APRIL 2013 QST Vol 97 No 4

QST

DEVOTED ENTIRELY TO AMATEUR RADIO

April 2013 WWW.ARRL.ORG

Celebrating... 75 Years of W1AW

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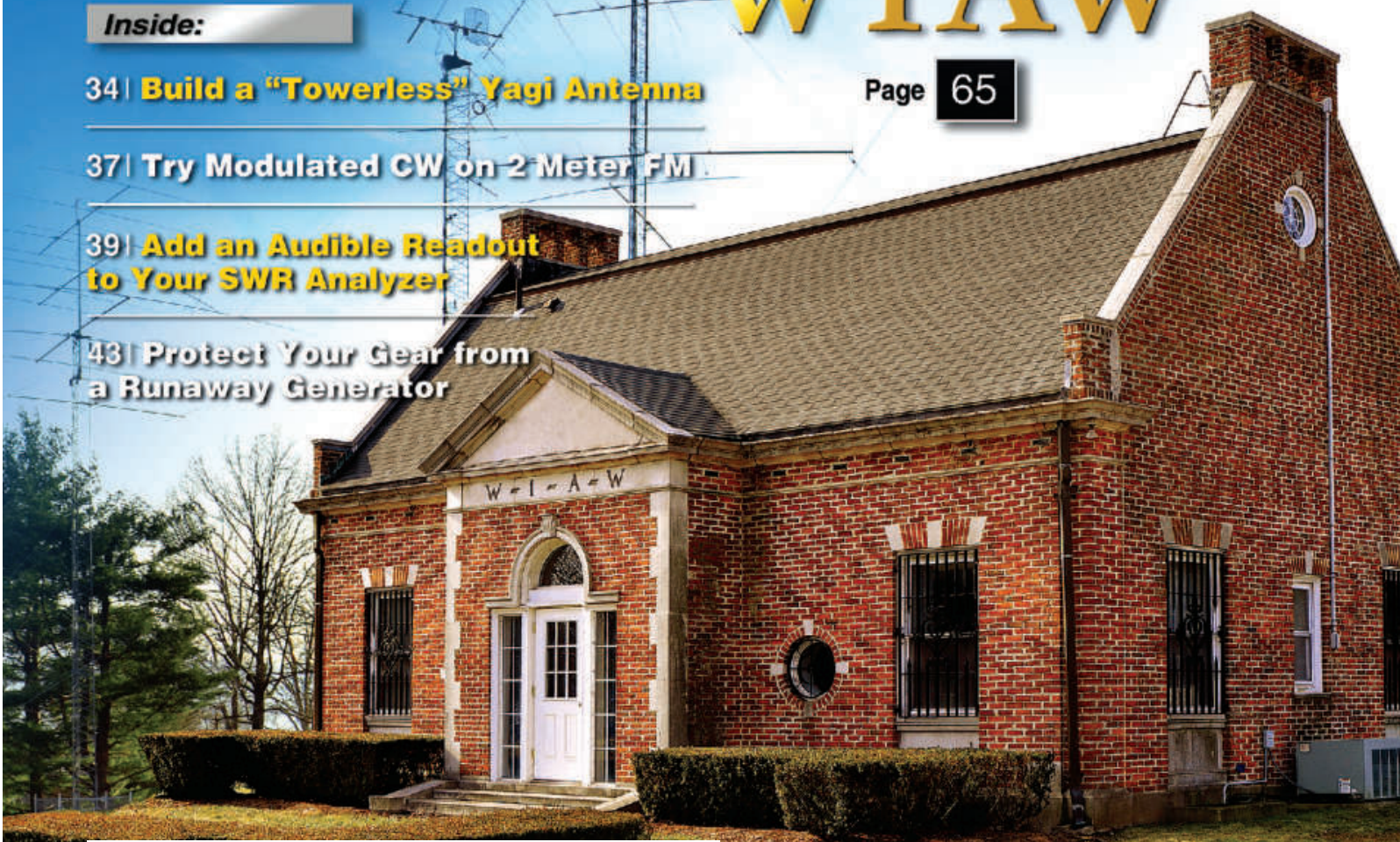
QST reviews:

48 | Yaesu FTDX3000 HF and 6 Meter Transceiver

Inside:



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Official Journal of ARRL The national association for AMATEUR RADIO®

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

The newly developed LCD has a wider viewing angle and higher contrast.

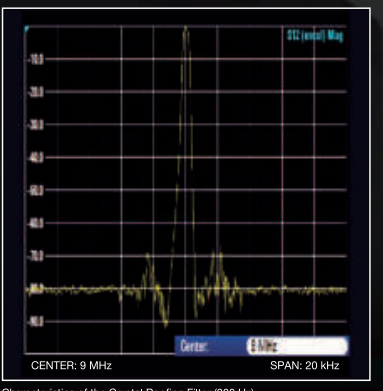
4.3-inch Large and wide color LCD display with high resolution

High Speed Spectrum Scope built-in

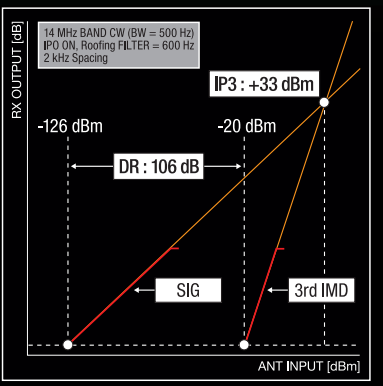
AF SCOPE display and RTTY/PSK encoder/decoder

Other features

The specialized Receiver amplifier for 50 MHz is built in / Three antenna connectors are provided / The "ANT-3" terminal may be assigned to "RX-only" / Signal output for an external receiver and the 9 MHz IF output are furnished / High speed Automatic antenna tuner built in / Optional μ-tune unit available / USB interface equipped



Characteristics of the Crystal Roofing Filter (300 Hz)



3rd Order Dynamic Range / IP3 (2kHz Spaceing)

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The radio

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

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Introducing the Yaesu FT-950 transceiver for DX enthusiasts
Superb receiver performance
Direct lineage from the legendary FT DX 9000 and FT-2000

HF/50 MHz 100 W Transceiver

FT-950

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

COMPACT HF/50 MHz TRANSCEIVER WITH IF DSP

Compact size : 9" X 3.3" x 8.5" and Light weight : 7.9 lb

A superb, compact HF/50 MHz radio with state-of-the-art IF DSP technology configured to provide YAESU World-Class Performance in an easy to operate package.

New licensees, casual operators, DX chasers, contesters, portable/field enthusiasts, and emergency service providers - *YAESU FT-450...This Radio is for YOU!*

HF/50 MHz 100 W All Mode Transceiver

FT-450 Automatic Antenna Tuner ATU-450 optional

FT-450AT With Built-in ATU-450 Automatic Antenna Tuner

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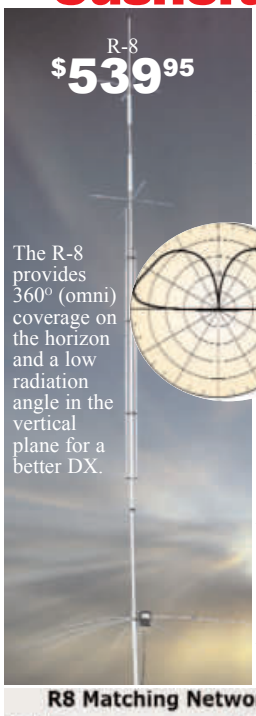
Cushcraft R8 *8-Band Vertical*



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

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

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

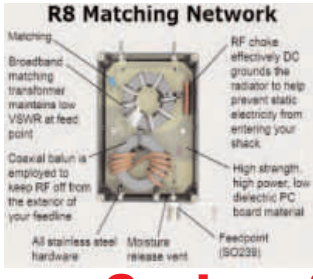
Rugged Construction: Thick fiberglass insulators, all-stainless hardware, and 6063 aircraft-aluminum tubing that is double or triple walled at key stress points handle anything Mother Nature can dish out.

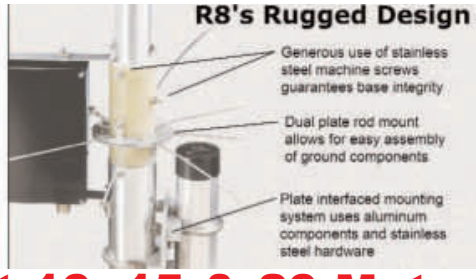
Compact Footprint: Installs in an area about the size of a child's sandbox -- no ground radials to bury and all RF-energized surfaces safely out of reach.

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

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

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





MA-5B *5-Band* Beam

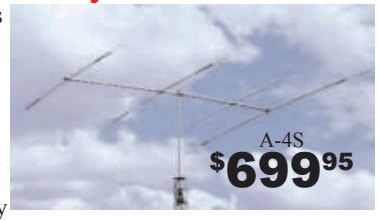
Small Footprint -- Big Signal

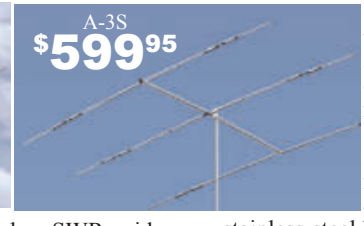
The MA-5B is one of Cushcraft's most popular HF antennas, delivering solid *signal-boosting directivity* in a bantam-weight package. Mounts on roof using standard TV hardware. Perfect for exploring exciting DX without the high cost and heavy lifting of installing a large tower and full-sized array. Its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

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

Cushcraft 10, 15 & 20 Meter Tribander Beams

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



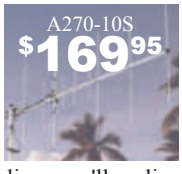


It goes without saying that the World-Ranger lineup is also famous for its rugged construction. In fact, the majority of these antennas sold years ago are still in service today! Conservative mechanical design, rugged over-sized components, stainless-steel hardware, and aircraft-grade 6063 make all the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

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

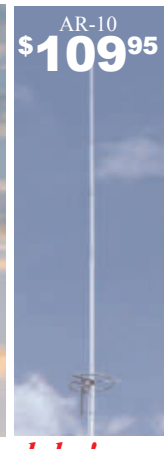
Cushcraft Dual Band Yagis

One Yagi for Dual-Band FM Radios



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

Cushcraft Famous *Ringo* Compact FM Verticals



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

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Life is a JOURNEY. Enjoy the ride!

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.
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In This Issue

April 2013 Volume 97 Number 4

Technical

News and Features

Our Cover
W1AW, the Hiram Percy Maxim Memorial Station, as seen from Main Street in Newington. The ARRL's flagship station was officially dedicated on September 2, 1938 on what would have been Maxim's 67th birthday. Today, the station boasts three operating studios with seven operating positions and has the capability to be on the air on 1.8 MHz to 2.4 GHz. For more on W1AW, please turn to page 65. You can also visit W1AW on the web at **www.arrl.org/w1aw**. Photo by RJS Photography.

Radiosport

Columns

Departments

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

The King of Mobile

75 WATTS

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*70 cm 45 W
FT-7900R
Size: 5.5" (W) x 1.6" (H) x 6.6" (D) / Weight: 2.2 lb
2 m/70 cm DUAL BAND

Best Selling, Reliable Mobile

55 WATTS

2 m MONO BAND — HEAVY-DUTY 75 W 2 m FM TRANSCEIVER
FT-2900R NEW
Size: 6.3" (W) x 2.0" (H) x 7.3" (D) / Weight: 4.0 lb

NEW — ULTRA RUGGED 55 W 2 m FM TRANSCEIVER
FT-1900R
Size: 5.5" (W) x 1.6" (H) x 5.8" (D) / Weight: 2.2 lb
2 m MONO BAND

Commercial Grade Field Radio Submersible Construction

COMPACT 5 W 2 m FM HANDHELD TRANSCEIVER
FT-270R
Size: 2.4" (W) x 4.7" (H) x 1.3" (D) Weight: 13.8 oz.
2 m MONO BAND NEW

Compact Field Radio with Top Mounted LCD and Loud Audio

ULTRA-COMPACT 5 W 2 m FM HANDHELD TRANSCEIVER
FT-250R
Size: 2.3" (W) x 4.3" (H) x 1.0" (D) / Weight: 12.4 oz.
2 m MONO BAND NEW

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New Advanced VX-8 Series GPS/APRS® Handheld Transceivers
Choose the Yaesu that meets your APRS® operating preferences in the field

50/144/(222)*/430 MHz
FM 5 W/AM 1W (50 MHz) Triple Band Handheld
VX-8DR * 222 MHz/1.5 W (USA version)
(7.4V 1,100 mAh Lithium Ion battery/FNB-101LI and battery charger/NC-66A included)

Actual Size

144/430 MHz
FM 5 W Dual Band Handheld
VX-8GR
(7.4V 1,100 mAh Lithium Ion battery/FNB-101LI and battery charger/NC-86A included)

Actual Size

VX-8DR NEW

All-in-one Prestigious Tri-band Transceiver
Bluetooth® for hands-free Operation with optional accessories
Waterproof/Submersible IPX 7 rated - 3 ft for 30 minutes

Optional GPS and antenna unit for GPS/APRS® operation

Attached to the radio (microphone input) using the optional GPS Antenna Adapter CT-136

The optional GPS Antenna Unit FGPS-2 attached to the optional speaker Microphone MH-74A7A

Bluetooth®

VX-8GR NEW

144/430 MHz Dual Band Transceiver with GPS unit included
Built-in GPS Antenna - Waterproof
Wide Band Receive for 108-999 MHz (Cellular blocked – US Version)

Supports APRS® communication by the Built-in Worldwide Standard AX.25 Data TNC

The VX-8 series radios are compatible with the world wide standard APRS® (Automatic Packet reporting System) using the GPS system to locate and exchange position information.

- SmartBeaconing™ Function
- Memories to list 50 stations
- Memories to store 30 APRS® messages
- DIGI-PATH routing indication function
- 8 DIGI-PATH routing settings
- GPS Compass Display - "Heading Up" or "North Up"
- APRS® Symbol Icon pre-set function
- Clearly displayed APRS® Beacon Messages
- Selective Message Received indicated by Flashing LED

APRS® is a registered trademark of Bob Bruninga WB4APR. SmartBeaconing™ from HamHUD Nichetronix

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Field Gear That Goes The Distance!

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HF/VHF/UHF Portable Operation Powerful Transceiver

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

FT-817ND

The Ultimate Backpack, Multi-Mode Portable Transceiver

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

FT-857D

The World's Smallest HF/VHF/UHF Mobile Transceiver

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

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

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The radio

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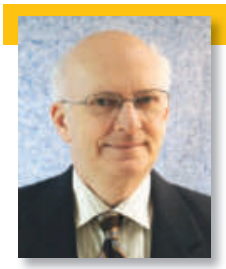

David Sumner, K1ZZ – dsumner@arrl.org
ARRL Chief Executive Officer

Techs on Ten

"Many Technician and Novice amateur licensees overlook the fact that they possess highly desirable operating privileges in the 10 meter band"

Owing to how it has evolved, the Amateur Radio licensing structure in the United States has some peculiarities. The FCC created the Technician and Novice classes of license in 1951, the former to encourage experimentation in the then-largely-unexplored frequency range above 220 MHz and the latter to serve as a temporary, one-time "learner's permit" with very limited operating privileges. The privileges afforded by the two licenses did not even overlap. For a time it was possible to hold Novice and Technician licenses simultaneously, with different call signs! Eventually Techs gained access to 6 and 2 meters and in 1976 were granted Novice privileges. The Novice became a renewable license in 1978.

In 1987 the ARRL persuaded the FCC to adopt what we called Novice Enhancement — a modest expansion of privileges to allow Novices to join the mainstream of Amateur Radio. It might well have been called Technician Enhancement because the most lasting effect was the granting of 10 meter voice privileges to Techs, something the ARRL had sought since 1969. When it became possible in 1991 to obtain a Technician license without passing a Morse code test, the international Radio Regulations still required Morse ability for operation below 30 MHz so two "flavors" of the license class resulted: Technician with privileges above 30 MHz and Technician Plus with the additional HF privileges of the Novice. The distinction disappeared in 2007 when Morse testing was dropped from the requirements for any class of amateur license and all Technicians immediately gained the Novice HF privileges.

Today about half of the radio amateurs in the United States hold Technician and Novice Class licenses — mostly Technician, since the Novice license is no longer available to new applicants and Novices now constitute less than 2% of the total amateur population. The Technician license is now the entry level into Amateur Radio yet it offers full privileges above 50 MHz — in many ways the most challenging part of the radio spectrum — along with the use of up to 200 watts of PEP output power for SSB voice at 28.3-28.5 MHz, RTTY and data at 28.0-28.3 MHz and CW at 28.0-28.5, 21.025-21.200, 7.025-7.125, and 3.525-3.600 MHz. Those are nice privileges, but not many Techs are using them.

Why not? There could be many reasons. Because of its origins there is a tendency still to think of the Technician as a VHF/UHF license. A new amateur's first exposure to on-the-air operating is likely to be a 2 meter repeater, many of which these days can connect to distant repeaters via the Internet; if you can talk to Australia with your VHF handheld, putting together an HF station to do the same thing may seem less appealing. Sunspots were not all that healthy in 2007 when thousands of Techs first experienced 10 meter operation, so they may have been disappointed. Techs who are interested in HF operation tend to upgrade quickly to General and Amateur Extra so they can explore all of the HF bands.

But we suspect the main reason is inertia. We all tend to fall into grooves, doing what we already know how to do rather than trying something new.

So here's a challenge for our Technician (and Novice) readers: Get on 10 meters. If you don't have a rig, see if you can borrow one from a friend. Lots of hams have spare gear lying around that they would be glad to see put to good use. It doesn't have to be the latest and greatest to get you on the air; practically any HF transceiver made in the last 40 years will do fine.

Antennas are easy. A quarter wave vertical is only about 8 feet tall; a half wave dipole is only about 16 feet from end to end; a quad loop can be made with 33 feet of wire. If you've never made an antenna and don't know where to start, ask a friend to show you how. (Note to club officers: this would be a good topic for a meeting program.)

Not that interested in SSB? No problem. The best kept secret about Technician operating privileges on 10 meters is that you can use RTTY and data on all of the same frequencies as Generals and Extras. There's a variety of digital data modes to explore, and lots of RTTY activity during contests and DXpeditions.

And while Morse code is no longer a licensing requirement, don't count out CW as worth a try. With CW you're not limited to 10 meters — you can explore 15, 40 and 80 meters as well! Purists may cringe, but Morse code readers and keyboards will get you on CW and let you make contacts.

Human nature being what it is, lots of hams are more interested in learning the code now than when it was forced on them. If your motivation is to be able to operate CW and not just to pass an unwanted test, skip practicing at slow speeds and go directly to listening to characters being sent fast enough that you can hear the rhythm and won't be tempted to count the individual dits and dahs. Bad habits are hard to break so it's better to not develop them in the first place.

See you on 10!

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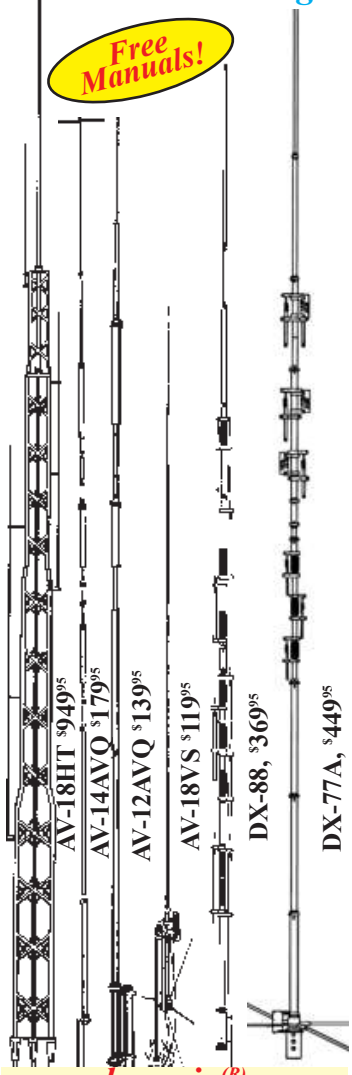

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Standing 53 feet tall, the famous *Hy-Gain HyTower* is the world's best performing vertical! The AV-18HT features automatic band selection achieved through a unique stub-decoupling system which effectively isolates various sections of the antenna so that an electrical 1/4 wavelength (or odd multiple of a 1/4 wavelength) exists on all bands. Approximately 250 kHz bandwidth at 2:1 VSWR on 80 Meters. The addition of a base loading coil (**LC-160Q, $109.95**), provides exceptional 160 Meter performance. **MK-17, $89.95**. Add-on 17 Meter kit. 24 foot tower is all rugged, hot-dip galvanized steel and all hardware is iridited for corrosion resistance. Special tilt-over hinged base for easy raising & lowering.

AV-14AVQ, $179.95. (10,15,20,40 Meters). 18 ft., 9 lbs. **The** Hy-Gain AV-14AVQ uses the same trap design as the famous Hy-Gain Thunderbird beams. Three separate air dielectric Hy-Q traps with oversize coils give superb stability and 1/4 wave resonance on all bands. Roof mount with Hy-Gain AV-14RMQ kit, $89.95.

AV-12AVQ, $139.95. (10, 15, 20 Meters). 13 ft., 9 lbs. **AV-12AVQ** also uses Thunderbird beam design air dielectric traps for extremely Hy-Q performance. This is the way to go for inexpensive tri-band performance in limited space. Roof mount with AV-14RMQ kit, $89.95.

AV-18VS, $119.95 (10,12,15,17,20,30,40,80 Meters). 18 ft., 4 lbs. **High** quality construction and low cost make the AV-18VS an exceptional value. Easily tuned to any band by adjusting feed point at the base loading coil. Roof mount with Hy-Gain AV-14RMQ kit, $89.95.

DX-88, $369.95. (10, 12, 15,17,20,30,40,80 Meters, 160 Meters optional). 25 ft., 18 lbs.

All bands are *easily* tuned with the DX-88's *exclusive* adjustable capacitors. 80 and 40 Meters can even be tuned from the ground without having to lower the antenna. Super heavy-duty construction. DX-88 OPTIONS: 160 Meter add-on kit, KIT-160-88, $199.95. Ground Radial System, GRK-88, $99.95. Roof Radial System, RRK-88, $99.95.

DX-77A, $449.95. (10, 12, 15, 17, 20, 30, 40 Meters). 29 ft., 25 lbs.

No ground radials required! Off-center-fed Windom has 55% greater bandwidth than competitive verticals. Heavy-duty tiltable base. Each band independently tunable.

Model #	Price	Bands	Max Power	Height	Weight	Wind Surv.	Rec. Mast
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AV-14AVQ	**$179.95**	**10,15,20,40**	**1500 W PEP**	**18 feet**	**9 pounds**	**80 MPH**	**1.5-1.625"**
AV-12AVQ	$139.95	10,15,20 M	1500 W PEP	13 feet	9 pounds	80 MPH	1.5-1.625"
AV-18VS	**$119.95**	**10 - 80 M**	**1500 W PEP**	**18 feet**	**4 pounds**	**80 MPH**	**1.5-1.625"**
DX-88	$369.95	10 - 40 M	1500 W PEP	25 feet	18 pounds	75 mph no guy	1.5-1.625"
DX-77A	**$449.95**	**10 - 80 M**	**1500 W PEP**	**29 feet**	**25 pounds**	**60 mph no guy**	**1.5-1.625"**

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Operate all bands 160-6 Meters at full 1500 Watt with this self-supporting, 43 feet high performance vertical! It assembles in less than an hour and its low profile blends in with the sky and trees -- you can barely see it . . .

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ARRL Governance Part II: Board Committees

This month I am going to discuss the ARRL Board Committees where much of the work of our Board takes place.

There are three Standing Board Committees along with other Advisory and ad hoc Board Committees. The three Standing Committees are the Administration and Finance Committee (A&F), the Programs & Services Committee (PSC) and the Executive Committee (EC). There is also an Ethics & Elections Committee, but it works a little differently so I'll discuss it later. Since there are three Committees of five Directors, each of the Board's 15 Directors serves on a single Standing Committee. The A&F and PSC Committees also have an appointed Vice President or Vice Director. The members of these Committees are appointed by the President at the January Board Meeting.

The Administration and Finance Committee is responsible for oversight of the ARRL's administration and financial management. For this reason, the ARRL's Treasurer is also an *ex officio* member of this Committee. One of the important tasks of the A&F Committee is approval of the ARRL's operating plan and budget for each year. Take it from me; the budget approval involves extensive scrutiny, discussion and analysis and it is a major effort on the part of the staff and the Committee members. The Committee also deals with audit and tax matters, reviews fundraising efforts, interfaces with the ARRL Foundation, and approves all major capital projects. Its role is critical to maintaining the financial strength and integrity of our organization. The current Chairman of the A&F Committee is New England Division Director Tom Frenaye, K1KI.

As its name suggests, the Programs & Services Committee monitors and evaluates a wide range of ARRL programs and services including contests and awards, Logbook of The World, W1AW and the outgoing QSL Service. Its other areas of oversight include the field organization, affiliated clubs, volunteer examiners and educational services. In recent years, it has also focused on emergency preparedness and Public Service. While changes to these programs can be contentious and difficult at times, PSC Members work hard to be fair and to do what is right for Amateur Radio. The PSC also recommends award recipients to the Board for outstanding volunteer service or outstanding achievement. The current Chairman of the PSC is Delta Division Director David Norris, K5UZ.

ARRL's President, Kay Craigie, N3KN, chairs the Executive Committee. It is comprised of the President and five Directors. The Directors themselves elect members of this Committee by secret ballot at the Annual Meeting in January. The First Vice President and the CEO are also members, but they do not vote. The Secretary and the General Counsel also attend. This Committee deals with one of our most important organizational priorities: regulatory and legislative matters affecting Amateur Radio. It formulates recommendations and strategies about these issues and presents them to the Board. It also reviews changes in the ARRL's overall governance structure, monitors the implementation of the ARRL Strategic Plan and approves applications for ARRL Affiliated Clubs.

The Ethics & Elections Committee is slightly different compared to the other committees. The President appoints its three members. Among other duties, they determine the eligibility of candidates for ARRL office, review their petitions, certifications, and campaign materials and supervise the balloting for Director and Vice Director. Dakota Director Greg Widin, KØGW, is currently Chairman of this Committee.

There are other Committees that address specific areas such as the DX Advisory Committee, the Contest Advisory Committee, the Historical Committee and the Public Relations Committee.

ARRL Committees are extremely important to the overall functioning and governance of our organization. More information about Committees, their responsibilities and their structure can be found on the ARRL website at **www.arrl.org/board-committees**.

W1AW Schedule

W1AW's schedule is at the same local time throughout the year. From the second Sunday in March to the first Sunday in November, UTC = Eastern US Time + 4 hours. For the rest of the year, UTC = Eastern US Time + 5 hours.

PAC	MTN	CENT	EAST	UTC	MON	TUE	WED	THU	FRI
6 AM	7 AM	8 AM	9 AM	1300		FAST CODE	SLOW CODE	FAST CODE	SLOW CODE
7 AM-1 PM	8 AM-2 PM	9 AM-3 PM	10 AM-4 PM	1400-1600 1700-1945	VISITING OPERATOR TIME (12 PM-1 PM CLOSED FOR LUNCH)				
1 PM	2 PM	3 PM	4 PM	2000	FAST CODE	SLOW CODE	FAST CODE	SLOW CODE	FAST CODE
2 PM	3 PM	4 PM	5 PM	2100	CODE BULLETIN				
3 PM	4 PM	5 PM	6 PM	2200	DIGITAL BULLETIN				
4 PM	5 PM	6 PM	7 PM	2300	SLOW CODE	FAST CODE	SLOW CODE	FAST CODE	SLOW CODE
5 PM	6 PM	7 PM	8 PM	0000	CODE BULLETIN				
6 PM	7 PM	8 PM	9 PM	0100	DIGITAL BULLETIN				
6^{45} PM	7^{45} PM	8^{45} PM	9^{45} PM	0145	VOICE BULLETIN				
7 PM	8 PM	9 PM	10 PM	0200	FAST CODE	SLOW CODE	FAST CODE	SLOW CODE	FAST CODE
8 PM	9 PM	10 PM	11 PM	0300	CODE BULLETIN				

♦ Morse code transmissions: Frequencies are 1.8025, 3.5815, 7.0475, 14.0475, 18.0975, 21.0675, 28.0675 and 147.555 MHz.
Slow Code = practice sent at 5, 7½, 10, 13 and 15 WPM.
Fast Code = practice sent at 35, 30, 25, 20, 15, 13 and 10 WPM.
Code bulletins are sent at 18 WPM.

♦ W1AW Qualifying Runs are sent on the same frequencies as the Morse code transmissions. West Coast qualifying runs are transmitted by K6YR and other West Coast stations on 3590 kHz and other frequencies. See "Contest Corral" in this issue. Underline one minute of the highest speed you copied, certify that your copy was made without aid, and send it to ARRL for grading. Please include your name, call sign (if any) and complete mailing address. Fees: $10 for a certificate, $7.50 for endorsements.

♦ Digital transmissions: Frequencies are 3.5975, 7.095, 14.095, 18.1025, 21.095, 28.095 and 147.555 MHz.

Bulletins are sent using 45.45-baud Baudot, PSK31 in BPSK mode and MFSK16 on a daily revolving schedule.

Keplerian elements for many amateur satellites will be sent on the regular digital frequencies on Tuesdays and Fridays at 6:30 PM Eastern Time using Baudot and PSK31.

♦ Voice transmissions: Frequencies are 1.855, 3.99, 7.29, 14.29, 18.16, 21.39, 28.59 and 147.555 MHz.

♦ Notes: On Fridays, UTC, a DX bulletin replaces the regular bulletins. W1AW is open to visitors 10 AM to noon and 1 PM to 3:45 PM Monday through Friday. FCC licensed amateurs may operate the station during that time. Be sure to bring your current FCC amateur license or a photocopy. In a communication emergency, monitor W1AW for special bulletins as follows: voice on the hour, teleprinter at 15 minutes past the hour and CW on the half hour.

W1AW code practice and CW/digital bulletin transmission audio is also available real-time via the *EchoLink Conference Server* W1AWBDCT. The conference server runs concurrently with the regularly scheduled station transmissions.

During 2013, Headquarters and W1AW are closed on New Year's Day, Presidents' Day (February 18), Good Friday (March 29), Memorial Day (May 27), Independence Day (July 4), Labor Day (September 2), Thanksgiving and the following day (November 28 and 29), and Christmas (December 25). For more information, visit us at **www.arrl.org/w1aw**.

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- ***QST* Archive and Periodicals Search – www.arrl.org/qst**
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  A searchable index for *QEX* and *NCJ* is also available.
- **Free E-Newsletters**
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- **Product Review Archive – www.arrl.org/qst**
  Search for, and download, *QST* Product Reviews published from 1980 to present.
- **E-Mail Forwarding Service**
  E-mail sent to your **arrl.net** address will be forwarded to any e-mail account you specify.
- **Customized ARRL.org home page**
  Customize your home page to see local ham radio events, clubs and news.
- **ARRL Member Directory**
  Connect with other ARRL members via a searchable online Member Directory. Share profiles, photos and more with members who have similar interests.

ARRL Technical Information Service — www.arrl.org/tis

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

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

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

ARRL Group Benefit Programs* — www.arrl.org/benefits

- **ARRL "Special Risk" Ham Radio Equipment Insurance Plan**
  Insurance is available to protect you from loss or damage to your station, antennas and mobile equipment by lightning, theft, accident, fire, flood, tornado, and other natural disasters.
- **The ARRL Visa Signature® Card**
  Every purchase supports ARRL programs and services.
- **MetLife® Auto, Home, Renters, Boaters, Fire Insurance and Banking Products**
  ARRL members may qualify for up to a 10% discount on home or auto insurance.

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

Programs

Public Service — www.arrl.org/public-service

Amateur Radio Emergency Service® – **www.arrl.org/ares**
Emergency Communications Training – **www.arrl.org/emcomm-training**

Radiosport

Awards – **www.arrl.org/awards**
Contests – **www.arrl.org/contests**
QSL Service – **www.arrl.org/qsl**
Logbook of the World – **www.arrl.org/lotw**

Community

Radio Clubs (ARRL-affiliated clubs) – **www.arrl.org/clubs**
Hamfests and Conventions – **www.arrl.org/hamfests**
ARRL Field Organization – **www.arrl.org/field-organization**

Licensing, Education and Training

Find a License Exam Session – **www.arrl.org/exam**
Find a Licensing Class – **www.arrl.org/find-an-amateur-radio-license-class**
ARRL Continuing Education Program – **www.arrl.org/courses-training**
Books, Software and Operating Resources – **www.arrl.org/shop**

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**
Support for Instructors – **www.arrl.org/instructors**
Support for Teachers – **www.arrl.org/teachers**
ARRL Volunteer Examiner Coordinator (ARRL VEC) – **www.arrl.org/vec**
Public and Media Relations – **www.arrl.org/media**
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The American Radio Relay League, Inc.

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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Steve Ford, WB8IMY, upfront@arrl.org

Radio at Sea and in the Air

By John Reisenauer, Jr, HI3/KL7JR

When Ron Hall, WQ3W, isn't plying the waters around Florida in his sailboat, the *Brisa del Mar,* he is in command of a US Airways Airbus A330 airliner.

On the water, Ron depends on his Kenwood TS-480HX transceiver and an insulated backstay (43 feet of insulated wire from tuner under aft seats to insulated portion of backstay) for his maritime mobile antenna.

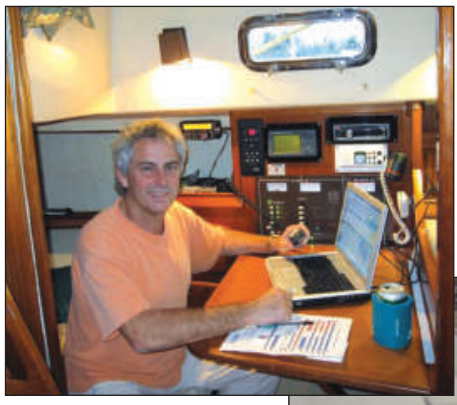
In the air you'll find Ron soaring over the North Atlantic and the Caribbean, making "aeronautical mobile" contacts as time permits. Hams who've never contacted an airliner in flight are often astonished when Ron gives his position in latitude, longitude and altitude, finally adding that he is moving at 575 MPH!

His flight deck aeronautical HF/VHF radio is an Allied Signal rig that produces a whopping 400 W on SSB. With all that power and an antenna at more than 35,000 feet, it is a small wonder that Ron tends to create pileups. "I'm always amazed at how easy it is to get a pileup going," Ron says. "I don't play radio while we are in VHF contact with ATC (air traffic control). Once we are over the ocean, however, I have plenty of time to make a few contacts between position reports. And I would like to emphasize that making Amateur Radio contacts is my last priority when I'm flying. I only do it when the workload is low. I know many people are afraid of flying and I do not want them to think no one is minding the store!"

The antenna on an A330 is an insulated portion of the vertical stabilizer and it is quite effective from 30,000 to 41,000 feet, according to Ron. The HF radio is physically located with other communications and navigational avionics gear in a room outside of the cockpit. A control head in the cockpit provides operation of all communications with only one panel.

The *Brisa del Mar* at sail. Note the solar panels at the stern.

WQ3W's seagoing antenna along an insulated portion of the backstay.



Ron Hall, WQ3W, enjoying Amateur Radio onboard his boat, the *Brisa del Mar.* He uses solar power to meet most of his electrical needs.

Captain Ron Hall, WQ3W, at the controls of a Boeing 767.

A close up of the radio control panel on the flight deck. Ron can operate on 160 through 12 meters, but is limited to USB or AM only.

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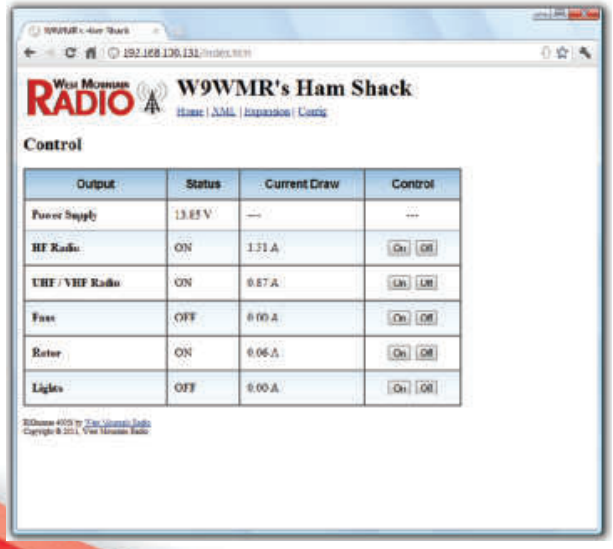

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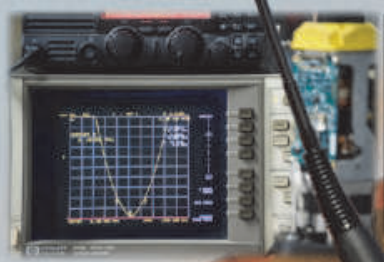

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Letters from Our Members

Challenges Make Amateur Radio Fun

I just wanted to let you know how much I enjoyed the chase in pursuit of the Diamond DXCC Challenge this past year. First licensed in1963, I took part in the DXCC Golden Jubilee in 1987 and the Diamond DXCC Challenge using only an "old" analog tube transceiver, a straight key, no amplifier, no computer and doing all my logging by hand. With close to 50 years of hamming under my belt, the fun is not yet over. Although I have had my frustrations dealing with bad behavior and clearly "over the top" stations for which there isn't much of a challenge, I look forward to all the coming DXpeditions and hopefully the next DXCC milestone, the 100th anniversary in 2037. In that year I will be 88, a good number, and presumably my last DXCC anniversary. Thanks for the fun and the challenges. These kinds of events are far more enjoyable for me than all those weekend contests, although I have worked my share of DX contests and Sweepstakes.

If nothing else, let this be a message to new and old timers alike: Much can be achieved with limited means, but lots of desire.

Roy Yenoli, K3RY
Gambrills, Maryland

Licensing Kids — the Debate Continues

Jim Crosby, K4JEC, cautioned us about dangers that come with licensing young ham operators ["Op-Ed: Too Young for Ham Radio?" Feb 2013, Page 99], raising concerns about the potential for inappropriate behavior on the air and potential culpability with the FCC for misconduct.

Jim's worries are misdirected. I do not worry about kids joining the hobby; I worry about adults with anger issues being on the air. I have been a ham for 36 years. I have never encountered bad behavior from someone under age 18, but I encounter it frequently in the Amateur Extra class band segments when I am trying to work rare DX. The FCC's Laura Smith and Riley Hollingsworth will likely point out that most, if not all, of the recent FCC actions have centered on inappropriate behavior by adults. I cannot recall any such citation toward a youth.

Most young people who are licensed are extremely bright and gifted and frequently come from families where a parent or grandparent is licensed and active. The youth ham has built-in Elmers and mentors who often operate with them to guide and train them.

My three daughters got their licenses at 8, 11 and 13. I always operated alongside them, not out of worry about what they would do, but out of concern about what an adult might say that was inappropriate. This happened to a daughter of a friend of mine and now she is inactive. If you share Jim's worry about young people being licensed, then join a school club as a mentor, or volunteer through your local radio club to help train the next generation.

I welcome more young people in our hobby — their enthusiasm and zeal inspire us all. I am grateful that I got into this hobby as a 12-year-old. Amateur Radio helped me grow emotionally, intellectually and socially, preparing me for the career I now enjoy. I was befriended by a lot of wonderful adults along the way, and I continue to meet some of the world's nicest people through Amateur Radio.

Scott Wright, MD, KØMD
Rochester, Minnesota

■ I agree fully with Jim Crosby, K4JEC. A six-year-old is too young to have the abilities called for in Part 97. I was licensed at the age of 12, but that was back in the 1950s when the knowledge level was tested at a higher standard than today. As Jim points out, even six-year-olds can memorize answers and retain them for a short time in order to pass a test. But what they really understand — in terms of responsibility and safety in particular — is minimal. I'm sure many will take exception to this, even though it is the truth.

Jerry Boyd, N7WR
ARRL Life Member
Baker City, Oregon

A Fine Job

The comments by Jerry Patrick, KB4FP ["Correspondence: Finding Fault With the FCC," Feb 2013, page 24] deserve comment. Those who have had contact with FCC Special Counsel Laura Smith — successor to Riley Hollingsworth, K4ZDH — find that she, like Riley, tries to be as helpful and friendly to the amateur community as possible, while taking action against the few who deliberately disregard the rules. Administrative procedures, including investigations, are not for publication, and immediate actions on alleged infractions are possible only when necessary to prevent injury to life or property. Immediate desist orders are necessarily restricted to cases affecting public safety, such as interference with aircraft control; otherwise, the rule is "innocent until proven guilty."

Perhaps Smith's comment that "to have fun is the true meaning of Amateur Radio" wasn't properly phrased. But the fact remains that far from all present amateur licensees are very active in ARES® and other service-related activities and are on duty when there is a call-out for a real emergency, or are true students and experimenters of communication theory and practice — contributors to the scientific state of the art.

Laura Smith appears to be doing a good job, of course with the assistance of Official Observers, in keeping our frequencies clean and punishing the few who would disrupt our bands. Riley was a hard act to follow and Laura is doing fine.

David Heller, K3TX
ARRL Life Member
Yardley, Pennsylvania

A Contest in Any Language

The expanded contest listings ["Contest Corral," Feb 2013, page 90] have all the basic information I need to operate each contest, listing each contest website for additional information. This is great! I was looking for a contest to work over the weekend of February 2-3 and I enjoy RTTY. I learned about the Mexican RTTY Contest from *The ARRL Letter* and went to that contest's website to learn more about it. Unfortunately, the website was in Spanish and I can't read that language. Lucky for me, I was reading *QST* the night before the contest and I came across the Contest Corral that listed all the parameters that I needed to know to work the contest — in English! This is a great help to me, as many foreign-sponsored contest websites are not in English.

Walter Mellish, KC2KZJ
Livingston, New Jersey

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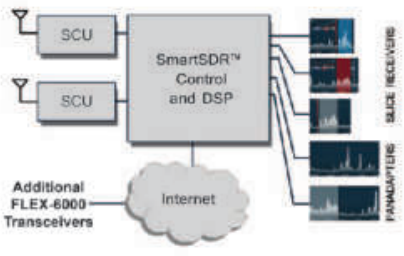

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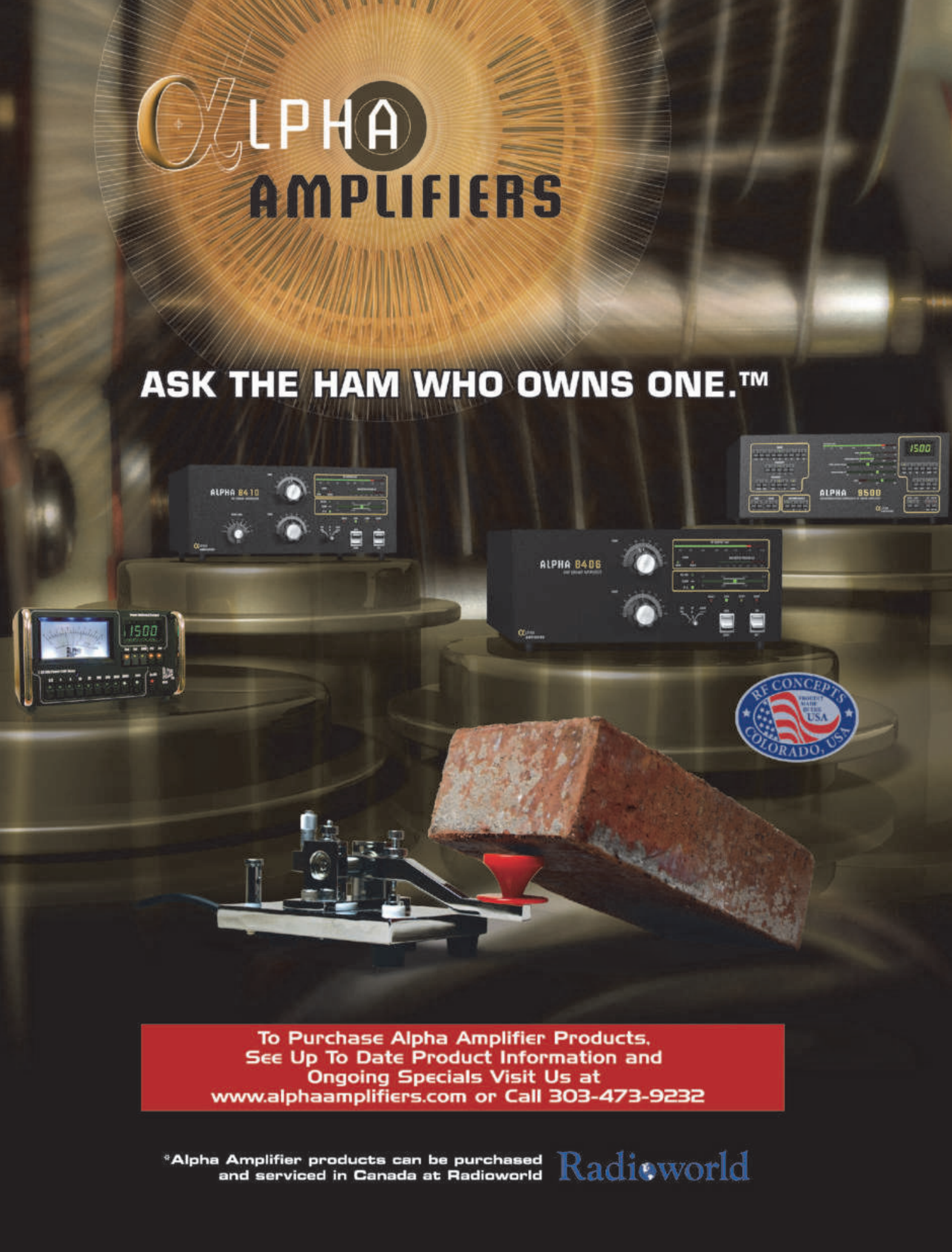
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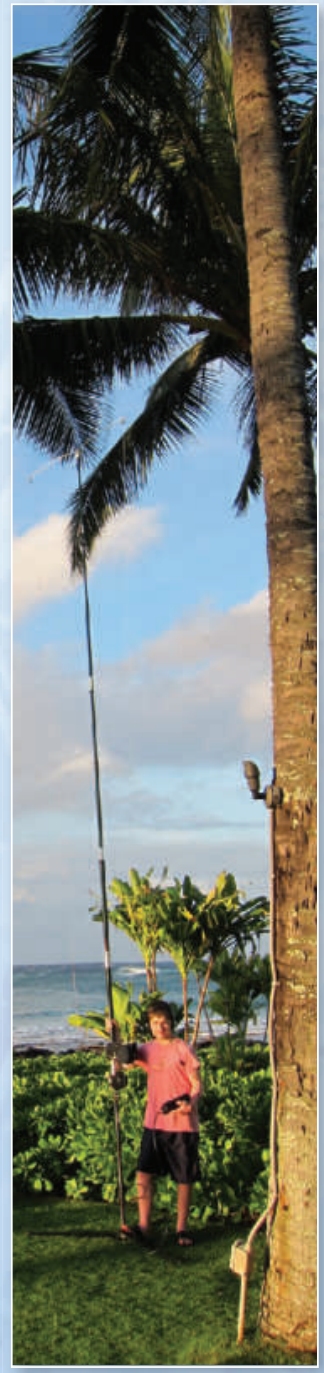

Sam Moran, KE7MAN

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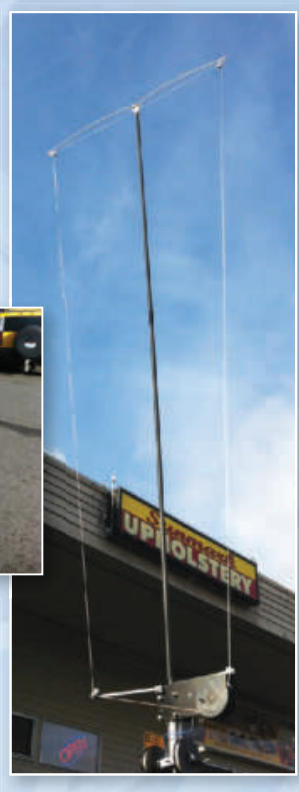

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Remote Control of Accessories via the Internet

Control station accessories while operating HF remote.

Jon Crisman, WØJEC

In recent forays into remote operation of my HF station over the Internet, I found that Internet remote control of my rig and antenna rotator was fairly straightforward. On the other hand, remote control of other station functions such as selecting antennas using a remote antenna switch, switching ac power on and off to my rotator controller and controlling other station accessories was more challenging. Here's how I worked everything out.

First, Talk to the Radio

My primary HF transceiver, a Kenwood TS-570S, can be controlled from the serial port of my home desktop computer. There are several great software choices for remote operation of the radio from my laptop over the Internet. I chose the *Ham Radio Deluxe* (*HRD*) developed by Simon Brown, HB9DRV.[1] *HRD* provides complete remote control of the radio for voice operation as well as digital modes.

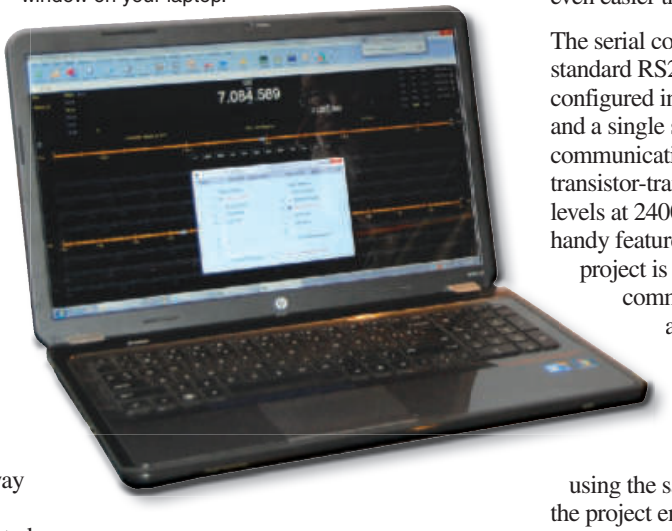
I also installed the *Logmein Hamachi* virtual private network (VPN) software to provide static IP addresses on my laptop and desktop computers.[2] *Skype* software and a SignaLink USB audio interface provide the audio pathway between the headset connected to my remote laptop and the Kenwood connected to the home desktop PC. The SignaLink USB also makes it possible to operate using digital modes with the *HRD* remote software.

Next, All the Other Bits

To provide remote rotator control of my beam antenna, I installed the Idiom Press RS232 control module in my Hy-Gain rotator controller and chose the shareware software *PstRotator* by Buda Codrut Gabriel, YO3DMU, which provides its own remote Internet server and uses my virtual private network to maintain a very reliable Internet connection to my Hy-Gain rotator controller.[3,4]

Next I needed to control my LDG DTS-6 antenna switch so I could remotely select from among my 40 and 80 meter dipoles, HF Yagi, HF vertical and even my dummy load as I operated.[5] Here I ran into a problem. The LDG company operator's manuals for the DTS-4 and DTS-6 switches mention that they can be computer controlled, and the company even provides the control code protocols. LDG never got around to creating the software for PC control — users were invited to write their own.

Remote accessory control is just another window on your laptop.



In addition to remote control of the antenna switch, I also wanted to have remote control of the power to several station accessories including the Hy-Gain rotator controller and the DTS-6 antenna switch. I also wanted to remotely control both power and switching between my primary and backup HF rigs. I enjoy tinkering with hardware and software, so I decided to build my own station control and DTS antenna switch hardware and write my own software.

Dig In with PICAXE

A recent *QST* article introduced me to the PICAXE microcontroller chip.[6] The chip, primarily intended for school projects, is sold by Revolution Education Ltd. of England. They sell a variety of microcontroller chips and project boards and furnish free software for writing and compiling simple programs and for downloading the software files into the chip. These chips can do almost anything, but for my purposes they offered on/off control of 12 V dc relays and the ability to send and receive serial commands and data between my PC and my DTS-6 antenna switch.

All I needed now was to build the PICAXE project board, program the chip and write the *Visual Basic Net* (*VB*) programs to exchange commands and data between the chip and my computer over the Internet. After freshening up my *Visual Basic* programming skills, this project turned out to be even easier than I had expected.

The serial communication with the PC uses standard RS232 voltage levels at 4800 baud, configured in eight bit words with no parity and a single stop bit (8-N-1), but serial communication with the DTS requires lower transistor-transistor logic (TTL) voltage levels at 2400 baud, 8-N-1. One of the very handy features of the PICAXE for this project is that the PC can send DTS commands to the PICAXE as RS232 at 4800 baud while the PICAXE relays the commands to the DTS as TTL at 2400 baud.

Data from the DTS returns to the PC through the PICAXE using the same pathway. That simplified the project enormously and eliminated a considerable amount of circuitry. The PICAXE also can be commanded to turn on and off eight individual Darlington pairs to sink up to 600 mA for each of eight 12 V dc relays. I probably will never need all eight control relays for station control but if you've got them, why not write the programming to use them?

The Hardware Piece

A schematic of the controller board is shown in Figure 1. All the parts are easily assembled on a commercial project board. It includes a 5 V dc regulator, the PICAXE chip, a Darlington array chip and serial communications between the PICAXE and both the PC and the antenna switch. The parts are readily available from RadioShack and the US distributor for Revolution Education.[7] It will help if you have some

[1]Notes appear on page 32.

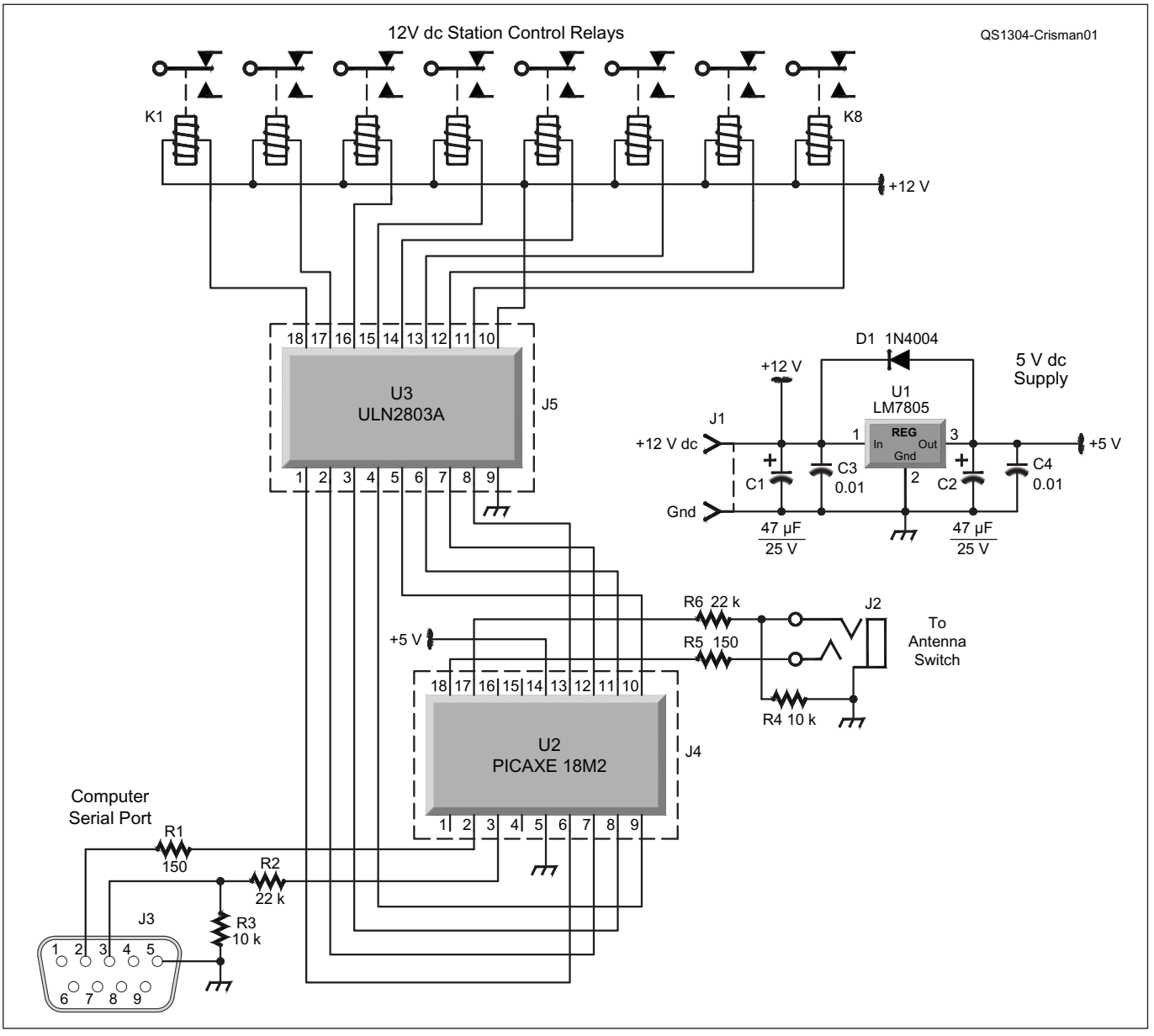


Figure 1 — Schematic diagram and parts list for the remote control switching box. U1 - U3 are available from PH Anderson, Springfield, VT (**phanderson.com/PICAXE**). They also offer the 18 pin dip sockets.

C1, C2 — 47 µF, 25 V electrolytic capacitor.
C3, C4 — 0.01 µF ceramic capacitor.
D1 — 1N4004 or equivalent silicon diode.
J1 — Power connection to match remote station power distribution.
J2 — Jack for controlling antenna switch or other TTL level accessory. Stereo phono jack used for my DTS-6.
J3 — DB9 female solder connector (RadioShack 276-1538).
J4, J5 — 18 pin DIP socket.
K1-K8 — SPDT, 12 V dc operated relays for accessory control. Connect to NC or NO contacts as appropriate for connected device. The relays I used have 10 A contacts and can be obtained from Digikey (2071-ND) or Mouser (769-JQ1AP-12V-F).
R1, R5 — 150 Ω, ¼ W resistor.
R2, R6 — 22 kΩ, ¼ W resistor.
R3, R4 — 10 kΩ, ¼ W resistor.
U1 — LM7805 5 V regulator IC.
U2 — 18M2 PICAXE processor IC installed in 18 pin DIP socket.
U3 — ULN2803A Darlington array IC installed in 18 pin DIP socket.
Project board (RadioShack 276-168B).

experience with basic component layout and soldering techniques — just be careful about solder bridges with the close spacing of the contacts for the dual-inline package (dip) IC sockets. The specified project board will give you ample room for all the components. I haven't provided detailed information about how to configure and install the station control relays you chose to use. Selecting and wiring these devices to the board will be based on your particular needs.

The Software Piece

The *QST* in Depth web page includes the *VB* software and the PICAXE program file.[8] The *VB* program I have written, *WØJEC Station Control/DST*, provides for computer control of the DTS-6 (or DTS-4) antenna switch as well as eight station control relays. After installation on your remote computer, start the program and click on CONFIGURE (see Figure 2) to list up to six antennas you have connected to your DTS and up to eight station accessories you want to control using the control relays. If you don't have six antennas connected to your DTS or eight station accessories to control, just leave those unneeded entries blank and the program will only offer selections for what you do have.

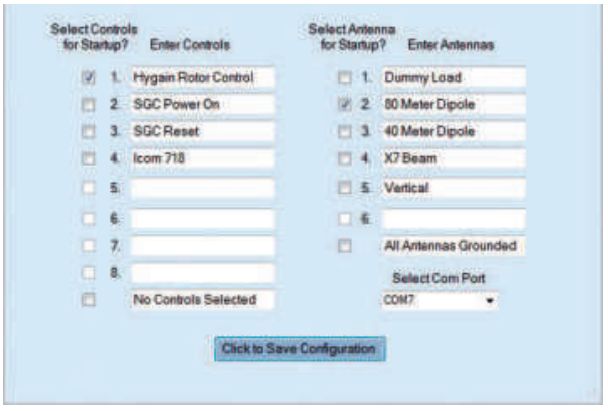


Figure 2 — Screen shot of the *WØJEC Station Control/DTS* configuration screen.

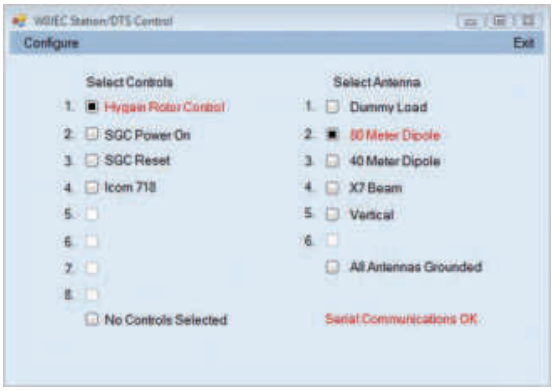


Figure 3 — Screen shot of the *WØJEC Station Control/DTS* control panel.

Using the CONFIGURE screen you can also chose which antenna and which controls will be automatically selected at startup. Using the program you can change antennas and turn on or off the control relays simply by clicking on the appropriate selection boxes as shown in Figure 3. In the event serial communication is lost between the PC and the PICAXE board, you will be given a warning and then all station controls will be automatically turned off and all antennas will be grounded. You will also be warned if the PICAXE board loses power or loses serial communication with the DTS switch.

Hooking it Up

After the PICAXE board is completed, it will need to be connected to your PC's serial port, or USB-to-serial adapter. The PICAXE program file I have furnished can then be loaded into the chip. The *Programming Editor* provided for free by Revolution Education is used for this purpose. Once the PICAXE chip is programmed, all you have to do is to Install the *VB* software on your PC; connect the PICAXE board to your PC's serial port, your DTS switch, and your station control relays; and the entire system can be tested.

Of course, the *WØJEC Station-DTS Control* program and PICAXE hardware will work fine on your home PC but I designed the system for remote operation. For that, *WØJEC Station-DTS Control* must be installed on your remote computer; configuring it with your home computer's static IP address (provided by your *Logmein Hamachi* virtual private network) and the firewall port selected for use on your home computer.[2] Next, install the server, *WØJEC Server,* on your home computer, selecting the firewall port you have chosen and the serial port used for the PICAXE board. You will now be remotely connected to the PICAXE board using the client to server connection between the two computers.

Making it Play

For my remote HF operation, my home computer is always running the *Logmein Hamachi* virtual private network, *WØJEC Server*, and the *PstRotatorAZ* software configured as a RS232/TCP Server. *Skype* is configured to turn on automatically when called by my remote laptop and it connects to the external soundcard in my SignaLink USB. My Kenwood 570S is connected to serial port 7, my Hy-Gain Rotator to serial port 8, the PICAXE board to serial port 17, and my ICOM 718 CI-V to serial port 18. The PICAXE board is connected to the DST-6 and the 12 VDC relays which control power to the Hy-Gain Rotor Controller, the DTS-6, an SGC antenna coupler, and the ICOM 718. My SignaLink USB is connected to both my Kenwood and Icom radios and receives and sends audio to and from the laptop using *Skype*.

On my remote laptop, *Logmein Hamachi* provides a VPN connection to my home computer over the internet. When I start the "*WØJEC Station-DTS Control*" software, it automatically turns on the Hy-Gain Rotator Controller and selects my 80 meter dipole antenna. The *PstRotatorAz* software controls the Hy-Gain Rotator over the internet and *Skype* provides an audio pathway to the radios. I have *HRD* on my remote computer configured to access its *HRD Remote Server* on my home computer using the VPN. When I start *HRD* on my remote computer, it automatically connects to and turns on my Kenwood at home. That's it. I'm ready to enjoy my HF station regardless of where I'm located.

If this sounds complicated, I have written a detailed step-by-step installation and operations guide that is included in the package on the *QST* in Depth web page, which also contains the PICAXE program file and the *VB* software, *WØJEC Station Control/DTS*. Using this guide, I am confident you will be up and running with your entire remotely controlled HF station in short order.

For those who do not use a DTS-4 or 6 antenna switch, I also wrote similar software to control a homemade antenna switch and designed the PICAXE hardware to accomplish this. These materials are also available on the *QST* in Depth web page.

Notes
[1]**hrdsoftwarellc.com**
[2]**www.logmein.com**
[3]**www.idiompress.com**
[4]**www.qsl.net/yo3dmu/index_Page346.htm**
[5]My remote antenna switch is an LDG (**www.ldgelectronics.com**) DTS-6 antenna switch. This unit is no longer produced by LDG, but may be found at dealers until supplies are depleted.
[6]M. Kelly, VE3FFK, "Canadian Club Digs PICAXE," *QST*, Apr 2011, pp 61-62.
[7]**www.PICAXE.com/distributors**
[8]**www.arrl.org/qst-in-depth**

ARRL member and Amateur Extra class licensee Jon E. Crisman, WØJEC, was first licensed in 1976. He has participated in all aspects of Amateur Radio in the years since. He built his first computer, a Heathkit H89, in 1980 and wrote his first computer program in assembly language for that computer. Since then, he has dabbled in various electronics projects and computer programming. He especially enjoys building antennas, helping to maintain the local radio club's repeater network, working contests (especially ARRL Sweepstakes and CQ SSB Worldwide DX) and providing ham radio communications support to county emergency management. You can reach Jon at 4545 Cartway Rd NW, Bemidji, MN 56601 or at **jcrisman@paulbunyan.net**.

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

The 2 Meter Q-Pole

Eric P. Nichols, KL7AJ

What's all this buzz about the J-pole? Is there something special about the letter J that makes it radiate better than any other letter? I think not!

I'm particularly fond of the letter Q. It's used in great words like *quality* and *quixotic*, and *squelch* and *squiggle*, and that ever-popular Eskimo lip-pulling contest, *eggeruutijuqq*. I have devised a Q antenna with properties of great benefit to the radio amateur. It is the only antenna capable of radiating omnidirectional diagonal polarization.

Unique qualifications make this the right antenna for the 21st century.

As you can see in the lead photo, the Q-pole strongly resembles the letter Q. This is naturally a very *high-Q* antenna. One might be tempted to think this is just a loop antenna, but don't be deceived. Notice the exquisitely designed Q-section shown in Figure 1.

Details, Schmetails

As you can see, the Q-pole uses the familiar *plumber's nightmare* construction, which results in an attractive antenna, not only to humans, but also to quail and squab, which may be apt to perch on it.

Although the Q-pole is quite easy to assemble, some caution is necessary during the final tuning process, which is not so daunting as to make one queasy. Until this antenna enters mass production (awaiting the arrival of my specially designed Q-multiplier), one may have to do some tweaking to get optimal performance. It helps to have a Q meter or equivalent equipment handy.

Feeding the Thing

Though the Q-pole may be fed with conventional 50 Ω coax, it is highly recommended that you feed it with high quality closed wire feed line. This method results in a perfect reflection on *any* frequency, which makes the entire tuning process much simpler, and sometimes entirely unnecessary. This remarkable property stems from Kirchhoff's Current Law, which tells us that a perfect conductor in parallel with a lousy conductor is still a perfect conductor.

Figure 1 — Detailed view of the Q section. Construction details are left to the reader.

And Now for Some Theory

Don't you just hate it when people ask you how something actually works? It is best to think of the Q-pole as a *recursive longwire*. We all know how well longwires work. The only problem with longwires is that they're…well…*long*. What if one were to take the far end of a longwire antenna and feed it back into the near end of the same antenna? As far as the radio signal is concerned either end of a longwire looks the same. In fact, the input of a longwire antenna looks just the same as the input of a short wire. Once you have this feedback established, there's no reason you can't just shrink the loop to any arbitrary size.

This is the same principle as a regenerative circuit. It is well known that you can achieve infinite amplification by careful feedback in an amplifier. Likewise, the Q-pole antenna achieves infinite pattern gain by this same principle of positive feedback.

The only tricky part is to somehow cause the signal to go around the loop in only *one direction*. If the radio waves are allowed to travel both directions, the aforementioned recursive gain is cancelled. This is where the special Q-section comes in. Its purpose is to direct the circulating current around the loop in only one direction — what one might call *polarized ac*. In this regard, the Q-section functions much like the traditional *hybrid* in one direction, but in the other direction it acts like a *lowbrid*.

Unlike most antenna principles that are reciprocal in nearly every aspect, this hybrid/lowbrid pairing is entirely unilateral. This is why, to the uninitiated, the Q-pole seems queerly asymmetrical. One must avoid the temptation to reorient the Q-pole so that the Q-section is at bottom (or top) dead center. What works for the letter Q also works for the antenna.

In Conclusion

Don't let tradition stifle your amateur radio enjoyment. Sure the J-pole has been around, and it's been analyzed ad nauseum. But isn't it time to try something different? And remember, QSO starts with Q!

Photos by the author.

ARRL member and Amateur Extra class licensee Eric P. Nichols, KL7AJ, has published numerous articles over the past 30 years, with an emphasis on radio design and techniques. He worked as a broadcast engineer for a quarter of a century, later applying his radio experience to experiments conducted at HIPAS Observatory and HAARP, as well as designing instrumentation for the UCLA Plasma Physics department. His offbeat look at Amateur Radio, *The Opus of Amateur Radio Knowledge and Lore*, was published in 2011 by *CQ Communications*. His book *Radio Science for the Radio Amateur*, will be released by the ARRL shortly. You can reach Eric at PO Box 56235, North Pole, AK 99705-1235 or at **kl7aj@acsalaska.net**.

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

The Garden Beam

A rotatable DX antenna with good gain and directivity — no tower necessary.

George Wallner, AA7JV

The Garden Beam used in the backyard of Tomi Pekarik, HA7RY. For best results, the mast extension supporting the boom guys should be non conductive.

DX work, which involves reaching distant stations, requires low angles of radiation. The June 2011 *QST* article "Is there an Optimum Height for an HF Antenna?" covers the subject of DX signal angles (and optimum antenna heights).[1]

The article points out that good DX work requires radiation at elevation angles between 5 and 19° and concludes that to achieve these low angles of radiation, any horizontally polarized antenna such as a Yagi or a dipole should be mounted at a height of 0.7 to 1.5 wavelengths. For example, antennas for the 20 meter band should be at a height of 50 to 100 feet.

Erecting a tower to raise an antenna to 50 or 100 feet, however, is not always possible, nor indeed, popular. This has left a large number of amateurs frustrated and disadvantaged when it comes to DXing.

The Vertical Alternative

The alternatives for tower challenged amateurs are verticals and low dipoles. Vertically polarized antennas have low angles of radiation even from ground level. They often suffer, however, from excessive ground losses, especially if their radials are short and few. Losses are especially high when the ground quality is poor. These losses can be reduced by raising the entire antenna, including the radials, 0.1 to 0.2 wavelengths above ground. This is called an elevated vertical. The elevated vertical only needs two insulated resonant radials — sometimes called counterpoises — in order to work properly. The usual vertical monopole, however, is omnidirectional and lacks the ability to focus the radiated energy toward a DX station. Also, they cannot be turned to eliminate noise or interference.

Multielement vertical phased arrays can have good gain and directivity. They are excellent DX antennas, but need a lot of space and, just as with the vertical monopoles of which they're made, they can suffer from high ground losses. One could turn a traditional Yagi on its side and make it achieve low angles of radiation from modest heights, but the entire antenna would have to be in front of its mast or tower to avoid the pattern distortion of the mast and feed line in the middle of the array.

The Vertical that Does the Job

The *Garden Beam* is a new antenna that combines the gain of a Yagi with the low radiation angle of an elevated vertical. The idea for this antenna came from several years of development work on light, high performance DXpedition antennas. Ever since our TX3A DXpedition, my partner Tomi Pekarik, HA7RY, and I have been working on a vertically polarized parasitic array that could float on sea water and would have good gain and front-to-back ratio (F/B). Indeed, such an antenna was tested with good results at C6AGU during the 2011 ARRL CW DX contest from the Bahamas.

The antenna proved to be such a good performer that we immediately started working on a version that did not need to be over sea water. We also realized that if we could make this antenna work without a tower (and without the ocean) we could solve one of the most persistent and fundamental problems facing many amateurs. As this antenna would most likely be mounted in a back yard, we decided to call it the Garden Beam (GB). While the GB does not need a tower, it is not quite a stealth antenna. It is, however, a lot stealthier than a 90 foot tower with a Yagi on top. When the GB is mounted at 10 feet above ground, the tip of its highest vertical element will be at 25 feet. The lead photo shows the antenna in Tomi's yard. He has been working a lot of great DX with his GB.

The operation of the GB is similar to a Yagi. It is an end-fire parasitic array of elements sized and spaced to provide the appropriate phasing required for beam forming. What is different is that the GB uses vertical monopole radiating elements. These vertical elements work in conjunction with corresponding horizontal counterpoise elements. The result is a vertically polarized antenna that has reasonable gain, excellent F/B, and because it is vertically polarized, low angles of radiation from modest heights. Also, because it is elevated, it does not suffer from excessive ground losses. Figures 1 to 3 show the *EZNEC* modeled radiation patterns and SWR of the antenna when mounted at a height of 10 feet above typical ground.[2] It is obvious that this antenna does not require a tower to be a good DX antenna.

Unlike a Yagi, performance of the GB does not improve substantially with increased height. There is a 0.2 dB improvement when the antenna is raised 10 feet, but above that there is no meaningful improvement. Nevertheless, the GB will also work well if mounted on a roof top, there just won't be much increase in performance. When mounted above a flat concrete roof — such as the roof of an apartment block — the antenna should be at least 6 feet above the

[1]Notes appear on page 36.

roof to minimize the influence of the concrete and its reinforcing bars, as well as signals coupling into the house wiring.

A word of caution about this antenna. If it is mounted at a height of 10 feet, its radiation lobe can be very close to ground — and people or animals. The appropriate RF exposure requirements should be determined and followed.

The Environment Matters

Antenna performance is not strongly dependent on the soil quality below the antenna. Soil conductivity 10 to 300 meters in front of the antenna, however, can have a big effect on performance. The curves shown in Figure 1 are for medium to poor soil (conductivity 0.005 S/m, dielectric constant of 13). Should you be fortunate enough to have salt water in front of the antenna, the forward gain will almost double to 9.5 dBi in the direction over the water.

Putting it Together

The following is a description of a three element 20 meter monoband GB. The antenna is simple and anyone with the skills to build a regular Yagi should have no difficulty building it. Parts and materials are available from many suppliers. I have used DX Engineering's 6061-T6 aluminum tubing because of convenience (**www.dxengineering.com**). The use of other tubing diameters and taper schedules will affect the element lengths by a few percent. Modeling in *EZNEC* or a similar antenna modeling program should allow the builder to determine the required lengths. Detailed construction drawings are provided on the *QST* in Depth web page.[3]

The elements of the antenna are mounted on a 3 inch aluminum pipe boom. (Aluminum pipe has thicker walls than aluminum tubing.) Note that neither the boom diameter nor its material have much effect on electrical performance, but they are important for mechanical stability and strength. Also, the metal boom, to which all the elements are connected, provides essential lightning protection if mounted on a well grounded metal mast and rotator.

The GB has three sets of elements, a reflector, a radiator and a director. Each set of elements consists of a vertical element and two corresponding horizontal elements — the counterpoises. The elements are made of telescoping aluminum tubing with diameters and taper aimed at a reasonable compromise between strength, low sag, light weight and low cost. For element lengths and diameters see Table 1. The radiator — the driven element — is fed via a gamma match that matches the antenna to the 50 Ω feed line.

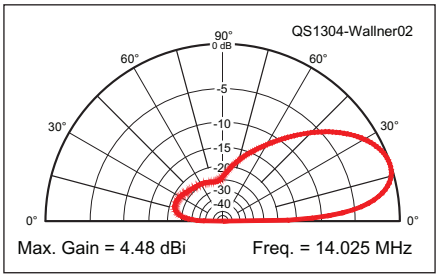


Figure 1 — *EZNEC* elevation pattern of the Garden Beam in the peak of its azimuth pattern. Note that the gain at the lower DX favored elevation angles is not greatly diminished.

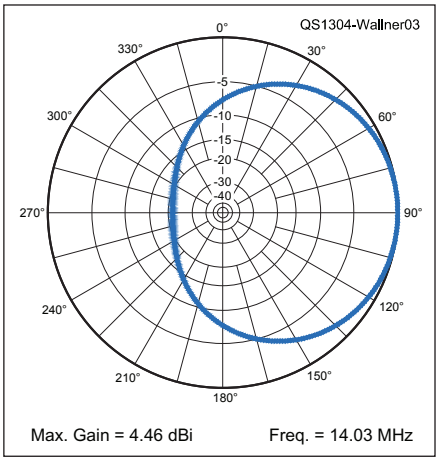


Figure 2 — *EZNEC* azimuth pattern of the Garden Beam in the peak of its elevation pattern.

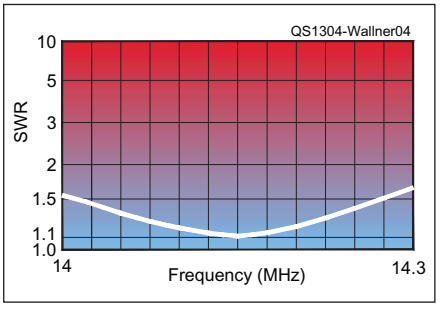


Figure 3 — *EZNEC* predicted SWR of the Garden Beam tuned for mid band.

The use of the gamma match results in a dc grounded fed element and a dc isolated coax inner conductor. These provide lower noise and improved safety.

Gamma Match Details

The gamma match contains a variable capacitor that is formed by the outer gamma tube and a smaller diameter inner tube. The inner tube is insulated and made snug inside the outer tube using Teflon rings. The resulting capacitor is an air dielectric capacitor that can be tuned by sliding the inner tube in and out. The maximum capacitance with the given diameters and dimensions is approximately 250 pF.

It is important to seal the top of the gamma tube to prevent rain water from entering the gamma capacitor. I used a small plastic cap from DX Engineering. The coax connector is mounted on an L shaped aluminum bracket grounded to the boom. (This must be a good connection.) The center contact of the connector is connected to the lower part (the inside tube) of the gamma capacitor. During testing the gamma match withstood continuous operation at full legal power.

The given dimensions should give you an antenna with acceptable SWR after adjusting the gamma capacitor and the gamma tap. Occasionally, tuning of the entire fed element may be required to obtain the lowest SWR possible. Tuning the antenna using an SWR meter is possible but can be time consuming and may not result in optimum settings.

Using a good quality antenna analyzer can make tuning easier and more precise. Tuning the antenna for best SWR involves changing three variables: the length of the radiator, the position of the gamma tap on the radiator and the value of the gamma capacitor. It must be noted that these three variables interact, so changes generally should be made in small steps.

The first step is to adjust the resonant frequency of the radiator for the desired frequency. To move the resonance down in frequency, lengthen the radiator. To move it up, shorten the radiator. Once resonance is set, adjust the gamma tap to get the resistive (R) part of the impedance close to 50 Ω. Moving the gamma tap upward increases the R (up to a point) and moving it down reduces it.

Once a value close to 50 Ω is obtained, adjust the gamma capacitor to cancel any reactive (X) component of the impedance. If the impedance has inductive reactance (+X), pull the capacitor tube outward until the reduced capacitor value cancels out the inductance of the gamma match. If the reactance is capacitive (–X), increase the capacitance by moving the tube inward (upward). Work the capacitor to obtain an X value of 0 Ω. As these adjustments interact, it will probably be necessary to go back and readjust the resonant frequency, the gamma tap and again the capacitance. It may take three or four iterations to arrive at the lowest SWR.

These adjustments can be made either at the intended height of the antenna (ideally 10 feet) or at a lower and more convenient

Table 1
Element Lengths for CW Band Segment (feet)

Element	Reflector	Fed Element	Director
Vertical	18.08	18.80	16.73
Horizontal	18.21	18.21	16.73
Gamma Tap Position		5.58	

Table 2
Element Lengths for SSB Band Segment (feet)

Element	Reflector	Fed Element	Director
Vertical	17.72	18.50	16.70
Horizontal	18.21	18.21	16.73
Gamma Tap Position		4.92	

height of about 6 feet. Moving the antenna up to its working height, however, will require some retuning. Changes in soil moisture below the antenna can detune the antenna to a moderate extent and cause the SWR to rise from 1:1 to 1:1.4, especially following heavy, soaking rains.

GB Element Details

The element dimensions and spacing are shown in Table 1. These dimensions achieve a compromise between reasonable forward gain, high front-to-back ratio and acceptable SWR bandwidth centered on the CW portion of the 20 meter band. Figure 3 shows that the lowest SWR is close to 1.1 at 14.025 MHz. At 14.000 MHz the SWR is 1.2 and at 14.200 it is 1.8, rising to 2.5 at 14.300 (these values were confirmed by measurements on my antenna). If your focus is on CW only, gain can be improved by about 0.5 dB by shortening the reflector to 17.95 feet and lengthening the director to 17.2 feet. The SWR bandwidth, however will be narrower, with the 1:2 SWR occurring at 14.125 MHz.

For optimizing the SWR for the SSB band segment, use the dimensions shown in Table 2. Note, however, that I have derived these values through modeling and have not actually tried them. The builder can find other element lengths that will result in a desired SWR distribution. For example, one could place the lowest SWR at 14.150 for a reasonable compromise between the CW and SSB segments of the band. Caution should be exercised when changing the element lengths, as with a Yagi, tuning the antenna for the highest gain may result in a narrow SWR bandwidth or poor F/B. It is always advisable to model any changes.

On the Air with the GB

I have been using the GB at my Florida location for several months now (see Figure 4). Performance has been excellent. (There is salt water around my station, which helps in some directions.) I have been able to work Europe on a regular basis using 1 W with reports of S3 to S7. The same antenna has been at work at HA7RY's station in Hungary, where Tomi has been able to compare the antenna with his three element monoband Yagi mounted on a 48 foot tower. On the average, the Yagi on the tower has been better by one S unit than the GB in contacts with North America. The same difference was observed on most of the NA reverse beacons (4 to 5 dB). In contacts with Australia the GB has often outperformed the Yagi, likely due to the lower arrival angles, for which the horizontal Yagi height is not ideal.

Figure 4 — The GB in the backyard of my Florida location. It is not visible from the front of the house.

In conclusion, if you can erect a tower, this antenna is not for you. However, if you are restricted to a vertical or a low dipole because you cannot have a tower, but you have the garden or roof space, the GB can improve your DX signal by several dB and give you the ability to reduce noise and interference. Those extra decibels may just make the difference in the next pileup. In any case, you will no longer need to feel inferior to guys with towers and beams.

Notes

[1]K. Siwiak, KE4PT, "Is There an Optimum Height for an HF Antenna?" *QST*, Jun 2011, pp 33-35.

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

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

ARRL member George Wallner, AA7JV, holds an Amateur Extra class license. His main interests are operating CW on the lower HF bands and participating in small, do it yourself DXpeditions to difficult places where he enjoys combining ham radio with diving. Some of his DX destinations have included PTØS, TX3A, VK9GMW, 5KØT, C6AGU and VK9WWI. George also enjoys homebrewing his station gear.

You can reach George at 17 N Hibiscus Dr, Miami Beach, FL 33139-5117 or at **aa7jv@atlanticbb.net**.

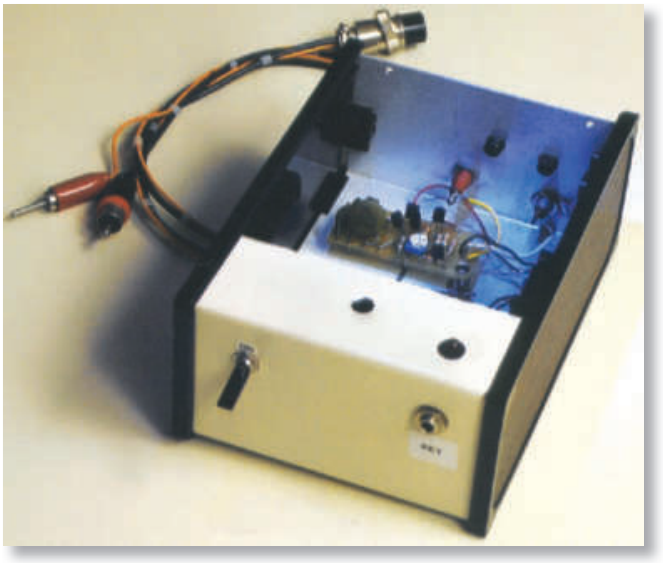
For updates to this article, see the *QST* Feedback page at www.arrl.org/feedback.

An MCW Keyer for V/UHF FM

Send code on 2 meter FM with this simple keyer.

Norman D. Wilford, W1TLZ

Arguably, modulated CW (MCW) is one of the earliest radio transmission modes. In the early days of radio, most receivers had no provision (later called a beat frequency oscillator or BFO) to decode Morse code sent by on-off keying of a carrier. A solution was for the transmitter to actually send a signal that contained a tone every time the key was depressed. In the early days, this was provided by mechanical methods, but later the circuitry used for voice modulation often included the capability to send MCW.



That Was Then

Today's VHF FM radios also suffer from the lack of ability to receive and reproduce code sent by the make and break keying of the carrier of a CW transmitter. The solution

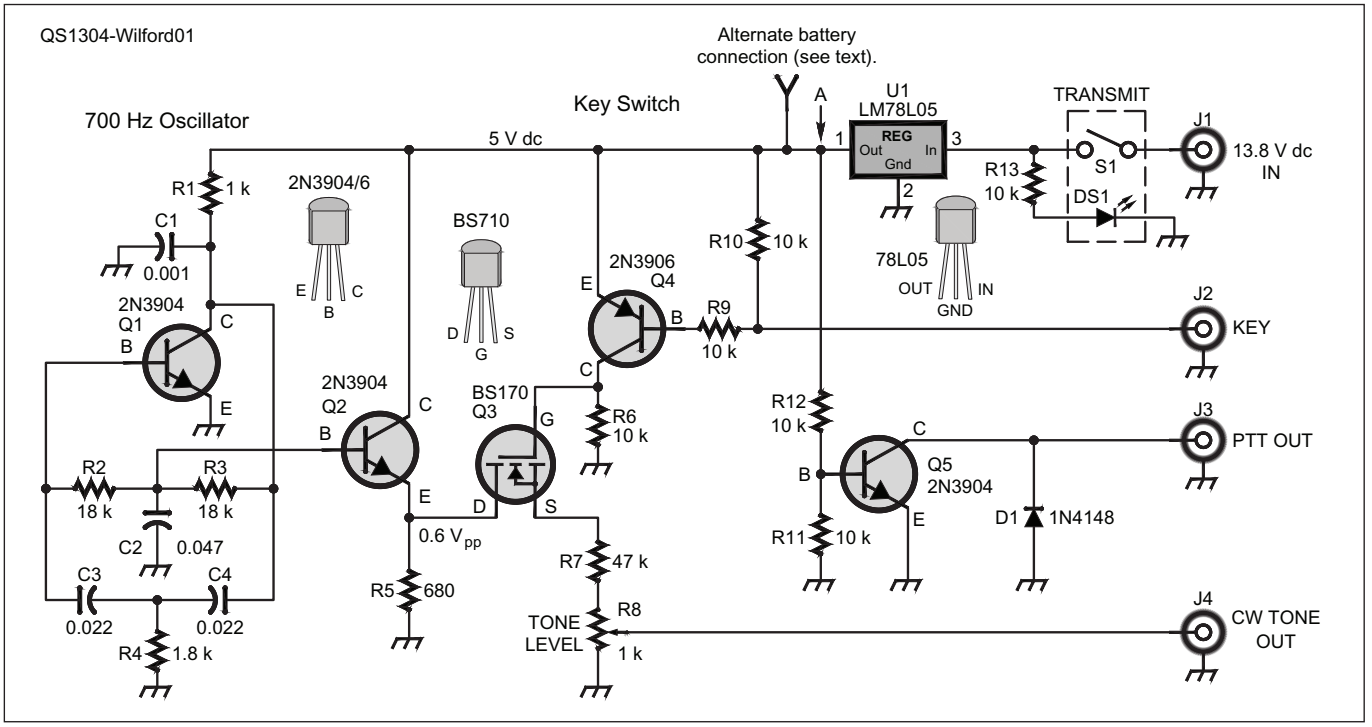


Figure 1 — Schematic diagram and parts list of the MCW keyer. Mouser parts are available from **www.mouser.com**.

C1 — 0.001 µF ceramic disk capacitor (Mouser 72-VY2102M29Y5UG63V7).
C2 — 0.047 µF ceramic disk capacitor (Mouser VY147M3IY5UG63VO).
C3, C4 — 0.022 µF ceramic disk capacitor (Mouser VY122M47Y5UG63VO).
D1 — 1N4148 diode (Mouser 512-1N4148).
DS1 — Part of S1.
J1-J4 — Panel mount RCA jacks.
Q1, Q2, Q5 — 2N3904 silicon PNP small signal transistor (Mouser 610-3904).
Q3 — BS170 MOSFET (Mouser 512BS170 VR).
Q4 — 2N3906 silicon PNP small signal transistor (Mouser 610-3906).
R1 — 1 kΩ, 5% carbon film resistor (Mouser IK CF1/4C102J).
R2, R3 — 18 kΩ, 5% carbon film resistor (Mouser CF1/4C183J).
R4 — 1.8 kΩ, 5% carbon film resistor (Mouser CF1/4C1.83J).
R5 — 680 Ω, 5% carbon film resistor (Mouser CF1/4C681J).
R6, R9-R13 — 10 kΩ, 5% carbon film resistor (Mouser CF1/4C103J).
R7 — 47 kΩ, 5% carbon film resistor (Mouser CF1/4C473J).
R8 — 1 kΩ, potentiometer (Mouser 652-3386S-1-102LF).
S1 — SPST push button switch with LED (RadioShack 275-009).
U1 — LM78L05 voltage regulator IC (Mouser 512-LM78L05ACZXA).

today can be the same as it was back then — insert a tone, keyed by the telegraph key into the audio system of the voice transmitter. The simple electronic circuit described here allows operating CW as MCW, for training, practice and communication on frequencies over which FM voice is normally employed. The signals can be used locally between two operators, or through a repeater — but do get permission from the repeater licensee before you use a repeater in this way.

How the Circuit Works

The circuit consists of a simple 700 Hz audio oscillator with its output tone fed to the microphone input of the transmitter. The tone is keyed by a hand key and thus can transmit the CW tones to a remote VHF receiver.

Referring to the schematic (see Figure 1), transistor Ql and associated parts make up a 700 Hz oscillator. About 0.62 V_{PP} is applied to the base of Q2 that feeds the tone to the drain of Q3. Transistor Q3 is used as a switch to feed the 700 Hz tone, via R7 to trimmer R8, the TONE LEVEL control. Transistor Q4 is keyed by a hand key and controls tone switch Q3, which feeds the tone to the transmitter audio input circuits for MCW code transmission. Transistor Q5 keys the transmitter PTT line when the power is first applied by the main switch, S1. The transmitter is keyed on, with no modulation, until the hand key is pressed to send the 700 Hz MCW code.

With these simple actions the operator is ready to transmit MCW for practice or play through any receiver tuned to the transmitter frequency. All connections to the transceiver should be through the hand microphone connector.

Build the Keyer

My favorite method of mounting parts is to cut up circuit boards into 5 inch squares and glue components in place on the foil side, using the schematic for preferred parts location. This allows all common (ground) connections to be soldered directly to the copper foil. (See Figure 1 for a parts list.)

I suggest that the oscillator section be assembled first. Mount and secure the oscillator section parts associated with Ql and Q2 and Rl through R5. With power applied, the voltage at the emitter of Q2 should be 0.6 V. There should be a 700 Hz tone at that test point. Finish mounting all remaining parts.

The 700 Hz tone from CW TONE OUT should be fed to the transceiver by RG-174 coax direct to the radio's MIC connector. Ground return for the PTT, CW TONE OUT and KEY lines can all be connected through the coax shield. A separate wire, taped to the outside of the RG-174, connected between PTT on the circuit board, and the PTT pin in the MIC connector is the KEY line.

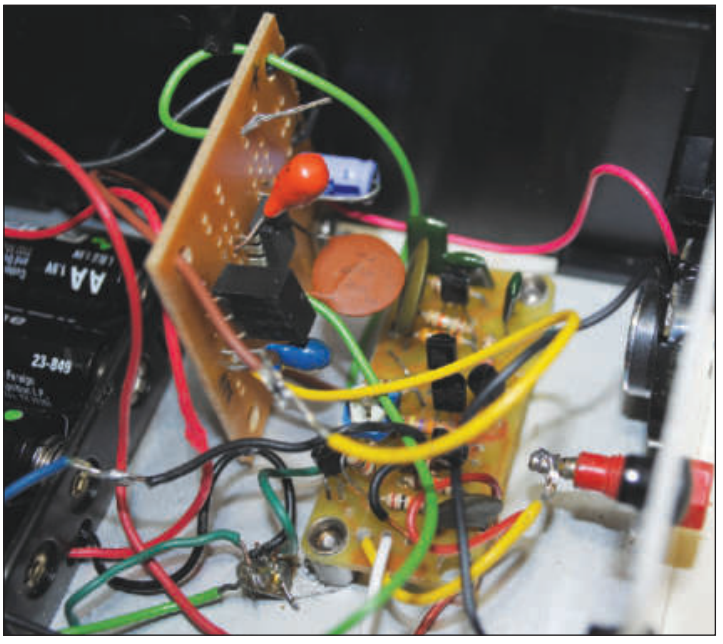


Figure 2 — Close up of a version of the keyer with the added sidetone board.

I found that power can be supplied by four AA, or AAA, 1.5 V batteries in series between point A and ground. Voltage regulator U1 is only necessary if the keyer is to be used with a 12-13.8 V supply.

When power is first applied, with S1 open, there should be no tone (from CW TONE OUT) until the hand key is closed. This keyer circuit is audio, so layout is not important except to keep leads short. Capacitor Cl, 0.001 ΩF, helps bypass any RF around oscillator transistor Ql.

If you would prefer to build your unit using a PC board, a layout drawing is available on the *QST* in Depth web page (**www.arrl.org/qst-in-depth**). In addition, my friend Mark Weber, AB4IX, (**mark@itglabs.com**) can supply a double sided, plated through, reflowed finish PCB with solder mask and silkscreen for $25, or the PCB with all parts for $35.

Operating the MCW Keyer

Connect the cable between the MCW keyer and VHF radio. Connect a hand key to the keyer. Turn on the VHF radio with a 50 Ω load attached. Turn on the MCW keyer and note that the VHF radio is immediately keyed. There should be no audio on the carrier. Tap the hand key and 700 Hz should be heard on a monitor radio.

Start with R8 set to minimum output. With the key closed, increase the output with R8 until the volume or level on a monitor receiver is about the same as with a normal voice. The audio should be clean and undistorted. You now have an MCW station for practice and local communication.

Some operators prefer to send code while listening to a sidetone version of what they are sending. Since the original design was completed, I have added a sidetone amplifier on a separate small board that provides this. The schematic is available on the *QST* in Depth web page. A photo of a version with both boards is shown in Figure 2.

Photo by the author.

ARRL member Norman D Wilford, W1TLZ, holds an Advanced class license and has been licensed since 1951. W1TLZ is his first and only call! Norman worked for Time/Life Research Laboratory from 1950 through 1970 in printing research that included electronics and darkroom work. He was self employed from 1970 until his retirement in 1992.

You can reach Norman at 3630 Hightower Ct, Cocoa FL 32926 or at **flyanque@gmail.com**.

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

An Audio Tone SWR Meter for the Visually Impaired

This adapter lets amateurs tune their antennas, antenna tuners or amplifiers without looking at a meter.

Bill Gerrey, WA6NPC

Audible SWR meters seem to come and go — in and out of production. Circuits for adapting off-the-shelf meters have existed for many decades, however. Here is a simplified modern adapter usable with any SWR meter. Units modified to date include the MFJ-816 HF and the MFJ-812B VHF SWR meters described here, but any unit could be adapted.

Justification

Why not make a talking version? Electrical speech devices provide mostly historical information. I don't wish to burn something up while listening to: "off scale," "5 to 1," "5. to 1," oops — followed by a smoke alarm. For me, the best use of an antenna tuning device occurs with dynamic feedback from the changing sound of a voltage controlled oscillator (VCO). Pitch changes of an audible oscillator are readily perceivable as adjustments to radio equipment are made.

In the vacuum tube days, I could rapidly tune an amplifier for maximum output by shooting for the highest pitch using an audible SWR meter in the FORWARD POWER setting.

I trim antenna length, while minimizing reflected power. I can resonate a counterpoise or adjust an in-line antenna tuner for lowest pitch, with the unit described here set to indicate reflected power.

The adapter described here goes beyond just relative readings by including a "go/no-go" pre-settable threshold over which the character of audible output is made to pulsate. Specifically, above a reading of your desired setting (1.5:1, 2:1, 3:1 or whatever you like), the sound of VCO pitch is still evident, but it is interrupted or *chopped* at a rate of 12 Hz.

A Brief History

The principle of adding a solid state variable frequency indicator to a visual meter was described in January 1955, in the *Braille Technical Press*.[1] Tom Fowle's updated circuit, with added design flexibility and the capability to quantify readings, has appeared in several instruments (see **www.ski.org/rehab/devices**). In general, his implementations call this indicator "The Fowle Gimique."

With only a few component differences, the Fowle Gimique appeared in a *QST* article.[2] That article described adapting the MFJ-209 antenna analyzer to use an audio readout.

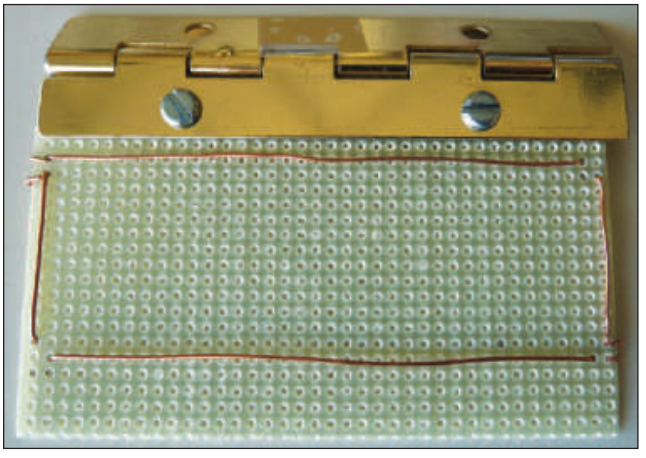


Figure 1 — View of the wiring board assembled to the hinge with common and V_{CC} buses applied, as described in the text. The common bus is closest to the flange of a 4 inch length of piano hinge that will secure the finished circuit to the back panel of the MFJ meter.

Description

With some SWR meter brands, this adapter necessarily requires its own separate cabinet. The MFJ units we selected have ample room, however, so that our adapter can comfortably fit inside.

The 1.5 inch loudspeaker is secured to the ½ inch lip at the left end of the rear panel. A speaker with a mounting flange is used, held to this lip by two #4-40 flathead machine screws and nuts. A few sound holes are drilled through the left apron of the cabinet's cover.

The prototypes described here use the construction technique called *point-to-point wiring* on blank perforated glass epoxy board made by Vector Electronics. Custom boards can be broken to size in a bench vise by breaking pieces off along lines of holes. The Vector Board® suitable for through hole IC assemblies has rows and columns of holes spaced on 1/10 inch centers.

In this case, I mounted the finished board by one edge with a piece of piano hinge (see Figure 1). Lengths of piano hinge can be obtained at hardware stores. Sections can then be hacksawed to suit your projects. Whether a hinge or a length of ½ inch wood molding is used to mount the board, there is ample room on the rear panel of the instrument to secure the board's far edge. The front edge rests comfortably atop the meter movement.

The decision was made to orient the board "solder side up," so that all solder connections would be accessible. The components are positioned on the underside, their leads brought through from beneath. The board should rest about 3/16 inch below the edges of the front and rear aprons, so that solder connections won't press against the cover plate. I line the underside of the top cover with file card paper using double sided adhesive tape, to further reduce the possibility of solder points shorting against the top.

Our board is 2⅜ inches wide (spanning 23 complete holes), by 3⅞ inches long (spanning 38 complete holes). L shaped power buses of solid wire are installed on the "solder side" of the board, defining a rectangular central area where all circuitry is placed (see Figure 1). Leaving room for the piano hinge flange along the far edge, and making sure that components have clearance behind the meter movement, the lengthwise runs of the L shaped buses follow holes at fair distances from their respective edges.

Thus, the circuit common bus runs lengthwise, six holes in from the far edge, then descends across the width, positioned along the right-edge column. The V_{CC} bus runs

[1]Notes appear on page 42.

along a row, five holes up from the front edge, with its short vertical run aligned with the column at the very left edge. Within the boundaries of these buses is a clear area of 12 × 36 holes open for installation of parts.

Since our speaker is mounted at the left end of the instrument, the board is mounted as far to the right as possible, so that components will clear the speaker when the board is lowered into place, ready to receive the MFJ top cover (see Figures 2 and 3).

Parts layout is not critical, except for my one obsession: Where there are two RF chokes in a pair of leads, I always place chokes at right angles to one another to minimize inductive coupling. The schematic diagram and parts list are provided in Figure 4.

If you follow the verbal circuit description (for us blind builders, available on the *QST* in Depth web page), you will glean the layout as it begins behind the meter movement and progresses rightward, the 556 being adjacent to the MFJ GAIN control.[3]

This assembly is self contained. However, in other implementations in which the audible meter reader needs to be in a separate little box, shielded cable should be used to connect to the visual meter. Here, though, twisted pair within the MFJ cabinet is fine. Twisted pair to the speaker is also good practice. Do not bundle all the wiring together, as VCO signals in the speaker leads, carrying high-current pulses with nice sharp transitions, can cross-talk their way into high-impedance circuitry.

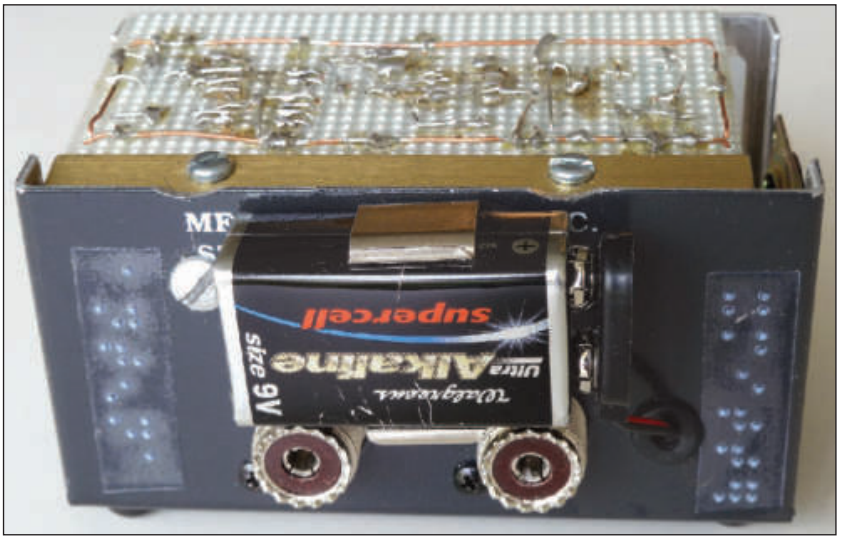


Figure 3 — View of the back of the unit with the adapter board folded down, ready for the cover to be put back.

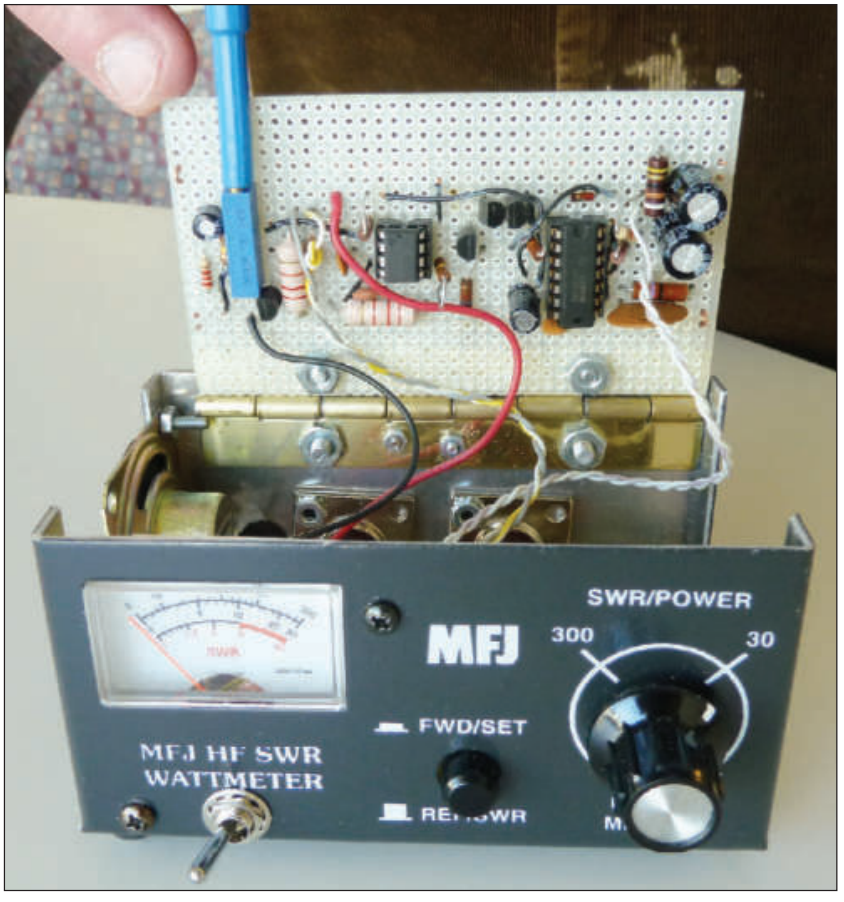


Figure 2 — This shows a front view of the completed project with the cover removed and the board opened using the hinge. A screwdriver is poised to calibrate the instrument by adjusting R3, as described in the text.

In the MFJ-816, there is just enough room below the meter movement for the SPST miniature toggle on/off switch of the audible circuit. The VHF MFJ-812B has a larger printed board, forcing you to mount the on/off switch elsewhere.

On both instruments, there is room above the connectors on the back panel for the 9 V battery. Lower on the panel, a hole fitted with a rubber grommet affords leads of the battery connector to pass through.

The choice of battery holder is up to you. Even hook-and-loop fastener with adhesive backing will hold it well enough, as long as you apply it fresh to each replacement battery.

Operation

This adapter senses the voltage drop across the visual meter movement. While its inputs exhibit shunt capacitance (to keep RF out of the system), its input resistance may be called infinite, for practical purposes. Thus, there is no effect on the visual meter by the audible circuit; with power to the Gimique turned off, a sighted operator won't notice the difference as he follows the MFJ instruction sheet.

Similar operation by the blind operator includes adjusting the gain control for a maximum pitch while in the FORWARD-POWER setting, then switching to REFLECTED POWER and noting the pitch of the audible readout. (Though the VCO will be pulsating, the FORWARD gain setting is adjusted for a

"peak" in pitch. Beyond this setting, the pitch will drop slightly, showing the user the proper setting at which the peak frequency is obtained.)

- Before transmitting, protect the meter movement by assuring that the GAIN control is turned fully counterclockwise. (This worry is moot if you get rid of that delicate visual meter; the audible circuit cannot be damaged or "pinned," so there!)
- With the audible system turned on, you will hear a ticking sound from the loudspeaker; A 22 MΩ resistor provides a small leakage current to the VCO, a purposeful feature reminding you not to run the battery down.
- Press the FORWARD/REFLECTED switch in, to the FORWARD position, send a constant carrier from your transmitter, and adjust the GAIN control for a peak in pitch of the audible circuit. (The tone will be pulsating, but its peak in frequency will still be easy to judge.)
- Next, press to release to select the REFLECTED position and note the character of the tone: If it is pulsating, this indicates that the standing wave ratio (SWR) is higher than your preset criterion. A smooth, uninterrupted tone means that the SWR is lower than your criterion. The lower the pitch (pulsating or not), the lower the SWR.
- Antenna trimming or circuit adjustments may now be made while listening to the VCO. If you are lucky, a perfect 1:1 match will be indicated by oscillations being reduced to the "tick tick" of idle.

Circuit Description

The 556 dual timer IC, U3, contains two oscillators. Pins 8 through 13 of U3 make up the audible tone generator. Pins 1 through 6, together with the 2.2 µF timing capacitor, generate a 12-beat/second pulsation. The pulsation is used to chop the audible tone when it is evoked.

A very linear voltage controlled oscillator combines the current-controlled 556 audible tone generator with a voltage-controlled current source as follows:

A current source is made up of the 2N2222 NPN transistor, Q1, in the feedback loop of an operational amplifier (op-amp), consisting of Pins 5, 6 and 7 of U2, the CA3240 dual op-amp. To convert this current source to be able to pull up the charging resistors of U3, an obscure circuit called a *current mirror* is used. A positive-going input pulls up the charging resistors on Pins 12 and 13 of U3.

The current mirror is made up of Q2 and Q3, two 2N2907 PNP transistors (carefully matched for other applications, but for our purposes, identical types are good enough). With the base and collector of Q2 shorted, the base-emitter diode establishes the bias of the second. Thus, when the 2N2222 pulls downward on the base-collector of the first, a mirror pull-up current establishes charging current for U3 via the collector of the second.

Pins 1, 2 and 3 of the U2, without feedback, comprise a comparator. This senses a settable voltage level from the screwdriver adjustable trimming potentiometer (R3). Non-inverting inputs of both op-amps in U2 are tied together, and this is the unprotected, very high-impedance, input of the Gimique system.

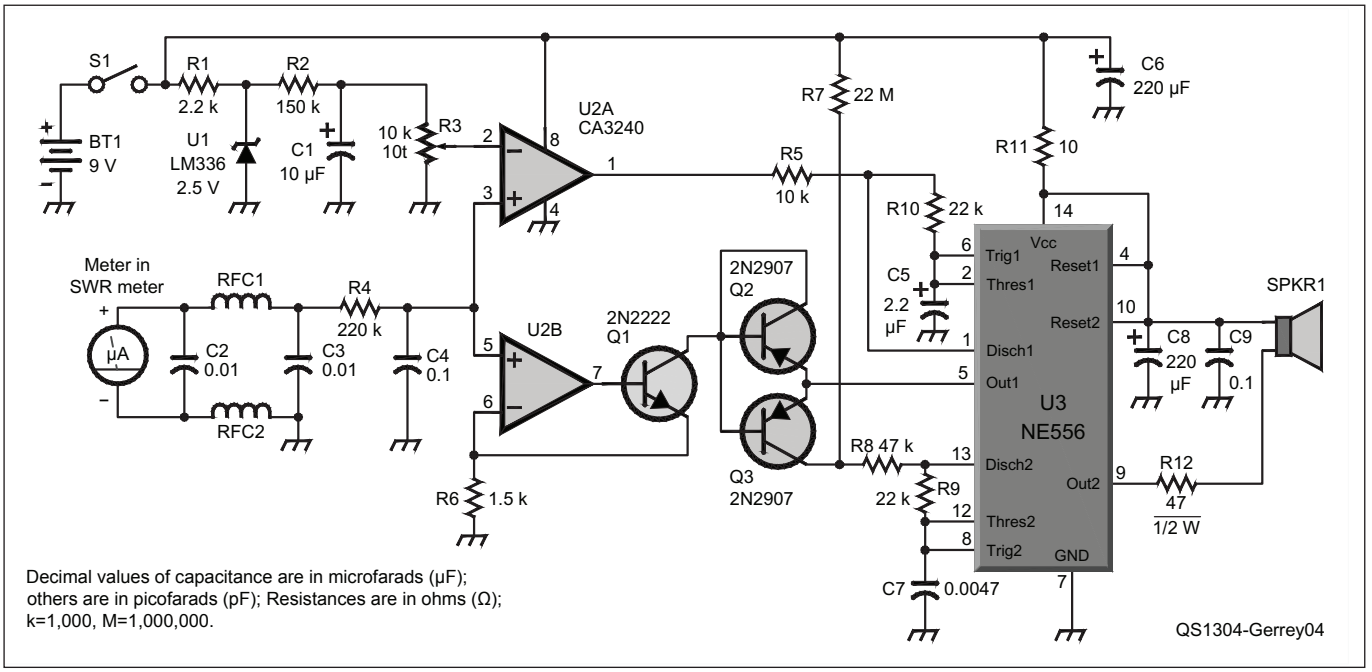


Figure 4 — Schematic diagram and parts list of the adapter. Mouser parts are available from **www.mouser.com**.

kr

C1 — 10 µF, 16 V electrolytic capacitor.
C2, C3 — 0.01 µF disc ceramic capacitor.
C4 — 0.1 µF disc ceramic capacitor.
C5 — 2.2 µF, 16 V electrolytic capacitor.
C7 — 0.0047 µF disc ceramic capacitor.
C6, C8 — 220 µF, 16 V electrolytic capacitor.
Q1 — 2N2222 NPN transistor.
Q2, Q3 — 2N2907 PNP transistors.
R1 — 2.2 kΩ, ¼ W resistor.
R2 — 150 kΩ, ¼ W resistor.
R3 — 10 kΩ, 10 turn potentiometer.
R4 — 220 kΩ, ¼ W resistor.
R5 — 10 kΩ, ¼ W resistor.
R6 — 1.5 kΩ, ¼ W resistor.
R7 — 22 MΩ, ¼ W resistor.
R8 — 47 kΩ, ¼ W resistor.
R9, R10 — 22 kΩ, ¼ W resistor.
R11 — 10 Ω, ½ W resistor.
R12 — 47 Ω, ½ W resistor.
RFC1, RFC2 — 2.2 mH for HF meter, 220 µH for VHF meter.
S1 — SPST toggle switch.
SPKR1—Loudspeaker, 1½ inch 8 Ω speaker with mounting flange, Kobitone brand (Mouser 25SP016).
U1 — LM336. 2.5 V regulator IC (used as a Zener diode).
U2 — CA3240 dual FET op-amp IC.
U3 — NE556 dual timer IC (not a CMOS version).
DIP socket — 8-pin for the CA3240.
DIP socket — 14-pin for the 556.
Perforated board, 2⅜ × 3⅞ inches, hole spacing at ⅒-inch centers. Cut from Vector Electronics 64P44WE (Mouser 574-64P44WE).

When the op-amp output (Pin 1 of U2) goes high, it starts the chopper. Pin 5 of U3, which rests high when the comparator output is low, supplies the emitters of the current mirror. Whenever an input voltage exceeds that set by R3, the comparator goes high, causing Pin 5 of the 556 to modulate those emitters.

A precision voltage standard, U1, is divided down to put 140 mV across this trim pot. This can cover the full range of voltage drop across the meter movement.

A 220 kΩ resistor, R4, and 0.1 µF capacitor, C4, protect the input of U2, and provide low-pass filtering against hum pickup of this very high-impedance system. Ahead of this, RF chokes, complete with capacitors shunting both ends, isolate the Gimique circuit from any RF that might be present on the meter leads.

The operation of the MFJ HF and VHF meters are similar, except that the operation of the FORWARD/REFLECTED power switch is opposite. On the VHF meter, REFLECTED is selected when the button is pressed in. The connectors on the rear panel are also reversed. Note in the parts list that different values of RFC-1 and RFC-2 are specified, depending on the frequency range.

Closing Comments

The back EMF generated by the meter movement slows down changes in readings as adjustments are made. Being a blind user, I scrap the meter in my personal units. In addition to eliminating the back EMF delay, this allows mounting the speaker behind the meter's opening. If it is desired to do this, a 1.2 kΩ resistor is substituted for the meter in the circuit.

This unit can be used for adjusting a transmitter to maximize output. Just press in the METER switch to select forward power, adjust the meter GAIN control for a comfortably low pitch and then adjust the transmitter for highest pitch possible. If pulsating of the VCO distracts you, another SPST switch can be used to disable the pulsation oscillator. This switch should be connected so as to short U3 Pins 2 and 6 to circuit common. Other applications are discussed in the portion in the *QST* in Depth web page.

Notes

[1]"The Transistorized Auditory Gimmick," *Braille Technical Press*, Volume VI, No. 1. Jan 1955.
[2]T. Fowle, WA6IVG, and B. Gerrey, WA6NPC, "Audio Readout for the MFJ-209 Antenna Analyzer," *QST*, Feb 2007, pp 36-39.
[3]**www.arrl.org/qst-in-depth**

Bill Gerrey, WA6NPC, received his first Amateur Radio operator's license in 1960 as a teenager and now holds an Amateur Extra class license. He has worked as an electrical engineer at the Rehabilitation Engineering Center of the Smith-Kettlewell Eye Research Institute in San Francisco for over 35 years. He designs vocational assistive devices, including measuring instruments and devices relating to job modification.

Bill was born in Reno, Nevada in 1947 and has been totally blind since a very early age. His interest in devices for the blind goes back to his early childhood. His father, who was also blind, kindled his passions for radio and early recording machines. His father's collection of *The Braille Technical Press*, dating back to 1950, became an integral part of Bill's education. With the encouragement of Robert W. Gunderson, W2JIO (SK), the editor of the magazine, the *Technical File*, a publication of technical information for blind enthusiasts, was born and continues to be supported by Smith-Kettlewell.

You can reach Bill at 154 Hermann St, San Francisco, CA 94102 or at **bilge@ski.org**.

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

In the March/April 2013 Issue...

■ John Roos, K6IQL, details his "Precision DDS for the Frequency Measurement Tests." The Frequency Measurement Test is held several times a year and it provides an opportunity to test our skills at determining the actual frequency transmitted by each of several test stations. Although John has achieved good results using laboratory quality synthesizers as RF frequency references, not all hams have access to this equipment. His solution is to design a DDS that could provide an acceptable alternative to more costly lab gear.

■ Luiz Amaral, PY1LL/AC2BR, built a 500 kHz CW transmitter, but he found that he needed to build an output filter to meet spectral purity requirements. Not having access to high-inductance coils for the filter, he created his own using ferrite cores from cast-off CRT televisions. Not only are they inexpensive, they perform quite well at MF frequencies with very low loss.

■ The "Two Turn Magnetic Loop Antenna for 30 through 10 Meters" by Wayne Openlander, W9NZB, describes the challenges he encountered while trying to build a relatively small, but effective, antenna for HF work.

■ "Fun with Voltage-to-Frequency Converters" by Dr Sam Green, WØPCE, details how these handy circuits can be put to work in a number of projects.

■ In his "SDR Simplified" column, Ray Mack, W5IFS, discusses statistics and the nature of noise.

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New Products

DX Engineering High-Power Multi-Band UNUN

The DXE-UN-43 DX Engineering Multi-Band Vertical UNUN (unbalanced-to-unbalanced transformer) is a matching device designed for use with any nonresonant 43 foot vertical antenna. The UN-43 is said to assure the best efficiency from a vertical multiband antenna and transmission line/tuner installation. The UN-43 allows tunable full band coverage on 160 to 10 meters when used with a user-supplied wideband tuner (required). The UN-43 is rated for up to 2 kW CW or 5 kW SSB. Components are enclosed in a weather sealed case with a silver-Teflon SO-239 input connector and stainless steel washers and wing nuts at the feed point connection. Price: $104.95. A complete kit with mounting hardware and tinned braid connections, model DXE-UN-43-R, is available for $129.95. For more information, or to order, visit **www.dxengineering.com**.

Overvoltage Protection for ac Generators — Revisited

Protect your gear from a runaway generator whether in the field or during an outage.

Jerry Paquette, WB8IOW

My article "Overvoltage Protection for ac Generators," published in the June 1994 issue of *QST*, described a circuit built after a runaway generator damaged several pieces of gear at our ARRL Field Day site in 1993.[1] Since the article was published, I have heard from many hams, sometimes to ask a question, but more often to say how they use the device, how it saved their equipment or how their equipment was damaged and they decided to build the circuit to avoid future damage to other ham gear.

What It Does

This circuit makes use of a readily available household ground fault circuit interrupter (GFCI) as the switching element. If the GFCI output voltage exceeds a threshold, an optically coupled triac simulates a leakage condition causing the GFCI to trip. This turns off the power to any equipment plugged into the GFCI's sockets. This version of the device not only senses the generator voltage, but also provides a visual indication of the voltage to allow routine monitoring.

In this article when I mention GFCI, I am referring to the US Class A GFCI designed to have a trip level of 4 to 6 mA. Do not be alarmed if you are shopping for a new GFCI and cannot find the Class A designation. In the US you are most likely to find exactly what you need at any electrical or building supply store.

In this version, the optically coupled triac driver has been changed to an MOC3083M, rated at 800 V to allow operation at voltage levels found in some other countries. Resistor R5 will need to be changed by hams in countries that use GFCI tripping circuits operating at voltages higher than 120 V or tripping at leakage currents above 5 mA.

In the 1994 article the return line from R5, the 12 kΩ, 2 W resistor, went to the GROUND terminal of the GFCI. Years later I moved it to the NEUTRAL terminal on the LINE side of the GFCI. This allows operation with an ungrounded generator. Not all hams ground their generators all the time. A good example is a portable generator used in the blacktopped area of an outdoor flea market at a hamfest. Woe betide any ham or vendor who would drive a ground rod through the blacktop.

In With the New

This improved circuit is designed to help protect your equipment from an over-voltage condition and to give a visual display of approximate line voltage. You will find it is simple to build and easy to adjust. There are fewer than 20 components mounted on the circuit board.

This circuit was first conceived as a quick-look line voltage indicator. Often, while I was working in a large coal-fired power plant, 6000 horsepower ac motors would start up, taking about 25 seconds or so to get up to speed. In the meantime some bus voltages would sag and the resultant voltages in some offices and shops would drop below 100 V. The original idea was to have 10 LEDs come on, one at a time, in 5 V increments, beginning at 85 V.

The LM3914 chip was the ideal integrated circuit for that purpose. The first units I built had 10 red LEDs and were used in the bar mode. The power for the circuit board was usually a 6 V ac or 9 V dc wall wart. It worked so well several friends around the power plant wanted them in their work areas.

This circuit cannot work with an existing GFCI mounted within a generator or some other device, such as a self contained GFCI adapter, because you need to have access to both the LINE side NEUTRAL terminal and the LOAD side HOT terminal. The only way to construct this project is to obtain all the parts necessary, including a new GFCI — one normally used for personal protection in the home.

The Circuit

The circuit is shown schematically in Figure 1. The GFCI is designed to trip at approximately 5 mA, or 0.005 A. When the internal circuitry of the GFCI detects an unbalance of current of approximately 5 mA or more between the HOT and NEUTRAL terminals on the LOAD side of the GFCI, it disconnects the power from the LOAD side.

Next on the schematic you will see trans-

After 10 Years We Can Do More

The original overvoltage protection article was a good idea that saved many generator operated stations from expensive damage due to runaway generators. This version provides similar functionality, but adds digital voltage readout so you can observe anomalies, perhaps before they cause problems. In addition, there have been a few improvements to the circuit to make it less subject to particular grounding configurations and to allow for operation in countries with higher mains voltage through the use of a higher voltage triac. As with the original, a protection set should be included at each operating position, rather than using a single one at the generator.

[1]Notes appear on page 46.

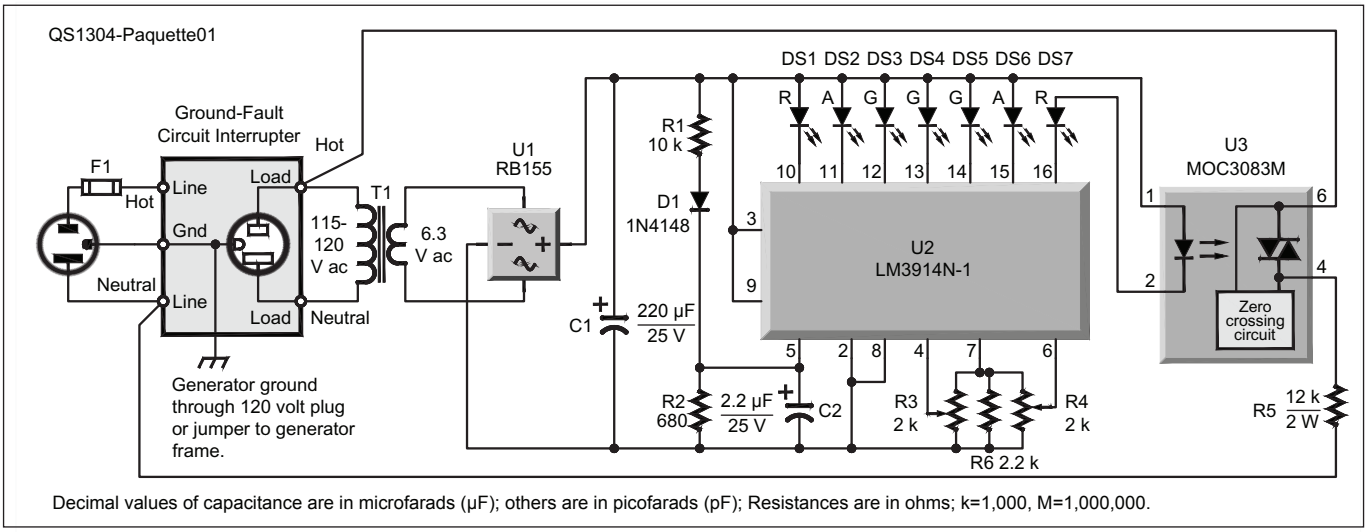


Figure 1 — Schematic diagram and parts list of the overvoltage protector. Digikey parts are available at **www.digikey.com**, Far Circuits from **www.farcircuits.net** and Mouser from **www.mouser.com**.

C1 — 220 µF, 35 V electrolytic capacitor (Digikey P10384TB-ND).
C2 — 2.2 µF, 25 V electrolytic capacitor (Digikey 478-1870-ND).
D1 — 1N4148 diode (Digikey 1N4148FS-ND).
DS1, DS7 — Red LED (Digikey P563-ND).
DS3-DS5 — Green LED (Digikey P564-ND).
DS2, DS6 — Amber LED (Digikey P565-ND).
F1 — Panel mounted fuse or circuit breaker rated at or less than the lower of the GFCI or extension cord rating.
R1 — 10 kΩ, ⅛ W carbon film resistor (Digikey 10KEBK-ND).
R2 — 680 Ω, ⅛ W carbon film resistor (Digikey 680EBK-ND).
R3, R4 — 2 kΩ potentiometer (Digikey CT94EW202-ND or 3296W-202LF-ND).
R5 — 12 kΩ, 2 W metal oxide resistor (Digikey 12KW-2-ND).
R6 — 2.2 kΩ, ⅛ W carbon film resistor (Digikey 2.2KEBK-ND).
U1 — RB255 rectifier assembly (Digikey RB155-BPMS-ND).
U2 — LM3914N-1 display driver IC (Digikey LM3914N-1-ND).
U3 — MOC3083M optical coupler IC (Digikey MOC3083M-ND).
T1 — 115 to 6.3 V power transformer (Digikey HM505-ND, Mouser 553-F13X or Mouser 41FD010).
Circuit Board, build per information provided or available from Far Circuits.

former T1. Its input voltage should be 115 V ac or whatever voltage you need wherever you will be using this protection circuit. The secondary voltage should be about 6.3 V ac. Any 6.3 V ac transformer rated at over 250 mA is suitable.

I chose not to use a PC mounted transformer because that would limit the transformer to perhaps only one specific transformer. You might have a transformer with a 12.6 V center tapped secondary. If so, use the center tap and one of the other secondary leads. It is important not to exceed the 6.3 V ac because the LM3914N-1 can get very warm in the bar mode if seven LEDs are on at once.

U1, a RB155 full wave bridge rectifier, converts the 6.3 V ac to unfiltered dc. Any of the full wave rectifiers in that series can be used, but I found the RB155 to be a little cheaper. C1, a 220 µF electrolytic capacitor filters the dc to operate the rest of the circuit.

The heart of the circuit is U2, the LM3914N-1 dot/bar display driver. (If you have or obtain an older LM3914 version it will work equally as well in this circuit.) This IC senses analog voltage levels and can drive up to 10 LEDs from the single IC. In our circuit we will use seven LEDs. R1, R2, D1 and C2 compromise the input circuit that provides a voltage level proportional to the line voltage. This is what U2 is measuring.

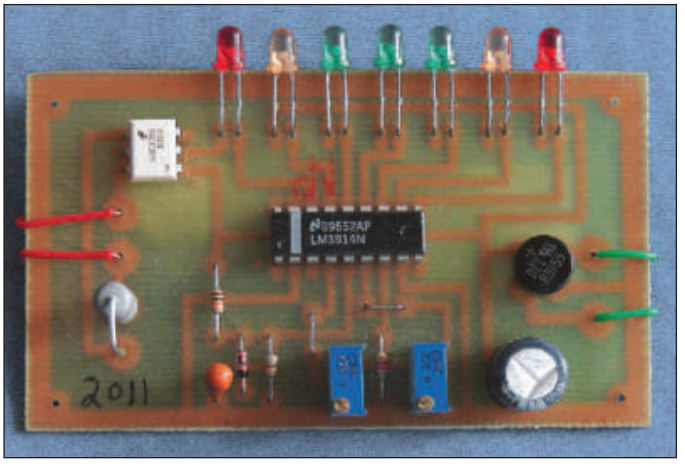


Figure 2 — View of the completed PC board showing the colored LEDs along the top. As discussed in the text, other construction techniques can be employed.

The two trimmer potentiometers (trim pots) allow for adjustment of the comparator inputs on Pins 4 and 6 of the LM3914N-1. Additionally, the two trim pots, each a 2 kΩ trim pot, are wired in parallel with each other and in parallel with resistor R6, a 2200 Ω resistor. The equivalent resistance is about 687.5 Ω. Refer to the LM3914N-1 datasheet and you will find that Pin 7 has an output reference voltage of 1.25 V. With the 687.5 Ω combined parallel resistance connected from Pin 7 to the circuit board ground, a current of 1.81 mA will flow.

Again, referring to the LM3914N-1 datasheet you will see that you multiply that current flowing on Pin 7 (1.81 mA) by 10 to get 18.1 mA and that is the maximum each connected LED will pass.

Circuit Construction

The circuit can be constructed on a perforated circuit board available from many suppliers, or you can make your own circuit board from the printed circuit layout on the *QST* in Depth web page.[2] I recommend using a premade board available from Far Circuits.[3] As I started this article I contacted

Fred at Far Circuits and was told he will have boards ready by the time this article is published. Far Circuits also sells the circuit board for the 1994 version of my "Overvoltage Protection for ac Generators" so be sure to get the newer circuit board.

You can also make your own board. A template has been included. The circuit board and the schematic were drawn by WB8IOW using the *TinyCAD* program available at: **/sourceforge.net/apps/mediawiki/tinycad/index.php?title=TinyCAD**. The two files, the schematic and the circuit board layout are available on the QST in Depth web page.

There are a few things you may notice about the board layout (see Figure 2) but I will point them out anyway. There are two wire jumpers. The first jumper connects Pin 4 of the LM3914N-1 to the wiper (Pin 2) of one of the trim pots and the second jumper connects Pin 6 of the LM3914N-1 to the wiper (Pin 2) of the other trim pot.

The 12 kΩ, 2 W resistor is standing on end to help keep heat away from the circuit board. There should be little heat produced when the circuit trips. The LEDs are spaced at 3/10 inch for ease in drilling holes in a panel.

Mount the circuit board, transformer and GFCI in a project box, cabinet, panel or whatever you want and have the power cord with a plug installed that will plug into a three wire receptacle. If you cannot easily cut the panel to mount the GFCI (see Figure 3) an alternate method is to use a standard electrical outlet box mounted to your project box.

Calibration and Setup

The LM3914N-1 datasheet has Pin 4 identified as R_{LO} and Pin 6 as R_{HI}.[4] In this circuit you will adjust the trim pot voltages appearing on Pins 4 and 6 as follows. Pin 4 will be set to 0.55 V dc and Pin 6 will be set to 0.35 V dc, the higher voltage being on Pin 4 and the lower voltage on Pin 6. These are good starting voltages and are based on using a transformer with a 6.3 V ac secondary.

Putting the low voltage on the HI terminal and the higher voltage on the LO terminal will reverse the direction of the bar display so that the circuit board does not have to be mounted upside down in order to get a left-to-right action of the bar. If that is difficult to understand, once built, reverse the two trim pot voltages and you will see what I mean. I have built a number of these circuits in the past that I mounted upside down to get the left-to-right bar display before I started reversing the R_{LO} and R_{HI} inputs.

Figure 3 — Socket side view of the overvoltage protection device. The input power is supplied on the right, while the GFCI sockets provide power to protected devices.

If you have a variable ac transformer available it will be much easier to adjust the trim pots so that the LEDs approximately represent the following voltages. Left to right, the first LED, red, would come on at 100 V ac, the second LED, amber, would be on at 105 V, the next three green LEDs would be on at 110, 115 and 120 V respectively. The next LED, amber, would be set to represent 125 V, and the seventh LED, red, would be set to come on at 130 V. The seventh LED is in series with the internal LED of the MOC3083M optical coupler.

The seventh LED will start to glow before sufficient current flows to activate the MOC3083M optical coupler, which then trips the GFCI. According to the MOC3083M datasheet, when the LED current is 5 mA or higher the MOC3083M will conduct and turn on its output triac.[5]

The output triac is internal to the MOC3083M and completes the circuit between the GFCI HOT terminal, on the LOAD side of the GFCI, through the MOC3083M, through the 12 kΩ, 2 W resistor, returning to the GFCI NEUTRAL terminal on the LINE side of the GFCI. At a trip voltage of 130 V ac the 12 kΩ resistor will cause 10.8 mA to flow as an unbalanced current that the GFCI will detect and will react to by tripping.

Final calibration

As mentioned earlier, using a variable transformer will help to make the proper adjustments. The variable ac transformer should be able to be adjusted between the range of 100 V and 132 V. The circuit can be used without adjusting with a variable ac transformer but accuracy cannot be assured.

Normal voltage in the home is about 120 V ac, with a range of +5% and –10%. In other words, 110 to 127 V. This circuit should be adjusted to cause the GFCI to trip about 130 V ac.

Whether or not you have access to a variable transformer, set the trim pot connected to Pin 4 of the LM3914N-1 to 0.55 V dc and adjust the trim pot connected to Pin 6 of the LM3914N-1 to 0.35 V dc.

With 120 V ac input the second and possibly the third green LED should be on. If you do not have the ability to raise or lower the input voltage with a variable transformer that is all you can do. Do not use an electronic light dimmer to supply power to the transformer. It will not work in this application.

If you have access to a variable transformer and have preset the voltage adjustments of Pins 4 and 6, lower the input voltage to 100 V ac and adjust the trim pot connected to Pin 6 so the first red LED just comes on, all other LEDs should be off. Then increase the voltage to 130 V ac and adjust the trim pot connected to Pin 4 so that the last red LED comes on and just trips the GFCI. You will have to lower the voltage and reset the GFCI. Adjust the input voltage to 100 V ac again; check that just the first red LED comes on. You may have to go back and forth between 100 V ac and 130 V ac a few times and tweak the trim pot settings to increase the accuracy.

Experience has shown the circuit is fairly stable, even after years being powered around the clock, but if you have a variable transformer you may want to check the accuracy from time to time.

Using this Overvoltage Protection Device

Each station or operating position should have one overvoltage protection device at the radio end of any extension cords or other power distribution systems. All the equipment plugged into the GFCI must not exceed the rating of the GFCI chosen, typically 15 or 20 A. The wiring between the generator and protection device must be sized to handle the current. The rating of F1 should be selected to be the lower of the GFCI or wiring current rating. In most operating positions, a small power strip is plugged into one of the front outlets of the GFCI and radios, computers and other equipment are plugged into the power strip.

Final Thoughts about the GFCI

I have had the opportunity to test this circuit with a variety of GFCI devices, from some costing a little over $5 and some industrial grade and hospital grade devices costing almost $60 each. I have found no difference

in operation, no matter which device I used. But keep in mind you usually get what you pay for. If you have the inclination, look at GFCI specifications on the Internet. Personally, I have usually used the devices that were sold at building supply stores.

I have seen some comments on the Internet from a few hams who said they had issues with unusual tripping with some GFCIs due to RF from high power transmitters. I personally had one trip in my house while transmitting no more than 100 W on 75 meters. I replaced it and that has taken care of the problem.

Safety Warnings

Working on this circuit can expose you to voltages that could injure or even kill you. Use extreme caution when you work on this circuit with power applied.

Be careful to wire the GFCI properly. Use the information supplied by the GFCI manufacturer.

Use a grounded power cord and tie the ground to the GFCI ground and the transformer metal case. Ground your generator per the instructions in the manufacturer's supplied owner's manual.

This use of this circuit does not in any way compromise the normal operation of the GFCI. The use of this circuit is to help protect equipment connected to the output of the GFCI. The use of this circuit is not meant to replace the need for surge protection, a function normally associated with surge protected power strips and similar protection equipment.

Notes

[1]J. Paquette, WB8IOW, "Overvoltage Protection for ac Generators", *QST*, June 1994, pp 43-44, and more recently published in part in the *ARRL Handbook*.
[2]**www.arrl.org\qst-in-depth**
[3]Circuit board available from Far Circuits, 1-847-836-914, **www.farcircuits.net**.
[4]LM3914 Dot/Bar Display Driver datasheet, National Semiconductor, February 2003, **www.national.com**.
[5]MOC3083M datasheet, Fairchild Semiconductor, **www.fairchildsemi.com/pf/MO/MOC3083M.html**.

Photos by Jerry Paquette, WB8IOW

ARRL member Jerry Paquette, WB8IOW, was first licensed in the early 1960s as a Novice and later had a W4 call sign when he lived in Kentucky. He obtained his current call sign in early 1970s. Jerry's father, Earl, formerly WA8YIQ had an interest in ham radio and he encouraged Jerry to get involved at an early age.

Jerry was a proud 1998 winner of the Herb S. Brier, W9AD, Instructor of the Year award for outstanding work as a Volunteer Instructor, presented by the ARRL through the Lake County (Indiana) Amateur Radio Club.

Jerry was a long time member of the NFPA and the IEEE. He worked for forty years in a 2400 MW coal fired power plant in the Electrical Testing Department working with voltages up to 345 kV and high speed protective relay devices. For years he was the owner of K&P Electronics and designer of over 150 circuits and circuit boards. With the help of several part time employees he produced over 1800 circuit boards sold to industry.

You can reach Jerry at 1966 Logans Ln, West Union, OH 45693 or at **wb8iow@arrl.net**.

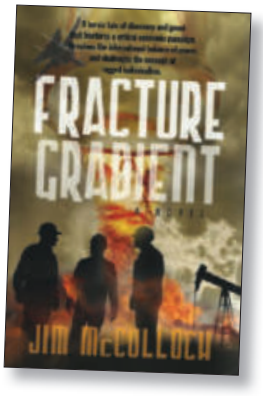
For updates to this article, see the *QST* Feedback page at www.arrl.org/feedback.

New Books

Reviewed by Rick Lindquist, WW1ME

Fracture Gradient

Jim McCulloch, WD7H



My first reaction to Jim McCulloch's debut novel was, "When's the movie coming out?" A former US Army officer and energy industry veteran, McCulloch concocts a thriller with just the right ingredients to satisfy modern moviegoers, all without relying on zombies or vampires. I say this even though the book's title suggests the all the excitement of an obscure and dusty geology principle, which it *is*, among other things. McCulloch offers three variant definitions for the term before you reach the title page; each hints at what's to come.

Set during the Reagan Era, *Fracture Gradient* plausibly blends international intrigue, deception, governmental cluelessness and denial, violence — *lots* of violence — murder and mayhem, geopolitics, and old fashioned sleuthing, with a dash of Amateur Radio thrown in. Some "battle" descriptions are not for the squeamish. How McCulloch resolves things may leave readers wondering whether something like this actually happened?" The plot exploits the same sorts of conspiracy theory overtones that fuel late night AM talk radio, but if I told you how it ends, what fun would that be?

Here's the basic setup: Some Big Oil scientists develop a revolutionary product that would render their industry largely obsolete — a definite game-changer. The fun begins when word leaks out, and bidding war of sorts erupts. How this plays out without veering too deeply into science fiction (or *is* it?) is the book's bread and butter, and readers will appreciate the twists at the end. In furthering the plot, McCulloch expropriates several late 20th and early 21st century figures as well as considerable military weapons nomenclature.

I'll leave it to readers to judge whether ham radio's role in the complex plot is entirely believable or appropriate (hey, this *is* fiction), but in an age when the characters used pay telephones, short wave radio communication was still cool and cutting edge. The author allows that his rough manuscript "languished in a desk drawer for far too long" before his wife urged him to dust it off and have at it.

If this story ever makes it to the silver screen, I'll be interested to see who plays Ronald Reagan — and if there's a role for Arnold Schwarzenegger.

Mossy Mountain Publishing, Banks, Oregon, 2012. ISBN: 978-0-9857745-0-9, softcover, 5.5 × 8.5 in, 447 pp. Available from **Amazon.com**, *$16.00.*

Feedback

- In "A Three to One Dummy Load" [Feb 2013, pp 30-32] there is an inconsistency between the wiring of R6-R9 in Figure 1 and the text. The text describes them interconnected at the intermediate point (bottom of R6 to bottom of R8), while the schematic doesn't show the connection. Either arrangement will provide the desired 1:1 SWR.

- In "The Penticton Solar Flux Receiver" [Feb 2013, pp 39-47] the lead map incorrectly shows Lake Sakakawea in Montana. It should have been shown in North Dakota.

- In "Digital Detective" [Feb 2013, p 80] in the digital edition of *QST*, the link **www.dxzone.com/cgi-bin/dir/jump2.cgi?ID=8861** text is correct but the link address is not. When selecting the link, change "8661" to "8861" and you will be able to access the correct web page.

Done In One: Temperature Alarm

The first in a series of one-night projects — a simple circuit that warns you when your rig's overheating

Paul Danzer, N1II

We all know heat is the enemy of electronic equipment. Many of today's rigs have either a cooling fan or a large heat sink, but no way to tell you if the fan is clogged with dust or the heat sink is blocked, resulting in what could be disastrously high temperatures.

Electronic Temperature Warning

A simple temperature warning circuit is shown in Figure 1. Since it consists of one chip, a sensing element and a few resistors, it can be assembled and put into place in one evening. The circuit is shown built on a modular IC breadboard socket and only nine wires have to be soldered — the three leads to the sensor in Figure 2 and the leads to variable resistors R1 and R2 (see Figure 1). If you prefer to solder all connections, Radio Shack printed circuit board 276-170 can be used with the same layout.

The circuit, shown in Figure 3, is based on an NTE7225, available online from RadioShack for about $2 plus shipping. The other parts are commonly available in most electronics outlets or RadioShack stores. The NTE is a substitute for the LM135, 235 and 335 line of temperature sensors, and if you are curious you can find their data sheets online.

Putting it Together

The red and black wires on the right in Figure 1 are the +12 and –12 V connections. Three wires connect to the sensor. Figure 2 shows the sensor with the flat side facing you; black (ground), red (output and positive) and green (adjustment). Heat shrink tubing, heated by a match, covers the solder joints from the three wires to the sensor.

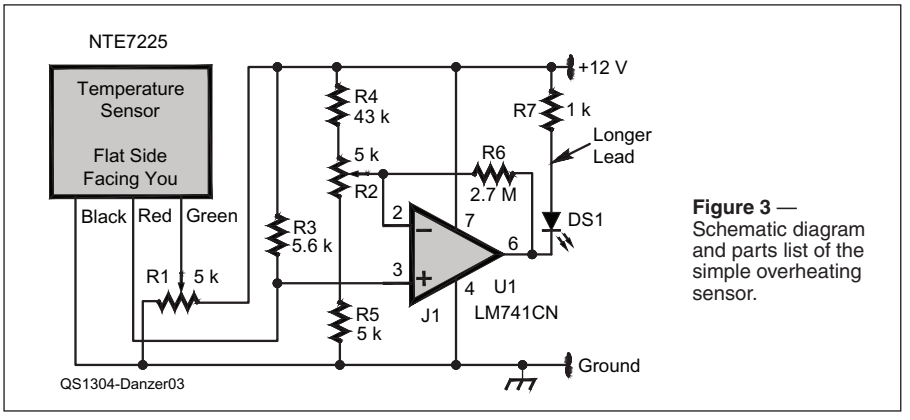


Figure 3 — Schematic diagram and parts list of the simple overheating sensor.

DS1 — Any red LED (RadioShack has an assortment of 20 as 276-1627).
J1 — Modular IC breadboard socket (RadioShack 276-003).
R1, R2 — 5 kΩ potentiometer (RadioShack 271-1715).
R3 — 5.6 kΩ, ¼ W resistor (green, blue, red).
R4 — 43 kΩ ¼ W resistor (yellow, orange, orange).
R5 — 5 kΩ ¼ W resistor (green, black, red).
R6 — 2.7 MΩ, ¼ W resistor (red, purple, green).
R7 — 1 kΩ, ¼ W, resistor (brown, black, red).
Temperature sensor — NTE7225 (RadioShack online, 550652802).
U1 — LM741CN or any 741 IC, such as (RadioShack 276-007).

Making it Play

Connect a voltmeter from the green sensor to ground. Adjust R1 for 2 V. Fasten the sensor's flat side to the rig heat sink or place it in the air stream of the cooling fan.

Next you have to use your rig for a while to get the air stream or heat sink up to normal temperature — perhaps in a contest or for a long contact. Now carefully adjust R2 so the red LED just goes out. From this point on if the temperature goes above this set point you are warned the rig may be overheating. On many rigs this point is somewhat less than 150° F.

If you cannot get the LED to go on or off with R2 set R2 to its mid point and adjust R1 until the LED changes; then adjust R2.

Either the breadboard unit shown, or the printed circuit board version can be mounted in an enclosure with the red LED extended to the front panel. The LED has two leads; the longer one is always the positive lead.

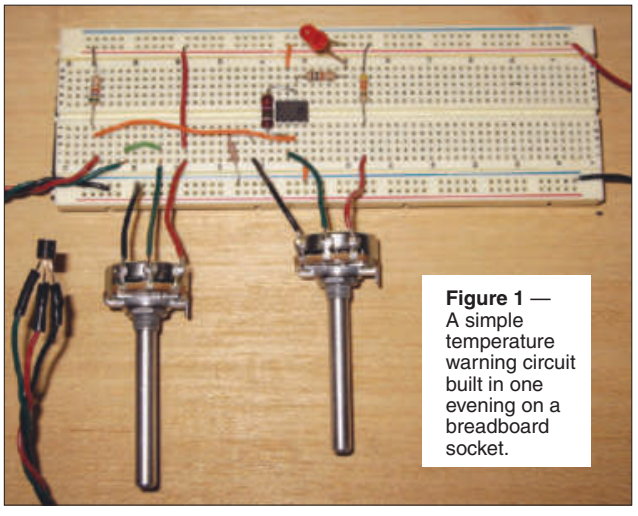


Figure 1 — A simple temperature warning circuit built in one evening on a breadboard socket.

Figure 2 — This inexpensive temperature sensing element is the heart of the project.

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 almost constantly since he first started. He uses his years of experience as an electronic engineer to design and build small, one-night ham radio projects. Currently he is a Professor of Computer Science at Housatonic Community College in Connecticut.

You can reach Paul at 2 Dawn Rd, Norwalk, CT 06851 or at **n1ii@arrl.net**.

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

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

Yaesu FTDX3000 HF and 6 Meter Transceiver

More than just a pretty face—this medium priced transceiver offers a top notch receiver and many other features.

Reviewed by Norm Fusaro, W3IZ Assistant Manager, Membership and Volunteer Programs Department
w3iz@arrl.org

At last summer's Japan Amateur Radio League Ham Fair in Tokyo, I was able to break away from my official duties as ARRL representative and check out some of the action on the floor. As always, there was a lot of commotion around the newest equipment displayed by the manufacturers, and the Yaesu booth was no exception. It was evident that the company had placed a lot of stock in their newest HF/6 meter transceiver because they had no fewer than six FTDX3000s on display for fairgoers to fiddle with. A gang of Yaesu representatives was on deck to answer questions.

Yaesu has been updating their HF transceiver line with FTDX series models that offer improved features and performance compared to the previous generation. So far the new models have been geared toward the top of the line, with the various versions of the FTDX9000 and FTDX5000. The FTDX3000 brings the new series down market a bit, with pricing closer to the popular FT-2000.[1]

The FTDX3000 is a 100 W transceiver for 160 through 6 meters. The 60 meter channels (including the most recent changes) are preset in special memories, taking the guesswork out of getting on the right frequency. The receiver covers 30 kHz to 56 MHz. It is a downconversion design (IFs at 9 MHz and 30 kHz) with selectable roofing filters and a suite of DSP filters and tools. SSB, CW AM, FM and digital modes are supported.

Look and Feel

In appearance, the FTDX3000 is a radical departure from what we are used to seeing in Yaesu's FT series radios. It's a very alluring transceiver that looks even nicer in person than it does in the brochures or print ads. The photos just don't seem to capture the seductiveness of this radio. The FTDX3000's profile has nice proportions with a soft satiny finish and no sharp corners. Even the push buttons have been softened with rounded edges and corners. If you see the FTDX3000 in a showroom it just purrs to you and says "Take me home."

When you first sit down with the FTDX3000, you will quickly notice the rig's layout was well planned, at least for my style of operating. I found myself accessing any of the knobs or buttons with natural fluid motions. For example, the main tuning knob drag is easily adjusted by simply holding the skirt and turning the big main knob to the left or right until you get the right feel for your fingertips. The control knob faces have a spun finish to give them a nice satin look and the grip surfaces of the knobs are knurled for a positive grasp while making adjustments. Some of the controls, such as AF GAIN and RF GAIN have smooth linear operation, while others like the MIC GAIN and NOTCH filter settings provide a soft click, affirming the control is being adjusted and ensuring that the settings don't move should a knob be bumped accidentally.

After powering up the radio, the first thing that attracted my attention was the bright full color 4.3 inch thin film transistor (TFT) display. The high resolution screen offers a lot of information at a quick glance. The animated multifunction meter's virtual needle bounces to the beat of received signals while at the same time the band scope shows activity peaks north and south of your listening frequency.

Filter status, VFO B frequency, CW zero beat, digital signal processing (DSP) and audio processing, antenna port and antenna tuner status are all simultaneously displayed on the TFT screen in an easy to read layout. The display even has a 24 hour clock that is set by holding the custom switch (C.S. button) for a second then entering the time via the front panel keypad. Frequently used buttons are illuminated and conveniently located to the left of the TFT display.

Out of the Box

In spite of its advanced features the FTDX3000 is relatively simple to use. Users are strongly urged to read the well illustrated owner's manual to fully understand all of the

Bottom Line

The FTDX3000 brings a boost in features and performance to Yaesu's mid-priced transceiver range. Narrow roofing filters in the front end and a suite of DSP features at the back end give it a formidable receiver for use on crowded bands. The color TFT display and new styling give the radio a modern look and feel.

[1]The following *QST* Product Reviews may be of interest: FT-2000 (Feb 2007), FT-2000D (Oct 2007), FTDX5000D (Dec 2010), FTDX9000D (Aug 2005), FTDX9000 Contest (Mar 2006) and FTDX9000MP (Jul 2010). Past *QST* reviews are available to ARRL members at **www.arrl.org/product-review**.

features and controls of this or any other piece of equipment, but out of the box operation of the FTDX3000 is straightforward. Connect an antenna, microphone or CW paddles and a 13.8 V dc power source and you can be on the air in no time.

There are three antenna jacks and the menus allow you to associate an antenna choice with each band. The built-in automatic antenna tuner is rated to match loads from 16.5 to 150 Ω (3:1 SWR). Tuner settings are stored in memories for fast band changes.

If you are to truly appreciate the beauty of this radio, then take some time to familiarize yourself with all of its features. Even with 196 menu items you will find that most of the settings in the various menus do not require regular access once you have customized the settings to suit your operating style. For those instances at which you would think a control knob would be better than a menu setting for quick access, the designers worked through this. Certain menu items such as the MONITOR GAIN or CONTOUR control that may require frequent adjustment can be quickly accessed by holding the button that activates a function for a second, which will take you directly to the menu item for that particular setting. The user can also configure the C.S. button to have quick access to any menu item.

Speaking of menus, I found them easier to use than menu systems in previous generation models. The menu choices are in plain language and easy to understand, compared to the somewhat cryptic labels in older models. Navigation is via a small cluster of arrow keys next to the TFT display.

On The Air

I used the FTDX3000 in a variety of operating situations including casual SSB contacts and nets, CW DXing and less than serious efforts in the ARRL 160 Meter Contest and Stew Perry Topband Distance Challenge. The FTDX3000 performs well regardless of your favorite mode of operation. The receiver is very quiet, especially if the digital noise reduction (DNR) is activated.

CW Features

For the CW operator there are some nice features such as the audio peak filter (APF) — a sharp audio filter that provides a very narrow audio bandwidth. The ’3000 includes an electronic keyer with memories, a CW spotting (zero beat) function and semi or full break-in (QSK). The ’3000 even has a built-in CW decoder that works fairly well as long as you are not trying to copy slow speed code sent with a straight key.

On previous models of Yaesu transceivers, the built in contest memory keyer feature was accessed through difficult to reach front panel buttons or by using an optional keypad accessory. The FTDX3000 comes with the FH-2 keypad as standard equipment, which makes using the contest memory keyer extremely easy. The FH-2 plugs into the rear of the transceiver and lies on the desk, providing easy access to the keys. The FH-2 is also used to activate features specific to SSB and digital modes of operation.

The contest memory keyer works in conjunction with your CW paddles allowing you to insert Morse characters before or after a prerecorded message. In addition to programming the memories using your CW paddles, messages in the memory keyer can also be programmed via the menu using the sub VFO knob to scroll through alphanumeric characters. The memory keyer is able to insert serial numbers for contests such as the ARRL November Sweepstakes and other events that require a consecutive serial number as part of the exchange. Granted, a serious contester will most likely be using dedicated software for contest logging, rig control and CW keying, but the casual operator will appreciate the built-in features.

The ’3000 has a tuning indicator displayed on the TFT screen that lets you quickly zero in on a CW signal. Combine this with the visual spikes on the band scope and you can troll a band, picking off stations with precision accuracy.

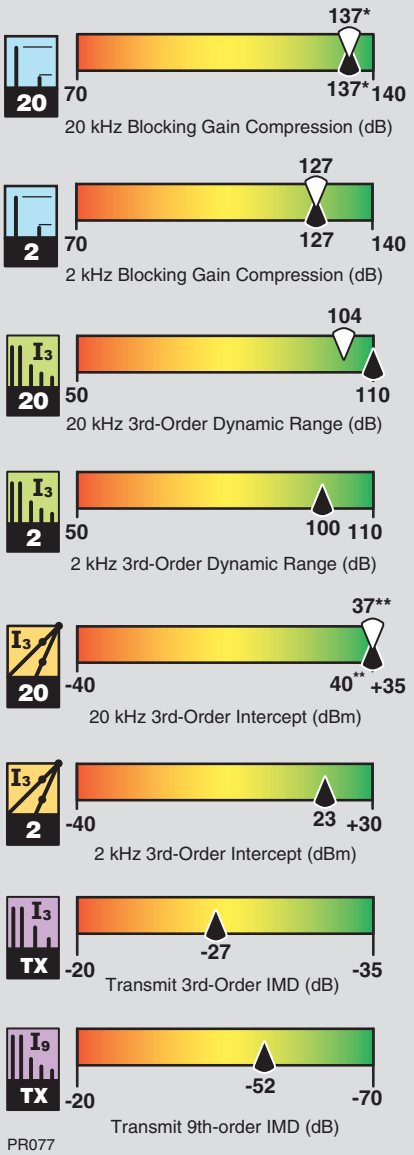
SSB Features

Phone operators will appreciate the two built-in three-band parametric equalizers that allow customization of your transmitted audio. Having two equalizers offers the flexibility to preset the controls for different microphones or different operating styles. One group of settings works with the speech processor off, and the other with the processor on.

I found that I could set the two equalizers for different effects and change them very quickly. For the parametric equalizer that is activated when the speech processor is on, I found that setting up the equalizer using a small amount of processing with 50-3000 Hz bandwidth (menu item 104) provides warm natural sounding audio for those armchair QSOs. I set the second equalizer, with the speech processor off, for stronger articulation in the upper midrange and reduced the transmit bandwidth to a tighter 300-2700 Hz to achieve a punchier signal that pierces through pileups. Whether checking into my weekly phone net or working some of the recent DXpeditions, the FTDX3000 yielded good audio reports with various equilizer settings.

For SSB operating, the FH-2 keypad is used to program and activate the optional DVS-6 digital voice recorder should you have that installed. The DVS-6 is a simple plug-in module and an upgrade well worth the few extra dollars to the active contester. The

Key Measurements Summary



PR077

Key: **Off scale *Blocking exceeded the levels indicated. See Table 1.

Values shown are for 500 Hz BW with 600 Hz roofing filter.

Dynamic range and intercept values with preamp off.

Intercept values were determined using -97 dBm reference.

80 M

20 M

FH-2 also allows you to record and play back the most recent 15 seconds of receive audio.

Digital Mode Features

Fear not, you digital operators out there. The Yaesu designers built some goodies into the FTDX3000 for you too. The rear panel has connections for FSK and AFSK to interface with a computer for RTTY and soundcard modes. RTTY keying polarity, shift and MARK frequency are adjustable via menus. The RTTY DSP filter characteristics (bandwidth, filter shape) can be adjusted separately from the CW and SSB filters. You can set up AFSK modes to work with VOX mode, eliminating a PTT connection. The manual cautions to reduce output power if you are transmitting continuously for several minutes, or if transmitting time exceeds receiving time.

If you just want to receive digital mode signals or make an occasional contact without connecting a computer, the FTDX3000 features a built-in RTTY and PSK encoder/decoder. Toggling the SCOPE button changes the lower portion of the TFT display into an RTTY or PSK display that shows a couple of lines of received text with a tuning aid to the right.

Using the FH-2 keypad, you can program five memory banks with text messages for RTTY and PSK operation. RTTY message memories are independent of PSK message memories. Direct keyboard entry is not an option, so inserting text on the fly, such as including the other station's call sign, is not possible.

While the built-in encoder/decoder will allow you to make some RTTY or PSK contacts, its utility is limited. An external computer with some of the amazing digital mode software available these days is still the way to go if you operate these modes regularly.

Computer Control

All Yaesu transceivers use CAT (Computer Aided Transceiver) to control the transceiver via software and a computer. Up until now this has been accomplished through a DB-9 serial port. Today, the serial port is going the way of the floppy disk. Most new computers don't include them, and using USB-to-serial adapters can be cumbersome.

The FTDX3000 has the standard DB-9 serial connection on the rear for CAT operation, but also adds the flexibility of using a USB cable to connect to your computer or laptop. To use the USB port you will have to download a USB driver from Yaesu's website. All I can say about the USB connection is what took them so long? After all, many

Table 1
Yaesu FTDX3000, serial number 2K020062

Manufacturer's Specifications	Measured in the ARRL Lab
Frequency coverage: Receive, 0.03-56 MHz (specified performance, amateur bands only); transmit, 1.8-54 MHz (amateur bands only).	Receive and transmit, as specified.
Power consumption: Receive, 1.8 A (no signal), 2.1 A (signal present); transmit, 23 A (100 W) at 13.8 V dc ±10%.	At 13.8 V dc: Receive, 1.88 A (VFO, TFT and backlights max brightness, max vol, no signal), 1.83 A (min brightness). Transmit, 9 A at 5 W RF output, 19 A (typical) at 100 W RF output. Operation confirmed at 12.4 V dc.
Modes of operation: SSB, CW, AM, FM, RTTY, PKT.	As specified.
Receiver	**Receiver Dynamic Testing**
SSB/CW sensitivity: 2.4 kHz bandwidth, 10 dB S+N/N: 0.5-1.8 MHz (IPO), 4.0 µV; 1.8-30 MHz, 0.16 µV (preamp 2 on); 50-54 MHz, 1.25 µV (preamp 2 on).	Noise floor (MDS), 500 Hz bandwidth, 600 Hz roofing filter: *Preamp* / *Off (dBm)* / *1 (dBm)* / *2 (dBm)* 0.137 MHz / –114 / –125 / –127 0.475 MHz / –125 / –138 / –140 1.0 MHz / –128 / –139 / –142 3.5 MHz / –127 / –138 / –141 14 MHz / –127 / –138 / –142 50 MHz / –125 / –137 / –141
Noise figure: Not specified.	14 MHz, preamp off/1/2: 20/9/5 dB
AM sensitivity: 6 kHz bandwidth, 10 dB S+N/N: 0.5-1.8 MHz (preamp off), 28 µV; 1.8-30 MHz (preamp 2), 2 µV; 50-54 MHz (preamp 2), 1 µV.	10 dB (S+N)/N, 1-kHz, 30% modulation, 6 kHz bandwidth, 15 kHz roofing filter: 1.0 MHz 2.60 µV (preamp off) 3.8 MHz 0.55 µV (preamp 2) 50 MHz 0.56 µV (preamp 2)
FM sensitivity: 15 kHz bandwidth, 12 dB SINAD: 28-30 MHz (preamp 2), 0.5 µV; 50-54 MHz, (preamp 2), 0.35 µV	For 12 dB SINAD, preamp 2: 29 MHz 0.23 µV 52 MHz 0.21 µV
Spectral display sensitivity: Not specified.	Preamp off/1/2: –100/–113/–120 dBm.
Blocking gain compression dynamic range: Not specified.	Gain compression, 500 Hz bandwidth, 600 Hz roofing filter: *20 kHz offset Preamp off/1/2* / *5/2 kHz offset Preamp off* 3.5 MHz 137*/141/134 dB 132/127 dB 14 MHz 137*/142/136 dB 132/127 dB 50 MHz 135*/139/133 dB 128/117 dB
Reciprocal mixing dynamic range: Not specified.	20/5/2 kHz offset: –106/–93/–82 dBc.

ARRL Lab Two-Tone IMD Testing (500 Hz bandwidth, 600 Hz roofing filter)**

Band/Preamp	*Spacing*	*Input Level*	*Measured IMD Level*	*Measured IMD DR*	*Calculated IP3*
3.5 MHz/Off	20 kHz	–23 dBm	–127 dBm	104 dB	+29 dBm
		–8 dBm	–97 dBm		+37 dBm
14 MHz/Off	20 kHz	–17 dBm	–127 dBm	110 dB	+38 dBm
		–6 dBm	–97 dBm		+40 dBm
		–86 dBm	0 dBm		+43 dBm
14 MHz/Pre 1	20 kHz	–28 dBm	–138 dBm	110 dB	+27 dBm
		–14 dBm	–97 dBm		+28 dBm
14 MHz/Pre 2	20 kHz	–36 dBm	–142 dBm	106 dB	+17 dBm
		–14 dBm	–97 dBm		+28 dBm
14 MHz/Off	5 kHz	–22 dBm	–127dBm	105 dB	+31 dBm
		–9 dBm	–97 dBm		+35 dBm
		–80 dBm	0 dBm		+40 dBm
14 MHz/Off	2 kHz	–27 dBm	–127 dBm	100 dB	+23 dBm
		–17 dBm	–97 dBm		+23 dBm
		–71 dBm	0 dBm		+36 dBm
50 MHz/Off	20 kHz	–33 dBm	–125 dBm	92 dB	+13 dBm
		–7 dBm	–97 dBm		+14 dBm

Second-order intercept point: Not specified.	14 MHz, preamp off/1/2: +87/+75/+75 dBm; 50 MHz, +89/+75/+75 dBm.
DSP noise reduction: Not specified.	Variable, 30 dB maximum.
Notch filter depth: Not specified.	Manual: >70 dB; auto: >70 dB, attack time: 100 ms.
FM adjacent channel selectivity: Not specified.	29 MHz, 86 dB; 52 MHz, 82 dB.
FM two-tone, third-order IMD dynamic range: Not specified.	20 kHz offset, preamp 2: 29 MHz, 86 dB†; 52 MHz, 82 dB. 10 MHz channel spacing: 29 MHz, 111 dB; 52 MHz, 105 dB.
S-meter sensitivity: Not specified.	S9 signal at 14.2 MHz, preamp off/1/2: 94.3/24.8/9.2 µV.
Squelch sensitivity: Not specified.	At threshold: SSB (preamp off), 9.22 µV; FM, 29 MHz (preamp 2), 0.42 µV; 52 MHz (preamp 2), 0.33 µV.
Receiver audio output: 2.5 W into 4 Ω at 10% THD.	2.6 W at 3.2% THD into 4 Ω (maximum audio). THD at 1 V RMS: 0.4%.
IF/audio response: Not specified.	Range at –6 dB points, (bandwidth)‡: CW (500 Hz): 450-947 Hz (497 Hz) Equivalent Rectangular BW: 501 Hz USB (2.4 kHz): 164-2306 Hz (2142 Hz) LSB (2.4 kHz): 157-2295 Hz (2138 Hz) AM (6 kHz): 79-2696 Hz (5234 Hz).
Image rejection: 160-10 meters, >70 dB; 50-54 MHz, >60 dB.	First IF rejection, 10 MHz, 60 dB; 14 MHz, 77 dB; 50 MHz,100 dB; image rejection, 14 MHz, 73 dB; 50 MHz, 70 dB.
Transmitter	**Transmitter Dynamic Testing**
Power output: 5-100 W, (2-25 W AM).	HF and 50 MHz: CW, SSB, RTTY, PKT, FM, as specified in specified supply voltage range. AM, 10-100 W (carrier).††
Harmonic suppression: >60 dB (1.8-29.7 MHz), >65 dB (50-54 MHz).	62 dBc (worst case 10 meters), 50-54 MHz, as specified. Meets FCC requirements.
SSB carrier suppression: At least 60 dB.	>70 dB.
Undesired sideband suppression: At least 60 dB.	>70 dB.
Third-order intermodulation distortion (IMD) products: –31 dB @ 14 MHz, 100 W PEP.	HF, 100 W PEP, 3rd/5th/7th/9th order: –27/–40/–42/–52 dB (worst case, 10 m); >–31/>–40/>–45/>–52 (typical). 50 MHz, 100 W PEP: –32/–38/–45/–61 dB
CW keyer speed range: Not specified.	4 to 59 WPM; iambic mode A or B.
CW keying characteristics: Not specified.	See Figures 1 and 2.
Transmit-receive turn-around time (PTT release to 50% audio output): Not specified.	S9 signal, AGC fast, 36 ms.
Receive-transmit turn-around time (tx delay): Not specified.	SSB, 34 ms; FM, 30 ms.
Composite transmitted noise: Not specified.	See Figure 3.

Size (height, width, depth): 4.5 × 14.4 × 12.3 inches; weight, 22 lbs.

Price: $2700; XF-127CN 300 Hz roofing filter, $200; DVS-6 digital voice recorder, $70.

*Blocking gain compression DR exceeded values shown; testing stopped after reaching the +10 dBm maximum output from the test fixture.

**ARRL Product Review testing includes two-tone IMD results at several signal levels. Two-tone, third-order dynamic range figures comparable to previous reviews are shown on the first line in each group. The "IP3" column is the calculated third-order intercept point. Second-order intercept points were determined using –97 dBm reference.

†Measurement was noise-limited at the value indicated.

‡Default values; bandwidth and cutoff frequencies are adjustable via DSP. CW bandwidth varies with PBT and Pitch control settings.

††Carrier level must be lowered to 25% of PEP for proper AM operation, for example a 25 W carrier with full modulation provides 100 W PEP output.

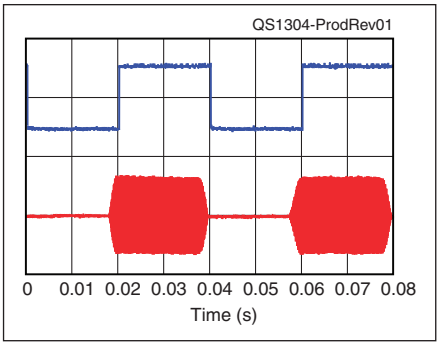


Figure 1 — CW keying waveform for the FTDX3000 showing the first two dits in full-break-in (QSK) mode using external keying. Equivalent keying speed is 60 WPM. The upper trace is the actual key closure; the lower trace is the RF envelope. (Note that the first key closure starts at the left edge of the figure.) Horizontal divisions are 10 ms. The transceiver was being operated at 100 W output on the 14 MHz band.

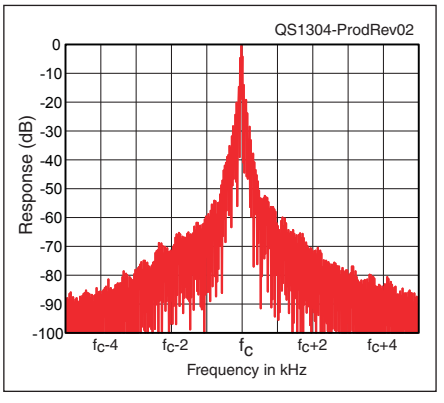


Figure 2 — Spectral display of the FTDX3000 transmitter during keying sideband testing. Equivalent keying speed is 60 WPM using external keying. Spectrum analyzer resolution bandwidth is 10 Hz, and the sweep time is 30 seconds. The transmitter was being operated at 100 W PEP output on the 14 MHz band, and this plot shows the transmitter output ±5 kHz from the carrier. The reference level is 0 dBc, and the vertical scale is in dB.

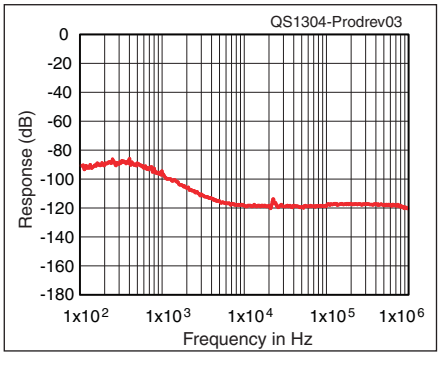


Figure 3 — Spectral display of the FTDX3000 transmitter output during composite-noise testing. Power output is 100 W on the 14 MHz band. The carrier, off the left edge of the plot, is not shown. This plot shows composite transmitted noise 100 Hz to 1 MHz from the carrier. The reference level is 0 dBc, and the vertical scale is in dB.

computers available to consumers today have USB only. The USB port on the '3000 is used only for CAT operation or CW keying from your PC but does not allow connection of a USB device. It sure would have been nice to be able to connect a USB keyboard for operating RTTY and PSK modes.

Receiving Features

The FTDX3000 is packed with an arsenal of interference fighting tools. Once you learn these features and their role, you will find them indispensible for isolating signals on the bands.

It should be noted that many of the settings are stored in the band stacking registers. If you take advantage of the FTDX3000's triple band stacking registers you can essentially set up your radio for SSB, CW and digital mode operation on each band. Once set up, there is no need for you to keep changing the filter selection or other settings when switching bands and/or modes.

Here are short descriptions of the features I found useful:

- *Selectable roofing filters.* These are in the first IF stage to limit the off-frequency signals reaching the mixer and amplifier stages. Choices are 600 Hz, 3 kHz, 6 kHz and 15 kHz. We didn't test the optional 300 Hz roofing filter. The filters can be selected automatically based on the bandwidth of the mode selected, or you can change the setting manually.
- *DSP bandwidth filters*. The bandwidth filters can be set separately for SSB, CW and RTTY/data modes using the WIDTH control. Bandwidth ranges are: SSB, 1.8 to 4 kHz; CW and RTTY/data, 500 Hz to 2.4 kHz. When the front panel NAR button is pushed, the ranges become 200 Hz to 1.8 kHz for SSB and 50 to 500 Hz for CW and RTTY/data. This two tier system lets you use the NAR button to toggle quickly between one very narrow setting and a wider one. Menu settings allow adjustment of the filter characteristics (soft or sharp, and steep, medium or gentle sloped skirts). Separate adjustments are available for HF SSB, CW and FSK filters and for 6 meter SSB and CW filters.
- *IF shift, IF notch*. Using the SHIFT and NOTCH controls, the operator can make adjustments to the IF passband to reduce or eliminate interfering signals. The FTDX3000 makes these available through knobs conveniently placed below the TFT display. These adjustments work in conjunction with the WIDTH setting and provide control of the receiver's IF passband to eliminate or reduce interference.
- *Audio peak filter*. APF is a CW only feature. It is a very narrow, very sharp audio filter than almost isolates CW signals within its passband. I find it a very useful feature when working CW on a crowded band.
- *Contour filter*. This filter allows additional filter shaping within the receiver passband, for example to suppress a low frequency rumble without affecting the rest of the signal. I found the CONTOUR filter useful as it allowed me to null unwanted signal components in the passband while enhancing the good components.
- *Digital noise reduction*. DNR is another DSP filtering component that uses 15 selectable algorithms to suppress a variety of noise situations you will encounter on any band on any given day.
- *Digital notch filter*. This handy filter works like a heterodyne seeking missile, searching out an annoying heterodyne and destroying it. It really expands the use of the 40 meter phone band when AM broadcast carriers make some frequencies above 7200 kHz unusable at night. A note about automatic notch filters: I cannot tell you how many times another ham has called me trying to diagnose a problem in which the CW sounds like thumping, or RTTY is not being decoded. The first thing I ask is if the DNF control is engaged. Using the band stacking registers to remember DNF settings for the different modes will help you avoid this sort of mistake.
- *Automatic gain control*. AGC is selectable (FAST, MID, SLOW) from the front panel and may be tailored through the menu. The AUTO setting automatically selects AGC characteristics for the selected mode.
- *IPO (intercept point optimization)*. Similar to many other Yaesu models, the IPO switch selects two levels of preamplification or bypasses the preamps and feeds the signal directly into the mixer. The ATT switch offers attenuation of 6, 12 or 18 dB.
- *Noise blanker*. The IF noise blanker can reduce or eliminate short pulse transient type noise or long pulse man-made noise. The noise blanker level is adjustable via the menu.

Split Operation

There are many times when split frequency operation is necessary, especially if you are an active DXer. For those who may not be familiar with operating split, allow me to explain. Split frequency operation involves transmitting on one frequency and receiving on a different frequency nearby in the same band (not to be confused with cross band or cross mode operation).

There are two typical instances when split frequency operation is used. One is if band allocations differ between operators, such as for phone operation on 40 meters if DX operators transmit below 7100 kHz and listen in the US phone band. The other is a DX pileup, in which a DX station listens for stations who are calling a few kHz above or below his or her transmitting frequency. That technique keeps the DX transmit frequency clear so that the calling stations can hear when he transmits and determine whom he is calling.

The FTDX3000 allows you to set up the QUICK SPLIT button to shift your transmit frequency up or down a predetermined increment. The spread can be set from –20 kHz to +20 kHz. For larger splits, as in the 40 meter phone example, you would simply press the VFO B TX button and tune to the correct transmit frequency. The VFO B frequency is shown on the TFT display and controlled by the CLAR/VFO-B knob to the right of the main tuning knob.

In any case, you do not want to be on the wrong VFO, causing interference to the DX or possibly operating illegally out of band. The FTDX3000 has a TXW button that, when pressed, switches the VFO so you can listen on your transmitting frequency. Releasing the TXW button reverts back to your original VFO configuration thus preventing the wrong VFO syndrome.

The dual VFOs in split operation are also used while working FM repeaters on the 6 meter or 10 meter bands.

The Spectrum Scope

Most HF radio operation relies on what you hear in the speaker or headphones, but visual enhancements abound. The monitor scope and panadapter are not new to ham radio. For example, the Yaesu FT-101E series popular in the 1970s offered a monitor scope accessory that tapped the IF stage of the radio allowing the user to visually monitor components of the transmitted signal as well as the signal being received. Most manufacturers offered similar accessories.

Today's technology has greatly enhanced transceiver visual aids providing the operator with (almost) real time view of the radio spectrum around the operating frequency. Is this just amusement, or does the band scope offer any real advantage? That depends on the operator. Say for instance you are on the 10 or 6 meter band calling CQ but nobody is answering. On the spectrum scope you notice a spike of activity above your calling frequency so you dial your VFO up there to find a station you'd like to contact. Without the visual aid, the only way you would have

Figure 4 — The FTDX3000's TFT display includes a virtual analog S meter. Icons offer visual information on various DSP filter and control settings at a glance. When the band scope is active, it replaces the information at the bottom of the display.

discovered this would have been to stop CQing and troll up and down the band. Given the propagation characteristics of bands such as 6 and 10 meters you could have missed the opportunity altogether.

The band scope on the FTDX3000 performs well at providing the information as described in the scenario above. However, the band scope display is small, limiting its readability and usefulness. If I had a wish for this feature it would be to be able to expand the size of the band scope within the TFT screen on the radio, or better yet to have a video output so that you could view all of the information on an external monitor. This feature can be added to other Yaesu radios such as the FT-2000 with the optional Data Management Unit (DMU).

Bandwidth for the band scope is adjustable (separate settings for each band), so you can take a wide view of the band, or zero in on one segment. You can monitor a fixed section of the band, or one that is always centered on your current operating frequency. You can store and retrieve band scope screens for later review. The AF-FFT window allows monitoring of signals in the receiver passband using a spectrum or waterfall display.

Lab Testing

ARRL Lab test results are shown in Table 1. The benefits of the new receiver design and narrow roofing filter are apparent, with blocking gain compression dynamic range of 127 dB and two-tone IMD dynamic range of 100 dB at 2 kHz spacing. These figures are a significant improvement over the FT-2000. Reciprocal mixing dynamic range (–82 dBc at 2 kHz offset) is also an improvement over the FT-2000.

The only testing issue noted is image rejection with certain frequency combinations in the general coverage receiver. For example, an S9 level 26 MHz signal at the antenna jack produces a barely audible image signal at 8 MHz. Increase the 26 MHz signal by 30 dB and the image increases to about S5, a noticeable level. This is a by-product of the downconversion receiver design, which allows the inclusion of high quality narrow roofing filters at the 9 MHz IF. Previous generation general coverage designs used upconversion (first IF around 60 to 70 MHz) so any images were well away from frequencies of interest, but it is more difficult to make narrow roofing filters for that high IF. Inside the ham bands the FTDX3000's bandpass filters attenuate any images to the point that they are not audible. Yaesu acknowledges that strong images may appear in the 9 to 12 MHz range, and the >70 dB image rejection specification is guaranteed inside the ham bands only.

Yaesu indicates that this will be improved with the installation of revised software version V01-06 or higher. We did not have this to test by press time, but it should be available for download from their web page by the time you read this.

Final Thoughts

My home station includes a Yaesu FT-2000 that I've used for several years. Placing the FTDX3000 side by side with the FT-2000 I was able to compare the two radios back and forth on the same antenna listening to the same signals. My first impression is that the FTDX3000 has a slightly quieter receiver. A distinct difference between the two radios can be found with the roofing filters. The FT-2000 has 6 kHz and 3 kHz roofing filters, but I don't hear much difference between them. With the FTDX3000, switching among the 600 Hz, 3 kHz and 6 kHz roofing filters has a more noticeable effect on signals in the passband.

When it comes to physical appearance, both transceivers are appealing to the eye. The FTDX3000's bright display and smooth design give it a real modern look on the desk with all the appeal of a sports car. The larger FT-2000's attractiveness is a bit on the mature side, somewhat conservative yet able to compete in any event.

The Yaesu FTDX3000 is a lot of radio in an attractive desktop package. It has so many features that it takes a well illustrated 140 page operating manual to cover them all. Its customizable configuration makes it compatible with any operating style. Competitive contester, weak signal DXer, 6 meter enthusiast, digital mode aficionado or a casual operator, it really makes no difference where your HF operating interests may lean. The features in the FTDX3000 allow it to compete on any level.

Manufacturer: Yaesu USA, 6125 Phyllis Dr, Cypress, CA 90630; tel 714-827-7600; **www.yaesu.com**.

See the Digital Edition of *QST* for a video overview of the Yaesu FTDX3000 HF and 6 Meter Transceiver.

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

How Close Is Too Close?

Q John, AJ4US, asks: I plan on installing separate 2 meter and 70 centimeter ¼ wave ground plane antennas in the attic to replace my dual band vertical. They will be fed from a diplexer, because I only have only one coax run going up to the attic. I use a diplexer at the shack end because my rig has separate connectors for the VHF and UHF antennas (see Figure 1). The maximum power on either band will be 50 W. I need to change to separate antennas because I plan to install an RF switched preamp in the line connected to the 70 centimeter antenna. I also plan on using snap-on ferrite cores (mix 43) on the coax cable at each antenna connection to act as common mode chokes.

I have two questions. First, how far apart should the antennas be to prevent interaction?

Second, how many ferrite cores would be required at each antenna to effectively choke off common mode current?

A Each diplexer will introduce about 0.5 dB loss, so having the preamp between the antenna and the first one will significantly reduce the loss of sensitivity due to both the diplexers and the coax loss — a good idea if you will be dealing with marginal signals, or have a long coax run.

The biggest coupled signal will likely be the pickup of the 70 centimeter energy by the 2 meter antenna, since the 2 meter ground plane will act very much like a 3/2 wave monopole on 70 centimeters.

If you look at the "Doctor" column from November 2011 (available on the *QST* web archive), you will see the measured coupling between a pair of 2 meter antennas and a discussion of the possible effects on the non transmitting radio. The key interaction I would be concerned with is that the non transmitting radio could be damaged by excessive RF from the one transmitting.

Based on the data in that column, I would think about 20 feet would be safe, but we don't know for sure how susceptible your radio is. I would also remove power from your 70 centimeter preamp while using 2 meters, since equipment is more likely to be damaged while powered on. Of course, with a dual band radio, you can't power down the part you aren't using.

One thing you could do is to use an RF switch instead of the diplexer at the radio end. They cost about the same as a diplexer and have less insertion loss. Of course, if you want to monitor both bands at once, that won't work.

Regarding the balun, or really choke, a few beads should be enough. Actually, if the coax drops straight down from the ground plane, there shouldn't be much common mode signal, but there will be some, and three should be plenty.

Q Stan, K8MJZ, asks: I've been a ham for over 50 years and have never run across my recent experience. I decided to purchase a new HF Yagi antenna. I assembled it and am very pleased with its gain and SWR. I noticed that all elements are insulated from the boom. I've had Yagis with the driven element isolated from the boom, but not the parasitic elements. What is the advantage of doing this?

A It really doesn't matter at all, in terms of performance, whether the elements are attached to the boom or not — as long as they are attached solidly so they don't become intermittent. The centers of the parasitic elements are at a point of zero voltage, also true of gamma, delta or T matched driven elements, which are often attached to the boom as well. That kind of construction is called "plumber's delight" since it can all (theoretically) be accomplished with plumbing fittings.

The major differences between insulated and boom connected element designs are two:

- The electrical design of an insulated boom configuration is a bit more straightforward because there is very little compensation needed in determining the length of each element. On the other hand, the mechanical design can be trickier because the insulators are often within the mechanical support path.
- There may be a benefit in having grounded elements in case of a lightning strike if the boom is connected to a grounded mast.

Note that neither of these effect how well the Yagi performs, once the design details are worked out.

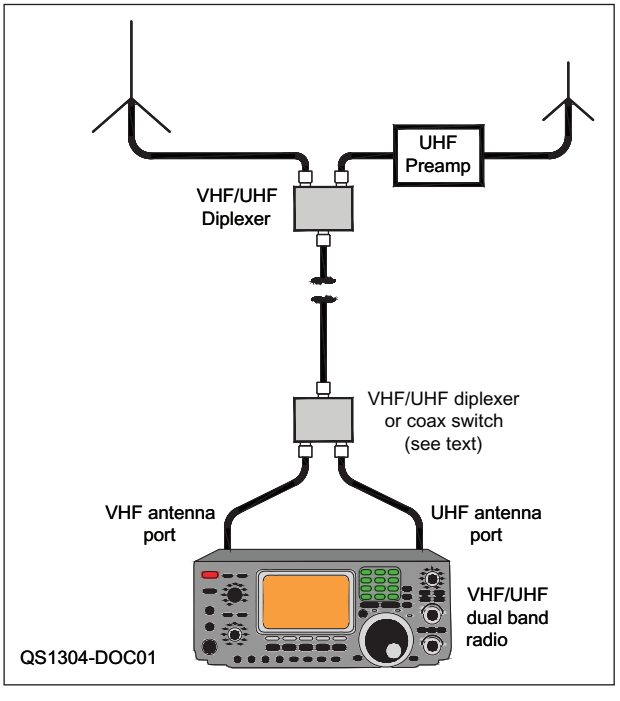


Figure 1 — Configuration of VHF and UHF antennas sharing a common feed line. It is important that they be separated enough so that the receiving equipment is not damaged by coupled RF. As discussed, having a switch instead of a diplexer at the radio end avoids the problem for the transceiver.

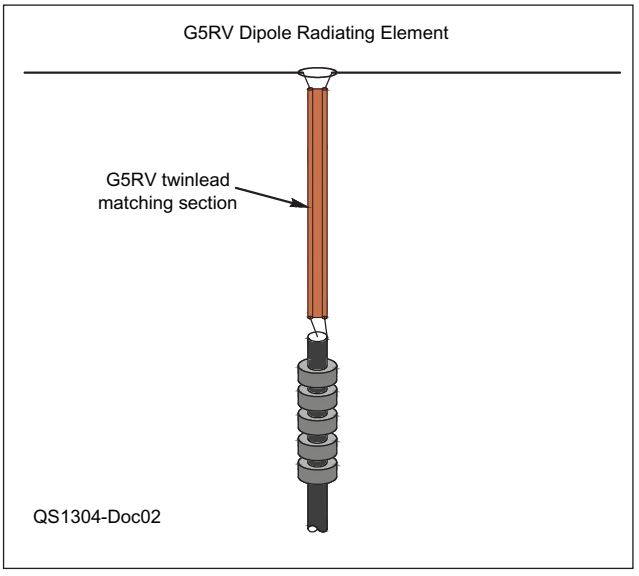


Figure 2 — A G5RV antenna can benefit from a balun or common mode choke at the interface between the coax and the twinlead unless it is desired to feed the antenna as a top loaded vertical on lower frequency bands.

Q Rich, KC8WPW, asks: I was interested in the article on baluns in the January 2013 issue of *QST*. I use a half size G5RV-type multiband dipole on 40 through 10 meters that uses 300 Ω twinlead for the matching section (see Figure 2). I have asked many more experienced hams if I need a balun. I get two answers — yes and no. What is your opinion?

A If used as a G5RV antenna, a common mode choke on the coax at the point it connects to the twinlead matching section is a good idea, just as at the transition between coax and any balanced antenna. It could be multiple ferrite beads (as shown in Figure 2) or a more formal type, but I like the beads in terms of weight, cost and simplicity.

The only downside is if you want to feed the whole system as a top loaded vertical on 160 or 80 meters by tying the feed lines together and feeding the system against ground. In that case, the choke will tend to make the vertical stop at the point of the choke.

So, if you're not going to feed it as a vertical, the choke can only make it better. But if you don't have any problems without it, there's an argument along the lines of "if it ain't broke, don't fix it"!

Q Mark, N2QT, asks: There has been an intense discussion about the spectral purity of signals observed during the recent ARRL RTTY Roundup contest. As you will no doubt remember this is similar to the key click discussions after CW contests of several years ago. The ARRL lab helped in cleaning up the CW key clicks by publicizing the problem and then adding spectral purity and keying waveforms to their equipment reviews. This helped improve the spectral purity of CW signals from new transceivers. Could a similar approach help clean up the RTTY bands as well?

A (Thanks to Senior ARRL Test Engineer Bob Allison, WB1GCM, for his response.) The Lab is working on new tests to measure the waveform shape of internally generated frequency shift keyed (FSK) signals. Many new transceivers have adjustments for shaping the CW waveform to prevent a near instantaneous rise time, which can cause clicks (but not always). While the adjustable shaping of the CW waveform is a great added feature, test data from our technical advisors show FSK signals from a modern transceiver often occur without any type of shaping. It seems logical that updated firmware could provide for FSK shaping and reduce undesired keying sidebands.

Based on my observations, the shaping of FSK waveforms is not the major cause of wide digital signals, although it should be considered. The use of sound card generated audio tones emanating from a PC into the MIC jack of an SSB transmitter makes it easy for many hams to use modes such as RTTY and other digital signaling modes. That process actually generates audio frequency shift keying (AFSK) in which the individual tones into a properly adjusted SSB transmitter should provide a transmitter output that is functionally equivalent to FSK.

Unfortunately, that method of RTTY can be troublesome, since both the sound card and the transceiver's audio chain have to be adjusted carefully particularly in terms of signal level adjustments, to avoid distortion. We have stressed in publications to use minimal automatic level control (ALC). The microphone gain or input gain should be adjusted just high enough to result in the needed power. The ALC indicator should always be showing just the first LED/LCD bar or, if using an analog meter, just slightly higher than zero. ALC circuitry is designed for speech, not audio tones.

Sometimes a poorly designed transmitter audio chain can generate audio harmonics that widen the signal spectrum. Generally, just about all transceivers have low harmonics and do not pose this problem. It's the harmonics generated from sound cards that are being fed into the microphone jack.

One last comment — the use of noise limiters while receiving RTTY signals can cause distortion that will widen out the perceived received signal. You can observe the effect while listening to a strong CW station with the noise limiter on. The signal will have key clicks, but when the noise limiter is turned off, the clicks go away. I would hope that RTTY (and CW) operators are aware of that effect and not blame signals generated in their receiver on the station at the other end.

John, KFØM, wrote in regarding my discussion of combining power amplifier modules for higher output in the March 2013 column. He notes that Tim, KL7WE (SK), wrote an article in The 1988 Central States VHF Society Proceedings describing the use if hybrid rings to split the drive and combine the output of two amplifiers on 70 centimeters. This method has advantages over the use of off the shelf power divider dividers as described in the colum.

The hybrid rings make sure that each amplifier module is 180° out of phase from the other so there is good isolation and little interaction from each other. If one amplifier fails, drive power is divided between the remaining amplifier and the dummy load on the fourth port so that you don't over drive and damage the remaining module.

In a similar manner on the output side, if one amplifier module fails then output power from the remaining module is divided between the antenna and the dummy load and doesn't feed into the failed module causing more damage.

There is a four port quadrature hybrid, usually constructed of strip line that is commonly used on Earth-Moon-Earth communication that also is useful in this application.

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

Steve Ford, WB8IMY, wb8imy@arrl.org

Palm Radio Mini-Paddle

Most modern HF transceivers include CW keyers. All you have to do is plug in a set of paddles and off you go. Thanks to the inventiveness of hams, you have a horde of paddles to choose from. Choices range from gorgeously machined desktop creations to miniscule miniature keys. Since I often like to operate while traveling, I was in the market for a compact set of paddles that could withstand the rigors of suitcases and coat pockets. As I browsed the marketplace, I chanced upon a particularly interesting design: the Palm Radio Mini-Paddle.

What Makes the Mini-Paddle Different

The Palm Radio Company is actually based in Germany. Their Mini-Paddle is a mere 1 × 1 × 3 inches. You can drop it into your pocket and hardly know it is there.

If its small size were its only attribute, there would be little to distinguish the Mini-Paddle at first glance. But what makes the Mini-Paddle different is that the paddles can be quickly retracted and protected within their aluminum enclosure. You simply push gently on the paddles. Within seconds they disappear into the case for safekeeping. When you're ready to operate, press the paddle assembly from the other end to expose the paddles once more.

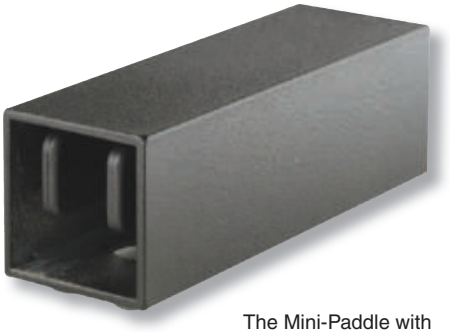
Out of the Case and On the Air

The Mini-Paddle includes rubberized feet to help hold it steady on most surfaces, but the package also includes a detachable base. For an additional $5.50, you can purchase a set of magnets that will secure the base to any metal surface. I purchased the magnets so that I could easily attach the Mini-Paddle to my Yaesu FT-817 transceiver (see Figure 1).

The Mini-Paddle comes with a 3 foot cable that offers a header style connector at one end (to attach to the key) and a ⅛-inch three conductor plug at the opposite end for your transceiver. The cable easily detaches from the key should you need to remove it. All components arrive in a hinged, transparent travel case.

The key offers three adjustment screws for spring tension, contact spacing and paddle stops. The instructions clearly show you how to make the adjustments, but I found the default settings to be completely comfortable. There was little, if any, "play" in the paddles; they felt quite firm between my thumb and index fingers.

My first test occurred at my home station with my Kenwood TS-2000 transceiver. I rested my left hand on the case to keep it from moving and started sending long strings of text with my transceiver's keyer in "practice" mode. I always expect to fumble a bit when using an unfamiliar key, but the smooth response of the Mini-Paddle surprised me. It felt as though I was working a much larger key. Within minutes I was confident enough to take the Mini-Paddle on the air.



The Mini-Paddle with the paddles retracted.

Going portable with the Mini-Paddle was a pleasure. When the magnets came into contact with my FT-817 case, they grabbed and held fast.

Quality Construction

A great deal of thought went into the design of the Palm Radio Mini-Paddle, and it shows. Even though I still haven't bothered to make adjustments, I did take a peek inside the case. The mechanics of the Mini-Paddle are meticulous, right down to the gold-plated contacts. With reasonable care these paddles should last a lifetime.

Manufacturer: Palm Radio, **www.palm-radio.de**. *Sold in the United States by Milestone Technologies, 10691 East Bethany Dr, Suite 800, Aurora, CO 80014; tel 800-238-8205;* **www.mtechnologies.com**. *$104.95.*

Figure 1 — The Mini-Paddle magnetically attached to my FT-817 transceiver.

H. Ward Silver, NØAX, n0ax@arrl.org

Experiment #123

Battery Characteristics — *Part 2*

In last month's column, I explored some of the basic terminology used to describe and compare batteries.[1] Material from *Batteries For a Portable World* clearly showed the differences between the common types of batteries that hams use to supply power for radios and accessories.[2] This month, we'll measure some common batteries by using the *data logging* function of an inexpensive digital multimeter (DMM).

Data Logging Voltmeter

Let's face it, taking regular measurements of a slowly changing parameter is bor-r-r-r-ring. I've done my share of watching a ticking clock and meter or gauge but today there are automated tools to do that job. They never get distracted, forget, or misread the data. The tool we'll use this month is the data logging DMM.

A full fledged data logger, such as a Fluke 2625A Hydra model (**www.fluke.com**) with multiple channels and high speed high accuracy precision measurements, is way beyond the needs of a typical ham. What we need is a single channel voltmeter with an interface to a PC.

The smaller sibling of the 2625A is Fluke's 289 DMM, which has impressive specifications for a voltmeter. Features include a USB interface and companion software so you can store or *log* data on a PC. This is a top-of-the-line DMM with a $600 price tag (the older Fluke 189 sells for a couple hundred less). I love my ultra reliable Fluke DMM but for ham shack data logging, I needed a less expensive solution.

A trip to the Jameco catalog (**www.jameco.com**) turned up the under $100 *house brand* MS8226, Jameco p/n 137462, with decent specs and an RS-232C interface. Searching the usual Internet bargain sites also turned up similar meters, some for as little as $30. You might also get lucky by watching for used meters from Fluke and other high end manufacturers.

The MS8226 has all the usual functions, plus temperature (°C) with an included thermocouple, capacitance (50 nF to 100 µF), frequency (to 5 MHz), duty cycle and true RMS measurements with an unspecified upper frequency limit. The RS-232C interface requires a USB-to-serial converter or running the host software on an older PC with a serial port.

Without making this a product review, I'll just say that the meter works as advertised and includes an easy to understand manual. The software is very basic, but useful as a means of creating time stamped data files of measurements from the voltmeter. Once the data is on the PC, you can export it into spreadsheet format for graphing or analysis as described later.

Figure 1 — The test setup for battery load tests. Loads are constructed from multiple resistors in parallel. The battery is held between two copper pennies in a vise with insulating jaws. Clip leads are used to connect the battery, load and logging DMM.

Winding Your Own Wirewound Resistors

If you don't have a power resistor handy, you can wind your own resistor from common copper wire. The *ARRL Handbook* gives resistance in Ω / 1000 feet. For a 1 Ω resistor, #20 AWG at 10.1 Ω / 1000 feet requires about 100 feet, and #30 AWG at 104 Ω /1000 feet requires about 10 feet. Wind enameled wire on a ceramic, glass or non melting plastic tube. A drop of epoxy will hold the wire in place.

Loading and Testing Batteries

We're going to record battery voltages with a resistive load applied every few seconds over an extended period of time. Comparisons will be made by manually transferring data into a multi-column spreadsheet for graphing. (The spreadsheet used for this column is available on the Hands-On Radio website.)

Remember that batteries store a lot of energy.

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

[2]I. Buchmann, *Batteries In a Portable World*, 2011, pp 34-37. Available from your ARRL dealer or the ARRL Bookstore, ARRL order no. 1156. Telephone 860-594-0355, or toll-free in the US 888-277-5289; **www.arrl.org/shop**; **pubsales@arrl.org**.

When choosing a load, plan for the heat that must be dissipated by using resistors with an adequate power rating and keeping them off of surfaces that can be damaged by elevated temperatures. The maximum power dissipation during a load test will be E^2/R, where E is the battery terminal voltage.

Use load resistances that will draw somewhat more than the Best Discharge Rate current in Table 1 of the previous experiment. Values around 1 Ω will work well for these tests, drawing a maximum current of 1.5 V / 1 Ω = 1.5 A, and dissipating a little over 2 W (1.5 V^2 / 1 Ω = 2.25 W). With this power dissipation a 5 W resistor can get hot enough to burn you or a workbench surface. (Don't use incandescent lamps as loads — their resistance varies with current.)

If you make your own loads, use several resistors in series or parallel to spread out the heat as shown in the photo of my test set in Figure 1. My loads are made out of paralleled 2 W metal oxide resistors. They are soldered between SO-239 UHF coax sockets made into a frame with #6-32 screws and threaded spacers. A banana plug fits snugly into the SO-239 making a fine high current connection or, at lower currents, clip leads can be used. Typical plastic battery holder contacts and wiring may not be heavy enough to handle the higher than normal discharge currents in these tests. I used copper pennies held in an insulating vise as my fixture contact with an extra heavy clip lead to the load.

AA to AAA Comparison

Before beginning, it's worth noting that what is usually referred to as a *battery* is a single package of chemicals more correctly referred to as a *cell.* A set of cells connected together form a *battery*, which derives from the original meaning of a group of identical pieces, such as an artillery battery of several guns. An assembly of six individual lead acid cells, each producing 2 V and connected in series create a vehicle's 12 V starting battery. In the case of single cell batteries, the word *cell* and *battery* are interchangeable.

Let's start by comparing two fresh batteries that use the same chemistry but have different capacities. I used AA and AAA alkaline batteries sold by Costco under their *Kirkland* brand name. Battery capacity is not specified by Costco but third party testing has found the AA cells to supply approximately 2300 mAh and the AAA capacity is probably about half that.

Figure 2 shows the initial portion of a 30 minute battery comparison when connected to a 1 Ω resistor load at room temperature (about 21° C). You can see that the initial terminal voltages are approximately the same and that

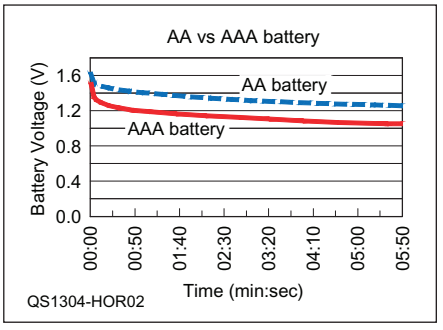


Figure 2 — While AA and AAA alkaline batteries have the same chemistry and open circuit voltage, the capacity of the smaller battery is more quickly depleted under load.

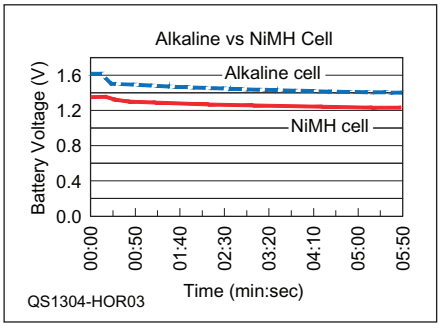


Figure 3 — The alkaline battery has a higher terminal voltage than the NiMH, although both have similar capacities and discharge at about the same rate under load.

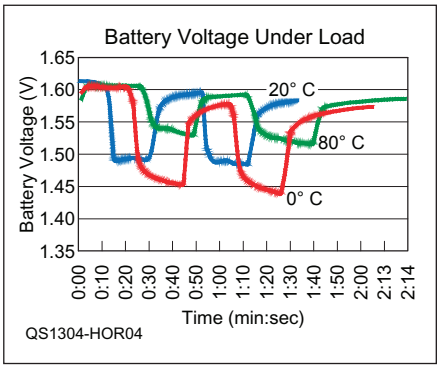


Figure 4 — Low temperatures increase a battery's internal resistance and voltage drop under load by slowing the chemical reactions that supply electrons to the external circuit. High temperatures accelerate the chemical reaction and lower internal resistance.

the capacity of the smaller AAA battery is depleted more quickly. At the end of the load test, (not shown in Figure 2)the AA cell terminal voltage recovered to 1.38 V and the AAA cell to 1.22 V.

Alkaline to NiMH Comparison

The open circuit voltage of the fresh rechargeable NiMH AA cell shown in Figure 3 is lower than that of a fresh alkaline cell by about 0.3 V. Both drop about the same amount when connected to a 1 Ω load. That difference narrows to 0.2 V after about 6 minutes. The 0.3 V margin can translate to a lot of extra operating time if alkaline cells are used.

Temperature and Internal Resistance

A battery's temperature affects its internal resistance quite a bit as you can see in Fig-ure 4. The same fresh battery was tested at 0, 20 and 80° C by connecting it to a 1 Ω load for 10 s with a 10 s rest between load periods. The open circuit terminal voltage was approximately the same at all three temperatures, varying only 8 mV from 1.604 to 1.612 V. The cold battery voltage dropped substantially under load — initially about 0.26 V at 1.6 A load, implying an internal resistance, R_{INT} of 0.26 / 1.6 = 0.16 Ω. At room temperature, voltage dropped 0.125 V for R_{INT} = 0.078 Ω. At 80° C (hot enough to burn the experimenter's fingers!) the voltage drop of 0.064 V indicates R_{INT} = 0.04 Ω, a 2:1 variation with temperature. This can be important when trying to get the most performance from a battery over a wide temperature range!

Other Data Logging Tasks

Obviously, data logging can be put to many other uses, such as recording temperature or current consumption. As with the radio astronomy project, logging can record audio (noise levels in that case) as well. A spreadsheet can convert voltages from sensors directly into physical units and combine different data elements to measure differential temperatures, ratios, minimum and maximum values and so forth. Best of all, a data logger can patiently record data to catch a power dropout or intermittent noise that never seems to happen when you're around.

[3]**www.batteryshowdown.com/results-lo.html**

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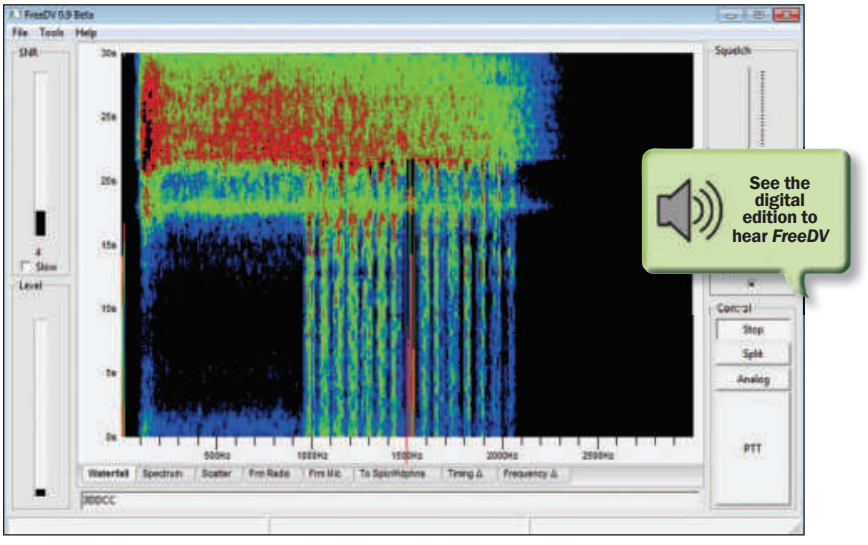
HF Digital Voice with *FreeDV*

If it seems that you're hearing more buzzing signals on 14.236 MHz these days, you are not mistaken. That's the sound of digital voice, often courtesy of the new *FreeDV* software for *Windows* and *Linux*.

Software-based digital voice communication on the HF bands is nothing new. However, earlier software implementations ran into patent infringement issues surrounding the all-important voice *codec*. Without the proper codec, you can't translate analog voice into digital data and still have the resulting signal occupy less than 2.3 kHz.

FreeDV dodges the patent problem by using the new open-source Codec2 developed by David Rowe, VK5DGR. Thanks to David, the ham community now has a codec all its own that can be incorporated into any application. Among the first software tools to incorporate Codec2 is *FreeDV*.



Decoding a digital voice signal on 20 meters with *FreeDV*.

FreeDV was in beta testing when this column was written, but you can download the latest version at **http://freedv.org/tiki-index.php**. If you are a *Windows* user, scroll down the page and look for the link to "*Windows* binary files" in the Download section.

I recently installed *FreeDV* and used it to eavesdrop on the activity. With the audio from my transceiver fed to my computer sound card, I simply nudged the VFO until the red 1500 Hz marker at the bottom of the waterfall display was in the middle of the signal trace. Seconds later I heard clear, noise-free voices in my computer speakers.

The abrupt transition from typical HF noisiness to telephone-quality audio is a shock. At first I wasn't sure what I was hearing. The raucous buzz was still issuing from my radio, but something altogether different was emanating from my desk speakers!

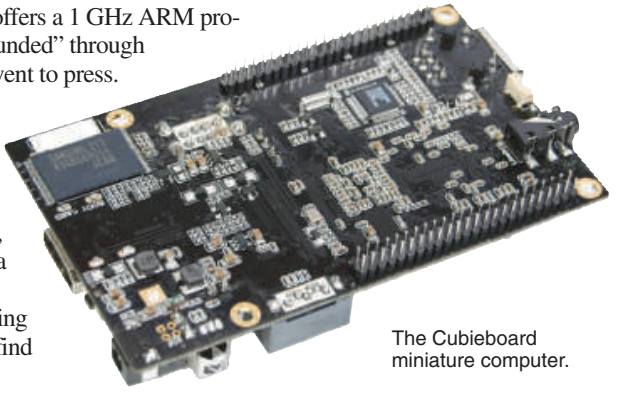
At my station it takes a moderately strong signal (about S5 or greater) for *FreeDV* to decode consistently. If the signal is too weak, or if it is plagued with fading, I hear lots of burbling and screeching — or nothing at all.

To transmit with *FreeDV*, you'll need a separate sound device and a microphone. I've been experimenting with a Plantronics USB headset. The computer treats the headset as a separate audio device, so all you have to do is configure *FreeDV* to use the headset as the "transmit" sound unit.

More Tiny Computers

By now you've probably heard of the remarkable Raspberry Pi miniature computer. Innovative hams are already snapping up these inexpensive powerhouses and putting them to work in some innovative projects.

Two more tiny computers have recently entered the scene. The $49 Cubieboard offers a 1 GHz ARM processor, 1 GB of RAM and much more. It emerged as the result of being "crowdfunded" through Indegogo. In fact, the developers had raised more than $95,000 when this issue went to press. (Crowdfunding is becoming a popular way for small start-up companies to raise cash quickly. Think "venture capital investing," but with participation open to the entire world.) More information is available at **http://cubieboard.org/**.



The Cubieboard miniature computer.

Another entry is the Klastor UG802 computer with a dual-core Cortex A9 1.2 GHz processor, 1 GB of RAM and a Quad-core Mali 400 graphics processor, all running the Android operating system. Unlike the Cubieboard, the UG802 is a consumer device intended to plug into the USB port on an HDTV and allow the owner to view Internet content. However, some insatiably curious hams are hacking these devices for applications well beyond what their designers intended. You'll find UG802s selling for less than $60 on **Amazon.com**.

Paul Wade, W1GHZ, w1ghz@arrl.org

Microwave Construction Practices

Unlike the lower bands, a microwave station requires some knowledge of construction techniques.

Microwave construction is not only fun, but it's within the capabilities of most amateurs. However, getting on the air requires some degree of construction, since you can't buy a ready to go box. At a minimum, a few modules must be connected together with coax and power cables. At the other extreme, the whole station may be homebrewed from scratch or from a kit.

The growth of cell phones and wireless networking has caused a proliferation of microwave integrated circuits offering high performance at low cost. Some of these are also useful for ham applications, allowing microwave construction to evolve from traditional waveguide "plumbing" to printed circuitry requiring surface mount assembly of tiny components. That said, waveguide techniques are still valuable for some components, such as filters and antennas, so proficiency in both types of construction is valuable.

The basic consideration in microwave circuitry is short lead lengths, particularly for ground returns. Current always flows in a complete loop (see Figure 1), with a return path through the "ground." The loop must be much smaller than one wavelength for a circuit to work properly — as the frequency gets higher, dimensions must get smaller. One area that requires particular care to ensure good ground return continuity is the transition from coax cable outside a cabinet to a PC board inside the cabinet.

Metalworking

Waveguide construction requires some basic metalworking skills, which are also useful for assembly and packaging of microwave systems. The minimal tools required are a hacksaw, drills, files and layout tools. While a hand drill can suffice, an inexpensive drill press will make work more precise and safer. DeWALT *Pilot Point* drill bits make clean, accurate holes in metals. Files can be used to make rectangular or odd-shaped holes.

For things like waveguides and antennas that are too large for a soldering iron, a hot air gun does an excellent job. Figure 2 shows the backshort of a waveguide transition being soldered with a hot air gun. You apply a small amount of paste flux (Kester SP-44) to the waveguide end and place a ring of solder along the joint, then apply heat to the whole area until the solder melts and flows into the joint. Figure 3 captures the instant when the solder has just started to melt. When the solder melts completely, it is time to remove the heat.

A torch can also be used for soldering, but tends to cause more oxidation of the metal. If a high-temperature brazed joint is desired, however, a torch is required.

Surface Mount Construction

A microwave printed circuit board (PCB) is typically double sided, with transmission-line circuitry printed on one side and a ground plane on the opposite side. The ground return path is best provided by plated through holes (PTH) connecting the two sides with minimum length. Surface mount components — integrated circuits, chip capacitors and chip resistors — are soldered directly to printed pads and transmission lines, as well as to ground pads with embedded PTH.

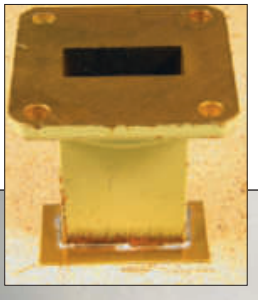


Figure 3 — The solder on the right side is starting to melt, but solder on left has not melted and is still solid wire.

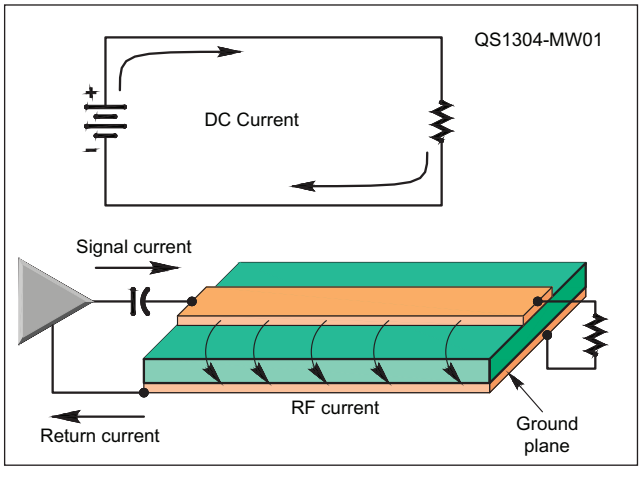


Figure 1 — Current must always flow in a complete loop that brings it back to the battery.

Figure 2 — A heat gun can be used to solder larger assemblies.

I do this soldering by hand, since I am usually experimenting and building up a circuit incrementally, testing each section as it is assembled. A small temperature controlled soldering iron is required, as well as fine tin-lead eutectic (63-37) solder. I prefer a low-residue solder like Kester 245 or Multicore X39B. I solder a simple chip component as shown in Figure 4 by holding it in position with tweezers (I like Swiss pattern #7 curved tweezers), tacking one end down with a bit of solder, then I solder the other end. Some hams prefer to hold components in place with a temporary adhesive like DAP Blue-Stik while soldering rather than holding the part with tweezers.

Finally, I go back and touch up the first end. The solder joint should end up with nice fillets like those in Figure 5. Too much heat can damage the metal contacts on the chip components, so I set the temperature of the soldering iron to about 650ºF — it should be just hot enough to melt solder on the ground pads, which have some heat sinking by the ground plane on the far side. When two or more components share a pad on the PCB, some planning of the assembly order can prevent components from floating during subsequent assembly.

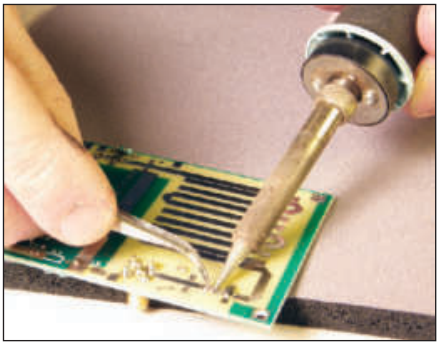


Figure 4 — You can use tweezers to hand solder surface mount components. A mouse pad provides a non-slip base.

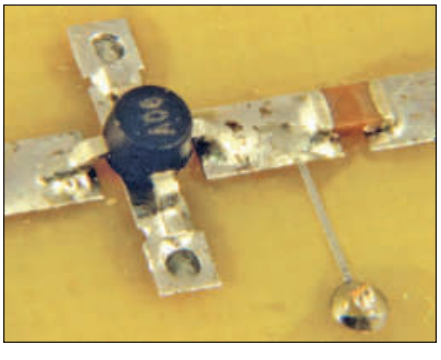


Figure 5 — A good surface mount solder joint should have nice fillets.

Many microwave integrated circuits come in very small packages, with lead pitch as small as 25 mils. It is difficult to solder these leads without shorting, so don't worry about shorts. Just get the leads all soldered in place, then use desoldering braid to suck up the excess solder. This usually results in a nice clean solder joint on each lead with no shorts. Some excess flux will remain, which should be cleaned up. The part in Figure 6 is just 2 mm long with 25 mil lead pitch — like a grain of rice with leads! The leads on the left side of the part have been cleaned up with desoldering braid, while the other side still has excess solder.

Another alternative for surface mount assembly is soldering in a toaster oven. I've never tried it, but there was a good description by James, VE5FP, in the January 2011 issue of *QST*.[1]

The key to working with small items is how well you can see them — as the parts get smaller, it becomes hard to see what you are doing. Good lighting and magnification not only makes things visible, but provides visual feedback that helps to steady your hands. Over the years, I have used extra strong reading glasses, magnifier lamps, a binocular headband magnifier and finally a surplus binocular stereo microscope.

Capacitors

I would like to add a few words about chip capacitors. Ordinary ceramic chip capacitors cost a few cents while microwave chip capacitors are more than a dollar each. All of them have parasitic resistance and inductance, but the microwave versions use lower loss materials, which make a difference at higher microwave frequencies.

I have found that the ordinary ones work fine in non-critical applications like blocking and bypass capacitors, even up to 10 GHz. However, microwave capacitors are preferred for more critical areas, like low noise or power amplifiers. I have also found that, for applications requiring high-Q for low loss, such as the printed comb filter in Figure 7, two ordinary capacitors in parallel, as shown, have lower loss than one expensive microwave capacitor. By paralleling the capacitors, the parasitic resistances are also paralleled, cutting the resistance in half. An additional advantage is that combinations can be chosen to yield non-standard capacitance values. This trick, paralleling microwave capacitors to reduce losses, could also be useful in very demanding applications, like high-power solid-state amplifiers.

[1]J. Koehler, VE5FP, "Reflow Soldering for the Radio Amateur," *QST*, Jan 2011, pp 32-35

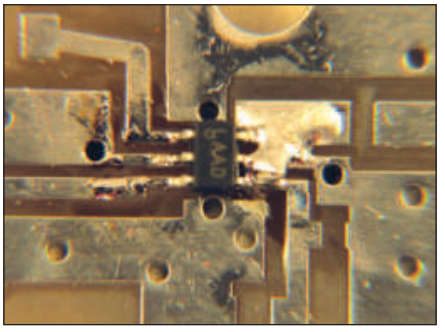


Figure 6 — The left side of this 2 mm long component has been cleaned up with desoldering braid, while the right side still has excess solder.

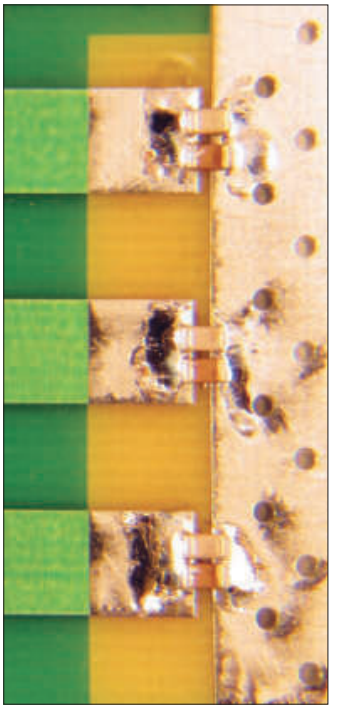


Figure 7 — At each of the three ends of this printed comb-line filter are two chip capacitors in parallel to reduce loss.

Collaboration

A problem we all face when building new microwave equipment is finding a nearby station to contact for testing.

One solution would be to convince a buddy to build a similar system, so that you will both have someone to work. If you have complementary skills, say one with metal and the other with surface mount soldering, you could help each other out. A larger group or club effort would be even better. Someone with experience and test equipment could be the Elmer for the group.

All photos by Paul Wade, W1GHZ.

Steve Sant Andrea, AG1YK, hk@arrl.org

Copper-Clad Pads, Coil Conductor and Tower Power

Johnson Dial Cover Restoration

A couple of years ago, I restored three Johnson Viking Valiant transmitters. In the course of making them "pretty," I needed the rubber gasket for the VFO dial cover, as the old one was dried and cracked. I discovered the perfect product in the large-scale model aircraft section of a hobby store. Fourmost Products' "Cockpit Coaming; large #120" (**www.fourmost.com/index.cfm?fuseaction=detail&id=88321&product=42**) is made to be cockpit trim on large model aircraft, but it fits the VFO/dial cover used on the Ranger, Valiant, Navigator, Pacemaker and others. Be sure to cut it a tiny bit long to compensate for the corners. — *73, Tom Dailey, WØEAJ, 270 S Lafayette St, Denver, CO 80209*, **daileyservices@qwest.net**

Safer and Easier Hazer

I live in an area where "hurricanes happen." I have a Hazer on my tower to save the tower and antenna from wind. The Hazer (**glenmartin.com**) is a triangular frame, about 3 feet tall, that fits around the tower and travels up and down on rollers. It has a lift cable running down the inside of the tower to raise and lower the antenna. When raised into position, it has a spring loaded latch that locks onto a tower rung and is released to lower the antenna. I wanted an easier and safer method for operating my Hazer and devised this technique.

I installed a post about 15 feet away from the antenna. The post is composed of two coaxial pipes, a 1½ inch OD pipe with a 1¼ inch OD inner pipe driven 10 feet into the ground. I installed an inexpensive all terrain vehicle winch at the top of the post with a watertight electrical box to hold the winch controller and pendant when not in use (see Figure 1). I threaded two brass ¼-20 screws through the bottom of the box. Inside, these connect to the winch controller (see Figure 2). I attach jumper cables from my car battery to the exterior ends of the brass screws to power the winch.

Next, I attached a pulley to the bottom of the tower (see Figure 3) away from the face with the Hazer latch and another at the bottom of the winch post. The lift cable runs about 2 inches above the grass when tight. The sideways force on the winch support post and tower leg is right at the ground level.

The cable is long enough so that, when the Hazer is on the ground for a storm, the cable runs from the Hazer to a pulley at the top of the tower. It does a 180° turn and then runs down the inside of the tower to a pulley at the bottom. At this bottom pulley it does a 90° turn and exits horizontally to the pulley at the bottom of the winch support pipes. From there it runs up the pipe to the winch.

To remove any tripping hazard when not in use, I put the cable into "clothesline mode" by loosening the winch cable enough to pull it up above head height where it is taped to the tower (see Figure 4). It is then wound around the winch at the post end (see Figure 5). This keeps the wire out of the way.

To raise and lower the antenna, first, with the Hazer resting on its latch, the cable is brought

Figure 1 — The winch and control box mounted on the post about 15 feet from the tower. The steel cable runs down to a pulley at the base of the post. [Pat Hamel, W5THT, photo]

Figure 2 — The interior of the watertight box showing the winch control unit and pendant in their storage locations. At the bottom are the two brass screws used as 12 V connection points. [Pat Hamel, W5THT, photo]

Figure 3 — This pulley added to the bottom of the tower redirects the cable toward the post mounted winch. In this view the cable is not in use, runs out of the tower and turns upward and out of the way. [Pat Hamel, W5THT, photo]

Figure 4 —The cable, in "clothesline mode," is taped to the tower about 6 feet up. [Pat Hamel, W5THT, photo]

Figure 5 — In "clothesline mode" the cable runs from its taped point on the tower, over the top of the winch and down to the post pulley. This keeps the cable well above ground when not in use. [Pat Hamel, W5THT, photo]

down to the pulley level and the slack is taken out. Once the cable is under tension, the Hazer can be lowered.

Now I can raise and lower the antenna quickly and safely, by myself, without aching shoulder muscles. — *73, Pat Hamel, W5THT, 1157 E Old Pass Rd, Long Beach, MS 39560*, **w5tht@arrl.net**

Cutting Circular Pads

While visiting a local Harbor Freight Tools Store (**www.harborfreight.com**) I found a small rotary cutter that I thought might be useful for producing circular pads on copper clad boards. I picked one up and was very pleased with the results. Isolated pads, cut into printed circuit board material, provide a quick way to produce circuit boards suitable for projects of small to medium complexity. With this technique the board develops along with the project. It produces boards similar to those using "Manhattan-style," "dead-bug" or "ugly" construction. In some cases, this method can be used to modify existing printed circuit boards to handle a few extra components. The only requirement is that the existing board has sufficient copper area to accommodate the new pads. Pads can usually be added without removing the PC board from its mounts.

The tool is an electric drill attachment called a "Rotary Spot Weld Cutter," (see Figure 6). I purchased it from Harbor Freight, item # 95343. Its intended purpose is to remove spot welds from sheet metal. When used to make isolated pads on copper clad material, it produces a pad approximately 8 millimeters in diameter with a 1 millimeter wide gap around each pad (see Figure 7).

Figure 6 — The Rotary Spot Weld Cutter is an effective tool for creating connection points on a copper-clad board. [Fred Franke, WB2NFO, photo]

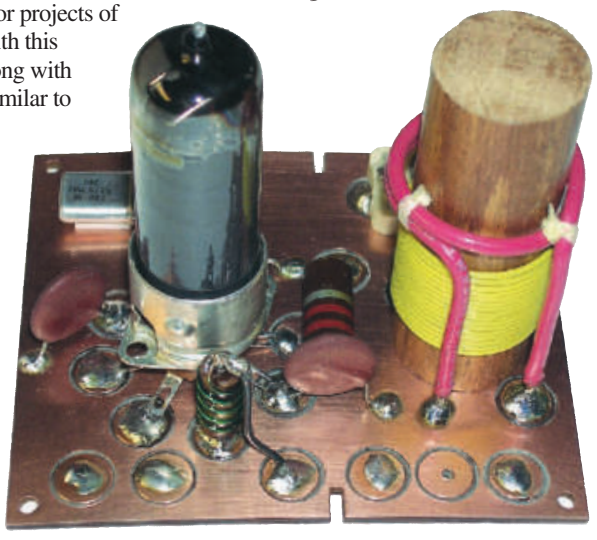


Figure 7 — The cutter makes 8 millimeter diameter connection "pads" in copper-clad boards allowing for quick and easy circuit construction. [Fred Franke, WB2NFO, photo]

If used in a drill press, the depth of the cut will be uniform all around the circumference of the pad, but perfectly good pads can be produced using a handheld electric drill. Just use a light touch so you don't cut completely through the board. The tool has a spring loaded center punch that keeps the cutter from wandering from its intended position. Since the cutter is designed to cut into steel it should be able to produce a great many pads in copper before becoming dull. If the teeth eventually do wear down, the cutter head is double sided and can be flipped 180° introducing a new set of teeth.

The tool costs $5, but Harbor Freight usually has "20% off" coupons and catalog specials so you probably will pay even less. Despite not having the best manual dexterity, I have had excellent success producing and modifying several circuit boards using just this tool and a ⅜ inch electric drill. — *73, Fred Franke, WB2NFO, 26 Dogwood Rd, Kings Park, NY 11754*, **ffranke@suffolk.lib.ny.us**

Coil Wire Supplier

I was never proficient at winding coils, but I thought I could wind one coil. I have plenty of wire and coil forms from 2 inch diameter and up, so I ordered a kit I'd had my eye on that only required winding one coil.

When it arrived, the wire was not included but the coil form was. When I looked at it I was stunned! I had forgotten that I was no longer back in the old tube days when coils were *coils*.

The form looked like a small black rubber grommet. The instructions said to put 24 turns of wire on it. My wire wouldn't even make two turns before completely filling the hole. Rereading the instructions, I discovered that this form is called a ferrite core and the wire required is 28 gauge magnet wire. What is magnet wire? Time for an Internet search!

After a little research I found that magnet wire is nothing more than enameled wire. Plain old copper wire with a coating of enamel, which is very hard and will withstand a lot of abuse. The next question was where to get this baby-sized wire? Rolls were available online but I only need a piece about 2 feet long.

One day, I went into a craft store for another item. The store was crowded and, as I maneuvered around the other shoppers, I found myself in the bead aisle. There, hanging on the wall, were small rolls of wire in a variety of gauges and colors. They called it "beading wire." It was available in 28 gauge. Just what I needed! I did wonder if this was really copper wire with enameled coating? For a few dollars I bought the smallest roll, which contained 72 feet. Removing it from the package, I scraped off the enamel and sure enough,

it looked like copper wire. I looked up the resistance per foot for 28 gauge wire and multiplied it by 72 feet. An ohmmeter measurement settled the question.

So, if you need short lengths of magnet wire, stop by your local craft store and pay a visit to the bead aisle. Be careful though, some beading "wire" might be steel or other light metals, or even colored string.

Now I have to wind that confounded coil! — *73, Wayne Smith, WA4WZP, 224 Saint John's St, Arden, NC 28704*, **myrepwaynesmith@gmail.com**

Quick Disconnects for Window Line

Having used window line for feeding my horizontal loop antennas for over 20 years, I found that my rapid disconnects outside are great for reducing the chance of damage from lightning strikes. I realized that, for experimenting with antennas, feed lines, tuners and RF ammeters, rapid disconnects inside would save time, frustration and generally make life easier. Using screw terminals to connect my 300 Ω window line to my Drake MN-2700 tuners works until I want to disconnect/reconnect it. Dropped screws and lock washers only serve as an annoyance. My MFJ balanced line RF ammeter does use banana style jacks but not with banana plug spacing; a dual banana plug saves stress, flexing and breakage of the wires as opposed to individual banana plugs on each conductor. What was I to do?

Figure 8 — Here are the two window line adapters, one for an MN-2700 tuner and the other for an MFJ RF ammeter. [Evan Rolek, K9SQG, photo]

Figure 9 — Here is the adapter installed on the RF ammeter. [Evan Rolek, K9SQG, photo]

After ruling out ideas like drilling holes and reconfiguring hardware, I decided to make some adaptors. With some offset brackets used to mount PC boards and banana socket spacer plates, I constructed the two types of adaptors shown in Figure 8. The one with the yellow banana jacks is for my MN-2700 tuners that have screw terminals. The other adaptor is for my MFJ RF ammeter since its connectors don't have banana plug spacing (see Figure 9). Not high tech, but the convenience is helpful whenever I reconfigure things for experimentation purposes. I'm sure readers can greatly improve upon my initial design. Who says window line is hard to deal with? — *73, Evan Rolek, K9SQG, 1295 Oakleaf Dr, Beavercreek, OH 45434*, **k9sqg@arrl.net**

Storing Crystals

If you're a vintage radio enthusiast like me, you probably have a large collection of crystals in various sizes piled on your operating desk. Organizing and storing them for easy access can be a problem. One solution I've found, especially for the larger FT-243 cases, is a large pill holder with separate compartments intended to hold 7 days of medicine. The larger FT-243 cases fit perfectly into the individual compartments. Each compartment pops open with a touch and closes securely to keep out dust and moisture. The pill holder I used is sold by pharmacies under the trade name "Push Button Pill Reminder 7-Day 2XL." Smaller pill holders are also readily available that can be used to store crystals in the HC6U holders typically used in Drake and Collins equipment. — *73, Robert Logan, NZ5A, 8712 Lone Tree Dr, Manor, TX 78653*, **bob.logan47@yahoo.com**

All Electric Tower

Recently, at a US government auction of surplus equipment, I purchased an interesting device developed by the Defense Department to help improve communications with troops in the field.

Once I got it home and unpacked, I realized that it was a revolutionary new way to raise antennas. This device didn't require towers, masts or guying of any kind.

It consists of a large metal plate about 20 square feet in size. In the center is a 7 foot cylindrical column made of some type of plastic. At the top of the pipe is an aluminum sphere 24 inches in diameter. There is also a control box supplied.

I set the equipment up as indicated in the manual and placed my tribander on top of the sphere. Activating the unit produced a slight crackling sound. I increased the height control from 0 feet and watched in amazement as my beam slowly rose into the air. As I increased the voltage, the beam continued to rise achieving 65 feet in less than a minute.

The unit operates by generating a high voltage electrostatic field. This field, in turn, generates a like polarity field around the antenna. Since like poles repel, the antenna is forced upward away from the base.

The device does have a few flaws. To achieve a height of 65 feet requires a 200,000,000,000 V, which produces a rather loud continuous sound of lightning striking all about the neighborhood. Additionally, there is a safety concern that I should mention. My spouse, on hearing the noise, walked out onto the patio to investigate. Unfortunately, she was wearing a pair of jeans that were decorated with some fancy embroidery made with metalized thread. The fire department needed their big ladder to get her out of the oak tree. — *HI, Steve Sant Andrea, AG1YK, Dog House Under the Oak Tree, Woodbury, CT 06798*, **ag1yk@arrl.net**

"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.

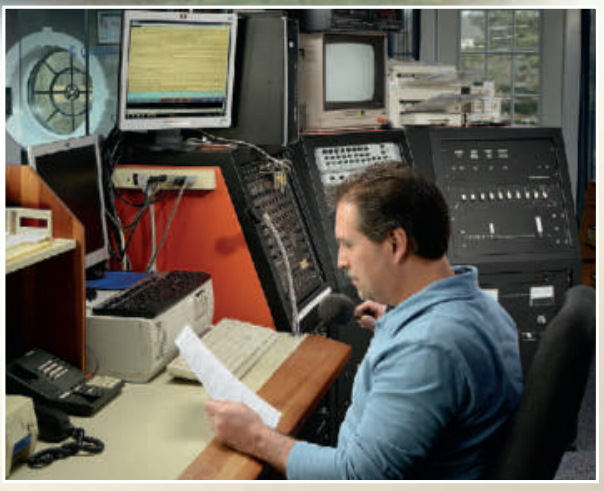
QST invites you to share your hints with fellow hams. Send them to "Attn: Hints and Kinks" at ARRL Headquarters, 225 Main St, Newington, CT 06111, or via e-mail to **hk@arrl.org**. Please include your name, call sign, complete mailing address, daytime telephone number and e-mail address on all correspondence.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

75 Years of W1AW

The world's most famous Amateur Radio station turns 75 in September. Here's a tour of the station in photos, plus information on how you can celebrate this milestone.

Photo stories by Joe Carcia, NJ1Q
W1AW Station Manager

Photos by RJS Photography



The main operating console houses the two computers used to generate the Morse code keying signals as well as the digital tones for all the station's Morse code, voice and digital transmissions. The racks to the right of W1AW Station Manager Joe Carcia, NJ1Q, control the power, keying and audio sources used by the broadcast equipment. Here, Joe is reading the nightly voice bulletin.

A quintessential piece of W1AW history, Hiram Percy Maxim's rotary spark gap transmitter — Old Betsy — sits proudly in the station's foyer. Although she is currently silent, plans are in the works to have her functional again for demonstrations, just in time for the ARRL's Centennial Celebration in 2014.

There are a number of radios available for visitors to use when operating from W1AW. Here in Studio One, ARRL Emergency Preparedness Manager Mike Corey, KI1U, makes a few QSOs.

W1AW's primary mission is the transmission of Morse code practice and bulletins. The bulletins are sent using Morse code, voice and digital modes. The equipment is mostly amateur grade equipment, with two Harris Corporation amplifiers still in service. A bank of seven transceivers — six ICOM IC-756ProII series and one Kenwood TS-590 — along with Ameritron, ICOM and Acom amplifiers accomplish this mission. The patch panel alongside the equipment is used to connect 17 various antennas to either the broadcast equipment or the visiting operator's transceivers.

Planning Your Visit to W1AW

September 2, 2013 marks W1AW's 75th anniversary. September 2 is also the birthdate of ARRL Founder Hiram Percy Maxim, so there are two reasons to celebrate! Licensed Amateur Radio operators are welcome to operate W1AW; here are some details to help you begin planning your visit. The station is open daily for visitor operations from 10 AM to 12 PM and 1 PM to 3:45 PM. Please be sure to bring with you either your original Amateur Radio license or a photocopy. Whether you're a Novice or an Amateur Extra, have a flair for Morse code or voice, like to dabble with BPSK31 or EchoLink, W1AW can provide a fun operating experience. After all, when operating as W1AW, you create the pileup! To make your operating experience easier, all logging is done by computer. Just enter your call sign and true signal report — the rest is done for you. You don't even need to worry about making out the QSL cards — we do that part. Just come by the station, tell us the band and mode you want to operate and we'll set up a radio for you.

Although a bit cramped, Studio Two offers a variety of capabilities. W1AW's Davis Weather System, APRS and WL2K 2 meter system are in full operation here. Operating via amateur satellite is accomplished with the ICOM IC-9100 and Yaesu G-5500 Az/El satellite antenna system. For those visitors wanting a taste of what software defined radio (SDR) is like, the FlexRadio FLEX-5000 will fit the bill.

This roll-top desk was once owned by Hiram Percy Maxim. Purportedly, Maxim gave this desk to some close friends, who as time went on, passed it down to other family members. In 2008 the desk was donated back to ARRL. Since it was Hiram's desk, what better place to have it on display than at W1AW!

Visitor Operator Studio Three is quite popular when it comes to visitor photographs, undoubtedly due to the iconic window in the background. When not being used for pictures, in this studio visitors can also avail themselves of the Yaesu and Kenwood radios when operating as W1AW.

W1AW engages in building and repairing as well! The station's workshop contains most of the necessary tools and components to accomplish these activities. W1AW station operator Scott Gee, WB9RRU, is tackling a relay board that will be used in an antenna switching project.

This plaque graces the wall leading up to the station's conference room. The "Maxim Memorial Tablet" was unveiled at the opening ceremonies of the dedication of station W1AW on September 2, 1938 by the ARRL's then-President Eugene C. Woodruff, W8CMP.

This operating position is located near the front of the station. It allows for D-STAR, WL2K and MARS activity. (ARRL/W1AW holds MARS callsign AAN1ARL.) In addition, visitors wishing to use EchoLink can do so from this spot. Normally, operation of the W1AW EchoLink Conference Server — W1AWBDCT — is performed here.

W1AW's conference room is normally used by ARRL staff to conduct meetings and hold classes. ARRL Education and Technology Program Instructor Nathan McCray, K9CPO, is seen here conducting a Morse code class for his fellow ARRL staffers.

W1AW Challenge Coin

This year, ARRL and the Amateur Radio community celebrate the 75th anniversary of W1AW, The Hiram Percy Maxim Memorial Station. ARRL has introduced a Challenge Coin to help commemorate this milestone. The die-struck, 1½ inch brass coin depicts the front of W1AW on one side in color fill. Around the perimeter are the words MAXIM MEMORIAL STATION and W1AW – ESTABLISHED 1938. The other side of the coin features the ARRL diamond logo against a hemisphere of the world. Around the perimeter are the words THE AMERICAN RADIO RELAY LEAGUE and AMATEUR RADIO SERVICE. The coin is struck with the year of issue, 2013. Five diamond shapes on the coin's head signify the five ARRL pillars: public service, advocacy, education, technology and membership.

Show off your support for 75 years of W1AW with a commemorative Challenge Coin, available for purchase from the ARRL Store (ARRL Order No. 3895), retail $9.95. Telephone 860-594-0355 or toll-free in the US 888-277-5289; **www.arrl.org/shop; pubsales@arrl.org**.

Marooned in Paradise

A stormy activation of Palmerston Atoll.

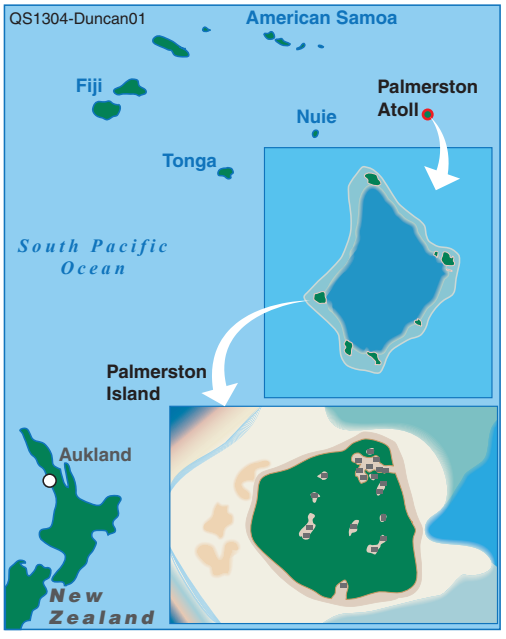


Figure 1 — Palmerston Atoll

Andrew Duncan, E51AND/AB7FS, and Kathy Cheval, ZK1SCH/KB7SCH

It was to be the adventure of a lifetime when in mid-August 2012 my wife Kathy and I set out as charter passengers on a small yacht, SV *Symbiosis*, sailing from Rarotonga (OC-013) to Palmerston Atoll (OC-124). The plan was to sail along with skipper Andre for 2 days to Palmerston — 270 nautical miles to the northwest — stay overnight and leave the next day to return to Rarotonga in time to celebrate our 20th wedding anniversary. I never thought ham radio would play a big part in our trip.

After 2 days of uneventful sailing over calm seas we landed on Palmerston Island, one of several islands that make up Palmerston Atoll (see Figure 1). We spent the night there, an idyllic tropical paradise of white coral sand and whispering palms, and set out to return to Rarotonga the next morning (see Figures 2 and 3). We had a calm first day at sea but as darkness set in, a storm blew up. The winds howled in the rigging and drove the seas to a white, foaming, thundering frenzy, thus beginning our big adventure!

The problems started with a small tear in the Genoa (front sail), which, within half an hour, was completely in tatters. At this point the yacht had made little headway, although seas exceeding 15 feet kept things exciting, to say the least! Skipper Andre jury-rigged a small storm jib (front sail), which provided some forward motion and better steering. We spent the entire night in furious seas with winds gusting over 50 knots. In the heaving, open cockpit and drenched in salt spray, Andre and I manned the helm alternating in grueling hour long shifts through the night.

Just before dawn we were 50 miles southwest of Palmerston headed for endless empty ocean and 10 nautical miles farther away from Rarotonga. Kathy and I staged a "mini mutiny" and convinced the skipper to return to Palmerston rather than fight the wind for 280 nautical miles back to Rarotonga. When we finally arrived back at Palmerston Island, besides the tattered Genoa, the vessel had a broken propeller, a failed GPS navigation system and a ruptured water tank. Our closest call, however, came when we were unfurling the foresail: The forestay, which is the primary support for the front of the mast, broke. Had this happened in the storm, the mast would likely have collapsed and the ship lost with all hands.

Our voyage was supposed to be a short and leisurely trip; now we were marooned on Palmerston Island. We would be stuck there until another ship came to the island — and that could be as long as 3 or 4 months.

Sojourn in Paradise

Palmerston Island is a typical tropical paradise — a brilliant blue lagoon and pristine white sand beaches encircling a tiny coral sand islet covered by coconut palms, pandanus [a palm-like tree — *Ed.*] and huge mahogany trees (see Figure 4). It is about 500 yards in diameter and the highest spot is approximately 9 feet above sea level.

William Marsters settled Palmerston in the mid 1800s and the current population of 66 are his descendants. English with a Leicestershire accent is spoken peppered

Figure 2 — Andy at the helm of SV *Symbiosis*.

Figure 3 — Kathy taking her turn at the helm.

with a little Cook Island Maori.

There are no shops or stores on the island. Anything that is not harvested from the land, lagoon or ocean comes in by ship on an infrequent basis.

The basic foods are parrot fish or other small reef fish from the lagoon, sometimes supplemented by wahoo and tuna, along with imported rice. The fish may be cooked but are often eaten raw. On Sundays and when there are guests, chicken or pork are added from island raised animals or imported foodstuffs. You haven't *really* eaten until you've been served a meal of pig's head baked in an umu, an open-air cooking pit (see Figure 5).

The island has electrical power provided by a small diesel generator from 6 AM to noon and 6 PM to midnight (assuming it is working). Rainwater collected in tanks is used for drinking and bathing. Amazingly, Palmerston has solar powered telephone service. Internet service at sub dial-up speeds is available only within 15 feet of the telecom shack (see Figure 6); mobile phone service is available within 100-200 feet of the shack. Phone charges are prohibitive for calls outside the Cook Islands.

Palmerston is a stopping point for yachters sailing from Europe or the US to New Zealand. A Dutch couple was leaving for Pago Pago so we arranged passage for Kathy on the one berth they had available. Once she arrived in Pago Pago she hopped a Hawaiian Airlines flight to Honolulu, then on to Portland and home. I stayed on Palmerston and planned to return to Rarotonga on the next ship — whenever that would be.

On the island I was graciously hosted by Eddie and Shirley Marsters and the extended family group of "Mama" Tuaine Marsters, and I volunteered as a teacher at the Palmerston Lucky School, a small school catering to 28 children.

Atoll on the Air

So how does ham radio figure into this picture? Initially our ship was to be equipped with a radio ground system so we had taken along a Snowdonia Radio Company X80 antenna, a Yaesu FT-857D transceiver and about 25 feet of coax. When the charter was transferred to a small 39 foot yacht, battery and grounding problems scuttled any attempt to get the radio working and the storm was the final straw. When we came ashore at Palmerston, however, the radio equipment came with us.

I powered the radio with an old deep cycle marine battery on a solar charger, which provided power for the small electric pump that brought water from the tanks to the taps. The antenna, a 17 foot vertical with a 9:1 unun, was bolted to a piece of steel rod pushed into the sand. There were no ground radials — where would I get the wire? For CW, I used a Kent Straight Key that I had taken along to work the Straight Key Century Club (SKCC) folks and for a logbook I had a school exercise book.

Figure 4 —The tropical island settlement with its palm trees and white beach.

Initially the station was set up in the open air living room of my quarters but high cable losses reduced the voltage to about 8.5 V, distorting the audio and limiting output to 50 W. Shifting the station to the kitchen shortened the cable and E51AND was on the air with 50-60 W and good audio (see Figure 7).

My first contact was at 0515Z on August 21 with ZL1RD, net control for the ANZA net on 14.183 MHz. E51AND was spotted on

Figure 5 — Sunday lunch — freshly killed pork in the umu. You haven't eaten until you have had freshly roasted pig's head!

the cluster and DX calls rapidly overwhelmed the net so I moved the SSB operation to 14.192 and CW to 14.050.

From Rags to Riches

I'm a confirmed "ragchewer" with no real experience in coping with a pileup. So being at the bottom of one was daunting to say the least! I slowly learned to operate split so that my feeble signal would not be lost in the din and to scribble fast in the log.

How did it feel to be at the DX end of a pileup? Imagine that you are in a football stadium filled with people each shouting out their names at the same time and it is your job to pick out just one of them.

CW was a *real* challenge. I had just gotten back into it after 40 years on sideband. I had joined the SKCC and was copying consistently at about 8 WPM. In spite of the obstacles, I managed to work about one third of the contacts on CW.

Even operating split, several kilohertz of the band was filled with a steady CW tone or SSB roar as hundreds of stations called. Every day I wished they would abide by the DX Code Of Conduct (**dx-code.org**); had they done so I could have worked three to five times as many stations as I did.

For all the frustrations of operating a pileup, there were some rewards. Some stations made an effort to facilitate the contacts. Words of support helped when I was ready to hurl the radio across the room in frustration or when the isolation of the atoll started to overwhelm me. Stateside and Aussie stations facilitated contacts with Kathy, who was operating from our home station in Oregon.

Figure 6 —The solar powered telephone shack provided Internet service within 15 feet and mobile phone service within 100-200 feet.

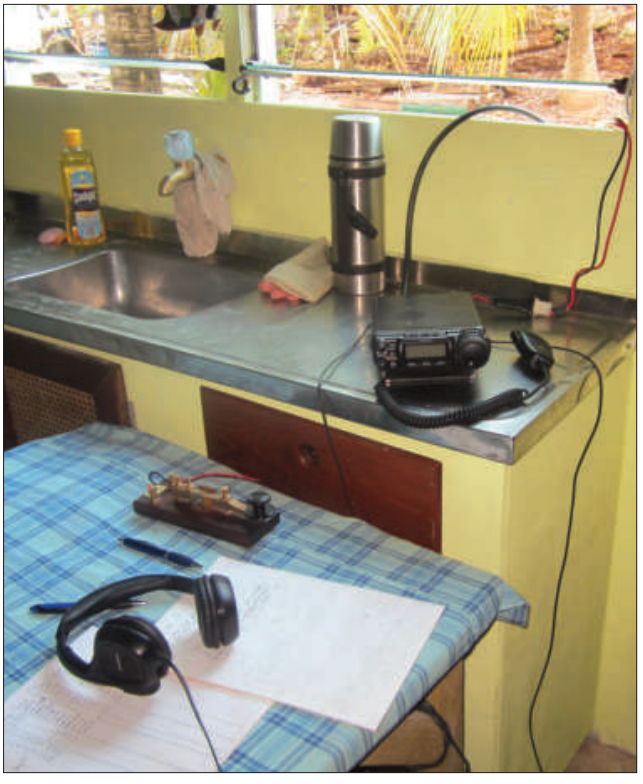


Figure 7 — This is the impromptu ham shack Andy used while "marooned" on Palmerston.

Return to Rarotonga

After just over a month on the island, a small cargo yacht came up from Rarotonga and gave me passage back, ending the impromptu activation of Palmerston Atoll with a final contact with RAØCGY at 0725Z on September 19.

I spent a week in Rarotonga to tidy up immigration paperwork for my extended stay and to say farewell to friends. Then I caught an Air New Zealand flight home to Oregon.

What an incredible time it had been. Aside from that one terrifying night in the storm, I had one amazing experience after another; living a life that one reads about only in stories. We plan to go back to Palmerston to visit the families — and of course we'll take along some radio equipment.

Afterword

Some noteworthy results: only about 30% of the thousand or so contacts had sent QSLs as of November 2012; Japanese and CW stations were the most frequent respondents, with Finland close behind. I confirmed only three contacts with women operators: two on SSB from Australia: Karen, VK2AKB, and Catherine, VK4GH; and one on SSB and CW — Tami, OM5MF, in Slovakia.

All photos by the author.

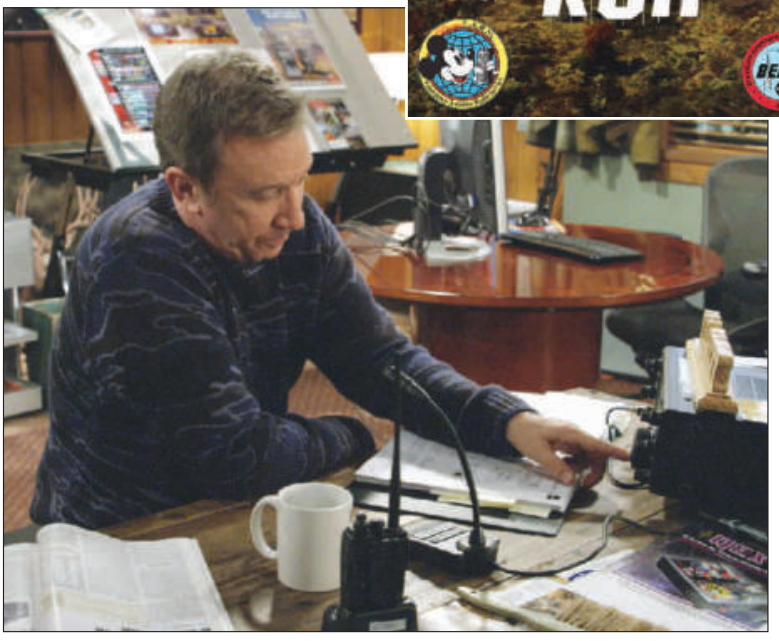
Andy Duncan, E51AND/AB7FS, was first licensed in 1970 in Alberta. In 1987 he moved to Oregon and earned his Amateur Extra class license to become AB7FS. For the last two decades Andy has operated as E51AND from the Cook Islands. Andy is an ARRL® member, a Volunteer Examiner Coordinator and a member of Polk County ARES. Andy's Amateur Radio interests include Search and Rescue, ragchewing and slow speed, straight key CW.

Kathy Cheval, ZK1SCH/KB7SCH, an ARRL member, was born in Hawaii. She holds a PhD in Mathematics Education from Oregon State University. Kathy is currently a mathematics specialist for the Salem Keizer School District. She obtained her ham radio license in 1993. When on the Cook Islands she operates as ZK1SCH.

Andy and Kathy can be reached at 768 Luscombe St, Independence, OR 97351, **kiaorana@minetfiber.com**

A Ham Radio Celebration in Hollywood

Southern California hams take over the lastMANstanding studio for a special event.



Here is Tim Allen in Mike Baxter's, KAØXTT, office operating one of the radios set up on the *Last Man Standing* set. [Photo courtesy ABC] Above is the K6H QSL card sent out to those who contacted the special event station. [Courtesy *Last Man Standing*]

John Amodeo, NN6JA

Let's face it, special radio events are fun. Many days go by when tuning a band from end to end brings only a few routine contacts. On special event days, the bands are crowded with lots of interesting activity.

I've participated in a few special events but never created one. I produce television shows for a living — I currently work on *Last Man Standing* — so I thought, why not try it? I decided to keep it simple — just a half-day event.

Some readers may know that on the ABC Television series *Last Man Standing*, Tim Allen's character, Mike Baxter, is a ham. Because of Mike's fictitious ham station (KAØXTT), we have a great collection of radio equipment on the set. There are a number of hams on the crew so we decided to make KAØXTT operational.

Initially, I thought we might sponsor the event. After carefully considering FCC regulations, however, we realized we couldn't. Remember, we're a TV show and using ham radio to directly promote the show could be viewed as a violation of FCC Regulation 97.113(a)(3). *Last Man Standing* is produced by 20th Century Fox and airs on the ABC Network. Both are commercial entities and licensed broadcasters, which would give the special event a very commercial tinge.

Still, I didn't want the ham community to miss out on a fun experience. I thought maybe the show could simply host the event. I could make our stage available to an organization that wanted to put on a radio event. Such an event would stay within the regulations.

Last season, the PAPA System put on a very successful event by conducting one of its Thursday Night D-STAR networks from our stage. The PAPA System is a sophisticated, multirepeater network of analog, D-STAR, IRLP and EchoLink modes covering most of Southern California. The PAPA organization has many experienced members. I invited the PAPA System owner Cecil Casillas, WD6FZA, and Net Controller Mike Lackie, N6HKH, to create an event that could be based on our stage.

We wanted the event to be national so we contacted Howard Price, KA2QPJ, from the Broadcast Employees Amateur Radio Society (BEARS) in New York (**www.w2abc.org**), which is affiliated with Disney Emergency Amateur Radio Service (DEARS) and Disney Amateur Radio Interconnect (DARI).

The timing was perfect. DARI had just added Los Angeles to their system, which linked the W2ABC repeater in Manhattan to WD4WDW in Orlando and WB6AJE in Los Angeles. John Bush, WB6AJE, operates an awesome repeater on Mount Wilson in the San Fernando Valley. This was a perfect arrangement since our studio is in "The Valley."

The Event

The event would be a collaboration between PAPA, BEARS, DEARS and DARI. The licensed hams who are part of the *Last Man Standing* (*LMS*) crew would host the event but would not operate. Any station that contacted us would get a limited edition QSL card.

The theme of the event would be "Ham Radio Celebrates Hollywood" and we applied for the special event call sign K6H. We would be transmitting from the working set of a TV show on historic Stage 9 at the CBS Studio Center lot in Studio City, California.

Without the cooperation of CBS Studio Center's VP of Operations Brian Lovell and the lot's Supervising Sound Engineer and Frequency Coordinator Tim Holly, N6QJ, the event would not have been possible. Tim is an old friend who helped with every step of the process.

Radio Locations and Equipment

Being a family comedy, the show has no budget for ham radio equipment. Luckily, several equipment manufacturers stepped up and loaned us gear. That's right; the equipment seen on *LMS* is all on loan and has to be returned at the end of the production season.

For the *LMS* special event, we had five stations: two HF, a D-STAR, an IRLP and a UHF, which are equipped as follows:

HF #1 was set up in Mike Baxter's office on the set and consisted of an ICOM IC-7700 transceiver with a Heil PR-781 microphone. The output passed through an I.C.E. BandPasser Filter into a Comet H-422 antenna. *Ham Nation*'s Julian Frost, N3JF, who

This is the K6H special event antenna farm on the roof of Studio 9. [John Amodeo, NN6JA, photo]

is also a PAPA member, brought this radio and stayed for the event.

HF #2 was set up in the "Outdoor Man" set's camera aisle and consisted of an ICOM IC-7600 transceiver with a Heil Finn driving a 10 meter I.C.E. Bandpass filter feeding a Spi-Ro 10 meter wire dipole. This is the actual radio seen in Mike Baxter's office.

The D-STAR radio operated from "The Bullpen" set was an ICOM IC-2820H transceiver using a Comet GP-1 antenna. We also installed multiple Internet connections to operate D-STAR using a DV-Dongle.

The IRLP radio using a Yaesu FT-857D transceiver connected to a Comet GP-1 antenna was on the set of "Ed's Office."

The BEARS UHF radio was a Yaesu FT-817ND transceiver driving a Comet GP-3 antenna.

Over the weeks before the event, the *LMS* hams installed and tested the equipment. The PAPA members spent the day before the event installing and testing their personal gear.

Event Day

On Sunday October 29, the operators took the stage. At 1600 Zulu all four radios started putting out the K6H call and got immediate responses.

It was great fun roaming the stage listening to operators making contacts on all those bands and modes. We also had a number of guests, including Bill Pasternak, WA6ITF, from *Amateur Radio Newsline*, which made for a party atmosphere, like a cross between a Field Day and a micro ham convention.

As the operators made contacts, two of our licensed staff members Nicole, N6NMM, and Billy, KJ6RVA, blogged on our Facebook page. In that way, we could answer questions and help with technical problems. Don Hill, KE6BXT, from the Amateur Television Network streamed live video of the action.

Technical Difficulties

Of course, we had a few problems. We overwhelmed the EchoLink system, but we kept going. Next, Reflector 12C went down so we moved to 31C and kept going. Then, a small storm called Sandy hit the eastern seaboard. We kept going. Considering the complexity of scheduling 20 hams to operate, installing the radios and six antennas, we did well. We owe the success of this event to the hard work put in by the PAPA members and the *LMS* crew.

What We Would Change

Even as we were doing the event, we were thinking up ways to improve it:

- One of our HF stations was dedicated to 10 meters. It would have been far better to have two equal stations capable of working any band at any time.
- The party atmosphere we created made a lot of noise and we really needed headphones for our operators.
- We chose to work with paper logs and we should have been using computers. It would have simplified the QSL card process.
- October 29 was the day of the CQ WW contest. On the positive side, many stations were on the air. On the negative side, too many stations were on the air. Many people had to fight their way through contesters to get to us. If we do another special event, we will pick a date with less competition.
- Lastly — more pizza. Never underestimate how hungry hams get.

The Stats

So how'd we do? We were only on the air for 4 hours but made about 800 contacts. That's more than three contacts per minute. Not too bad. All US states were represented as well as stations from Australia, Canada, The Netherlands and New Zealand.

We made our last contact at 2000 Zulu. It was a lot of work. We made some mistakes but more importantly, we all learned so much. That's the essence of ham radio. Few hobbies teach you as much and yet are so much fun. For a few hours the event brought together operators from all across the country.

Video of the event can be seen at: **www.youtube.com/watch?v=W7CaXZtsdEc**

Hopefully, *LMS* will be renewed for next season. If it is, maybe we'll do another event and get to talk to you. Stay tuned…

Curtain Call

The show owes special thanks to Ray Novak, N9JA, from ICOM, Mick Stwertnik, KB6JVT, from NCG/Comet and Dennis Motschenbacher, K7BV, from Yaesu. We also thank the folks at ABR Industries, Alpha Delta, Array Solutions, **CheapHam.com**, DX Engineering, MFJ, PowerWerx, RadioWavz and RT Systems.

Mike Anderson, KJ6TNN; Karl Cain, KC6B, and Al Karel, KK6AL, operating the analog UHF/IRLP station set up in the office of Ed Alzate (played by Hector Elizondo). [Mike Whatley, WA4D, photo]

John Amodeo, NN6JA, an ARRL® member, has been licensed for 40 years, starting as a Technician Plus in the early 1970s and upgrading to General in the late 1970s. He moved to Los Angeles in the early 1980s where he became KA6MVE. John upgraded to Amateur Extra class in the summer of 2011 and changed his call to NN6JA.

John has worked in the entertainment industry as an editor, director and producer for the past 30 years. He is currently the producer of ABC Television's *Last Man Standing* starring Tim Allen. He has written numerous articles about television and radio technology and presented a forum entitled "Ham Radio and Hollywood" at the 2012 Dayton Hamvention.

John is a member of ARLHS (Amateur Radio Light House Society), QCWA (35965), BEARS, GSBARC (Great South Bay ARC), LIMARC (Long Island Mobile ARC), PAPA System and the Win System. He can be reached at 11684 Ventura Blvd, Suite 810, Studio City, CA 91604, **JAmode.tv@gmail.com**.

Field Day the Solo Way

Roughing it for Field Day can teach some valuable lessons.

Thomas Mills, NU9R

For Field Day 2012, I wanted to do something different: to operate in an unusual location that presented challenging conditions. I've worked Field Day for several local clubs over the years. After only a few, it seemed to become routine. I wondered what it would be like to operate under harsher conditions.

The yellow steed and trusty wagon all ready for a Field Day adventure in the wilderness.

This compact digital station made for an effective Field Day operation.

In 2012, my yellow "steed," a Honda Gold Wing, and I headed to the woods. I loaded my gear into a wagon I'd pull behind me and headed off to a "primitive" campsite near my home in Illinois.

On Friday, "Yellow" and I started out toward the trail. I arrived, hot and sweaty from the summer heat. My joints ached from the jostling of the journey. This was already promising to be a different kind of Field Day!

The campground was primarily intended for equine campers. All but one campsite had lashing posts. I had no such need as my "steed" would not wander. Looking around, I chose a site well away from the others.

My site had no electricity or running water. This was truly roughing it, complete with mosquitoes, the whinnying of horses and the smell of natural fertilizer. I pulled in and set up camp.

Field Day in the Field

In the morning, I arose at first light. After breakfast, I began setting up my station. My equipment consisted of an FT-897D transceiver, laptop computer and SignaLink. Setting up the radio was simple, the antenna, more difficult.

I had my trusty Buddipole antennas. I used one as a 2 meter/70 centimeter J-pole. The other became a 6 meter Yagi. Since there was no cell service I needed some way to stay in touch with my spouse.

The real challenge was setting up the Windom. I found a fairly straight line through the woods that was well over the 135 feet I needed. I always carry two 100 foot lengths of rope. I tied one end of the rope around a rubber mallet and launched it at a well situated branch, which I caught on the first attempt. I hoisted the antenna up, and I repeated the process at the other end.

Dr Murphy Makes a House Call

Despite my planning, something I had eaten for breakfast didn't agree with me. There I was, not well and quite some distance from home. I knew I needed help but with no cell phone service my only hope was…well, ham radio.

There was no answer on the repeater, on 146.52 or any of the other calling frequencies. Finally, I was able to get an e-mail through to my spouse on the Winlink network thanks to Bruce, W5HCS, and his *WINMOR* (Winlink Message Over Radio) station. My spouse braved the wilderness and brought what I needed.

Digital Action

When Field Day began, the pileups were incredible. There was no way I could compete on voice as a 1B 20 W station on battery power. What could I do? I decided on 40 meter digital and found the waterfall full of RTTY. Before long, I was calling DE NU9R QRZ. No hunt and pounce for me! I had plenty of action on one frequency to keep me busy on Saturday.

When I awoke on Sunday, I turned on the rig and found the band alive with activity. The familiar double tracks of RTTY had dissipated but there was plenty of strong PSK-31. A simple CQ CQ CQ DE NU9R and I was back in business.

Overall, I met my goal of operating Field Day *in the field*. I learned a lot about my setup and my capabilities. The most important lessons were to always bring a medical kit and that digital modes work.

When I returned home, the wagon was emptied. "Yellow" got a much deserved bath and now we're ready to ride again!

All photos by the author.

Thomas Mills, NU9R, an ARRL® member, is a retired Air Force Master Sargent with 21 years of work on aircraft avionics. He is currently involved in USAF MARS and his local ARES. His equipment consists of a Kenwood TS-480SAT transceiver for mobile HF. The radio feeds a High Sierra 1800 Pro motorized antenna and a 6 meter monoband. The truck also has a Kenwood TM-D710A transceiver for UHF/VHF operations and APRS. Tom can be reached at 1502 N Gilbert St, Danville, IL 61832, **nu9r@rocketmail.com**

Managing Your Modulation

Whatever mode you favor, overdriving your final causes signal splatter and generates ire among nearby operators.

Steve Sant Andrea, AG1YK

Everything has its limits. Whether you are on a mountain operating a 1 W rig or at a contest station running a 1500 W amplifier, each has its power limits. Trying to push beyond those limits will distort your signal and send it splattering across the band. This is not a way to make friends on the air.

Amplifiers amplify, that is, if you input a 1 W RF signal and the amplifier generates a 2 W signal, the amplifier has doubled your 1 W output power.

"Okay," you say, "how about for a 10 W output? I just need to up the input to 5 W and I'll get 10 W, right?"

Not exactly. An amplifier is designed to accept a certain input power range and amplify it to produce a specified output. The amplifier above is designed to take 1 W of input and produce 2 W of output.

As the input drive power rises above the 1 W level, overdriving of the amplifier occurs, which results in "flat topping," a condition in which the waveform has its peak chopped off (see Figure 1A).

Unfortunately, when flat topping occurs, it seriously distorts the waveform. This, in turn, creates a spray of secondary signals — splatter — all around your main carrier (see Figure 1B).

Messy Modulation

The reasons for splatter are complicated and are detailed in the "Modulation" chapter of *The ARRL Handbook*.[1] The bottom line is that overdriving the final distorts the transmitted signal, generating splatter around your carrier. If the overdrive is bad enough, this splatter can extend for 10s of kilohertz around your signal — "splattering" all over adjacent stations.

To control this unpleasant fact of RF amplifier design, engineers developed automatic level control (ALC) circuits. ALC circuits work by measuring the peak amplitude of the input signal. When that amplitude rises high enough to overdrive the amplifier, the ALC circuit feeds back a dc voltage to one or more previous stages in the amplification chain to reduce the peak amplitude back into the "safe" range.

Whether your rig is a vintage boat anchor or a cutting edge software defined radio (SDR), most employ an ALC circuit. In most implementations, the transmitter's meter can be set to monitor the ALC voltage; in some a lamp or LED flashes when the ALC is activated.

Staying on the Level

Your responsibility is to make sure you operate your transmitter in a clean and splatter-free way. To do this, you need to adjust the sound level used to modulate your transmitter, which brings us to the grueling part of this article, the part where you *read the manual*.

There I've said the "M" word. Now take a deep breath and get hold of yourself — I'll wait…

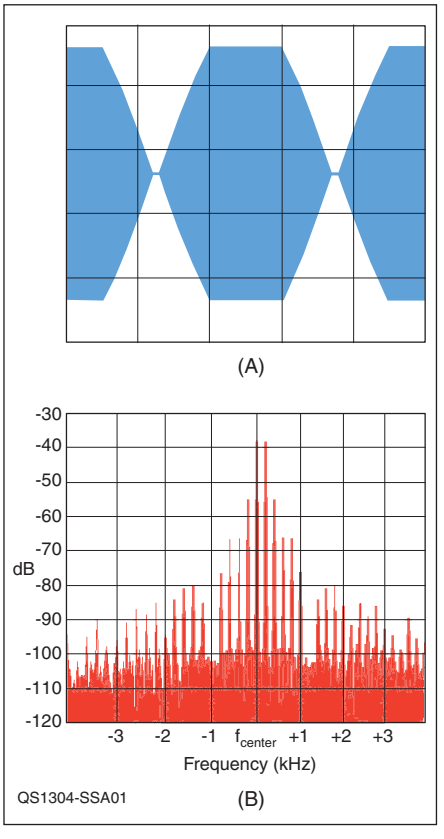


Figure 1 —Diagram A shows the flat topping effect of overdriving the final amplifier. Diagram B is a typical spectrum display of the splatter that results.

There are many different radios in the world and while I can give you a rundown of the process, exactly how to adjust your ALC on your transmitter is something you have to find in your manual.

Before beginning, connect a dummy load and cut your power down to the minimum. Now, check your rig's metering control. On some rigs you select the ALC mode, on others, it activates automatically. The first adjustment should be MICROPHONE GAIN. Most rigs use the meter's ALC indication to adjust the mic gain for the best modulation. Generally, you speak into the microphone while monitoring the ALC level and adjust the mic gain to keep the ALC in the range your manual suggests. Be aware that some rigs use separate MIC GAIN adjustments for FM and AM/SSB.

Watch your posture! Position the mic where it is comfortable to use and speak in your normal tone. Adjust the mic gain to your normal voice level and a comfortable operating position — not the other way around.

If your rig includes a speech processor, it also needs adjusting. Generally you need to adjust the mic gain and also processor input and output levels. If your processor is external, adjust it first (yes, that's another manual to find) and then adjust your mic gain based on the processor's output.

For digital modulation, the adjustment depends on whether you interface your sound card to the MIC input or the accessory input. For the MIC INPUT, set up a dummy message and start sending. Since you have already set up the mic gain for your voice, you don't want to have to readjust it when changing modes, so check the ALC meter reading and adjust your sound card output to keep the ALC in the "green." The accessory input doesn't use the microphone amplifier so the mic gain adjustments shouldn't be affected. Again, check your manual for the specific adjustments. You will probably have to balance your sound card output level with your transmitter's carrier level to keep the ALC happy.

Finally, once you complete these adjustments, it is a good idea to write them down. This goes especially for adjustments to your computer. You never know when the kids will come by and fiddle a little.

Steve Sant Andrea, AG1YK, is an associate editor at *QST*. He can be reached at **ag1yk@arrl.org**.

[1]Available from your ARRL dealer or from the ARRL Store, ARRL order no 4197 or 4050. Telephone toll-free in the US 888-277-5289 or 860-594-0355, fax 860-594-0303; **www.arrl.org/shop**; **pubsales@arrl.org**.

ARRL Board of Directors Convenes in New Orleans for 2013 Annual Meeting

With a new Congress in session, the ARRL Board of Directors adopts revised legislative objectives to protect the Amateur Radio Service.

S. Khrystyne Keane, K1SFA
ARRL News Editor

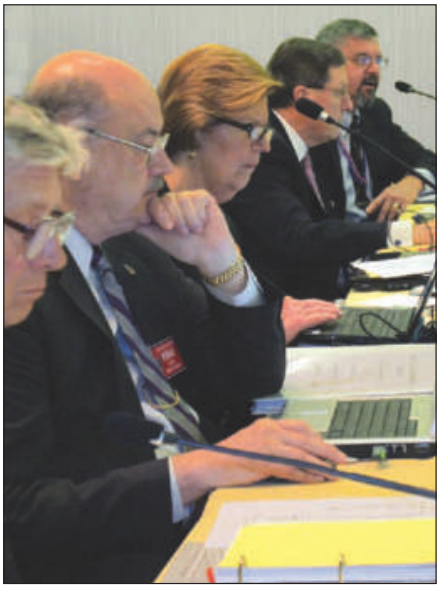
The ARRL Board of Directors held its 2013 Annual Meeting January 18-19, 2013 in New Orleans, Louisiana, under the chairmanship of President Kay Craigie, N3KN. The Board welcomed two newly elected members to the Board family: Hudson Division Director Mike Lisenco, N2YBB, and Northwestern Division Vice Director James Pace, K7CEX; Lisenco and Pace were elected in November 2012. At its meeting, the Board set legislative objectives for the 113th Congress, approved the organization's amended financial plan, elected members to the Executive Committee and ARRL Foundation, bestowed awards and more.

Here are some highlights of the actions taken at the meeting:

Legislative Objectives

The Board set seven legislative objectives for the 113th Congress of the United States:

- To seek legislation instructing the FCC to extend the requirement for "reasonable accommodation" of Amateur Radio station antennas — a requirement that now applies to state and local regulations — to all forms of land use regulation.
- To oppose legislation that would lead to the reallocation of amateur spectrum or to sharing arrangements that reduce the utility of existing allocations.
- To oppose legislation that diminishes the rights of federal licensees in favor of unlicensed emitters or encourages the deployment of spectrum-polluting technologies.
- To seek recognition of the unique resources, capabilities and expertise of the Amateur Radio Service in any legislation that addresses communications issues that are related to emergencies, disasters or homeland security.
- To support the complementary legislative objectives of other radiocommunication services — particularly the public safety and scientific services — that require spectrum access and protection from interference for non-commercial purposes that benefit the public.
- To oppose "distracted driving" legislation that does not clearly exempt two-way mobile radio transmitters or receivers used by FCC-licensed radio amateurs.
- To support legislation authorizing FCC Commissioners to appoint an electrical engineer or computer scientist as an additional



Left to right: ARRL Southwestern Division Director Dick Norton, N6AA; ARRL West Gulf Division Director David Woolweaver, K5RAV; ARRL Chief Development Officer Mary Hobart, K1MMH; ARRL Chief Financial Officer Barry Shelley, N1VXY, and ARRL General Counsel Chris Imlay, W3KD. Imlay updated the Board on the state of Amateur Radio enforcement and the visibility of the FCC's enforcement efforts.

ARRL First Vice President Rick Roderick, K5UR, and ARRL President Kay Craigie, N3KN, prepare to start the 2013 Annual Meeting of the ARRL Board of Directors.

Newly elected Hudson Division Director Mike Lisenco, N2YBB (left) and Midwest Division Director Cliff Ahrens, KØCA.

ARRL Great Lakes Division Director Jim Weaver, K8JE, and ARRL Delta Division Director David Norris, K5UZ, enjoy a brief break during the meeting.

ARRL Rocky Mountain Division Director Brian Mileshosky, N5ZGT, and ARRL Southeastern Division Director Greg Sarratt, W4OZK. Honorary Vice President Frank Butler, W4RH (back) also attended the meeting.

ARRL Southwestern Division Vice Director Marty Woll, N6VI, and ARRL West Gulf Division Vice Director John Robert Stratton, N5AUS — discuss antenna zoning restrictions during a break.

member of their staffs to ensure that Commissioners have adequate access to technical expertise when making decisions.

Other Actions

2013 Plan: The Board ratified the 2013-2014 budget plan, as approved by the Administration & Finance Committee. According to ARRL Chief Financial Officer Barry Shelley, N1VXY, income from operations was positive in 2012, with membership dues, program fees and advertising revenues producing strong results, while expenses in total for the organization were under budget. ARRL Treasurer Rick Niswander, K7GM, reported that the value of the ARRL's investment portfolio stood at $17.7 million at the end of 2012.

Logbook of The World ad hoc Committee: The Board voted to create the Logbook of The World (LoTW) ad hoc Committee. This committee has been tasked with reviewing policies and practices associated with how LoTW functions today including the fixed and variable costs, issues concerning user interface and usability, and economic value of an LoTW award point or credit. The committee will provide the ARRL Board with a progress report and preliminary recommendations at the 2013 Second Meeting in July.

Symbol Rate Rule Modernization Committee ad hoc Committee: Since 1989, when the FCC's rules concerning symbol rate limitations were codified, modern digital communications techniques have rendered these limitations obsolete. As such, the Board voted to create the Symbol Rate Rule Modernization ad hoc Committee. This committee has been tasked with evaluating potential modifications to the Amateur Service rules to permit and facilitate the use and development of high symbol rate digital communications techniques. The committee will recommend modifications to the ARRL Board at the 2013 Second Meeting in July.

ARRL Foundation: ARRL New England Division Director Tom Frenaye, K1KI, as ARRL Foundation President, reported that the Foundation now oversees and facilitates more than 70 scholarships, with eight new scholarships added in recent months.

Scouting and Amateur Radio: Upon the recommendation of the Programs & Services Committee, the Board approved the creation of the ARRL Amateur Radio Service to Scouting Award. This "square knot" award will be administered consistent with the Community Organization Award program of the Boy Scouts of America (BSA). The award's qualification criteria, nomination process, administration and implementation will be jointly determined by ARRL staff and members of ARRL's previous ad hoc Committee on Scouting.

Emergency Communications Advisory Committee: The Emergency Communications Advisory Committee (ECAC) was created at the 2010 Annual Meeting of the League's Board of Directors, with a sunset date of January 31, 2013. As the ECAC needed more time to complete current pending tasks, the Board extended the ECAC's current charter to January 31, 2014.

ARRL Central Division Vice Director Kermit Carlson, KX9A, and ARRL Dakota Division Vice Director Kent Olson, KA0LDG.

ARRL Northwestern Division Director Jim Fenstermaker, K9JF (right) welcomes newly elected Northwestern Division Vice Director Jim Pace, K7CEX, to the Board family.

ARRL Executive Committee: As ARRL President, Craigie also serves as Chairman of the Executive Committee. The Board elected the following Directors to the League's Executive Committee: Bob Vallio, W6RGG (Pacific); David Woolweaver, K5RAV (West Gulf); Jim Fenstermaker, K9JF (Northwestern); Dick Isely, W9GIG (Central), and Brian Mileshosky, N5ZGT (Rocky Mountain). ARRL Chief Executive Officer David Sumner, K1ZZ, and First Vice President Rick Roderick, K5UR, also serve on this committee, but do not have a vote.

Awards and Recognitions: The Board had the pleasure of bestowing four awards at the 2013 Annual Meeting: the ARRL International Humanitarian Award, the George Hart Distinguished Service Award and the print and audio winners of the Bill Leonard, W2SKE, Professional Media Award.

The next meeting of the ARRL board of Directors is scheduled for July 19-20, 2013 in Windsor, Connecticut.

All photos by Harold Kramer, WJ1B

S. Khrystyne Keane, K1SFA, is the ARRL News Editor. She can be reached via e-mail at **k1sfa@arrl.org**.

Summary of Major Board Actions

S. Khrystyne Keane, K1SFA

The *Minutes* of the 2013 Annual Meeting of the ARRL Board of Directors, Moved and Seconded, are now published on the ARRL website at **www.arrl.org/board-meetings**. If you do not have Internet access, you may request a written copy of the *Minutes* by writing to ARRL Secretary, 225 Main St, Newington, CT 06111.

Elections and Appointments

9 Executive Committee — Elected

Elected Directors to the Executive Committee

10 ARRL Foundation Directors — Elected

Elected West Gulf Division Director David Woolweaver, K5RAV; Central Division Director Dick Isely, W9GIG, and Andrea Hartlage, KG4IUM, to serve three-year terms as ARRL Foundation Directors.

35 Committee Appointments — Announced

Administration & Finance: Chairman Tom Frenaye, K1KI (New England); Greg Widin, KØGW (Dakota); Dennis Bodson, W4PWF (Roanoke); Cliff Ahrens, KØCA (Midwest); Bill Edgar, N3LLR (Atlantic); Vice Director Marty Woll, N6VI (Southwestern), and Treasurer Rick Niswander, K7GM.

Programs & Services: Chairman David Norris, K5UZ (Delta); Greg Sarratt, W4OZK (Southeastern); Mike Lisenco, N2YBB (Hudson); Dick Norton, N6AA (Southwestern); Jim Weaver, K8JE (Great Lakes), and Vice Director Tom Abernethy, W3TOM (Atlantic).

Ethics & Elections: Chairman Greg Widin, KØGW (Dakota); Cliff Ahrens, KØCA (Midwest), and Dennis Bodson, W4PWF (Roanoke).

Legal Defense & Assistance: Chairman Cliff Ahrens, KØCA (Midwest); Brian Mileshosky, N5ZGT (Rocky Mountain); Vice Director Mike Raisbeck, K1TWF (New England); Jim Tiemstra, K6JAT (Pacific); Jim O'Connell, W9WU, and General Counsel Chris Imlay, W3KD.

RF Safety: Chairman Greg Lapin, N9GL; West Gulf Division Vice Director John Robert Stratton, N5AUS (Board liaison).

EMC Committee: Central Division Vice Director Kermit Carlson, W9XA (Chairman).

Historical Committee: International Affairs Vice President Jay Bellows, KØQB (Chairman); Tom Frenaye, K1KI (New England); Dick Norton, N6AA (Southwestern); Vice Director Rod Blocksome, KØDAS (Midwest); Mike Marinaro, WN1M, and Bob Allison, WB1GCM (staff liaison).

HF Band Plan Committee: Second Vice President Bruce Frahm, KØBJ (Chairman); Tom Frenaye, K1KI (New England); Dick Norton, N6AA (Southwestern); Steve Ford, WB8IMY, and Chuck Skolaut, KØBOG.

Public Relations Committee: Chairman Kevin O'Dell, NØIRW; Don Carlson, KQ6FM; Steven Polunsky, W5SMP; Mark Kraham, W8CMK; Ed Tyler, N4EDT; Bill Morine, N2COP; John Sovik, KB8WPZ; Alan Bauld, VE3CBR (RAC); Vice Director Jim Boehner, N2ZZ (Roanoke — Board liaison), and Allen Pitts, W1AGP (interim staff liaison).

Microwave Band Plan Committee: First Vice President Rick Roderick, K5UR (Chairman); Vice Director Rod Blocksome, KØDAS (Midwest); Vice Director Marty Woll, N6VI (Southwestern); ARRL Chief Executive Officer David Sumner, K1ZZ, and Paul Rinaldo, W4RI.

Youth in the Second Century Committee: Chairman Brian Mileshosky, N5ZGT (Rocky Mountain); Andrea Hartlage KG4IUM; Nathaniel Frissell, W2NAF; Jeremy Breef-Pilz, KB1REQ; Sterling Coffey, NØSSC; Joel Monza, KC2SNL, and Marcel Stieber, AI6MS.

Centennial Celebration Committee: President Kay Craigie, N3KN (Chairman); ARRL Chief Executive Officer David Sumner, K1ZZ; Vice Director Dwayne Allen, WY7FD (Rocky Mountain); Greg Widin, KØGW (Dakota); David Woolweaver, K5RAV (West Gulf); Vice Director Mike Raisbeck, K1TWF (New England); Bob Inderbitzen, NQ1R; Dave Patton, NN1N; Steve Ford, WB8IMY, and Allen Pitts, W1AGP.

ARDF Coordinator: Joe Moell, KØOV

Advisory Committee Chairs: Al Dewey, KØAD, Contest; Arne Gjerning, N7KA, DX; Jim Cross, WI3N, Emergency Communications, and Steve Clark, AG4V, VHF/UHF.

Organizational

25 Legislative Objectives for 113th Congress — Approved

Adopted seven legislative objectives for the 113th Congress.

27 2013-2014 Plan — Approved

Approved the 2013-2014 budget and operating plan.

28 Amateur Radio Service to Scouting Award — Approved

Approved the creation of a "square knot" award to be administered by the Boy Scouts of America.

31 Emergency Communications Advisory Committee — Renewed

Renewed the committee's charter through January 31, 2014.

32 Ad hoc Logbook of The World Committee — Approved

Established a committee to review policies and practices associated with how LoTW runs today including the fixed and variable costs, issues concerning user interface and usability, and the economic value of an LoTW award point or credit.

38 Ad hoc Symbol Rate Rule Modernization Committee — Approved

Established a committee to evaluate potential modifications to the Amateur Service rules to permit and facilitate the use and development of high symbol rate digital communications techniques.

Awards

29 The 2012 ARRL International Humanitarian Award — Conveyed

The Board voted to bestow the 2012 ARRL international Humanitarian Award on John Bush, KH6DLK/V63JB.

30 The 2012 George Hart Distinguished Service Award — Conveyed

The Board voted to bestow the 2012 George Hart Distinguished Service Award on Marcia Forde, KW1U.

37 The 2012 Bill Leonard, W2SKE, Professional Media Award — Conveyed

The Board voted to bestow the 2012 Bill Leonard, W2SKE, Professional Media Award on Lucy Ann Lance (audio) and Lynn Anderson (print).

ARRL Board Bestows Awards at 2013 Annual Meeting

Two radio amateurs and two professional journalists honored at January's Board meeting.

S. Khrystyne Keane, K1SFA
ARRL News Editor

The ARRL Board of Directors had the pleasure and distinction of bestowing four annual awards at its 2013 Annual Meeting: the ARRL International Humanitarian Award, the George Hart Distinguished Service Award and the audio and print awards for the Bill Leonard, W2SKE, Professional Media Award.

ARRL International Humanitarian Award

The Board voted to bestow the 2012 ARRL International Humanitarian Award upon John Bush, KH6DLK/V63JB, of Hilo, Hawaii and Federai, Ulithi, Yap, Federated States of Micronesia. Bush was recognized for his promotion of the development and welfare to the population of the Island of Federai in the Ulithi Atoll of the Federated States of Micronesia. In addition, he was acknowledged for his efforts in the development of an electronic infrastructure on the island, including electronic technologies and Amateur Radio.

"Power comes from a solar farm and is limited," said ARRL Pacific Section Manager Robert Schneider, AH6J, one of many who nominated Bush for the award. "The Big Island Amateur Radio Club (BIARC), of which John is a member, put together care packages, along with (low power consumption) computers, Amateur Radio equipment and other badly needed supplies and has assisted John in getting these supplies and delivering them to the island."

According to Richard Darling, AH7G, Bush's enthusiasm has spread to the Big Island Amateur Radio Club of Hawaii Island and to the Volcano Rotary Club: "Both organizations have sent dictionaries for each school child, and with the international Rotarians, assist in sending medical equipment to the island. The BIARC supports John's programs on Federai Island with a ham radio phone patch and a health and welfare net, in addition to supplying school supplies, clothing and medical supplies. The club sent a transceiver, tower, coax and antenna to the island. Until John provided amateur radios to the island, there was no way for island residents to communicate with another island, as the island has no phone or Internet system."

The ARRL International Humanitarian Award is conferred upon an amateur or amateurs who demonstrate devotion to human welfare, peace and international understanding through Amateur Radio. The ARRL has established this annual award to recognize those who have used Amateur Radio to provide extraordinary service to others in times of crisis or disaster.

George Hart Distinguished Service Award

The Board voted to bestow the 2012 ARRL George Hart Distinguished Service Award upon ARRL Eastern Massachusetts Section Traffic Manager Marcia Forde, KW1U, of Concord, Massachusetts. Forde was recognized for her dedication to the National Traffic System (NTS). Since the early 1980s, she has held many positions within the NTS, including serving as Section Traffic Manager for the Eastern Massachusetts Section, Net Manager for the Eastern Area Net and a as a Director of the Trans-Continental Corps. Forde, who has run various digital message systems — from a packet node to a *Winlink* classic node — is active in recruiting volunteers for all levels of the NTS.

Marcia Forde, KW1U, is the recipient of the 2012 George Hart Distinguished Service Award. She was recognized for her service and dedication to the National Traffic System.

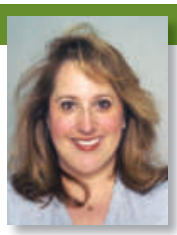
This award is named for longtime ARRL Communications Manager George Hart, W1NJM, chief developer of the NTS. It is conferred upon an ARRL member whose service to the League's Field Organization is of the most exemplary nature. Selection criteria include the nominee's operating record with the NTS, participation within the Amateur Radio Emergency Service® (ARES®) or station appointments and/or leadership positions held within the ARRL Field Organization.

Bill Leonard, W2SKE, Professional Media Awards

This year, the Board recognized two professional journalists with the Bill Leonard, W2SKE, Professional Media Award. This award is a national level award that is given each year to honor up to three professional journalists whose outstanding coverage best reflects the enjoyment, importance and public service value of the Amateur Radio Service. This award — created as a tribute to the late CBS News President Bill Leonard, W2SKE, an avid Amateur Radio operator — is divided into three categories, each with its own award: audio, visual and print (no video award was bestowed this year). The following media professionals received the Bill Leonard Award in their respective categories:

- **Audio**: Lucy Ann Lance, a radio show host with WLBY 1290 AM in Ann Arbor, Michigan, was recognized for a March 2012 interview with three ARES/RACES hams who volunteer with SKYWARN in Michigan's Washtenaw County. Thanks to the three hams, Washtenaw County's Emergency Services Department was able to activate its warning sirens prior to an EF3 tornado in Dexter, Michigan. Their early action contributed to no lives being lost in the tornado. Listen to Lance's interview at **lucyannlance.com/?p=19455**.

- **Print**: Lynn Anderson, an editor with *The Best Times*, a newspaper catering to older adults in Johnson County, Kansas, was honored for her article "Johnson County Hams: Cruising the Air Waves for Fun and Service," which featured radio amateurs with the Johnson County Radio Amateurs Club (JCRAC) and their passion for Amateur Radio. JCRAC members told the nominating committee that they were "all impressed with the accuracy of the information presented in the article. It is clear that Ms Anderson did a thorough review and let the hams in the article help her with the facts. She cared!" Read Anderson's article at **www.thebesttimes.org/people/cover_stories/0812_johnson_county_hams.shtml**.



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

FCC Adopts Sweeping Changes to Experimental Radio Service

With the new rules, the FCC has struck a reasonable balance between the objective of facilitating experimentation and that of protecting incumbent users from harmful interference.

In a *Report & Order* (*R&O*) — FCC 13-15 — released February 4, the FCC adopted numerous changes to its Experimental Radio Service (Part 5), revising and streamlining its rules. With the new rules, the FCC states that the Experimental Radio Service will have "a more flexible framework to keep pace with the speed of modern technological change, while continuing to provide an environment where creativity can thrive." The new rules will become effective 30 days after being published in the *Federal Register*. As of press time, no date has yet been set for publication.

The FCC's rules contain numerous provisions for experimentation and development of new radio equipment and techniques. The *R&O* noted that the Experimental Radio Service rules "prescribe the manner in which the radio spectrum may be made available to manufacturers, inventors, entrepreneurs and students to experiment with new radio technologies, equipment designs, characteristics of radio wave propagation, or service concepts related to the use of the radio spectrum. To encourage innovation, the Part 5 rules provide flexibility regarding allowable frequency range, power and emissions. In exchange for this flexibility, experimental operations are not protected from harmful interference from allocated services, and Experimental Radio Service licensees must not cause harmful interference to stations of authorized services, including secondary services."

To accomplish this transition, the FCC — through the *R&O* — is creating three new types of Experimental Radio Service licenses: the Program License, the Medical Testing License and the Compliance Testing License. According to the FCC, this new license structure will "benefit the development of new technologies, expedite their introduction to the marketplace and unleash the full power of innovators to keep the United States at the forefront of the communications industry. Our actions also modify the market trial rules to eliminate confusion and more clearly articulate our policies with respect to marketing products prior to equipment certification. We believe that these actions will remove regulatory barriers to experimentation, thereby permitting institutions to move from concept to experimentation to finished product more rapidly and to more quickly implement creative problem-solving methodologies."

These new Program Licenses will be available to qualified entities such as universities with accredited graduate research programs in engineering, research labs, and manufacturers with spectrum management experience and will permit much broader latitude to conduct experiments within a specific geographic area than is typically provided by a conventional experimental license. However, these licensees will be re-quired to post technical details of the experiment in advance, to conduct due diligence in their local operating environment to identify any interference risks and to plan accordingly to avoid causing harmful interference to incumbent licensees, and to designate a "Stop Buzzer" point of contact with the ability to cease operation immediately in the event of harmful interference.

The ARRL had expressed "great concern" that the FCC had proposed "virtually no limits" on the frequency bands available for these new classes of experimental license. With particular regard to the Medical Testing License, the ARRL argued that, with appropriate notifications to Amateur Radio operators, medical equipment experiments could be conducted in amateur allocations, but it also contended that the ubiquitous and frequency-agile nature of Amateur Radio spectrum use makes such spectrum largely unsuitable for any medical equipment experimentation. The ARRL maintained in its comments that only medical facilities — and not manufacturers — should be eligible for a medical program license and that experimenters are obligated to address interference susceptibility issues before commencement of experimental operations and affirmatively assume all responsibility for such interference.

"We note again that harmful interference caused by an experimental licensee to any licensed service is unacceptable, and thus we find no need to exclude certain Amateur Radio bands from potential use by medical testing licensees," the FCC said in the *R&O*. "More generally, we do not find the concerns raised regarding medical experimental licenses to be fundamentally different than the concerns raised about research program experimental licenses, which we [have] already address[ed]. In particular, any Part 5 licensee, including a medical testing licensee, will be responsible for ensuring that harmful interference is not caused to authorized spectrum users. Similarly, medical testing licensees must ensure that their devices are immune to interference effects from authorized services sharing the same bands as their devices. Testing under a medical testing license will allow for such testing. Thus, we will not restrict medical testing licensees from operating in any of the specific bands noted by commenters," including the ARRL.

The *R&O* adopted the following changes to the Experimental Radio Service:

- Consolidates rules for broadcasting experiments (currently in Parts 73 and 74) into a new subpart within Part 5 and eliminates developmental licensing rules in several FCC rules parts so that all experimental authority will be under the Part 5 ERS Rules, providing clear and consistent guidelines to applicants for all types of experimentation.
- Establishes Program Experimental Licenses for colleges and universities with an accredited graduate research program in engineering, research laboratories, manufacturers of radio frequency (RF) equipment, manufacturers that integrate radio frequency equipment into their end products and health care institutions to allow broad experimental authority under a single license.
- Creates an FCC website where program licensees will register individual experiments to be conducted under a program license at least 10 days prior to commencing the experiment.
- Requires that each program licensee post on the FCC website a report for each individual experiment completed, including a description of its results.
- Establishes a compliance testing license, which will be available to FCC-recognized testing laboratories that test RF devices for certification purposes.
- Establishes a medical testing license to permit health care facilities to undertake clinical trials of cutting-edge wireless medical technologies.
- Establishes a process whereby the FCC can specify innovation zones where program licensees may operate in addition to their authorized area of operations.
- Broadens opportunities for market trials by adopting a new subpart within the ERS rules that contains provisions for product developmental trials, as well as market trials, and modifies the rules to clarify when operation or marketing of RF devices is permitted prior to equipment certification, including the number of devices that can be imported for such purposes.
- Makes other targeted changes to the FCC's experimental rules and procedures.

"While the FCC did not incorporate every suggestion offered by the ARRL, the new rules as adopted depart significantly from the Commission's original proposals and are generally responsive to the comments filed, including ours," commented ARRL Chief Executive Officer David Sumner, K1ZZ. "Our initial impression is that they represent a reasonable balance between the interests of incumbent licensees and the need for greater experimental flexibility. If after review, any ARRL member has concerns that have not been adequately addressed in the *Report & Order*, I invite him or her to contact me as we consider whether any additional filings by the ARRL are necessary in order to protect the interests of the Amateur Radio Service."

It's Time to Gear Up for ARRL Field Day

It's that time of year again — time to start gearing up for ARRL Field Day, June 22-23, 2013! ARRL's flagship operating event — always held the fourth full weekend in June — brings together new and experienced hams for 24 hours of operating fun.

Field Day packets are now available for download at **www.arrl.org/field-day**. It includes the complete rules, as well as other reference items such as forms, ARRL Section abbreviation list, entry submission instructions, a Frequently Asked Questions section, guidelines for getting bonus points, instructions for Get-On-The-Air (GOTA) stations and a kit for publicizing your event with the local press. New for 2013: Stations operating as Class A or B may begin setting up at 0000 UTC on Friday (which will be Thursday 8 PM EDT, 7 PM CDT, 6 PM MDT and 5 PM PDT). The groups may start and stop their set-up, resuming the set-up later, but may spend only a maximum of 24 hours cumulative time for setting up their sites.

A brief informational flier entitled "What is Field Day?" has also been included in this year's Field Day packet. Amateur Radio clubs and individuals are encouraged to reproduce this flier as a handout for information tables. Find it and more on the ARRL's Field Day web page.

BSA to Offer Amateur Radio Operator Rating Strip

The Boy Scouts of America (BSA) has approved an Amateur Radio Operator rating strip for Scouts and Scouters to wear on their uniforms. According to BSA Communication Services Director Jim Wilson, K5ND, the strip recognizes the Scout or Scouter's availability as an Amateur Radio operator for communication services for events and activities, as well as emergencies. All registered youth members and adult leaders who also hold a valid FCC-issued Amateur Radio license of any class are eligible to wear the rating strip.

"Last year, the BSA Awards and Insignia Committee introduced the Morse Code Interpreter Strip upon the recommendation of the BSA's National Radio Scouting Committee," Wilson told the ARRL. "We are always looking for ways to promote Amateur Radio, both within Scouting and to the world. The National Radio Scouting Committee thought this new Amateur Radio rating strip was a wonderful way to do exactly that, as it readily identifies to everyone that the wearer is a licensed radio amateur, prepared to be useful and to help others."

Wilson, who heads up the National Radio Scouting Committee, said that the Amateur Radio Operator rating strip is similar to the Amateur Radio Operator badge offered as a proficiency badge by Scouts Australia, as well as the badge recently introduced by Scouting Netherlands. It follows in the footsteps of the Scout Radioman personal interest badge for Senior Scouts and Explorer Scouts that was offered by the Boy Scouts of America in the 1940s. The strip is worn on the right sleeve.

FCC News

FCC Denies Missouri Ham's Petition Regarding CC&Rs

On January 28, the FCC denied a Petition for Reconsideration (PFR) filed by James E. Whedbee, NØECN, of Gladstone, Missouri. Whedbee filed the PFR in May 2012 in response to the FCC denying his Petition for Declaratory Ruling (PDR) filed in April 2012 that urged the FCC to address covenants, conditions and restrictions (CC&Rs). In his PDR, Whedbee argued that CC&Rs restrict Amateur Radio facilities in violation of Section 310(d) of the Communications Act of 1934, as amended. He also asserted that there is a "controversy of CCR enforcement against Amateur Radio operators," and "requested a declaratory ruling terminating the controversy by holding that such CC&Rs are unenforceable." The FCC concluded that the Mobility Division "properly acted" on Whedbee's PFR: "Given the opportunity for public comment already afforded by the Public Notice and the opening of GN Docket No. 12-91, and in light of the pendency (and later release) of the Commission's report to Congress and the statutory purpose of that report, your Petition was moot, premature, repetitive and frivolous." Read the FCC's letter to Whedbee at **http://transition.fcc.gov/Daily_Releases/Daily_Business/2013/db0125/DA-13-101A1.pdf**.

New International Reply Coupon Introduced

The Universal Postal Union (UPU) has introduced the newest model of the International Reply Coupon (IRC): The Doha model — so named for the 25th Universal Postal Congress that took place in Doha, Qatar in October 2012 — will replace the current model, known as the Nairobi model. Although the US Postal Service (USPS) no longer sells IRCs, they are still available in other countries and post offices in the US are mandated to redeem them.

The Doha model IRC will become available for purchase on July 1, 2013. It is valid for exchange until the end of 2017. The Nairobi model — first issued on July 1, 2009 — remains valid until December 31, 2013. IRCs are exchangeable in every UPU member country for stamps representing the minimum postage for an ordinary priority letter-post item or airmail letter sent abroad for a reply. According to the UPU as of October 31, 2012, 120 postal systems around the world worldwide had issued more than four million Nairobi IRCs with a total value of approximately $5 million.

Although postal systems are not obliged to sell IRCs, it is mandatory for them to exchange the coupons. According to the UPU, if a postal system — such as the USPS — does not sell IRCs, it is possible to purchase them in a post office located in another country.

The Czech Republic won the UPU's contest to design the new IRC, beating out 13 other countries. Czech artist and graphic designer Michal Sindelar designed the new IRC, the design of which illustrates the theme "Water for Life." This theme reflects the United Nations International Year of Water Cooperation in 2013.

The new Doha model IRC will become available for purchase July 1, 2013; it is valid until December 31, 2017. Although the US Postal Service no longer sells IRCs, they are still available in other countries and post offices in the US are mandated to redeem them.

Section Manager Election Notice

To all ARRL members in Colorado, Eastern Washington, Georgia, Los Angeles, Sacramento Valley, San Francisco, South Texas, West Virginia, and Western Washington sections. You are hereby solicited for nominating petitions pursuant to an election for Section Manager (SM). Incumbents are listed on page 16 of this issue.

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

We suggest the following format:

(Place and Date)

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

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

(Signature____ Call Sign___ City ___ ZIP___)

Any candidate for the office of Section Manager must be a resident of the Section, an Amateur Radio licensee of Technician class or higher and a full member of the League for a continuous term of at least two years immediately preceding receipt of a nominating petition. Petitions must be received at Headquarters by 4 PM Eastern Time on June 7, 2013. If more than one member is nominated in a single section, ballots will be mailed from Headquarters on or before July 1, 2013, to full members of record as June 7, 2013, which is the closing date for nominations. Returns will be counted August 20, 2013. Section Managers elected as a result of the above procedure will take office October 1, 2013.

If only one valid petition is received from a section, that nominee shall be declared elected without opposition for a two-year term beginning October 1, 2013. If no petitions are received from a section by the specified closing date, such section will be resolicited in the October 2013 *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

Global Planning and Preparation for Disasters

An update on international emergency and disaster response communications events.

There's much activity in the world of emergency and disaster response communications planning, exercises and operations occurring outside the United States. These activities have a robust international platform of support. The International Amateur Radio Union (IARU) represents the global community of Member-Societies, which includes the ARRL®. Its worldwide initiatives include conferences, networking, and planning for and supporting areas affected by disasters. Region 2 is comprised of the Americas and is aided by Amateur Radio support mechanisms across the Western Hemisphere, as are Regions 1 and 3.

World Amateur Radio Day 2013: 100 Years of Disaster Communications

Radio Amateurs around the world celebrate World Amateur Radio Day each year on April 18, which is the day the IARU was founded in 1925. The first recorded instance of Amateur Radio being used to provide communications in a natural disaster occurred in 1913 during severe flooding in the Midwest of the United States.

Accordingly, the theme of the event for 2013 is "Amateur Radio: Entering Its Second Century of Disaster Communications." Related activities will provide an opportunity to spread the word about what radio amateurs are doing in the field of disaster communications.

Philippine Hams Respond to Super Typhoon Bopha

Typhoon Bopha (local name "Pablo"), a Category 5 super storm, hit the Philippines on December 3, driving 40,000 people to shelters. Of the 20 typhoons to strike the country in 2012, Bopha was the strongest with heavy rain and winds gusting up to 130 mph as it came ashore at Mindanao.

The Philippine Amateur Radio Association (PARA) had its Ham Emergency Radio Operations (HERO) program up when the typhoon struck. RADNET 5, a local club of Amateur Radio operators in Tacloban City, provided the city with vital communications links and stayed in constant contact with the National Disaster Risk Reduction & Management Council. More than 5000 families were evacuated from the Saint Bernard municipality. RADNET 5 also assisted the Red Cross in Tacloban and Saint Bernard. The mammoth response and recovery phases panned out well due to pre-planning on the part of responders, preparation by the populace and the cooperation of the evacuees. *— IARU Region 3 Disaster Communications Committee Chairman Jim Linton, VK3PC, with Philippine Amateur Radio Association Chief Operating Officer Eddie Valdez, DU1EV.*

Region 2 Meeting Will Include Emergency Communications Workshop

IARU Region 2 will celebrate its triennial General Assembly in Cancun, Mexico, in September 2013. Official delegations of its Member-Societies will work on important issues and will also feature, for the first time, an Emergency Communications Workshop (ECW). This workshop will gather IARU Region 2 emergency coordinators and other national level Amateur Radio emergency communications experts to:

- Share information on Amateur Radio responses to emergencies in the region
- Increase the capacity for amateurs in Region 2 to respond to large scale, multinational communications emergencies
- Provide an opportunity for national level Amateur Radio emergency communications leaders to network and increase the level of cooperation and collaboration within IARU Region 2.

The ECW will be held September 24-25 at the Fiesta Americana Condesa, Cancun. The event is open to representatives and Emergency Coordinators of IARU Member-Societies in Region 2 and other regions, as well as representatives of other Amateur Radio emergency communications organizations that are national or international in scope. Workshop information can be found at **www.arrl.org/emergency-communications-workshop-2013**.

GAREC-2012: One World, One Commitment

The eighth Global Amateur Radio Emergency Communications Conference, GAREC-2012, took place in Port Dickson, Malaysia, November 12-14. It was hosted by the Malaysian Amateur Radio Transmitters' Society and was attended by 17 delegates from nine countries. The theme of the conference was "One World, One Commitment." In 2005, the first GAREC conference was organized on the initiative of Seppo Sisatto, OH1VR, in Tampere, Finland. Following the success of that event and the increased interest in international and regional cooperation, a decision was made to hold GAREC conferences annually.

The status of programs in Finland, Germany, Hong Kong, Indonesia and Switzerland was discussed, highlighting the differences and similarities in the various approaches to emergency planning.

The conferees considered common issues facing Amateur Radio emergency communicators. They recognized that by sharing information individual countries could tackle tough problems and pursue solutions together. Such understanding provides valuable support to the global Amateur Radio emergency and disaster relief community.

Conferees participated in a directed exercise in which they worked together as a team to provide communications for a fictional country and event. The exercise gave them a

chance to enhance interpersonal relationships, which in turn helped them to work together more efficiently.

The IARU HF Emergency Operating Procedures (**www.iaru-r1.org/index.php?option=com_content&view=article&id=218&Itemid=164**) was reviewed following its use in GlobalSET and national exercises. A number of procedural improvements were identified. The delegates will present these improvements to the IARU Regional Emergency Coordinators (EMCOR).

The delegates suggested that future conferences seek to involve partners in emergency response, such as the International Federation of Red Cross and Red Crescent Societies (IFRC) and International Telecommunication Union (ITU). This will ensure that the most value is gained from the memoranda of understanding that exist between those organizations and the Amateur Radio community.

The next GAREC conference will be held in Zurich, Switzerland, June 25-27, 2013.

Cesar Pío Santos, HR2P — Region 2 EMCOR

Dr Cesar Pío Santos, HR2P, is the current IARU Region 2 emergency coordinator and one of the most experienced and connected radio amateurs of the Western Hemisphere. Santos works across the region to promote networking, coordination, planning and exercising, all in preparation for an actual emergency in disaster-prone Region 2 countries. Santos said "It is of great interest to us that the transmission of formal messages in digital formats is incorporated into emergency communications groups in those areas of Region 2 where the capability is still to be implemented, and that Member-Societies count in their areas on radio message servers (RMS) for the strengthening of the e-mail message network, as a complement to the service and as a response of the radio amateurs in case of an event or disaster."

IARU R2 EMCOR Dr Cesar Pio Santos, HR2P, center, with the President of Honduras Mr Porfirio Lobo Sosa and Mrs Norma Leiva, HR2NL.

Last November, the President of Honduras, Mr Porfirio Lobo Sosa, inaugurated the Regional Center II of the Permanent Commission of Contingencies (COPECO). One of five new regional and logistical centers of COPECO, it is equipped with seismological and meteorological stations. On hand was Commissioned Minister Lisandro Rosales of COPECO, who told Santos he recognized the important role of radio amateurs when conventional communications fails during disasters. The President Pro Tempore of the Coordination Center for the Prevention of Natural Disasters in Central America (CEPREDENAC) who is also the General Director of the National Civilian Protection System of Panama (SINAPROC) also spoke of the good relationship existing in his country with radio amateurs. Santos congratulated him on the Panamanian government's decision to adopt the International Amateur Radio Permit convention, which can greatly expedite operations during disasters.

I had the privilege of serving as the IARU Region 2 EMCOR from 2002 to 2007. My mission was to promote intra-regional coordination and planning for mutual assistance when major disasters overwhelm the amateur service response assets of an individual country or countries. To that end I drafted and published the first IARU Region 2 Emergency Communications website and represented the area emergency coordinators to the Region 2 organization and administration at large. It is a particularly fond memory for me and it was a real pleasure and honor to work with so many diverse personalities throughout the Americas, all dedicated to public service in times of greatest need. — *K1CE*

ITU Holds Forum on Disaster Management and Climate Change

Marco Gudiel, TG9AGD, the IARU's Region 2 Area D director, presented a paper titled "Radio Amateurs and Emergency Communications" at the Multi-Stakeholder Forum on the Role of Telecommunications/ICT in Disaster Management and Climate Change. The event was organized by the ITU, the Superintendencia de Telecomunicaciones and the Guatemalan Telecom Regulator and Administrator, and was held November 5-7, 2012, in Guatemala City, Guatemala. ITU Deputy Secretary-General Mr Houlin Zhao was among those presiding over the ceremonies.

Gudiel reported on the discussion of the key role radio amateurs, commercial telecommunications providers and the media play during relief operations, mitigation and disaster response. Topics that were explored included how telecom operators can guarantee a reliable infrastructure; the importance of strong public-private associations for disaster preparedness, mitigation and response; the role of satellite communications operators; and the role of the Amateur Radio communications infrastructure in disaster response and emergency communications.

Gudiel presented a program entitled "Radio Amateurs and Emergency Communications" with a discussion of the IARU and its initiatives, emphasizing that when traditional telecommunications services are inoperative, radio amateurs "take charge of this vital service." Gudiel told the conferees "in countless cases, radio amateurs become the only means of communication between a location isolated by disaster and the rest of the world" and "we operate as trained volunteers, counting on our own equipment that is capable of operation in different modes." He goes on to say "Thus, we provide effective emergency communications to the population, without cost to the governments involved."

The conference was interrupted by the exclamation point of a magnitude 7.4 earthquake that shook the entire region. The temblor prompted the suspension of the forum, which resumed 1 hour later — without the presence of the government officials who had just garnered instant local responsibilities!

Closing Note from IARU EmComm Coordinator

A lack of interest in emergency communications is, unfortunately, very common. This shortcoming is not limited to the amateur service — I have been confronted with it throughout my professional career as the coordinator of emergency telecommunications of the United Nations system. In short: Nothing happens before something has happened. At such a moment, everybody knows what went wrong and supports all efforts to improve things through preparedness, training and resources. But all too fast such lessons are forgotten, and all the other day-to-day challenges take priority.

The way forward needs endurance and continuity. The fact that GAREC conferences, a spontaneous local idea in 2005, are now yearly events, rotating between continents, shows nevertheless that there are people who either do remember or who keep in mind why the Amateur Radio community deserves the privileges we enjoy. The value of these privileges has never been higher than in this time of a dramatic increase of commercial spectrum demands. — *Hans Zimmermann, F5VKP/HB9AQS, IARU International Coordinator for Emergency Communications*

Contest Corral — April 2013

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

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

Start - Finish Date-Time		Date-Time		Bands HF / VHF+	Contest Title	Mode	Exchange	Sponsor's Website
1	7 PM	1	11 PM	- / 144	VHF Spring Sprints	Ph CW Dig	Grid square (6-character preferred)	sites.google.com/site/springvhfupsprints
1	1400Z	1	2000Z	1.8-28 / -	Low Power Spring Sprint	CW	RST, grid square, category	www.hamradio.sk
2	0200Z	2	0400Z	3.5-28 / -	ARS Spartan Sprint	CW	RST, S/P/C and power	www.arsqrp.blogspot.com
2	1600Z	2	See web	3.5 / 50,144	OK1WC Memorial Contest	Ph CW	RS(T) and serial	www.hamradio.cz/ok1wc
5	0200Z	5	0300Z	1.8-14 / -	NS Weekly Sprint	CW	Serial, name and S/P/C	www.ncccsprint.com
6	0400Z	6	0800Z	7 / -	LZ Open 40 Meter Contest	CW	6-digit serial and serial from previous QSO	www.lzopen.com
6	12 Noon	6	6 PM	14 / -	PODXS 31 Flavors Contest	Dig	S/P/C and name or 070 number	www.podxs070.com
6	1200Z	7	2359Z	1.8-28 / -	QRP ARCI Spring QSO Party	CW	RST, S/P/C, power or QRP ARCI number	www.qrparci.org/contests
6	1500Z	7	1500Z	1.8-28 / -	SP DX Contest	Ph CW	RS(T), serial or SP province	spdxcontest.pzk.org.pl
6	1600Z	7	1600Z	3.5-28 / -	EA RTTY Contest	Dig	RST, serial or EA province	www.ure.es/contest
6	1800Z	7	See web	1.8-28 / -	Missouri QSO Party	Ph CW	RS(T), serial, MO county or S/P/C	www.w0ma.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
10	1300Z	10	See web	1.8-28 / -	CWops Monthly Mini-CWT Test	CW	Name, member number or S/P/C	www.cwops.org/onair.html
13	1600Z	13	1959Z	3.5-14 / -	EU Spring Sprints	CW	Both call signs, serial, name	www.eu-sprint.com
13	0000Z	15	0000Z	1.8-28 / 50-432	Montana QSO Party	Ph CW Dig	S/P/C or MT county	www.fvarc.org
13	0000Z	14	2400Z	- / 10G+	Worldwide EME Contest	Ph CW	TMO/RS(T) and "R"	www.dubus.org
13	0700Z	14	1300Z	1.8-28 / -	Japan International DX Contest	CW	RST, JA prefecture or CQ Zone	jidx.org
13	1400Z	14	0200Z	1.8-28 / 50	New Mexico QSO Party	Ph CW Dig	Call sign, name and NM county or S/P/C	www.swcp.com/~n5zgt
13	1800Z	14	See web	1.8-28 / 50	Georgia QSO Party	Ph CW	RS(T), S/P/C or GA county	www.georgiaqsoparty.org
13	2100Z	14	2100Z	1.8-28 / -	Yuri Gagarin DX Contest	CW	RST, ITU Zone	gc.qst.ru/en
14	1200Z	14	1800Z	3.5,7 / -	International Vintage Contest	Ph CW	RS(T), grid square	www.contestvintage.beepworld.it
15	0200Z	15	0400Z	1.8-28 / -	Run For the Bacon	CW	RST, S/P/C, Flying Pig nr or power	www.fpqrp.org
16	7 PM	16	11 PM	- / 222	VHF Spring Sprints	Ph CW Dig	Grid square (6-character preferred)	sites.google.com/site/springvhfupsprints
19	2100Z	20	2100Z	1.8-28 / -	Holyland DX Contest	Ph CW Dig	RS(T), serial or Israel district	www.iarc.org
20	0000Z	20	2359Z	1.8-28 / 50	TARA Skirmish Dig Pfx Contest	Dig	Name, prefix	www.n2ty.org/seasons/tara_dpx_rules.html
20	0500Z	20	0859Z	3.5,7 / -	ES Open HF Championship	Ph CW	RS(T), serial, dupes OK once/hour	www.erau.ee
20	1200Z	21	2359Z	3.5-28 / -	CQMM DX Contest	CW	RST, continent and category	www.cqmmdx.com
20	1600Z	20	1959Z	3.5-14 / -	EU Spring Sprints	Ph	Both call signs, serial, name	www.eu-sprint.com
20	1600Z	21	0400Z	3.5-28 / -	Michigan QSO Party	Ph CW	Serial and MI county or S/P/C	www.miqp.org
20	1700Z	21	1300Z	3.5-28 / -	EA QRP Contest	CW	RST, category, M if EA QRP member	www.eaqrp.com
20	1800Z	21	1800Z	1.8-28 / 50,144	Nebraska QSO Party	Ph CW Dig	RS(T), NE county or S/P/C	www.qcwa.org/chapter025.htm
20	1800Z	21	1800Z	1.8-28 / -	South Dakota QSO Party	Ph CW Dig	RS(T) and SD county or S/P/C	www.w0blk.org
20	1800Z	21	1800Z	1.8-28 / 50,144	North Dakota QSO Party	Ph CW	RST and ND county or S/P/C	www.w0nd.com
20	1800Z	21	See web	1.8-28 / 50,144	Ontario QSO Party	Ph CW	RS(T), S/P/C or Ontario QTH	www.va3cco.com
20	2000Z	20	2200Z	1.8-28 / -	Feld-Hell New Member Sprint	Dig	RST, S/P/C, Feld-Hell member nr	www.feldhellclub.org
20	2100Z	21	See web	1.8-28 / -	YU DX Contest	CW	RST and ITU zone	www.yu1srs.org.rs/dl/yudx/yudxmain.html
21	**1800Z**	**21**	**2359Z**	**3.5-28 / -**	**ARRL Rookie Roundup**	**Ph**	**Both calls, name, check, S/P XE# or "DX"**	**www.arrl.org/contests**
24	7 PM	24	11 PM	- / 432	VHF Spring Sprints	Ph CW Dig	Grid square (6-character preferred)	sites.google.com/site/springvhfupsprints
27	0001Z	28	2359Z	28 / -	Ten-Ten Spring Digital Contest	Dig	Call, name, county & S/P/C, 10-10 number	www.ten-ten.org
27	1200Z	28	1200Z	3.5-28 / -	SP DX RTTY Contest	Dig	RST, serial, SP province	www.pkrvg.org
27	1300Z	28	1259Z	1.8-28 / -	Helvetia Contest	Ph CW Dig	RS(T), serial or Swiss canton	uska.ch/amateurfunkpraxis/contest/info-kw
27	1500Z	28	0300Z	7-28 / -	QRP To The Field	CW	RST, S/P/C	www.zianet.com/qrp
27	1600Z	28	See web	7-28 / -	Florida QSO Party	Ph CW	RS(T), FL county or S/P/C	www.floridaqsoparty.org
28	1700Z	28	2100Z	3.5-28 / -	BARTG 75 Sprint	Dig	Serial	www.bartg.org.uk

All dates refer to UTC and may be different from calendar date in North America. Times given as AM or PM are local times and dates. No contest activity occurs on the 60, 30, 17 and 12 meter bands. Serial = Sequential number of the contact. S/P/C = State, Province, DXCC Entity. XE = Mexican state. Publication deadline for Contest Corral listings is the first day of the second month prior to publication date (April 1 for May *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 ARRL September VHF Contest Results

The Magic Band comes to life in September

By Jeff Klein, K1TEO, k1teo@arrl.net

The 2012 September VHF contest can be characterized by activity and conditions on most bands, and some unexpected 6 meter openings for much of the country on both Saturday and Sunday (Sep 8-10). The openings were modest by June contest standards but did include not only E-skip but some DX openings as well. Congratulations to Daniel, CX9AU, who had the highest DX score ever for the September contest!

One unusual aspect of this year's contest was the large turnover of stations in all categories making the Top Ten lists. 2012 saw at least half of the calls change in each Top Ten and several with six or seven new members. Set your plan now for 2013 to determine how you can add your call to the list and continue to keep the top competitors on their toes.

Figure 1 — The 6 meter band came to life during the September VHF Contest with a mix of sporadic E and transequatorial propagation (TEP). [Map courtesy EA6VQ and DXMaps.com]

Band Conditions

Contesters always hope for unusual conditions to make things as interesting as possible. September contests hold the best chance for tropo enhancement of the three major ARRL events during the year.

Tropo conditions during the week before the contest were quite good between the Midwest and East Coast. A cold front moving east late in the week ended the Midwest part of the enhancement. By Friday morning and evening there were excellent conditions up and down the East Coast ahead of the front. As the front moved east Saturday, all hope of good tropo conditions ended. In the southeast there were rain showers, the Pacific Northwest had areas of heavy fog, while in California the weather was quite nice but conditions were poor.

The real story for band conditions in this contest was E-skip across much of the eastern half of the country both days and some TEP as well. The band was open from the Southeast US to the Northeast for a part of Saturday afternoon and evening. Some in the Northeast were able to link the E-skip with TEP to work into South America. Those in the southern part of the US were able to work the TEP directly and many ended up with quite a few South Americans in the log. The events repeated themselves the following day, ending with a strong E-skip opening from Florida to the north with many Florida stations running stations for several hours. Figure 1 gives a general idea of what was being worked during the contest time period.

Single Operator Results

The Single Operator, Low Power category (SOLP) remains the most popular, with entries up a small amount this year to 234. Bob, K2DRH, continues to top this category from his Illinois QTH, once again finishing ahead of Mitch, WB1GQR, who operates from Mt. Equinox in Vermont.

In the Single Operator, High Power (SOHP) category, Jeff, K1TEO, managed to hold off a hard-charging Price, W8ZN, to take the top spot. Jeff was in a better location for the Es this time, which added 50 QSOs and 25 grids to his 6 meter totals. "It was tough this time around" noted Jeff, "as my 903 station got water in the feed line from the heavy rains at the start of the contest, and 3 GHz and 10 GHz were not working very well. Fewer rovers were worked than prior years as well."

The Single Operator Portable (SOP) category saw the same number of entrants as last year, but a substantial turnover of top participants. While many-time leader Chris, W1MR, returned to have the top score, the second highest scorer was a first-time contester. Nelson, W7LUD, took a logging road to the top of a mountain in CN88 to set up on 50, 144, and 432 SSB. He added 222 and 903 FM to build his score. This was his first time ever on 6 meters and he said "it was so much fun to work weak signal VHF/UHF that I am hooked." Welcome Nelson and congratulations on the fine second place finish.

Multioperator

Twenty one logs were submitted in the Limited Multioperator (ML) category, with the W3SO team earning a clear win with 171k points. They had high grid totals on all bands although with the poor conditions on 144 MHz and up their totals were down from their typical results. The W2SZ team used their usual portable location on Mt Greylock in Western Massachusetts to dominate the Multioperator category, nearly tripling the score of the next highest team. With conditions less than favorable they recorded solid scores on the bottom four bands but really excelled with the microwaves. They worked 144 grids on 903 MHz and up, more than most of the competitors tallied on all bands.

Regional Leaders

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

WB1GQR (W1SJ, op)	80,520	A
K2KIB	78,200	A
AF1T	69,664	A
WB2SIH	55,120	A
K1KG	54,692	A
K1TEO	452,452	B
K3TUF	255,509	B
WA2FGK (K2LNS, op)	211,008	B
WB2RVX	125,836	B
W3PAW	106,428	B
W1MR	31,450	Q
WB2AMU	2,759	Q
N1PRW	408	Q
KC2JRQ	10	Q
W3SO	171,310	L
W2LV	96,200	L
W1QK	13,924	L
NE1B	6,996	L
W2OW	4,272	L
W2SZ	745,140	M
K2LIM	152,640	M
K3YTL	100,084	M
W2EA	97,536	M
K3EOD	31,948	M
W1RT/R	99,840	R
NN3Q	51,888	R
W3HMS	17,110	R
W1AUV/R	15,340	R
N2ZBH	11,250	R
K2QO/R	55,110	RL
K9JK/R	33,352	RL
N2SLN/R	8,120	RL
KV2X	4,814	RL
AB2YI/R	2,535	RL
WA3PTV	52,728	RU
KJ1K	5,254	RU

Southeast Region
(Delta, Roanoke and Southeastern Divisions)

N3LL	41,654	A
N4QWZ	33,696	A
KX4R	30,738	A
N4BP	16,320	A
W5MRB	13,689	A
W8ZN	361,849	B
W3IP	55,944	B
N2CEI	43,875	B
W4WA	36,176	B
KE2N	32,943	B
W4IY	86,180	L
W4NH	83,985	L
K1HTV	18,407	L
W5ELK	476	L
W4NFR	90	L
KD2JA	15,405	M
K1KC	10,146	M
W4TUN	648	M
W4YCC	560	M
W4GZX	120	M
AG4V	13,311	R
W5VY	2,240	RL

Central Region
(Central and Great Lakes Divisions; Ontario Section)

K2DRH	103,040	A
KC9BQA	9,060	A
KF8QL	8,004	A
VA3ELE	7,009	A
VE3KZ	6,956	A
WØUC	66,920	B
VE3ZV	54,538	B
K8MD	39,720	B
VA3ST	34,668	B
K8TQK	34,572	B
N8XA	2,052	Q
KC9MMM	189	Q
K9PLS	138	Q
K9HA	72	Q
W1MRK	36	Q
W1RIE	36	Q
N8ZM	38,688	L
KY4ARC	169	L
N9UHF	17,680	M
K8MM	17,510	M
WZ8T	11,502	M
N2BJ	10,260	M
K9ZM	169	M
VE3OIL/R	57,750	R
VE3WJ	19,532	R
VE3CRU/R	2,871	R
AB8M/R	966	R
W9II	833	R
W8ISS/R	108	RL
VE3RKS/R	24	RL
K8DOG/R	380	RU

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

KØSIX	13,662	A
NØLL	7,980	A
WB5ZDP	7,810	A
W6ZI	6,327	A
WØJT	6,123	A
KØAWU	15,890	B
NR5M	14,018	B
K5LLL	12,888	B
W3XO/5	11,076	B
WØLGQ	6,188	B
KBØHNN	2,296	Q
NØJK	714	Q
KØNR	12	Q
WØVB	10,990	L
WD5IYF	480	L
K5QE	252,648	M
KBØHH	72,772	M
KC5MVZ	1,625	M
NØLNO/R	27,200	R
W9FZ/R	7,310	R
AE5P/R	5,538	R
WK5F/R	4,255	R
NØHZO/R	1,890	R
WAØVPJ/R	21,376	RL
WØZF/R	3,105	RL
KD5EUO	516	RL
WBØHBJ	156	RL
KCØP/R	6,680	RU
KRØVER/R	1,764	RU

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

AF6RR	8,640	A
K6TSK	6,960	A
VE7FYC	3,762	A
N6LB	3,150	A
KG7P	2,834	A
N7EPD	16,402	B
KC6ZWT	12,250	B
K7ND	8,880	B
W7FI	7,040	B
W7GLF	4,092	B
W7LUD	5,110	Q
KD8IPE	272	Q
KF6CVA	24	Q
WB6W	9,240	L
K6ZGI	1,224	L
N7CKJ	518	L
K6MI	41,820	M
VE7JH	18,270	M
W6TV	15,860	M
KD7UO	2,552	M
K7BWH	126	M
K6EU/R	3,906	R
KB5WIA	1,394	R
N6GP/R	768	R
KI6QEL/R	3,105	RL
N6ZE/R	2,000	RL
WW7D/R	16,072	RU

The K5QE team continues to turn in top notch scores, placing second with 252k. They used E-skip to great effect, tallying the highest grid total of any station on 6 meters with 117. They also used moonbounce well, working over 100 grids on 2 meters in the contest! Sixty of those grids were worked off of the Moon.

Rovers

Rover entries were down a bit this year to 46. Most of the drop was in the Classic Rover category, which had a total of 25 entries. Rovers have a large impact on scores and many non-rover participants noticed the drop in number of entries. Some of the poor weather in key parts of the country may have had an impact on participation this year. Let's hope 2013 sees a return to higher levels of activity!

Returning to take the top spot in the Classic Rover category was John, W1RT, along with his partner Andy, K1RA. The two debated a number of different routes this year, deciding at the last moment to head east to Cape Cod in the hope of catching some tropo before the massive cold front moved through and eliminated any hope of good tropo conditions. Their plan went awry when

Bruce, W9FZ, must have had a hard time concentrating on the bands during this beautiful sunset in DM84XX. [Bruce Richardson, W9FZ, photo]

Top Ten by Category

Single Operator, Low Power

K2DRH	103,040
WB1GQR (W1SJ, op)	80,520
K2KIB	78,200
AF1T	69,664
WB2SIH	55,120
K1KG	54,692
N3LL	41,654
N4QWZ	33,696
WA3EOQ	32,344
KX4R	30,738

Single Operator, High Power

K1TEO	452,452
W8ZN	361,849
K3TUF	255,509
WA2FGK (K2LNS, op)	211,008
WB2RVX	125,836
W3PAW	106,428
W0UC	66,920
W3IP	55,944
VE3ZV	54,538
N3HBX	50,715

Single Portable

W1MR	31,450
W7LUD	5,110
WB2AMU	2,759
KB0HNN	2,296
N8XA	2,052
N0JK	714
N1PRW	408
KD8IPE	272
KC9MMM	189
K9PLS	138

Limited Multioperator

W3SO	171,310
W2LV	96,200
W4IY	86,180
W4NH	83,985
N8ZM	38,688
K1HTV	18,407
W1QK	13,924
W0VB	10,990
WB6W	9,240
NE1B	6,996

Multioperator

W2SZ	745,140
K5QE	252,648
K2LIM	152,640
K3YTL	100,084
W2EA	97,536
KB0HH	72,772
K6MI	41,820
K3EOD	31,948
VE7JH	18,270
N9UHF	17,680

Rover

W1RT/R	99,840
VE3OIL/R	57,750
NN3Q	51,888
N0LNO/R	27,200
VE3WJ	19,532
W3HMS	17,110
W1AUV/R	15,340
AG4V	13,311
N2ZBH	11,250
W9FZ/R	7,310

Limited Rover

K2QO/R	55,110
K9JK/R	33,352
WA0VPJ/R	21,376
N2SLN/R	8,120
KV2X	4,814
KI6QEL/R	3,105
W0ZF/R	3,105
AB2YI/R	2,535
W5VY	2,240
N6ZE/R	2,000

Unlimited Rover

WA3PTV	52,728
WW7D/R	16,072
KC0P/R	6,680
KJ1K	5,254
KR0VER/R	1,764
K8DOG/R	380

Joel Christiansen, W9II, activated three grids in the Chicagoland area during his first-ever venture as a Rover. [Joel Christiansen, W9II photo]

Affiliated Club Competition

Club Name	Logs	Score
Medium Club		
North East Weak Signal Group	19	799,790
Potomac Valley Radio Club	24	790,011
Mt Airy VHF Radio Club	13	705,816
Nacogdoches ARC	3	262,441
Contest Club Ontario	12	184,001
Northern Lights Radio Society	12	145,281
Society of Midwest Contesters	7	116,009
Florida Contest Group	5	99,336
Florida Weak Signal Society	6	67,151
Badger Contesters	9	59,159
Pacific Northwest VHF Society	12	48,404
South East Contest Club	3	37,580
Tennessee Contest Group	3	33,789
Roadrunners Microwave Group	4	25,284
Frankford Radio Club	5	23,084
Mad River Radio Club	3	18,461
Northern California Contest Club	6	15,772
Yankee Clipper Contest Club	8	15,201
Rochester VHF Group	5	10,975
Western New York DX Assn	3	1,359
Contest Group Du Quebec	3	399
Grand Mesa Contesters of Colorado	3	300
Local Club		
Murgas ARC	3	312,604
Stoned Monkey VHF ARC	6	18,151
Bristol (TN) ARC	6	11,475
Bergen ARA	3	1,615

significant rig problems curtailed their early efforts.

The Limited Rover (RL) category saw a slight downturn in submitted logs with a total of 16. K2QO roved once again from New England out toward Western New York to rack up 55k points with over 400 QSOs. They had very high grid totals on 6 and 2 meters for a rove that helped rack up the score.

The Unlimited Rover (RU) category continues to have a small group of competitors as once again there were five entrants. Joe, WA3PTV, came out on top after a high finish in the Rover category last year. He made an impressive 110 QSOs on the microwave bands to score over 50k points. Second place Darryl, WW7D, made a lot of folks in the Pacific Northwest very happy, handing out almost 300 Qs on the bottom four bands. While some of his plans to fly to various airports around the region were delayed or cancelled because of weather, he still made it to nine Oregon and Washington grids.

Club Competition

Club submissions were up slightly this year with a total of 26 competitors. Twenty two were in the Medium category while four were in the Local category. About 40 percent of all entrants were part of a club score.

In perhaps the closest competition in years, the top two clubs were less than 10,000 points apart. The North East Weak Signal Group (NEWS) edged out the Potomac Valley Radio Club (PVRC) 799,790 to 790,011. The NEWS Group moved up from second a year ago while the PVRC also moved up one position. Last year's champs, the Mt Airy VHF Club (Packrats), had an excellent score this time around as they were also over 700k points. They submitted fewer logs this year while the PVRC showed a nice increase in participation.

Among the four entries in the Local Club category, the Murgas ARC took the top spot. They returned to the lead position after a one-year absence in 2011. Last year's number two and three clubs repeated with the Stoned Monkey VHF ARC and Bristol ARC both doubling the number of entries to help their scores.

Summary

Having personally participated in this contest for over 35 years, I always hope that something interesting will happen so it won't be the "same old same old." There had been good tropo conditions from my QTH for the weeks leading up to the contest, something that makes a contest a lot of fun for me. Knowing the radical weather change was coming and the WWV reports not showing any signs of an aurora over the weekend, I was a bit disappointed starting out the contest. Therefore, what a nice surprise it was to have E-skip on 6 meters and to make it even better have it happen both days! Moral of the story — with all the stations on the air during a VHF contest, something is bound to happen and it is not always the expected. I hope those who participated had fun making contacts, trying out new rigs, greeting old friends and just getting on the air. I hope to be on once again next fall and as always will be rooting for something unusual to happen. As they say, "You gotta be in it to enjoy it!" Hope to see you this September 14-16!

A special thanks to several operators who made contributions to help out with the content of this contest summary: N3LL and K5QE who were kind enough to send their logs and provide insights on the 6 meter openings from their QTHs; W3PAW, W9FZ, K6MI, KX4R, W7LUD, VE7JH and W0UC who provided input on their operation; K1RA for his help with creating maps summarizing the 6 meter openings; K9AKS who continues to keep the records list for the contest so we know when new ones are set; and finally to my good friend Stan, KA1ZE, who helped me find some data for the article. Thanks, guys!

Rove to the Extended Article

Even though 6 meters took center seat for this contest, there were many interesting other aspects. Take a look online (**www.arrl.org/contest-results-articles**) as Bruce, W9FZ, recounts his Panhandle Mania of One — another unique rover effort, activating low activity grids. He has a lot of fun and makes it for others at the same time. There's much more to be found in the extended writeup!

ARRL Straight Key Night 2013

For decades, during the first 24 hours of January, hundreds of amateur radio operators have participated in the annual ARRL Straight Key Night (SKN). I am always impressed, when reading the online soapbox (**www.arrl.org/soapbox**), by the number of participants who either select a favorite key from their collections or decide to put numerous keys on the air. From J-37s and J-38s to old military keys to a wide variety of homebrew masterpieces, the sound of CW rises from the static, frequently combining with vintage radios, recreating the magic atmosphere that so many of us remember from the days of our youth.

Just as it's possible to identify a beloved song by hearing the first few notes of the melody, experienced SKN participants will often recognize the rhythm of a fist on the air and instinctively recognize it as belonging to some old friend with whom they have shared on-the-air memories over the years. That is part of the joy of the event — having fun with old friends in an annual reunion of syncopated rhythms of "dits" and "dahs."

In 2013, 188 participants from 48 states, provinces and countries submitted logs totaling over 1500 contacts for SKN. Some participants were quite active — K3SEW completed 50 contacts during the 1440 minutes of SKN while 13 individuals made just a single contact — but those individual QSOs were memorable enough to merit reporting the station's participation in the event.

Each year the participants in SKN are asked to nominate the station demonstrating the best fist for the event, as well as the station who held the most interesting QSO. Five stations each received multiple votes for "Best Fist" in SKN 2013: Brian, K9VKY; Luke, AC8LJ; Howard, K7IRA; John, K7FD, and Brian, KØDTJ. Ed, W7GVE, was the choice of three participants as "Most Interesting QSO" — one more than the seven runner-up stations. Congratulations to all those who in some way were acknowledged by their on-the-air peers for the quality of their style or the quality of their story!

As the clock strikes the second day of a new year, SKN whispers a fond "73" as the last of the participants slips back into the ether, to await the next adventure. Why not add ARRL Straight Key Night to next year's holiday schedule? It would be a great way to usher in the ARRL's Centennial Celebration in 2014.

Participants

AA4Q, AA4TB, AA4ZS, AA5N, AA6E, AA6SC, AA8UU, AAØQZ, AB7MP, AB8FJ, AB9NZ, AC7JW, AC8JW, AC8LJ, AE3A, AE6C, AE7CG, AE7XI, AF4MY, AI6II, HP1AC, HP1IBF, K1EEE, K1LNL, K1NV, K1PDY, K1RM, K3BVQ, K3DQB, K3MD, K3PX, K3SEW, K3STX, K3SWZ, K3VYY, K4IV, K4JYS, K4RCG, K5BZH, K5LXP, K5NZ, K5RIX, K5SOH, K5TUC, K5WL, K5ZRK, K6FFY, K6KQV, K6LG, K6PBQ, K6RQT, K6TY/Ø (WB6VRN,op), K7ETM, K7JF, K7TFW, K7UA, K7ZYV, K8AB, K8JRE, K8JV, K8KK, K8NB, K8OC, K9WWT, K9YA, KA3YNV, KA7T, KB2KDV, KB5IRC, KB9W, KC7YE, KC8UR, KC9KEP, KCØGXX, KD5QHV, KF8KS, KG4KGY, KN4SA, KN5L, KO4OP, KO8S, KØCVN, KØCY, KØDTJ, KØHGN, KT3A, KT4OM, KW6G, KW6R, N1AW, N1CHP, N2BE, N2GT, N2KZ, N2MGT, N4XE, N5DY, N5NT, N7TML, N8GM, N8KC, N8XMS, N9BOR, NC6V, NF8M, NG2T, NIØR, NJ3K, NN7A, NR4J, NW3V, PS7HD, VE2AHH/W4, VE7BQO, VE7NI, VE7OM, VO1NA, W1DUW, W1FWB, W1OH, W1PID, W1RO, W1SFR, W1TPB, W1UJ, W2LG, W2LID, W2QJH, W3CB, W3GK, W4NB, W4RK, W4YOK, W5PDW, W5QLF, W5ROS, W6JHQ, W6KOW, W6LX, W6TDX, W6VNR, W7GVE, W7IZE, W7LNG, W7UYJ, W8FDV, W8IX, W8WTS, W9CBT, W9KMP, W9PPG, WA1ABI, WA2ELW, WA2QQF, WA5YOM, WA7OET, WA7YAZ, WA8OKR, WA8QNN, WA9PWP, WA9PYH, WA9WJB, WA9ZBW, WA9ZJI, WAØVQY, WB2AWQ/7, WB4EDB, WB6FRZ, WB6SCA, WB8CFO, WB8DQT, WB8LZG, WB8SIW, WB8YYY, WB9DLC, WB9HFK, WBØB, WBØCJB, WBØCNK, WBØIXI, WDØECO, WDØK, WI4L, WØCC, WØCZ, WØRQO, WW4DX, XE2JA

W1AW Active in SKCC Weekend Sprintathon

Operators Use Hiram Maxim's Straight Key

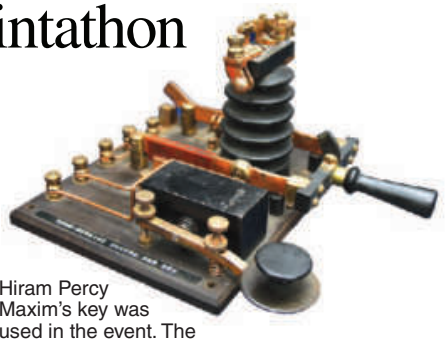
Sean Kutzko, KX9X
ARRL Contest Branch Manager, **kx9x@arrl.org**

Fans of manually sent CW worked W1AW in the Straight Key Century Club's (SKCC) monthly Weekend Sprintathon in March. Not only was W1AW activated by a team of ARRL staffers, each QSO was made with the straight key used by The Old Man himself, Hiram Percy Maxim.

The idea to activate W1AW in SKCC was launched by ARRL Emergency Preparedness Manager Mike Corey, KI1U. A member of SKCC for many years (he holds SKCC #2679C), Mike recently rekindled his interest in sending manual CW when he found an old key and sounder at an antique store. Having refurbished the unit, he mentioned to fellow staffers how much fun it was putting old keys on the air. W1AW Station Manager Joe Carcia, NJ1Q, noted that a staffer had used Hiram's straight key from his famous spark gap transmitter "Old Betsy" years ago during ARRL Straight Key Night, and the idea to use it during an SKCC Weekend Sprintathon was born.

Corey posted news of the upcoming activation to the SKCC e-mail reflector. When SKCC webmaster Pete Spotts, W1PNS, read the notice, he offered to make W1AW a "bonus" station for the event, allowing QSOs with W1AW to be worth extra points. ARRL staffers were up to the challenge and fun of making QSOs with other SKCC'ers.

A team of ARRL staffers operated W1AW (SKCC #6707) in shifts. While most of the activity centered on 20 and 40 meters, some QSOs were made on 15 and 80 meters as well. "It was exciting to make QSOs with Hiram's old key," Corey said, "but it can be pretty tiring, too! If you're out of practice using a straight key, the 'glass arm' shows up very quickly."



Hiram Percy Maxim's key was used in the event. The key's transmit-receive switch is a knife switch. [Mike Corey, KI1U, photo]

"It was great to use the key from Old Betsy," noted ARRL Test Engineer Bob Allison, WB1GCM, "I hope the stations we worked were as thrilled as we were!"

SKCC offers numerous on-air opportunities to engage in manually sent CW. Their Weekend Sprintathons occur on the second weekend of every month. For more information, visit their website at **www.skccgroup.com**.

The 2013 ARRL April Rookie Roundup – Phone

1800 UTC - 2359 UTC Sunday, April 21

- Get ready for the RR! This six hour event is aimed at amateurs licensed for three years or less. Rookies work everybody; Non-rookies work only Rookies. If you were first licensed in 2013, 2012 or 2011, you can enter as a rookie.
- Rookies can enter as a Single Operator or invite some rookie friends over and operate as a Multioperator.
- Up to five Single Operator Rookies can form a team and their individual scores will be added together.
- This is a great way for clubs to get their newer members on the air. Be a good Elmer!
- All scores must be submitted online by 2359 UTC Wednesday, April 24. No late entries will be accepted.
- Complete rules, logging sheets and links for submitting your score can be found at **www.arrl.org/rookie-roundup**.

Scan this QR code to go directly to the Rookie Roundup home page.

Charlie Reppert, KD8OSD of Marysville, MI took first place in US Call Area 8 during the 2012 April Rookie Roundup. Look for Charlie to defend his title in his last year of rookie eligibility in 2013. (Photo courtesy KD8OSD)

Sean's Picks

Sean Kutzko, KX9X, kx9x@arrl.org

- **State QSO Parties this month:** Florida, Georgia, Michigan, Missouri, Montana, Nebraska, New Mexico, North Dakota, Ontario, South Dakota.
- **QRP contests this month:** SARA Low Power Spring Sprint (Apr 1), ARS Spartan Sprint (Apr 2), QRP-ARCI Spring QSO Party (Apr 6-7), NAQCC Monthly QRP Sprint (Apr 10), Flying Pigs Run for the Bacon (Apr 15), EA QRP Contest (Apr 20-21), QRP To The Field (Apr 27-28).
- **2013 Spring VHF Sprint Schedule:**

144 MHz – Monday, April 1, 2013 (7 PM to 11 PM local time)

222 MHz – Tuesday, April 16, 2013 (7 PM to 11 PM local time)

432 MHz – Wednesday, April 24, 2013 (7 PM to 11 PM local time)

Microwave – Saturday, May 4, 2013 (6 AM until 1 PM local time)

50 MHz – 2300Z Saturday, May 11, until 0300Z Sunday, May 12, 2013.

- **EA RTTY Contest (Apr 6-7):** 24 hours of RTTY! Spanish stations send a signal report and their province; all others send a signal report and a sequential QSO number, beginning with 001.
- **JA International DX Contest, CW (Apr 13-14):** How many Japanese prefectures (states) can you work? Find out! DX stations send RST and CQ zone; JA stations send RST and their prefecture. A great contest.
- **ARRL Rookie Roundup — Phone (April 21):** The ARRL RR is in its third year! Aimed at the newly licensed, this six-hour contest helps get you on the air and have fun. If you were licensed in 2011, 2012 or 2013, you can enter as a Rookie. Complete info at **www.arrl.org/rookie-roundup**.
- **Ten-Ten Spring Digital Contest (Apr 27-28):** Explore the digital modes while working 10 meters during this solar peak! No 10-10 number? No problem; work 10 stations that have one and apply for your own!

April 2013 W1AW Qualifying Runs

W1AW Qualifying Runs are held at 9 AM EDST (1300Z) Thursday, April 4 and at 4 PM EDST (2000Z) Thursday, April 18. The West Coast Qualifying Runs will be transmitted by station K6YR at 3590 kHz at 9 PM PDST on April 10 (0400Z April 11). Unless indicated otherwise, sending speeds are from 10 to 35 WPM.

Bernie McClenny, W3UR, w3ur@arrl.org

V84SMD — Brunei 2012

International cooperation brings hams from across the globe to put Brunei on the air.

Gerard Jacot, F2JD

Organized by the Mediterraneo DX Club of Italy (MDXC) and Gemilang Radio Club of Tutong, Brunei, the V84SMD DXpedition to Brunei Darussalam took place from November 10-23, 2012.

Brunei Darussalam, a Southeast Asia sultanate, is situated on the big island of Borneo (IOTA OC-088). It shares the northern part of the island with Malaysia.

The Mediterraneo DX Club (**www.mdxc.org**) is an international group of hams based in Italy whose focus is to activate countries and islands having little or no ham radio activity. The MDXC chose Brunei Darussalam because the sultanate is rich in history and culture. Brunei is a charming country with incredibly friendly people.

Making Preparations

The DXpedition was an effort of friendly cooperation between MDXC hams in nine countries, namely Austria, Belgium, Brunei Darussalam, France, Germany, Indonesia, Italy, Romania and Switzerland.

Our two Italian leaders, Antonio, IZ8CCW, and Gabriele, I2VGW, spent the months prior to the DXpedition trading e-mails and having Skype conferences with the Gemilang team, which obtained the V84SMD call sign and a 6 meter permit.

As our departure date approached, we gathered our equipment and packed it up for shipping. Our equipment consisted of five ICOM transceivers (four IC-7000s and one IC-7200) and two Elecraft K2 transceivers used mainly for CW. To make sure we would be heard we brought two Acom 1010 700 W amplifiers, one Tokyo Hy-Power 700 W amplifier, one Ameritron 500 W amplifier and one Italian HAL600 Atlantic 600 W solid-state amplifier. The Gemilang Radio Club supplied one Yaesu FT-950 transceiver.

On the Beach

We arrived in the capital city of Bandar Seri Begawan on November 11 and were treated to a very warm welcome from the Gemilang group. We were able to resolve the usual customs problems quickly and boarded a bus to take us 35 km to the Halim Plaza Hotel in Tutong. Stations were set up at both Pantai Seri Kenangan beach and the Halim Plaza Hotel in Tutong and operated simultaneously.

The members of Gemilang had prepared an excellent site at Pantai Seri Kenangan, literally, the "unforgettable beach," which is 4.5 km from the city of Tutong. The site included a large air conditioned tent with an operations room and barbecue area, power and exterior lightning as well as two 3 element Yagis for 15 and 20 meters. We are grateful to Roslan, V85AVE, vice president of Gemilang group, and Ayub, V85TX, who, with their extraordinary team, had worked so hard to set up the site.

At the beach site, the antenna farm included two five band Spiderbeams, 80 and 160 meter verticals, a vertical for 30 meters, a vertical for 12 meters and a K9AY terminated loop for receiving. Norbert, DJ7JC, brought along a Four-Square for 40 meters. We had a very

Michel, F5EOT (left), the V84SMD HF "Antenna Magician" and Paolo, IW2ETR, installing one of the Spiderbeams.

Hard work and cooperation between the Mediterraneo DX Club and the Gemilang Radio Club of Tutong, Brunei made the V84SMD DXpedition a success.

Brunei locals Ayub, V85TX; Nazim, V85AX; Moksin, V85XD, and Roslan, V85AVE, were big supporters of the MDXC V84SMD DXpedition.

Gerard, F2JD,working his favorite mode — CW.

The Royal Barge is shown here in front of the Sultan Omar Ali Saifuddien Mosque in Bandar Seri Begawan. The mosque is a major tourist attraction of Brunei.

large area on the beachfront and Stefano, IZ5GST, did a good job erecting the verticals and maintaining them.

We also erected a 6 element 6 meter Yagi, which was very effective, especially for contacting Japan. Ovidiu, YO9XC, and Feri, YO5OED, were very active on the Magic Band and made more than 600 contacts.

At the Halim Plaza Hotel site we had two 100 W stations. We mounted a five band Spiderbeam and a multiband vertical on the roof of the hotel — a difficult task since the roof wasn't flat. We operated these two stations near our rooms on the ninth floor.

A minibus running on a 3 hour schedule transported operators between the hotel and the beach. The drivers, who were members of the team, did a great job.

Two days after we arrived two officials visited us, Legislative Council Member His Honorable Awang Haji Ramli bin Haji Lahit and Penghulu Mukim Telisai. The event drew the local press and television reporters, who conducted interviews with the foreign team members. You can see an interview at: **www.rtbnews.rtb.gov.bn/index.php?option=com_content&view=article&id=5728%3Alaunching-of-amateur-radio-expedition&catid=34%3Alocal&Itemid=66**

On Friday November 16 a group of hams from Sumba, East Malaysia came to Brunei to meet us. They included John, 9M6JC; Mervyn, 9M6EMT; Tom, 9M6TMT, and some shortwave listeners. We had a great visit with them and enjoyed showing them our operation.

In conjunction with the event and as part of our contribution to promote Amateur Radio, we held an open house at the beach site November 18.

An Uncooperative Ionosphere

We operated with five foreign radio teams each working 3 hour shifts plus one Brunei operator team. Our CW team consisted primarily of DJ7JC, DJ9RR, DL3GA, F2JD and OE3JAG with some additional activity by ON7RN and YO5OED. The two SSB teams were F5EOT, HB9OCR, IZ5GST, IT9ZZO and YO9XC and I8YGZ, IK2LTR, IW2ETR, ON7RN and YO5OED. The main RTTY team included F1HRE, IK2LTR, IW2ETR and IZ2GNQ. A mixed SSB/RTTY team was made up of I2VGW, IZ5GST, IZ8CCW, ON7RN and YB3MM. The local V8 operators were also very active, mostly on SSB and RTTY. Finally, Eleanor, the spouse of Heye, DJ9RR, was a big help, especially at the antenna farm.

Unfortunately, propagation wasn't on our side. This was evident especially during the daytime when we sometimes only made a few contacts in a shift. The final tally was only 39,141 contacts, which was much fewer than what we had expected. Of course, we logged many Japanese stations and we were able to contact some European and American stations, though the constant din coming from the Japanese stations made that difficult. Our final results were: CW — 16,448; SSB — 14,561 and RTTY — 8132. 14,060 unique calls were logged from 163 DXCC Entities and all 40 CQ Zones. The team would like especially to thank Giuliano, IK2VUC, for all his hard work as the V84SMD QSL Manager.

Photos courtesy of Gerard Jacot, F2JD.

Jon Jones, NØJK, n0jk@arrl.org

More Magic In January

Hot propagation on 6 meters had the "down-unders" working the "up-tops."

Despite the sun "taking a nap" over the holidays, several more openings occurred from Australia and New Zealand to the mainland USA, particularly on January 1, 16 and 18.

Carl Luetzelschwab, K9LA, read about December ZL contacts on 6 meters and commented: "No doubt an E_s (sporadic E) link for us farther North." Now to the questions posed in last month's column.

Why were so few other Pacific countries heard/worked during the December ZL openings?

This is probably due to the geometry of the path. New Zealand and the southern mainland states are roughly equidistant from the geomagnetic equator. Australia is one E_s hop farther away from North America and the Transequatorial Propagation (TEP) zone.

In theory, it may be possible for New Zealand to reach North America in the summer on 6 meters.

There were a few VK contacts in January. K4RX (EM70), K5RK (EL29) and N3LL (EL86) were among the fortunate few to work VK5PO January 15/16. It likely requires double hop E_s for VK to reach the TEP zone beaming toward North America. Contacts with Remi, FK8CP, were not reported; he may have been in France at this time. New Caledonia is well situated for the TEP zone to North America and Remi may be able to reach it directly without needing an "E_s link." Some of the other South Pacific countries may have been in the wrong location to work TEP to North America, possibly too close to the geomagnetic equator. The E51WL/b on 50.049 MHz was active but not spotted in North America.

Where was Hawaii?

That was answered January 18/19 when K6MIO/KH6 caught a great opening to much of North America! Hawaii was "there" in December, but the propagation was not. The path from the mainland USA to Hawaii is north of the geomagnetic equator. Thus, TEP is not possible. Propagation to Hawaii from North America on 6 meters may take place via multihop E_s, direct F_2 or F_2 backscatter, but not chordal hop TEP.

Summer in North America is the peak E_s season and the winter E_s season peaks "down under." Why have no ZL contacts been reported by North American stations during the last week of June?

E_s-TEP contacts are rarely made from North America to CX, LU, PY, etc during June via E_s links to TEP. On June 7, 2012, KØGU, KF6A, W9DR, K1TOL, AC4TO and others worked LU5FF. On June 12, K1HTV spotted LW3EX on 6. In theory, it may be possible for New Zealand to reach North America in the summer on 6 meters. To do so, the path from the New Zealand end needs an E_s link to reach the TEP path that continues to North America. The LUs don't. So, the ZL-US mainland summer path requires more factors to fall into place for it to work. Perhaps ZL1RS and ZL3NW will explore the potential of the path this summer.

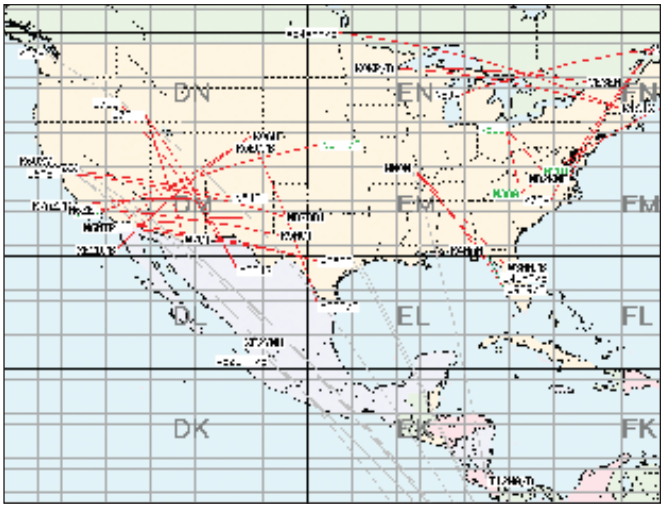


Figure 1 — On January 1, HC2UA was spotted on 50.095 MHz. Was it F_2 or multihop E_s? [**dxmaps.com**]

First 24 GHz contact via the Moon from North America to Japan

Al Ward, W5LUA, worked JA6CZD on 24 GHz on January 2, 2013.

On the Bands

50 MHz. E_s dropped off after the holidays, but a number of good openings were reported mid-month. On January 1, stations in the Pacific Northwest worked California and the Midwest. K7CW, VA7FC and AE7KI were active. From Wichita, Kansas, Bob, WBØNRV, made contacts to Arizona and California. (Bob was active on EME back in the '80s.) VE3KU worked PY1NX at 2253 UTC on the 1st for a great start in the New Year. K1TOL, N3DB, N8CJK, KF8MY and others spotted PP1CZ, PY1RO and PY4RGS. K6QXY, KE7V and NA6XX spotted HC2UA on 50.095 MHz around 2100 UTC January 1 (see Figure 1). This may have been F_2 or multihop E_s. Ecuador has been relatively rare compared to other South American countries.

The solar flux was over 140 the first week of January but no definite North American F_2 contacts were reported. On the 12th, monster sunspot AR1654 was directly facing the Earth, but no significant flares or CMEs occurred. Six meters took a break. Then, on the 13th, E_s formed across the Gulf of Mexico and Central America. This allowed "E_s links" on to South America via TEP. NWØW (EM47) worked TI5XP, TI5/N5BEK and V31AE around 2330 UTC. Then Fred, PY2XB, worked KØYW (DM67), WD5K (EM12) and was heard by WØWOI (EN22) around 0020 UTC. On the evening of the 14th (15th UTC) Dave, N7DB, in Oregon had E_s to Colorado and Kansas.

January 16 UTC the ZL to North America path opened again. W5KI, NØXA (EM28), KA9CFD (EN40), K5SW (EM25), K5YY, WZ8D and others worked Rod, ZL3NW, between 0010–0200 UTC.

W5KI in Arkansas worked Rod at 0013 UTC and heard ZL3NW for over 1½ hours! "Sam, K5SW, worked Rod, ZL3NW (RE66), on 50.095 CW. I thought I had gotten in too late, but kept 'dogging' the posted frequencies. Finally, Rod began to peak about 0142 UTC. San, K5YY and I both called and he went back to San. I called next and worked Rod 559. He was only readable for 3-4 minutes.

I knew he was on the band earlier as I heard guys calling and working him, but I was unable to copy him here until that time frame." Rod sent this e-mail to San:

> Hello San,
>
> Great to make the contact with you and thanks for calling.
>
> We may have had a contact in the past but I too would need to check my paper log.
>
> I was using a TS-2000 and a home-made amplifier using 3 × 4CX250B tubes — about 1 kW out. The antenna is also homemade and is 10 elements on an 80 ft tower. I do however get some QRM from the local TV transmitter, which does not help. It will be going QRT in April so my noise floor should be reduced.
>
> I look forward to future 6m contacts with you.
>
> VY 73 Rod ZL3NW

On the 16th an extensive E_s-TEP opening to South America took place. Again, E_s to the Gulf of Mexico and Central America set the stage. K2DRH (EN40) spotted ZF1EJ at 2324 UTC and Andy, YS1AG, at 2358 UTC. KØHA (EN10) had good copy on PY1RO at 2330 UTC, noting "aurora TEP flutter" on the signal. Brazilian stations were spotted across the southeast states. K4MM heard ZL1RS at 0007 UTC on the 17th. Rare Paraguay ZP5SNA went into K4MVL's log at 0005 UTC. W7OUU in Idaho heard the W9DR/b (EL86) via double hop E_s at 2335 UTC on the 18th.

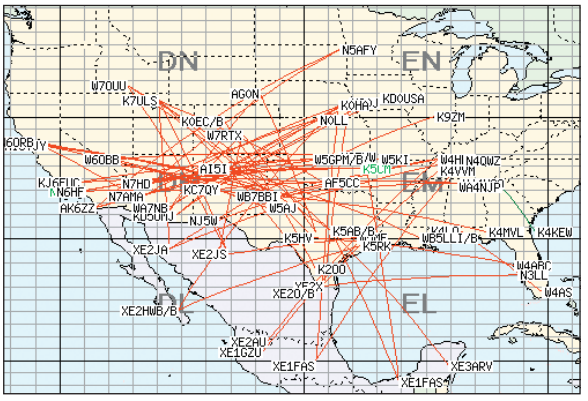


Figure 3 — January 28 was "XE evening" with Mexico working into W4, W5, W7, W9 and WØ lands. [**dxmaps.com**]

"An Interesting Event" — Jim Kennedy, K6MIO/KH6

A rare winter 6 meter opening from Hawaii to the southern states took place the evening of January 18 (19 UTC). K6MIO/KH6 (BK29) worked W4, W5, W6, W7 and WØ from 0024-0120 UTC. Fred, KH7Y, worked K7JA. W4GCB put out the first spot. Jay, N4OX, reports:

"I was one of the fortunate ones to work Jim, K6MIO/KH6, on SSB on January 19, 2013 UTC (January 18 local). I called my buddy, Roger, NA4RR, and he worked him before I did and I thought I was going to be left out, but Jim peaked right after working NA4RR and I put him in the log for my first KH6 on 6 meters. NA4RR was running 50 W from an FT-817 with a Tokyo Hy-Power amplifier (**www.tokyohypower.com**) and a 6 element quad at 35 feet. Jim was the first KH6 for NA4RR as well. I was running 100 W from a Kenwood TS-590S and a Hex Beam at 45 feet. I am borrowing the TS-590S from NA4RR — I told him I get another month of rental on the 590S for the KH6 tip! I believe Bert, WA4VUT, worked Jim as well. Bert has a pair of stacked 5 element M^2 Yagis (**www.m2inc.com**) and 1500 W."

On the 19th, Sam, K5SW (EM25), also "worked Jim, K6MIO/KH6 (BK29), at 0109 UTC on 50.130 MHz SSB with 5 × 5 sigs (he was being worked by many stations, but he was not copied here for a long time, then his signal began to improve). I may have heard bits of the KH9 beacon on 50.014." Tim, NWØW (EM47), heard K6MIO/KH6 and also heard VK5PO weakly CQing under KB7Q. ZL1RS worked K6QG (CM98) in California at 0117 UTC.

The Wake Island beacon KH9/WA2YUN/b was spotted by K5RK, W6TOD and WA7JTM around 0120 UTC!

"I copied KH9/WA2YUN/b at 0134Z on 50.014 nobody home — sob sob." — WA7JTM

What was the propagation mode from North America to Hawaii and Wake Island? K5SW speculated it might be direct F_2 as the path did not cross the geomagnetic equator. Sam observed: "There was lots of E-skip going on as well." From Hawaii, Jim, K6MIO/KH6, thinks that the primary mode was multihop E_s. "The band opened here at 1418 HST 01/18/13 (0018 UTC 01/19/13) and was open for about 1¼ hours. The first station through was WA4VUT in Mobile,

Figure 2 — Jim, K6MIO/KH6, was at his station on January 18 when a rare 6 meter opening formed allowing him to contact stations in the southeastern US. [Jim Kennedy, K6MIO/KH6, photo]

AL. In all, I had 35 contacts and the states worked included Alabama, Arizona, California, Florida, Mississippi, Nevada, Oklahoma, Pennsylvania, Texas and perhaps a couple of others.

"The skip footprints corresponded to $2E_s$, $3E_s$ and $4E_s$. All the signals were of roughly equal strength, as the 'searchlight' lit up one footprint and then another, back and forth. W6 was no stronger than W4 and there were about as many stations worked in each of the three footprints. I suspect that this opening was a combination of chordal sporadic E to the mainland southeast coast with irregularities scattering signals out of the chordal path at roughly $2E_s$, $3E_s$ and $4E_s$ ranges. It was an interesting event."

Jim Kennedy, K6MIO/KH6, presented a talk — "Extreme Multi-Hop 50 MHz E_s" — at the Central States VHF Society (**www.csvhfs.org**) meeting in St Louis, Missouri, July 24, 2010 discussing this type of "extreme" E_s propagation. The terms he mentioned earlier — "$2E_s$, $3E_s$ and $4E_s$" — refer to discrete E layer hops for the signals. The $2E_s$ range is 3400-4400 km, $3E_s$ = 5100-6600 km and $4E_s$ = 6800-8800 km. This is based on the geometry and height of the E layer. With discrete E_s hops, there may be gaps from which a location could not work Hawaii. Often scattering off irregularities in the E_s layer can fill in some of these gaps. Chordal E_s occurs when the signals do not return to earth but reflect within the E layer.

The skip angle would not be enough to return the ray path to the ground, but it could send the path forward nearly parallel to the Earth's surface.

"If the upcoming ray path from the ground-based antenna was somehow bent away from its original path so that it hit the sporadic E cloud at a much shallower angle (often called *grazing incidence*), then the signal could skip off the cloud, also at a shallow angle, but with a much lower free-electron density than otherwise required. The skip angle would not be enough to return the ray path to the ground, but it could send the path forward nearly parallel to the Earth's surface.

"With the Earth's curvature, the path would eventually run into the E layer again farther downstream, without ever hitting the ground, as a chordal hop. The second encounter with the E layer would still be at a very shallow angle and this could produce yet another chordal hop, and so on. If suitable clouds were available farther downstream, this could go on until something else bent the path sharply enough to bring it back down to Earth."[1]

Due to the shallower angle between the signals path and the E layer, the MUF may be higher with chordal hops than regular E_s. The same process occurs in the F layer with TEP. Thus, the January 18/19 opening between Hawaii and the mainland USA was an E layer event, probably due to a combination of chordal E_s and scattering of signals out of the E layer at nE_s distances.

This opening had many stations "pumped up" for the January VHF Contest. Unfortunately, the Hawaiian opening did not repeat itself during the contest. There were some E_s Saturday evening of the contest from W4 to W1, W2, W8, W9 and WØ. From eastern Kansas, W4IMD, and W4NH (EM84) were loud on E_s around 0245 UTC January 20. W9EWZ (EN52) worked Louisiana, Texas and Oklahoma from 0300-0500 UTC. Sunday evening W9EWZ and K2DRH (EN40) worked E_s to Florida. Most of the openings were limited and short lived. On the 22nd BV2DQ and BA4SI copied the KH9/WA2YUN/b at 0500 UTC.

January 28 was "XE evening" for many (see Figure 3). XE1AU, XE2JA, XE2JS and XE2OR worked W4, W5, W7, W9 and WØ from 0100-0300 UTC. Rafael, XE2OR (DL98), ran off 20 contacts with W6 and W7 between 0320-0340 UTC. K7ULS (DN41) worked XE2JS, K2OO, K5HV and KE5Q while running just 100 W and a vertical. N5AFY (EM15) logged XE1CQ, XE1FAS, XE2AU and XE2JS. (Thanks *205MorningReport,* **www.w1rzo.com**.)

The last significant opening of the month took place the evening of the 28th through the 29th UTC. KB3RHR chatted with Eden, ZF1EJ, at 2255 UTC and caught Faber, HK6F, at 2257 UTC, who showed up under Eden on the 28th. I believe Faber is the owner of the HK6FRC/b. AC4TO, N4QWZ and K8LEE spotted LU5FF around 0040 UTC the 19th. Later NØJK (EM28) logged KD5OMJ (DM41) 0240 UTC and NØLL (EM09) chatted with XE2JS (DL68) at 0315 UTC. Bill, KØHA (EN10), logged XE1FAS and XE1GZU (DL80). Bernie, W3UR (*QST*'*s* "How's DX" editor), was active from Dominica as J77A and made some TEP contacts to Argentina, Brazil and Paraguay (**dxing.at-communication.com/en/j76a_j77a_dominica-island**).

144 MHz. There aren't many terrestrial reports this month for 2 meters or the UHF bands despite relatively warm weather in many states. WBØYWW (EN22) worked WØANH in rare EN47 on the 14th at 0308 UTC with 59 signals. NØYK (DM98) worked NØSP (DM79) and WA7KYM (DN71) January 26 at 1425 UTC. John, W5UWB (EL17), caught an interesting "Trans-Gulf" tropo opening on January 27: "While playing on 2 meter EME this evening, 144.117 MHz, I could not detect K9KNW's (EL96ec) EME signal, but after re-aiming the antenna direct, we completed on tropo."

Fred, KH7Y, gave John, W9JN, his 50th state on 2 meters via EME on January 30.

Roger, VE1SKY, has another way to work his favorite VHF and UHF bands despite the propagation doldrums; he has been active on the AO-7, FO-29 and VO-52 satellites. This is a good way to make use of your gear and a challenging activity in its own right. Yuri, UT1FG/mm, who is very active on 6 meters, is on the FO-29 and VO-52 birds from all water grids. (Thanks *205MorningReport.*)

222 MHz. NØPOH (DM79) reports WA7KYM (DN71) and WDØBQM (DN81) are active on 222.

1296 MHz. W5MRB (EM35) heard WD5AGO/b on 1296.300 MHz on January 27 at 1650 UTC.

[1]J. Kennedy, KH6/K6MIO, "Extreme Multi-Hop 50 MHz E_s," Paper presented at the Conference of the Central States VHF Society, St Louis, MO, July 24, 2010.

Here and There

Jeff, K1TEO, graces the February 2013 cover of *CQ Magazine*.

The KH6HME call is now registered to the California Pacific Amateur Radio Club. The KH6HME VHF/UHF and microwave beacons on the "Big Island" will continue to be active under that call sign. Thanks KH7Y.

Lance, W7GJ, will be active from Clipperton Island on 6 meters with the Cordell group TX5K as you read this. Good luck working him.

Al Ward, W5LUA, has worked VK7MO/p in 10 different Australian grids on the 3 centimeter microwave band. VK7MO runs 45 W to a dish antenna that is only 0.7 meters. He uses an 18 inch offset feed on a dish similar to a satellite TV dish antenna. One could run this setup from an apartment, duplex rental or "CC & R" restricted area as this type of dish antenna is allowed. I find this amazing — working the "ultimate DX of EME" from a "no outside antenna" home with a satellite TV dish antenna. Forty five W is high power on the 3 centimeter band but I am intrigued by this concept.

Special Events

Maty Weinberg, KB1EIB, events@arrl.org, www.arrl.org/special-event-stations

Contact these stations and help commemorate history. Many provide a special QSL card or certificate!

Jan 1-Dec 31, 0000Z-2359Z, EI13CLAN, Dublin, Ireland. Irish Radio Transmitters Society. The Gathering. 28.050 21.320 18.080 14.220. Certificate & QSL. David, O'Connor, Silver Howe, Sydenham Mews, Corrig Avenue, Dunlaoghaire Co Dublin, Ireland. *2013 is the year of the Gathering in Ireland, a celebration of all things Irish. The IRTS has been issued a special call, EI13CLAN, which will be on air throughout the year. In keeping with the spirit of the Gathering, the IRTS offers the chance for all amateurs with Irish ancestry to get their call entered on the CLAN Roll of Honor, details at* **irts.ie/clancq** *or* **www.qrz/db/ei13clan.com***; queries* **clan@irts.ie**; **irts.ie**

Mar 15-Mar 17, 1500Z-2200Z, KC5ZJY, Pineville, LA. The Amateur Radio Club of Central Louisiana. Louisiana Nursery Festival Special Event. 21.260 14.250 7.235. Certificate.* ARCCLA, PO Box 8852, Alexandria, LA 71306. **arccla@arccla.us** *or* **www.clarc.us**

Mar 23-Mar 24, 0000Z-2359Z, W4P, Punta Gorda, FL. Peace River Radio Association and Charlotte Amateur Radio Society. Ponce de Leon 500th Anniversary and 2013 Charlotte County Air Show. 14.250. QSL. Peace River Radio Association, PO Box 510943, Punta Gorda, FL 33951. **www.w4dux.net**

Mar 30-Mar 31, 1300Z-2200Z, KC2YYL, Youngstown, NY. Niagara County Special Events Radio Club. Amateur Radio Lighthouse Spring QSO Party. 7.225; 20/17/15/12 m. Certificate. John Titta, AC2DD, 1460 Staley Rd, Grand Island, NY 14072. *YouTube search "KC2YYL." ARLHS #1804. Bands may vary depending on conditions.* **ac2dd@arrl.net** *or* **www.kc2yyl.net**

Apr 1-Apr 6, 0000Z-2359Z, KØR, Boone, IA. Tall Corn Amateur Radio Club. Frost Buster Race. 15 20 40 m SSB CW PSK. Certificate. E-mail only **w0bnw@yahoo.com**. *Commemorating the first race of the season at the Boone Speedway.* **www.qrz.com/kd0med** *or* **www.qsl.net/kd0med**

Apr 4-Apr 7, 1600Z-2359Z, W4GGM, Columbia, TN. Maury Amateur Radio Club. Mule Days. 14.260 14.065 7.260 7.065. QSL. Andreas Eastep, KJ4JEK, 504 Hemingway Dr, Columbia, TN 38401. *A celebration of all things related to mules.* **www.w4ggm.org**

Apr 5-Apr 6, 2200Z-2200Z, W5CCH, Oklahoma City, OK. Oklahoma City-County Health Department Amateur Radio Club. National Public Health Week. 28.365 21.365 14.265 7.265 PSK 14.070 7.035. Certificate. Dave Cox, Oklahoma City-County Health Department, 921 NE 23rd St, Oklahoma City, OK 73105. **www.occhd.org/w5cch**

Apr 6, 1300Z-2100Z, W8VP, Cambridge, OH. Cambridge Amateur Radio Association. World Famous Cambridge Glass, 1902-1958. 14.260 7.235. Certificate & QSL. Cambridge Amateur Radio Association, PO Box 1804, Cambridge, OH 43725. *4th Special Event in CARA's year-long 100th Birthday Celebration. QSL. Certificate available for anyone who works ALL 12 of CARA's monthly Special Events of 2013.* **www.w8vp.org**

Apr 6-Apr 7, 1400Z-1000Z, K4NBR, Titusville, FL. North Brevard Amateur Radio Club. Relay For Life. 28.380 14.200 7.185. Certificate. NBARC, PO Box 1033, Mims, FL 32754. **northbrevardarc.com**

Apr 6-Apr 7, 1800Z-2359Z, WØD, Saint Louis, MO. The Dent County Raiders. Missouri QSO Party. 21.380 14.250 7.220 3.825. QSL. WAØJCO, 6954 Winona Ave, Saint Louis, MO 63109.

Apr 9-Apr 11, 1400Z-2100Z, W4LX, Fort Myers, FL. Fort Myers Amateur Radio Club. Honoring WWII Gunners at Buckingham Airfield. 28.360 21.360 14.270. Certificate & QSL. FMARC, PO Box 61183, Fort Myers, FL 33906. **www.fmarc.net**

Apr 9-Apr 14, 1600Z-2200Z, W4F, Clearwater, FL. Silver Wings Fraternity. Sun n' Fun Fly In. 28.325 21.250 14.250. QSL. Bob Flynn, WA4OAB, 1281 Forrest Hill Dr, Clearwater, FL 33756. **wa4oab@gmail.com** *or* **www.silverwings.org**

Apr 11-Apr 15, 1330Z-0527Z, W1MGY, Indian Orchard, MA. Titanic Historical Society. 101st Anniversary of the Titanic Voyage. 14.260 14.033 7.260 7.033. QSL. Titanic Historical Society QSL, PO Box 51053, 208 Main St, Indian Orchard, MA 01151. **webpages.charter.net/kb1mu/Titanic/titanic.htm**

Apr 12-Apr 13, 1700Z-2400Z daily and Apr 14 1700Z-1900Z, K4S, Venice, FL. Tamiami Amateur Radio Club. Venice Shark's Tooth Festival. 21.313 18.153 14.236 14.075. QSL. Jack Sproat, W4JS, 1419 E Manasota Beach Rd, Englewood, FL 34223. **tamiamiarc.org**

Apr 13, 1300Z-2200Z, W3SGJ, Beaver County, PA. Beaver Valley Amateur Radio Association. 90th Anniversary. 21.380 14.280 7.240 3.970, PSK31, CW. Certificate & QSL. Beaver Valley Amateur Radio Association, PO Box 424, South Heights, PA 15081. *Certificate for two or more bands or two or more modes.* **w3sgj.org**

Apr 13, 1400Z-2100Z, W4MGN, McAlester, OK. Masonic Gathering, Amateur Radio Masons. Celebrating Ninety Years of the International Order of Rainbow for Girls. 14.333. QSL. Wade Massey, 1016 Weiss Ave, Princeton, TX 75407. *To track the station or for additional information, like our Facebook page at* **www.facebook.com/groups/W4MGN.SE/** *or follow us on Twitter @W4MGN* (**twitter.com/W4MGN**).

Apr 13, 1600Z-2259Z, NI6IW, San Diego, CA. USS *Midway* (CV-41) Museum. USS *Midway* (CV-41) Decommissioned 1992, Chief Petty Officer Grade Established 1893. SSB 14.320 7.250 14.070 PSK31 D-STAR 012C. QSL. USS *Midway* Museum Radio Room, 910 N Harbor Dr, San Diego, CA 92101.

Apr 13-Apr 14, 0900Z-1500Z, W4C, Georgiana, AL. Jim Bell Wireless Association. 42nd Annual Calico Fort Arts and Crafts Fair. 28.400 21.350 14.240. QSL. George Milligan, AK4NG, 1507 Ramer Grady Rd, Ramer, AL 36069. *Everyone is invited to stop by and try their hand at the Morse Code Demo table.* **www.k4tns.org**

Apr 13-Apr 14, 1400Z-2000Z, W4S, Sevierville, TN. Sevier County Emergency Radio Service. 101 Years After The Titanic Sinking. 21.325 14.260 7.210 3.815. Certificate* & QSL. Richard Sawaya, Sr, N4JTQ, 2005 Spence Mountain Lp, Sevierville, TN 37876. *100% QSL with a SASE 8 x 10 or larger envelope for both QSL card and certificate.* **2013titanicevent@gmail.com** *or* **www.sevierares.org**

Apr 19-Apr 21, 1700Z-1700Z, K2BSA/8, Zanesville, OH. Muskingum Valley Council BSA. Scoutfest 2013. 14.290 7.190. QSL. Matt Murphy, c/o Muskingum Valley Council BSA, 734 Moorehead Ave, Zanesville, OH 43701. **kc8bew@gmail.com** *or* **kc8bew.net**

Apr 20, 0000Z-2359Z, GB5IMD, Flat Holm Island, Wales. Gordano Amateur Radio Group. International Marconi Day. 28.505 21.250 14.250 7.150. Certificate. Jim Bryant, 2 Redcliffe Close, Portishead, Bristol BS20 8HB, United Kingdom. *Full details at* **g4usb.net/IMD/imd-2013/**. *Awards info* **at g4usb.net/IMD/the-award/**. **www.g4kpm.co.uk/flat-holm-expedition-april-2013.html**

Apr 20, 1400Z-2200Z, K5C, Burton, TX. 24th Annual Cotton Gin Festival. 21.340 14.340 14.040 7.040. Certificate. Burton Cotton Gin Special Event Station K5C, PO Box 98, Burton, TX 77835. **burtoncottongin@earthlink.net**

Apr 20, 1500Z-2200Z, W5BMC, Morgan City, LA. Bayouland Emergency Amateur Radio Service. Bayou Teche Black Bear/Wooden Boat Festival. 14.265 7.265 EchoLink node 507010. QSL. Jackie Price, KA5LMZ, 708 Front St, Morgan City, LA 70380.

Apr 20-Apr 21, 1900Z-1900Z, W7ZA, Aberdeen, WA. Grays Harbor Amateur Radio Club. GHARC Birthday Event. 14.255 14.050. QSL. GHARC Birthday Event, PO Box 2250, Aberdeen, WA 98520. **gharc.org**

Apr 26-Apr 28, 1400Z-2000Z, N9L, Springfield, IL. Sangamon Valley Radio Club. Boy Scouts of America Lincoln Trail Hike. 14.270 14.030 7.260 7.030. QSL. Sangamon Valley Radio Club, c/o American Red Cross, 1045 Outer Park Dr, Springfield, IL 62730. **ed@efgaffney.com** *or* **www.svrc.org**

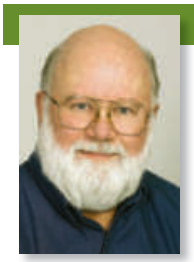
Apr 27, 1200Z-2100Z, W4OLB, Maryville, TN. Smoky Mountain Amateur Radio Club. WB4NBE Commemorative. 14.285 14.070 7.185 7.035. QSL. Smoky Mt ARC, 2054 Independence Dr, Maryville, TN 37803. **smokymountainarc.org**

Apr 27, 1400Z-1900Z, W2M, Poughkeepsie, NY. The QSY Society. 222nd Birthday of Samuel F. B. Morse. 18.076 14.061 7.034. QSL. Stan Levandowski, 6 Chatham Ct, Fishkill, NY 12524. *Do not send money or envelopes!* **wb2lqf@arrl.net** *or* **www.qsysociety.org**

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.

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 **Jun** *QST* would have to be received by **Apr 1**. In addition to being listed in *QST*, your event will be listed on the ARRL Web Special Event page.

You can view all received Special Events at **www.arrl.org/special-event-stations**.



John Dilks, K2TQN, k2tqn@arrl.org

Heathkit SB-240 2 kW Amplifier

A sidelined prototype finds its way into the light.

I discovered an unknown amplifier on eHam.net. The seller's description was very tempting. As I read about the features, I could see it was a descendent of the still popular SB-220 amplifier. In the past I owned two of these and both were very good performers.

The features Heath designed into the SB-240 put this amplifier well ahead of its time. It used the same reliable 3-500Z tubes as the SB-220. This one, housed in the cabinet style of the SB-104 series, was to be sold as a complement to that line. Here are some of the unique features of this amplifier:

- A plug-in transformer
- SSB/CW switchable power supply so you can run 1 kW CW/SSB or 2 kW SSB
- Temperature controlled two stage fan
- Overdrive grid current lock out protection
- Protection up to 5:1 SWR
- Zero signal plate current
- Normal and overdrive LEDs
- Metering of forward PEP, reflected power, plate current, grid current and high voltage
- Requires less than 100 W drive
- Coverage of 80, 40, 20, 15 and 10 meters
- 220 V ac or 125 V ac power supply

It appears this amplifier is like an SB-220 on steroids.

David Poplewski, KC8IV, with his "lost" SB-240.

The seller was David Poplewski, KC8IV. He opened his eHam.net listing with these words, "What! You say you never heard of a Heathkit SB-240 amplifier. Well you and most of the ham radio operators around the world never heard of this amplifier and there is a story behind it. This is a very, very, very, rare piece of Heathkit history."

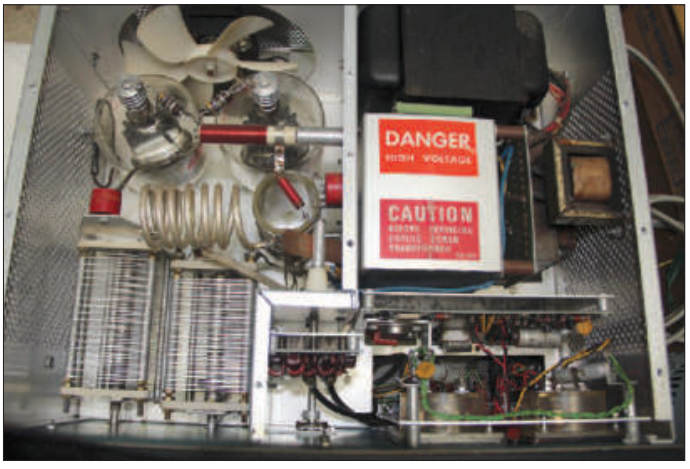
Dave's Story, Working at Heathkit

The story of the SB-240 begins with an American serviceman posted overseas and a fateful mail call:

> During the Vietnam War, in 1968, I was stationed in Germany. One evening, during mail call, I received a Heathkit catalog. This was almost as much of a highlight as receiving a letter from my wife. To get a Heath catalog while in the

This is a front view of the SB-240. You can see the "HOHMBREW Electronics model SIGNAL 2400EX" on the panel.

This is a front panel view of the metering system.



A top view of the interior showing the 3-500Z tubes in the neat and spacious interior.

Army was a real pleasure. I could just drool over all the cool kits to build, but, alas, not while I was so close to going home and getting out of the Army.

When I got to the back of the catalog, I saw an advertisement that the Heath Company was looking for electronic technicians. Since I would be getting out in 90 days, I decided I'd write them a letter about the positions they had and ask them for a job. The Heath Company wrote back and said to come see them when I got out and they would have a job for me.

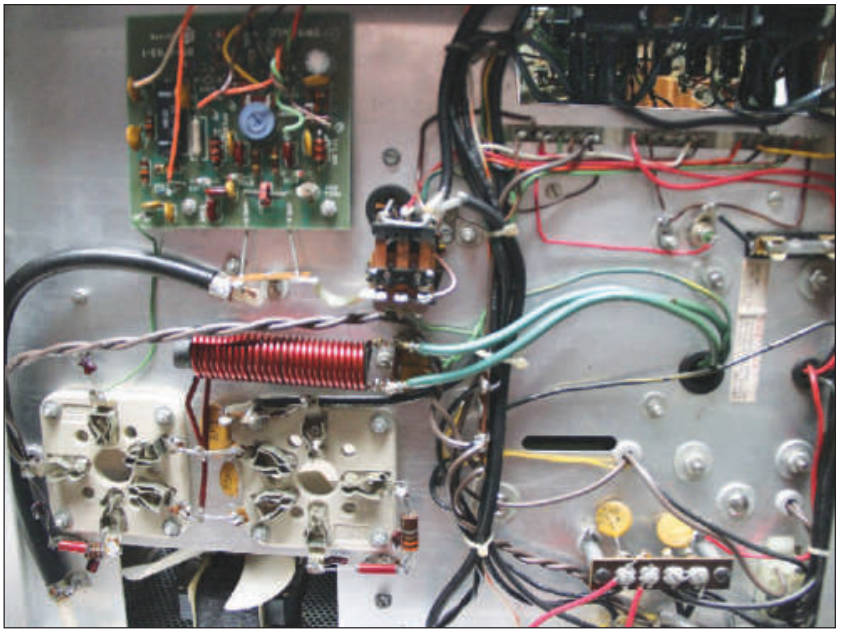
When I got home in the fall of 1968, I headed to Benton Harbor, MI to see about the job. I took a short test, did a few interviews and I was hired as a production line technician in the wired instruments division.

Over his 25 years there, Dave advanced to the position of Technical Consultant for Amateur Radio Products, then to Customer Service Supervisor for Amateur Radio Products, and then to Amateur Radio Product Line Manager.

He eventually moved to Quality Evaluation Engineering where he could put his technical talents to work. It was a hands-on position where he was able to work with engineering and new product development. It was there he had the opportunity to test build this SB-240, evaluating the manual and construction steps.

During beta testing, to disguise the amplifier, the front trim strip said "HOHMBRU Electronics model SIGNAL 2400EX" and was painted the two-tone tan and brown colors.

In his eHam.net posting he went on to say, "Since Heathkit no longer exists; I have decided that I now can sell this amplifier. I have had this amplifier in storage since 1976 and it is beautiful."



The underside shows this to be a well built amplifier in like-new condition.

Why We Never Heard About the SB-240

Dave built a prototype amplifier for evaluation but there the story takes a sharp turn:

> When this amplifier was developed, it was sent from final engineering through the normal Heathkit manual proof build cycle; to establish the engineering and build-ability of the kit. It also was an opportunity to build it using production parts. This was a limited proof build of only 10 units. To my knowledge there are only three still in existence.
>
> As far as engineering and manual departments were concerned, this amplifier was ready for final production. It never made it to market because, about the time it was ready for production, the FCC was considering banning the manufacturing of Amateur Radio amplifiers with 10 meter capability. The decision hadn't actually been made, but the Amateur Radio Product Manager in charge at the time decided he didn't want to pick a fight with the FCC over the issue. He decided to put the product on the shelf and that's where the design stayed. How do I know this is true? Because I worked at Heathkit for 25 years and I was one of the 10 builders. Some of us were lucky enough to retain our proof build units.

Dave's historic SB-240, kit building manual, operating instructions and schematic have been sold to, I assume, a happy new owner.

Dave concluded, "Do I ever regret going to work for Heathkit? Not in the slightest. I can say this: If Heathkit was still in business today with the original management, prior to Zenith, and there was still customer support for its products, at 70 years old I would still be working for Heathkit. I used to love going to work there and it was a pleasure."

Conclusion

There is a photo of another SB-240 online at Sindre Torp's, LA6OP, web page: **home.online.no/~sindtorp/sb240front.JPG**. It is painted in the familiar Heathkit green.

I think Heath missed the boat with this amplifier. I see that Heath later sold a similar (four band) unit, the HL-2200. This one was not very popular as the price was much higher than the SB-220 and SB-221, and it was almost the same amplifier.

Heathkit is gone now. (See "Heathkit Declares Bankruptcy, Closes for Good (Again)") at **www.arrl.org/news/heathkit-declares-bankruptcy-closes-for-good-again**.) Nevertheless, Heathkits are still a favorite in our shacks and will live on in our memories. — *K2TQN*

Convention and Hamfest Calendar

Gail Iannone, giannone@arrl.org

Abbreviations
Spr = Sponsor
Tl = Talk-in frequency
Adm = Admission

Alabama (Greenville) — May 4 D H R T V
8 AM-2 PM. *Spr:* Jim Bell Wireless Assn. Butler County Fairgrounds, 360 American Legion Rd. Repeater Council Meeting. *Tl:* 146.67 (103.5 Hz). *Adm:* $5. Tables: First free, $5 each additional. Jerry McCullough, KE4ERO, 274 W Pettibone Rd, Georgiana, AL 36033; 334-301-5007; **ke4ero@gmail.com**; **www.k4tns.org/hamfest.html**.

Alabama (Mobile) — Apr 13 D F H R V
8 AM-2 PM. *Spr:* Mobile ARC. Abba Shrine Center, 7701 Hitt Rd. *Tl:* 146.82 (203.5 Hz). *Adm:* $5. Tables: $10. Brian Naylor, KF4IRC, 509 Farnell Ln, Mobile, AL 36606; 251-473-6965; **kf4irc@arrl.net**; **w4iax.net/hamfest**.

Arkansas (Dewitt) — May 4 D F R S V
9 AM-4 PM. *Spr:* Grand Prairie ARC. Dewitt Community Center, 1 Ron Fowler Park Ln. *Tl:* 146.58. *Adm:* $2. Tables: $10. Randy Geater, K5NDX, 510 W 14th St, Almyra, AR 72003; 870-672-2508; **grandprairiearc@yahoo.com**.

Arkansas (Texarkana) — May 4 D H R V
8 AM-3 PM. *Spr:* Four States ARC. Four States Fair and Rodeo, 3700 E 50th St. *Tl:* 146.62 (100 Hz). *Adm:* $5. Tables: $10. Danny Freeman, KE5THI, 3612 Bann St, Texarkana, AR 71854; 870-773-1134; **ke5thi@yahoo.com**; **4SARC.org**.

SANTA CLARA VALLEY SECTION CONVENTION

March 23, Del Rey Oaks, CA
D F H R S V

8 AM-5 PM. *Spr:* Naval Postgraduate School ARC. The Moose Lodge, 555 Canyon Del Rey Blvd. *Tl:* 146.97 (94.8 Hz). *Adm:* Free. Tables: $20. Linda Bittner, K6GRL, 831-238-1340; **k6grl@arrl.net**; **radiofest.org**.

California (Sonoma) — Apr 27
D F H R S T V
8 AM-noon. *Spr:* Valley of the Moon ARC. Sonoma Veterans' Memorial Building, 126 First St W. Demonstration of radio stations, direction finding. *Tl:* 145.35 (88.5 Hz). *Adm:* Free. Tables: $10. Darrel Jones, WD6BOR, 358 Patten St, Sonoma, CA 95476; 707-996-4494; **wd6bor@vom.com**; **vomarc.org**.

INTERNATIONAL DX CONVENTION

April 19-21, Visalia, CA
D H Q R S

Friday 9 AM-5 PM, Saturday 8 AM-5 PM, Sunday 7:30-11 AM. *Sprs:* Northern California DX Club, the Central Arizona DXA, and Utah DXA. Visalia Convention Center, 303 E Acequia Ave. DX Academy (Friday, 8 AM-noon); Contest Academy (Friday, 1-5 PM); top DX operators from around the world; special guest from ARRL HQ Ed Hare, W1RFI, Laboratory Manager; N6V Special Event Station; Saturday BBQ lunch; Saturday eve banquet; Sunday Breakfast Buffet; RV parking ($40 for the weekend). *Adm:* advance (online by Apr 10 or mail-in by Apr 5) $100, door $110 (includes all meals); one-day admission $40 (no meals). Steve Jones, N6SJ, 2100 Bear Gulch Rd, Woodside, CA 94062; 650-851-8985; **n6sj@earthlink.net**; **www.dxconvention.org**.

Connecticut (Gales Ferry) — Apr 20 F H R
Sellers 8 AM for equipment setup; 9 AM for bidders' inspection; public 10 AM-3 PM (or until last item is sold). *Spr:* Radio Amateur Society of Norwich. Gales Ferry Firehouse, 1772 Rte 12. RASON Auction. *Tl:* 146.73, 449.725 (156.7 Hz). *Adm:* $2. Gary Divan, WT1SND, 102 Plain Hill Rd, Baltic, CT 06330; 860-884-4218; **WitsEnd@portone.com**; **www.RASON.org**.

EASTERN VHF/UHF CONFERENCE

April 26-28, Manchester, CT
D F H R S T

Friday 6-10 PM, Saturday 8 AM-10 PM, Sunday 8 AM-noon. *Spr:* North East Weak Signal Group. Baymont Inn and Suites, 20 Taylor St. Friday eve Hospitality Room, Saturday banquet. *Tl:* 144.2 USB. *Adm:* advance $25, door $30. Mark Casey, K1MAP, 480 Main St, Hampden, MA 01036; 413-566-8118; **map1@mapinternet.com**; **newsvhf.com**.

Coming ARRL Conventions

March 16
Nebraska State, Lincoln, NE*
West Texas Section, Midland, TX*

March 23
Santa Clara Valley Section, Del Rey Oaks, CA
South Texas Section, Rosenberg, TX*
MicroHAMS Digital, Redmond, WA*

March 29-30
Maine State, Lewiston, ME*

March 30
North Carolina State, Raleigh, NC*

April 13-14
Communications Academy, Seattle, WA

April 19-20
Southeastern VHF, Cocoa Beach, FL

April 19-21
International DX, Visalia, CA

April 20
Louisiana State, Monroe, LA

April 26-28
Eastern VHF/UHF, Manchester, CT
Idaho State, Boise, ID

May 4
South Carolina Section, Spartanburg, SC

May 17-19
Dayton Hamvention®, Dayton (Trotwood), OH

May 31-June 2
Northwestern Division, Seaside, OR

June 1
Georgia State, Marietta, GA

June 7-8
West Gulf Division, Plano, TX

June 8
Delta Division, Rogers, AR
Tennessee State, Knoxville, TN

*See March *QST* for details.

SOUTHEASTERN VHF SOCIETY CONFERENCE

April 19-20, Cocoa Beach, FL
D F H S

Friday and Saturday 9 AM. *Sprs:* Southeastern VHF Society and Florida Weak Signal Society. Hilton Cocoa Beach Oceanfront, 1550 N Atlantic Ave. Noise figure and antenna range, Friday luncheon with WB4SLM; Saturday banquet. *Adm:* See website. Chuck Hoover, KØVXM, 1945 E Phillips Ct, Merritt Island, FL 32952; 321-453-1193; **k0vxmfl@gmail.com**; **www.svhfs.org**.

Florida (Coral Gables) — Apr 20 F T
7 AM-noon. *Sprs:* Flamingo Net and University of Miami ARC. University of Miami, Physics Parking Lot, 5101 San Amaro. *Tl:* 147.15 (94.8 Hz). *Adm:* Free. Bill Moore, WA4TEJ, 4470 SW 74th Ave, Miami, FL 33155; 305-264-4465; **wa4tej@juno.com**; **www.flamingonet.8m.net**.

Florida (Hudson) — Mar 16 H R T V
Setup 6 AM; public 8 AM. *Spr:* Gulf Coast ARC. EZ Mini Storage, 15830 US 19 N. *Tl:* 146.67. *Adm:* $6. Tables: $6 (includes 1 tailgate space). Bill Pfaff Jr, KI4QJK, 13304 Laurel Wood Ct, Hudson, FL 34667; 727-869-0784; **ki4qjk@yahoo.com**; **gulfcoastarc.org**.

Florida (Oakland Park) — Apr 13 F H R T V
Sellers 6 AM, buyers 7 AM. *Spr:* Broward ARC. Collins Center, 3900 NE 3rd Ave. Cy Harris W4MAQ Memorial Free Flea. *Tl:* 146.91 (110.9 Hz). *Adm:* Free. Robin Terrill, N4HHP, 4240 SW 20th St, Ft Lauderdale, FL 33317; 954-249-5343; **n4hhp@comcast.net**; **browardarc.org**.

Florida (Orlando) — Apr 20 D H R T
6 AM-noon. *Spr:* AES Orlando. Amateur Electronic Supply, 620 Commonwealth Ave. *Tl:* 444.125 (103.5 Hz). *Adm:* Free. Tables: Bring your own tables and chairs. Jack Moyer, K4KDI, 12026 Florida Woods Ln, Orlando, FL 32824; 407-443-1963; **k4kdi@hotmail.com**; **aesham.com**.

Florida (Tampa) — Apr 20 F H Q R T V
8 AM-1 PM. *Spr:* Tampa ARC. TARC Clubhouse, 7801 N 22nd St. TARCFest. *Tl:* 147.105 (146.2 Hz). *Adm:* $3. Tables: $15. Bill Bode, N4WEB, 14302 Capitol Dr, Tampa, FL 33613; 813-382-9262; **n4web@hamclub.org**; **www.hamclub.org**.

Georgia (Ellijay) — Mar 16 H R T
7 AM-2 PM. *Spr:* Ellijay ARS. Ellijay Lions Club, 1729 S Main St. *Tl:* 145.17 (100 Hz). *Adm:* $5. Tables: None provided. Richard Wehunt, W4LKD, 6768 Doublehead Gap Rd, Blue Ridge, GA 30513; 706-838-4956; **jgwehunt@yahoo.com**; **www.w4hhh.org**.

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

Georgia (Sugar Valley) — Apr 27
D F H R S T V
8 AM-2 PM. *Spr:* Cherokee Capital ARS. Sugar Valley Community Center, 3295 Sugar Valley Rd NW. *Tl:* 443.675, 146.805 (both 100 Hz). *Adm:* $5. Tables: $10. Felton Floyd, AF4DN, 1054 Mountain Loop Rd NW, Sugar Valley, GA 30746; 770-324-9859; fax 706-337-2289; **af4dn@arrl.net**; **www.k4woc.com**.

IDAHO STATE CONVENTION
April 26-28, Boise
D H Q R S T V

Friday noon-Sunday noon. *Spr:* Voice of Idaho ARC. Boise Hotel and Convention Center, 3300 S Vista Ave. *Tl:* 147.24 (100 Hz). *Adm:* advance $10, door $12. Tables: $60. Don Lynn, ND7L, 41 N Hastings Dr, Nampa, ID 83687; 208-899-5801; **don_lynn@pacbell.net**; **www.idahostateconvention.com**.

Illinois (Arthur) — Apr 21 D F H R S T V
8 AM-noon. *Spr:* Moultrie ARK. Moultrie/Douglas County Fairgrounds, IL Rte 133. *Tl:* 146.655 (162.2 Hz). *Adm:* $7. Tables: $10. Ralph Zancha, WC9V, Box 55, Lovington, IL 61937; 217-254-7574; fax 217-728-4016; **rzancha@one-eleven.net**; **www.qsl.net/mark/**.

Illinois (Galva) — Apr 21 D F H R T
8 AM-noon. *Spr:* Area AR Operators. Galva High School, 1020 N Center Ave. *Tl:* 145.49 (225.7 Hz). *Adm:* advance $5 (3 stubs), door $5 (1 stub). Tables: $10. Bill Anderson, WA9BA, 30 Wallace St, Galva, IL 61434; 309-932-3023; **wa9ba@arrl.net**; **www.aa9ro.com**.

Illinois (Sandwich) — May 5 D F H R T
8 AM-2 PM. *Spr:* Kishwaukee ARC. Sandwich Fairgrounds, 1401 Suydam Rd. DeKalb Hamfest. *Tl:* 146.73 (100 Hz). *Adm:* advance $5 (double stub), door $7 (single stub). Tables: $10 (bring your own chairs). Bob Yurs, W9ICU, 1107 Commercial St, Sycamore, IL 60178; 815-895-7584; **w9icu@arrl.net**; **www.karc-club.org**.

Indiana (Columbus) — Apr 13 F H R V
8 AM-2 PM. *Spr:* Columbus ARC. Bartholomew County Fairgrounds Community Building, 750 W County Rd 200 S. *Tl:* 146.79 (100 Hz). *Adm:* advance $4.50, door $5. Tables: $8. Matthew Bruner, KC9BWO, 325 Robbins St, Hope, IN 47246; 812-375-4860; **kc9bwo@att.net**; **www.carcnet.org**.

Indiana (Peru) — Apr 20 D F H R V
7 AM-1 PM. *Sprs:* Cass County, Grant County, Miami County, and Kokomo ARCs. Miami County 4-H Fairgrounds, 1029 W 200 N. *Tl:* 147.345. *Adm:* $5. Tables: $5. Steve Shepler, WA9RVM, Box 824, Marion, IN 46952; 765-661-5260; **shepler1@gmail.com**; **nci-hamfest.net**.

Iowa (Des Moines) — Apr 20 D F H R V
8 AM-1 PM. *Spr:* Des Moines RA Assn. Iowa State Fairgrounds, Elwell Family Center, E 30th St and E University Ave. *Tl:* 146.94 (114.8 Hz). *Adm:* $6. Tables: $20. Kevin Sanders, KØKDS, Box 88, Des Moines, IA 50301; 515-999-0426; **info@dmraa.com**; **www.dmraa.org/hamfest**.

LOUISIANA STATE CONVENTION
April 20, Monroe
D F H Q R S V

8 AM-2 PM. *Spr:* Twin City Ham Club. Barak Shrine Temple, 6620 Frontage Rd. Northeast Louisiana Regional Ham RadioFest; special guest from ARRL HQ Mike DeChristopher, N1TA, MVP Awards and Program Assistant. *Tl:* 146.85. *Adm:* $5. Tables: $10. Robert Oehmichen, N5ARM, 2402 Pinehurst Dr, Monroe, LA 71201; 318-366-3332; **n5arm@arrl.net**; **w5ea.org**.

Louisiana (Ruston) — Apr 27 F H R S T V
8 AM-1 PM. *Spr:* Piney Hills ARA. Cook Parish Park, 2800 Kavanaugh Rd. Swapfest/Hot Dog Social. *Tl:* 147.12 (94.8 Hz). *Adm:* Free. Tables: Free. James Christian, W5JC, 555 Pisgah Church Rd, Bernice, LA 71222; 318-285-7417; **w5jc@hotmail.com**; **www.phara.us**.

Maine (South Portland) — Apr 20
D F H R T V
8 AM-noon. *Spr:* Portland Amateur Wireless Assn. Stewart Morrill American Legion Post #35, 413 Broadway St. *Tl:* 146.73 (100 Hz). *Adm:* $5. Tables: $10. John Bogner, W1JLB, 90 Wayside Rd, Portland, ME 04102; 207-776-2288; **jbogner1@maine.rr.com**; **www.qsl.net/pawa**.

Maryland (Hagerstown) — May 4
D H Q R S T V
8 AM-noon. *Spr:* Antietam Radio Assn. Washington County Agricultural Center, 7313 Sharpsburg Pike (Rte 65). *Tl:* 147.09 (100 Hz). *Adm:* $5. Tables: advance $10, door $15. Herman Niedzielski, K2AVA, 21512 Leitersburg-Smithsburg Rd, Hagerstown, MD 21742; 301-791-5841; **k2ava@myactv.net**; **www.w3cwc.org**.

Massachusetts (Cambridge) — Apr 21. Nick Altenbernd, KA1MQX, 617-253-3776 (9 AM-5 PM); **w1gsl@mit.edu**; **www.swapfest.us**.

Michigan (Cadillac) — May 4 D F H R V
8 AM-noon. *Spr:* Wexaukee ARC. Cadillac Jr High School, 500 S Chestnut St. *Tl:* 146.98. *Adm:* $5. Tables: $10. Alton McConnell, NU8L, Box 163, Cadillac, MI 49601; 231-876-1485; **nu8l@yahoo.com**; **www.wexaukeearc.org**.

Michigan (Highland) — Apr 20 D F H R
8 AM-noon. *Spr:* Milford ARC. Milford High School, 2380 S Milford Rd. *Tl:* 145.49 (67 Hz). *Adm:* advance $5, door $6. Tables: $1.50 per foot. Robert Mueller, K8RGM, 3655 W Buno Rd, Milford, MI 48380; 248-685-8903; **k8rgm@comcast.net**.

Minnesota (Brainerd) — Apr 20 D F H R V
9 AM-1 PM. *Spr:* Brainerd Area ARC. Brainerd National Guard Armory, 1115 Wright St. *Tl:* 147.225. *Adm:* $6. Tables: $12. Al Doree, WØRC, 33247 E Shamineau Dr, Motley, MN 56466; 218-575-2404; **doreeaj@brainerd.net**; **www.brainerdham.org**.

Missouri (Aurora) — Apr 13 D F H R S V
Set up Friday 6-8 PM, Saturday 6-8 AM; public Saturday 8 AM. *Spr:* Ozark ARS. Pate Early Childhood Center, 400 Terrace Dr. *Tl:* 146.97. *Adm:* advance $4, door $5. Tables: advance $8, door $10 (first free). Mike Sanders, KØAZ, 18169 Hwy 174, Mount Vernon, MO 65712; 416-466-0401; **k0az@arrl.net**; **www.w0oar.com**.

Missouri (Kansas City) — Apr 20
D F H R S V
8 AM-2 PM. *Spr:* Ararat Shrine ARC. Ararat Shrine Center, 5100 Ararat Dr. *Tl:* 145.13. *Adm:* advance 3 for $10, door $4 each. Tables: $17. David Hinkley, KAØSOG, 1221 SE 11th St, Lee's Summit, MO 64081; 816-525-4826; **ka0sog@arrl.net**; **www.hambash.com**.

New Hampshire (North Conway) — Mar 16
D F R V
8 AM-1 PM. *Spr:* White Mountain ARC. North Conway Community Center, 2628 White Mountain Hwy (Rte 16). *Tl:* 145.45 (100 Hz). *Adm:* $3. Tables: $10. Greg Fitch, KB1EZJ, Box 1932, Conway, NH 03818; 603-759-6671; **kb1ezj@w1mwv.com**; **www.W1MWV.org**.

New Jersey (Succasunna) — Apr 20
D F H Q R T V
Sellers 6 AM, buyers 8 AM. *Spr:* Splitrock ARA. Roxbury Senior Center, 72 Eyland Ave. *Tl:* 146.985 (131.8 Hz). *Adm:* $7. Tables: $25 (tailgating $20). Greg Mohr, W2GCM, Box 610, Rockaway, NJ 07866; 973-945-5191; **operations@splitrockara.org**; **www.splitrockara.org**.

New Jersey (Tinton Falls) — May 4
D F H R T V
Setup 7 AM; public 8 AM-noon. *Spr:* Garden State ARA. MOESC (formerly called MAECOM), 100 Tornillo Way. *Tl:* 147.045 (67 Hz). *Adm:* $5. Tables: $15 (per parking space; includes 1 admission). John King, KA2F, 18 Carmel Way, Eatontown, NJ 07724; 732-542-1822; **ka2fka2f@yahoo.com**; **www.gardenstateara.org**.

New Mexico (Albuquerque) — Apr 27 R T
Dawn-Noon. *Sprs:* AR Caravan Club and Albuquerque ARC. Transcore Parking Lot, 8600 Jefferson St NE. *Tl:* 145.33 (100 Hz). *Adm:* Free. Don Wood, W5FHA, 9100 Wimbledon Dr NE, Albuquerque, NM 87111; 505-828-0988; **w5fha@arrl.net**.

New York (Binghamton) — Apr 14
D F H R V
8 AM-2 PM. *Spr:* Binghamton ARA. Broome Community College (Ice Center), 907 Upper Front St. Hamfest and Technology Show. *Tl:* 146.865 (146.2 Hz). *Adm:* $6. Tables: $10. Louis Alfonsetti, AC2HL, 5 Parmerton Dr, Endicott, NY 13760; 607-768-6685; **bara hamfest@gmail.com**; **www.w2ow.org**.

New York (Middletown) — Apr 14
D F H R T V
8 AM-4 PM. *Sprs:* KJI Electronics and DX Engineering. Dennis Cosgrove Community Center, 8 Wes Warren Dr. *Tl:* 146.76 (100 Hz). *Adm:* $6. Tables: $12 (advance only by Apr 5); $10 (space only, bring your own table). Neil Shubert, AC2O, 16 Pioneer Tr, Monroe, NY 10950; 914-490-2001; **carmic7@gmail.com**; **www.ocarc-ny.org**.

New York (Palmyra) — Apr 13 D F H R T V
Setup 7 AM; public 8 AM. *Spr:* Drumlins ARC. VFW Memorial Post 6778, 4306 Rte 31. *Tl:* 146.685. *Adm:* $5. Tables: $5. David Taylor, KB2KBY, 228 W Jackson St, Palmyra, NY 14522; 315-597-4293; **kb2kby@rochester.rr.com**; **www.drumlinsarc.org**.

North Carolina (Kinston) — Apr 27
D F H Q R S T V
8 AM-3 PM. *Spr:* Down East Hamfest Assn. Lenoir Community College Gymnasium, 231 Hwy 58 S. *Tl:* 146.685, alternate 145.31 (both 82.5 Hz). *Adm:* advance $5 each or 3 for $12, door $6 each or 3 for $15. Tables: $12; 2 tailgate spaces $12; electric outlets $5 each. Byron Highland, K4BMH, 3753 Thorne Dr, Farmville, NC 27828; 252-347-1498; **bhighland@nc.rr.com**; **www.downeasthamfest.org**.

North Carolina (Morganton) — Apr 20
D F H R S T V
8 AM-1 PM. *Spr:* McDowell ARA. Burke County Fairgrounds, 145 Bost Rd. *Tl:* 147.15. *Adm:* advance $4, door $5. Tables: $10. Michael Fox, KF4MWX, 4895 Karen Ct, Morganton, NC 28655; 828-437-2787; **kf4mwx@gmail.com**; **www.cvhamfest.com**.

Ohio (Athens) — Apr 28 D F H R S T V
8 AM-1 PM. *Spr:* Athens County ARA. Athens Community Center, 701 E State St. *Tl:* 145.15. *Adm:* $5. Tables: advance $10, door $14. William McFadden, WD8RIF, 12600 Adeline Cir, Athens, OH 45701; 740-593-7176; **wd8rif@arrl.net**; **ac-ara.org/**.

Ohio (Cuyahoga Falls) — Apr 13 D F H R
8 AM-1 PM. *Spr:* Cuyahoga Falls ARC. Emidio & Sons Party Center, 48 E Bath Rd. 59th Annual Hamfest. *Tl:* 147.27. *Adm:* $6. Tables: $21/$15. Ted Sarah, W8TTS, 239 Bermont Ave, Munroe Falls, OH 44262; 330-688-2013; **w8tts@w8tts.com**; **www.cfarc.org/hamfest2013.html**.

Ohio (Jackson) — Apr 20 D F H R T V
9 AM-1 PM. *Spr:* Jackson County ARC. OSU Extension Facility, 17 Sandpipe Rd. *Tl:* 146.79 (167.9 Hz). *Adm:* $5. Tables: Free. Sid Grant, W8SFC, Box 241, Wellston, OH 45692; 614-354-9477; **ggrant5@roadrunner.com**.

Pennsylvania (Boston/McKeesport) — Apr 28 D F H R V
8 AM-2 PM. *Spr:* Two Rivers ARC. The Boston Spectrum, 6001 Smithfield St. *Tl:* 146.73, 146.52. *Adm:* $5. Tables: $20. Roger Johnson, WI3R, 1301 Clearview Ave, White Oak, PA 15131; 412-203-2015; **wi3r@comcast.net**; **www.trarc.net**.

Pennsylvania (Newtown/Wrightstown Twp) — May 5 D F H Q R T V
Setup 6 AM, public 7 AM. *Spr:* Warminster ARC. Middletown Grange Fairgrounds, 576 Penns Park Rd. *Tl:* 147.09, 443.95 (both 131.8 Hz). *Adm:* $5. Tables: indoor $15; tailgating $10 plus admission. Stew Leabman, KB3JRB, Box 113, Warminster, PA 18974; 215-794-1360; **hamfest12@k3dn.org**; **www.k3dn.org/hamfest.htm**.

Pennsylvania (Spring Grove) — Apr 13 D F H Q R S T V
8 AM-1 PM. *Spr:* York Hamfest Foundation. Porters Community Fire Company, 1199 Porters Rd. *Tl:* 147.33 (123 Hz). *Adm:* $6. Tables: $15 each for first 3 tables; $5 for each additional over 3. Duane Sterner, KB3QLQ, 7197 Hershey Rd, Spring Grove, PA 17362; 717-332-1385; **duane.sterner@yahoo.com**; **www.yorkhamfest.org**.

South Carolina (Moncks Corner) — Apr 20 T
9 AM-3 PM. *Spr:* Trident ARC. Moncks Corner Fraternal Order of Police Lodge 19, 1310 S Live Oak Dr. 7th Annual TARC Tailgate Party. *Tl:* 147.15 (91.5 Hz). *Adm:* $2. Tables: $5. Vaughn Duryea, KJ4ZFY, 207 Hollytree Cir, Ladson, SC 29456; 843-771-4969; **vduryea@sc.rr.com**; **www.tridenthams.org/events.htm**.

SOUTH CAROLINA SECTION CONVENTION

May 4, Spartanburg
D F H R S T V

8 AM. *Spr:* Blue Ridge ARS. Piedmont Interstate Fairgrounds, 575 Fairgrounds Rd. Upstate Hamfest. *Tl:* 146.61, 146.82. *Adm:* advance $7, door $8. Tables: $31 (first), $11 each additional. Rick Bagwell, KD4DRA, 108 Pinonwood Ct, Simpsonville, SC 29680; 864-414-1352; **kd4dra@gmail.com**; **brars.org**.

Tennessee (Bartlett) — Apr 13 D F H Q R S T V
9 AM-3 PM. *Spr:* Mid-South ARA. Bartlett Station Municipal Center, 5868 Stage Rd. Memphis FreeFest. *Tl:* 147.03 (107.2 Hz). *Adm:* Free. Tables: Free. Tony Brignole, WA4KHN, 2444 LaCosta Dr, Bartlett, TN 38134; 901-372-2738; **abrigno@comcast.net**; **www.maraonline.org**.

Tennessee (Clarksville) — May 4 F H R T
8 AM-2 PM. *Spr:* Clarksville Amateur Transmitting Society. Hilldale Baptist Family Life Picnic Pavilion, 250 Old Farmers Rd. *Tl:* 147.39 (123 Hz). *Adm:* Free. Tables: Free. John Freed, KX6F, 216 Maplewood Dr, Clarksville, TN 37042; 931-216-2503; **jdfreed@bellsouth.net**; **www.kf4l.org**.

Texas (Belton) — Apr 20 D F H R T V
7 AM-2 PM. *Spr:* Temple ARC. Bell County Expo Center, 301 W Loop 121. HamEXPO. *Tl:* 146.82 (123 Hz). *Adm:* $5. Tables $10-$25. Mike LeFan, WA5EQQ, 1802 S 13th St, Temple, TX 76504; 254-773-3590; fax 254-231-4128; **mlefan@lefan.com**; **www.beltonhamexpo.org**.

Texas (Smithville) — May 4 D H R T
7 AM-noon. *Spr:* Bastrop County ARC. Dr. George M. Jones VFW Post 1309, 557 Loop 230 N. *Tl:* 145.35, 443.75 (114.8 Hz). *Adm:* $1. Tables: $10. Al Loeschman, WD5IQR, 1197 Lovers Ln, Bastrop, TX 78602; 979-574-3655; **wd5iqr.al@gmail.com**; **www.bcarc-hams.org/**.

COMMUNICATIONS ACADEMY

April 13-14, Seattle, WA
D H R S

Saturday and Sunday 8:30 AM-5 PM. *Sprs:* WWA Medical Services Communications, ARES of King County, and Seattle ACS. South Seattle Community College, 6000 16th Ave W. Radio Kit Contest; Communications Vehicles display; special guest from ARRL HQ Mike Corey, KI1U, Emergency Preparedness Manager. *Tl:* 441.8 (141.3 Hz). *Adm:* advance early-bird by Apr 1 $30 (1 day), $55 (2 days); Apr 2-10 $35 (1 day), $65 (2 days); door $45 (1 day), $75 (2 days); all admission fees include lunch. Marina Zuetell, N7LSL, Box 15624, Seattle, WA 98115; 206-524-6567; **n7lsl@arrl.net**; **CommAcademy.org**.

Washington (Selah) — Apr 13 F H R V
9 AM-4 PM. *Spr:* Yakima ARC. Selah Civic Center, 216 S 1st St. *Tl:* 146.66 (123 Hz). *Adm:* $7. Tables: advance $15, door $20. Lindsay Kooser, N7RHW, Box 9211, Yakima, WA 98909; 509-965-6612; **n7rhw@arrl.net**; **w7aq.org**.

West Virginia (Ripley) — May 5 D F H R V
8 AM-2 PM. *Spr:* Jackson County ARC. Ripley Middle School, 1 School St. *Tl:* 146.67. *Adm:* $5. Tables: $5. Roy Moore, KB8ZSG, 25 Daniels Run Rd, Spencer, WV 25276; 304-927-4412; **afa2ax@yahoo.com**.

Wisconsin (Cedarburg) — May 4 D H R
Setup 6 AM; public 8 AM. *Spr:* Ozaukee RC. Circle-B Recreation Center, 6261 State Hwy 60. *Tl:* 146.97 (127.3 Hz). *Adm:* advance $4, door $5. Tables: $10 (buy 4, get 1 free). Tom Nawrot, AA9XK, 10335 N Grasslyn Rd, Mequon, WI 53092; 262-242-1029; **tnawrot@wi.rr.com**; **www.ozaukeeradioclub.org**.

Wisconsin (Stoughton) — Apr 13 D F H R S V
8 AM-noon. *Spr:* Madison Area Repeater Assn. Mandt Community Center, 400 Mandt Parkway. *Tl:* 147.15 (123 Hz). *Adm:* $5. Tables: $16 (until Apr 1), $20 (Apr 1-12), $25 day of event. Paul Toussaint, N9VWH, 3835 County Rd A, Stoughton, WI 53589; 608-205-1994; fax 608-205-1996; **w9hsy@execpc.com**; **www.qsl.net/mara/swapfest.html**.

Wisconsin (Superior) — May 4 D F H R V
9 AM-2 PM. *Spr:* Arrowhead RAC. Head of the Lakes Fairgrounds, 4700 S Tower Ave. *Tl:* 146.94 (103.5 Hz). *Adm:* $7. Tables: $10. Robert Schulz, KCØNFB, 115 Eden Ln, Duluth, MN 55805; 218-724-6957; **arac_hamfest@charter.net**; **www.thearac.org**.

Wyoming (Sheridan) — Apr 20 F H R V
8 AM-2 PM. *Spr:* Cloud Peak Radio and Electronics Group. Masonic Lodge, 109 S Gould St. *Tl:* 146.82 (100 Hz). *Adm:* Free. Tables: $10 before Apr 7, $15 after Apr 7. Gary Morton, AA5XJ, 2076 Summit Dr, Sheridan, WY 82801; 307-752-4536; **aa5xj@arrl.net**.

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 **April 1** to be listed in the **June** 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**.

The Learning Never Stops

A faded teenage interest in ham radio revitalizes one ham's retirement.

Mike Marshall, KF7VKF

Back in the late 1970s I wanted to be a ham operator, but I had one major problem — the code requirement. I could appreciate CW as a skill, but I knew I would never master it. The 2007 elimination of the code requirement helped increase my interest in Amateur Radio, and I sincerely believe many others have joined our ranks because they weren't required to learn code.

Due to my fear of learning code, I became a Citizens Band operator in the 1970s. Back then you had to be licensed for CB, but unfortunately, there were more unlicensed CB operators than licensed ones and finally the licensing requirement was eliminated. When the CB radio service became a circus I became disenchanted, sold my FT-101 ham transceiver and took up other hobbies.

The Time Is Right

Over the years I still yearned to be part of the amateur community. I saw the good hams did in floods, hurricanes and other disasters. Within 3 months of my retirement I moved to a new state, settled in my new home and was ready to track down a ham club in my area so I could find out how to become one of those people I truly admired.

When I was young, you knew if there was a ham in your neighborhood by their tower or because you experienced television interference. Now, with the Internet, you can go to a website and find when and where a ham club is meeting. That's exactly what I did.

I attended my first meeting in March 2012 and met wonderful people who encouraged me to take my Technician license test. Just before the April meeting, I passed.

While I waited for my license to be added to the database, I acquired the equipment I wanted for my shack. I knew I wanted an FT-101 for nostalgic reasons and a 2 meter rig would be a necessity. Many helpful people gave suggestions and an Elmer suggested I look on the club website, where someone had an FT-101 for sale. I bought that beautiful piece of equipment and the addiction started. I soon bought three 2 meter mobile units and one handheld dual-band transceiver. I bought two working 2 meter mobile units, one for a base and one for my truck as well as one inoperative one that I could fix.

I soon discovered that setting up a shack required more than a transceiver, microphone and antenna. I forgot how much equipment I accumulated during my CB years. I probably haven't spent as much on all my equipment as some spend on just their transceiver, but equipping my shack is still exciting.

What have I gleaned from this experience? I learned that no matter how old I get, learning never stops. I learned that if you want to belong to a group you have to seek them out and participate. I even realized that CW, while not my best area, can be learned. I haven't learned it yet, but I will.

Michael Marshall, KF7VKF, an ARRL® member, was born in California but moved to Utah in 2011. He became a ham operator in 2012. Mike has five base stations, four of which are tube type units. He also has four mobile units and two handhelds. When Mike bought his current house he made sure there were no antenna restrictions and then became a ham. Mike belongs to ARES® and the Dixie Amateur Radio Club and has worked the St George Marathon. He can be reached at 337 N 3560 W, Hurricane, UT 84737, **youngbloodhawk@hotmail.com**

Mary M. Hobart, K1MMH, k1mmh@arrl.org

The ARRL Foundation Creates New Funds

On February 5, 2013 the ARRL Foundation Board of Directors met by conference call for its Annual Meeting. In addition to conducting the business of electing officers as well as reviewing the year-end financial report, the FY 2012 audited financial statements and activity in the Foundation's investment portfolio, the nine Directors unanimously approved the creation of several new funds.

The Betty Weatherford, KQ6RE, Memorial Scholarship was created as an endowed scholarship. The Board also voted to divide the $481,360.91 gift from the estate of Alfred E. Friend, Jr., W4CF, into an endowed scholarship fund and a new endowed educational activities fund. After a review of the guidelines for creating new scholarships, the Board voted to formalize the contribution level for an endowed scholarship at $25,000 and the minimum award for any new scholarship at $1,000.

Individuals or clubs interested in creating or transferring a scholarship to the ARRL Foundation should visit the scholarship program section of the ARRL website at **www.arrl.org/sample-terms-of-reference**.

Amateur Radio or other youth oriented groups interested in applying for grant funding, including the new Alfred E. Friend Jr, W4CF, Education Activities Fund, should visit **www.arrl.org/amateur-radio-grants** for more information.

The ARRL Foundation is an IRS-designated non-profit organization holding federal tax identification number 23-7325472. Contributions to the ARRL Foundation are tax deductible as allowed by law.

75, 50 and 25 Years Ago

Al Brogdon, W1AB

April 1938

- The cover photo shows an unintentionally funny photo of two hams climbing a tree, ropes in hand, ready to hang some new antennas.
- The editorial discusses the way ham radio opens doors to the world for handicapped people.
- In "Amateurs Mobilize in Southern California Flood Emergency," Clinton B. DeSoto, W1CBD, reports that many isolated cities' only contact with the rest of the world was via hams.
- John Tynes, W6GPY, presents "A Tuned Loop for 80- and 160-Meter Reception."
- "Some Practical Aspects of Speech Amplifier Design," by Dana Bacon, W1BZR, describes how to get wide frequency response with low hum levels.
- "Putting the Harmonic Generator to Work," by John Reinartz, W1QP, tells us about his four-band transmitter with an 814 final.
- National Park Service Engineers R. D. Waterhouse and W. C. Hilgedick describe the "De Luxe Battery-Operator Portable Stations" used by that organization.
- Marshall Wilder, W2KJL, reports on "The Construction of Television Receivers."
- "Modernizing the 56-Mc. Transceiver," by A. S. Burke, W3VR, and T. Leaf, tell about their crystal-controlled transmitter and non-radiating receiver.

April 1963

- The cover photo shows Lew McCoy, W1ICP, author of over 200 *QST* articles, working in the ARRL Lab on his latest gadget.
- The editorial reports that the FCC has set forfeiture rules for fines levied because of small infractions of their rules.
- "TE Propagation — V.H.F. Discovery Extraordinary" reports on this new mode, accompanied by "How Does TE Work," by R. A. Whiting, 5B4WR.
- Byron Stotts, W4KCW, tells us about his A.M./D.S.B. rig, in "Simple Sideband for Six."
- "The VO-Can," by George Shuart, W4AMN, tells how to get V.F.O. stability the easy way — by putting the V.F.O.'s tuned circuit in an outboard box, away from the heat-producing electronics.
- George Grammer, W1DF, presents Part II of "A.C. in Radio Circuits."
- Nicholas Skeer, K1PSR, describes "Two Nuvistor Converters for 220 Mc." (one tunable and the other crystal-controlled).
- "An Audio Meter Reader for the Sightless," by Ken Blaney, W6PIV, uses a simple comparator system for good accuracy.
- Robert Guba, W1QMN, and Jon Zimmer, W2BVU, discuss "Pulse: A Practical Technique for Amateur Microwave Work."
- In "The HBR-8 Becomes the HBR-11," Ted Crosby, W6TC, tells how he added R.F. and I.F. stages, and added A.G.C. and accessories to the basic receiver.

April 1988

- The cover photo shows a photo of WBØTUH's new technique of infusing his beam's coaxial cable with dye, which shows the beam's RF pattern in a visual rainbow pattern surrounding the beam.
- The editorial discusses our band usage plans to accommodate the various new modes of operation.
- "PC-Board Production in the ARRL Lab," by Tom Miller, NK1P, and Paul Pagel, NB1FB, explains how we can make PC boards at home, using a computer and simple techniques.
- John Grebenkemper, KI6WX, continues explaining "Phase Noise and Its Effects on Amateur Communications," with Part 2 addressing phase noise measurement.
- Chuck Hutchinson, K8CH, and Zack Lau, KH6CP, tell us about "Improving the HW-9 Transceiver."
- Doug DeMaw, W1FB, presents the results on his experiments with "On-Ground Low-Noise Receiving Antennas."
- Doug, W1FB, also writes a "Product Review" of the "MFJ-931 Artificial RF Gound."
- Emil Pocock, W3EP, discusses "Sporadic-E Propagation at VHF: A Review of Progress and Prospects."
- Larry Shima, WØPAN, alerts us to "Get Ready for the New W1AW," following the station's recent refurbishment.
- Thomas Willeford, N8ETU, gives us some excellent tower-climbing safety advice, in "Don't Fall Head over Heels because of Amateur Radio."

Field Organization Reports

January 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 are at this web page: **www.arrl.org/public-service-honor-roll**.

610
KJ4G

491
W5KAV

437
KØIBS

357
WM2C

345
KT2D

315
KB2ETO

280
WE2G

272
WB9FHP

270
WD9FLJ

265
WB8RCR

252
WB8R

236
KB8VXE

227
W2MTA

220
KA2ZNZ
KB2BAA
KC2QVT

210
K2HAT

205
KT5SR

201
K2ABX

200
W4SEE

191
KB2KOJ

190
K8RDN

189
WA2BSS

185
W5DY
N8IO

184
KK5NU

178
K4BG

175
WK4P

170
KB2RTZ

168
WD8USA

166
KC8YVF

165
WS6P
KE5HYW
K7OAH

160
VE7GN
N2GJ
N7CM
K7EAJ
KG0GG
W4DNA

159
KC5ZGG

155
KK4LSL
KB1UAU
WB4ZIQ

150
K9LGU

149
KØLQB

148
N8FVM

146
W7JSW

145
WA9LFO

140
K7BFL
N9VC
N5TMC
KK3F

137
KF7PDV

135
W3YVQ
WA3EZN

130
W9BGJ
K6JT
WI2G
WB2FTX
W8DJG
K4IWW
KJ4JPE

129
KA8ZGY

127
W2DWR

125
KE4CB
N2JBA
KF5IOU

124
N2DW

122
W3CB
NM1K

120
KA4FZI
NN7H
AG9G
WV8CH
WØLAW
K6HTN
NA7G
AK4RJ
W4TTO
WB8WKQ
KB8RCR
N8OSL

117
N5MBQ

115
K1PJS
N7EIE

113
AE5VY

111
W9WXN

110
W7QM
W7GB
W5CU
WA1STU
NX9K
WA5LOU
K7BDU
W7QM
KC5OZT
N2WKT
AA2SV
N5NVP
K4GK
WB6OTS
N7XG
N7YSS
KB1NMO
KB1RGQ
N7IE
KA1G
N9MN
W2EAG

109
KK7DEB

108
KK4BVR

105
KD2AXP
KF7GC
K4JUU

101
KB9KEG

100
KØVTT
KB5KKT
N9VT
K4SCL
K5AXW
N5OUJ
N1JX
K6FRG
WA2NDA

N3SW
K2UHF
KC2PDO
N2RAI
K3IN
AA3SB
KB3LNM
WB4FDT
WØCLS
NØMEA
WAØVKC
NU8K
WB8HHZ
WB8SIQ
WG8Z
WD8Q
KJ4RUD
WB8TQZ
K8VFZ
KD8CYK

99
AA5VZ
KC2SFU
N3RB

97
W3TWV
WØRJA
K2GW

96
W9EEU

95
KD8DNE

93
K7MQF
NA9L
KJ6PCC
WJ3P
KB1NYE

92
W2CC
KJ7NO

91
WB6N

90
WA4BAM
N3KB
N2VC
N5RL
N3ZOC
WB3FTQ
W3GQJ
KJ4HGH
W8IM
KB8HJJ
KC8BW
KD8RPP

89
N2RTF

88
NC3F

87
WDØGUF

85
KE5YTA

K7FLI
KD7OED
N8SY
KS4PG
WB4Y

84
KC2EMW

83
KC5MMH

81
KJ6IJJ
W7YV

80
KB7RVF
KZ8Q
KØDEU
NIØI
NØMHJ
KFØXO
KCØZDA
K8KV
WB4RJW
W8MAL

79
KK7TN

77
AL7N
N9WLW

76
K4VWK
W5XX
KC2UMX
KD8DNQ

75
N9EXM
KC4PZA

74
AB9ZA

73
K6RAU
KD8AAD

72
NC8V

71
WB8YYS

70
N2YJZ
W8CPG
KBØDTI
KDØAYN
KØDLK
NØDUW
NØDUX
WØFUI
KDØNJH
N3NTV
KØPTK
KØRXC
KD7ZUP

The following stations qualified for PSHR in previous months, but were not recognized in this column yet. (Dec 2012) WB4FDT 100.

Section Traffic Manager Reports

The following Section Traffic Managers reported: AK, AL, AR, AZ, CT, EB, ENY, EPA, EWA, GA, ID, IL, IN, LA, LAX, KS, MDC, ME, MI, MN, MS, NC, NFL, NNJ, NTX, OH, OK, OR, SFL, SJV, SNJ, STX, TN, UT, WCF, WI, WNY, WPA, WV, WY.

Section Emergency Coordinator Reports

The following ARRL Section Emergency Coordinators reported: ENY, EWA, GA, IA, ID, IN, KY, MDC, MI, MN, MO, MT, ND, NM, NLI, NTX, NV, OK, STX, SV, 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.

W5KAV 4284, WB9FHP 2812, KK3F 2193,K6HTN 1114, WØRJA 864, NX9K 858, N9VC 845, K6FRG 629, WD8Q 571, K6JT 544, WB8WKQ 525.

The following station qualified for BPL with Originations plus Deliveries: NM1K 117.

Silent Keys

Silent Keys Administrator, sk@arrl.org

It is with deep regret that we record the passing of these amateurs:

N1AGC **Maginniss**, Colleen M., Brewster, MA
W1AKG **Domorod**, James W. Sr, Wilmington, DE
K1AU **Miller**, Grier B., Lenox, MA
W1CIX **Roscoe**, Norman W., W Bridgewater, MA
WA1CKU **Curtis**, Laurence M. Jr, Swansea, MA
W1CYB **Rose**, William E. Jr, Amherst, NH
N1EX **Sedgewick**, Richard D., Dover, NH
W1IOK **Litwinowich**, Zenon J., Portland, ME
W1JKQ **Ketonen**, Tauno, Rutland, MA
W1NNU **Fenton**, F. L., Coventry, RI
NW1P **Dyer**, Paul O., Hancock, ME
NY1S **Zdrojowy**, Joseph P., Bucksport, ME
N1SFS **Brown**, Richard H., Belmont, NH
KB1SNK **Gerke**, Jane M., Plainville, CT
N1SPC **Vicinus**, Bruce W., Plainville, CT
KG1U **Roiter**, Benjamin D., Lynn, MA
WA1VAL **Calkins**, Edward A. Jr, Warwick, RI
♦W1XG **Edgerton**, James C., Arlington, MA
ex-WB2AKY **Laws**, William E., Mays Landing, NJ
WB2DUW **Turner**, Robert T., Hudson, NY
KC2FI **Grover**, Frank N. Sr, Elmira, NY
NK2H **Osier**, William H., Endicott, NY
K2HIP **Lo Bianco**, Matthew, Jackson, NJ
W2ICW **Schickler**, Henry, Port Washington, NY
N2IID **Alonso**, Joseph C., Paramus, NJ
♦WA2JWJ **Amaniera**, John, Staten Island, NY
KA2JXI **Ousterhout**, Roger E., Ogdensburg, NY
K2KCF **Merriman**, Floyd C., Hendersonville, NC
WB2MMS **Scalzi**, Mario F., Poughkeepsie, NY
KD2MS **Derugeris**, Flaviano, Atlantic City, NJ
K2MV **Adleman**, Meyer, Fords, NJ
W2PIG **Stewart**, James E., Grand Island, NY
W2PTF **Stein**, Donald F., Wappingers Falls, NY
KE2QY **Farrell**, R. P. Jr, Niskayuna, NY
K2ROC **Fredrickson**, Theodore, Rochester, NY
N2VDK **Schmidt**, Ruth E., Pittsford, NY
W2VR **Pettipas**, Walter P., East Northport, NY
WB2VWQ **La Bumbard**, Richard N., Newfield, NY
W2WIA **Kuligowski**, Edward H., Massapequa, NY
W2WKU **Hess**, Marvin H., Buffalo, NY
♦KB2YHZ **Carrier**, Willis H. II, Myersville, MD
KA2YJI **Pollard**, Russell V. Jr, Johnstown, NY
K3AN **Savage**, William J. Jr, Salem, SC
KB3EGQ **Hyland**, Angelina P., Smyrna, DE
WA3FLC **Miller**, William J., Titusville, PA
W3FYC **Fetterman**, Robert K., Lansdale, PA
♦K3GEG **Cox**, John Michael., Bowie, MD
N3GUK **Beck**, James G., Wallingford, PA
WI3I **Cupper**, Robert D., Meadville, PA
K3IWK **Byers**, Charles W., Dover, PA
K3JLK **McCouch**, William N., Plymouth Meeting, PA
W3LTI **Diehl**, William J., Camp Hill, PA
K3ML **Gossard**, Milford C., Cudjoe Key, FL
W3MXD **Heckendorn**, William M., Newville, PA
W3NV **Cooper**, Frank W., Canfield, OH
KB3WRX **Stewart**, Ed, Reynoldsville, PA
KE3WY **Harewood**, Christopher P., Lancaster, PA
KB4AG **Gann**, Allen, Easley, SC
KK4AMD **Oberlin**, Don R., Midway, GA
KD8ANH **Griffith**, Larry L., Niles, MI
WR4AP **Pickering**, Austin R., Bradenton, FL
K4BCN **Purks**, Russell C., Valrico, FL
KJ4BIQ **Miller**, Mark, Lexington, KY
KK4BJC **Brown**, William T., Gadsden, AL
KB4CGW **Clemmons**, Edward L. Sr, Winston-Salem, NC
W4CUX **Worley**, William, Alpharetta, GA
K4EAH **Vaughn**, Joe B., Toccoa, GA
WD4ESF **Mertins**, Ernest C., Bonneau, SC
W4EU **Carter**, Earl H., Chesterland, OH
W4FL **Daughton**, Glenn B., Cocoa Beach, FL
KB4GGF **Morgandale**, Chester J., Memphis, TN
W4GMI **Bash**, Clyde D., Pleasant Hill, TN
KD4GQD **Lewis**, John C., Cantonment, FL
KJ4GYQ **Kumbera**, William C. Jr, Deltona, FL
♦W4HU **Swafford**, John H., Fogelsville, PA
WA4IEN **Grigsby**, Chester N., Florence, AL
KA4IST **Kennedy**, Charles M., Cedar Island, NC
W4JAC **Cerniglia**, John A., Rotonda West, FL
K4JDV **McReynolds**, Gerald N. Jr, South Daytona, FL
K4JZ **Curry**, Wendell Y., Greensburg, KY
WK4K **Lamar**, James B. Jr, Kernersville, NC
KF4KHY **Frink**, Joyce V., Aransas Pass, TX
K4KHZ **Sokol**, Ronald M., Rich Creek, VA
KB4KIO **Peek**, Dorothy I., Candler, NC
KA4LEO **Oxendine**, Harry P. Jr, Knoxville, TN
WD4LES **Forsyth**, J. F., Staunton, VA
KB4MDI **Morgan**, Daniel M., Birmingham, AL
WD4MLD **West**, Edward H., Northport, AL
W4MWW **Lanter**, Kenley M., Thomasville, GA
AC4N **Nail**, Clifford A. Sr, Pikeville, TN
WW4N **Rickard**, Clifford E., Florence, AL
W4NFY **Moore**, James V., Tallahassee, FL
WD4OJF **Roberts**, James Lynn., Shepherdsville, KY
KG4OPM **Huennekens**, Marc, Weaverville, NC
KF4ORR **Byrd**, James E., Soddy Daisy, TN
W4QAT **Patterson**, Minter A., Tuscaloosa, AL
K4RPX **Ketron**, Stanley H., Jacksboro, TN
♦K4SB **Sleight**, Edward W., Acworth, GA
♦KE4TA **Norman**, Steven A., Toccoa, GA
W4TJB **Bryant**, Edward L., Johnson City, TN
K4TKQ **Chandler**, Melvin L., Wortham, TX
N4TMU **Hughes**, William R., Inverness, FL
KJ4UDZ **Piotrowski**, Darlene A., Singers Glen, VA
W4UJL **Showalter**, Clair E., Orlando, FL
K4VPS **Chapin**, Ronald A., Augusta, GA
K4WCS **Solomon**, William C., Savannah, GA
KB4WON **Madden**, James L., Belton, SC
WA4ZXH **McGuire**, Edward W., Campbellsville, KY
♦K5ARH **Griffith**, Nolen Daniel Jr, Lafayette, LA
N5BVT **Lockyear**, Bob G., Las Cruces, NM
NK5C **Fariss**, Delbert T., Pasadena, TX
K5CCF **Townsend**, Fred L., Shreveport, LA
WA5DVJ **Canfield**, Charles B. Sr, Lake Charles, LA
K5EIR **Frohnapfel**, A. C., Austin, TX
KD5FSH **Cooper**, Sharon L., Saratoga Springs, NY
W5HLS **Boteler**, Ralph, Hammond, LA
K5IWY **Holleyhead**, William E. Jr, Denton, TX
♦KE5K **Magruder**, Edmund H., Vicksburg, MS
N5KAA **Chester**, Andrew Jr, Missouri City, TX
KF5LNW **Sturdivant**, Wayne, Beaumont, TX
W5LV **Barbee**, William A., Grenada, MS
W5LYM **Terry**, V. L., Paradise, TX
K5MIZ **Look**, Alverta J., Houston, TX
K5MVC **Earl**, Keith R., Albuquerque, NM
N5MWT **Morrison**, John G., Shreveport, LA
N5NFY **Dukes**, Richard E., Alamogordo, NM
KD5NXV **Pierson**, Kenneth R., San Angelo, TX
N5NXX **Cross**, Norman C., Strang, OK
W5OXS **McCoy**, Walter A., Arlington, TX
NR5Q **Vaughan**, Bruce, Springdale, AR
W5QBJ **Page**, Edmond, Largo, FL
K5QGE **Goodson**, David H., Comanche, TX
AB5QU **Richard**, Ted L., Paradise, TX
W5RME **Robertson**, Malcolm E., Horseshoe Bay, TX
WB5SBO **Hancock**, Jerry L., Sherman, TX
♦K5SGP **Hiern**, Barrie C., Rome, GA
W5TZR **Gagnon**, Ralphe L., Hemet, CA
N5VAU **Ritter**, Louis H., Richland Hills, TX
W5VKN **Cravens**, Fred M., Amarillo, TX
WV5Y **Spight**, David L., New Albany, MS
KB5ZAN **Talbot**, William A., San Antonio, TX
WB6AWU **Lee**, Carl Jr, Fontana, CA
K6CRI **Beckman**, Kenneth E., San Jose, CA
WA6EIW **Turner**, Victor E. Jr, Mustang, OK
N6GK **Knapp**, Gregory J., Morgan Hill, CA
ex-W6HVP **Tavetian**, Hrach "Ed," Los Angeles, CA
KD6HVZ **Green**, James R., Alpine, CA
WB6ICU **Matell**, Pauline, Citrus Heights, CA
AA6IR **Miller**, Henry C., Thousand Oaks, CA
AG6IU **Beck**, Kerrol T., San Marcos, CA
KH6JEZ **Carnevale**, Americo B. Sr, Pukalani, HI
WA6LEE **Rombeck**, Albert C., Irvine, CA
AC6LK **Federwisch**, Harold R., Henderson, NV
N6NRN **Blanc**, Rene, Sacramento, CA
K6OPY **Kleyn**, Peter A., La Jolla, CA
KG6OWN **Adams**, Dana R., Sherman Oaks, CA
♦KA6PBU **Tavernier**, Claude E. Jr, Denver, IA
KG6QV **Gehricke**, Fred W., Thousand Oaks, CA
K6RCW **Moulton**, Reuben B., Twain Harte, CA
K6UMX **Johnson**, Louis D. Sr, Fontana, CA
KC6UNJ **Wallrabenstein**, James J., Lucerne, CA
WE6V **O'Keefe**, James M., San Jose, CA
W6VBV **Woore**, Edward H., Claremont, CA
WA6YKH **Myatt**, William J., Tustin, CA
K6YYT **Cassaday**, Vic K., Tulare, CA
AJ7C **Poole**, William B., Phoenix, AZ
♦N7COA **Gregory**, David L., Green River, WY
KD7CSL **Nelson**, Roger S., Great Falls, MT
♦W7DIK **Muncey**, Thomas J., Reno, NV
K7ETZ **Karamatic**, King, Aberdeen, WA
N7HGX **Warner**, Margaret L., Snohomish, WA
KC7KGJ **Nehill**, Arthur F., Phoenix, AZ
WA7LTR **Kuykendall**, William B., Vancouver, WA
KF7LWA **Gonser**, Dee Mara M., Vancouver, WA
K7NEA **Wigginton**, Joe G., Las Vegas, NV
KG7NU **Harnisch**, Carl A., Kingman, AZ
♦K7RP **Palmer**, Richard V., Fairview, TX
W7RX **Paine**, Robert M., Seattle, WA
WJ7S **Lange**, Larry M., Eugene, OR
W7TXU **Flint**, James W., Ellensburg, WA
KJ7US **Taylor**, Preston J., Tucson, AZ
WA7UZL **Myers**, Roy R. Jr, Tacoma, WA
N7YBT **Rogers**, Karen B., Klamath Falls, OR
KF7YDK **Wulff**, Bradley M., Las Vegas, NV
KE7ZFZ **Vial**, Ken D., Grand Ronde, OR
KC7ZUM **Killian**, Ray, Cle Elum, WA
WB8CKA **Marsh**, John H., Mulliken, MI
KC8DEN **Malone**, Dale E., Barberton, OH
N8DRT **Germann**, Frank, Sunbury, OH
ex-N8ESW **Tippett**, Addis "Lee," Flushing, MI
W8EVZ **Resler**, James, Largo, FL
KB8GAK **Talbot**, John D., Fairfield, OH
W8GAL **Schummer**, Walter A., Pace, FL
N8GBM **Rago**, Beverly J., Painesville, OH
♦W8GG **Lee**, Gregory, Crown City, OH
W8LDW **Rogers**, Joseph N., Enon, OH
K8LEK **Kempton**, Larry E., Waverly, OH
WD8MBB **Higelmire**, Charles C. Jr, Onondaga, MI
AD8N **Wright**, Wallace M. Jr, Dayton, OH
KB8NLE **Palmer**, Herbert T., Metamora, MI
KC8OFT **Utter**, John R., Lawrence, MI
K8PIX **Pixley**, Lloyd, Muskegon, MI
WD8RJR **Baumgarte**, Paul H., Delphos, OH
W8RTN **Tippett**, Douglas A., Waynesboro, VA
WB8SYW **Perry**, Richard E., Athens, OH
KB8TXP **Hartley**, Stephen D., Arcadia, FL
WB8VVF **Veen**, Jan F. A., Holland, MI
KA8WNO **Davis**, L. W., Coalton, WV
WA8YAG **Kleopfer**, Joseph A., Petersburg, MI
WD9ACP **Tisdale**, James F., South Bend, IN
N9ALZ **Warnke**, Orlan, Montello, WI
W9AVF **Holzer**, Walter J., Milwaukee, WI
W9BRD **Newkirk**, Rodney N., Chicago, IL
AA9CU **Britt**, Grace M., Charlottesville, VA
WB9EEK **Kelley**, Paul B., Wauwatosa, WI
W9FYO **Bowers**, Donald W., Evansville, IN
KB9GNL **McLain**, Gregory P., Evansville, IN
W9HDC **Peikett**, Glenn F., Hamilton, IL
W9LHW **Moretti**, Orest, Sun City, AZ
W9NLA **McNally**, Franklin E., Madison, WI
W9OVO **Cardy**, Clayton S., Algoma, WI
♦W9QBH **Hajek**, Robert J., Albuquerque, NM
N9RPJ **Burtsfield**, Ronald W., Washington, IL
W9TAD **Konefsky**, Carl G., Michigan City, IN
AA9TU **Pardo**, Saul, Chicago, IL
W9VCI **Rich**, Anthony J., Sugar Grove, IL
W9WLZ **Davis**, Oliver D., Green Bay, WI
N9ZEU **Mevis**, Henry A., Racine, WI
WBØAEW **Riley**, Thomas M. Jr, Independence, MO
ADØAO **Olasov**, Alvin D., Mount Pleasant, SC
WØCPL **Soper**, Kenneth K. Sr, Sunrise Beach, MO
KDØGGN **Hannigan**, Joseph C., Pagosa Springs, CO
ABØGT **Larson**, Leslie B., Duluth, MN
NØIC **Ormsby**, William L., Denver, CO
KØJT **Teepe**, John H., Chesterfield, MO
KEØKA **Winkler**, Glenn D., Lees Summit, MO
KEØKN **Spadino**, Arnold J., Sioux Falls, SD
KDØMEZ **Roland**, Richard D., Westminster, CO
WØNKI **West**, James M., Fort Worth, TX
NØOH **Hart**, Jerry P., Pflugerville, TX
WØONU **Reynolds**, Jimmie H., Georgetown, TX
WBØQVC **Bryan**, Robert W., Union, MO
WØQXK **Hoeft**, Willard A., Winona, MN
KDØRZM **Boomgaarden**, Gary L., Ellsworth, MN
KEØTE **Pickard**, Frank Jr, Saint Cloud, MN
NØUIE **Adreme**, Lana J., Kansas City, MO
KBØWEQ **Jeffers**, June L., Gardner, KS
NØYGM **Knight**, Kenneth G., Colorado Springs, CO
KCØYMH **Hartnett**, Gregory T., Louisburg, KS
KCØZEE **Lawless**, Raymond C., Apple Valley, MN
VE3TIJ/N2ZVK **Faul**, David S., Pickering, ON, Canada

♦ Life Member, ARRL

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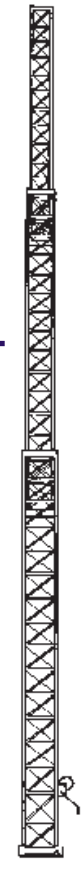

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Exam: 35-question General test (Element 3)
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Exam: 50-question Extra test (Element 4)
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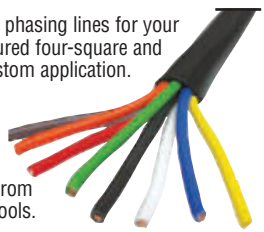

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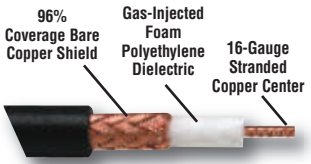

DXE-8X Low-Loss Foam Dielectric Cable (also known as RG-8X or Mini-8)

- Very flexible; ideal for short, in-shack jumper cables
- .242" Type II jacket is non-contaminating and UV-resistant
- Direct-bury

Attenuation/ 100 ft.	Power Rating	Efficiency %
0.6 dB @ 5 MHz	3.0 kW	86%
0.9 dB @ 10 MHz	2.2 kW	81%
1.4 dB @ 30 MHz	1.2 kW	69%
2.0 dB @ 50 MHz	0.9 kW	62%
3.8 dB @ 150 MHz	0.4 kW	42%

Cable Only		
DXE-8X	By the foot	**$.31/ft.**
DXE-8X-1000	1,000 ft.	**$259.99**

Pre-cut Cable with Connectors		
Part Number	**Length/Ft.**	**Price**
DXE-8XDU003	3	**$9.88**
DXE-8XDU006	6	**$10.88**
DXE-8XDU012	12	**$12.88**
DXE-8XDU025	25	**$17.88**
DXE-8XDU050	50	**$26.88**
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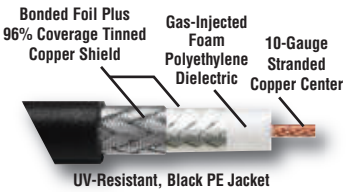

DXE-400MAX Low-Loss Cable

- Low-loss, gas-injected foam polyethylene dielectric bonded tape foil covered by a braided copper shield
- .405" low-density polyethylene jacket is UV resistant, ideal for outdoor use
- Direct-bury

Attenuation/ 100 ft.	Power Rating	Efficiency %
0.3 dB @ 5 MHz	6.9 kW	93%
0.5 dB @ 10 MHz	4.8 kW	90%
0.8 dB @ 30 MHZ	2.8 kW	83%
1.1 dB @ 50 MHz	2.1 kW	79%
1.8 dB @ 150 MHz	1.2 kW	65%
3.3 dB @ 450 MHz	0.7 kW	47%

Cable Only		
DXE-400MAX	By the foot	**$.82/ft.**
DXE-400MAX-500	500 ft.	**$364.99**

Pre-cut Cable with Connectors		
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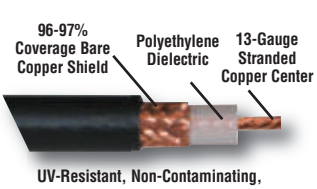

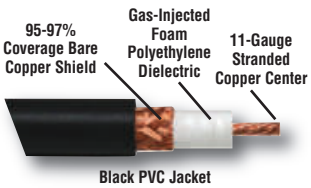

Gas-Injected Foam Won't Absorb Water.

DXE-213U MIL-Spec Cable

- .405" Type II jacket is non-contaminating and UV-resistant, suitable for outdoor use
- Direct-bury

Attenuation/ 100 ft.	Power Rating	Efficiency %
0.4 dB @ 5 MHz	4.9 kW	90%
0.6 dB @ 10 MHz	3.4 kW	87%
1.0 dB @ 30 MHz	2.0 kW	79%
1.3 dB @ 50 MHz	1.5 kW	73%
2.4 dB @ 150 MHz	0.9 kW	57%

Cable Only		
DXE-213U	By the foot	**$.89/ft.**
DXE-213U-500	500 ft.	**$409.99**

Pre-cut Cable with Connectors		
Part Number	**Length/Ft.**	**Price**
DXE-213UDU003	3	**$11.88**
DXE-213UDU006	6	**$14.88**
DXE-213UDU012	12	**$20.88**
DXE-213UDU025	25	**$33.88**
DXE-213UDU050	50	**$57.88**
DXE-213UDU075	75	**$80.88**
DXE-213UDU100	100	**$99.88**
DXE-213UDU150	150	**$144.88**

DXE-8U Low-Loss Foam Dielectric Cable

- .405" high-flex PVC jacket
- Low-loss foam dielectric

Attenuation/ 100 ft.	Power Rating	Efficiency %
0.3 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%

Cable Only		
DXE-8UDU	By the foot	**$.79/ft.**
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Part Number	**Length/Ft.**	**Price**
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Continued from page 108

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- Full 360° grip for specified tubing size

Part Number	Nominal Size	Thread Bolt Size	Price
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DXE-SAD-150A	1.50	1/4-20	**$7.75**
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DXE-SAD-200A	2.00	5/16-18	**$10.05**
DXE-SAD-200B	2.00	3/8-16	**$11.25**
DXE-SAD-250A	2.50	5/16-18	**$12.05**
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DXE-SAD-300A	3.00	5/16-18	**$13.60**
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V-Bolt Style, sized to accommodate ranges of tubing sizes

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DXE-CAVS-3P	2.00 to 3.00	3/8-16	**$15.25**

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You can use DX Engineering's newly engineered Guy Rings to secure your rope guys and stabilize your DX Engineering, Hustler or other aluminum vertical antenna. They work with three- and four-way guying systems and are a great complement to our tubing kits.

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DXE-GR-5P Guy Rings.....**$7.95 set of 5**

V-Bolt Style Saddle Clamps with Stainless Steel Saddles

- Stainless Steel Saddles, serrated to secure hard pipe surfaces
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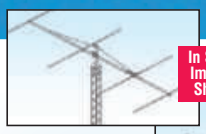

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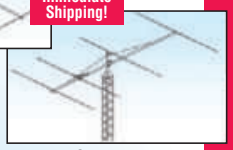

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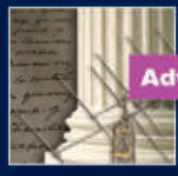

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DX Engineering also stocks replacement parts for all BTV antennas

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DXE-AOK-12M	12 Meter Add-On Kit for BTV	$59.95
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DXE-AOK-80M	80 Meter Add-On Kit for 4BTV	$59.95

DX Engineering Offers You Complete, Ready-to-Install Antenna Packages!

They include an antenna, tilt base, radial plate with wire, a direct coax adapter and more. Plus, with free shipping to the lower 48 states, you'll save money while you're working more bands.

Get Totally Free Shipping with Your Order

TOTALLY FREE SHIPPING

DXE-HSR-4BTV-P	4-Band Package	$379.00
DXE-HSR-5BTV-P	5-Band Package	$419.00
DXE-HSR-6BTV-P	6-Band Package	$454.00

Icom IC-V8000 144 MHz FM Transceiver

This durable, easy-to-operate mobile rig will get your communications through. The IC-V8000 has a sturdy aluminum chassis packed with 75 watts of output power. It uses a front firing speaker and can be almost completely controlled with the keyed microphone. You can name and store over 200 frequencies in 10 different banks, making the IC-V8000 a versatile, yet easy to operate, mobile transceiver. See the entire Icom product line at DXEngineering.com

ICO-IC-V8000 — 2 Meter FM Transceiver $229.95

Mirage 2 Meter Amplifier

If you've got a 2 meter base or mobile station, then this amplifier can boost your 50 watt signal up to 160 watts. That includes all modes, too: FM, Digital, SSB and CW. Plus, it features a low-noise receive preamplifier and automatic, RF-sensing T/R switching. You can also use external direct keying with a rear panel RCA phono connector. Mirage offers more VHF and UHF amplifiers; the entire list is at DXEngineering.com.

MIR-B-5018-G — 160 Watt 2 Meter Amplifier $409.95

Samlex Desktop Switching Power Supply

Samlex's SEC-1235M Desktop Switching Power Supply provides a well-regulated 13.8 Vdc output at any current demand up to 35 amps peak—plenty of power for your whole station. It gives your reliable power that is well-filtered to suppress unwanted noise and RFI. The entire Samlex line of power supplies can be found at DXEngineering.com.

SXA-3435 — Samlex SEC-1235M DC Power Supply $125.95

See website for all available configurations

Full Size 75/80 Meter Quarter-Wave Vertical Antennas

These 68 foot tall, high-performance, full size antennas have rugged base sections (2, 3 or 4 inch diameter) made from aircraft-grade aluminum tubing.

See video on how these four UNGUYED DX Engineering 80M Verticals easily withstood SuperStorm Sandy at DXEngineering.com!

The VA-1 requires simple guying. The VA-2 and VA-3 models are very stout and don't require guying. The VA-2 and VA-3 antennas are supplied with a Heavy Duty Plus Stainless Pivot Base and can be lowered easily with the optional, DXE-VRW one-man, manual winch.

- 2:1 bandwidth up to 500 kHz
- DX Engineering structural design + high strength tubing custom manufactured to our rigid specifications **= Highest Wind Ratings**
- High strength, UV-protected Extren® insulator **= High Power Handling Capacity**
- Specially manufactured stainless steel and aluminum saddle clamps, stainless steel bolts, and precision machining **= Reliability Second to None**
- Specially manufactured Pivot Base supplied with VA-2 and VA-3 antennas **= Easy Tilt Up and Down**

DXE-7580FS-VA-1	Vertical Antenna, standard HD, 2 inch O.D. base section	$379.50
DXE-7580FS-VA-2	Vertical Antenna, Heavy Duty, 3 inch O.D. base section	$825.00
DXE-7580FS-VA-3	Vertical Antenna, Super Duty, 4 inch O.D. base section	$1,775.50

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DXE-VRW-1 Manual Winch

A great option, this winch allows one person to easily raise or lower a VA-2 or VA-3 vertical antenna.

DXE-VRW-1 — Manual Winch $169.99

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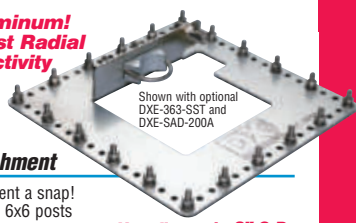
Stainless Radial Plate with Coax Attachment



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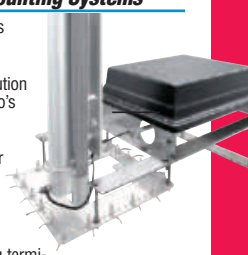
- 0.125" thick 304 stainless steel
- Accommodates up to 120 radials
- Patented high current coax connection to radials

Now fits up to 3" O.D. mount

DXE-RADP-3	Complete with 20 stainless bolt sets	$54.50
DXE-RADP-1HWK	20 sets of 1/4" stainless hardware	$7.50
DXE-SSVC-2P	Stainless Saddle Clamp for attachment to steel tube 1" to 2" O.D.	$11.95

MFJ-998RT Remote Tuner Mounting Systems



These Remote Tuner Mounting Systems provide an easy way to mount your MFJ-998RT tuner to any quarter-wave vertical antenna. They're the perfect solution for the Full Legal Limit Power DX'er who's using MFJ-998RT's great auto-tuning features. The ATU-2 mounts to the DX Engineering RADP-3 Radial Plate for a secure connection.

The DXE-ATU-2 has custom laser-cut stainless steel brackets, a right angle PL-259/SO-239 adapter, an insulated stranded copper feedline cable with ring terminal and other specialized hardware that facilitates the correct RF connections for maximum power transfer to antenna without arcing. Stainless steel hardware and instructions are included.

The DXE-MBV-ATU-2 has everything that the DXE-ATU-2 features, plus it includes a bias tee power injector and the MFJ-998RT remote IntelliTuner, making it a complete setup!

DXE-ATU2	Remote Tuner Mounting System	$64.50
DXE-MBV-ATU-2	Remote Tuner Mounting System with MFJ-998RT	$824.45

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S9v43 $199.99
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The S9v 43' is a high-performance lightweight telescoping fiberglass vertical. The best value in high-performance 'tall' verticals!

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20-6 meters *Fixed or Portable Operation*

The S9v 31' and 18' are tapered, ultra-lightweight fiberglass vertical antennas. Friction-locking sections and high-tech polymer tube rings allow the antenna to be quickly and safely deployed in practically any environment without tools!

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Aluminum Radial Plate
Includes 20 sets of stainless steel nuts & bolts

Designed to handle the higher power of the Tokyo Hi Power HL-45B.

NEW! Z-817H
The ultimate autotuner for QRP radios including the Yaesu FT-817(D) with addition of the Tokyo High Power HL-45B. Interfaces to the CAT port (ACC) on the back of the radio with the provided cable. One button push on the tuner and the Z-817H takes care of the rest. Will also function as a general purpose antenna tuner with other QRP radios or QRP radios with up to 75 watt HF amps. Powered by four AA internal Alkaline batteries (not included). 2000 memories cover 160 through 6 meters.
Suggested Price $159.99

- ***RF Sensing***
- ***Tunes Automatically***
- ***No Interface Cables Needed***

AT-200ProII
The AT-200ProII now includes LEDs to show antenna position and if the tuner is in bypass. A two position antenna switch stores 2000 memories per switch. Handles up to 250 watts SSB or CW on 1.8 to 30 MHz and 100 watts on 54 MHz. Rugged and easy to read LED bar graphs simultaneously show RF power and SWR. Includes a six foot DC power cable. ***Suggested Price $259.99***

AT-1000ProII
LDG Electronics' new flagship 1KW tuner features: 5 to 1,000Watts PEP; RF Sensing; Auto and Semi Tuning Modes; 1.8 to 54 MHz range; 6 to 800 ohm range (15 to 150 on 6M); simplified operation; and an optional external 4.5" analog meter. With the two position antenna switch, there are 2,000 memories that store tuning parameters for almost instantaneous memory recall whenever you transmit on or near a frequency you've used before. Includes six foot DC power cable. ***Suggested Price $539.99***
Optional M-1000 external analog meter $129.99

IT-100
Matched in size to the IC-7000 and IC-706, for either manual or automatic tunes, and status LEDs. Control the IT-100 and its 2000 memories from either its own button or the Tune button on your IC-7000 or other Icom rigs. For your Icom radio that is AH3 or AH-4 compatible.
Suggested Price $179.99

YT-100
For Yaesu FT-857, FT-897 and FT-100 (and all D models) an integrated tuner, powered by the interface. Press the tune button on the tuner, and everything else happens automatically.
Suggested Price $199.99

KT-100
For AT-300 compatible Kenwood transceivers (except TS-480HX). The KT-100 actually allows you to use the Tune button on the radio. 2,000 memories for instant recall of the tuning parameters for your favorite bands and frequencies.
Suggested Price $199.99

YT-450
Designed for Yaesu's newest 100 watt radios. Interfaces directly with the Yaesu FT-450 and FT-950 radios. Press the tune button on the tuner and the rest happens automatically. It will quickly match nearly any kind of coax fed antenna with an SWR of up to 10:1. 2000 memories recall settings in an instant! Seamless connection to a PC. ***Suggested Price $249.99***

YT-847
YT-847 Autotuner is an integrated tuner for the Yaesu FT-847. An included CAT/Power cable interfaces with your FT-847. Just press the tune button on the tuner and everything else happens automatically! ***Suggested Price $249.99***

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We have a tuner that will work for you!

*We make tuners that will work with any transceiver. Don't know which one is right for you? Give us a call or see the **Tuner Comparison Chart** on our web site for more selection help!*

LDG ELECTRONICS

radio not included

AT-897Plus
for the Yaesu FT-897

If you own a Yaesu FT-897 and want a broad range automatic antenna tuner, look no further! The AT-897Plus Autotuner mounts on the side of your FT-897 just like the original equipment and takes power directly from the CAT port of the FT-897 and provides a second CAT port on the back of the tuner so hooking up another CAT device couldn't be easier. ***Suggested Price $199.99***

NEW! AT-600ProII

Building on the success of the AT-600Pro, we refined and expanded the model with an optional external 4.5" analog meter. The new AT-600ProII keeps many of the same features of the previous model, but simplifies the operation. With the two-position antenna switch, there are 2,000 memories that store tuning parameters for almost instantaneous memory recall whenever you transmit on or near a frequency you've used before. Includes six-foot DC power cable.

Suggested Price $369.99

Optional M-600 external analog meter $129.99

Z-100Plus

Small and simple to use, the Z-100Plus sports 2000 memories that store both frequency and tuning parameters. It will run on any voltage source from 7 to 18 volts; six AA batteries will run it for a year of normal use. Current draw while tuning is less than 100ma. The Z-100Plus now includes an internal frequency counter so the operating frequency is stored with tuning parameters to make memory tunes a blazingly fast 0.1 seconds; full tunes take an average of only 6 seconds. Includes six foot DC power cable. ***Suggested Price $159.99***

- ***RF Sensing***
- ***Tunes Automatically***
- ***No Interface Cables Needed***

AT-100ProII

This desktop tuner covers all frequencies from 1.8 – 54 MHz (including 6 meters), and will automatically match your antenna in no time. It features a two-position antenna switch with LEDs, allowing you to switch instantly between two antennas. The AT-100ProII requires just 1 watt for operation, but will handle up to 125 watts. Includes six foot DC power cable.

Suggested Price $229.99

Z-11ProII

Meet the Z-11ProII, everything you always wanted in a small, portable tuner. Designed from the ground up for battery operation. Only 5" x 7.7" x 1.5", and weighing only 1.5 pounds, it handles 0.1 to 125 watts, making it ideal for both QRP and standard 100 watt transceivers from 160 - 6 meters. The Z-11ProII uses LDG's state-of-the-art processor-controlled Switched-L tuning network. It will match dipoles, verticals, inverted-Vs or virtually any coax-fed antenna. With an optional LDG balun, it will also match longwires or antennas fed with ladder-line. Includes six foot DC power cable. ***Suggested Price $179.99***

radio not included

Z-817

The ultimate autotuner for QRP radios including the Yaesu FT-817(D). Tuning is simple; one button push on the tuner is all that is needed - the Z-817 takes care of the rest. It will switch to PKT mode, transmit a carrier, tune the tuner, then restore the radio to the previous mode! 2000 memories cover 160 through 6 meters. The Z-817 will also function as a general purpose antenna tuner with other QRP radios. Just transmit a carrier and press the tune button on the tuner. Powered by four AA internal Alkaline batteries (not included), so there are no additional cables required.

Suggested Price $129.99

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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 or South center of rotation scale on meter, low voltage control, max mast size of $2^{1}/_{16}$ inches.

HAM-VI **$749.95** with DCU-2

HAM IV and HAM V Rotator Specifications	
Wind Load capacity (inside tower)	15 square feet
Wind Load (w/mast adapter)	**7.5 square feet**
Turning Power	800 in.-lbs.
Brake Power	**5000 in.-lbs.**
Brake Construction	Electric Wedge
Bearing Assembly	**dual race/96 ball bearings**
Mounting Hardware	Clamp plate/steel U-bolts
Control Cable Conductors	**8**
Shipping Weight	26 lbs.
Effective Moment (in tower)	**2800 ft.-lbs.**

TAILTWISTER SERIES II

T-2X **$799.95**

T-2XD2 **$899.95** with DCU-2

See more info below

For large medium antenna arrays up to 20 square feet wind load. Has 5-second brake delay and Test/Calibrate functions. Low temperature 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 strength, electric locking steel wedge brake, North or South center of rotation scale on meter, low voltage control, $2^{1}/_{16}$ inch maximum mast size.

TAILTWISTER Rotator Specifications	
Wind load capacity (inside tower)	20 square feet
Wind Load (w/ mast adapter)	**10 square feet**
Turning Power	1000 in.-lbs.
Brake Power	**9000** in.-lbs.
Brake Construction	Electric Wedge
Bearing Assembly	**Triple race/138 ball brngs**
Mounting Hardware	Clamp plate/steel U-bolts
Control Cable Conductors	**8**
Shipping Weight	31 lbs.
Effective Moment (in tower)	**3400 ft.-lbs.**

CD-45II

CD-45II **$449.95**

For antenna arrays up to 8.5 sq. feet mounted inside tower or 5 sq. ft. with mast adapter. Low temperature grease good to -30 F degrees. *New* Test/Calibrate function. Bell rotator design gives total weather protection, dual 58 ball bearing race gives proven support. Die-cast ring gear, stamped steel gear drive, heavy duty, trouble free gear train, North center scale, lighted directional indicator, 8-pin plug/socket on control unit, snap-action control switches, low voltage control, safe operation, takes maximum mast size to $2^{1}/_{16}$ inches. MSLD light duty lower mast support included.

CD-45II Rotator Specifications	
Wind load capacity (inside tower)	8.5 square feet
Wind Load (w/ mast adapter)	**5.0 square feet**
Turning Power	600 in.-lbs.
Brake Power	**800 in.-lbs.**
Brake Construction	Disc Brake
Bearing Assembly	**Dual race/48 ball brings**
Mounting Hardware	Clamp plate/steel U-bolts
Control Cable Conductors	**8**
Shipping Weight	22 lbs.
Effective Moment (in tower)	**1200 ft.-lbs.**

hy-gain® DCU-2 Digital Rotator Controller

. . . gives you full automatic and manual control of hy-gain rotators

DCU-2 **$399.95**

New!

New hy-gain DCU-2 Digital Controller gives you fully automatic or manual control of your *hy-gain HAM or Tailtwister Rotators.* Just dial in your beam heading and press the rotate button or let *Ham Radio Deluxe* (or other program) control your DCU-2. Your antenna automatically rotates to your desired direction precisely and safely.

First, the DCU-2 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. This greatly reduces potentially damaging overshoot.

Fine tuning and full manual control is effortless with *automated* Left and Right direction buttons - - no more worrying about manually releasing and relocking the brake. Brake automatically releases before fine tuning begins and relocks after fine tuning is completed.

Bright blue LCD displays actual heading, dial-in beam heading, computer controlled beam heading in one degree increments and your call sign.

Advanced Features

AutoBrake *Release* - no need to remember to release brake or release too soon - release time is automatic and settable 0-8 seconds.

Coast feature allows antenna to gently stop before the 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 your antenna before turning begins. Great for older rotators with "sticky" brakes. It jogs your rotator backwards slightly to ease brake pressure enough to release.

Offset feature allows you to calibrate your display to show actual beam heading.

USB and RS-232 ports for computer control. Compatible with *Ham Radio Deluxe* and other programs. Adjustable LCD sleep time. Field upgradeable Firmware. 8.5W x 4.3H x 9D inches. 110 VAC. **Order** DCU-2X for 220 VAC.

HAM-VI

HAM-VI **$749.95** *with DCU-2*

New!

New HAM-VI, $749.95, like HAM-IV but with DCU-2 digital controller. For medium antennas up to 15 square feet wind load.

Rotator Options

MSHD, $109.95. Above tower heavy duty mast support. For T2X, HAM-IV, HAM-V, HAM-VI. Accepts $1^{7}/_{8}$ to $2^{5}/_{8}$ inch OD. Centers on 2 ½ inches.

TSP-1, $34.95. Lower spacer plate for HAM-IV, HAM-V and HAM-VI.

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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KENWOOD TH-F6A
2M/220/440 FM Handheld

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KENWOOD TH-D72A
2M/440 FM Handheld with GPS

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KENWOOD TM-281A
2M FM Mobile

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KENWOOD TM-V71A
2M/440 FM Mobile

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KENWOOD TM-D710A
2M/440 FM Mobile with TNC

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KENWOOD TS-480SAT
100W HF/6M Mobile with Antenna Tuner

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KENWOOD TS-2000
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KENWOOD TS-590S
100W HF/6M Transceiver

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KENWOOD TS-990S
200W HF/6M Flagship Transceiver

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ARRL Field Day is June 22-23, 2013

The Most Popular On-Air Operating Event!

Show off your support for ARRL Field Day!

Official Field Day T-shirts, Hats, Mugs, Participation Pins, and more—are a great way to recognize your involvement in this annual operating event. All items are available for order now, and will begin shipping April 1. **Clubs, order early!** Collect orders from members, and place a single order—pay only $12.50 shipping for orders over $50, while supplies last.

- **Field Day T-Shirt**
  T-shirt featuring the 2013 Field Day logo on front chest. ARRL diamond and "Ham Radio" silkscreened on top back.
  ARRL Order No. 0002 (S-4XL) ..... **Only $12.95**
- **Field Day Hat**
  Gray hat embroidered with "ARRL Field Day". One size fits most.
  ARRL Order No. 0026 ..... **Only $9.95**
- **Field Day Pin**
  Official 2013 Field Day Pin. Size 1-1/4" round.
  ARRL Order No. 0051 ..... **Only $5.00**
- **GOTA Pin**
  Don't forget GOTA pins for your Field Day newcomers. Size 1"x 1".
  ARRL Order No. 8911 ..... **Only $5.00**
- **Field Day Poster** (pack of 25)
  Encourage participation in ARRL Field Day. A great recruitment tool!
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  Log sheets, dupe sheets, VHO Operating Tips, WAS map and more.
  ARRL Order No. 4500 ..... **Only $7.95**
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  A collection of tools and resources for Field Day FUN!
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  Show off your Field Day pride with a special patch. Size: 3" round.
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200W HF/6M Transceiver

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2M/440 FM Handheld
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ALINCO DJ-V57T
2M/440 FM Handheld
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WOUXUN KG-UV3D2/220
2M/220 FM Handheld
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ALINCO DJ-G29T
220/900 MHz FM Handheld
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UHF 16 CH Commercial Handheld
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ALINCO DR-135TMKIII
2M FM Mobile
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WOUXUN KG-UVA1X
VHF/UHF 16 CH Commercial HT
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ALINCO DX-SR8T
Compact HF Transceiver
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WOUXUN KG-UV6X
VHF/UHF Commercial Handheld
WXUSB Cable required for programming and accessing all features.
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MFJ-259B *World's* most popular Antenna Analyzer is super easy-to-use!

MFJ-259B
$289.95

The MFJ-259B is the world's most popular Antenna Analyzer and the easiest to use! Just select a band and mode. Set frequency. Your measurements are instantly displayed!

Handheld Antenna Lab

Owning the MFJ-259B is like having an entire antenna lab in the palm of your hand!

Measure SWR quickly or make sophisticated measurements such as Return Loss, Reflection Coefficient, Resonance, Complex Impedance (R+jX), Impedance Magnitude (Z) plus Phase in degrees. Covers 1.8 to 170 MHz -- no gaps.

Coax Analyzer

Determine coax cable velocity factor (Vf), loss in dB, coax length, distance to open or short plus detect wrong coax impedance.

Frequency Counter

Measure frequency of external signals using the separate BNC counter input.

Signal Generator

Use as a signal source 1.8-170 MHz with digital dial accuracy for testing and alignment.

Inductance and Capacitance

Measure Inductance (uH) and Capacitance (pF) at RF frequencies not at audio frequencies used by most L/C meters.

Digital and *Analog* Meters

A high-contrast backlit LCD gives precision readings and *two* side-by-side *analog meters* make antenna adjustments intuitive.

Smooth, Stable Tuning

Velvet-smooth reduction drive tuning and precision *air-variable capacitor* makes setting frequency easy and stable.

Battery Saver & More

Battery-saver, low-battery warning, battery voltage meter and charger are all built in. Use ten Alkaline, NiCad or NiMH AA batteries (not included) or 110 VAC with MFJ-1312D, $15.95. 4Wx6¾Hx2D inches.

Here's What You Can Do

Find true antenna resonant frequency
Tune *antenna quickly for minimum SWR*
Match complex loads to your feedline
Adjust *mobile whips without stressing finals*
Determine safe 2:1-SWR operating windows
Adjust *tuners without generating QRM*
Find exact location of shorts and opens
Cut *stubs and phasing lines accurately*
Check cable for loss and contamination
Find *value of unknown coils and caps*
Test RF transformers and baluns
Troubleshoot *filters and networks*
Find self-resonance and relative Q
Check *patterns and compare gain*
MFJ-259B does all this and more!

MFJ Analyzer Accessories

MFJ-29C, $24.95. Tote your MFJ-259B anywhere with this *genuine* MFJ custom carrying case. Special foam-filled fabric cushions blows, deflects scrapes and protects knobs and meters from harm. **MFJ-39C, $24.95.** Like MFJ-29C, but for MFJ-269.

MFJ-66, $24.95. Plug-in coils turns any MFJ Antenna Analyzer into a sensitive and accurate *band switched* dip meter. 2 coils.

MFJ-92AA10, $29.95. Ten MFJ *SuperCell*™ Ni-MH AA rechargeable batteries.

MFJ-99B, $88.90. ***Save $7!*** MFJ-259B Deluxe Accessory Pack: MFJ-29C Pouch, 10 Ni-MH batteries, dip coils, AC adapter. **MFJ-98B, $88.90.** Like MFJ-99B but for MFJ-269.

MFJ-99, $60.85. ***Save $5!*** Like MFJ-99B, less batteries, for MFJ-259B. **MFJ-98, $60.85.** Like MFJ-99 but for MFJ-269.

MFJ-99C, $40.90. ***Save $5!*** AC Adapter and 10 Ni-MH batteries for MFJ-259B/269.

MFJ-917, $29.95. Current balun lets you make balanced line antenna measurements on HF with your MFJ Analyzer. **MFJ-7702, $3.95.** MFJ-917 to MFJ Analyzer adapter.

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MFJ-5510, $9.95. Cigarette lighter cord.

MFJ-269 ...1.8-170 MHz and 415-470 MHz plus 12-bit A/D!

The MFJ-269 does everything the MFJ-259B does - and much more!

Expanded Frequency Coverage

MFJ-269 adds UHF coverage from 415 to 470 MHz -- right up into the commercial band. With it, you can adjust UHF dipoles, verticals, Yagis, quads and repeater collinear arrays with ease -- plus construct accurate phasing harnesses and timed cables. Also use it as a signal source to check UHF duplexers, diplexers, IMD filters and antenna patterns.

Much Better Accuracy

New *12-bit* A/D converter gives much better accuracy and resolution than common 8-bit A/D converters -- *an MFJ-269 exclusive!*

Complex Impedance Analyzer

Read Complex Impedance (1.8 to 170 MHz)as series equivalent resistance and reactance (Rs+jXs) or as magnitude (Z) and phase (degrees). Also reads *parallel* equivalent resistance and reactance (Rp+jXp) -- *an MFJ-269 exclusive!*

MFJ-269
$389.95

CoxCalculator™

Lets you calculate coax line length in feet given electrical degrees and vice versa for any frequency and any velocity factor -- *an MFJ-269 exclusive!*

Use any Characteristic Impedance

You can measure SWR and coax loss with *any* characteristic impedance (1.8 to 170 MHz) from 10 to over 600 Ohms, including 50, 51, 52, 53, 73, 75, 93, 95, 300, 450 Ohms -- *an MFJ-269 exclusive!*

Logarithmic Bar Graph

Has easy-to-read LCD *logarithmic* SWR bargraph and SWR meter for quick tuning.

Uses instrumentation grade N-connector to ensure minimum mismatch on all frequencies. Includes N to SO-239 adapter.

MFJ-269*PRO*™ Analyzer

Like MFJ-269, but has extended commercial frequency coverage in UHF range ***(430 to 520 MHz)*** and *ruggedized* cabinet that protects LCD display, knobs, meters and connectors from damage in the field/lab.

MFJ-269PRO
$419.95

MFJ-266 ...Wide range 1.5-185 MHz and 300-490 MHz!

New!

MFJ-266
$349.95

The compact MFJ-266 covers HF (1.5-65 MHz) in 6 bands, plus VHF (85-185 MHz) and UHF (300-490 MHz).

In *Antenna Analyzer* mode, you get Frequency, SWR, Complex Impedance (R+jX), and Impedance Magnitude (Z) *all displayed simultaneously* on a high-contrast backlighted LCD (SWR only on UHF).

In *Frequency-Counter* mode, the MFJ-266 functions as a 500-MHz counter with up to 100 Hz resolution and measures relative field strength of a signal and its frequency and can be used for tracking measurement interference.

MFJ-266 also functions as a 10 dBm signal source with digital-frequency readout. It can also measure inductance and capacitance at RF frequencies.

Features include solid-state band switching and electronic varicap tuning with a smooth 10:1 lockable vernier tuning drive.

Use eight AA *alkaline* batteries or 110 VAC with MFJ-1312D, $15.95. Includes N-to-SO-239 adapter. 3¾Wx6½Hx2¾D inches. 1.3 lbs.

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Ham Radio's *Most Popular* 300 Watt Antenna Tuner

More hams use MFJ-949s than any other antenna tuner in the world!

Why? Because the world's leading tuner has earned a world-wide reputation for being able to match just about anything.

Full 1.8-30 MHz Operation

Tune your antenna for minimum SWR! Works 1.8-30 MHz on dipoles, verticals, inverted vees, random wires, beams, mobile whips, shortwave receiving antennas . . . Use coax, random wire, balanced lines. Has heavy duty 4:1 balun for balanced lines.

Custom inductor switch

Custom designed inductor switch, 1000 volt tuning capacitors, *Teflon*(R) insulating washers and proper L/C ratio gives you *arc-free* no worries operation

MFJ-949E **$179.95** up to 300 Watts PEP transceiver input power.

The MFJ-949E inductor switch was *custom* designed to withstand the extremely high RF voltages and currents that are developed in your tuner.

8-Position Antenna switch

Antenna switch lets you select two coax fed antennas, random wire/balanced line or dummy load through your MFJ-949E or direct to your transceiver.

Lighted Cross-Needle Meter

Full *size* 3-inch lighted Cross-Needle Meter. Lets you easily read SWR, *peak* or average forward and reflected power simultaneously. Has 300 Watt or 30 Watt ranges.

QRM-Free PreTune™

MFJ's *QRM-Free PreTune™* lets you pre-tune your MFJ-949E *off-the-air* into its built-in dummy load! Makes tuning your actual antenna faster and easier.

Plus Much More!

Full *size* built-in non-inductive 50 Ohm dummy load, scratch-proof Lexan multi-colored front panel, $10^{5}/_{8}$x$3^{1}/_{2}$x7 inches. Superior cabinet construction and more!

MFJ-948, $159.95. Econo version MFJ-949E. Has all features except for dummy load.

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Every MFJ tuner is protected by MFJ's famous one year *No Matter What™* limited warranty. We will repair or replace your MFJ tuner (at our option) for a full year.

More hams use MFJ tuners than all other tuners in the world!

MFJ-989D *Legal Limit* Tuner

MFJ-989D **$389.95**

New, improved MFJ-989D *legal limit* antenna tuner gives you better efficiency, lower losses and a new *true* peak reading meter. Easily handles *full* 1500 Watts SSB/CW, 1.8-30 MHz, including MARS/WARC bands. Six position antenna switch, dummy load. *New* 500 pF air variable capacitors. *New* improved *AirCore™* Roller Inductor. *New* high voltage current balun. *New* crank knob. $12^{7}/_{8}$Wx6Hx$11^{5}/_{8}$D".

MFJ-986 Two knob *Differential-T™*

MFJ-986 **$349.95**

Two knob tuning (differential capacitor and *AirCore™* roller inductor) makes tuning foolproof and easier than ever. Gives minimum SWR at only one setting. Handles 3 KW PEP SSB amplifier input power (1.5 KW output). Gear-driven turns counter, lighted peak/average Cross-Needle SWR/Wattmeter, antenna switch, balun. 1.8 to 30 MHz. $10^{3}/_{4}$Wx$4^{1}/_{2}$Hx15 in.

MFJ-962D *compact* kW Tuner

MFJ-962D **$299.95**

A few more dollars steps you up to a KW tuner for an amp later. Handles 1.5 KW PEP SSB amplifier input power (800W output). Ideal for Ameritron's AL-811H! *AirCore™* roller inductor, gear-driven turns counter, pk/avg lighted Cross-Needle SWR/Wattmeter, antenna switch, balun, Lexan front, 1.8-30MHz. $10^{3}/_{4}$x$4^{1}/_{2}$x$10^{7}/_{8}$ in.

MFJ-969 300W *Roller Inductor* Tuner

MFJ-969 **$219.95**

Superb *AirCore™* Roller Inductor tuning. Covers *6 Meters* thru 160 Meters! 300 Watts PEP SSB. *Active* true peak reading lighted Cross-Needle SWR Wattmeter, *QRM-Free PreTune™*, antenna switch, dummy load, 4:1 balun, Lexan front panel. $10^{1}/_{2}$Wx$3^{1}/_{2}$Hx$9^{1}/_{2}$D inches.

MFJ-941E *super value* Tuner

MFJ-941E **$139.95**

The *most for your money!* Handles 300 Watts PEP, covers 1.8-30 MHz, *lighted* Cross-Needle SWR/Wattmeter, 8 position antenna switch, 4:1 balun, 1000 volt capacitors, Lexan front panel. Sleek $10^{1}/_{2}$Wx$2^{1}/_{2}$Hx7D in.

MFJ-945E HF/6M *mobile* Tuner

MFJ-945E **$129.95**

Extends your mobile antenna bandwidth so you don't have to stop, go outside and adjust your antenna. Tiny 8x2x6 in. *Lighted* Cross-Needle SWR/Wattmeter. Lamp and bypass switches. Covers 1.8-30 MHz *and* 6 Meters. 300 Watts PEP. **MFJ-20, $6.95,** mobile mount.

MFJ-971 *portable/QRP* Tuner

MFJ-971 **$119.95**

Tunes coax, balanced lines, random wire 1.8-30 MHz. Cross-Needle Meter. SWR, 30/300 or 6 Watt QRP ranges. Matches popular MFJ transceivers. Tiny 6x$6^{1}/_{2}$x$2^{1}/_{2}$ in.

MFJ-901B *smallest* Versa Tuner

MFJ-901B **$99.95**

MFJ's smallest (5x2x6 in.) and most affordable wide range 200 Watt PEP Versa tuner. Covers 1.8 to 30 MHz. Great for matching solid state rigs to linear amps.

MFJ-902 *Tiny Travel* Tuner

MFJ-902 **$99.95**

Tiny $4^{1}/_{2}$x$2^{1}/_{4}$x3 inches, full 150 Watts, 80-10 Meters, has tuner bypass switch, for coax/random wire.

MFJ-904H, $149.95. Same but adds Cross-needle SWR/Wattmeter and 4:1 balun for balanced lines. $7^{1}/_{4}$x$2^{1}/_{4}$x$2^{3}/_{4}$ inches.

MFJ-16010 *random wire* Tuner

MFJ-16010 **$69.95**

Operate all bands anywhere with MFJ's reversible L-network. Turns random wire into powerful transmitting antenna. 1.8-30 MHz. 200 Watts PEP. Tiny 2x3x4 in.

MFJ-906/903 *6 Meter* Tuners

MFJ-906 **$99.95**

MFJ-906 has lighted Cross-Needle SWR/Wattmeter, bypass switch. Handles 100 W FM, 200W SSB. **MFJ-903, $69.95**, Like MFJ-906, less SWR/Wattmeter, bypass switch.

MFJ-921/924 *VHF/UHF* Tuners

MFJ-921/924 **$89.95**

MFJ-921 covers 2 Meters/220 MHz. **MFJ-924** covers 440 MHz. SWR/Wattmeter. 8x$2^{1}/_{2}$x3 in.

MFJ-931 *artificial* RF Ground

MFJ-931 **$109.95**

Eliminates RF hot spots, RF feedback, TVI/RFI, weak signals caused by poor RF grounding. Creates artificial RF ground or electrically places far away RF ground directly at rig. **MFJ-934, $209.95**, Artificial ground/300 Watt Tuner/Cross-Needle SWR/Wattmeter.

Free MFJ Catalog

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Tech Help: (662) 323-0549
FAX:(662)323-6551 8-4:30 CST, Mon.-Fri. ***Add shipping.***

MFJ *IntelliTuner*™ Automatic Tuners

More hams use MFJ tuners than all other tuners in the world!

World's most advanced Automatic Antenna Tuners feature world renowned MFJ AdaptiveSearch™ and AutomaticRecall™ algorithms -- world's fastest ultra-wide range tuning. Nine World Class models! Choose your features: Digital/Analog/Audio SWR-Wattmeter, Antenna Switch, Balun, Radio Interface, Digital frequency readout, Remoteable, Coax/Balanced Lines/Wire Tuning, Field Upgradeable . . .

MFJ-993B 300 Watt *IntelliTuner*™

The World's Best Selling Automatic Antenna Tuner!

The MFJ-993B *IntelliTuner*™ lets you tune any antenna -- balanced or unbalanced -- *automatically* and *ultra fast*.

It's a comprehensive automatic *antenna tuning center* complete with SWR/Wattmeter, antenna switch for two antennas and 4:1 current balun for balanced lines.

MFJ's exclusive *IntelliTuner*™, *Adaptive Search*™ and *Instant Recall*™ algorithms give you *ultra fast* automatic tuning with over 20,000 *VirtualAntenna*™ Memories.

Select 300 Watt SSB/CW power level and match 6-1600 Ohm antennas ***Or . . .*** select **150 Watt** SSB/CW power level and match *extra wide-range* 6-3200 Ohms!

You get a highly efficient L-network, 1.8-30 MHz coverage, Cross-Needle *and* digital meters, audio SWR meter, *backlit* LCD, remote control port, radio interface, heavy-duty 16 amp/1000V relays.

MFJ-993B **$259.95**

The MFJ-993B automatically tunes for minimum SWR and remembers your frequency and tuner settings. The next time you operate on that frequency and antenna, these tuner settings are instantly restored and *you're ready to operate in milliseconds!* 10W x2¾ Hx9D". Use 12-15 VDC/1 amp or 110 VAC with **MFJ-1316, $21.95**. Radio interface cables, remote control available. See ***www.mfjenterprises.com***

for 600 Watt amps

AL-811/ALS-600/ALS-500

For 600 Watt amps like Ameritron AL-811/ALS-600/ALS-500M. Matches 12-800 Ohms. 10,000 *Virtual Antenna*™ memories. Cross-Needle SWR/Wattmeter. 10Wx2¾Hx9D inches.

MFJ-994B **$359.95**

***No Matter What*™ Warranty**

Every MFJ tuner is protected by MFJ's famous one year *No Matter What*™ limited warranty. We will repair or replace your MFJ tuner (at our option) for a full year.

1500 Watt *Legal Limit*

for Ameritron AL-1500/1200/82 amps

Roam the entire HF spectrum 1.8-30 MHz *hands-free* with full *1500 Watt* legal limit on SSB/CW and near-perfect SWR! Lighted LCD/Cross-Needle Meter.

MFJ-998 **$699.95**

300 Watt...*Extra*...Wide Range

SWR/Wattmeter, 10000 VA Memories

Extra *wide matching range at less cost.* Exclusive dual power level: 300 Watts/6-1600 Ohms; 150W/6-3200 Ohms. Cross-Needle SWR/Wattmeter.

MFJ-991B **$219.95**

200 Watt ...Compact

Digital Meter, Ant Switch, Wide Range

World's fastest compact auto tuner uses MFJ *Adaptive Search*™ and *InstantRecall*™ algorithms. 132,072 tuning solutions instantly match virtually any antenna with near perfect SWR.

MFJ-929 **$219.95**

200 Watt ...Econo

Small, Ant Switch, 20K VA Memories

High-speed, wide matching range and compactness at low cost! Leave in-line and forget it -- your antenna is *always* automatically tuned! 2-position antenna switch.

MFJ-928 **$199.95**

200 Watt *MightyMite*™

Matches IC-706, FT-857D, TS-50S

No *extra space needed!* Just set your IC-706/7000, FT-857D, TS-50S on top of this matching low-profile automatic tuner -- it's all you need for a completely automated station using *any* antenna! Just tune and talk!

MFJ-925 **$179.95**

G5RV Antenna

MFJ-1778 **$44.95**

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

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

200W...Weather-sealed

for Remote/Outdoor/Marine

MFJ-926B **$279.95**

Fully *weather-sealed for remote Outdoor/Marine use*! Tough, durable, built-to-last the elements for years.

200 Watt...Remote

Coax/Wire Ant, No pwr cable needed

MFJ-927 **$259.95**

Weather protected fully automatic *remote* auto tuner for wire ***and*** *coax* antennas -- an MFJ exclusive. Powers through coax -- No separate power cable needed.

Free MFJ Catalog

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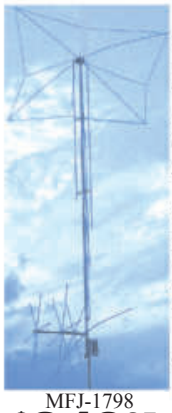
http://www.mfjenterprises.com for instruction manuals, catalog, info

10 Bands -- 1 MFJ Antenna!

Full size performance . . . No ground system or radials. Operate 10 bands: 75/80, 40, 30, 20, 17, 15, 12, 10, 6 and 2 Meters with one antenna . . . Separate full size radiators . . . End loading . . . Elevated top feed . . . Low Radiation Angle . . . Very wide bandwidth . . . Highest performance no ground vertical ever . . .



MFJ-1798
$349.95

Operate 10 bands -- 75/80, 40, 30, 20, 17, 15, 12, 10, 6 and 2 Meters with this MFJ-1798 vertical antenna and get *full size performance* with no ground or radials!

Full size performance is achieved using separate full size radiators for 2-20 Meters and highly efficient end loading for 30, 40, 75/80 Meters.

Get very low radiation angle for exciting DX, automatic bandswitching, omni-directional coverage, low SWR. Handles 1500 Watts PEP SSB.

MFJ's unique *Elevated Top Feed*™ elevates the feedpoint *all the way to the top* of the antenna. It puts the maximum radiation point high up in the clear where it does the most good -- your signal gets out even if you're ground mounted.

It's easy to tune because adjusting one band has minimum effect on the resonant frequencies of other bands.

Self-supporting and just 20 feet tall, the MFJ-1798 mounts easily from ground level to tower top -- small lots, backyards, apartments, condos, roofs, tower mounts.

Separate *full size* quarter wave radiators are used on 20, 17, 15, 12, 10 and 2 Meters. On 6 Meters, the 17 Meter radiator becomes a 3/4 wave radiator.

The active radiator works as a stub to decouple everything beyond it. In *phase* antenna current flows in all parallel radiators. This forms a very large equivalent radiator and gives you incredible bandwidths. Radiator stubs provide automatic bandswitching -- absolutely *no loss* due to loading coils or traps.

On 30, 40, 75/80 Meters, end loading -- the most efficient form of loading -- gives you highly efficient performance, excellent bandwidth, low angle radiation and automatic bandswitching.

MFJ's unique *Frequency Adaptive L-Network*™ provides automatic impedance matching for lowest SWR on these low bands. Tuning to your favorite part of these bands is simple and is done at the *bottom* of the antenna.

You don't need a ground or radials because an effective counterpoise that's 12 feet across gives you *excellent* ground isolation. You can mount it from ground level to roof top and get awesome performance.

The feedline is decoupled and isolated from the antenna with MFJ's exclusive *AirCore*™ high power current balun. It's wound with *Teflon*® coax and can't saturate, no matter how high your power.

Incredibly strong solid fiberglass rod and large diameter 6061 T-6 aircraft strength aluminum tubing is in the main structure.

Efficient high-Q coils are wound on tough *low loss* fiberglass forms using highly weather resistant *Teflon*® covered wire.

MFJ *6-Band* Halfwave Vertical Antenna

6 bands: 40, 20, 15, 10, 6, 2 Meters . . . No radials or ground needed

MFJ-1796
$229.95

MFJ-1796 is only 12 feet high and has a tiny 24 inch footprint! Mount anywhere -- ground level to tower top -- apartments, small lots, trailers. Perfect for field day, DXpeditions, camping.

Efficient end-loading, no lossy traps. Entire length always radiating. Full size halfwave on 2/6 Meters. High power *air-wound* choke balun eliminates feedline radiation. Adjusting one band has minimum effect on other bands.

MFJ-1796W, $229.95. WARC band version for 12, 17, 30, 60 Meters only.

MFJ-1792, $189.95. Full size 1/4 wave radiator for 40 Meters. 33 ft., handles 1500 Watts PEP. Requires guying and radials.

MFJ-1793, $209.95. Like MFJ-1792 but has full size 20 Meter 1/4 wave also.

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

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

MFJ-1775
$249.95

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

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

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

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

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

Built-to-last -- incredibly strong solid rod fiberglass center insulator and 6063 T-6 aircraft strength aluminum tubing radiator. Assembles in an afternoon. Adjusting one band has little effect on other bands.

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

MFJ *80/40/20* Meter *Rotatable* Dipole

MFJ-1785
$369.95

Now you can operate the *low bands* on 80, 40, and 20 Meters with a true rotatable dipole that'll blend in with the sky! Take advantage of excellent low band propagation during this low sunspot cycle. Handles 1500 Watts SSB/CW. 80/40 meter end-loading coils are wound on fiberglass forms with *Teflon*™ wire, and resonated with capacitance hats to ensure extremely low-losses. Full-size on 20 Meters gives incredible DX. Balun included! 33 foot low-profile, inconspicuous. Easily rotatable with a medium duty rotator like Hy-gain's AR-40.

MFJ's Super High-Q Loop™ Antennas

MFJ-1786
$419.95

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

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

Super easy-to-use! Only MFJ's super remote control has *Auto Band Selection*™. It auto tunes to desired band, then beeps to let you know. No control cable is needed.

Fast/slow tune buttons and built-in two range Cross-Needle SWR/Wattmeter lets you quickly tune to your exact frequency.

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

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

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

MFJ's G5RV Antenna

MFJ-1778
$44.95

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

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

Dealer/Catalog/Manuals

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

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

MFJ Dummy Load/Wattmeter

1.5 kW Dry Dummy Load has built-in precision, true peak-reading SWR/Wattmeter switchable to external antenna!

MFJ-267
$159.95

World's most versatile 1.5 kW dummy load has a *built-in* true peak reading SWR/Wattmeter that you can switch and use independently!

You'll find tons of uses!

Tune up your transceiver, linear amplifier or antenna tuner into a safe 50 Ohm dummy load at *full power*. Then instantly switch to your antenna and monitor SWR, forward and reflected power.

Use for testing/tuning transmitters, transceivers, amplifiers, antenna tuners, baluns, transformers, filters, matching networks, coax, stubs, transmission lines and antennas.

The 50-Ohm dry dummy load works DC to 60 MHz. SWR is below 1.3:1 at 30 MHz. Can handle 100 Watts for ten minutes or 1500 Watts for ten seconds. Comes with power derating curve.

Extra-large three-inch lighted Cross-Needle meter reads SWR (1:1 to 8:1), forward and reflected power *simultaneously*.

Reads *true peak* PEP or average power on 300/3000 Watts forward and 60/600 Watts reflected power ranges 1.8-54 MHz.

High accuracy comes from a carefully designed directional coupler, an accurate active-peak reading circuit and a precision d'Arsonval meter movement.

RF tight perforated aluminum cabinet. 4½Wx3½Hx10½D inches. Uses 12 VDC or 120 VAC with **MFJ-1312D, $15.95.**

MFJ HF/VHF/UHF Dummy Loads

Dry 300 Watt *HF /VHF* Dummy Load

MFJ-260C
$39.95

Air-cooled, non-inductive resistor in a perforated metal housing; Has SO-239 connector. Full load for 30 seconds. Silk-screened derating curve to 5 minutes. Handles 300 Watts. SWR is below 1.1:1 to 30 MHz, 1.5:1 from 30 to 650 MHz. Compact 2¼x2¼x7 inches. **MFJ-260CN, $49.95.** With type "N" connector.

Dry 1.5 kW *HF/VHF/UHF* Dummy Load

MFJ-264
$74.95

Ham radio's most versatile 50 ohm *dry* dummy load. Works with all radios from 160 Meters through 650 MHz. SWR below 1.3 to 650 MHz and below 1.1 at 30 MHz. Handles 100 watts for ten minutes, 1500 Watts for 10 seconds. 3Wx3H x9D inches. Has SO-239 connector. **MFJ-264N, $84.95.** With type "N" connector.

Oil-Cooled 1 KW CW, 2 KW SSB VersaLoad ™

MFJ-250X
$49.95

Run 1KW CW or 2 KW PEP for 10 minutes. Run *continuous duty* with 200 Watts CW or 400 watts PEP. Transformer oil not included. Low VSWR to 400 MHz. Under 1.2:1 to 30 MHz. SO-239 connector. Safety vent with cap, carrying handle. 7½Hx6⅝D inches. **MFJ-250, $69.95.** Includes transformer oil (no PCB).

3 GHz, 300 Watts Dry Dummy Load

MFJ-263
$99.95

New high-tech metal film resistor gives low SWR up to 3 GHz at 300 Watts! Mounted on large heavy-duty air-cooled heatsink. SWR is less than 1.1 DC to 1 GHz, 1.2 at 1.5 GHz and 1.5 at 3 GHz. Handles 125 Watts *continuous* and 300 Watts for ten seconds. High quality *Teflon*(R) N connector. 10¾Wx2¼Hx5¼D in. **New!**

MFJ Frequency Counters

MFJ-886
$129.95

MFJ-886 covers 1 MHz to 3 GHz with 300 MHz direct count, 0.1 Hz resolution. 4 gate times. 10-digit high-contrast 3/4 inch LCD display. Lock display button. Bargraph shows RF field strength. Includes rechargeable Ni-Cad batteries, charger, telescopic antenna. Black anodized aluminum. 2¾x2¼x1¼ inches.

MFJ-888
$199.95

MFJ-888, like MFJ-886, but covers *10 Hz*-3 GHz. Measures frequency/ period, has 50/1M Ohm input, auto hold, LED backlight, beeper. 2¾x4¼x1¼ inches

Field Strength Meters

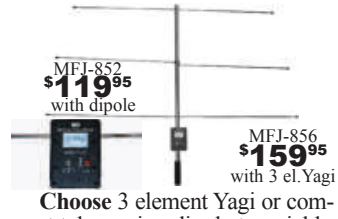
MFJ-802
$49.95

MFJ-802 shows relative antenna field strength. Use to determine radiation pattern. Has large 3 inch meter. Telescoping *dipole* reduces influence of surrounding objects and is more reliable and repeatable than monopole. Sensitivity control. Jack for remote sensor. **MFJ-802R, $34.95.**

MFJ-801
$29.95

MFJ-801 has 1¾ inch meter, sensitivity control, 20 inch extended telescoping monopole antenna.

Find Power Line Noise fast!



MFJ-852
$119.95
with dipole

MFJ-856
$159.95
with 3 el.Yagi

Choose 3 element Yagi or compact telescoping dipole to quickly pinpoint noise. Walk or drive with these handheld, directional noise finders to search out leaky insulators, loose hardware and corroded ground lines quickly. Track noise directly to pole, transformer, insulator or others. Has field-strength meter, headphone jack to listen or record. Operates in optimum 135 MHz region. Sensitive .3uV receiver, 70 dB AGC.

81 dB Step Attenuator

MFJ-762
$89.95

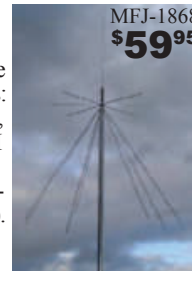
81 dB Attenuator in 1 dB steps. 50 Ohms. Usable to 500 MHz. 250 milliwatt maximum input. BNC connectors. Shielded stages. Connect between receiver and antenna and use S-meter as a precision calibrated field strength meter. Prevent receiver blocking, cross-modulation. Determine gain/loss, ideal for fox hunting. Evaluate linearity. Isolate circuits. Extend range of sensitive equipment. Measure input/output level differences.

Compact Cross-Needle SWR/Wattmeters

MFJ-822
$59.95

MFJ-822, $59.95. Large 3-inch *lighted* Cross-Needle meter covers 1.8-200 MHz in 2 power ranges: 30/300 Watts. Read forward, reflected power, SWR *simultaneously*. Compact 3¼Wx3¼H x3¼D inches takes little space. Perfect for home, mobile or portable use. SO-239 connectors. Use 12 VDC for lamp (cable included). **MFJ-842, $59.95.** Like MFJ-822, but covers 140-525 MHz, 15/150 Watt ranges.

25-1300 MHz Discone Antenna



MFJ-1868
$59.95

Ultra wide-band antenna receives 25-1300 MHz. Perfect for scanners. Transmit 50-1300 MHz. Handles 200 Watts. Ideal for 6/2/1¼Meters, 70/33/23 CM ham bands. Excellent for testing various transmitters on single coax. SO-239, 50 feet coax, stainless steel elements.

Free MFJ Catalog

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

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MFJ *Speech Intelligibility* Enhancer

. . . makes barely understandable speech highly understandable!

MFJ-616
$189.95

"What did you say?" Can you hear but . . . just can't always understand everything people are saying?

As we get older, high frequency hearing loss reduces our ability to understand speech. Here's why . . .

Research shows that nearly *half* the speech intelligibility is contained in 1000 to 4000 Hz range, but contains a miniscule 4% of total speech energy.

On the other hand, the low frequencies, 125 to 500 Hz have most of the speech energy (55%) but contribute very little to intelligibility -- only 4%.

To dramatically improve your ability to understand speech, you must:

First, drastically increase the speech energy above 500 Hz, where 83% of the speech intelligibility is concentrated.

Second, drastically reduce speech energy below 500 Hz where only 4% of speech intelligibility lies.

The MFJ-616 splits the audio speech band into four overlapping octave ranges centered at 300, 600, 1200 and 2400 Hz. You can boost or cut each range by nearly 20 dB.

A balance control and separate 2½ Watt amplifiers let you equalize perceived loudness to each ear so both ears help.

By boosting high and cutting low frequencies and adjusting the balanced control, speech that you can barely understand become highly understandable!

Even if you *don't* have high frequency hearing loss, you'll dramatically improve your ability to understand speech. You'll get an edge in contesting and DXing and enjoy ragchewing more.

Here's what *QST* for April, 2001 said . . . *"I expected a subtle effect at best, but I was astonished . . . The result was remarkably clean, understandable speech without hissing, ringing or other strange effects . . . made a dramatic improvement . . ."*

Immuned to RFI. Has phone jack, on/off speaker switch, 2 inputs, bypass switch. 10Wx2½Hx6D". Needs 12 VDC.

MFJ-1316, $21.95. For 110 VAC operation. Provides 12 VDC/1.5 Amps.

MFJ-72, $69.80. *All-in-one MFJ-616 Accessory Pack.* Includes MFJ-392 headphones, two MFJ-281 speakers and MFJ-1316 power supply. ***Save $7!***

Try it for 30 Days

Order from MFJ and try it -- No obligation. If not delighted, return it within 30 days for refund less shipping.

MFJ Contest Voice Keyer

Transformer-coupled -- No RFI, hum or feedback . . . 75 seconds total, 5-messages . . . Records received audio . . .

MFJ-434B
$199.95

Let this *new* microprocessor controlled MFJ *Contest Voice Keyer*™ call CQ, send your call and do contest exchanges for you in your own natural voice!

Store frequently used phrases like "CQ Contest this is AA5MT", "You're 59" . . . "Qth is Mississippi" . . . Contest by pressing a few buttons and save your voice.

Record and playback 5 natural sounding messages in a total of 75 seconds. Uses *eeprom* -- no battery backup needed. Use your mic or its built-in mic for recording.

You can repeat messages continuously and vary the repeat delay from 3 to 500 seconds. Makes a great voice beacon and calling CQ is *so* easy.

You can also record and play back off-the-air signals -- great help if you didn't get it right the first time! No more "*Please repeat*".

A playing message can be halted by the *Stop Button*, your microphone's PTT/VOX, remote control or computer.

Has jack for remote or computer control (using CT, NA or other program). Lets you select, play and cancel messages.

Your mic's audio characteristics do not change when your MFJ-434B is installed.

All audio lines are RF filtered to eliminate RFI, audio feedback and distortion. An audio isolation transformer totally eliminates hum and distortion caused by ground loops.

New! **It's** easy to use -- just plug in your 8 pin round or modular mic plug, set the internal jumpers for your transceiver and plug in the appropriate (included) cable for your rig.

Built-in speaker-amplifier. Speaker/phone jack. Use 9 Volt battery, 9-15 VDC or 110 VAC with optional MFJ-1312D, $15.95. 6½Wx2½Hx6½D in.

MFJ-73, $34.95. MFJ-434B Remote Control with cable.

60 dB Null *wipes out* noise and interference

MFJ-1026
$199.95

Wipe out noise and interference *before* it gets into your receiver with a 60 dB null!

Eliminate all types of noise -- severe power line noise from arcing transformers and insulators, fluorescent lamps, light dimmers, touch controlled lamps, computers, TV birdies, lightning crashes from distant thunderstorms, electric drills, motors, industrial processes . . .

It's *more effective* than a noise blanker! Interference much stronger than your desired signal can be completely removed without affecting your signal.

It works on *all modes* -- SSB, AM, CW, FM -- and frequences from BCB to lower VHF.

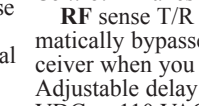
You can null out strong QRM on top of weak rare DX and then work him! You can null out a strong local ham or AM broadcast station to prevent your receiver from overloading.

Use the MFJ-1026 as an *adjustable phasing network.* You can combine two antennas to give you various directional patterns. Null out a strong interfering signal or peak a weak signal at a push of a button.

Easy-to-use! Plugs between transmitting antenna and transceiver. To null, adjust amplitude and phase controls for minimum S-meter reading or lowest noise. To peak, push reverse button. Use built-in active antenna or an external one. MFJ's exclusive *Constant Amplitude Phase Control*™ makes nulling easy.

RF sense T/R switch automatically bypasses your transceiver when you transmit. Adjustable delay time. Uses 12 VDC or 110 VAC with MFJ-1312D, $15.95. 6½x1½x6¼ in.

MFJ-1025, $179.95. Like MFJ-1026 less built-in active antenna, use external noise antenna.



MFJ *tunable* Super DSP filter

MFJ-784B
$279.95

Only MFJ gives you *tunable* and *programmable* "brick wall" DSP filters.

You can continuously *tune* low pass, high pass, notch and bandpass filters and continuously *vary* bandwidth to pinpoint and eliminate interference.

Only MFJ gives you 5 factory pre-set and 10 programmable pre-set filters you can customize. **Automatic** notch filter searches for and eliminates multiple heterodynes. Advanced adaptive noise reduction silences background noise and QRM.

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http://www.mfjenterprises.com *for instruction manuals, catalog, info*

MFJ *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!

MFJ-891 **$109.95**

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 *high-accuracy* Digital SWR/Wattmeter

MFJ-826B **$179.95**

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.

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" VHF SWR Wattmeter, 2M/C/N Meter, SWR/Watts, 1.8-30 MHz, 300/3000W Fwd, 60/600W Ref. True Peak.

MFJ-812B **$39.95**

Lighted 3" 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!

MFJ-1164B **$79.95**

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.

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-655B **$219.95**

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.

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ACCESSORIES

Plug & Play Cables

RBC-XX, $69.95. *Includes all the cables you need to get you on the air in minutes!*

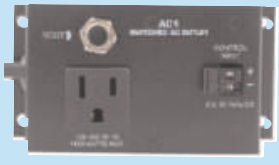
Has Microphone/speaker cables, data (CAT) cable, telephone cable, power supply.

For Kenwood, Icom, Yaesu, Flex, Elecraft and more. See *www.mfjenterprises.com* for model number for your rig.

Rotator Cable

RBC-RCC, $36.95. Required to control a rotator (rotator controller must have an RS-232 port).

Remote Switched AC Outlet



RBC-120REL, $149.95. Use this to turn your radio (or other 120 Volt/15 Amp device such as a power supply) on or off remotely. For *all* Icom radios and some later model Yaesu radios without remote on/off capability.

Microphone/headphone Interface

Microphone/Headphone Interface

RBC-CMI1, $249.95. Plug this noise cancelling microphone into your cellphone and get real PTT with many other bells and whistles. Provides receive audio for your car or headphones. Superb audio. Cellphone, headphones not included.

Cordless Phone Interface

RBC-CPI1, $179.95. Lets you use your cordless phone to control your station.

RBC-212
$499.95

CONTROL YOUR RIG

- TX, RX, Set/Speak VFO's
- Scan the bands
- Set and recall memories
- Fine tune stations
- Apply filters

ROTATE YOUR BEAM

- Set heading
- Stop rotation

SWITCH ANTENNAS

- Control rig antenna tuner
- Set auxiliary relays

HAM-VI Rotator & Digital Controller

New hy-gain HAM-VI, $749.95, like HAM-IV but with DCU-2 *digital controller*. Gives you fully automatic or manual control of medium antennas up to 15 square feet wind load. ***www.hy-gain.com***

HAM-VI
$749.95
with DCU-2

MFJ Headphones

MFJ-392B, $24.95. Superb padded headband/ear cushioned headphones. High-performance driver for enhanced audio.

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- 50/15/5 Watt Output
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ENTRY-CLASS 2m + 70cm DIGITAL MOBILE

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†*www.icomamerica.com/amateur/DSTAR for details about free software*

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- 10 Watt on 23cm (FM, DV, DD)
- RX: 1240–1300MHz*
- 100 Alphanumeric Memory Channels
- USB Rig Control, Ethernet Plug for DD
- Black Box Operation
- Remote Control Head, Remote Speaker and Cables Included
- PC Software Included

NEW ID-51A D-STAR ready
2m + 70cm VHF/UHF DUAL BAND PORTABLE

- 2m + 70cm FM Analog & Digital*
- 5/2.5/1.0/0.5/0.1 Watt Output
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D-PRS™

IC-80AD 2m + 70cm DUAL BANDER

D-STAR ready

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- RX: 0.495–999.990MHz*
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†*www.icomamerica.com/amateur/DSTAR for details about free software*

IC-92AD
2m + 70cm MILITARY RUGGED AND SUBMERSIBLE

D-STAR ready

- 5/2.5/0.5/0.1 Watt Output
- RX: 0.495–999.990, 118–174, 350–470MHz*
- 1304 Alphanumeric Memory Channels
- Optional GPS Speaker Mic (HM-175GPS)
- IPX7 Submersible

ID-31A
UHF/70cm + D-STAR

D-STAR ready

- 5/2.5/0.5/0.1 Watt Output
- RX: 400–479MHz*
- 1252 Alphanumeric Memory Channels
- Built-in GPS Receiver
- IPX7 Submersible

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*Frequency specs may vary. Refer to owner's manual for exact frequency specs.

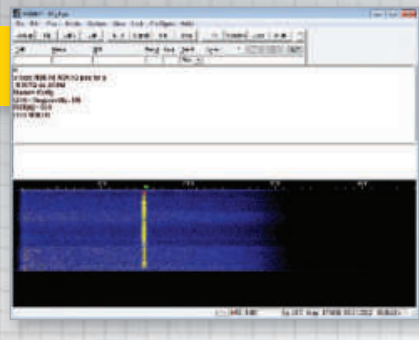
QST QuickStats

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

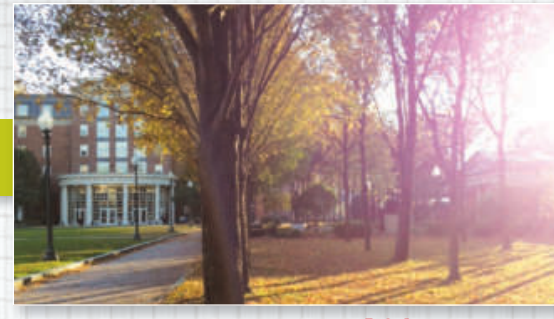
Online QuickStats Poll Results for January 2 through February 4, 2013.

Get on the web and vote today at **www.arrl.org/quickstats**!



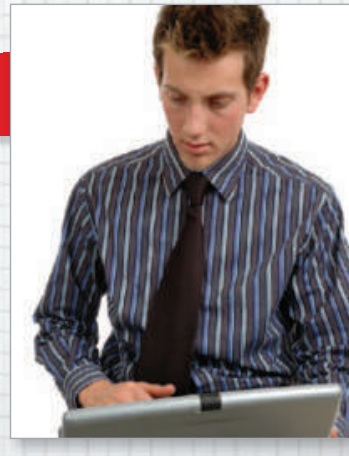
How do you feel about the frequent use of macros during keyboard-to-keyboard digital contacts?

- They don't bother me **52%**
- They are used far too often **19%**
- I don't operate digital modes **29%**



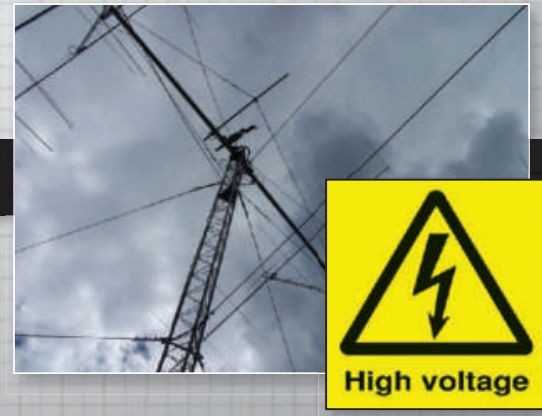
Did your college have an Amateur Radio club?

- Yes **39%**
- No **46%**
- I'm presently in college and we have a club on campus **1%**
- I'm presently in college and we don't have a club on campus **2%**
- I never attended college **12%**



If you were to apply for a job, would you mention your Amateur Radio experience on your resume?

- Yes **63%**
- No **5%**
- It depends on the nature of the job **32%**



Are you comfortable working around high voltage?

- Yes **73%**
- No **27%**

HF

VHF

UHF

IC-7410 HF + 6m

100 Watt Output (40W AM)

RX: 0.030–60.000MHz*

32 Bit Floating Point DSP Unit

+30 dBm 3rd Order Intercept Point*

Double Conversion Superheterodyne System

Built-in 15kHz 1st IF Filter (Optional 3kHz/6kHz)

USB Port for PC Control and Audio In/Out

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RX: 0.030–60.000MHz*

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Digital Twin Passband Tuning

USB Port for PC Control and Audio In/Out

Flexible Selectable Filter Width and Shape

USB Port for PC Control and Audio In/Out

IC-7000 HF/6m/2m/70cm

100W (40W AM),
50W on 2M (20W AM),
35W on 70CM (14W AM)

RX: 0.03–199.999,
400–470MHz*

Digital IF Filters

Digital Voice Recorder

Front Panel Separation
with Optional 3.5m
or 5m Cable (As Shown)

IC-9100 HF + 6m + 2m + 70cm + 23cm[1]

100/100/100/75/10[1] Watt Output[3]

RX: 0.030–60.000[2], 136.000–174.000[2],
420.000–480.000[2], 1240.000–1320.000[2,3]MHz

AM[3], FM, SSB, RTTY, CW, & DV[1]

Satellite (Mode B/J/L[1])

+30dBm TOI[2]

Two Independent 32-bit DSP Systems

3kHz/6kHz 1st IF "Roofing" Filters[1] (HF/6m)

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[1]Optional UX-9100 required. [2]HF (14MHz) [3]See manual for AM output power.

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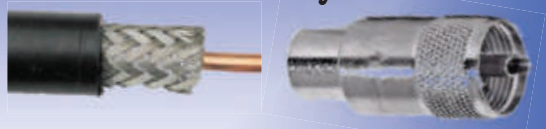

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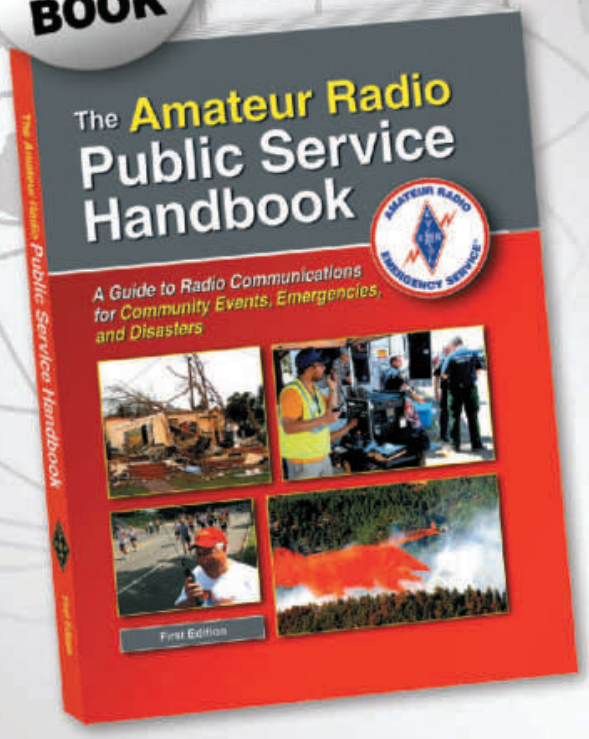

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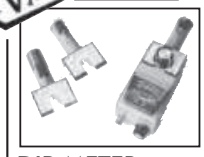

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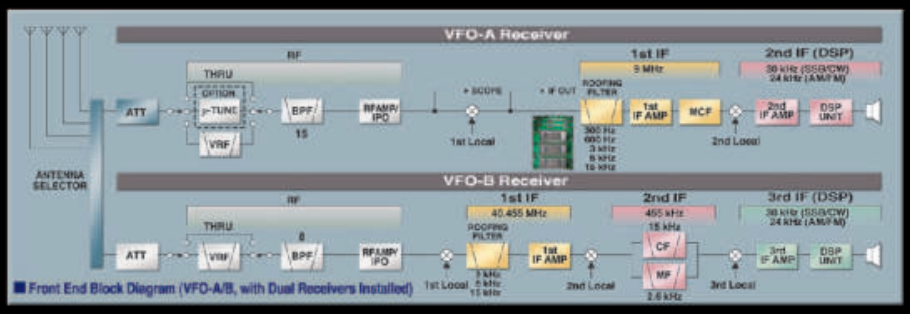

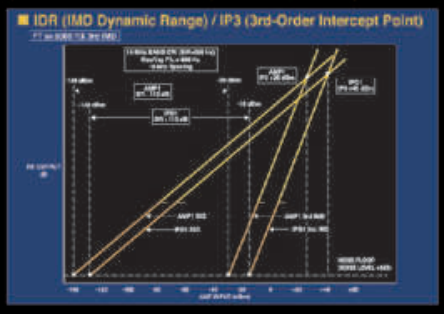

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