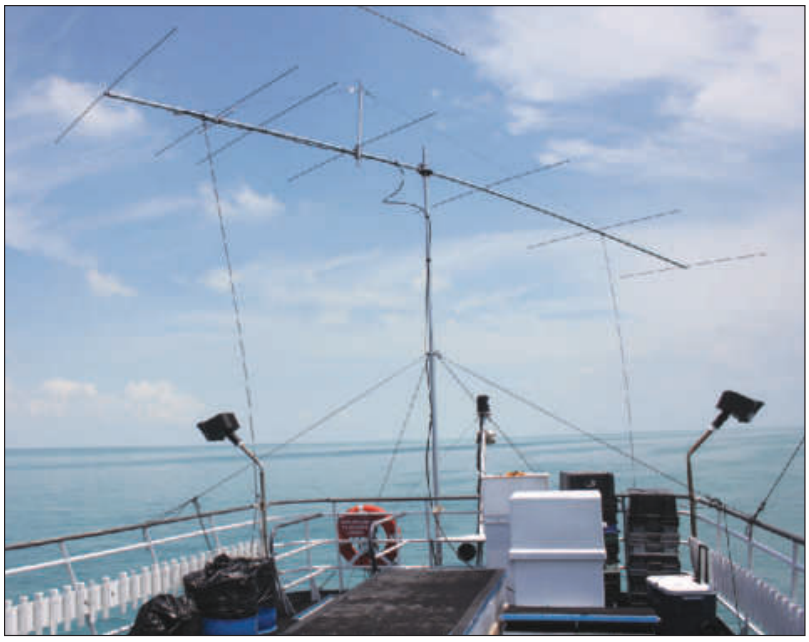


Figure 1 — K4N's station #2 used this 6M7JHV Yagi. This antenna accounted for the majority of the contacts. [Marshall Williams, K5QE, photo]

Our QSL manager is Joey, W5TFW. Please send him your card with an SASE and he will get you a QSL card in return. No LoTW.

This was a difficult enterprise to pull off. The team made it happen. So a big *thank you* to George, NR5M; Pete, K9PW; Jason, N5NU; Dan, N5TW; Bill, N5YA; Bill, K5YG, and Marshall, K5QE.

Larry, NØLL (EM09), worked K4N June 13 at 1532Z on 6 meters. Larry now needs only two more grids to complete the FFMA. Jay, KØGU (DN70), and I also logged K4N on the 13th. I worked K4N at 1602Z from work on a short break using a 2 element Yagi, Marshall, K5QE, was at the mic. On July 7 I heard Doug, VE5UF (DO61) working K4N via multihop E_s at 2245Z (see Figure 2). Doug said he heard K4N for over 2 hours at S-9. This was not the first Grid Expedition to EL84. Back in June, 2004 K4T was active from Dry Tortugas for a few days. It may be many more years before another group as dedicated and well-equipped as K4N go back to Dry Tortugas.

Trans-Pacific Tropo

July 25-27 the famous Pacific tropo duct opened between Hawaii and the US West Coast. Fred Honnold, KH7Y, operated using the KH6HME call sign. On July 25, he reported 22 contacts to southern California, two to northern California and one in Oregon on 2 meters. Fred was running two 7 element Yagis and a TS-2000X transceiver at 100 W from the beacon site on Mauna Loa (see Figure 3). It took him almost 5 hours to drive to the beacon site from his home. Chip, K7JA (DM03), "worked KH6HME (Fred, KH7Y, operator) 25 July at 1857Z. Fred's signal was 51 but building to 55. Propagation is very selective at the moment." Dave, N7DB, reported "Ben, N6FM (CN73), down in Florence, Oregon worked Fred around 2026Z and eventually worked via both CW and SSB on 2 meters. Ben reported he was up to 55 at 2211Z.

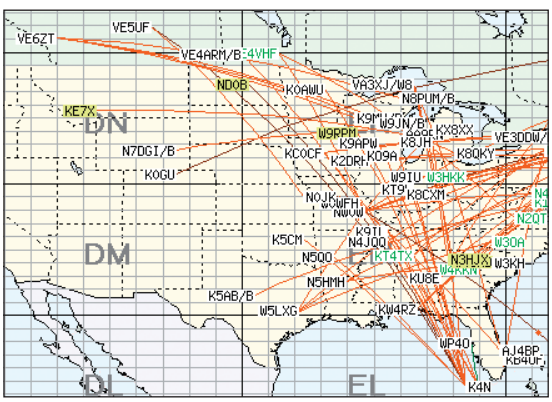


Figure 2 — On July 7 VE5UF (DO61) worked K4N via multihop E_s at 2245Z. [**dxmaps.com**]

Figure 3 — Fred, KH7Y, took this shot of the KH6HME operating site on Mauna Loa during the trans-Pacific tropo opening July 25. [Fred Honnold, KH7Y, photo]

Up the Coast, Ken, W7KKE (CN75), in Lincoln City, Oregon was hearing KH6HME weakly at 2203Z. No contact reported. Farther inland, Lou, WA7GCS, here in CN85 told me he was hearing bits and pieces of CW coming thru on the frequency of KH6HME after 2200Z." The 432 MHz KH6HME beacon was heard July 27 by K6FV (CM87) at 0500Z and K6QXY (CM88) heard both the 432 and 1296 MHz KH6HME beacons all day July 27. Gordon, WB6NOA, who is a longtime observer of the trans-Pacific tropo openings commented that "Here in Orange County, signals were fair, but nothing like openings years ago."

On the Bands

50 MHz Fourth of July Fireworks. There were a number of good openings to Africa, Europe and the Far East, with conditions actually improving toward the end of the month. Bob, K6QXY, worked BV2DQ on July 3 at 0030Z. Mario, K2ZD, worked rare TJ3SN on CW at 2023Z. Mario notes EA8 stations were very loud at this time. Arne, N7KA, heard EA4SV at 2240Z. Jay, KØGU (DN70), worked CU2, CT1 and EA8 around 2245Z, then west to Japan JE1BMJ (QM05) at 2341Z. Jay added BV2DQ to his log at 0018Z on the 4th at 11,295 km. Interesting how 6 meters was open nearly simultaneously to western Africa, Europe and the Far East. This has happened other times as well.

Tim, NWØW (EM47), logged EA8DBM at 2252Z on the 3rd. IK5MEJ noted loud CQs from Dennis, K7BV, at 2251Z. Bill, KØHA, logged GMØEWX, EA4CRP, EA7RM and EA1NL. Chet, W6XK (CM97), logged Randson, BV2DQ, July 4 and also picked up K1TL for his state # 50 on 6 meters. W7MEM Montana also worked BV2DQ for his 6 meter DXCC # 99. Dave, N7DB, logged Han, JE1BMJ, at 0353Z the 4th. WB8VLC/7 (CN84) worked JE1BMJ with 599 signals while running only 35 W at 0400Z the 4th. Mike's power then went out and he ran the radio off batteries. He had a JF2 answer him but had trouble reading the call as the lights were out as he logged the contact! On July 5, Mike, K4PI, logged 13 JA stations. July 6 UTC W7EW heard BA4SI for over an hour. John, KF7PCL, worked JL8GFB at 0440Z.

July 7 was a good day. Dave, N2SLO (FN30), worked N7LKA (DN13) and W4TTU (DN54) at 0100Z for new grids. NH2T Guam heard HA5JI and HA8CE at 0735Z. VE2HAY activated rare grid FO31 and N3MK was one of the lucky ones to work it at 1441Z. The KG4RX Guantanamo Bay DXpedition worked though the midsection. KØHA (EN10) and NØXA (EM28) logged them on the 7th. Bill, KØHA, also worked PJ5/K3TRM.Tim, NWØW, snagged SV1DH at 1755Z for a new country. This may be one of the first contacts for Costas, SV1DH, to the US Midwest since the F2 openings of Solar Cycle 23. Tim also worked 9H1XT and EA7RM.

Europeans had a rare summertime opening to Angola. GØJHC, LA8AJA, OE5MPL and others found rare D2EB around 1900Z. SM6CVX noted D2EB to be "real 599 amazing!" Pat, W5OZI, worked Rafa, XE2OR/m, in grid DL62 July 9 for his #100 grid in Mexico. Is there an award for working 100 XE grids on 6 meters? This is an outstanding accomplishment. Perhaps one of the Mexican radio clubs may sponsor an award for "VUCC-XE."

Dave, N9HF, worked FP/KV1J on the 11th at 1507Z "for a new one." He said the FP never got above S2-S3. AC4G (EM65) reports "a 6 meter E_s opening on the morning of July 12 from 1030Z to 1230Z just after sunrise. Signals topped out at approximately S-5 with most contacts made while receiving stations with S2 signals. The following EU stations were worked or heard: EA1EJ, S57RR, G4RRA, CT1HZE, CT1FFU, CT1DIZ, EA5/GØCSC, CT1FJC, PA2M and K4N (EL84)." Bruce uses a 5 element Yagi and 100 W. Jim, AD1C (DM79), had a strong double hop opening to New England on the 14th between

1857-1921Z including WU1ITU (FN22). He runs an IC-770 transceiver to a G5RV antenna in the attic.

July 15 Rich, K1HTV (FM18), reports KF6A (EN73) copied him (both stations using single Yagis) via EME at 0340Z. "It is encouraging to know that a single Yagi station can copy another single Yagi station via the moon on 50 MHz using JT65A. As EME guru Lance, W7GJ, wrote to KF6A, on the 6 meter ON4KST reflector, "Dan, your 'tiny itty bitty antenna' can act like four Yagis with ground gain. That is the secret weapon of a single good Yagi and clear terrain!" On July 19 (0238Z July 20) Steve, W5KI, in Arkansas worked a loud VYØHL (FP53).

Great E_s was reported Saturday July 20 during the afternoon and evening of the CQ VHF Contest (see Figure 4). Overall, 6 meter propagation was much better than for the ARRL June contest. Several EA8 stations were into Nebraska for KØHA (EN10). Later the band opened to Japan. K4PI worked JA7QVI at 2356Z. Russ, K4QI (FM06), found JE1BMJ above the contest interference for a contact. He had JA4JVA answer his CQ but the JA was covered up by domestic contesters. Chip, K7JA, worked JE1BMJ at 0249Z on the 21st. Strong single and double hop E_s across the country for many. Bill, KØHA, worked 184 grids on 6 meters in the contest. Sunday morning July 21 E_s to the Caribbean with Pedro, NP4A (FK68), very loud for NØJK (EM28) and K3PA (EM29) at 1437Z on double hop E_s. KE7SW (CN87) worked NP4A via triple hop E_s at 1500Z (see Figure 5).

A major late season Far East opening occurred July 26. Ken, AC4TO (EM70), logged JAØMVW at 2335Z on July 26. WP4O (EL87) worked VE7SL (CN88) 2 minutes earlier. N5DG, K5RK and N3XX also reported JA contacts. Jim, W7OUU (DN22), made 10 JA contacts over 3 hours. "The band would come and go in waves. JE1BMJ and JA7QVI were the most consistent reaching 599 at times." Jay, KØGU, logged 28 JAs from 2351Z July 26 to 0142Z the 27th and his second ever South Korean contact — HL5BMX — at 0119Z July 27. South Korean to North America contacts have been very rare on 6 meters in Solar Cycle 24.

On July 28, KØGU (DN70), worked JQ1TIV (PM95) at 2357Z. This is late in the summer E_s season for Japan to North America openings. Jay, KØGU, also worked JE1BMJ and JH1OBS heard the KH9/WA2YUN/B at 2349Z.

144 MHz 2 Meter Meteor Scatter Tropo and E_S. Gedas, W8BYA, worked XE2OR and K4N via meteors.

Brandon, N8PUM (EN66), reports tropo on July 13 UTC to K5SW (EM25) at 0342Z. The next morning Arnold, KE5JXC (EL39), worked WB9LYH (EN54) and N9DG (EN53) over 1000 mile paths at 1445Z. On the 14th, K5SW worked WB9LYH (EN54) and KCØCF (EN32) logged K9MRI (EN70) around 0245Z. Sam, K5SW, also worked AA7A (DM43) on E_s at 1704Z on July 14.

Two meter E_s popped up the morning of July 26. W8BYA (EN70) worked W1COT (FN31) at 1546Z. VE3EN (FN25) logged WB4AEG (EM74) at 1532Z and Sam, K5SW, heard W3EP (FN31).

222 MHz. KE5JXC (EL39) worked N9DG (EN53) July 13 around 1500Z.

432 MHz. N8PUM (EN66) worked W9UIJ (EN52) at 0316Z July 13 via tropo. KE5JXC logged N9DG (EN53) at 1505Z on the 13th.

1296 MHz and Up. On July 30, around 0230Z WZ1V (FN31) noted "WB2SIH (FN31), K3TUF (FN10), WA2LTM (FN20), K2DZM (FN20), K1PXE (FN31), K3GNC (FN20), WB2JAY (FN30) — 1296.110 MHz — big group, good signals." Vic, WB4SLM (EM82), heard the K4UHF (EM85) 1296 and 2304 MHz beacons 599 July 30 around 1130Z.

Here and There

Where next for the K4N group? Mel, KD7DCR, suggested "Now, rest up you guys; DM02 will be 'cooler' next season, eh?" Phil, NØKE, is familiar with the DM02 grid. "The southern part of San Clemente Island west of San Diego is the only land in the DM02 grid and is a military reservation. DM02 may be a difficult one now after 9/11 due to security concerns. Other suggestions of grids to activate are CM79 and several grids in Maine.

Steve, VK3OT, commented on the Solar Cycle 24 VK to North America opening in the August, 2013 WA50 and notes additional openings he has worked.[2] Steve worked Florida and Texas on a number of days in January 2012 and 2013. On January 11, 2011 he worked K7TNT WY, N5JEH NM and K9HMB IL. See a log of Steve's Cycle 24 6 meter contacts from QF12 and VK5PO (PF95) here: **home.vicnet.net.au/~vk3six/blog.htm**.

XRØZR plans to be on the air from Juan Fernandez Island November 8-21, 2013. Josep, EA3AKY, is an active 6 meter DXer and will be part of the group as the primary 6 meter operator. He plans to use a K3 transceiver, PR6 kW amplifier and a 6M8GJ Yagi for both EME and terrestrial operation. The north-south path from North America to Juan Fernandez across the geomagnetic equator is near optimum for TEP and even F2 during periods of high geomagnetic activity. If the second peak of Solar Cycle 24 arrives this fall XRØZR could be in many 6 meter DXers' logs.

[2]J. Jones, NØJK, "World Above 50 MHz," *QST*, Aug 2013, pp 92-94.

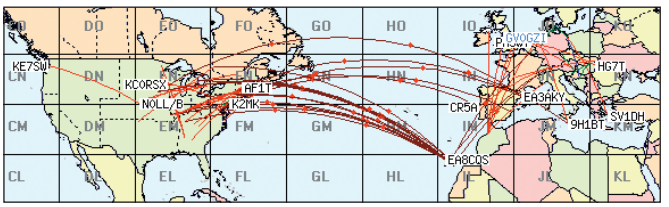


Figure 4 — Operators of the CQ VHF Contest experienced a great E_s opening on July 20. [**dxmaps.com**]

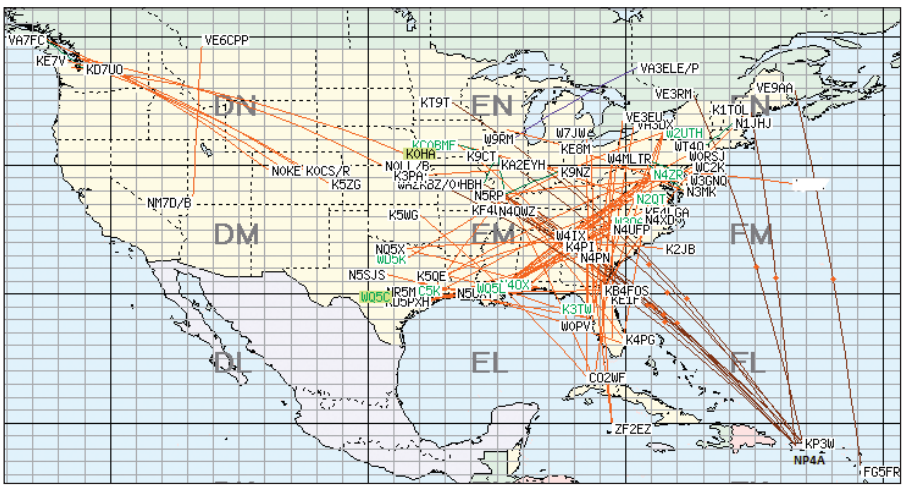


Figure 5 — July 21 was a hot day for Caribbean E_s. [**dxmaps.com**]

John Dilks, K2TQN, k2tqn@arrl.org

K2TQN's Mobile Museum

A wealth of vintage gear housed in a customized RV brought back fond memories for countless hams.

Last month I wrote about the estate of Earl Abbott, W2FTT (SK). After his passing in 1996, I found myself with a big collection that I wanted others to experience. This became the impetus for my mobile museum.

My first attempt at a mobile museum involved taking a vanload of gear to ham club meetings, where I spoke about the various vintage radios and accessories. The talks were popular and I received more invitations than I could accommodate. But it was time-consuming to load the van, drive to the club meeting, unload, give my presentation, pack up the equipment and reload the van, then drive home. Often I arrived home well after midnight. It just wasn't working.

My next idea was to have a museum in my home. But my spouse didn't appreciate this concept, especially after we visited a nice home-style museum in the Boston area. The owner had to get on 2 meters every weekend and call to passing hams to encourage them to turn off the highway and visit his museum. I realized that I would have to do the same.

My final idea was to build my museum in an old RV and drive it to hamfests and club meetings. This way I could bring my museum to the hams rather than trying to get them to come to my museum. Back in 1998 a friend found a suitable vehicle at an auction. It had been some sort of office or mobile shop, so it was completely open inside with no walls — and it was waterproof.

The mobile museum set up at the hamfest at Howard County Fairgrounds, Maryland. [John Dilks, K2TQN, photo]

I bought the vehicle and felt like I was "King of the Road" as I drove it home. That was the beginning of my museum.

I had to design the interior, which was no easy task. Each plan ended up looking like

The original 1932 station. From the left: A 1932 Hammarlund Comet Pro receiver, speaker, coil box and the QSL card of the first owner, Dare Aucott, W3CRY, of Atlantic City, New Jersey; a well-made homebrew 300 W transmitter built by Joe Hoffman, W2DST, of New York. On the table and wall: the 1933 station log, license, lamp and chair of the late Earl Abbott, W2FTT, Manahawkin, New Jersey, and a collection of 1930s QSL cards from southern New Jersey hams. [John Dilks, K2TQN, photo]

This is the working 1950 Collins AM station, which replaced the original 1932 station display. [Mark Garland, N3JLD, photo]

Ron Lawrence, W4RON, and Ernie Hite, WB4KFL (SK), check out the commercial receivers. [John Dilks, K2TQN, photo]

A close-up view of one of the right side displays showing radios from the 1950s to the 1920s. [Mark Garland, N3JLD, photo]

This selection of commercial receivers is on the passenger side of the mobile museum. [Mark Garland, N3JLD, photo]

the inside of a convenience store and I didn't like that. I found "crate" style furniture, at a neighbor's yard sale so I purchased all of it. I converted the furniture into a set of tables and shelves suitable for displaying the equipment. The rustic appearance worked well. Everything I built was fastened to the floor and the walls to keep it secure in transit.

Designing the Exhibit

The RV had two doors — one front and one rear. I wanted the display to follow a timeline that took visitors farther into the past as they moved toward the rear. Entering at the front, visitors saw my first display, a 1932 ham station with vintage QSL cards, logbooks and a 1932 calendar. As they continued to the rear on the driver's side they saw displays of equipment that went from the 1950s to the 1920s. Vintage tubes and a key collection were displayed on a shelf just above. Finally, at the rear was a working pre-1920 spark transmitter.

On the passenger side I installed the sofa and a shelf featuring various manufactured receivers and one heavy transmitter. There would be no more loading and unloading during visits. I was all set to hit the road.

On the Road

I took my mobile museum to the 1998 Antique Wireless Association (AWA) convention in Rochester, New York. I had reserved two spots at the end of a main aisle in the flea market area. This 30-foot spot worked well and I found myself busy for 3 days, unable to take a break most of the time.

The RV's old generator worked flawlessly the whole time. Now that the museum had been fully tested, it was ready for other hamfests and club meetings.

From RV to *QST*

This mobile museum lasted all year; I documented several locations in 1999 and have a lengthy file on my website (**www.k2tqn.com**) that tells the story of those trips.

On a 2-week trip that year I stopped at ARRL headquarters in Newington, Connecticut, and set up in the parking lot. It seemed that most of the employees came out and toured the museum, and Rick Lindquist, WW1ME, took photos to illustrate a story about the museum on ARRL's website.

About 2 months later Rick called me and asked if I would be interested in writing a "Vintage Radio" column for *QST*. Of course I jumped at the chance, and my column premiered in the January 2000 issue of *QST*.

Since 2000 I have updated the 1932 station to a working 1950 Collins AM station. This station was shown a few times but I was forced to take the museum off the road due to medical problems I experienced at the time. It has remained stationary next to my home since then.

Conclusion

I would like to do a road trip to ARRL's Centennial Convention and Hamfest in 2014, but the cost to put the rolling museum back on the road is beyond my means. I paid all of the museum's costs and travel expenses, and I never charged any admission or accepted cash donations.

Operating the mobile museum and sharing my collection have given me great pleasure. The joy I felt while watching old timers relive their memories, hearing grandparents tell their grandchildren how they once had a radio like that way back when, and meeting hams of all ages was immeasurable. I always drove home with a huge smile on my face.

Convention and Hamfest Calendar

Gail Iannone, giannone@arrl.org; www.arrl.org/hamfests-and-conventions-calendar

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

Alabama (Helena) — Oct 12 D F H R T V
9 AM-1 PM. *Spr:* Shelby County ARC. Helena Amphitheater, 4151 Helena Rd. *Tl:* 146.98 (88.5 Hz). *Adm:* $2. Robert Thomas, KC4AF, 205-283-4000; **kc4af@arrl.net**; **www.helenahamfest.com**.

Arizona (Kingman) — Oct 12 D F H R S T V
7 AM-3 PM. *Spr:* Mohave ARC. Centennial Park, 3333 Harrison St. *Tl:* 147.24 (123 Hz). *Adm:* Free. William Smith, KD7MIA, 928-303-9857; **bill1021@gmail.com**; **www.k7mpr.net**.

Arkansas (Morrilton) — Oct 19 F T
8 AM. *Spr:* Randy Griffin Memorial RC. Petit Jean State Park, 1069 Petit Jean Mountain Rd. *Tl:* 146.52. *Adm:* Free. Dale Temple, W5RXU, 501-771-1111; **w5rxu@att.net**; **k5boc.org**.

PACIFIC DIVISION CONVENTION
October 11-13, Santa Clara, CA
D F H Q R S V

Friday 8 AM-Sunday 1 PM. *Spr:* Mount Diablo ARC. (Pacificon 2013). Marriott Santa Clara, 2700 Mission College Blvd. Youth activities, Wouff Hong ceremony, coffee with Gordon West, banquet. *Tl:* 147.06 (100 Hz). *Adm:* adv $23, door $28. Misa Siemons, KJ6BUE, 925-945-8007; **pacificoninfo@pacificon.org**; **www.pacificon.org**.

FALL TECHFEST
November 2, Lakewood, CO
H R S

8 AM-4 PM. *Spr:* 285 TechConnect RC. Lakewood Elks Club, 1455 Newland St. *Tl:* 147.225 (107.2 Hz). *Adm:* $10. Nancy Stitt, KØNNC, 303-838-6427; **k0nnc@arrl.net**; **na0tc.org**.

Colorado (Longmont) — Sep 29 D F H R V
8 AM-2 PM. *Spr:* Boulder ARC. Boulder Cty Fairgrounds, 9595 Nelson Rd. 60th Annual Event. *Tl:* 146.7. *Adm:* $5. Michael Derr, W3DIF, 303-404-2161; **mderr44995@aol.com**; **www.qsl.net/w0dk/barcfest_files/barcfest.html**.

CONNECTICUT STATE CONVENTION
October 13, Meriden, CT
D F H R S T V

8 AM-2 PM. *Spr:* Nutmeg Hamfest Alliance. Sheraton Four Points Hotel, 275 Research Pkwy. 21st Annual Nutmeg Hamfest, ARES/EmComm vehicle display and demo; QCWA informational table; ECARS Net Info; ARRL representatives. *Tl:* 147.36. *Adm:* $7. John Bee, N1GNV, 203-440-4973; **info@nutmeghamfest.com**; **nutmeghamfest.com**.

DELAWARE STATE CONVENTION
October 26, Georgetown, DE
D H Q R S T V

6 AM (tailgating), 7:30 AM-3 PM (indoor expo). *Spr:* Sussex ARA. Sussex Technical High School, 17099 Cty Seat Hwy (Rte 9). Silent Auction. *Tl:* 147.09 (156.7 Hz). *Adm:* $5. Bill Duveneck, KB3KYH, 302-537-4755; **kb3kyh@arrl.net**; **www.radioelectronicsexpo.com**.

Florida (Leesburg) — Nov 2 F T
8 AM-2 PM. *Spr:* Lake ARA. LARA Clubhouse, 11146 Springdale Ave. *Tl:* 147.255 (103.5 Hz). *Adm:* Free. Mike Walker, K9SSL, 352-702-0071; **mwalker@apk.net**; **k4fc.org**.

Coming ARRL Conventions

September 14
Roanoke Division Convention, Virginia Beach, VA*

September 20-21
W9DXCC Convention, Elk Grove Village, IL*

September 20-22
ARRL/TAPR Digital Communications Conference, Seattle, WA*

September 27-28
SEDCO/W4DXCC Convention, Pigeon Forge, TN*

September 27-29
Mid-Atlantic States VHF Conference, Bensalem, PA*

September 28
North Dakota State Convention, West Fargo, ND*
Washington State Convention, Spokane Valley, WA*

September 29
EMCOMM East Convention, Rochester, NY*

October 6
Maryland State Convention, West Friendship, MD*

October 11-13
Pacific Division Convention, Santa Clara, CA

October 12
Iowa State Convention, Sergeant Bluff, IA
Pacific Northwest VHF Conference, Moses Lake, WA

October 12-13
Florida State Convention, Melbourne, FL

October 13
Connecticut State Convention, Meriden, CT

October 18-19
Microwave Update Conference, Morehead, KY

October 26
Delaware State Convention, Georgetown, DE

November 2
Fall TechFest, Lakewood, CO

November 2-3
Georgia Section Convention, Lawrenceville, GA

November 8-9
Midwest Division Convention, Lebanon, MO

November 9
All Ohio ARES Conference, Reynoldsburg, OH

November 16-17
Indiana State Convention, Fort Wayne, IN

December 6-7
West Central Florida Section Convention, Plant City, FL

***See September *QST* for details.**

FLORIDA STATE CONVENTION
October 12-13, Melbourne, FL
D F H Q R S T V

Saturday 9 AM-5 PM, Sunday 9 AM-2 PM. *Spr:* Platinum Coast ARS. Melbourne Auditorium, 625 E Hibiscus Blvd. 48th Annual Melbourne Hamfest, consignment table, ARES Badging, ARRL awards. *Tl:* 146.85. *Adm:* adv $6, door $7. Don Winn, AF4Z, 321-254-9495; **hamfest2013@pcars.org**; **pcars.org**.

Florida (Odessa) — Sep 28 D F H R T
8 AM-1 PM. *Spr:* Suncoast ARC. Gunn Hwy Flea Market, 2317 Gunn Hwy. Pasco Cty Hamfest. *Tl:* 145.35. *Adm:* $5. Ron Wright, N9EE, 352-683-4476; **mccrpt@tampabay.rr.com**; **sarcfl.com**.

Florida (Pinellas Park) — Nov 9 F H R T V
8 AM-noon. *Spr:* St. Petersburg ARC. Freedom Lake Park, 9990 46th St. *Tl:* 147.06. *Adm:* Free. Clayton Parrott, KJ4RUS, 727-215-8140; **clayton_parrott@yahoo.com**; **www.sparc-club.org**.

Georgia (Blythe) — Oct 12 D H R T V
9 AM-2 PM. *Spr:* ARC of Augusta. Blythe Area Community Ctr, 3129 Hwy 88. *Tl:* 145.49. *Adm:* $6. Doug Pugh, KE4JSJ, 803-279-6725; **doug9945@yahoo.com**; **w4dv.org**.

Georgia (LaGrange) — Oct 12 D F H R S T V
9 AM-1 PM. *Spr:* LaGrange ARC. Oakside Baptist Church, 1921 Hamilton Rd. *Tl:* 146.7 (141.3 Hz). *Adm:* $5. Anna Pike, KD4PCU, 334-521-2662; **lagrangehamfest@yahoo.com**; **www.lagrangeradioclub.org**.

GEORGIA SECTION CONVENTION
November 2-3, Lawrenceville, GA
D F H R S T V

Saturday 8 AM-4 PM, Sunday 8 AM-2 PM. *Spr:* Alford Memorial RC. Gwinnett Cty Fairgrounds, 2405 Sugarloaf Pkwy. Stone Mountain Hamfest & Computer Expo, youth lounge, contests, on-site camping. *Tl:* 146.76, (107.2 Hz). *Adm:* adv $6, door $8. Chris Balch, KS4MM, 855-786-8643; **hamfest@stonemountainhamfest.com**; **www.stonemountainhamfest.com**.

Georgia (Rome) — Oct 19 F H R T
8 AM-1 PM. *Spr:* Northwest Georgia ARC. Senior Center, 406 Riverside Pkwy NE. Al Brock Memorial Hamfest. *Tl:* 146.94 (88.5 Hz). *Adm:* Free. Grover Keith, KA5QFI, 706-766-1118; **ka5qfikeith@aol.com**; **w4vo.org**.

Hawaii (Honolulu) — Sep 14 D F H R V
8 AM-noon. *Spr:* Emergency ARC. Fleet Reserve Assn Branch 46, 891 Valkenburgh St. *Tl:* 146.88, 146.80. *Adm:* Donation. Chris Colquhoun, NH7QH, 866-620-0127; **nh7qh@earchi.org**; **earchi.org/**.

Hawaii (Kameula) — Oct 5 F Q R S V
9 AM-2 PM. *Sprs:* Kona ARS, Kohala Hamakua RC, Big Island ARC. Waimea Community Ctr,

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

Mamalahoa Hwy. *Tl:* 443.65 (100 Hz). *Adm:* $5. Stuart Johnston, KH7DX, 808-896-1290; **kh7dx@arrl.net**; **www.cfht.hawaii.edu/~veillet/hwars.html**.

Iowa (Hastings) — Sep 21 D F R
8 AM-1 PM. *Spr:* Heartland Hams ARC. Indian Creek Historical Society Museum, 59256 380th St. *Tl:* 145.29. *Adm:* $3. Donald Brown, AC0TS, 712-526-2080; **don_jean_2000@yahoo.com**; **www.heartlandhams.org**.

IOWA STATE CONVENTION
October 12, Sergeant Bluff, IA
D F H Q R S V

8 AM-2 PM. *Spr:* Sooland ARA. Community Ctr, 903 Topaz Dr. Sioux City Ham Radio Convention. *Tl:* 146.97 (110.9 Hz). *Adm:* $5. Jim Rhodes, KØXU, 712-898-2140; **K0XU@longlines.com**; **www.k0tft.org**.

Kentucky (Hazard) — Oct 26 D F H V
8 AM-noon. *Spr:* Kentucky Mountains ARC. Hazard/Perry Cty Senior Ctr, 354 Perry Park Rd. *Tl:* 146.67 (103.5 Hz). *Adm:* $5. Johnnie Brashear, KY4JLB, 606-487-9347; **jlb741@yahoo.com**; **kmarc.net**.

MICROWAVE UPDATE CONVENTION
October 18-19, Morehead, KY
D F H R S T

Friday and Saturday all day. *Spr:* Jeff Kruth, WA3ZKR. Space Science Ctr at Morehead State University, 235 Martindale Dr. Antenna and equipment testing, tours of 21 meter dish and facilities, banquet. *Tl:* 144.52. Registration: adv $40, door $45. Jeff Kruth, WA3ZKR, 606-356-8900; **kmec@aol.com**; **microwaveupdate.org**.

Louisiana (Pineville) — Oct 19
D F H Q R S T V
8 AM-1 PM. *Spr:* ARC of Central Louisiana. Community Ctr, 708 Main St. *Tl:* 147.33 (173.8 Hz). *Adm:* $5. Scott Wren, KD5DFL, 318-290-3122; **kd5dfl@hotmail.com**; **www.arccla.us**.

Maryland (Hollywood) — Oct 26
D H Q R T
9 AM-3 PM. *Spr:* St Mary's County ARA. Hollywood VFD Bingo Hall, 24801 Three Notch Rd. *Tl:* 146.64 (-146.2 Hz). *Adm:* Free. Ken McNeely, KB3YPY, 301-862-4105; **ken.mcneely@yahoo.com**; **k3nhk.org**.

Maryland (Westminster) — Oct 27
D F H R T
8 AM-noon. *Spr:* Carroll County ARC. Carroll County Agriculture Ctr, 706 Agriculture Ctr Dr. Mason-Dixon Hamfest. *Tl:* 145.41 (114.8 Hz). *Adm:* $5. Steve Beckman, N3SB, 443-435-1089; **n3sb@qis.net**; **www.qis.net/~k3pzn**.

Massachusetts (Cambridge) — Oct 20. Nick Altenbernd, KA1MQX, 617-253-3776; **w1gsl@mit.edu**; **www.swapfest.us**.

Michigan (Kalamazoo) — Oct 20
D F H Q R S T V
8 AM-noon. *Sprs:* Kalamazoo ARC and Southwest Michigan AR Team. Kalamazoo Cty Expo Ctr, 2900 Lake St. *Tl:* 147.04 (94.8 Hz). *Adm:* adv $5, door $6. Hollis Locke II, WB8ALW, 269-213-5272; **wb8alw@w8vy.org**; **KalamazooHamFest.com**.

Michigan (Muskegon) — Oct 19
D F H Q R S V
8 AM-noon. *Spr:* Muskegon County Emergency Communication Services. Fellowship Reformed Church, 4200 E Apple Ave. *Tl:* 146.82 (94.8 Hz). *Adm:* adv $5, door $6. James Duram, K8COP, 231-638-7010; **hamfest@mcecs.net**; **www.mcecs.net/Hamfest.htm**.

Missouri (Belton) — Oct 19 D H R S V
8 AM-1 PM. *Spr:* SouthSide ARC. St Sabina Catholic Church, 700 Trevis Ave. *Tl:* 147.12 (151.4 Hz). *Adm:* adv 3 for $7, door $4 each. Forrest Creason, KDØRSX, 816-714-8647; **KD0RSX@gmail.com**; **southsidearc.net**.

Missouri (Kirkwood) — Oct 26 D F H V
7:30 AM-12:30 PM. *Spr:* St Louis ARC. Kirkwood Community Ctr, 111 S Geyer Rd. 22nd Annual Halloween Hamfest. Breakfast made to order. *Tl:* 147.15. *Adm:* adv $3 each or 4 for $10; door $5 each or 2 for $10. Bob Sluder, NØIS, 636-285-7605; **bcsluder@msn.com**; **www.halloweenhamfest.org**.

MIDWEST DIVISION CONVENTION
November 8-9, Lebanon, MO
D F H Q R S T V

Friday 6-9 PM, Saturday 8 AM-4 PM. *Spr:* Lebanon ARC. Cowan Civic Ctr, 500 E Elm St. W1AW/Ø Special Event Station On-The-Air, special guest speakers including astronaut Steven Nagel. *Tl:* 146.7 (88.5 Hz). *Adm:* adv $5, door $7. Ron Lowrance, K4SX, 636-745-0078; **k4sx@centurytel.net**; **www.arrlmidwestconvention.com**.

Nebraska (Papillion) — Oct 19 D F H R T
9 AM-2 PM. *Spr:* 3900 Club. American Legion Post 32, 230 W Lincoln St. *Tl:* 147.39. *Adm:* $5. Tom Huber, WDØBFO, 402-734-0523; **wd0bfo@cox.net**; **www.3900Club.com**.

New Hampshire (Londonderry) — Nov 2
D F H R T V
8 AM-noon. *Spr:* Interstate Repeater Society. Lion's Hall, 353 Mammoth Rd. *Tl:* 146.85 (85.4 Hz). *Adm:* $3. Chris Martin, KB1QVM, 603-434-6137; **kb1qvm@yahoo.com**; **www.irs.nhradio.org**.

New Jersey (Lakewood) — Oct 12
D F H R T V
6 AM-noon. *Spr:* Jersey Shore ARS. Pine Park, 500 Country Club Dr. *Tl:* 146.91 (127.3 Hz). *Adm:* $5. George McGlaughlin, K2HCW, Box 811, Ocean Gate, NJ 08740; 732-237-9448; **k2hcw@comcast.net**; **www.jsars.org**.

New Jersey (Mullica Hill) — Sep 15
D F H Q R T V
8 AM. *Spr:* Gloucester County ARC. Gloucester Cty 4-H Fairgrounds, 240 Bridgeton Pike (Rte 77). *Tl:* 147.18 (131.8 Hz). *Adm:* $8. Cory Sickles, 856-582-9146; **wa3uvv@arrl.net**; **w2mmd.org**.

New Jersey (Township of Washington) — Oct 12 D F H Q R T V
8 AM-2 PM. *Spr:* Bergen ARA. Westwood Regional High School, 701 Ridgewood Rd. *Tl:* 146.79 (141.3 Hz). *Adm:* $5. Jim Joyce, K2ZO, 286 Ridgewood Blvd N, Township of Washington, NJ 07676; 201-664-6725; **k2zo@arrl.net**; **bara.org**.

New Jersey (Township of Wall) — Sep 28
D F H T V
6 AM-1 PM. *Spr:* Ocean-Monmouth ARC. InfoAge Learning Ctr, Project Diana Site, 2300 Marconi Rd. *Tl:* 146.775 (103.5 Hz). *Adm:* $5. Jeff Harshman, N2LXM, 732-996-0637; **n2lxm@arrl.net**; **n2mo.org**.

New Mexico (Roswell) — Oct 5 H T
7 AM-5 PM. *Spr:* Pecos Valley ARC. Cielo Grande Recreation Area (Old Roswell Airport), 1612 W College Blvd. *Tl:* 147.32 (162.2 Hz). *Adm:* Free (if not tailgating). Jim Tucker, KBØQNW, 575-208-9696; **kb0qnw@yahoo.com**; **www.w5zu.com**.

New Mexico (Socorro) — Oct 26
D H R S T V
8 AM-3 PM. *Sprs:* Socorro ARA, Tech ARA, and the City of Socorro. NM Firefighters Training Academy, 600 Aspen St SW. *Tl:* 146.68 (100 Hz). *Adm:* Free. Al Braun, AC5BX, 575-835-3370; **ac5bx@juno.com**; **www.socorroara.org**.

New York (Hicksville) — Oct 27
D F H Q R V
9 AM-2 PM. *Spr:* Long Island Mobile ARC. Levittown Hall, 201 Levittown Pkwy. Tune-up clinic. *Tl:* 146.85 (136.5 Hz). *Adm:* $6. Richard Cetron, K2KNB, 516-694-4937; **richierec@arrl.net**; **www.limarc.org**.

New York (Queens) — Oct 6 D F H Q R T V
9 AM-2 PM. *Spr:* Hall of Science ARC. NY Hall of Science Parking Lot (Flushing Meadow Corona Park), 47-01 111th St. *Tl:* 444.2 (136.5 Hz). *Adm:* buyers $5, sellers $10 per space plus $5 adm. Stephen Greenbaum, WB2KDG, 718-898-5599; **WB2KDG@arrl.net**; **www.hosarc.org**.

North Carolina (Maysville) — Oct 13
D F H R T
8 AM-3 PM. *Spr:* Maysville Hamfest Assn. Rotary Park Community Ctr, 704 8th St. *Tl:* 145.31 (82.5 Hz). *Adm:* Free. Byron Highland, K4BMH, 252-347-1498; **bhighland@nc.rr.com**.

Ohio (Georgetown) — Nov 2 D F H R V
8 AM-2 PM. *Spr:* Grant ARC. ABCAP Bldg, 406 W Plum St. *Tl:* 146.73. *Adm:* $2. Rodney Crawford, WD8CTX, 937-446-2338; **wd8ctx@juno.com**; **www.garcohio.net**.

Ohio (Massillon) — Nov 3 D F H Q R S V
8 AM-2 PM. *Spr:* Massillon ARC. Massillon Boys and Girls Club, 730 Duncan St SW. 53rd Annual Hamfest. Auction. *Tl:* 147.18 (110.9 Hz). *Adm:* $5. Terry Russ, N8ATZ, 330-837-3091; **truss@sssnet.com**; **www.w8np.org**.

ALL OHIO ARES® CONFERENCE
November 9, Reynoldsburg, OH
R S V

8 AM-5 PM. *Spr:* ARRL Ohio Section. Ohio Fire Academy, 8895 E Main St. Go Box Display, EmComm Vehicle/Trailer Display. *Tl:* 147.06 (94.8 Hz). *Adm:* Free. Scott Phillips, N8SX, 440-258-3934; **n8sx@arrl.net**; **www.arrl-ohio.org/SEC/default.html**.

Oklahoma (Ardmore) — Oct 25-26
D F H R S V
Friday 5-8 PM, Saturday 8 AM-1 PM. *Spr:* Texoma Hamarama Assn. Ardmore Convention Center, 2401 N Rockford Rd. *Tl:* 146.97. *Adm:* adv $8, door $10. Henry Allen, W5TYD, 214-673-7942; **w5tyd@arrl.net**; **texomahamarama.org**.

Oklahoma (Enid) — Nov 2 D F H R S V
8 AM-3:30 PM. *Spr:* Enid ARC. Hoover Bldg, 316 E Oxford Ave. *Tl:* 145.29. *Adm:* $2. Bill Keck, K5ECI, 580-233-2496, **k5eci@sudden link.net**; **www.enidarc.org/enidhamfest**.

Pennsylvania (Sellersville) — Oct 20
D F H R T V
7 AM-1 PM. *Spr:* RF Hill ARC. Sellersville Firehouse, 50 N Main St. *Tl:* 145.31 (131.8 Hz). *Adm:* $6, non-ham spouses and children free. Jim Soete, WA3YLQ, 215-723-7294; **wa3ylq@hotmail.com**; **www.rfhill.ampr.org**.

Pennsylvania (Washington) — Nov 3
D H Q R S T V
8 AM-3 PM. *Spr:* Washington Amateur Communications. Washington Cty Fairgrounds,

2151 N Main St. *Tl:* 146.79, 147.27. *Adm:* $5. Bud Plants, N3TIR, 724-350-6745; **bud@n3tir.com**; **www.wacomarc.org/hamfest.html**.

South Carolina (Conway) — Nov 9
D F H R S T V
7 AM (flea market), 8 AM (indoors). *Spr:* Grand Strand ARC. Old Pee Dee School (Academy of Hope), 3521 Juniper Bay Rd. *Tl:* 145.11 (85.4 Hz). *Adm:* adv $6, door $7. Edward Jordan, KF4ECK, 843-458-3856; **kf4eck@w4gs.org**; **www.w4gs.org**.

South Carolina (Rock Hill) — Oct 5
D F H R T V
7 AM-2 PM. *Spr:* York County ARS. Faith Assembly of God, 2800 Faith Blvd. *Tl:* 147.03 (88.5 Hz). *Adm:* $5. Ken Tedder, WB4BSW, 803-389-0584; **ktedder@rhtc.net**; **www.rockhillhamfest.com**.

South Carolina (Sumter) — Oct 26 D F R T
8 AM-4 PM. *Spr:* Sumter ARA. Bethel Baptist Church, 2401 Bethel Church Rd. *Tl:* 147.015. *Adm:* $5. Thomas D'Anella, KC4ZTC, 803-661-9934; **tdanella@sc.rr.com**; **sumterhamradio.org/**.

Tennessee (Bristol) — Oct 19
D F H R S T V
8 AM-2 PM. *Spr:* GrayHamfest Assn. Bristol Motor Speedway, 151 Speedway Blvd. *Tl:* 145.29 (103.5 Hz). *Adm:* $7. Charles Stuchell, K4CWA, 423-538-3868; **k4cwa@arrl.net**; **grayhamfesttn.org**.

Tennessee (Chattanooga) — Oct 26
D F H R S T V
8 AM-3 PM. *Spr:* Chattanooga ARC. Alhambra Ctr, 1000 Alhambra Dr. *Tl:* 146.79. *Adm:* $5. Wayne James, WB4IEJ, 423-899-7970; **Hamfest@W4AM.org**; **www.w4am.org**.

Texas (Aransas Pass) — Nov 2
D F H R S T V
8 AM-2 PM. *Spr:* South Texas ARC. Aransas Pass Civic Ctr, 700 W Wheeler Ave. 15th Annual Coastal Bend Hamfest. *Tl:* 146.82 (107.2 Hz). *Adm:* $8. Albert DeMeulle, KF5ARJ, 361-633-9330; **demeulle@cableone.net**; **n5crp.org**.

To All Event Sponsors

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

Events that are sanctioned by the ARRL receive special benefits, including an announcement in these listings and online. Sanctioned conventions are also listed in the *ARRL Letter*. In addition, events receive donated ARRL prize certificates and handouts.

For hamfests: Once the form has been submitted, your ARRL director will decide whether to approve the date and provide ARRL sanction. *For conventions:* Approval must come from your director and the ARRL executive committee.

The deadline for receipt of items for this column is the **1st of the second month preceding publication date**. For example, your information must arrive at HQ by **October 1** to be listed in the **December** issue. Information in this column is accurate as of our deadline; contact the sponsor or check the sponsor's website for possible late changes, for driving directions and for other event details. Please note that postal regulations prohibit mention in *QST* of games of chance such as raffles or bingo.

Promoting your event is guaranteed to increase attendance. As an approved event sponsor, you are entitled to special discounted rates on *QST* display advertising and ARRL web banner advertising. Call the ARRL Advertising Desk at 860-594-0207, or e-mail **ads@arrl.org**.

Texas (Azle) — Nov 9 D F H S T V
7 AM-1 PM. *Spr:* Tri-County ARC. Azle Community Center, 404 W Main St. *Tl:* 147.16 (110.9 Hz). *Adm:* $5. David Johnson, KB5YLG, 817-995-7832; **kb5ylg@yahoo.com**; **www.wc5c.org/WC5CClub/NCTECH/tabid/152/Default.aspx**.

Washington (Bremerton) — Oct 19 D F H R
9 AM-3 PM. *Spr:* North Kitsap ARC. VFW Hall, 9981 Central Valley Rd. *Tl:* 146.44. *Adm:* $2. Al Warner, KE7RPR, 360-830-3683; **adw52@msn.com**; **www.nkarc.org**.

PACIFIC NORTHWEST VHF CONFERENCE

October 12, Moses Lake, WA
H Q R S T
8 AM-4 PM. *Spr:* Pacific Northwest VHF Society. Best Western Plus Lake Front Hotel, 3000 W Marina Dr. 19th Annual Conference. *Tl:* 144.2 USB. Registration: adv $40, door $50. James Christiansen, K7ND, 253-549-4062; **secretary@pnwvhfs.org**; **pnwvhfs.org**.

Wisconsin (Colby) — Oct 12 D H R
8 AM-noon. *Spr:* Black River ARA. Colby Lions Pavilion, 103 W Adams St. 8th Annual Central Wisconsin Swapfest. *Tl:* 147.15 (114.8 Hz). *Adm:* $3. Bob Braun, KB9BLV, 715-654-5552; **kb9blv@yahoo.com; myplace.frontier.com/~centralwihamfest**.

Wisconsin (Hubertus) — Oct 13 D F H R
8 AM-2 PM. *Spr:* Southeastern Wisconsin FM Amateur Repeater Society. Richfield Chalet, 1271 Hwy 175. *Tl:* 146.82 (127.3 Hz). *Adm:* $5. Darrell Welch, K9ABC, 414-899-6010; **dw@charter.net**; **www.sewfars.com**.

New Books

Reviewed by Rick Lindquist, WW1ME

World War II Radio Heroes — Letters of Compassion (2nd edition)

By Lisa L. Spahr with Austin Camacho

This second edition of Lisa Spahr's *World War II Radio Heroes* updates the original book, published in 2007. The "heroes" of this relatively easy but historically informative read are the various compassionate radio amateurs and short-wave listeners who intercepted messages from or about members of the US Armed Forces being held as prisoners of war that were included in German and Japanese propaganda broadcasts. The author's grandfather Robert Spahr — "Pappy" — was one of those POWs, and she only learned of the radio messages some six decades later, after examining the contents of her grandfather's "war trunk," which contained dozens of letters containing messages that listeners had copied and mailed to Spahr's family. The book contains images and transcriptions not only of letters from radio listeners reporting on her grandfather's situation but those recounting messages of other POWs as well.

Many radios produced during the 1930s and 1940s covered the short-wave bands, and these — plus the possibly superior equipment possessed by a few radio amateurs who had been put off the air for the duration of the war — made it possible for many people to hear, transcribe and relay these critical messages to family members back home. As Spahr explains, "*Calling Back Home* was a nightly radio program that was broadcast from Berlin, Germany, on Radio Berlin, a station playing propaganda day and night. POWs' names, next of kin, and short messages would be read over the airwaves."

A very personal book, *Radio Heroes* also represents a continuation of Spahr's campaign to gain greater recognition for those individuals who passed on thousands of messages to families of POWs. She would like to see a documentary or even a feature film on the subject and has spoken on the topic at Dayton Hamvention.

She's waiting in the meantime to hear from still others whose lives were touched and brightened by the efforts of these casual radio listeners during a difficult time in the nation's history.

Spahr Consulting, 2013. ISBN 978-0-9891914-0-1, softcover, 7.2 × 10 in, 210 pp. Available from Amazon.com, $16.47.

75, 50 and 25 Years Ago

Al Brogdon, W1AB

October 1938

- The cover photo shows George Grammer, W1DF, tweaking his latest project, an inexpensive single-signal receiver (described in this issue).
- The editorial speaks to the matter of the amateur being balanced in his pursuit of Amateur Radio, one of the points in the Amateur's Code.
- Ed Handy, W1BDI, takes us on "A Visit to W1AW," the new Maxim Memorial Station.
- In "Amateurs Aid Hughes on World Flight," By Goodman, W1DX, tells how hams helped with communication as Howard Hughes recently set a new world's speed record for a round-the-world flight.
- J. E. Jennings, W6EI, describes his latest four-stage rig, in "A Six-Band One-Kilowatt Transmitter."
- "Characteristics of Sky-Wave Transmission," by Harner Selvidge, W9BOE, presents some practical information on the subject that is of interest to hams.
- T. M. Ferrill, W1LJI, discusses effective design of low-power R.F. and audio stages, in "Refinements in Combination Exciters."

October 1963

- The cover is a photo of the Single-Sideband Sixer (described in this issue), with part of its schematic diagram as the background.
- Jay Gooch, W9YRV, and Estil Carter, WA9DNF, report on "The Single-Sideband Sixer," a 12-watt beam-deflection-tube transmitter.
- Theo Brunner, W4MTM, performs some modifications to get on "S.S.B. with an AN/ART-13."
- In Part I of "Basics for Beginners," George Grammer, W1DF, discusses "Antennas and Feeders."
- Once again, John Troster, W6ISQ, brings tears of laughter to our eyes with his discussion of 'phone net operation, in "QMT." Some of us have likely heard the net he writes about.

October 1988

- The cover photo shows the Ariane-4 rocket just before it launched AMSAT's OSCAR 13 and placed it into orbit.
- The editorial reports on "Black Thursday" — August 4, the day that we received the bad news about losing 2 MHz of the 220 MHz band. The fight goes on….
- Zack Lau, KH6CP, describes "A Relative RF Ammeter for Open-Wire Lines."
- With solar cycle 22's peak soon to come, Don Button, AJ1T, tells us how to "Build a Simple 12-Meter Beam."
- Today's high-power tubes are more difficult to "tame" than the older tubes, so Richard Measures, AJ6K, discusses how to obtain "Improved Anode Parasitic Suppression for Modern Amplifier Tubes."
- HQ's Phil Sager, WB4FDT, gives us the details of the bad news from Washington, in "FCC Reallocates 220-222 MHz — ARRL Fights On!"
- "A Concise History of the ARRL Headquarters Station." The first HQ station, 1MK, was put on the air by the HQ hams in 1924.

Field Organization Reports

July 2013

Public Service Honor Roll

This listing recognizes radio amateurs whose public service performance during the month indicated 70 or more points in six categories. Details on the program can be found at **www.arrl.org/public-service-honor-roll**.

538 W5KAV
504 KC8QWH
413 KD8HPG
390 KØIBS
370 KT2D
366 KJ4G
364 KB8VXE
315 WB8RCR
313 WB9FHP
309 N8JMW
293 WM2C
270 KB2ETO
255 N8OSL
250 KK4BVR
220 WA3EZN KA2ZNZ
216 KBØDTI
212 WB8R
210 WD8USA
207 WB8YYS
200 W4SEE
198 KE7QPV
195 W9ILF KC5ZGG K7EAJ N7CM
190 KK5NU K2ABX
189 K2HAT W2MTA
182 KD5RQB
180 AG9G KB8QKC K8RDN
179 KC8EIA
173 KB2KOJ
170 W9BGJ W5DY W4DNA
168 KF7PDV
166 N9WLW W9EEU
160 KE4CB KGØGG KE5HYW KB2RTZ KK3F N8FVM
155 N5TMC WK4P KK7DEB
150 WB9WKO WB4ZIQ KD8QPF
147 K2GW
145 N7IE
140 W7ARC WB9QPM WE2G KB2BAA KC2QVT W7FQQ VE7GN KB1NMO N8IO K7OAH WA4STO N1UMJ
139 KA8ZGY
137 W3CB
135 W3YVQ NX8A
134 K4BEH
130 K1PJS K7BFL K2TV N9VC WV8CH WB2FTX K6JT WA2NDA K6FRG W8DJG K4GK WI2G K4IWW KJ4JPE KW1U
129 N2GJ
127 W1INC
125 WS6P N2JBA
124 K9DUR
122 KJ6PCC
121 AE5VY KD7THV
120 KØVTT KA4FZI K9LGU WA5LOU KF5IOU K6HTN WØLAW N2WKT WK4WC KO4OL NA7G WB8WKQ
118 W9WXN W7JSW
115 WO2H WA1STU KB1UAU N8CJS K4JUU KØPTK
112 WA7PTM
111 N2RTF
110 VE3GT WA1MXT W7GB N7YRT N7EIE WA4BAM NX9K K5AXW KC5OZT WB6UZX K7BDU W7QM W2EAG WB4Y KF7GC N7XG N7YSS N1IQI K1YCQ KA1G N9MN
106 KB1YNE
105 KF5TTN AK4RJ W4TTO
KK7TN N1TF
103 K7MQF K4VWK
101 KC2UMX
100 K9JM K7HRW N2WGF W8CPG WØCLS NØMEA WAØVKC N1JX N3RB KB2QO AB9ZA KA9QWC KB5KKT W5CU AA2SV K6JGL N3SW AA3SB KB3LNM WB4FDT N9VT NM1K NØYR W8MAL WG8Z K4SCL W7YV K8VFZ WB8TQZ
97 N2DW KB8RCR W3GQJ
95 WAØCGZ
94 W2CC KC5MMH KC2SFU
93 WØRJA
92 KD2DEJ
91 NU8K
90 N3KB KT5SR N5RL KA5AZK N3ZOC K3IN K1HEJ N8IBR KB8HJJ WB4BIK N5NVP WB6OTS NS7K K8KV KJ4HGH
89 KC8BW
88 KJ7NO
86 KB9KEG N1LKJ
85 N5MBQ KR6LH
84 KC2EMW
83 NC3F KC4BQK K7FLI
82 AB1AV KE5YTA
81 WDØGUF
80 KU6J W6KJ N1ZIH WA9QIB KØDEU NIØI NØMHJ KCØZDA KA2GQQ N2VC KB7RVF KC7ZZ KZ8Q KB1WXC WB8RJW
79 KJ6IJJ
78 K9LOT WB3FTQ
77 AJ7B N8SY
76 NA9L W8IM
75 W5XX
74 KB5PGY
73 N9EXM
71 KC4PZA
70 K6RAU KDØAYN KØDLK NØDUW NØDUX WØFUI KDØNJK N3NTV KØRXC KD7ZUP N2YJZ KA8IAF

The following stations qualified for PSHR in previous months, but were not recognized in this column yet. (June) KO4OL 130, KC4BQK 77. (May) KO4OL 195, KC4BQK 77. (Apr) KO4OL 110, KC4BQK 83.

Section Traffic Manager Reports

The following Section Traffic Managers reported: AK, AL, AR, CT, DE, EB, EMA, ENY, EPA, EWA, GA, IA, ID, IL, IN, KS, KY, LA, LAX, MDC, ME, MI, MN, MS, NC, NE, NFL, NLI, NNJ, NTX, OH, OK, OR, ORG, SD, SFL, SJV, SNJ, STX, SV, TN, UT, VA,

Section Emergency Coordinator Reports

The following ARRL Section Emergency Coordinators reported: ENY, EWA, GA, IA, ID, IN, KS, MDC, MI, MN, NC, ND, NLI, OH, OK, STX, SV, TN, WV.

Brass Pounders League

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

NX9K 3645, WB9FHP 2832, KK3F 2720, WA4STO 1759, K6HTN 1315, K7BDU 1051, N9VC 889, N1IQI 834, WØRJA 813, K6FRG 780, NS7K 687, K6JT 680, WA3EZN 589, KW1U 519.

The following stations qualified for BPL with Originations plus Deliveries: NM1K 134, K8LJG 111.

Silent Keys

Silent Keys Administrator, sk@arrl.org

It is with deep regret that we record the passing of these amateurs:

KB1IGN **Ray**, Richard F., Gloucester, MA
WA1JYO **Klecowsky**, Vera M., West Haven, CT
W1KVQ **Ryan**, Herbert G., S Hamilton, MA
K1MKY **Janacek**, Michael J. II, Terryville, CT
K1NED **Morris**, Harold H., North Smithfield, RI
W1OBR **Obermeier**, Raymond, Port Richey, FL
W1SVT **Gates**, Randall H. Sr, Pownal, VT
W1WLG **Aldrich**, John D., Portsmouth, RI
W1YTQ **Bean**, Fred W. Sr, Brewer, ME
KA2AJX **Soganic**, George M. Sr, Titusville, NJ
KC2AU **Abraham**, Louise E., Fulton, NY
WA2CKK **Heifferman**, Charles, Tamarac, FL
KW2D **Jaworski**, Peter C., Ancram, NY
KC2EP **Landell**, William F., Mount Holly, NJ
KA2FWE **Cox**, Frank J., Port Orange, FL
ex-KA2GCK **Nolles**, Sytze, Ballston Spa, NY
WA2IDY **Schecter**, Martin, Boynton Beach, FL
K2JK **Easton**, Elmer C., Piscataway, NJ
K2MFA **Vitale**, Robert J., Syracuse, NY
WA2MGE **Conway**, John D., Roswell, NM
N2OLF **O'Brien**, Robert M. Sr, Lodi, NY
ex-N2ROC **Fredrickson**, Theodore, Rochester, NY
KB2SLC **Dodge**, Frederick P., Albany, NY
WB2UDV **Jensen**, A. "Vern," Neptune, NJ
WA2UYM **Jaworski**, Regina, Ancram, NY
K2WT **Rodriguez**, William B. Sr, Weeki Wachee, FL
KB3AIK **Pragel**, John W., Eldersburg, MD
AB3J **Balogh**, Joel, Landenberg, PA
ex-WB3JQF **Kelly**, Alex "Zel" F., Wilkes Barre, PA
W3NCX **Mohr**, Henry T., Allentown, PA
♦ KB3RI **Mulrooney**, Robert J., Wilson Borough, PA
K3SIS **Smith**, William J., Carmel, IN
K4AKU **Hart**, Norman E., Clearwater, FL
N4AYN **Judd**, Dennis L., Powder Springs, GA
K4BDY **Wilbanks**, William R., Americus, GA
K4CBS **Evans**, David E., Fort Pierce, FL
K4ENL **Bamford**, David A., Holden Beach, NC
KG4GOY **Brown**, Luther, Wilmington, NC
K4GXZ **Comer**, Herman Jr, Lebanon, TN
♦ W4HFU **Emens**, Frank H., Huntsville, AL
K4HNI **Allen**, John, Knoxville, TN
W4INO **Thompson**, Marion L., Atlanta, GA
AF4IZ **Silvers**, Mike V., Chattanooga, TN
KG4JNX **Smith**, Stanley T. Jr, Mobile, AL
WB4LQX **Sims**, Charles W., Florence, AL
WB4MNZ **Gaskins**, Malcolm B., Campbellsville, KY
W4NMK **Reilly**, Jeremiah "Dan" Jr, Black Mountain, NC
KF4PMG **Church**, Carmen K., Live Oak, FL
K4RRN **Gilbert**, Barbara S., Bristol, TN
KD4SGJ **Ethridge**, Michael F., Bonaire, GA
KA4ZPV **Trio**, Russell "Rosario," Statesboro, GA
KC5BFZ **Storey**, Kirk L., Haworth, OK
KD5BNM **Reuter**, Jeffrey P., Fort Lee, VA
ex-KE5DYC **Bryant**, Carroll "C.D.," Magee, MS
ex-N5EL **Bumpus**, Floyd, Temple, TX
KM5IO **Barker**, Charles W., Hobart, OK
♦ W5MV **Brock**, Ralph H., Lubbock, TX
W5NUI **Prine**, James R., Stayton, OR
AC5PH **Pepin**, George P., Broken Arrow, OK
K5PS **Smith**, Paul S., Mena, AR
W5PUP **Whitecotton**, Betty L., Gary, TX
KA5RMT **Maniago**, Reynaldo G., Vernon, TX
KC5WEN **Bell**, Victor P., Azle, TX
KR5Z **Dishon**, Dale, Palestine, TX
KK6BIL **Carpenter**, Mark C. Jr, Sanger, CA
K6JGV **Just**, Orson N., Torrance, CA
WA6LVH **Mattson**, Philip T. Jr, La Jolla, CA
W6NTD **Weathers**, William A., Redding, CA
WB6NXQ **Taylor**, Ralph O., Lemoore, CA
KH6SQ **Clayton**, Terrence F., Pukalani, HI
KA6UHP **Salzman**, Norman, Santa Barbara, CA
W6UTE **Shaphran**, Nathan, Culver City, CA
K6YVG **Ryan**, Robert B., Medford, OR
KD6ZVK **Johnson**, Keith Eric., Kentfield, CA
♦ W7DEO **Ferree**, Gary B., Great Falls, MT
WB7ECD **Derus**, Thomas J., Acme, WA
W7GAP **French**, Grant H., West Valley City, UT
ex-KC7PDM **Statler**, Eugene D., Spokane, WA
N7PXN **Johnston**, Jeanne R., Astoria, OR
KE7UQM **Beaudreau**, Garry M., Coeur d'Alene, ID
W7VG **Sexton**, Charles D., Portland, OR
KI7WZ **Hutson**, David K., Nampa, ID
KD8AUL **Dean**, Eric R., Newport, MI
N8AWO **Henderson**, James T., South Bend, IN
N8AYF **Sosnowski**, Chester S., Kawkawlin, MI
K8BSM **Sargent**, Jack W., Kettering, OH
W8FBX **Siebert**, Donald, Smithland, KY
KC8FZU **Gammey**, Edward C., Cleveland, OH
K8KAE **Chopko**, Edward J. Sr, Newton Falls, OH
W8KQZ **Hoover**, Russell L., Dayton, OH
W8MUA **Martin**, Bob, Olmsted Falls, OH
WN8MWM **Nicodemus**, Scott L., Bradford, OH
K8QIV **Gill**, Kenneth F., Olmsted Falls, OH
WD8QJC **Olson**, Betty A., Ironwood, MI
KB8VZN **Emery**, Earl, Flint, MI
N8WWM **Adair**, Douglas W., Toledo, OH
W9ALA **Griffith**, Timothy N., Energy, IL
W9BTH **Beutner**, Grant C., Milwaukee, WI
K9EAR **Teel**, James R., Eureka, IL
KC9IEL **Milner**, Catherine A., Cold Spring, WI
N9LXS **Love**, Russell L. Sr, Cedarville, IL
N9LXX **Fox**, Ronald B., Springfield, IN
♦ KJ9N **Pickering**, Alan J., Duette, FL
KB9NLS **Anderson**, Jean E., Rockford, IL
K9PE **Paus**, Elton E., Madison, WI
ex-N9QQG **Wright**, Melvin O. Jr, Freeport, IL
KC9QQN **Hawkins**, Terry, Milton, WI
WA9UVK **Roehner**, Herbert W., Port Washington, WI
KA9VSV **Beebe**, Harley D., Loves Park, IL
KA9WGG **Wing**, David S., Freeport, IL
KDØBKH **Rust**, Edwin A. II, Kansas City, KS
NØBTC **Bramstedt**, Kathryn A., Hugo, MN
KAØCNK **Schoening**, Galen W., Albion, NE
WØEOL **Jacobson**, Harry C., Clinton, OK
WDØFCK **Scholl**, Floyd D., Wayne, NE
WØHJZ **Weimer**, Donald G., Westwood, KS
WØML **Parries**, Marlowe M., Moorhead, MN
KCØRL **Olson**, Eugene L., Colorado Springs, CO
WØUNP **Lenagar**, G. Robert "Bob," Overland Park, KS
WØYIJ **Wilkes**, Robert L., Saint Louis, MO
VE3AAG **Delahunty**, Norman, Ottawa, ON, Canada
VE3EB **Bray**, Earl, Vancouver Island, BC, Canada
VE6AQH **Sproule**, Norman G., Calgary, AB, Canada
DJ3HJ **Knobloch**, Rudolf, Breisach, Germany

♦ Life Member, ARRL

Note: Silent Key reports must confirm the death by one of the following means: a letter or note from a family member, a copy of a newspaper obituary notice, a copy of the death certificate, or a letter from the family lawyer or the executor. Please be sure to include the amateur's name, address and call sign. Allow several months for the listing to appear in this column.

Many hams remember a Silent Key with a memorial contribution to the ARRL Foundation or to ARRL. If you wish to make a contribution in a friend or relative's memory, you can designate it for an existing youth scholarship, the Jesse A. Bieberman Meritorious Membership Fund, the Victor C. Clark Youth Incentive Program Fund, or the General Fund. Contributions to the Foundation are tax deductible to the extent permitted under current tax law. Our address is: The ARRL Foundation Inc, 225 Main St, Newington, CT 06111.

Strays

A YL Reports on "The Day of YLs"

Saraj Cory, KU6F, participated in the third annual HF Contest, "The Day of YLs," May 18 and 19, 2013. Saraj reports, "The bands were horrid that weekend; the noise level was ridiculous. I wore my headphones, pointed the 20 meter beam east, called CQ 20, CQ DX, CQ Day of the YL and happily worked the subsequent pileup. There was the occasional booming signal, but mostly hissing air with the threads of a pileup of voices on the other end. The notch filter was my friend! Even so, I made 326 contacts amounting to 44 states, Puerto Rico, Mexico, Germany, Argentina, Cuba, Netherlands, Guatemala, St Lucia, Uruguay, Japan, Hawaii and five Canadian provinces."

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Eric, K6EJC, Mgr.
Magnolia between
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burbank@hamradio.com

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

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1509 N. Dupont Hwy., 19720
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Ken, N2OHD, Mgr.
RT.13 1/4 mi., So. I-295
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Leon, W7AD, Mgr.
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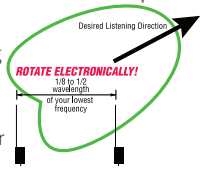

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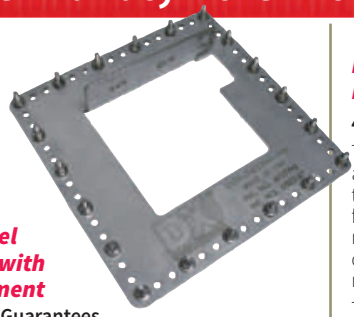

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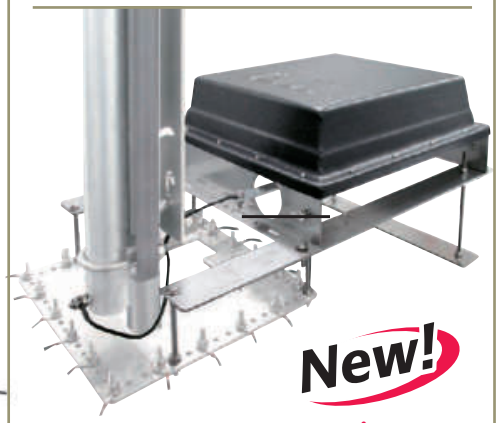

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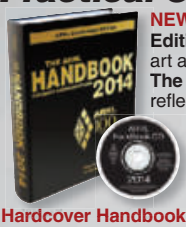

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DXE-SAD-300A	3.00"	5/16"-18	$13.60
DXE-SAD-300B	3.00"	3/8"-16	$15.25
DXE-SAD-400A	4.00"	3/8"-16	$34.70
DXE-SAD-450A	4.50"	3/8"-16	$39.95

V-Bolt Cast Saddle	Tube O.D.	Bolt Thread	Price
DXE-CAVS-1P	0.50"-1.75"	1/4"-20	$10.25
DXE-CAVS-11P	0.50"-1.75"	5/16"-18	$10.75
DXE-CAVS-2P	1.00"-2.00"	5/16"-18	$12.25
DXE-CAVS-3P	2.00"-3.00"	3/8"-16	$15.25

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—no lossy coils or traps
- 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

Super Duty Saddle Clamps

Super Duty Saddle Clamps are designed for maximum clamping strength to control large or unbalanced loads. They feature an A356-T6 cast aluminum saddle, with rough, as-cast finish for a secure grip. The clamps include a cast stainless reinforcement plate; armor coated bolt sets are available separately.

Part Number	Tube O.D.	Price
DXE-SDS-200P	2.00"	$34.00
DXE-SDS-250P	2.50"	$41.00
DXE-SDS-300P	3.00"	$51.00

Resin Support Blocks

Securely mount tubing to any flat surface. These blocks have an insulated mount between the tubing and plates, ideal for antenna construction and electrical applications.

See the entire selection at DXEngineering.com.

V-Bolt Stainless Steel Saddles

The saddles feature serrated edges to grip hard pipe surfaces. These clamps include stainless steel V-bolts, and can be ordered with a tab and 1/4" hardware for grounding applications.

V-Bolt Stainless Saddle	Pipe Size	Ground Lug	Price
DXE-SSVC-1P	1/2"-3/4"	No	$6.95
DXE-SSVC-1PG	1/2"-3/4"	Yes	$7.95
DXE-SSVC-150P	1"-1 1/2"	No	$9.95
DXE-SSVC-150PG	1"-1 1/2"	Yes	$10.95
DXE-SSVC-2P	1"-2"	No	$11.95
DXE-SSVC-3P	2"-3"	No	$14.95

The Best Aluminum Tubing Available

Just Add Clamps and Slide It Together for a Complete Antenna Element!

6063-T832 Aluminum Tubing

- Better than the other guys, same price
- Order from us and the competition—We're sure that you'll send theirs back
- Smoothly telescoping pre-slit or un-slit lengths
- Custom made just for DX Engineering

3' lengths .058" wall - 3/8" to 2 1/8" O.D.
6' lengths .058" wall - 3/8" to 2 1/8" O.D.
Perfect for Most Elements
6061-T8 .120" wall - 1.5" to 3" O.D. un-slit
For Booms and HD Element Designs

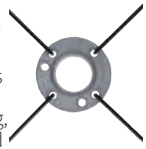
See DXEngineering.com for specs and additional tubing. DX Engineering has All-Stainless Steel Element Clamps to fit exact tubing sizes!

Coaxial Cable Grounding Brackets

These stainless steel brackets have two holes for chassis- or bulkhead-mount connectors (not included). Each bracket comes with a stainless steel V-bolt and hardware.

DXE-CGB-150 Bracket for 0.50" to 1.50" O.D. Tube.....$15.95
DXE-CGB-200 Bracket for 1.00" to 2.00" O.D. Tube $15.95

Guy Rings



Use DX Engineering's Guy Rings to secure your rope guys and stabilize your aluminum vertical antenna. They work with three- and four-way guying systems and are a great complement to our tubing kits. These guy rings are super strong, virtually impervious to the elements and fit 0.75", 1.0", 1.25", 1.50" and 2.0" O.D. tubing.

DXE-GR-5P Set of 5 Guy Rings $7.95

Telescoping Antenna Tubing Kits

Available in either fiberglass or aluminum, these kits contain several tapered sections of DX Engineering tubing and stainless steel band camps, allowing you to build your own vertical antenna. You can design, experiment and create an adjustable setup tailored specifically to your specs. The tubing telescopes smoothly and comes in larger sizes and wall thicknesses.

DXE-FTK50 Fiberglass Antenna Tubing Kit, 50' Max. Length $138.00
DXE-ATK65 Aluminum Antenna Tubing Kit, 65' Max. Length $194.50

Exclusively from DX Engineering!

1K2 VHF 1,200 Watt Amplifiers

These compact amps are perfect for Field Day and DXpeditions, and they're also perfect for your shack. The 1K2 is the smallest 1,200 watt amplifier ever offered and it weighs a mere 13 pounds. Adding the built-in switching power supply brings the total weight to just 20 pounds. These amplifiers use a single LDMOS FET rated at an incredible 1,250 Watts, able to handle a 65:1 SWR.

1K2 Amplifiers are designed for EME (CW and JT65), SSB, CW or the very popular JT6M for meteor scatter.

MSQ-6M-1K2 6 Meter 1,200 Watt Amplifier with Power Supply Was ~~$3,299.00~~ Sale $2,995.00
MSQ-6M-1K2-NOPS 6 Meter 1,200 Watt Amplifier without Power Supply Was ~~$2,699.00~~ Sale $2,425.00
MSQ-2M-1K2* 2 Meter 1,200 Watt Amplifier with Power Supply Was ~~$3,299.00~~ Sale $2,995.00
MSQ-2M-1K2-NOPS* 2 Meter 1,200 Watt Amplifier without Power Supply Was ~~$2,699.00~~ Sale $2,425.00

*Sale prices on M2 Amplifiers expire on 10/1/2013

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1330 to 2130 UTC (November-February)
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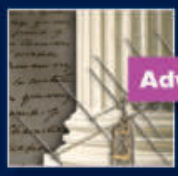
Sale Code: **1310QS**
Prices & specifications subject to change without notice.

DXENGINEERING.COM
800-777-0703



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Regular	$39	$76	$111	Monthly *QST* via standard mail for US members
Canada	$49	$93	$132	Monthly *QST* via standard mail for Canadian members
International *QST*	$62	$118	$167	Monthly *QST* via air mail for international members
International – no printed *QST*	$39	$76	$111	Digital *QST* only
Family	$8	$16	$24	Reside at the same address as the primary member, no additional *QST*. Membership dates must correspond with primary member.

Membership includes $15 per year for subscription to *QST*. Dues subject to change without notice and are nonrefundable.

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Additional membership options available online at www.arrl.org/join.

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☐ Total enclosed payable to ARRL $ _____

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Tech/International: **330.572.3200** Country Code: **+1**
Sale Code: **1310QS**
Prices & specifications subject to change without notice.

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Made in the USA to DX Engineering's Rigid Specifications.

Available in full spools or cut to your custom length.

Made in USA

Bulk Cable	Impedance	Length	Price
Low-Loss Mini-8 Cable			
DXE-8X	50 Ω	per foot	**$0.31**
DXE-8X-1000	50 Ω	1,000'	**$259.99**
Low-Loss Cable			
DXE-213U	50 Ω	per foot	**$0.89**
DXE-213U-500	50 Ω	500'	**$409.99**
DXE-11U	75 Ω	per foot	**$0.52**
Premium Low-Loss Cable			
DXE-400MAX	50 Ω	per foot	**$0.82**
DXE-400MAX-500	50 Ω	500'	**$364.99**
Low-Loss Foam Cable			
DXE-8U	50 Ω	per foot	**$0.79**
DXE-8U-500	50 Ω	500'	**$359.99**
Highly Flexible Cable			
DXE-58AU	50 Ω	per foot	**$0.29**
Flooded Jacket Cable			
DXE-F6-CTL	75 Ω	per foot	**$0.19**
DXE-F6-1000	75 Ω	1,000'	**$149.95**

Multi-Conductor Control Cable

The ideal cable to control your rotator or antenna switch, this color-coded stranded copper cable is reliable and flexible. A vinyl jacket shields it from the elements and it is available by the foot and in bulk spools. Find all the details at DXEngineering.com.

Part Number	Conductors (Gauge)	Description	Price/ Foot
COM-CW3	3 (20 AWG)	Standard	**$0.25**
COM-CW4	4 (20 AWG)	Standard	**$0.28**
DXE-CW8	2 (18 AWG) 6 (22 AWG)	Standard	**$0.48**
DXE-CW8-HD	2 (16 AWG) 6 (18 AWG)	Heavy Duty	**$0.89**
DXE-CW9	9 (24 AWG)	Cat5e	**$0.32**
DXE-CW9S	9 (24 AWG)	Shielded	**$0.36**

Phasing Cables

DX Engineering provides precision, electrically-tuned phasing lines for your 50 or 75 Ω applications. Choose from pre-manufactured four-square and two-antenna array cables or contact us with your custom application.

Multi-Conductor Heavy Duty Tinned Copper Flat Braid

A critical part of any grounding system, this Flat Braid is made with terminals for quick, easy installation. See more sizes and grounding solutions at DXEngineering.com.

Part Number	Length	Price
7 AWG Braid Rated at 85 Amps 1" Wide, for a 1/4" Stud		
DXE-TCB10-RT01	1'	**$5.75**
DXE-TCB10-RT03	3'	**$8.75**
DXE-TCB10-RT05	5'	**$12.75**
DXE-TCB10-RT10	10'	**$18.75**
10 AWG Braid Rated at 53 Amps 1/2" Wide, for a #10 Stud		
DXE-TCB05-RT01	1'	**$4.75**
DXE-TCB05-RT03	3'	**$5.75**
DXE-TCB05-RT05	5'	**$6.75**
DXE-TCB05-RT10	10'	**$9.75**

DXE-8X BNC Jumper Cables

These male BNC jumper cables use secure, crimped connectors and tube-shrink seals, which make them impervious to the elements. They are Hi-Pot and high voltage tested. In addition to these 50 Ω assemblies, 75 Ω cables are available as well.

DXE-8XDB002 2' Length.....**$14.25**
DXE-8XDB003 3' Length.....**$14.75**
DXE-8XDB006 6' Length.....**$15.75**
DXE-8XDB012 12' Length.....**$17.75**
DXE-8XDB025 25' Length.....**$21.75**
DXE-8XDB050 50' Length.....**$32.75**

DX Engineering is the Best Place to Get Coax, Here's Why:

- 100% High Voltage (Hi-Pot) Tested
- Your **Coax Cable Order is Shipped FREE** Anywhere in the Contiguous 48 States
- Weatherproof: Adhesive Shrink Tubing Seals Connections
- Silver-plated PTFE-insulated Connectors
- Hand Crafted by Top Techs

Made in USA

Black PVC Jacket

DXE-8U Low-Loss Foam Dielectric Cable

- .405" high-flex PVC jacket

Attenuation per 100 feet	Power Rating	Efficiency
0.3 dB @ 5 MHz	5.4 kW	93%
0.5 dB @ 10 MHz	4.1 kW	90%
0.9 dB @ 30 MHZ	2.2 kW	81%
1.2 dB @ 50 MHz	1.8 kW	77%
2.2 dB @ 150 MHz	1.0 kW	60%

Pre-cut Cable with Connectors		
Part Number	Length	Price
DXE-8UDU002	2'	**$13.25**
DXE-8UDU003	3'	**$13.75**
DXE-8UDU006	6'	**$16.75**
DXE-8UDU025	25'	**$41.75**
DXE-8UDU050	50'	**$64.75**
DXE-8UDU100	100'	**$117.75**

UV-Resistant, Non-Contaminating, Black PVC Jacket

DXE-213U MIL-Spec Cable

- .405" Type II UV-resistant jacket is non-contaminating and suitable for outdoor use

Attenuation per 100 feet	Power Rating	Efficiency
0.4 dB @ 5 MHz	4.9 kW	90%
0.6 dB @ 10 MHz	3.4 kW	87%
1.0 dB @ 30 MHz	2.0 kW	79%
1.3 dB @ 50 MHz	1.5 kW	73%
2.4 dB @ 150 MHz	0.9 kW	57%

Pre-cut Cable with Connectors		
Part Number	Length	Price
DXE-213UDU003	3'	**$14.75**
DXE-213UDU006	6'	**$18.75**
DXE-213UDU012	12'	**$24.75**
DXE-213UDU025	25'	**$39.75**
DXE-213UDU050	50'	**$68.75**
DXE-213UDU075	75'	**$95.75**
DXE-213UDU100	100'	**$118.75**
DXE-213UDU150	150'	**$171.75**

UV-Resistant, Black PE Jacket

DXE-8X Low-Loss Foam Dielectric Cable

Known as RG-8X or Mini-8

- Very flexible; ideal for short, in-shack jumper cables
- .242" Type II jacket is non-contaminating and UV-resistant
- Direct-bury

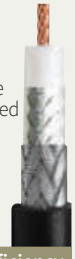
Attenuation per 100 feet	Power Rating	Efficiency
0.6 dB @ 5 MHz	3.0 kW	86%
0.9 dB @ 10 MHz	2.2 kW	81%
1.4 dB @ 30 MHz	1.2 kW	69%
2.0 dB @ 50 MHz	0.9 kW	62%
3.8 dB @ 150 MHz	0.4 kW	42%

Pre-cut Cable with Connectors		
Part Number	Length	Price
DXE-8XDU003	3'	**$11.75**
DXE-8XDU006	6'	**$12.75**
DXE-8XDU012	12'	**$16.75**
DXE-8XDU025	25'	**$21.75**
DXE-8XDU050	50'	**$32.75**
DXE-8XDU075	75'	**$43.75**
DXE-8XDU100	100'	**$53.75**
DXE-8XDU150	150'	**$74.75**

UV-Resistant, Non-Contaminating, Black PVC Jacket

DXE-400MAX Low-Loss Cable

- Gas-injected foam, polyethylene dielectric bonded tape foil covered by a braided copper shield
- .405" low-density UV-resistant polyethylene jacket is ideal for outdoors
- Direct-bury



Attenuation per 100 feet	Power Rating	Efficiency
0.3 dB @ 5 MHz	6.9 kW	93%
0.5 dB @ 10 MHz	4.8 kW	90%
0.8 dB @ 30 MHz	2.8 kW	83%
1.1 dB @ 50 MHz	2.1 kW	79%
1.8 dB @ 150 MHz	1.2 kW	65%
3.3 dB @ 450 MHz	0.7kW	47%

Pre-cut Cable with Connectors		
Part Number	Length	Price
DXE-400MAXDU003	3'	**$16.75**
DXE-400MAXDU006	6'	**$18.75**
DXE-400MAXDU018	18'	**$35.75**
DXE-400MAXDU025	25'	**$43.75**
DXE-400MAXDU050	50'	**$66.75**
DXE-400MAXDU075	75'	**$99.75**
DXE-400MAXDU100	100'	**$119.75**
DXE-400MAXDU150	150'	**$179.75**

See DXEngineering.com for more connector options.

The #1 Line of Autotuners!

AT-1000ProII

LDG Electronics' flagship 1KW tuner features: 5 to 1,000Watts PEP; RF Sensing; Auto and Semi Tuning Modes; 1.8 to 54 MHz range; 6 to 800 ohm range (15 to 150 on 6M); simplified operation; and an optional external 4.5" analog meter. With the two position antenna switch, there are 2,000 memories that store tuning parameters for almost instantaneous memory recall whenever you transmit on or near a frequency you've used before. Includes six foot DC power cable.

Suggested Price $539.99

Optional M-1000 external analog meter $129.99

NEW! AL-100

The AL-100 is compatible with all Alinco radios including the new DX-SR8T. Includes Alinco interface cable.

The AL-100 is the definitive low cost automatic antenna tuner for the definitive low cost Amateur transceiver! It has been designed from the ground up to provide the power handling you asked for, in a small, lightweight package that is perfect for portable as well as sitting on your desk in your shack!

Suggested Price $149.99

NEW! USB-100

The USB-100 provides serial communication for the AT-1000 and AT-600 over a USB port to your computer. Third party software will be available to provide communication including Army MARS.

Suggested Price $49.99

IT-100

Matched in size to the IC-7000 and IC-706, for either manual or automatic tunes, and status LEDs. Control the IT-100 and its 2000 memories from either its own button or the Tune button on your IC-7000 or other Icom rigs. For your Icom radio that is AH3 or AH-4 compatible.

Suggested Price $179.99

YT-100

For Yaesu FT-857, FT-897 and FT-100 (and all D models) an integrated tuner, powered by the interface. Press the tune button on the tuner, and everything else happens automatically.

Suggested Price $199.99

KT-100

For AT-300 compatible Kenwood transceivers (except TS-480HX). The KT-100 actually allows you to use the Tune button on the radio. 2,000 memories for instant recall of the tuning parameters for your favorite bands and frequencies.

Suggested Price $199.99

YT-450

Designed for Yaesu's newest 100 watt radios. Interfaces directly with the Yaesu FT-450 and FT-950 radios. Press the tune button on the tuner and the rest happens automatically. It will quickly match nearly any kind of coax fed antenna with an SWR of up to 10:1. 2000 memories recall settings in an instant! Seamless connection to a PC. ***Suggested Price $249.99***

YT-847

YT-847 Autotuner is an integrated tuner for the Yaesu FT-847. An included CAT/Power cable interfaces with your FT-847. Just press the tune button on the tuner and everything else happens automatically! ***Suggested Price $249.99***

Designed to handle the higher power of the Tokyo Hi Power HL-45B.

Z-817H

The ultimate autotuner for QRP radios including the Yaesu FT-817(D) with addition of the Tokyo High Power HL-45B. Interfaces to the CAT port (ACC) on the back of the radio with the provided cable. One button push on the tuner and the Z-817H takes care of the rest. Will also function as a general purpose antenna tuner with other QRP radios or QRP radios with up to 75 watt HF amps. Powered by four AA internal Alkaline batteries (not included). 2000 memories cover 160 through 6 meters.

Suggested Price $159.99

- ***RF Sensing***
- ***Tunes Automatically***
- ***No Interface Cables Needed***

AT-200ProII

The AT-200ProII now includes LEDs to show antenna position and if the tuner is in bypass. A two position antenna switch stores 2000 memories per switch. Handles up to 250 watts SSB or CW on 1.8 to 30 MHz and 100 watts on 54 MHz. Rugged and easy to read LED bar graphs simultaneously show RF power and SWR. Includes a six foot DC power cable. ***Suggested Price $259.99***

- ***RF Sensing***
- ***Tunes Automatically***
- ***No Interface Cables Needed***

AT-100ProII

This desktop tuner covers all frequencies from 1.8 – 54 MHz (including 6 meters), and will automatically match your antenna in no time. It features a two-position antenna switch with LEDs, allowing you to switch instantly between two antennas. The AT-100ProII requires just 1 watt for operation, but will handle up to 125 watts. Includes six foot DC power cable.

Suggested Price $229.99

LDG ELECTRONICS

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*We make tuners that will work with any transceiver. Don't know which one is right for you? Give us a call or see the **Tuner Comparison Chart** on our web site for more selection help!*

LDG ELECTRONICS

radio not included

AT-897Plus
for the Yaesu FT-897

If you own a Yaesu FT-897 and want a broad range automatic antenna tuner, look no further! The AT-897Plus Autotuner mounts on the side of your FT-897 just like the original equipment and takes power directly from the CAT port of the FT-897 and provides a second CAT port on the back of the tuner so hooking up another CAT device couldn't be easier. ***Suggested Price $199.99***

AT-600ProII

Building on the success of the AT-600Pro, we refined and expanded the model with an optional external 4.5" analog meter. The new AT-600ProII keeps many of the same features of the previous model, but simplifies the operation. With the two-position antenna switch, there are 2,000 memories that store tuning parameters for almost instantaneous memory recall whenever you transmit on or near a frequency you've used before. Includes six-foot DC power cable.

Suggested Price $369.99

Optional M-600 external analog meter $129.99

Z-100Plus

Small and simple to use, the Z-100Plus sports 2000 memories that store both frequency and tuning parameters. It will run on any voltage source from 7 to 18 volts; six AA batteries will run it for a year of normal use. Current draw while tuning is less than 100ma. The Z-100Plus now includes an internal frequency counter so the operating frequency is stored with tuning parameters to make memory tunes a blazingly fast 0.1 seconds; full tunes take an average of only 6 seconds. Includes six foot DC power cable. ***Suggested Price $159.99***

NEW! RT-100

A Technological Breakthrough in Remote Tuning!

The RT-100 is a coax in / coax out tuner designed to be placed near the feedpoint of the antenna. If you're worried about power loss due to SWR in your feedline, the RT-100 is the answer. Place the RT-100 near the feedpoint and virtually eliminate all feed line loss due to SWR.

The RT-100 is DC powered over the coax, so add your own DC injection circuit or use the LDG RC-100 to power and control the tuner from your shack. The RC-100 will provide DC power over the coax as well as control for Auto mode, Lock, and Tune.

Suggested Price $199.99

Optional RC-100 $49.99

Z-11ProII

Meet the Z-11ProII, everything you always wanted in a small, portable tuner. Designed from the ground up for battery operation. Only 5" x 7.7" x 1.5", and weighing only 1.5 pounds, it handles 0.1 to 125 watts, making it ideal for both QRP and standard 100 watt transceivers from 160 - 6 meters. The Z-11ProII uses LDG's state-of-the-art processor-controlled Switched-L tuning network. It will match dipoles, verticals, inverted-Vs or virtually any coax-fed antenna. With an optional LDG balun, it will also match longwires or antennas fed with ladder-line. Includes six foot DC power cable. ***Suggested Price $179.99***

radio not included

Z-817

The ultimate autotuner for QRP radios including the Yaesu FT-817(D). Tuning is simple; one button push on the tuner is all that is needed - the Z-817 takes care of the rest. It will switch to PKT mode, transmit a carrier, tune the tuner, then restore the radio to the previous mode! 2000 memories cover 160 through 6 meters. The Z-817 will also function as a general purpose antenna tuner with other QRP radios. Just transmit a carrier and press the tune button on the tuner. Powered by four AA internal Alkaline batteries (not included), so there are no additional cables required.

Suggested Price $129.99

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hy-gain® Rotators

. . . the first choice of hams around the world!

HAM-IV

The most popular rotator in the world!

HAM-IV **$649.95**

For medium communications arrays up to 15 square feet wind load area.*Has* 5-second brake delay, Test/Calibrate function. Low temperature grease permits normal operation down to -30 degrees F. Alloy ring gear gives extra strength up to 100,000 PSI for maximum reliability. *Precision* indicator potentiometer. Ferrite beads reduce RF susceptibility. Cinch plug plus 8-pin plug at control box. Dual 98 ball bearing race for load bearing strength and electric locking steel wedge brake prevents wind induced movement. North/South center of rotation scale on meter, low voltage control, max mast $2^{1}/_{16}$".

HAM-VI **$749.95** with DCU-2

HAM-VII **$799.95** *with DCU-3*

TAILTWISTER SERIES II

T-2X **$799.95**

T-2XD2 **$899.95** with DCU-2

T-2XD3 **$949.95** with DCU-3

For large medium antenna arrays up to 20 sq. ft. wind load. Has 5-second brake delay, Test/Calibrate functions. Low temp grease, tough alloy ring gear, indicator potentiometer, ferrite beads on potentiometer wires, weatherproof AMP connectors plus 8-pin plug at control box, triple bearing race with 138 ball bearings for large load bearing, electric locking steel wedge brake, North/South center of rotation scale meter, low voltage control, $2^{1}/_{16}$" max mast. **MSHD, $109.95.** Above tower heavy duty mast support. T2X, HAM-IV, HAM-V, HAM-VI. Accepts $1^{7}/_{8}$-$2^{5}/_{8}$" OD.

CD-45II

CD-45II **$449.95**

For antenna arrays up to 8.5 sq. feet mounted inside tower or 5 sq. ft. with mast adapter. Low temperature grease good to -30 F degrees. *New* Test/Calibrate function. Bell rotator design gives total weather protection, dual 58 ball bearing race gives proven support. Die-cast ring gear, stamped steel gear drive, heavy duty, trouble free gear train, North center scale, lighted directional indicator, 8-pin plug/socket on control unit, snap-action control switches, low voltage control, safe operation, takes maximum mast size to $2^{1}/_{16}$ inches. MSLD light duty lower mast support included.

HAM IV and HAM V Rotator Specifications	
Wind Load capacity (inside tower)	15 square feet
Wind Load (w/mast adapter)	**7.5 square feet**
Turning Power	800 in.-lbs.
Brake Power	**5000 in.-lbs.**
Brake Construction	Electric Wedge
Bearing Assembly	**dual race/96 ball bearings**
Mounting Hardware	Clamp plate/steel U-bolts
Control Cable Conductors	**8**
Shipping Weight	26 lbs.
Effective Moment (in tower)	**2800 ft.-lbs.**

TAILTWISTER Rotator Specifications	
Wind load capacity (inside tower)	20 square feet
Wind Load (w/ mast adapter)	**10 square feet**
Turning Power	1000 in.-lbs.
Brake Power	**9000** in.-lbs.
Brake Construction	Electric Wedge
Bearing Assembly	**Triple race/138 ball brngs**
Mounting Hardware	Clamp plate/steel U-bolts
Control Cable Conductors	**8**
Shipping Weight	31 lbs.
Effective Moment (in tower)	**3400 ft.-lbs.**

CD-45II Rotator Specifications	
Wind load capacity (inside tower)	8.5 square feet
Wind Load (w/ mast adapter)	**5.0 square feet**
Turning Power	600 in.-lbs.
Brake Power	**800 in.-lbs.**
Brake Construction	Disc Brake
Bearing Assembly	**Dual race/48 ball brings**
Mounting Hardware	Clamp plate/steel U-bolts
Control Cable Conductors	**8**
Shipping Weight	22 lbs.
Effective Moment (in tower)	**1200 ft.-lbs.**

hy-gain® DCU-3 Digital Rotator Controller

6 Programmable Beam Headings . . .

Gives you fully automatic and manual control of your hy-gain rotators

New!

DCU-3 **$449.95**

New DCU-3 Digital Controller lets you program 6 beam headings! Gives you fully automatic or manual control of your hy-gain HAM or Tailtwister Rotators.

Push a memory button or dial in your beam heading or let *Ham Radio Deluxe* (or other) control your DCU-3. Your antenna automatically rotates precisely and safely to your desired direction.

DCU-3 makes sure your antenna is free and safely unlocked before turning begins and then turns off your motor before your antenna reaches its final destination. Your antenna *gently* coasts to a stop before the brake locks. Greatly reduces potentially damaging overshoot.

Fine tuning and full manual control is effortless with *automated* Left and Right direction buttons - - no more worrying about releasing and relocking the brake. Brake *automatically* releases before fine tuning begins and relocks after fine tuning.

Bright blue LCD displays actual, dial-in and computer controlled beam headings in one degree increments and your call.

AutoBrake Release - no need to remember to release brake -- release time is automatic and adjustable 0 to 8 seconds.

***Coast* feature** allows antenna to gently stop before brake locks. Adjustable coast delay (*0-10 degrees*) turns off motor before antenna reaches its final destination to reduce potentially damaging overshoot.

AutoJog unlocks and frees antenna before turning -- great for older rotators with "sticky" brakes. It jogs the rotator backwards slightly to ease brake pressure enough to release.

Offset feature allows you to calibrate display to show actual beam heading. USB/RS-232 ports. Adjustable LCD sleep time. Field upgradeable. 8.5Wx4.3H x9D". 110 VAC. **DCU-3X** for 220 VAC.

DCU-2, $399.95. **Digital** Rotator Controller, like DCU-3, but no programmable memories. 110 VAC. Order **DCU-2X**, for 220 VAC.

HAM-VI & HAM-VII

New!* HAM-VII, $799.95.** Like HAM-IV but with ***DCU-3 digital controller with *six programmable memories*. For medium antennas up to 15 sq. ft. wind load.

New!

HAM-VII **$799.95** *with DCU-3*

HAM-VI **$749.95** *with DCU-2*

HAM-VI, $749.95. Like HAM-VII but with ***DCU-2*** digital controller.

AR-40

AR-40 **$349.95**

For compact antenna arrays and large FM/TV up to 3.0 square feet wind load area. Dual 12 ball bearing race. Automatic position sensor never needs resetting. Fully automatic control -- just dial and touch for any desired location. Solid state, low voltage control, safe and silent operation. $2^{1}/_{16}$ inch maximum mast size. MSLD light duty lower mast support included.

AR-40 Rotator Specifications	
Wind load capacity (inside tower)	3.0 square feet
Wind Load (w/ mast adapter)	**1.5 square feet**
Turning Power	350 in.-lbs.
Brake Power	**450 in.-lbs.**
Brake Construction	Disc Brake
Bearing Assembly	**Dual race/12 ball bearings**
Mounting Hardware	Clamp plate/steel bolts
Control Cable Conductors	**5**
Shipping Weight	14 lbs.
Effective Moment (in tower)	**300 ft.-lbs.**

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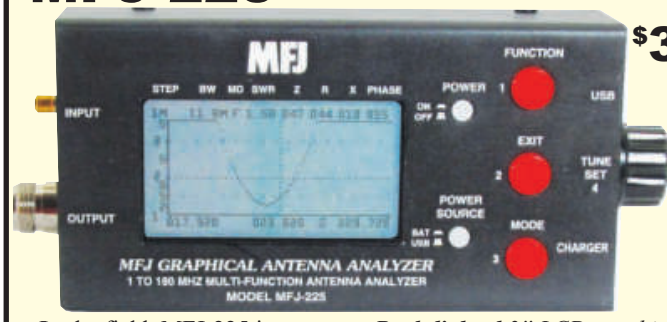

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Tunes 1.5 to 179.9 MHz with rock-solid stability and *no gaps*. VFO is state-of-the-art programmable DDS (direct digital synthesis) generator with *pin-point 1-kHz resolution*. DDS control means no switches or tuning elements, just a reliable velvet-smooth optical encoder.

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MFJ-213, $199.95. Reads SWR, complex impedance, impedance magnitude. Measures capacitance, inductance, field strength, frequency, generate test signals. Tune stubs, analyze coax, test baluns, RF transformers, more.

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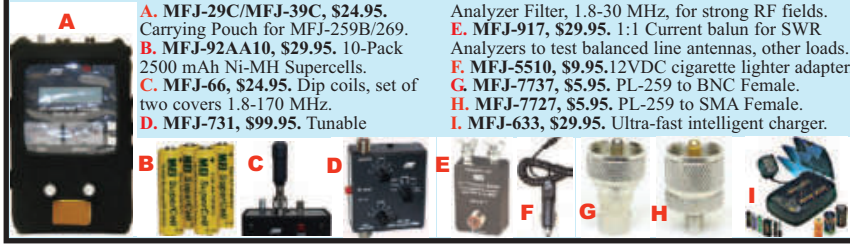

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Antenna switch lets you select two coax fed antennas, random wire/balanced line or dummy load through your MFJ-949E or direct to your transceiver.

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MFJ-969 **$219.95**

Superb *AirCore™* Roller Inductor tuning. Covers *6 Meters* thru 160 Meters! 300 Watts PEP SSB. *Active* true peak reading lighted Cross-Needle SWR Wattmeter, *QRM-Free PreTune™*, antenna switch, dummy load, 4:1 balun, Lexan front panel. $10^{1}/_{2}$Wx$3^{1}/_{2}$Hx$9^{1}/_{2}$D inches.

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MFJ-941E **$139.95**

The *most for your money!* Handles 300 Watts PEP, covers 1.8-30 MHz, *lighted* Cross-Needle SWR/Wattmeter, 8 position antenna switch, 4:1 balun, 1000 volt capacitors, Lexan front panel. Sleek $10^{1}/_{2}$Wx$2^{1}/_{2}$Hx7D in.

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Extends your mobile antenna bandwidth so you don't have to stop, go outside and adjust your antenna. Tiny 8x2x6 in. *Lighted* Cross-Needle SWR/Wattmeter. Lamp and bypass switches. Covers 1.8-30 MHz *and* 6 Meters. 300 Watts PEP. **MFJ-20, $6.95,** mobile mount.

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MFJ-901B **$99.95**

MFJ's smallest (5x2x6 in.) and most affordable wide range 200 Watt PEP Versa tuner. Covers 1.8 to 30 MHz. Great for matching solid state rigs to linear amps.

MFJ-902 *Tiny Travel* Tuner

MFJ-902 **$99.95**

Tiny $4^{1}/_{2}$x$2^{1}/_{4}$x3 inches, full 150 Watts, 80-10 Meters, has tuner bypass switch, for coax/random wire.

MFJ-904H, $149.95. Same but adds Cross-needle SWR/Wattmeter and 4:1 balun for balanced lines. $7^{1}/_{4}$x$2^{1}/_{4}$x$2^{3}/_{4}$ inches.

MFJ-16010 *random wire* Tuner

MFJ-16010 **$69.95**

Operate all bands anywhere with MFJ's reversible L-network. Turns random wire into powerful transmitting antenna. 1.8-30 MHz. 200 Watts PEP. Tiny 2x3x4 in.

MFJ-906/903 *6 Meter* Tuners

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MFJ-906 has lighted Cross-Needle SWR/Wattmeter, bypass switch. Handles 100 W FM, 200W SSB. **MFJ-903, $69.95**, Like MFJ-906, less SWR/Wattmeter, bypass switch.

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MFJ-921/924 **$89.95**

MFJ-921 covers 2 Meters/220 MHz. **MFJ-924** covers 440 MHz. SWR/Wattmeter. 8x$2^{1}/_{2}$x3 in.

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Eliminates RF hot spots, RF feedback, TVI/RFI, weak signals caused by poor RF grounding. Creates artificial RF ground or electrically places far away RF ground directly at rig. **MFJ-934, $209.95**, Artificial ground/300 Watt Tuner/Cross-Needle SWR/Wattmeter.

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MFJ-993B 300 Watt *IntelliTuner*™

The World's Best Selling Automatic Antenna Tuner!

The MFJ-993B *IntelliTuner*™ lets you tune any antenna -- balanced or unbalanced -- *automatically* and *ultra fast*.

It's a comprehensive automatic *antenna tuning center* complete with SWR/Wattmeter, antenna switch for two antennas and 4:1 current balun for balanced lines.

MFJ's exclusive *IntelliTuner*™, *Adaptive Search*™ and *Instant Recall*™ algorithms give you *ultra fast* automatic tuning with over 20,000 *VirtualAntenna*™ Memories.

Select 300 Watt SSB/CW power level and match 6-1600 Ohm antennas ***Or . . .*** select **150 Watt** SSB/CW power level and match *extra wide-range* 6-3200 Ohms!

You get a highly efficient L-network, 1.8-30 MHz coverage, Cross-Needle *and* digital meters, audio SWR meter, *backlit* LCD, remote control port, radio interface, heavy-duty 16 amp/1000V relays.

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The MFJ-993B automatically tunes for minimum SWR and remembers your frequency and tuner settings. The next time you operate on that frequency and antenna, these tuner settings are instantly restored and *you're ready to operate in milliseconds!* 10W x2¾ Hx9D". Use 12-15 VDC/1 amp or 110 VAC with **MFJ-1316, $21.95**. Radio interface cables, remote control available. See ***www.mfjenterprises.com***

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Roam the entire HF spectrum 1.8-30 MHz *hands-free* with full *1500 Watt* legal limit on SSB/CW and near-perfect SWR! Lighted LCD/Cross-Needle Meter.

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300 Watt...*Extra* Wide Range

SWR/Wattmeter, 10000 VA Memories

Extra *wide matching range at less cost.* Exclusive dual power level: 300 Watts/6-1600 Ohms; 150W/6-3200 Ohms. Cross-Needle SWR/Wattmeter.

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200 Watt ...Compact

Digital Meter, Ant Switch, Wide Range

World's fastest compact auto tuner uses MFJ *Adaptive Search*™ and *InstantRecall*™ algorithms. 132,072 tuning solutions instantly match virtually any antenna with near perfect SWR.

MFJ-929 **$219.95**

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Small, Ant Switch, 20K VA Memories

High-speed, wide matching range and compactness at low cost! Leave in-line and forget it -- your antenna is *always* automatically tuned! 2-position antenna switch.

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200 Watt *MightyMite*™

Matches IC-706, FT-857D, TS-50S

No *extra space needed!* Just set your IC-706/7000, FT-857D, TS-50S on top of this matching low-profile automatic tuner -- it's all you need for a completely automated station using *any* antenna! Just tune and talk!

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for Remote/Outdoor/Marine

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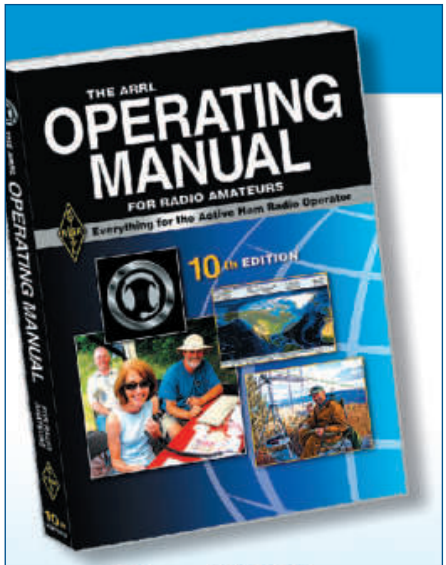
October 24-October 31, 2013



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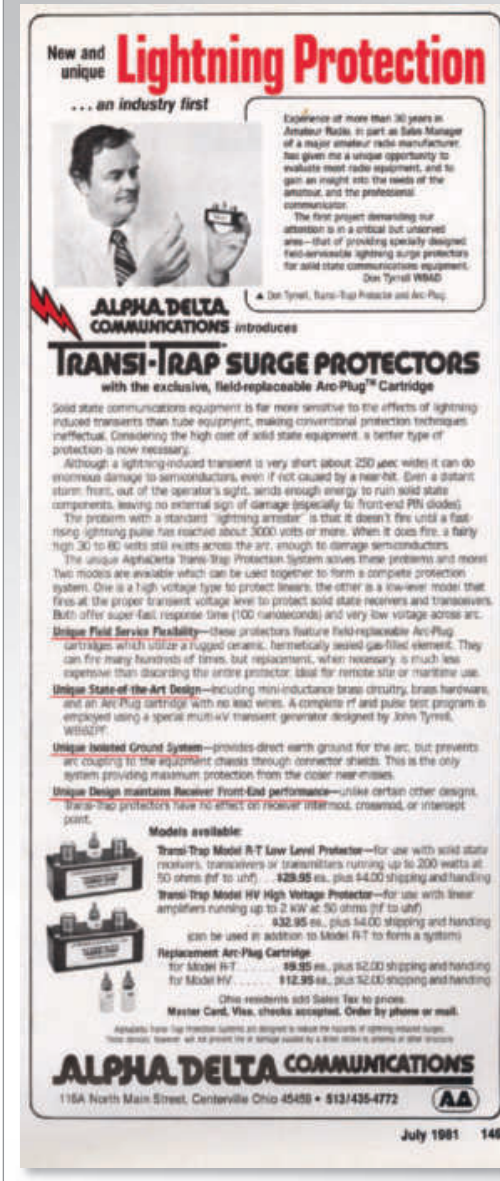

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Solid state communications equipment is far more sensitive to the effects of lightning induced transients than tube equipment, making conventional protection techniques ineffectual. Considering the high cost of solid state equipment, a better type of protection is now necessary.

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The unique AlphaDelta Transi-Trap Protection System solves these problems and more! Two models are available which can be used together to form a complete protection system. One is a high voltage type to protect linears; the other is a low-level model that fires at the proper transient voltage level to protect solid state receivers and transceivers. Both offer super-fast response time (100 nanoseconds) and very low voltage across arc.

Unique Field Service Flexibility—these protectors feature field-replaceable Arc-Plug cartridges which utilize a rugged ceramic, hermetically sealed gas-filled element. They can fire many hundreds of times, but replacement, when necessary, is much less expensive than discarding the entire protector. Ideal for remote site or maritime use.

Unique State-of-the-Art Design—including mini-inductance brass circuitry, brass hardware, and an Arc-Plug cartridge with no lead wires. A complete rf and pulse test program is employed using a special multi-kV transient generator designed by John Tyrrell, WB4ZPP.

Unique Isolated Ground System—provides direct earth ground for the arc, but prevents arc coupling to the equipment chassis through connector shields. This is the only system providing maximum protection from the closer near-misses.

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July 1981 149

Since then, many of the advertisers in that issue have gone out of the ham radio business and are no longer around. Some are still in the business, including **ALPHA DELTA**.

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8-Band Portable *Dipole*

34 feet Radiators
Covers 7-55 MHz

MFJ-2289
$179.95

Whether you're relaxing in the mountains or beach or at your antenna restricted neighborhood, MFJ's BigEAR™ portable HF dipole puts out a strong full-size dipole signal!

Full Size Performance

BigEAR's™ whopping 34-feet stainless steel radiator -- *twice the length* of other portables -- gives you *full-size dipole* performance on 20-6 Meters. An *ultra low loss*, high-Q adjustable *air-wound* loading coil gives you highly efficient loaded dipole performance on 30/40 Meters.

Full-size and ultra low loss loading coil is a winning combination that stands head and shoulders above shorter backpack antennas. All your power is radiated, not wasted in loading coils.

Rotatable Dipole Directivity

BigEAR's™ dipole pattern lets you aim a strong main lobe toward your QSO or null out QRM by simply rotating your tripod or mount.

True General Coverage

You can tune it up with exceptionally low SWR on any frequency between 7.0 and 55 MHz. Handles QRP to a full killowatt PEP.

Element Tips High In-the-Air

Distinctive V-shaped elements are set 45 degrees from the horizon to keep element tips high in the air. This maximizes radiation, minimizes ground loss and prevents hazardous contact.

Built-in Guanella Current Balun

Current Balun gives you consistent high-performance. Kills feedline radiation, pattern distortion, SWR shifts, RFI, noise pickup.

True Backpack Portability

Antenna is over 34 feet long fully extended, but disassembles and collapses to 27 inches in seconds. Fits most backpacks or suitcases! Just 2 pounds -- you'll hardly know you are packing it!

Goes Up Fast

Fewer parts to assemble. Much faster tune-up procedure. Heavy-duty aluminum center block instantly mounts on any mast/tripod up to 7/8 inches with MFJ's heavy-duty *NoTool*™ mast lock. SO-239. For confined spaces, shorten whips and use loading coil to resonate.

BigStick™ 18-foot Portable Vertical

For the Ham on-the-go!

Carry a BigStick™ for strongest, loudest portable signal on the band!

MFJ-2286
$99.95

MFJ's extra long 17 foot stainless-steel telescoping whip gives you *full-size antenna* for full size performance 20 to 6 Meters but collapses to just 28 inches.

An ultra low loss, high-Q adjustable *air-wound* loading coil gives you highly efficient operation on 30/40 Meters.

This extra long radiator and ultra low loss loading coil is a winning combination that stands head and shoulders above shorter backpack antennas.

Antenna is 18 ft. fully extended. Disassembles and collapses to 28" in seconds. Fits most packs or suitcases! Just 2 pounds, you'll hardly know you are packing it!

Tapped loading coil covers 7-55 MHz without gaps. Great for Ham Bands and outstanding for image-free shortwave broadcast!

Everything included for instant operation. Easily mounts to any mast up to 1/2 inch. SO-239 for coax. 3/8-24 antenna connector.

Counterpoise kit included. Ensures low SWR, high efficiency.

All aluminum, stainless steel construction ensures years of excellent performance. *One kilowatt rated.*

18 foot Telescopic Fiberglass Mast with Tripod

MFJ-1919EX, $139.95.

***Put your antennas anywhere and get them up high with this super-strong* 18 foot telescoping fiberglass mast and heavy-duty steel MFJ-1919 tripod.**

QuickClamps™ easily collapses mast to 5 feet. Mast has thick 1/8 inch wall, .75 inch diameter top, 1.5 inch bottom. 15 lbs.

All tripods are black heavy-duty steel with braced triangle base, non-skid feet and mast lock.

MFJ-1918EX, $89.95. MFJ-1918 *tripod with super strong 9.5 foot telescoping fiberglass mast*. Collapses to 3.8 feet. *QuickClamps*™. Mast has thick 1/8" wall, 3/4 inch top, 1 inch bottom. Weighs 6.5 lbs.

Tripods Only

MFJ-1919, $89.95, *Large tripod*. Supports 100 lb. antenna. Built-in 1.4 inch diameter mast extends 7.8 feet. Collapses to 4.5Hx.5D feet. Triangle base spreads to 4.8 feet on a side. Weighs 9.75 lbs.

MFJ-1918, $49.95, *Smaller tripod*. Supports 66 lbs. 1 inch diameter mast extends 6 foot. Collapses to 3.2Hx.3D feet. Triangle base spreads to 2.75 feet. Weighs 6.75 lbs.

17 foot *Stainless Steel* Telescoping Whip

MFJ-1979, $59.95. Super-strong, super long *17 foot stainless steel* telescoping whip. 27 in. collapsed. 10 sections. 3/8-24 threaded base. **MFJ-1977, $44.95**/12ft;**MFJ-1796, $39.95**/10ft **MFJ-1974, $34.95**/8ft;**MFJ-1972,** $14.95/4½ft

Single-band Rotatable *mini*-Dipoles

Use these inexpensive, lightweight, *isolated* mini-dipoles when space is limited for temporary or permanent installations. Rotate to null QRM/noise and to focus your signal. Coax choke balun, mast not included. For 40/30/20/17/15/12/10/6 Meters. Order **MFJ-22XX** (insert band in "XX") **$44.95**. 75/60 Meters, $49.95 each. Total length 14 feet. For mounting masts up to 1.25" OD.

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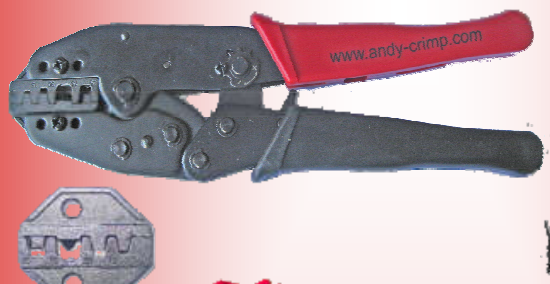

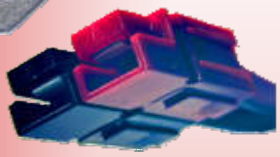

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These babies are clean . . . Your buddies won't hear *any* RF hash on your signal! *None* in your receiver either! These super clean *MightyLites*™ meet all FCC Class B regulations.

Less than 35 mV peak-to-peak ripple under 25 or 45 amp full load. Load regulation is better than 1.5% under full load.

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A whisper quiet internal fan efficiently cools your power supply for long life.

22 Amp Continuous

Ham Radio's smallest and lightest 22 Amp continuous power supply is also its best selling!

MFJ-4125 **$84.95**

22 Amps continuous/25 Amps max at 13.8VDC. 5-way binding posts on front, 5A quick connects on back. 85-135/170-260 VAC input. 2.9 lbs. 5¾Wx3Hx5¾D".

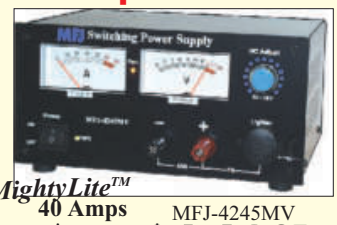
MFJ-4125P, $94.95. Adds 2-pairs *Anderson PowerPoles*™.

22 Amp Continuous

MFJ-4225MV **$99.95**

22 Amps continuous, 25 Amps maximum. Like MFJ-4125 but adds Volt/Amp meters, cigarette lighter plug. Adjustable 9-15 VDC Output. 5¼Wx 4½Hx6D in. Weighs 3.7 lbs. Use 85-135 VAC or 170-260 VAC input. Replaceable fuse.

40 Amp Continuous



MightyLite™

MFJ-4245MV **$149.95**

40 Amps continuous, 45 Amps max. Adjustable 9-15 VDC output. Volt/Amp meters, cigarette lighter plug, front 5-way binding posts, two rear quick connects. 5.5 lbs. 7½Wx 4¾Hx9D inches. Use 85-135 VAC or 170-260 VAC input. Replaceable fuse.

70 Amp Continuous

MFJ-4275MV **$249.95**

75 Amps maximum and 70 Amps continuously. Adjustable voltage 4.0-16 VDC. Short circuit, overload and over-temperature protection, 10.5 lbs. 9¾Wx5½Hx9½D". Great for Ameritron's ALS-500M mobile amplifier!

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Power multiple Transceivers/accessories from a* single *DC power supply . . . Keeps you neat, organized and safe . . .Prevents fire hazard . . . Keeps wires from tangling up and shorting . . . Fused and RF bypassed . . . 6 foot, 8 gauge color coded cable . . .

Versatile 5-Way Binding Posts

MFJ-1118 **$84.95**

MFJ-1118, $84.95. Power two HF and/or VHF rigs and six accessories from your main 12 VDC supply. *Built-in 0-25 VDC voltmeter*. Two pairs 35 amp 5-way binding posts, fused and RF bypassed for transceivers. Six pairs RF bypassed binding posts provide 15 Amps for accessories. Master fuse, ON/OFF switch,"ON" LED. 12½x2¾x2½ in.

MFJ-1116 **$59.95**

MFJ-1116, $59.95. 8 pairs binding posts, 15A total.Voltmeter, on/off switch.

MFJ-1112 **$44.95**

MFJ-1112, $44.95. 6 pairs binding posts, 15 Amps total.

MFJ-1117 **$64.95**

MFJ-1117, $64.95. Powers *four* transceivers simultaneously (two at 35 Amps each and two at 35 Amps combined). 8x2x3 inches.

MFJ-1128 **$104.95**

***All PowerPoles*™**

MFJ-1128, $104.95. 3 high-current outlets for transceivers. 9 *switched* outlets for accessories. Mix & match included fuses as needed (one-40A, one-25A, four-10A, four-5A, three-1A fuses installed). 0-25 VDC *Voltmeter*. Extra contacts, fuses. 12Wx1¼Hx2¾D".

MFJ-1126 **$84.95**

MFJ-1126, $84.95. 8 outlets, each fused, 40 Amps total. Factory installed fuses: two 1A, three 5A, two 10A, one 25A, one 40A. *0-25 VDC Voltmeter*. Includes *extra PowerPoles®*, *extra* fuses -- *no extra cost*. 9Wx1¼Hx2¾ inches.

MFJ-1129 **$114.95**

PowerPoles™ AND 5-Way Binding Posts

MFJ-1129, $114.95. 10 outlets each fused, 40 Amp total. 3 high-current outlets for rigs -- 2 *PowerPoles®* and one 5-way binding post. 7 *switched* outlets for accessories (20A max) -- 5 *PowerPoles®* and 2 binding posts. Fuses include (1- 40A, 2-25A, 3-10A, 3-5A, 2-1A installed). *0-25 VDC Voltmeter*. Includes extra *PowerPoles®* and fuses, 12½Wx1¼Hx2¾D inches.

MFJ-1124 **$64.95**

MFJ-1124, $64.95. 6 outlets each fused, 40 Amps total. 4 *PowerPoles®*, 2 high-current binding posts, Installed fuses: 1-40A, 2-25A, 2-10A, 1-5A, 1-1A. Includes extra *PowerPoles®* & fuses -- *no extra cost*.

15 Amp Continuous

MFJ-4115 **$59.95**

15 Amps continuous, 17 Amps max at 13.8 VDC. Over-voltage, over-current protection. 5-way binding posts. Load fault indicator and automatic shutdown. 90-130 VAC input. 1½ lbs. Tiny 3¾Wx2¼Hx3¾D inches fits easily in an overnight bag.

30 Amps Continuous

Linear with 19.2 lb.Transformer

MFJ-4035MV **$149.95**

This heavy-duty linearly regulated MFJ-4035MV has *abolutely no RF Hash*. It delivers 30 Amps continuous, 35 Amps maximum from its massive 19.2 lb. transformer. Front panel adjustable 1-14 VDC output with convenient detent at 13.8 VDC. Volt/Amp Meters. 1% load regulation, 30 mV ripple. Over-voltage/current/temperature protection, 5-way binding posts, 2 pairs of quick-connects and a covered cigarette lighter socket for mobile accessories. Front panel replaceable fuse. 110 VAC input. 9½Wx6Hx9¾D in.

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

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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 *Speech Intelligibility* Enhancer

. . . makes barely understandable speech highly understandable!

MFJ-616
$189.95

"What did you say?" Can you hear but . . . just can't always understand everything people are saying?

As we get older, high frequency hearing loss reduces our ability to understand speech. Here's why . . .

Research shows that nearly *half* the speech intelligibility is contained in 1000 to 4000 Hz range, but contains a miniscule 4% of total speech energy.

On the other hand, the low frequencies, 125 to 500 Hz have most of the speech energy (55%) but contribute very little to intelligibility -- only 4%.

To dramatically improve your ability to understand speech, you must:

First, drastically increase the speech energy above 500 Hz, where 83% of the speech intelligibility is concentrated.

Second, drastically reduce speech energy below 500 Hz where only 4% of speech intelligibility lies.

The MFJ-616 splits the audio speech band into four overlapping octave ranges centered at 300, 600, 1200 and 2400 Hz. You can boost or cut each range by nearly 20 dB.

A balance control and separate 2½ Watt amplifiers let you equalize perceived loudness to each ear so both ears help.

By boosting high and cutting low frequencies and adjusting the balanced control, speech that you can barely understand become highly understandable!

Even if you *don't* have high frequency hearing loss, you'll dramatically improve your ability to understand speech. You'll get an edge in contesting and DXing and enjoy ragchewing more.

Here's what *QST* for April, 2001 said . . . *"I expected a subtle effect at best, but I was astonished . . . The result was remarkably clean, understandable speech without hissing, ringing or other strange effects . . . made a dramatic improvement . . ."*

Immuned to RFI. Has phone jack, on/off speaker switch, 2 inputs, bypass switch. 10Wx2½Hx6D". Needs 12 VDC.

MFJ-1316, $21.95. For 110 VAC operation. Provides 12 VDC/1.5 Amps.

MFJ-72, $69.80. *All-in-one MFJ-616 Accessory Pack*. Includes MFJ-392 headphones, two MFJ-281 speakers and MFJ-1316 power supply. ***Save $7!***

Try it for 30 Days

Order from MFJ and try it -- No obligation. If not delighted, return it within 30 days for refund less shipping.

MFJ Contest Voice Keyer

Transformer-coupled -- No RFI, hum or feedback . . . 75 seconds total, 5-messages . . . Records received audio . . .

MFJ-434B
$199.95

Let this *new* microprocessor controlled MFJ *Contest Voice Keyer*™ call CQ, send your call and do contest exchanges for you in your own natural voice!

Store frequently used phrases like "CQ Contest this is AA5MT", "You're 59" . . . "Qth is Mississippi" . . . Contest by pressing a few buttons and save your voice.

Record and playback 5 natural sounding messages in a total of 75 seconds. Uses *eeprom* -- no battery backup needed. Use your mic or its built-in mic for recording.

You can repeat messages continuously and vary the repeat delay from 3 to 500 seconds. Makes a great voice beacon and calling CQ is *so* easy.

You can also record and play back off-the-air signals -- great help if you didn't get it right the first time! No more "*Please repeat*".

A playing message can be halted by the *Stop Button*, your microphone's PTT/VOX, remote control or computer.

Has jack for remote or computer control (using CT, NA or other program). Lets you select, play and cancel messages.

Your mic's audio characteristics do not change when your MFJ-434B is installed.

All audio lines are RF filtered to eliminate RFI, audio feedback and distortion. An audio isolation transformer totally eliminates hum and distortion caused by ground loops.

New! **It's** easy to use -- just plug in your 8 pin round or modular mic plug, set the internal jumpers for your transceiver and plug in the appropriate (included) cable for your rig.

Built-in speaker-amplifier. Speaker/phone jack. Use 9 Volt battery, 9-15 VDC or 110 VAC with optional MFJ-1312D, $15.95. 6½Wx2½Hx6½D in.

MFJ-73, $34.95. MFJ-434B Remote Control with cable.

60 dB Null *wipes out* noise and interference

MFJ-1026
$199.95

Wipe out noise and interference *before* it gets into your receiver with a 60 dB null!

Eliminate all types of noise -- severe power line noise from arcing transformers and insulators, fluorescent lamps, light dimmers, touch controlled lamps, computers, TV birdies, lightning crashes from distant thunderstorms, electric drills, motors, industrial processes . . .

It's *more effective* than a noise blanker! Interference much stronger than your desired signal can be completely removed without affecting your signal.

It works on *all modes* -- SSB, AM, CW, FM -- and frequences from BCB to lower VHF.

You can null out strong QRM on top of weak rare DX and then work him! You can null out a strong local ham or AM broadcast station to prevent your receiver from overloading.

Use the MFJ-1026 as an *adjustable phasing network*. You can combine two antennas to give you various directional patterns. Null out a strong interfering signal or peak a weak signal at a push of a button.

Easy-to-use! Plugs between transmitting antenna and transceiver. To null, adjust amplitude and phase controls for minimum S-meter reading or lowest noise. To peak, push reverse button. Use built-in active antenna or an external one. MFJ's exclusive *Constant Amplitude Phase Control*™ makes nulling easy.

RF sense T/R switch automatically bypasses your transceiver when you transmit. Adjustable delay time. Uses 12 VDC or 110 VAC with MFJ-1312D, $15.95. 6½x1½x6¼ in.

MFJ-1025, $179.95. Like MFJ-1026 less built-in active antenna, use external noise antenna.

MFJ *tunable* Super DSP filter

MFJ-784B
$279.95

Only MFJ gives you *tunable* and *programmable* "brick wall" DSP filters.

You can continuously *tune* low pass, high pass, notch and bandpass filters and continuously *vary* bandwidth to pinpoint and eliminate interference.

Only MFJ gives you 5 factory pre-set and 10 programmable pre-set filters you can customize. **Automatic** notch filter searches for and eliminates multiple heterodynes. Advanced adaptive noise reduction silences background noise and QRM.

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http://www.mfjenterprises.com *for instruction manuals, catalog, info*

MFJ *giant* 6.5 inch SWR/Wattmeter

World's *largest HF SWR/Wattmeter has giant 6½ inch meter!*

This one you can SEE! Extra-long scales gives you highly accurate SWR and power measurements. Huge numbers makes reading easy across your shack.

Like your analog watch, one glance at the meter needle gives you fast and accurate readings without actually reading the scale.

MFJ's exclusive *TrueActive*™ peak reading circuit captures *true* peak or average forward and reflected power readings.

Has 20/200/2000 Watt ranges for accurate QRP or QRO operation.

MFJ-868
$149.95

Exclusive MFJ Wattmeter *Power Saver*™ circuit turns on meter only when RF power is being measured.

Covers 1.8-30 MHz. Use 9 volt battery or 12 VDC or 110 VAC with MFJ-1312D, $15.95. 7Wx5 1/2Hx5D in. SO-239 connectors.

Giant 144/220/440 MHz SWR/Wattmeter

MFJ-867, $159.95. Like MFJ-868 giant SWR/Wattmeter, but covers 144/220/440 MHz.

MFJ peak-reading *giant* 4.5 inch *Cross-Needle* SWR/Wattmeter

New!

See it all at once on giant Cross-Needle SWR/Wattmeter! MFJ-891 simultaneously displays forward/reflected power and SWR on easy-to-read three-color scale. 20, 200, 2000 Watt ranges have individual scales. *True*™*Active peak-reading circuit* reads forward and reverse *true peak* power in all modes. New directional coupler gives increased accuracy over entire 1.6 to 60 MHz frequency range. Low bias Schottky diode detectors increase linearity at low power -- great for QRP. Super-bright LED backlight with on/off switch provides smooth even illumination. DC grounded antenna connections prevent electrostatic build up. Quality SO-239 connectors. Designer-styled molded front panel and rugged metal housing looks great. 7 1/4Wx4 1/2Hx4 1/2D in.

MFJ-891
$109.95

MFJ *high-accuracy* Digital SWR/Wattmeter

MFJ-826B has a large high-contrast, high-accuracy *backlit* LCD display. Auto-ranging selects optimum full-scale range from 25W, 250W and 1500W ranges with full 10-bit resolution on each range. Covers entire amateur power spectrum. Built-in frequency counter selects frequency compensated data set to insure highest accuracy for each band. Displays frequency, provides digital read-out for older rigs and QRP rigs. *True* peak/average and forward/reflected power, SWR and frequency are *simultaneously* displayed. Select bargraphs to display forward/reflected power *or* forward /SWR *or* SWR only. MFJ's *PeakHold*™ freezes highest forward power displayed 1, 2 or 3 seconds. When SWR is greater than 1.5 to 3 (selectable) an alarm LED lights and buzzer sounds. Use 12 VDC or 110 VAC with MFJ-1312D, $15.95. 6 1/2Wx2 5/8Hx6D inches.

MFJ-826B
$179.95

www.mfjenterprises.com . . . World's largest selection of HF/VHF/UHF SWR Wattmeters!

MFJ-822
$59.95

Lighted 3" Cross-Needle Meter, SWR/Watts, 1.8-200 MHz, Fwd/Ref pwr, 30/300W. Compact.

MFJ-862
$69.95

Lighted Cross-Needle Meter, SWR/Watts, 144/220/440 MHz, 30/300 Watts Fwd, 60/6 W Ref.

MFJ-864
$99.95

Lighted Cross-Needle,SWR/Watts, 1.8-60/144/440 MHz, 30/300W Fwd, 6/60W Ref. Hook up HF&VHF/UHF rigs.

MFJ-815C
$89.95

Lighted 3" C/N Meter, SWR/Watts, 1.8-30 MHz, 300/3000W Fwd, 60/600W Ref. True Peak.

MFJ-812B
$39.95

VHF SWR Wattmeter, 2M/220 MHz, built-in field strength meter, Fwd/Ref, Pwr in 2 30/300W ranges.

MFJ-4416B *Super* Battery Booster

Boost battery voltage as low as 9 Volts back up to 13.8 VDC! Keeps your transceiver at full power output, compensates for run down battery, wiring voltage drop, car off . . .

MFJ-4416B
$149.95

Boost battery voltage as low as 9 Volts back up to 13.8 VDC! Keeps your transceiver at full power output, provides full performance/efficiency, prevents output signal distortion and transceiver shutdown. Compensates for run-down battery, wiring voltage drop or when car is off. Provides up to 25 Amps peak with 90% efficiency. Selectable 9/10/11 Volts minimum input voltage prevents battery damage from over-discharging. RF sense turns MFJ-4416B off during receive to save power and increase efficiency. Adjustable 12 to 13.8 VDC output pass-through voltage improves efficiency and lets transceiver run cooler. Has output over-voltage crowbar protection. *Anderson PowerPoles*® and high-current 5-way binding posts for DC input, regulated output. 7 3/4Wx4Hx2 1/8D inches.

100 Watts SSB from cigarette lighter socket!

MFJ-4403
$119.95

4-Farad capacitors supply 25 Amps needed for 100 Watts SSB peaks and replenished by 10 Amps average from cigarette lighter socket. Protects against reverse/over voltage, voltage transients, short circuits. Provides super noise/ripple filtering.

MFJ AC Line RFI Filter

Eliminate obnoxious power line and computer hash and noise by 6 S-units!

Filters and reduces AC power line RFI, hash, noise, transients, surges generated by computers, motors, RF transmitters, static/lightning by 30 db and up to 60-80 dB with a good earth ground. Super fast, *nano-second* overvoltage protection. Four 3-wire 15A, 120VAC outlets.

MFJ-1164B
$79.95

Transceiver Surge Protector

MFJ-1163, $69.95. Protects your expensive transceiver from damaging power surges. Capacitive decoupling and *ultra-fast* MOVs protection. 4 AC outlets.

MFJ all-in-one *Transmit Audio Console*

MFJ all-in-one *Transmit Audio Console* gives you an *8-Band Equalizer* for full quality ragchewing audio *or* powerful, pileup penetrating speech . . . Adjustable *Noise Gate* gives you transparent, back-ground noise reduction . . . Clean low-distortion *Compressor* gives you more powerful, richer, fuller sounding speech and higher average power SSB . . . Smooth *Limiter* keeps audio peaks from over-driving your transmitter, prevents SSB distortion and splatter. *Universal Mic-Interface* lets you use any microphone with any transceiver. Has low-noise preamp, mic voltages, PTT jack, impedance matching, level controls, RF/audio isolation, VU meter, headphone monitor, auxiliary input.

MFJ-655B
$219.95

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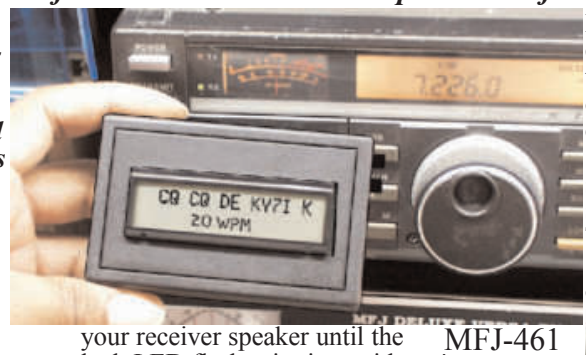
MFJ . . . The World Leader in Amateur Radio!

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 $2^{1}/_{4}$x$3^{1}/_{4}$x1 inches. $5^{1}/_{2}$ 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-464 **$199.95** *(Keyboard, paddle not included.)*

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

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. $1^{3}/_{4}$Wx$1^{3}/_{4}$D x$^{3}/_{4}$H 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. $8^{1}/_{2}$x$2^{1}/_{4}$x$3^{3}/_{4}$ inches.

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

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. $4^{1}/_{2}$Wx1Dx2H in.

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 4x2x$3^{1}/_{2}$ 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. $4^{1}/8$x$2^{5}/8$x$5^{1}/4$ in.

MFJ-422DX, $99.95.

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

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Creating New Standards for HF Mobiles

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QST QuickStats

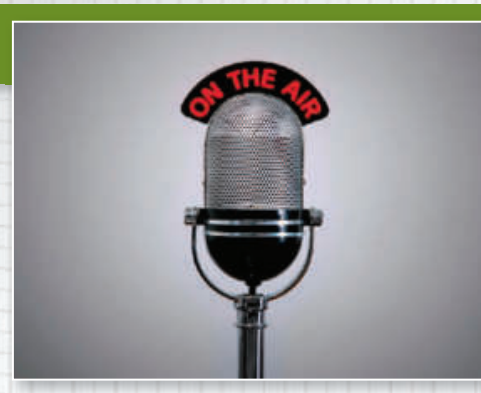
sta·tis·tics (st-tstks) n.
1. (used with a sing. verb) The mathematics of the collection, organization and interpretation of numerical data, especially the analysis of population characteristics by inference from sampling.
2. (used with a pl. verb) Numerical data.

www.arrl.org/QuickStats

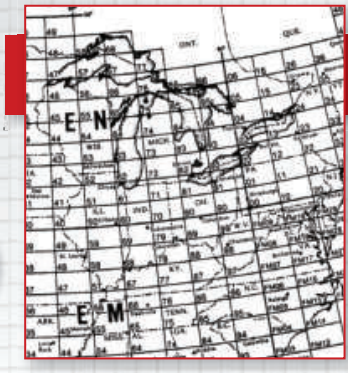
Online QuickStats Poll Results for July 4 through August 4, 2013.

Get on the web and vote today at **www.arrl.org/quickstats**!

Within the past year, how often did you listen to ARRL Audio News?



- Every week **4%**
- Once in a while **20%**
- Never **70%**
- I never heard of ARRL Audio News **6%**

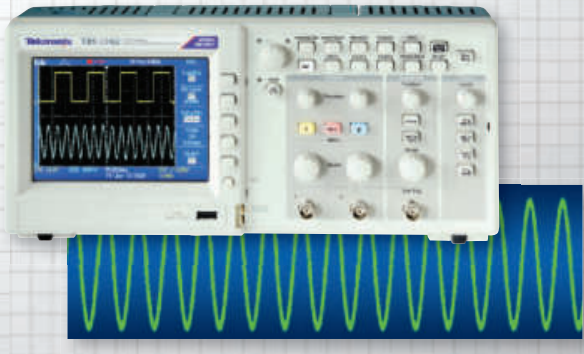


Are you familiar with the Maidenhead Locator System?

- Yes, and I know the designator for the grid square where I live **83%**
- Yes, but I don't know the grid square for my location **5%**
- No **12%**

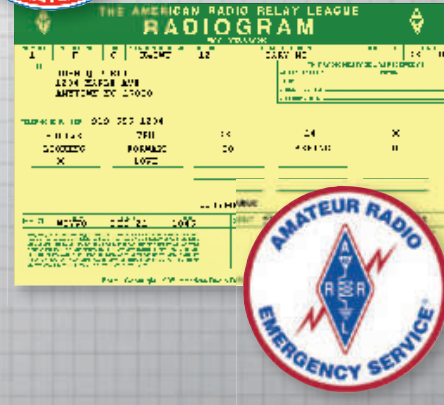
Do you know how to use an oscilloscope?

- Yes **75%**
- No **25%**



Do you participate in CW traffic nets?

- Yes **9%**
- No **91%**



digital HFDSP

Icom's pioneering work in Digital Signal Processing lets today's ham isolate weak signals without needing to buy expensive optional filters.

your **hobby.** your **life.** your love for **ham radio.**

IC-7800

200 Watt Output (50W AM), Built-in Power Supply

RX: 0.030–60.000MHz*

Four 32 Bit IF-DSPs + 24 Bit AD/DA Converters

2 Independent Receivers

+40dBm 3rd Order Intercept Point

3 Roofing Filters

Selectable, "Build Your Own" IF Filter Shapes

IC-7700

200 Watt Output (50W AM), Built-in Power Supply

RX: 0.030–60.000MHz*

Two 32 Bit IF-DSPs + 24 Bit AD/DA Converters

Single Receive

+40dBm 3rd Order Intercept Point

3 Roofing Filters

Selectable, "Build Your Own" IF Filter Shapes

IC-7600

USB Control Audio

100 Watt Output (30W AM), Optional PS-126

RX: 0.030–60.000MHz*

USB Port for CI-V Format PC Control and Audio In/Out

Dual Receive

+30 dBm 3rd Order Intercept Point

3 Roofing Filters

Selectable, "Build Your Own" IF Filter Shapes

RS-BA1

Advanced Remote Control Software

Custom Radio Configuration

Memory Channels

Interference Rejection Functions

IF Filter Settings

S-meter and SWR Observation

RX Voice Recording Function

RC-28

Remote Control Accessory

Remote Control USB Encoder

Use in Conjunction with RS-BA1 Software

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By John Devoldere, ON4UN

This fifth edition features new and updated material. Highlights include…

…a thoroughly revised discussion of **receiving antennas**. You'll discover how to greatly enhance their operational bandwidth. In addition, low-signal transformers for Beverages and other receive-only antennas are analyzed in great detail, along with effective common-mode filters.

…a new examination of **phased arrays**, with new concepts such as the hybrid-fed 4-square array and opposite-voltage feed system. This is a must-read for every serious antenna builder!

…dozens of new propagation maps based on DX Atlas, as well as an in-depth analysis of the influence of sunspot cycles on 160-meter ducting.

…a new discussion of cutting edge technology including **Software Defined Radio** and the revolutionary **LP-500 Digital Station Monitor**.

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System Requirements: Windows® XP, Windows Vista® or Windows® 7, as well as Macintosh® systems, using Adobe® Acrobat® Reader® software. The Acrobat Reader is a free download at **www.adobe.com**. PDF files are Linux readable.

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- Antenna Design Software
- Antennas: General Terms and Definitions
- The Feed Line and the Antenna
- Receiving Antennas
- The Dipole Antenna
- Vertical Antennas
- Large Loop Antennas
- Phased Arrays
- Other Arrays
- Yagis and Quads
- Low Band DXing from a Small Garden
- From Low Band DXing to Contesting

ON4UN's Low-Band DXing
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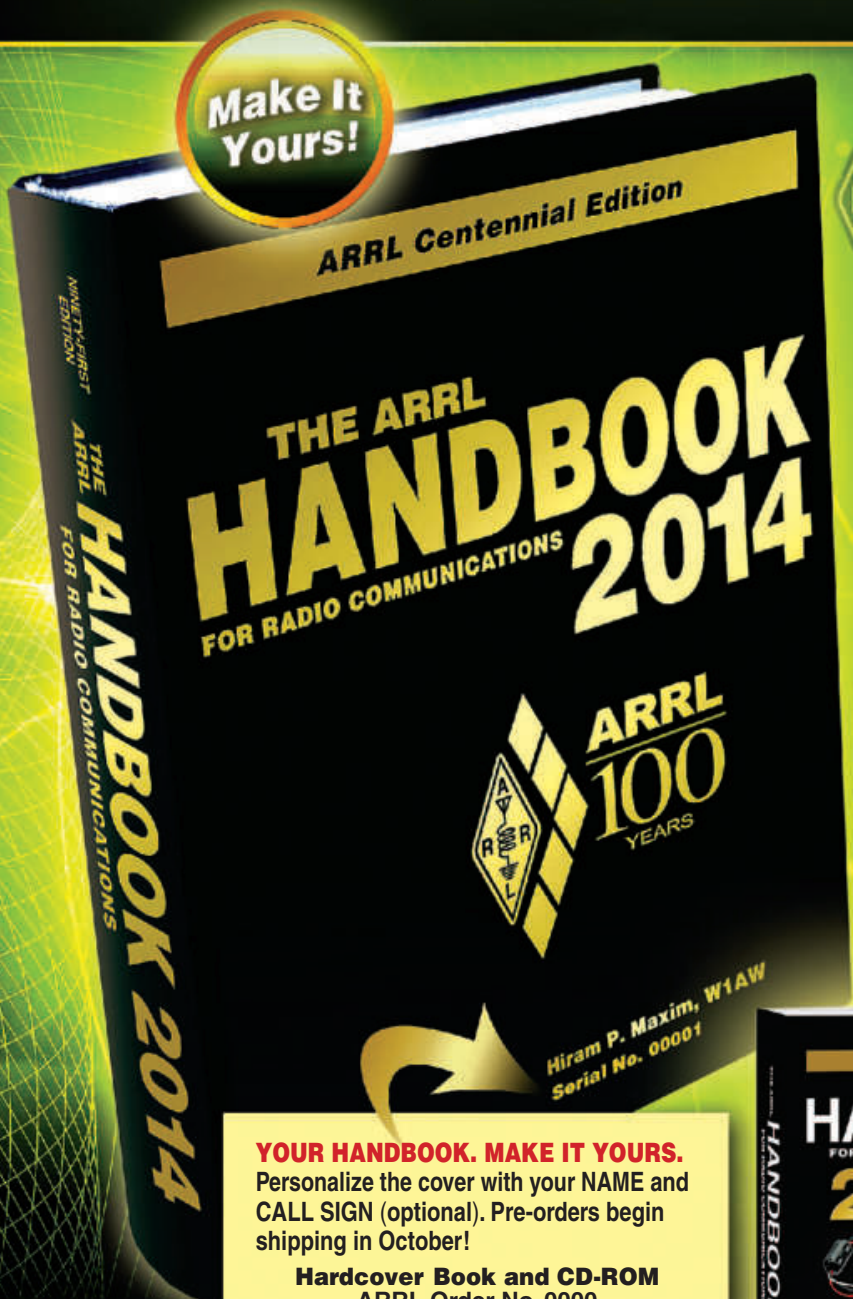

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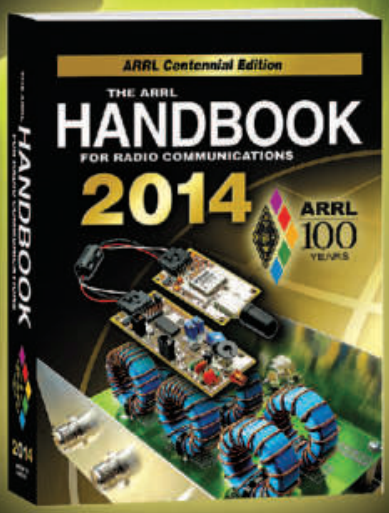

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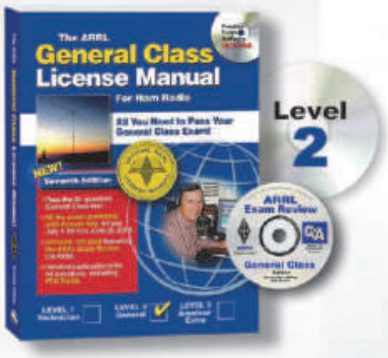

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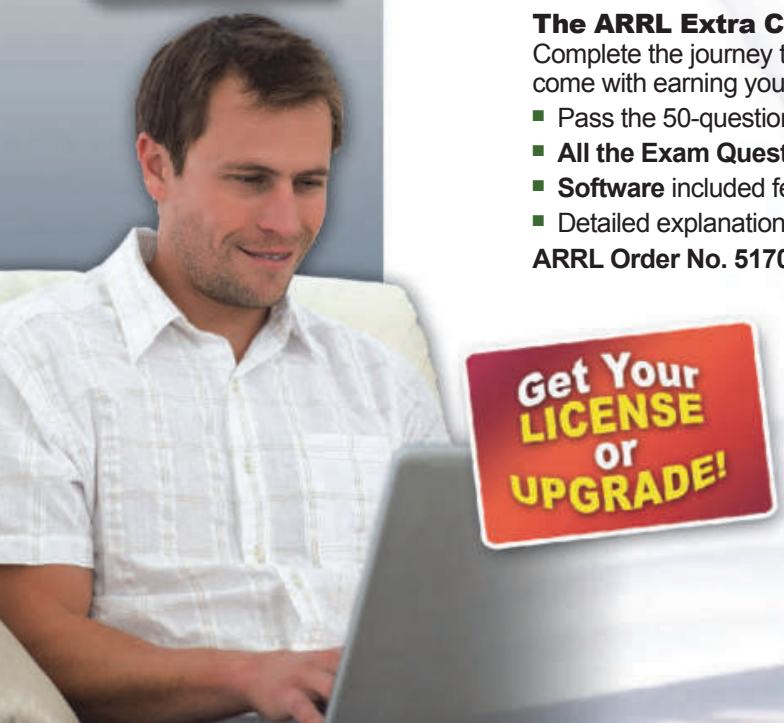

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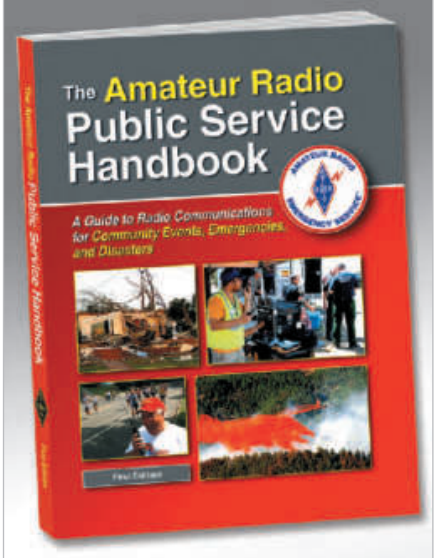

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plus FM broadcast(RX)

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Memory Channels: 199 channels
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FCC 2013 narrowband compliant, Frequency Stability: ±2.5ppm
Operating Voltage: 7.4V
Waterproof: IP 55,
Standard SMA antenna connector
FCC Certified

TYT TH-UVF1A Dual Band HT
144-148 MHz VHF(TX), 430-450 MHz UHF(TX), 136-174 & 400-470MHz plus FM broadcast (RX) FCC 2013 narrow band compliant, 128 memory channels, alpha numeric display, standard SMA antenna connector
FCC Certified

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DC Power Supply
DC 13.8V Output: (9-15V adjustable)
Output current: 0-30A, 25A cont.
Ripple & Noise: <15m Vp-p
Digital Display

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13.8 VDC at 40 amps continuous, Adjustable output voltage from 9 to 15 VDC

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Max.Power(W): 60
V.S.W.R: <1.5
Length (M): 0.92
Weight(g): 135
Connector: PL-259

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Frequency (MHz): 144/430
Max.Power(W): 60
V.S.W.R: <1.5
Length (M): 0.92
Weight(g): 135
Connector: PL-259

P-600 Small External Speaker
Speaker Max Power: 3 Watts
Cord: 4.5M
Size: 80x70x40MM

S-850B Antenna
Frequency (MHz): 144/430
Max.Power(W): 150
V.S.W.R: <1.5
Length (M): 1.04
Weight(g): 350
Connector: PL-259

WP-119
Frequency(MHz): 144/430
Zo(Ω): 50
POWER(W): 10
Length(mm): 200
Weight (g): 15
Connector: SMA Male
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- Second Century Campaign for the ARRL Endowment
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Friday & Saturday, July 18-19, 2014

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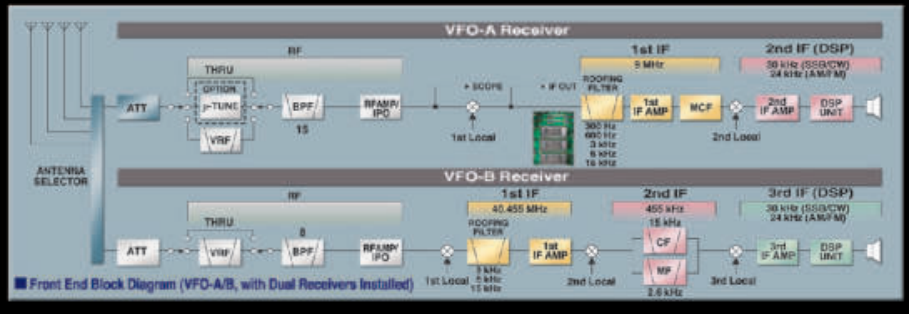

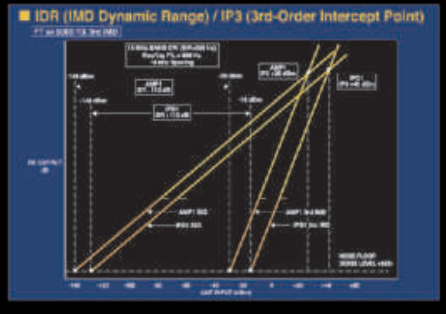

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