QST

DEVOTED ENTIRELY TO AMATEUR RADIO

May 2011 WWW.ARRL.ORG

QST reviews:

Inside:

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Dayton Hamvention®
Dayton, Ohio
May 20-22, 2011

ARRL National Convention at Ham-Com
Plano, Texas
June 10-11, 2011

Dayton Ad Section page 129

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Official Journal of ARRL The national association for AMATEUR RADIO®

The radio YAESU ...

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

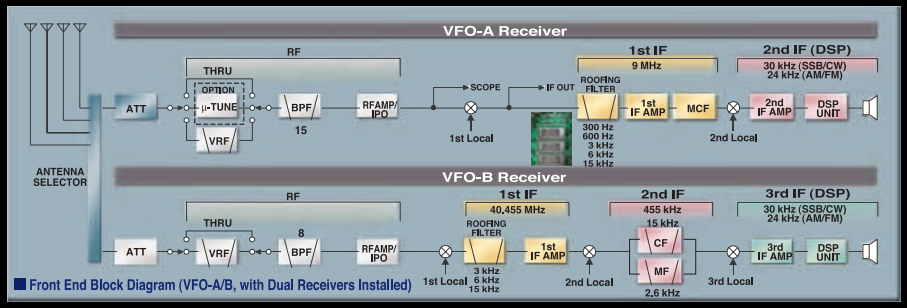
The New Premium HF/50 MHz Transceiver
FT DX 5000 Series

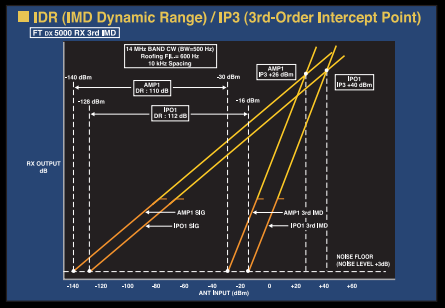
Two Totally Independent Receivers - The VFO-A/Main Receiver utilizes Super Sharp Roofing filters to give you the highest performance and best flexibility

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

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

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





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

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

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

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

HF/50 MHz 200 W Transceiver NEW
FT DX 5000

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

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

YAESU
Choice of the World's top DX'ers SM

Vertex Standard US Headquarters
10900 Walker Street Cypress, CA 90630 (714) 827-7600

QUADRA SYSTEM

VL-1000

HF/50 MHz 1 kW* Linear Amplifier

* Without 12/10 meters and 500 W on 6 meter in USA

VP-1000

48 V 48 A Switching Power Supply

The New Standard of Excellence in Linear Amplifier Technology!

For a bold, clean signal from "Top Band" through the "Magic Band", the VL-1000/VP-1000 QUADRA SYSTEM belongs in your station!

- Innovative Quadra Push-Pull RF Design for 1 kW of MOSFET Power
- Powerful 16-bit Control CPU Provides High-Speed Antenna Tuning with Extensive Memory and Multi-Band Memory Data Backup

- Large Dot-Matrix LCD Display Features World's First Panoramic SWR Monitor

- Active Safety Protection Circuitry Assures Reliability and Quick Diagnosis of System Anomalies

- High-Performance Switching Relays with Automatic Maintenance Mode
- Direct Air Flow Cooling System Provides Efficient Dissipation of Heat

- Automatic Band Change for Quick QSY

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

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Choice of the World's top DX'ers℠

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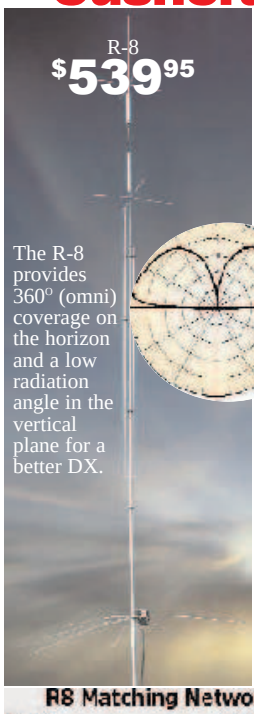
Cushcraft R8 *8-Band Vertical*

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!

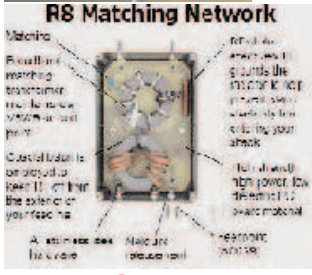
Rugged Construction: Thick fiberglass insulators, all-stainless hardware, and 6063 aircraft-aluminum tubing that is double or triple walled at key stress points handle anything Mother Nature can dish out.

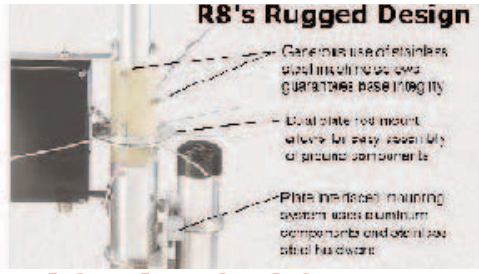
Compact Footprint: Installs in an area about the size of a child's sandbox -- no ground radials to bury and all RF-energized surfaces safely out of reach.

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!

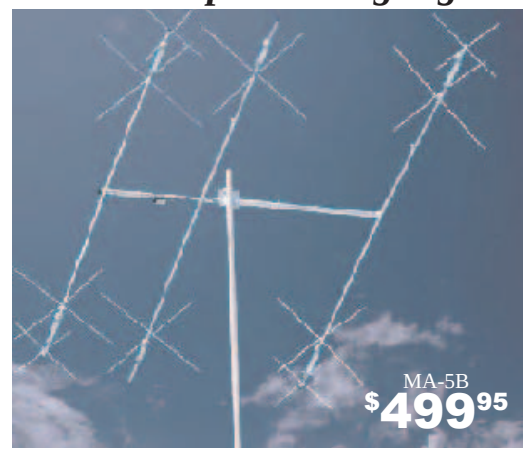
R-8GK, $56.95. R-8 three-point guy kit for high winds.





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

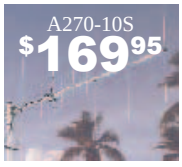
Only the best tri-band antennas become DX classics, which is why the Cushcraft World-Ranger A4S, A3S, and A3WS go to the head of the class. For more than 30 years, these pace-setting performers have taken on the world's most demanding operating conditions and proven themselves every time. The key to 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.

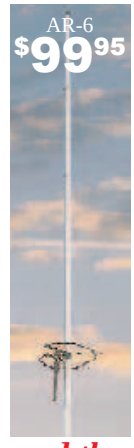
Cushcraft Dual Band Yagis

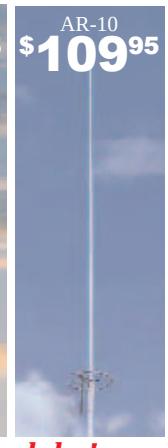
One Yagi for Dual-Band FM Radios



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!

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

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Amateur Radio Antennas
308 Industrial Park Road, Starkville, MS 39759 USA
Open: 8-4:30 CST, Mon.-Fri. ***Add Shipping.***
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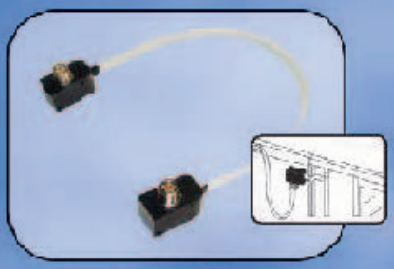
Life is a JOURNEY. Enjoy the ride!



NEW! COMET CTC-50M
Window Gap Adapter!

Max Power: HF 100W PEP
VHF: 60W FM
UHF: 40W FM
900MHz - 1.3GHz: 10W
VSWR: <500MHz 1.3:1
>500MHz 1.5:1
Impedance: 50Ohm
Length: 15.75"
Conn: 24k Gold Plated SO-239s

MALDOL HVU-8
Ultra-Compact 8 Band Antenna!

Unique ground radial system rotates 180 degrees around the base if building side mounting is required.

Max Power: HF 200W SSB/100W FM
6M - 70cm: 150W FM
TX: 80/40/20/15/10/6/2M/70cm
Impedance: 50 Ohm
Length: 86" approx
Weight: 5lbs 7oz
Conn: SO-239
Max Wind Speed: 92MPH

Each band tunes independently.
Approx 2:1 band-width:
80M 22kHz
40M 52kHz
20M 52kHz
15M 134kHz
10M 280kHz

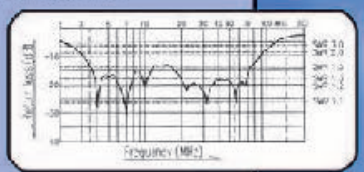
COMET CHA-250B
Broadband HF Vertical!

3.5 - 57MHz with SWR of 1.6:1 or less!

- *NO ANTENNA TUNER NEEDED*
- *NO RADIALS*
- *NO TRAPS*
- *NO COILS*

If you suffer in an antenna restricted area, must manage with space restrictions or you simply want to operate incognito you will be forced to make significant antenna compromises. The CHA-250B makes the most of the situation, making operating HF easy!!

Max Power: 250W SSB/125W FM
TX: 3.5 - 57MHz
RX: 2.0 - 90MHz
Impedance: 50Ohm
Length: 23'5"
Weight: 7lbs 1 oz
Conn: SO-239
Max Wind Speed: 67MPH



NEW! COMET H-422
40/20/15/10M compact, broadband, rotatable dipole!

Assemble in either a "V" or horizontal ("H") configuration.
CBL-2500 2.5kW balun and heavy duty hardware included.

Max Power: 1000W SSB / 500W FM
SWR: Less than 1.5:1 at center frequency
Rotation Radius: "V" 12' 5" "H" 17' 5"
Length: "V" 24' 5" "H" 35' 10"
Weight: 11 lbs 11 ozs
Wind load: 3.01 sq feet
Max Wind Speed: 67 MPH

COMET and Maldol

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

Or contact NCG Company, 15036 Sierra Bonita Lane, Chino, CA 91710
909-393-6133 • 800-962-2611 • FAX 909-393-6136 • www.natcommgroup.com

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Contents

This Month in QST

May 2011 ■ Volume 95 Number 5

Technical

JOHN MAUSHAMMER

News and Features

Interested in Writing for *QST*? www.arrl.org/qst-author-guide e-mail: qst@arrl.org

Radiosport

Our Cover
It doesn't matter how you get there, just as long as you get there! The ARRL EXPO makes two stops in 2011 — one at the Dayton Hamvention in May and another in June at the ARRL National Convention at Ham-Com in Plano, Texas. Inset photo, top: ARRL Membership and Volunteer Programs Manager Dave Patton, NN1N (right) checks cards for various ARRL awards, such as DXCC, at the 2010 Hamvention. Photo by ARRL News Editor S. Khrystyne Keane, K1SFA. Inset photo, bottom: You don't have to be a "big gun" to handle a soldering gun. ARRL Teachers Institute Instructor Nathan McCray, K9CPO, mentors a young person at the kit building booth, just one of the many fun and exciting activities offered at ARRL EXPO. Photo by ARRL Marketing Manager Bob Inderbitzen, NQ1R. Turn to page 71 to find out more about ARRL EXPO.

Departments

May 2011 ■ Volume 95 Number 5

QST (ISSN:0033-4812) is published monthly as its official journal by the American Radio Relay League, Inc, 225 Main Street, Newington, CT 06111-1494, USA. Periodicals postage paid at Hartford, CT, USA and at additional mailing offices.

POSTMASTER: Send address changes to: QST, 225 Main St, Newington, CT 06111-1494, USA. Canada Post: Publications Mail Agreement #40612608. Canada Returns to be sent to Bleuchip International, PO Box 25542, London, ON N6C 6B2.

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See page 14 for detailed contact information.

Telephone: **860-594-0200**
Fax: **860-594-0259**

NEW COMPACT HF TRANSCEIVER WITH IF DSP

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-450D...This Radio is for YOU!

Compact size: 9" X 3.3" X 8.8" and Light weight: 7.9 lb

HF/50 MHz 100 W All Mode Transceiver

FT-450D

With Built-in Automatic Antenna Tuner

NEW **Illuminated Key buttons**

NEW **300 Hz/500 Hz/2.4 kHz CW IF Filters**

NEW **Foot stand**

NEW **Classically Designed Main Dial and Knobs**

NEW **Dynamic Microphone MH-31A8J Included**

■ **The rugged FT-450D aluminum die-cast chassis, with its quiet, thermostatically controlled cooling fan provides a solid foundation for the power amplifier during long hours of field or home contesting use.**

MOS FET RD100HHF1

■ **Large informative Front Panel Display, convenient Control knobs and Switches**

■ **The IF DSP guarantees quiet and enjoyable high performance HF/50 MHz operation**

Handy Front Panel Control of Important Features including:

- **CONTOUR Control Operation**
  The Contour filtering system provides a gentle shaping of the filter passband.
- **Manual NOTCH**
  Highly-effective system that can remove an interfering beat tone/signal.
- **Digital Noise Reduction (DNR)**
  Dramatically reduces random noise found on the HF and 50 MHz bands.
- **IF WIDTH**
  The DSP IF WIDTH tuning system provides selectable IF passband width to fight QRM.
  SSB - 1.8/2.4/3.0 kHz, CW - 300 Hz/500 Hz/2.4 kHz
- **Digital Microphone Equalizer**
  Custom set your rig to match your voice characteristics for maximum power and punch on the band.
- **Fast IF SHIFT Control**
  Vary the IF SHIFT higher or lower for effective interference reduction / elimination.

More features to support your HF operation

●10 kHz Roofing filter ●20 dB ATT/IPO ●Built-in TCXO for incredible ±1 ppm/hour (@+77°F, after warm-up) stability ●CAT System (D-sub9 pin): Computer programming and Cloning capability ●Large, Easy-to-See digital S-meter with peak hold function ●Speech Processor ●QUICK SPLIT to automatically Offset transmit frequency (+5 kHz default) ●TXW to monitor the transmit frequency when split frequency operation is engaged ●Clarifier ●Built-In Electronic Keyer ●CW Beacon (Up to 118 characters using the CW message keyer's 3 memory banks) ●CW Pitch Adjustment (from 400 to 800 Hz, in 100 Hz steps) ●CW Spotting (Zero-Beating) ●CW Training Feature ●CW Keying using the Up/Down keys on the microphone ●Two Voice Memories (SSB/AM/FM), store up to 10 seconds each ●20 second Digital Voice Recorder ●Dedicated Data Jack for FSK- RTTY operation ●Versatile Memory System, up to 500 memory channels that may be separated into as many as 13 Memory Groups ●CTCSS Operation (FM) ●My Band / My Mode functions, to recall your favorite operating set-ups ● Lock Function ●C.S. Switch to recall a favorite Menu Selection directly ●Dynamic Microphone included ●IMPORTANT FEATURES FOR THE VISUALLY IMPAIRED OPERATOR – Digital Voice Announcement of the Frequency, Mode or S-meter reading

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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

"The Best of the Best Just Got Better"

Introducing the new FT-950 Series with PEP-950 (Performance Enhancement Program)

COMPACT HF/50 MHz TRANSCEIVER WITH IF DSP

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

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

HF/VHF/UHF Portable Operation
Just Got a Lot More Powerful!

FT-897D TCXO DSP 60 m Band

HF/50/144/430 MHz
100 W All Mode Transceiver (144 MHz 50 W/430 MHz 20 W)

HF/VHF/UHF Multimode Mobile Transceiver,
now Including Built-in DSP

FT-857D DSP 60 m Band

HF/50/144/430 MHz
100 W All Mode Transceiver (144 MHz 50 W/430 MHz 20 W)

Real Performance,
Really Portable

FT-817ND

HF/50/144/430 MHz
5 W All Mode
Transceiver
(AM 1.5 W)

60 m Band

Automatic Matching for FT-897/857 Series Transceivers

FC-40
Automatic-Matching 200-Memory Antenna Tuner (160 m ~ 6 m Band)

WATERPROOF

Mobile Auto-Resonating 7~430 MHz for FT-897/857 Series Transceivers

ATAS-120A
Active Tuning Antenna System (no separate tuner required)

VHF/UHF Base RadialKit ATBK-100 for ATAS-120A.

ATAS MICRO

ATAS-25
Manually-Tuned Portable Antenna

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Advanced Dual Band Mobile Radio
5.2” x 1.6” Large dot matrix (264 x 64 dots) LCD display
GPS / APRS® / Bluetooth® Features

FTM-350AR

New Vacuum Cup-Mounting Bracket permits Angle Adjustment
New APRS® Operation Capability, and newly Expanded User Friendly Functions

144/(220)*/430 MHz 50 W FM Dual Band Transceiver

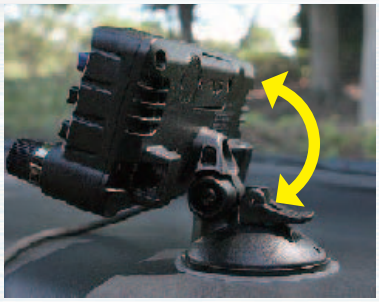
FTM-350AR NEW

220 MHz 1 W (USA version only)

New Features of The FTM-350AR

1. New Vacuum Cup-Mounting Bracket with Angle Adjustment

The new MMB-98 Mounting bracket allows easy installation of the radio control display to your Dashboard by placing the vacuum mount in the desired location and pressing a lever. You may then adjust the display to the optimum viewing angle.



2. Expanded APRS® functions

- **Uses the worldwide-accepted GPS NMEA data format**
- **Navigation to another APRS® BEACON station is possible, even if the beacon station is moving.**
- **Waypoint data (Data in/out) is available from the ACC connector on the rear of the main unit.**
- **Sub-Band APRS® operation may be active in the background, even when operating in Mono-Band Display mode.**
- **Newly added Voice Alert function**
- **Re-allocated often used keys to more convenient positions for easier operation**
- **Programmable keys on the DTMF Microphone provide direct access to APRS® functions**

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*SmartBeaconing™ from HamHUD Nichetronix

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Public Service
Advocacy
Education
Technology
Membership

H.R. 607

"Not later than 10 years after the date of enactment of this Act, the paired electromagnetic spectrum bands of 420-440 megahertz and 450-470 megahertz…shall be auctioned off by the Federal Communications Commission through a system of competitive bidding…."

These words are contained in Section 207(d) of H.R. 607, a bill introduced in the U.S. House of Representatives on February 10 by New York Republican Peter King, who is Chairman of the House Committee on Homeland Security. This section of the bill is entitled "Recovered Public Safety Spectrum" and mandates the auctioning of spectrum to offset the loss of revenue — revenue that was supposed to go toward reducing the federal deficit — the federal government will incur by not auctioning off the so-called D Block of spectrum in the 700 MHz band and by allocating it instead for a public safety interoperable broadband network.

The ARRL fully supports the public safety community and recognizes its urgent need for greater communications interoperability. However, as the advocate for Amateur Radio on Capitol Hill the ARRL cannot and will not tolerate such an ill-conceived and unnecessary attack on two-thirds of the 70 cm band — a band that provides much of our own public service and disaster communications capabilities as well as experimental, satellite, and other activities in the public interest .

H.R. 607, the short title of which is the "Broadband for First Responders Act of 2011," represents but one — and is clearly not the best — of several possible ways to fulfill the widely recognized need for such a network. If the bill as written were to become law, under the provisions of Section 207 *all* public safety use of spectrum between 170 and 512 MHz — and *all* federal law enforcement communications regardless of frequency that is not carried on commercial networks — would cease within 10 years and would be forced to migrate to the 700 MHz and 800 MHz bands.

It is not at all clear why, from the entire range of spectrum between 170 and 512 MHz, the bands 420-440 MHz and 450-470 MHz — which are not currently "paired" in any sense of the word — were chosen to be designated for auction. Neither band is allocated principally to public safety and therefore cannot be "recovered" from that use.

In the band of concern to radio amateurs, 420-440 MHz, the primary allocation is to federal radiolocation (military radar) with amateurs able to use the band, with some geographic restrictions, on a secondary basis. The only public safety use is in a very small part of the 421-430 MHz segment and is limited to the areas immediately surrounding Buffalo, Cleveland, and Detroit. There is no public safety allocation at all in the 430-440 MHz segment, and indeed such an allocation would be contrary to the international Table of Frequency Allocations.

While not of direct concern to us, the situation in the 450-470 MHz band is somewhat similar. It contains thousands of land mobile systems licensed to small businesses, broadcast auxiliary facilities, and the General Mobile Radio Service (GMRS) and Family Radio Service (FRS) that are used by countless taxpayers.

As soon as the text of H.R. 607 became available the ARRL Washington Team headed by President Kay Craigie, N3KN analyzed it and developed a strategy to attack Section 207(d). We immediately made our concerns known on the Senate side of the Hill, to head off the possibility of a similar provision being included in legislation being developed there. President Craigie sent a polite three-page letter to Chairman King detailing the reasons for our firm opposition to Section 207(d); similar letters went to each of the co-sponsors.

We also networked with the public safety community. The ARRL is a member of the Governing Board of the National Public Safety Telecommunications Council (NPSTC), a federation of more than a dozen public safety communications organizations. While expressing our concerns about Section 207(d) we assured the other NPSTC members of our support for the bill's underlying objective. On March 8 NPSTC Chair Ralph Haller wrote to say that "NPSTC is very concerned about Section 207(d) of the Act and believes that the section needs to be amended to address the concerns of public safety and the amateur radio users." The Executive Committee of the Board of APCO International, a leading organization of public safety communications professionals, has gone on record with its own concerns about Section 207 and is cooperating in having our concerns addressed in conjunction with theirs.

Knowing that ARRL members would want to join the fight, we publicized the issue on the ARRL website and provided a sample letter to serve as the basis for personal letters to Representatives. These efforts were supplemented by volunteers who put together an online letter generator **www.kd4pyr.net/hamletter.htm** that has proved to be very popular, with more than 7,000 letters to Congress being generated by this system in its first three weeks. We have asked members to be sure to sign their letters and to send the originals to Chwat & Co., our legislative relations consultant, for hand delivery to Congressional offices. You have responded admirably; Chwat's office in Alexandria, Virginia has been flooded with mail, faxes, and email attachments. Another volunteer, Al Petrunti, KA1TCH, offered to produce a video to explain the issue and what ARRL members can do to help.

H.R. 607 has been referred to the House Committee on Energy and Commerce. In meeting with committee staff we found there was a clear understanding of our concerns. It is extremely unlikely that the bill will make it through the committee process in its current form. Even so, we cannot rest until Section 207(d) has been amended or deleted.

If you are one of the thousands of ARRL members who already have taken action, thank you! If not, please visit **www.arrl.org/hr-607** and review the information posted there, including the video. That also will be the best place to look for updates in the weeks and months to come.

David Sumner, K1ZZ
ARRL Chief Executive Officer

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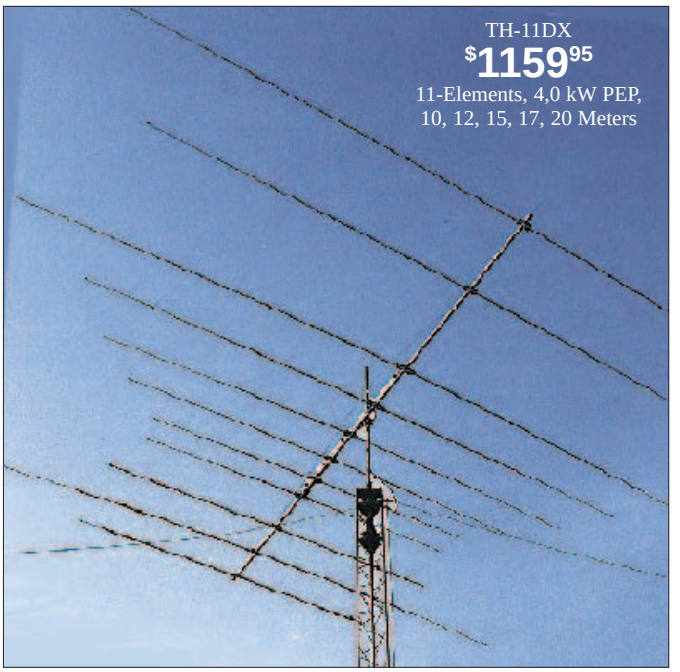

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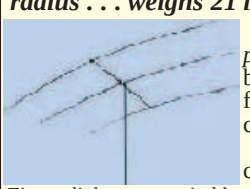

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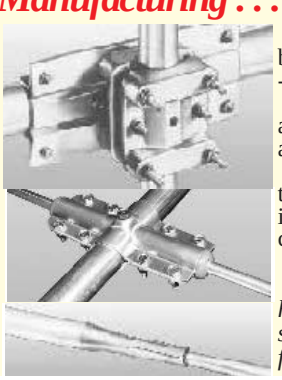

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This Just In

Joel P. Kleinman, N1BKE
jkleinman@arrl.org

In Brief

- The Japan Amateur Radio League asked that 7.030 MHz be kept open for emergency communications following the earthquake, tsunami and nuclear power disaster that struck northeastern Japan on March 11.
- The National Public Safety Telecommunications Council (NPSTC) — a federation of more than a dozen public safety communications organizations — has gone on record as sharing the ARRL's concerns regarding HR 607, the *Broadband for First Responders' Act of 2011*. The ARRL is actively opposing the legislation in its current form because part of it threatens to reallocate 420-440 MHz.
- Amateur Radio has moved a step closer to a medium frequency (MF) allocation below the AM broadcast band. See Happenings, this issue, for details.
- The ARRL Executive Committee met March 19 in Chicago.
- In a *Report and Order* released March 4, 2011, the FCC has eliminated the requirement that amateur stations transmitting Spread Spectrum use Automatic Power Control (APC) to reduce transmitter power. At the same time, the Commission reduced the maximum power of a Spread Spectrum emission from 100 to 10 W PEP.
- NASA Astronaut Doug Wheelock, KF5BOC, will be attending the ARRL EXPO — part of the Dayton Hamvention — as a special guest of the ARRL and AMSAT. Hamvention organizers named their 2011 award winners, including Amateur of the Year Shirley Roberts, N8LX.
- Four Americans — including three Amateur Radio operators — were killed by pirates off the coast of Oman in February.
- Nominations are open for a variety of ARRL awards. See **www.arrl.org/arrl-award-nominations**.
- The winner of the March 2011 *QST* Cover Plaque Award is Howard "Skip" Teller, KH6TY, for his article, "Digital VOX Sound Card Interface."

Media Hits

Allen Pitts, W1AGP
Media & Public Relations Manager

- HR 607, the House bill that would take away our 420-440MHz frequencies and sell them to the highest bidder, may not have made national news but is an obvious error by Representative Peter King. PIOs and others have responded with alarm and incredulity at the scheme of putting one of our most used bands on the auction block.
- Regulatory Specialist Dan Henderson's quote, "Of serious concern to the ARRL is the inclusion of the 420-440 MHz amateur allocation in the list of frequencies to be cleared for auction," has appeared in many places — indicating we are getting the word out. Meanwhile the February crop of Amateur Radio media hits about our emergency services (many of which use that 440 band) continued to come in. "Communication improves since Nisqually quake" appeared in MyNorthwest.com, a website serving several Seattle radio stations. JoAnn Jordan, Public Education Coordinator for the Seattle Office of Emergency Management, says, "There were lessons to be learned; one of them was learning just how important HAM radio was in making sure people who needed help got it." *The Desert Dispatch* (CA) told how the Silver Valley Unified School District officials bought amateur radios for each of its schools and the district office. "When cell phones, desk phones and computers break down, radio is independent of any infrastructure." The *Stuttgart Daily Leader* (AR) reported their community leaders would be able to communicate in part because the fire department now has Amateur Radio equipment and the *Orlando Sentinel's* (FL) article, "Amateur Radio spotters swing into action during weather emergencies," told of our services in that region.
- These capabilities are not lost on emergency planners. Examples included "Draper officials want to add HAM radio operators to emergency plan" appearing in the *Draper Journal* (UT). "It is critical to have communications during an emergency, and amateur radio will be necessary to the success of that communication," said Draper Police Department Officer Eric Braegger. The *Traverse City Record-Eagle* (MI) did a major picture spread titled "No Dead Air" about their local TBARG group and the Calabasas (CA) City Council presented an Annual Public Safety Award to Evan Feinstein, KI6JVR, age 18, who heads the Amateur Radio club at his school, received training from the LA County Disaster Communication Service and is one of the youngest people to work out of the Malibu/Lost Hills Sheriff's Station. On the other end of the country, Larry Gispert, KR4X, was recognized by Commissioner Sharpe who presented a service commendation on behalf of the Board of County Commissioners for Tampa, FL.
- But not all was EmComm. "Teachers prepare to track Kentucky's first satellite" was a pleasant read in *Morehead News* (KY). "The kit is intended to be operated by a teacher and their students to monitor and download data from the KySat1 satellite or other satellites that transmit on the amateur radio bands..." and "Fox on the Run" in *World Radio Magazine* told of the Royal Harbor ARC of Tavares, FL. They happily got the cover and had a three page story with pictures about their fox hunting activities. Central Middle School students in their Amateur Radio club are working on building crystal radios after school according to the *Midland Daily News* (MI). Media also covered the Viking ARC, KF5CRF, who placed 5th in the School Club Roundup from Eisenhower Middle School in Lawton, OK despite competition from the high schoolers (and past winners) at the William Byrd ham radio club, WB4HS, in Roanoke, VA.
- Finally, you can never be too young to promote Amateur Radio to media. In "5th-grade ham radio operator new PIO," PIC Woody Woodward said, "I think he'll do a great job. He's the kind of kid who's going to take the bull by the horns." Christopher Tate, KJ4UBL, definitely started out right with an article in the *Burlington Times News* (NC).

Hawai'i and California Feel Tsumani's Impact

Although damage was nowhere near the level of that inflicted on northeastern Japan, boats and structures along the Pacific coast, particularly in Santa Cruz and Crescent City, California, experienced significant damage. In Santa Cruz harbor, 18 boats were sunk with four more washed out to sea. Damage was estimated at $18 million, and Governor Brown declared several counties a disaster area.

CRAIG SMITH, W6WL

Santa Cruz ARES team member Don Taylor, K6GHA, at the controls in the ARES operation center with volunteer operator Vicki Boriack.

According to PIO Bill Conklin, AF6OH, the Santa Cruz County ARES Team activated the Santa Cruz County Tsunami Resource Net in advance of the anticipated 5 to 7 foot wave. More than 30 local ARES radio operators staffed and manned served agencies including the Santa Cruz County Emergency Operations Center, Evacuation Centers, The Red Cross, Salvation Army Corps Canteen Truck One, Santa Cruz County Harbor Coast Guard Auxiliary and a number of local Fire Departments.

Tsunami-related flooding damage was also reported on Maui and the Big Island of Hawai'i. — *Bill Conklin, AF6OH*

Cape Fear Amateur Radio Society Grant Put to Good Use

The Cape Fear Amateur Radio Society (CFARS) will be upgrading its repeaters and antennas after receiving a grant from the South River Electric Membership Corporation (SREMC) *Operation Round Up*. Each month, the electric cooperative "rounds up" the electric bill of participating members to the next highest dollar. The extra money, averaging $6 per year, is deposited into the *Operation Round Up* fund. An independent board of community leaders distributes the funds raised to nonprofit organizations that serve the health, safety, educational or recreational needs of citizens within the service area. — *Burt VanderClute, N4ERM*

GENE TYREE, N4ANV

Accepting the *Operation Round Up* check on behalf of the Cape Fear Amateur Radio Society are (l to r) Chuck Ward, KJ4RV, Treasurer; Dale Mohr, KI4WOH, President; William McNeill, KD4DCR, Vice President; Catherine O'Dell, SREMC Manager of Member and Public Affairs, and Mike Eagen, KØRRP, Recorder/Editor.

Inside HQ

ARRL 2010 Highlights — *Part 2*

As Chief Operating Officer, one of my responsibilities is to identify operational trends here at HQ. In this issue, I am going to complete the 2010 review that I began last month.

Good news! On-air activity is up. The Awards Branch processed 7400 DXCC applications in 2010, up a bit from 2009. However, they processed 853,462 DXCC credits, an increase of more than 100,000 credits from the previous year, causing us an operational hiccup while we coped with the inrush of applications during the last months of the year. Worked all States Award applications were also up a tick in 2010.

Logbook of the World (**www.lotw.org**) continued its phenomenal growth ending 2010 with 37,536 users and 317 million QSO records. Not that paper cards still aren't popular! Over 900,000 paper QSL cards passed through the Bureau in 2010, a 35% increase from 2009.

Contest log submissions for 2010 were up by 9% from 2009 and 22% since 2007. Better band conditions during the ARRL DX CW contest led to a spike of activity. Logging programs and web tools have made it easier than ever to submit contest entries. Over 1800 more logs were received for the ARRL DX Contest in 2010 than in 2009. 2010 also saw the highest number of VHF+ contest log submissions since 1998. This may be attributable to the VHF capability included with newer HF transceivers. A new contest, The Rookie Roundup, debuted in 2010. It's aimed at those licensed for three years or less. The results from the inaugural run, and support from the contesting community, indicate this should be a great event in the future.

We published some brand new books and revised many of our flagship titles in 2010 including our best selling *The ARRL Handbook for Radio Communications.* A practice exam CD to was added to *The Ham Radio License Manual* and it is now included in all ARRL License Manuals. We also introduced three new kits: ARRL's PIC Programming Kit, ARRL Morse Code Oscillator Kit and the Keyer Touch Paddle Kit.

One disappointment was that there were not as many new Amateur Radio licensees during the second half of the year as they were in the first half. In 2010, new Amateur Radio operators decreased 9% compared to 2009. Nevertheless, license upgrades were about equal in 2009 and 2010. We're emphasizing upgrades this year, so we are monitoring these trends closely. Overall, the total number of US amateurs rose in 2010 by 2% to 696,041. The 2009 total was 682,497.

In 2010, the number of ARRL Accredited Volunteer Examiners reached an all-time high of 33,822. This dedicated group of volunteers administered 41,339 exam elements at 6294 exam sessions last year. Thanks to all you! To learn about becoming a VE, visit **www.arrl.org/volunteer-examiners**.

In 2010, a D-Star repeater system, now housed in the ARRL Laboratory, gives W1AW access to the worldwide D-Star gateway system on 2 meters, 70 cm and 23 cm. The digital side of the 23 cm D-Star system is also used to connect to the EchoLink system. This system has substantially increased our digital mode capabilities and knowledge.

73,

Harold Kramer, WJ1B
ARRL COO/Publisher *QST*
wj1b@arrl.org

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Radio Clubs (ARRL-affiliated clubs) – **www.arrl.org/clubs**
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Quick Links and Resources

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QEX – *A Forum for Communications Experimenters* – **www.arrl.org/qex**
NCJ – *National Contest Journal* – **www.arrl.org/ncj**
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From QST Magazine, March, 2005

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

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

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

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

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

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

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

ALS-500M $849 Suggested Retail

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

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

Virtually indestructible! *Load Fault Protection* eliminates amplifier damage due to operator error, antenna hitting tree branches, 18-wheeler passing by. *Thermal Overload Protection* disables/bypasses amp if temperature is excessively high. Auto resets.

Typically 60-70 watts in gives full output. ON/OFF switch bypasses amplifier for "barefoot" operation. Extremely quiet fan comes on as needed. Excellent harmonic suppression, push-pull output, DC current meter. 13.8 VDC/80 Amps. 3½x9x15 in. 7 lbs.

ALS-500M, $849, 500 Watt mobile amp.
ALS-500MR, $879, ALS-500M/Remote Head

ALS-500RC, $49, Remote head for ALS-500M (for serial # above 13049).

ARF-500K, $179.95, Remote kit for ALS-500M serial # lower than 13049. Includes AL-500RC Remote Head, filter/relay board for ALS-500M, cables, hardware, instructions.

Free ***online manuals!*** Ameritron brings you the finest high power accessories!

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

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

RCS-8V Remote Coax Switch. . . $169.95

Replace **5** coax with 1! 1.2 SWR at 250 MHz. Useable to 450 MHz.<.1 dB loss, 1kW@ 150MHz.

RCS-10 Remote Coax Switch. . . $179.95

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

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

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

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ADL-2500 fan-cooled Dry Dummy Load, $219.95

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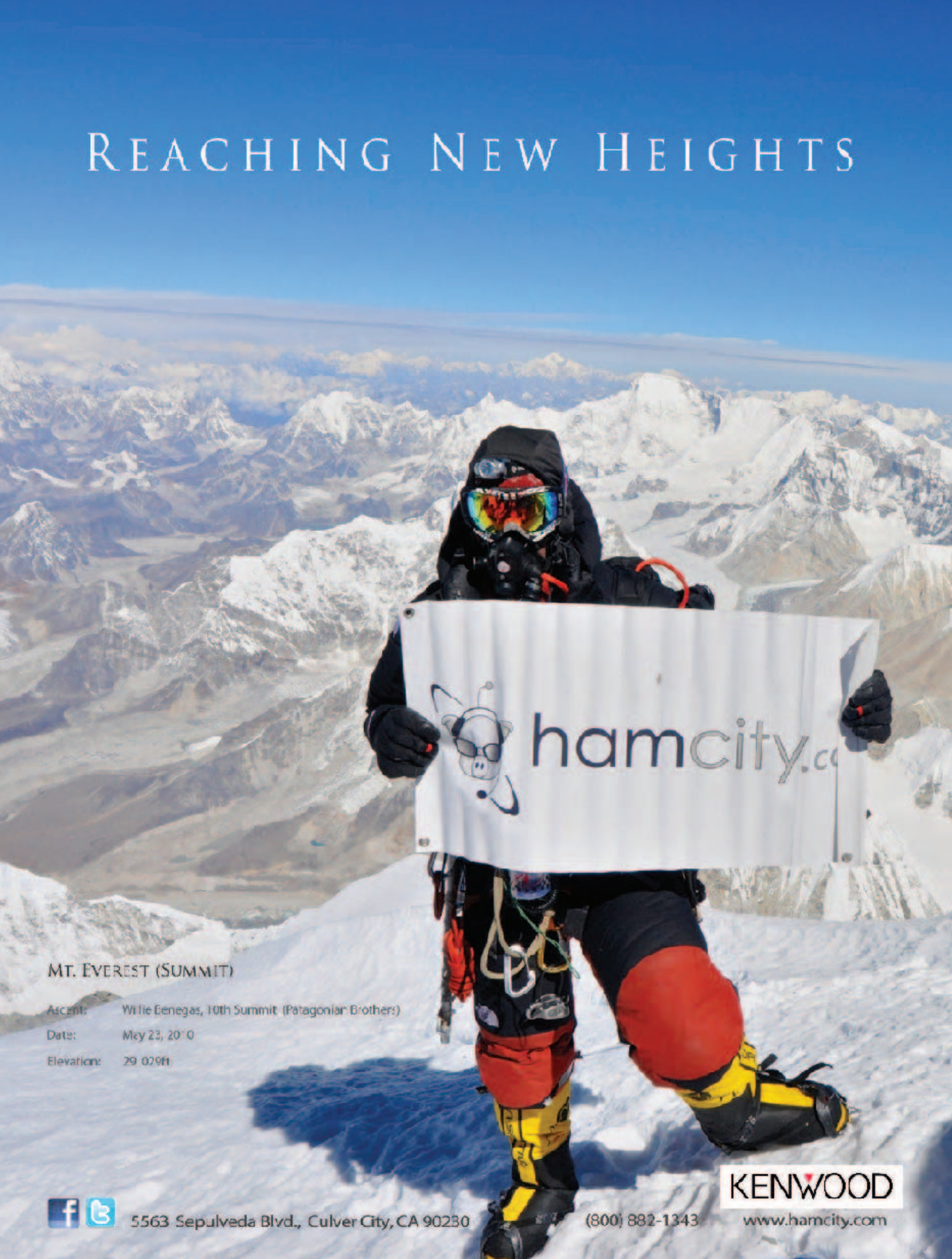

Mt. Everest (Summit)

Ascent: Willie Benegas, 10th Summit (Patagonian Brothers)

Date: May 23, 2010

Elevation: 29,029ft

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Every Shirt Tells a Story (This One Does, Anyway...)

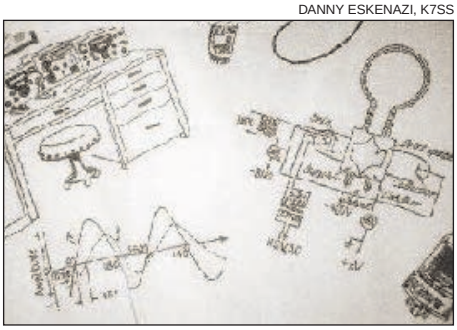
A non-ham friend picked up a shirt for me at a California swap meet back in the 1970s, knowing that I collected vintage Hawaiian shirts. Not being into radio, that's what he thought it was. I was delighted to get it.

I had no idea as to its origin until a few years later I ran across an old W6UK QSL card, and there was Alvino Rey, the father of the pedal steel guitar, wearing the same shirt. Took a much closer look, and sure enough, found the "REY" laundry mark!

I actually wore it quite a bit over those years, and have a favorite photo wearing it, standing next to my contesting hero Katashi Nose, KH6IJ, at a DX convention.

Oddly enough it seems to have shrunk a bit over the years without having been washed, so now it just rests in the closet.
— *Danny Eskenazi, K7SS*

DANNY ESKENAZI, K7SS



I've got a ham radio shirt, how about you? **Probably, but this one's way cooler. Danny, K7SS, recently came across his old W6UK QSL card with world-famous bandleader Alvino Rey (SK) wearing the shirt that now graces Danny's closet. The photo shows part of the shirt.**

From the W6UK QSL card: **Alvino Rey wearing the shirt that now belongs to K7SS.**

JOHN DILKS, K2TQN

Collecting takes patience: QST's **Vintage Radio columnist John Dilks, K2TQN, knows that full well. He negotiated with a seller for "7 or 8 years" before coming to terms with her on this Colonial Globe 700 (circa 1933). Designed by Raymond Loewy, it's a 5 tube AM receiver as well, and serves as a perfect complement to his other vintage radio gear.**

Enter the 6th Annual Photo Contest

Have you ever wanted to see a photo of yours in *QST*, the annual ARRL Amateur Radio Calendar or another ARRL publication? Well, here's your chance!

If you're among the winners, not only will your photographic skill be propagated far and wide, but we're offering $100 as the First Prize. The winning photo and three runners-up will be published in *QST*. All submitted photos will also be considered for the 2012 ARRL Calendar.

Deadline: Photos must be received at ARRL HQ by June 30, 2011.

Subject: Must be directly related to Amateur Radio, and be in good taste. Extra points will be awarded for photos showing folks having fun with Amateur Radio. Photos will be judged on overall quality and composition.

Requirements: Digital images or color prints accepted. (A digital image printed on photo paper doesn't work as well as a high-resolution file attachment, however.) A digital image up to 6 MB in size can be e-mailed to **upfront@arrl.org**, subject line "2011 Photo Contest." An image may also be burned to a CD and mailed to ARRL Photo Contest, 225 Main St, Newington, CT 06111. All entries must include caption information describing where the photo was taken, along with a description of the subject of the photo as well as the names and call signs of any persons shown. If you entered last year's contest, please do not resend the same photo for this year's contest. One entry per person.

Miscellaneous: All decisions of the judges, composed of *QST* editorial and production staff, are final.

BOB WILSON, N6TV

One of last year's best: **Bob Wilson, N6TV, writes: "This was taken at dusk at the Visalia International DX Convention, April 17, 2010, showing a 105 foot Tower Trailer made by US Tower, with a new 3 element SteppIR DB18E beam at the top." Bob's photo was judged among the best of those submitted for the 2010 ARRL Photo Contest. The deadline for this year's contest is June 30.**

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CORRESPONDENCE

CONTESTERS' COURTESY

Recently I noticed something that has never happened before. I'm a net control station for the Vintage Sideband Net every Sunday afternoon on 14.293 MHz. We've frequently been unable to hold the net during a DX contest due to interference; the DXers just camp on top of us and ignore requests to change frequency.

The Sunday afternoon of the ARRL International DX Phone Contest was amazing. We went through the full hour without a single station jumping on top of us. Yes, they were close, but far enough away that even with my not super-selective rig, I was able to copy (with some difficulty at times) most of the stations that wanted to check in. Some were only S-2 or -3 and too far down in the mud, but an alternate net control could often pick them up. Such common courtesy is not commonly heard in a DX contest. Maybe the vast majority of good ops have prevailed upon the small minority of others to listen — and ask — before sending. I hope this is a continuing trend.

AL PARKER, W8UT, ARRL Life Member
New Bern, North Carolina

SOUNDS GOOD TO ME

The article by *QST* Technical Editor Joel Hallas, W1ZR ["Sounding Good on the Air — Setting Your Audio Controls," Apr 2011, pages 41-42] is the best technical article on operation that I've read in ages. I've become rather well known for chastising other operators for overdriving their transmitters and producing distorted signals. Many will turn the gain down while we're talking, but the next day they have cranked it up again. From commercial engineers to newly licensed operators, they don't seem to understand how the audio, ALC and speech processors should be adjusted. Radio operators by nature like to see meter needles swing while they are transmitting, but the most natural, clean, easy-to-read signals are sent when the ALC meter needle is bouncing on the bottom pin.

ED LOEFFLER, WØEJL
Burwell, Nebraska

HOW I SPENT MY SUMMER VACATION

A recent column by David Sumner ["It Seems to Us: A Good Year to Upgrade," Mar 2011, page 9] got me to revisit my experience of Elmering a very special new ham, my son. I have been a licensed ham since 1978. As you can imagine a lot has changed in the last 33 years! My son, who at the time was 9, was really excited to get his ticket. The only question was could he handle the material. Here are some study tips that proved very successful.

For kids, the best time to start studying for their first license is right after they get out of school for summer break: At first, my thought was "What kid would want to study as soon as school is done?" As it turns out this is a great time. Kids have been in a study mind frame for the last nine months with multiple subjects. Like a well-trained athlete, they are ready to go.

Limit study time to ½ hour a day: Ask your child for just a half hour of their time. This works great. We would work the study material during the week and use the weekends for hands-on training.

Set a flexible goal: When we started this project, I had no idea how long it would take, so our first goal was to just stick with the 30 minutes a day studying. After awhile I was able to gauge how long it would take to get through the material. From that point I was able to project a date on when he might be ready to take the test.

Use the computer generated tests at the end, not the beginning: There is a lot of computer generated software available both online and for purchase. These tests — when used after all of the material has been reviewed — can point out weak spots to work on and build confidence.

By following these tips, Sam passed his Technician exam on his first try. He became KD8OQT, and by his idea, changed his call and is now N8FPR, his late grandfather's call.

The process turned out to be a great learning experience for the both of us. He ended up with his ticket and I got a greatly needed refresher course. So now it's on to the next challenge: the General exam in summer 2011!

RUSSELL FITZGERALD, N8FZ
ARRL Life Member
Lansing, Michigan

BEARS REPEATING

I was delighted to see the Uniden HomePatrol-1 scanning receiver featured in *QST* ["Product Review," Apr 2011, pages 47-53]. But I was somewhat shocked and disappointed to see that while the article points out the difficulty that maritime enthusiasts have in loading their desired frequencies into the scanner, the article failed to point out that amateurs face almost the same problem.

My local ARRL-affiliated radio club operates three repeaters, but none are listed on **www.radioreference.com**, a website that bills itself as "the world's largest radio communications data provider featuring a complete frequency database, trunked radio system information and FCC license data." One repeater is a D-STAR repeater (the Uniden HomePatrol-1 does not decode D-STAR), while the other two are 2 meter FM analog repeaters. Why? Since there are other sources of the information, such as the annual *ARRL Repeater Directory*, **www.radioreference.com** only lists amateur repeaters that are affiliated with SKYWARN, ARES®, Red Cross or emergency communications.

Since this website refuses to list our repeaters, none of their information is available for download from Uniden. I personally submitted the information to **www.radioreference.com**, but their database administrator declined any similar amateur listings as "against the website's policy." Many amateurs have chimed in against this policy, but **www.radioreference.com** insists it will not list ordinary amateur repeaters in their database.

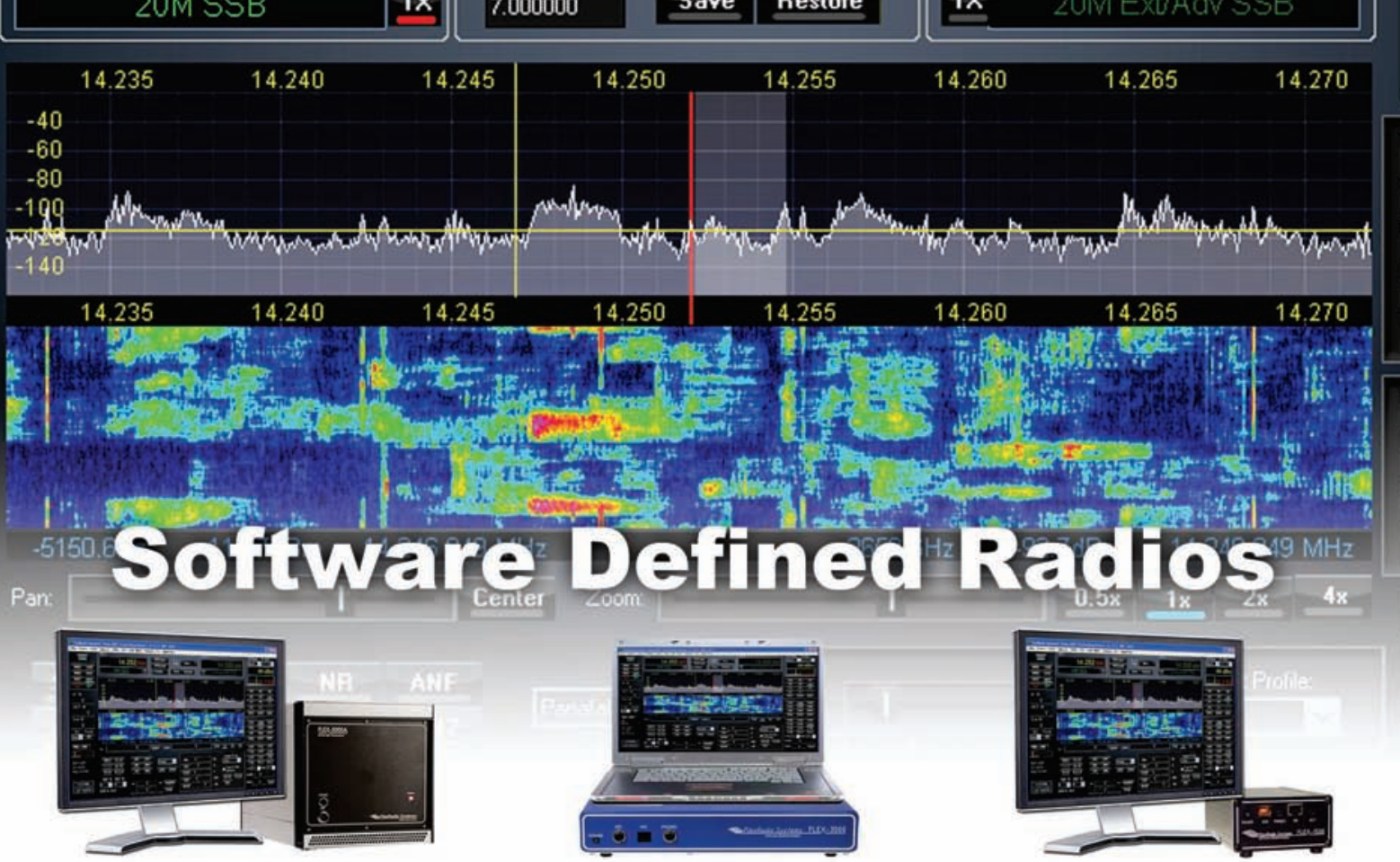
LARRY E. PRICE, W4RA, ARRL Life Member
Past President, ARRL
Statesboro, Georgia

A LOST ART

I enjoyed the article by Steve Ford, WB8IMY ["The Art of Conversation," Mar 2011, page 73]. Fifty years ago, I gained more pleasure conversing on ham radio than I do today. Now so many contacts amount to just giving out signal reports. To buck the trend, here are a couple of things I do to get a discussion going. I attempt to find out what other hobbies the person at the other end enjoys. That often gets the chat started. Another technique I use is to ask if they have access to the Internet. If they do, I ask them to log on to the Mount Rainier National Park website at **www.nps.gov/mora**. When they log on, they can access five webcams. As they do, I proceed to describe the area they're seeing, since I know it quite well. If the weather is good, there is a lot to see — and talk about!

WALLACE MUSIC, W7UUO
Lacey, Washington

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



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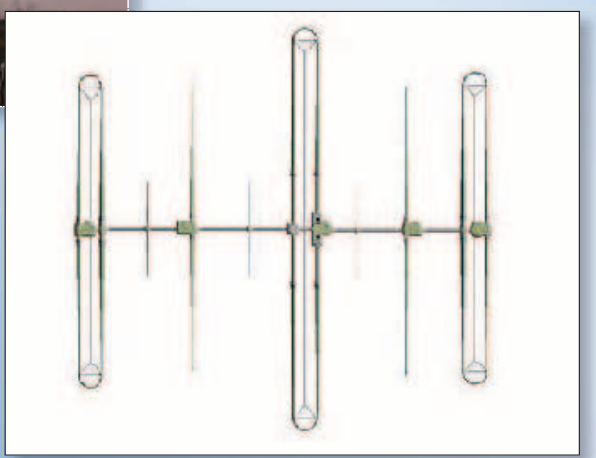

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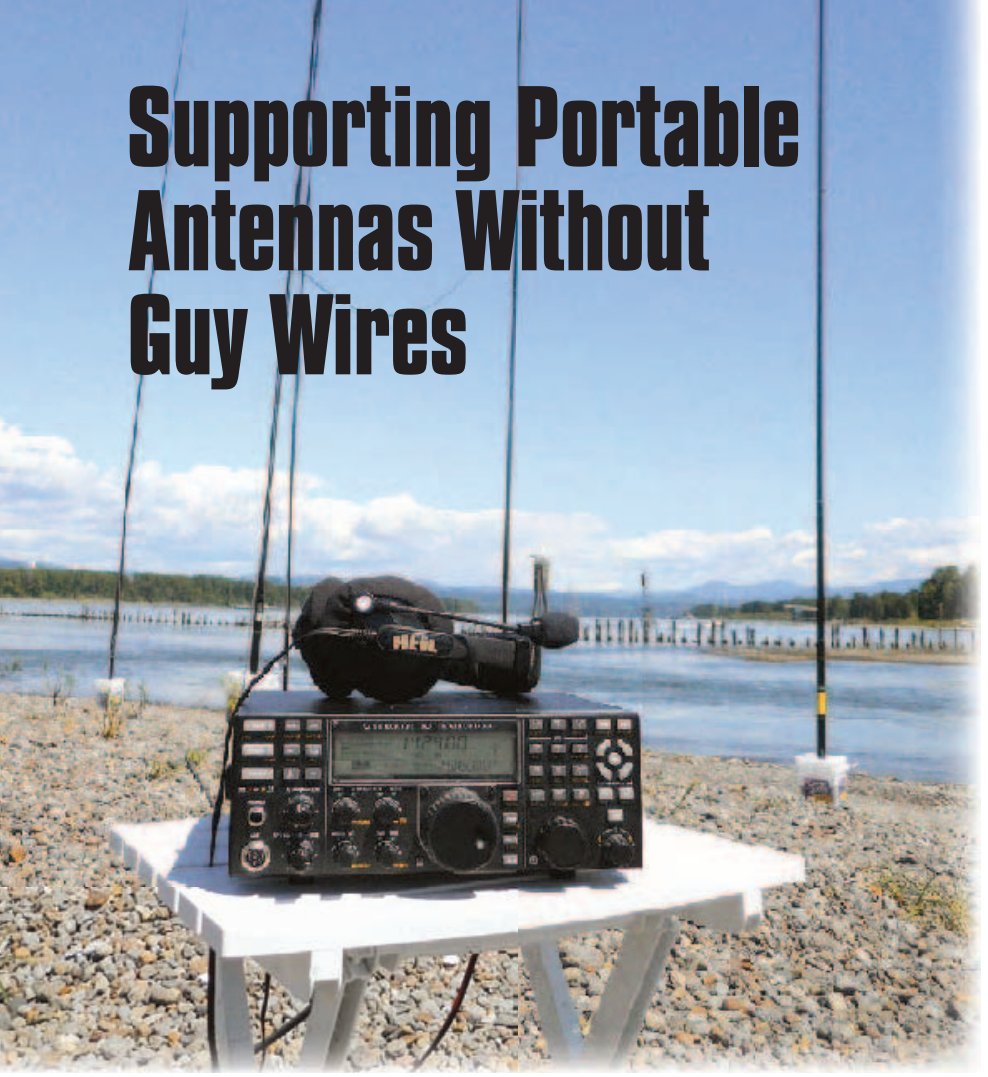
Supporting Portable Antennas Without Guy Wires



A handy antenna — perhaps just right for your Field Day station.

Dave Fisher, KGØD/7

Look Mom, No guy wires! There are plenty of papers on designing antennas. This is more about supporting those antennas — without guy wires. Helping the grandkids build sand castles with small buckets on the beach triggered the idea. The materials for construction are simple — 33 foot fiberglass poles, 5 gallon plastic buckets with snapping lids and sand. These components make it easy to build a four element 20 meter monoband Yagi vertical without those messy guy wires.

I've been operating portable for several years now. This was caused by my proximity to a 50 kW AM station compounded by electronic noise from the neighbors. My portable operating locations needed to be near trees for antenna supports. This limited my operating locations. Using guy wires for support avoided the need for trees but these were a hassle to install and move.

A Better Way

This easy to duplicate antenna solved all my problems at once. The configuration I chose offers a four element 20 meter vertical Yagi of half wave dimensions that can be readily steered in multiple directions. The same materials can be used to construct similar antennas for other bands (see Table 1 for

Figure 1 — Antenna construction starts with the driven element.

Figure 2 — Detailed view of the antenna feed connections. Vinyl electrical tape is used to secure the wire, pole sections and commercial 1:1 balun.

Table 1

Element Wire Lengths and Interelement Spacing (feet) for Five DX Bands

Frequency (MHz)	*Reflector (+5%)*	*Driver (468/MHz)*	*First Director (–5%)*	*Second Director (–10%)*	*Element Spacing*
14.18	34.7	33.0	31.4	29.8	9.2
18.10	27.1	25.9	24.6	23.3	7.2
21.30	23.1	22.0	20.9	19.8	6.2
24.91	19.7	18.8	17.8	17.0	5.3
28.85	17.0	16.2	15.4	14.6	4.5

Figure 3 — The coax support vertical is built next. It gets the coax away from the driven element's bottom section. The coax support vertical is built just like the driven element. Each section is raised in three foot increments, taping each section as they are extended, until both are at full height. At this point you have an omnidirectional half wave vertical dipole. This is a good time to hook up the radio and check the band to see where you want to aim the antenna.

Figure 5 — The cat was kind enough to empty several more buckets of litter so more elements can be added. Using 20 meter data from Table 1, I measured and cut the wires needed for a reflector and two directors. I've included additional data for other bands these verticals could support. Part of the 20 meter reflector wire is extended above the pole and the other couple inches hangs down toward the ground.

dimensions), or base fed monopoles for lower bands. The base fed antennas require ground radials, making them more difficult to move, but they can still be effective choices if those are the bands you want to use.

The wire antenna elements are supported by 33 foot telescoping fiberglass poles that are available from a couple sources. The ones I use collapse to 45½ inches. Each weighs about 3⅓ pounds. The plastic buckets I use originally held cat litter. A nested stack of five buckets weighs 10 pounds and measures 27 × 12 × 10 inches — easy to manage. It is important to use buckets with lids that snap in place. There are many choices for buckets. Some large hardware stores sell them already empty. This is the best source. Others contain products such as soap, paint, swimming pool chlorine and cat litter that must be used first.

Figure 1 shows a bucket partially full of sand with the fiberglass pole in place. You can use sand, dirt or rocks dug from almost any operating location. These will make a bucket weigh 40 to 60 pounds depending on material density. Another option is bolting a PVC cap on the bucket's bottom. This will hold the bottom of your pole in place when you use water, rocks or snow/ice for wintertime operations. A 5 gallon bucket of water will weigh about 40 pounds. Two 20 pound bags of rice per bucket could also be used instead of sand. Long grain brown rice is said to lower the radiation angle and increase operating range. The lid snaps in place over the filled bucket and helps keep the pole stable.

The center fed driven element will be most effective if the coax to element transition is through a 1:1 balun or common mode choke. I used a commercial balun, but your favorite technique should be suitable. The coax should be routed as close to perpendicular to both the element and antenna axis as feasible. Figure 2 shows the details of the coax support system. At this point you have an effective 20 meter vertical dipole (see Figure 3).

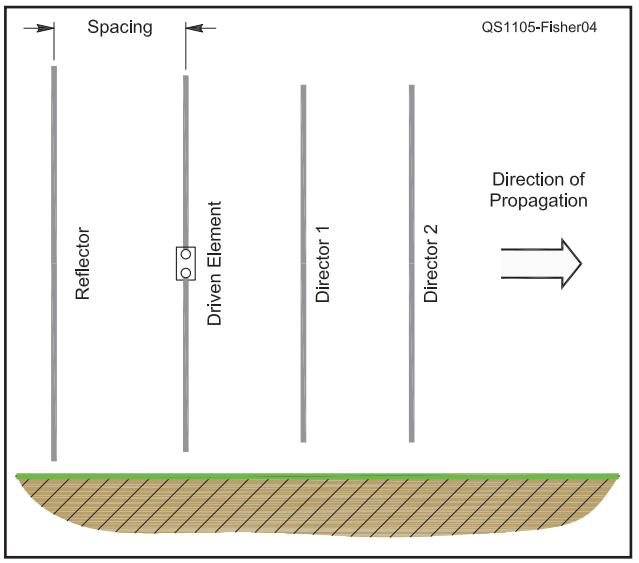


Figure 4 — Configuration of four element vertical Yagi. Dimensions are in Table 1.

Add Some Gain with a Little More Stuff

Now that the technique is proven, it is easy to make a top notch antenna array. I added a reflector and two directors resulting in a four element 20 meter vertical monoband Yagi. The configuration is shown in Figure 4. While somewhat stationary, it doesn't take much to pick up and move the parasitic elements to steer the antenna to other directions. If you will be in the same spot for a while, take the time to precompute and mark the bucket locations for directions you think you will want. Figure 5 shows the antenna looking north to Europe. Figure 6 is a side view.

The *EZNEC* predicted elevation and azimuth patterns are shown in Figures 7 and 8. This antenna provides a lot of gain for the investment.[1]

[1]J. Devoldere, *ON4UN's Low-Band DXing: 25 Years of Low Band Success,* Fifth Edition. Available from your ARRL dealer or the ARRL Bookstore, ARRL order no. 8560. Telephone 860-594-0355, or toll-free in the US 888-277-5289; **www.arrl.org/shop/**; **pubsales@arrl.org**. Data included with the provided CD includes many other multielement Yagi antennas with element quantity, length and spacing recipes.

Figure 6 — Side view of the four element 20 meter Yagi deployed on the beach on McGuire Island in the Columbia River.

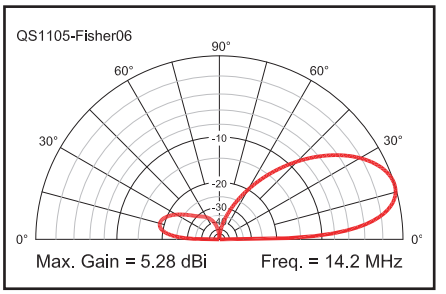


Figure 7 — Elevation pattern of the 20 meter vertical Yagi over typical ground. If you have a steady signal source, the design makes it easy to experiment with different spacings to see if the gain, or the front to back ratio can be improved. For reference the gain of a single element is –0.1 dBi.

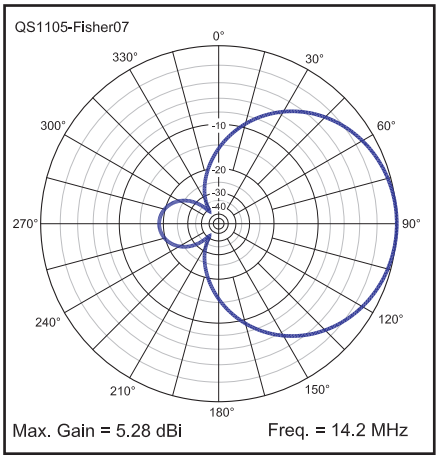


Figure 8 — Azimuth pattern of the 20 meter vertical Yagi at peak elevation angle of 17°.

Hamspeak

ARRL Field Day — Annual operating event, the fourth full weekend each June, in which US stations set up in portable, simulated emergency configurations and contact as many other such stations as possible. See **www.arrl.org/field-day** for details.

Azimuth plot — Graphical representation of signal strength from an antenna as a function of horizontal angle around the antenna center. It is made at a particular elevation angle, often the angle with the maximum response.

Director — One of the elements of a multielement parasitic directive antenna. The director receives energy from the driven element (attached to the feed line) and reradiates it to combine in the direction of the director. The director is usually shorter than ½ wavelength.

Elevation pattern — Graphical plot of the radiation intensity of an antenna at different elevation angles. For an omnidirectional antenna, the elevation pattern is the same at every azimuth angle. Other antennas will have elevation patterns that are different at each azimuth angle, so usually the plot at the most significant azimuth is shown. Elevation patterns with large signals near the horizon are generally preferred for line of site operations, such as in VHF mobile communication. Low elevation angles also provide for the longest distance communication via ionospheric propagation.

Guy wire — A set of wires used to hold a tower or other structure in position.

Radials — Portion of a usually vertical antenna, designed to provide an artificial ground or a connection to real ground. The multiple radials project radially from the antenna base in multiple directions.

Reflector — One of the elements of a multielement directive antenna. The reflector receives energy from the driven element (attached to the feed line) and reradiates it to combine in the direction away from the reflector. The reflector is usually longer than the driven element.

Yagi — Multielement directive antenna array in which one or more elements are driven by connection to a transmission line and the others are parasitically coupled. Yagis are generally characterized by high gain for their size accompanied by narrow operating frequency range.

ARRL member and Amateur Extra class operator Dave Fisher, KGØD, received his Novice class license in 1976 along with the call WN7EAL. He passed his General and Advanced class exams in 1977 and received the call KAØBYS. In 1980 he passed the Amateur Extra exam and received his current call. He has lived on a floating home on the Columbia River in Portland for the last 22 years.

Dave has been in the cold storage business since 1975. He is presently working for VersaCold Logistics as the Director of Engineering for West North America. He project manages new construction projects, designs custom ammonia refrigeration systems, maintains existing warehouses and develops ways to operate more efficiently for lower energy usage.

You can reach Dave at 17809 NE Marine Dr, Slip A5, Portland, OR 97230 or at **kg0d@arrl.net**.

A Transmitter for Fox Hunting

If you want to try fox hunting, someone needs to bring the tramsitter.

Mark Spencer, WA8SME

Fox hunting is introduced to teachers during the ARRL Education and Technology Program (ETP) Teachers Institutes (**www.arrl.org/teachers-institute-on-wireless-technology**). This is a very popular activity among the teachers because they see the value of an outdoor activity that uses many aspects of the science and technology of radio. This can reinforce what the students learn about in the classroom. In addition, it relates to the real world of radio direction finding that the students see on many science and nature TV documentaries (see Figure 1).

Our first fox transmitter controller was developed to allow common handheld 2 meter radios to serve as hidden transmitters for ETP classes.[1] This flexible micro-

[1]Notes appear on page 36.

KD7RPP

Figure 1 — Miguel Enriquez, KD7RPP, a Teachers Institute instructor, introducing fox hunting concepts to his students.

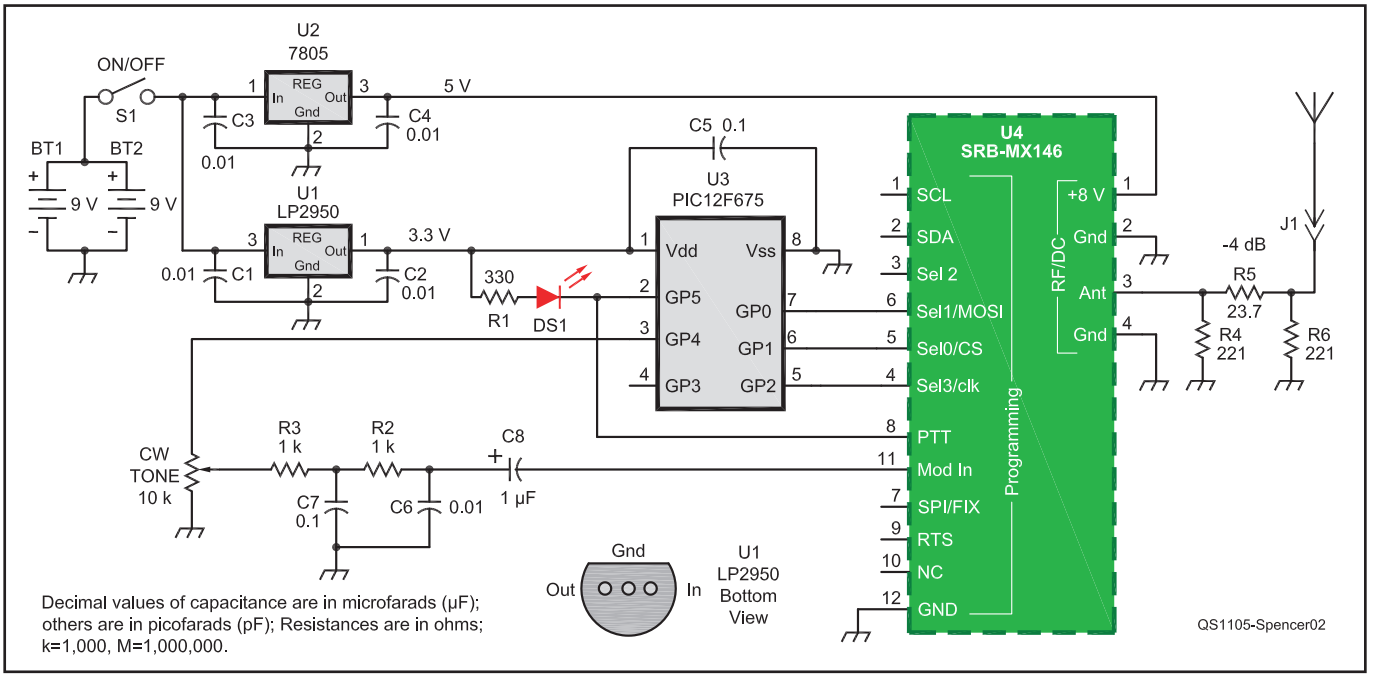


Figure 2 — ETP fox hunter controller circuit diagram and parts list. Digi-Key parts are available from www.digikey.com.

BT1, BT2 — 9 V transistor radio type battery.
C1-C4, C6 — 0.01 µF polystyrene or ceramic capacitor.
C5, C7 — 0.1 µF polystyrene or ceramic capacitor.
C7 — 1 µF polystyrene or ceramic capacitor.
DS1 — LED.
J1 — Jack to match desired antenna connection.
R1 — 330 Ω, ¼ W, 5% resistor.
R2, R3 — 1 kΩ, ¼ W, 5% resistor.
R4, R6 — 221 Ω, ¼ W, 1% SMD resistor. (Digi-Key p237fct-nd).
R5 — 23.7 Ω, ¼ W, 1% SMD resistor. (Digi-Key p221fct-nd)
S1 — SPST PC board mounting miniature toggle switch.
U1 — 3.3 V regulator IC, LP2950 (Digi-Key lp2950cs-3.3-nd).
U2 — 5 V regulator IC, 7805 (Digi-Key mc7805ct-bpms-nd).
U3 — PIC microprocessor PIC12F675 (Digi-Key PIC12F675-I/P-nd).
U4 — SRB-MX146 2 meter transmitter module (see text).

controller-based controller worked well, but proved to be fairly fragile because of all the interconnecting plugs and cables, and the variety of handhelds in use. Nothing stops a lesson or demonstration faster than an equipment failure. Time is far too valuable.

Our solution to this reliability issue is the simple fox transmitter project presented here. Duplicating this project provides a valuable learning experience covering the use of microcontrollers and also serial communications along with producing a fun, homebrew project. This fox transmitter is made up of a PIC microcontroller and a very frequency agile 2 meter transmitter module. The microcontroller programs the frequency of the transmitter, turns the transmitter on and off at intervals during the fox hunt activity and generates the fox ID as well as the control operator's call sign in Morse code. It is all in an affordable and rugged package.

Transmitter Module

The 2 meter transmitter module is an SRB Module Transmitter SRB-MX146 available from RPC-Electronics.[2] The module is designed for APRS operation and is a low power (less than 1 W), FM transmitter for sending APRS position packets. The module requires an external antenna, a dc power source, connections to the data audio source and PTT lines. In addition, connections to switches or a microcontroller are needed to set the operating frequency (see Figure 2).

The frequency of the transmitter can be set by three different methods, all detailed in the device documentation. First, four switches can be attached to the module to switch select one of 16 preset APRS channels. Second, the user can hard wire the appropriate pins to a specific channel if frequency agility is not required. This simplifies the interface circuitry for the module. Third, an ASCII stream of data can be sent to the transmitter module via Integrated Circuit (I2C) or Serial Peripheral Interface (SPI) protocols to set any frequency within the 2 meter band. This data stream is sent to the module by a microcontroller or computer. Frankly, the detail of the documentation that comes with the transmitter module is a bit sparse, particularly with regard to programming the frequency. The following discussion of SPI, along with the module documentation will help you better understand how to program the frequency.

Serial Peripheral Interface

The SPI protocol is used to send data between devices serially, one bit at a time. In SPI there are slave and master devices. There can be bidirectional communications between the master and the slave(s). For this project, we instead use one way communications between the master, the microcontroller, and the slave, the transmitter module. It requires up to four interconnecting lines (three in this case) between the master and slave devices to accomplish SPI. The Sel0/CS is the device select line. This line is used to signal a connected device that the upcoming data stream is intended for the device. The Sel1/MOSI is the data output line from the master to the slave. Finally, the Sel3/CLK is the clock line that provides the clock pulses that clock the data bits from the data line.

The computer or microcontroller that sends data via SPI goes through the following steps.

1. The SPI-CS line is brought to the low state (ground) to signal the slave device that it is about to receive some data.

2. The first bit of the data to be sent is set on the SPI-MOSI line, either high or low (1 or 0). Data can be sent either most significant byte (MSB) or least significant byte (LSB) first, depending on the devices involved.

3. The SPI-CLK line is pulsed high then low to clock in the bit presented on the SPI-MOSI line to the slave.

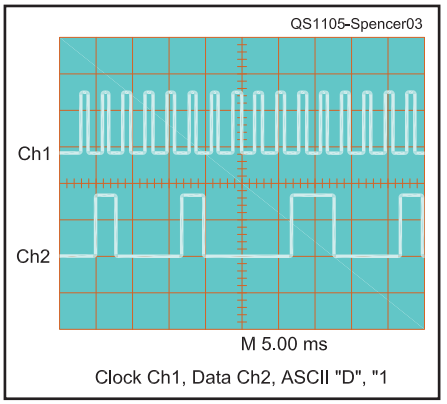


Figure 3 — SPI data stream.

4. Steps 2 and 3 are repeated to send the complete byte(s) of data.

5. Finally, the SPI-CS line is brought to the high state (1) to signal the slave that the data transmission is complete and the received data can be accepted.

The oscilloscope snapshot in Figure 3 illustrates the SPI process for sending the first few characters of the data stream to the transmitter module. The scope snapshot was triggered by the SPI-CS line going low. The top trace shows the clock pulses while the bottom trace shows the data bits that are clocked into the transmitter module.

The frequency can be sent to the transmitter module in a number of formats. I will mention only a few here while the module documentation has more detail. The frequency can be sent in binary, hexadecimal or decimal number format, and in Hz, kHz or MHz units. For me, sending the frequency in decimal format in Hz units was more intuitive and gave finer control over the frequency.

What was not clear in the module documentation is that the data that is sent to the transmitter module has to be sent as ASCII characters, not as decimal numbers. ASCII is a code that is sent to computer display devices to represent the character to be displayed. For instance, to display the decimal number 1, you need to send a value that represents the character "1", not the actual number 1. The ASCII number that represents the character "1" is 49. If you send the decimal number 1 to a computer display device, you probably would see nothing happen at best, or some unexpected garbage because the decimal number 1 is a control code for START OF HEADING. A subset of the ASCII number set for the relevant data that is sent to the transmitter module to set the frequency is listed in Table 1.

For example, to set the transmitter module to the frequency of 146.52 MHz, the ASCII formatted data stream D146520000

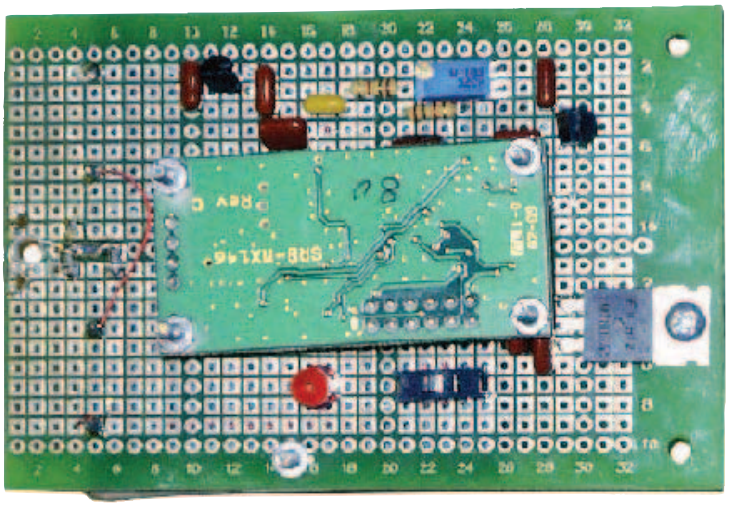


Figure 4 — ETP fox prototype.

Table 1
Decimal Digit to ASCII Conversion

Decimal Digit or Letter	*ASCII Coded Digit*
0	48
1	49
2	50
3	51
4	52
5	53
6	54
7	55
8	56
9	57
D	68

would be sent over the SPI-MOSI line to the module with the MSB sent first in each byte. In other words, the actual ASCII number sequence to accomplish this frequency setting would be: 49, 68, 52, 54, 53, 50, 48, 48, 48, 48.

Once the frequency is set, it is a simple matter of bringing the PTT line of the transmitter module low and applying an audio signal to the audio input line to begin transmitting. There is one precautionary quirk of the module. The voltages applied to the input lines of the module must be at CMOS levels (3.3 V maximum). Therefore the controlling interface voltages must be adjusted accordingly.

The Microcontroller

The fox transmitter project uses the PIC12F675 microcontroller. This powerful little device is programmed to set the frequency of the transmitter module and then begin the fox transmission cycle of one minute on, sending the fox ID in Morse code, the control operators call sign at the end of the one minute transmission period, then shut down for four minutes before the cycle is repeated. The frequency, fox ID (MOE, MOI, MOS, MOH, MO5) and the control operator's call sign are programmed into the microcontroller's firmware (which can be changed with re-programming).

The microcontroller software that I developed is simply modified by changing the frequency and call sign variables in the program to the specific data needed by the builder. The software is available on the QST-in-Depth website.[3]

It all comes together in the circuit depicted in Figure 2. The fox transmitter is powered by two 9 V batteries wired in parallel (a modification of this arrangement will be mentioned in a moment). The 9 V from the batteries is connected to the high current 5 V regulator that provides power to the transmitter module. The transmitter module is available in two forms, a high power (500 mW and 8 V)

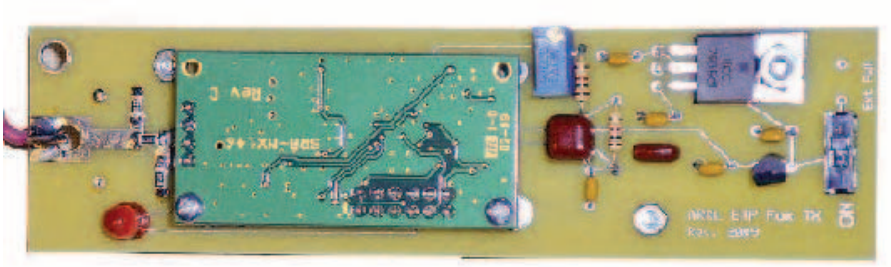


Figure 5 — ETP fox final project.

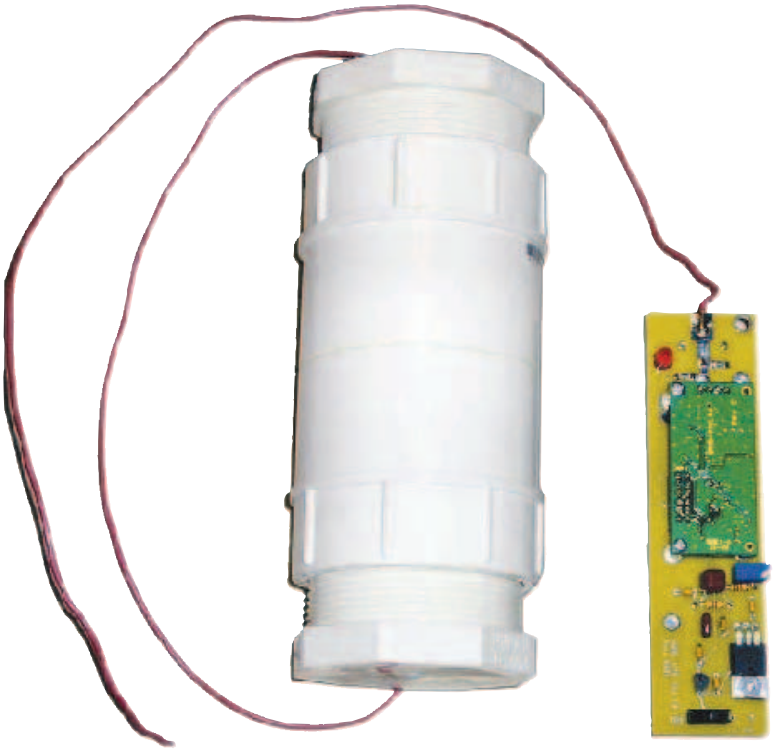


Figure 6 — ETP fox ready for action in a PVC protective housing.

Hamspeak

APRS — Automatic position reporting system. System that accepts global positioning system (GPS) position data from a GPS satellite receiver and processer, formats it into an AX-25 packet for transmission via Amateur Radio, usually on 144.39 MHz. Position data is available via radio or over the Internet.

ASCII — American Standard Code for Information Interchange. A computer "alphabet" obtained by mapping each printable and control character into a seven bit data word (often implemented with eight bits by including an error checking parity bit). See **www.cs.tut.fi/~jkorpela/chars.html**.

CMOS — Complementary metal oxide semiconductor. An integrated circuit logic family with particularly low power requirements.

Fox hunt — Competitive Amateur Radio activity in which hams track down a transmitted signal. Usually directive antennas and triangulation are used.

Oscilloscope — Type of electronic test instrument traditionally with a cathode ray display screen that shows time on the horizontal axis and voltage on the vertical axis.

PIC microcontroller — Programmable interface controller. One of a family of processor based integrated circuits that can be programmed to perform multiple functions.

PTT — Push-to-talk, a method of transmit-receive switching in which a button or lever on the microphone is used to actuate the circuitry used to switch from receive to transmit mode.

and a low power (350 mW and 5 V) module. I chose the low power module for the fox and therefore the voltage regulator is a 7805. If you choose the high power module, the 9 V batteries should be wired in series and the voltage regulator should be a 7808. The second 3.3 V regulator provides power to the PIC12F675.

I mentioned that the transmitter module requires CMOS level voltages on the control and data lines. I chose to power the PIC12F675 with 3.3 V to simplify the interfacing with the transmitter module. Normally the PIC12F675 is powered at 5 V, but is rated to operate between 2 and 5.5 V, so it handles 3.3 V just fine (and this certainly uncomplicates the interconnecting circuitry).

The audio frequency generated by the PIC12F675 to produce the Morse code is in the form of a square wave. The resistor and capacitor components between the microcontroller output line and the transmitter audio input line provides some filtering and microphone gain control to clean up the square wave.

Finally, I use the fox transmitters to demonstrate the concepts of fox hunting to teachers often times in very close and confined spaces. This requires the use of some low power transmitters and 350 mW is some significant power close in. Therefore, approximately 4 dB of attenuation was added to the circuit to cut the power down a bit. More or less attenuation can be added if needed for your particular application.

The hand wired prototype of the fox transmitter is shown in Figure 4. Formal circuit boards were designed for the final fox transmitters to make them more uniform and rugged as shown in Figure 5. The narrow board design allows for the foxes to be housed in PVC pipe fittings to make them more rugged and water resistant (see Figure 6).

In Summary

Fox hunting is a great, and useful, activity for Scout groups, schools and ham groups. It combines outdoor activities with some science of radio and radio operating techniques in a refreshing way that just might stimulate further interest in ham radio — and just might help save someone's life. This fox transmitter project might be a good one for a club homebrew project that supports not only club activities but also could support your local school or Scout organizations, and give you an opportunity to introduce ham radio in a very positive way.

Notes

[1]See **www.arrl.org/etp-kits-projects**, click on SCHOOL FOX HUNTING ACTIVITY, then LEARN MORE.

[2]**www.rpc-electronics.com/rf.php**

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

ARRL member and Amateur Extra class operator Mark Spencer, WA8SME, was the ARRL Education and Technology Program (ETP) Coordinator when this article was written. He recently transitioned to an engineering position with a firm that does rapid research and development of prototype unmanned underwater and other autonomous maritime vehicles for the Office of Naval Research and other Department of Defense agencies. He still maintains close ties to the ETP and provides as much support as time permits. So if you need some help or have some questions about this project, please be patient. One side point of interest; Mark states that he has used every content area presented during the ARRL Teachers Institute and the skills he learned in his over 45 years as a ham radio operator in his position as a Research and Development engineer. Quite a validation of the ETP — and ham radio! Mark can be reached at **wa8sme@comcast.net**.

New Products

AIM *UHF* ANTENNA ANALYZER FROM ARRAY SOLUTIONS

◊The AIM *UHF* antenna analyzer from Array Solutions is similar to the AIM 4170C but with extended frequency coverage. The new unit operates from 5 kHz to 1 GHz and features a temperature compensated oscillator (TCXO), scan averaging up to 256 times and an expansion port for accessories. The package includes a wall power supply, calibration loads, a USB cable, free software updates and a printed *Quick Start* guide. Price: $895. For more information, visit **www.arraysolutions.com**.

LOOPS-N-MORE VHF ANTENNAS

◊ Loops-N-More offers halo type half-wave loop antennas for the 6, 2 and 1.25 meter amateur bands. Based on the proven KB6KQ designs, the antennas are made from 6061 aluminum with stainless steel hardware. Rated at up to 750 W, these antennas are horizontally polarized and designed for SSB/CW operation from mobile or home stations. Price: 6 meter loop, $135. 2 meter or 1.25 meter loop, $65. For more information, visit **loopsnmore.com**.

ICOM IC-7410 HF/6 METER TRANSCEIVER

◊ ICOM's new IC-7410 replaces the IC-746PRO. The '7410 uses faster digital signal processing and technology developed from the current IC-7600/7700/7800 series of transceivers. Optional 3 kHz and 6 kHz roofing filters are available. The IC-7410 comes with a standard type B USB connector on its back panel. Modulation input, audio output, RTTY demodulator output and CI-V command can be controlled via the USB cable. Also, a conventional CI-V remote control jack is built into the IC-7410. Optional RS-BA-1 remote control software has been announced with details to come. Price class: $2000. For more information, visit your local dealer or **www.icomamerica.com**.

An Emergency Backup Solar Power System

This article describes one ham's use of solar power technology as a backup for the important circuits in the home — including the ham station.

Jim Talens, N3JT

Many ham radio solar energy articles offer guidance for powering a rig outdoors, whether on vacation or in the field. After hurricane Isabel a few years ago, I was without commercial power for 4 days and surveyed my options. I had relied on a gasoline-powered generator, but it consumed prodigious amounts of gasoline, requiring the constant inconvenience of starting and stopping it. Then, a few weeks later the generator wouldn't start at all. The problem was that a mouse had built a luxury home inside the front cowling, which led to the timing chain skipping a tooth or two. The repair, which took a full day, served to move me more resolutely toward a solar solution. Thank you, Mickey.

My original objective was to have enough power to keep my ham station on the air in the event of a power grid outage. That quickly evolved into a more complex project to keep the nine major circuits in the house powered, including the station, kitchen, gas heating system controls and bedrooms. So what remained was the fun part — solar panels, batteries and control boxes. The solar panels are shown on the author's front lawn in the lead photo and the system design is shown in Figure 1.

System Design

The balance between solar panel power capacity and battery capacity is determined in part on how often and long the grid outages occur where you live. In my case, it is occasional, with a risk of up to several days' outage caused by downed power lines from a hurricane or ice storm. The more common outages are hours long, caused by thunderstorms or high winds in winter. In fact, in late January a snowstorm caused a 24 hour outage in our neighborhood while we were away in Florida. Our neighbors noted that our timer controlled lights were the only illumination on the street. The other factor, of course, is cost. Solar energy from panels currently costs about $5/W.[1] I chose two 165 W panels for a peak output of 330 W.

The Panels

Solar panels are assemblies of series-wired solar cells, each of which remains a high series resistance until exposed to solar energy.[2] Because the power output of a solar panel falls precipitously when there is any less than full solar exposure on all cells, only full exposure really counts. My location is surrounded by tall oak trees that limit sun exposure on the solar panels to about 2 hours daily. The panels are positioned at the optimal location, which happens to be on my front lawn, and are camouflaged from the street by bushes. My maximum panel output is 660 Wh per day because, in our area of the country, near Washington DC, the average daily solar exposure is just over 4 hours and, as noted, I get barely half that.[3] My solar panel system therefore does not lend itself to selling power back to the grid, though the system design in a more sunlit location could easily do so.[4]

Battery Capacity

Of course, how much power is available in the event of a commercial outage is determined by the capacity of the batteries as supplemented by other sources. Putting

[1]Notes appear on page 40.

aside those other sources for now, the batteries required to sustain electrical functionality would be sized according to the load demand and duration of the likely pattern of outages. My ham station draws about 3 kW running nominally full legal power while transmitting. The duty cycle on CW or SSB considering listening times, even in contests or emergency operations, is probably less than 50%, a bit higher for data modes. So the average load represented by the station is about 1.5 kW. Monthly house consumption is normally under 600 kWh, or 20 kWh per day.[5] This includes televisions, lights, operating perhaps a weekend contest at full power, the heating system pump (natural gas fired hot water system), appliances and other typical loads.[6]

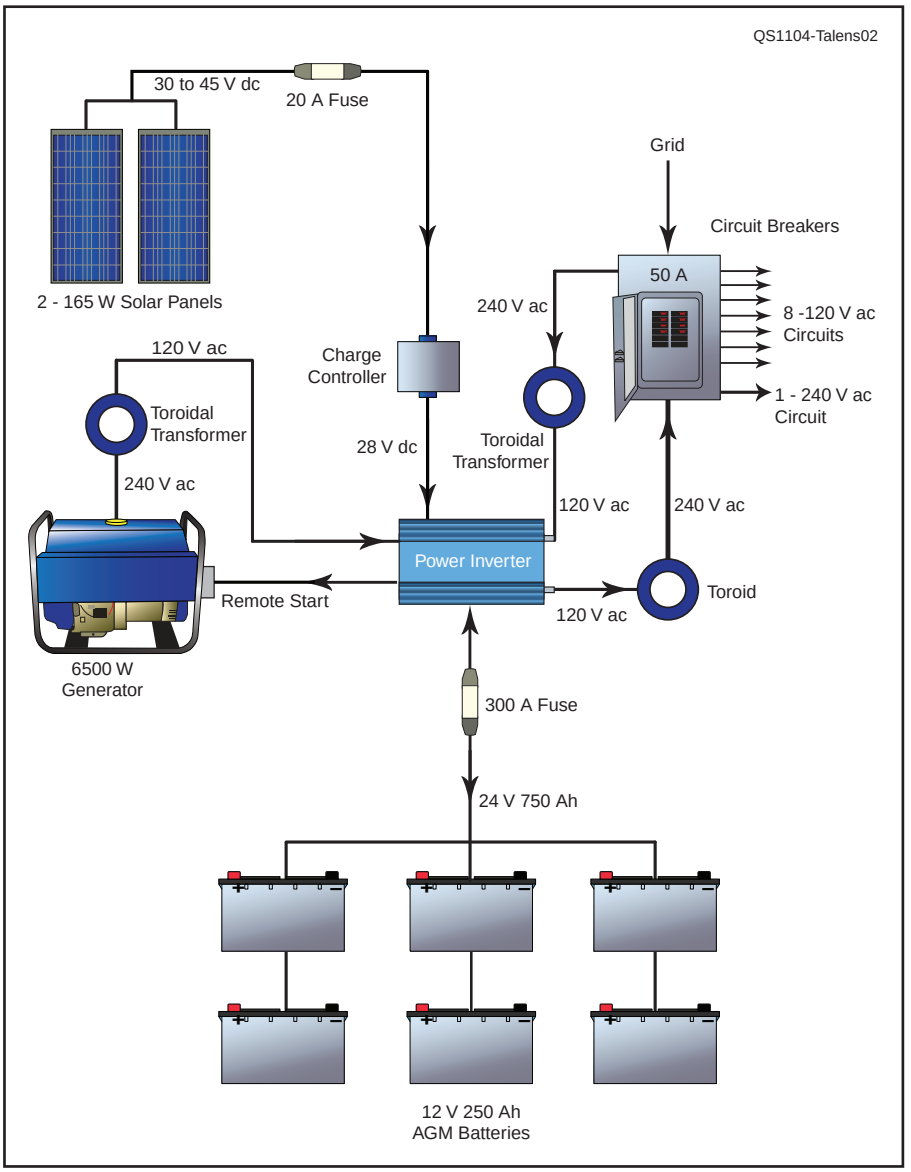


Figure 1 — Block diagram of the solar power system showing major components.

Batteries of sizeable capacity are not inexpensive, but to handle an outage one must have enough stored energy to handle the required loads. In my case, I chose six 12 V, 250 Ah, AGM lead acid batteries.[7] AGM batteries require no maintenance, are sealed against fumes and leakage even if broken, last longer than standard (flooded cell) lead acid batteries and are not as subject to freeze damage as standard lead acid batteries. My batteries are located in the garage and are wired in pairs as a 24 V system. In my case, I have three sets of two batteries each.[8] Each battery weighs about 200 pounds so they are not easy to move around, but with a little leverage and a wooden ramp they can be positioned by one person.

Because batteries depend on a chemical reaction to produce electricity, their actual available capacity depends in part on the rate of discharge relative to their total capacity. Available capacity is always less than total capacity. Normally, the Ampere-hour capacity of a battery is measured at the rate of discharge that will deplete it in 20 hours, called the C/20 rate. Discharging faster than this rate results in less capacity, and vice versa. The relation is not linear, however, so that the C/100 rate is typically only 10% more than the C/20 rate and the C/8 rate is about 10% less than the C/20 rate. Freezing temperatures can reduce capacity by 20%. A typical set of discharge curves appears in Figure 2. The more deeply a battery is discharged the fewer such discharges remain in its life, so for longevity it is advisable to plan on never discharging below perhaps 65% of capacity. In my system, each 250 Ah battery pair at 24 V is capable of supplying 6 kWh, or 300 W for 20 hours, but for planning purposes the more conservative figure should be 4 kWh. Three such battery pairs, representing all six batteries as a battery bank, can then be relied upon to provide a conservative estimate of 12 kWh at the rate of 600 W over 20 hours.

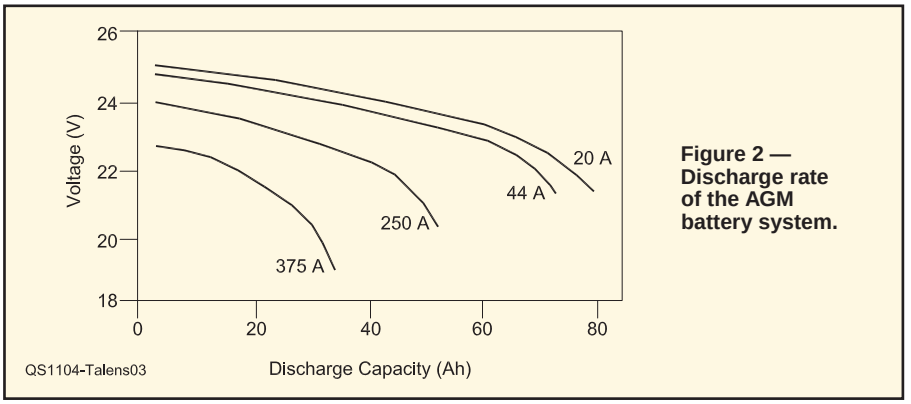


Figure 2 — Discharge rate of the AGM battery system.

Table 1

Typical Power Consumption Over 4 Hour Period

Item	*Power (W)*	*Consumption (kWh)*
Ham gear	150	0.60
Microwave oven (0.25 hour)	1000	0.25
Television — 2 hrs	70	0.14
Three lights (CFL) (4 hours)	48	0.19
Refrigerator and freezer	150	0.60
Miscellaneous[9]		0.80
Total		*1.98*

How Long

Over the 10 years we've been at our current residence, we have had only two power outages lasting more than 8 hours. The other outages were from a few minutes to several hours. The design goal for emergency backup, then, should be focused on the "most likely worst occurrence," in my case 2 to 4 hours. The battery bank at the C/4 discharge rate is about 3 kWh over the 4 hour period. Based on the loads indicated in Table 1, the fully charged battery bank will comfortably handle a 4 hour power outage and keep minimal home comforts (television, lights, refrigerator, freezer) and the ham shack alive for the entire period. The conservative adjustment allows for inopportune appliance activation during the period. It also assumes the ham gear is in use at 100 W output.

The most common outage in my neighborhood occurs during a thunderstorm and involves a blown breaker on a power pole. It's fairly evident by the loud "bang" and, in some cases, the visibly open breaker atop a pole. The power company typically resets these in an hour or two so the notion of continued use of 1500 W on 20 meters is not unreasonable but is probably not prudent should the outage last longer than expected.

Operational Details

On sunny days the batteries are charged by the two solar panels. Each is a Photowatt 24 V panel peaking at 34.4 V and 4.8 A. A Blue Sky Energy Solar Boost 6024H charge controller is used to normalize output voltage to properly charge the 24 V battery bank.[10] AGM batteries require a three step charging cycle that is handled by the charge controller (see Figure 3).

Contingency System.

While the solar panels can supply 660 Wh per day, enough to maintain a full charge, it is hardly enough to replenish discharged batteries quickly. More importantly, what happens in the event of a long outage? Should the batteries reach a preset discharge level of 23 V, the system is designed to automatically start the natural gas powered generator, which supplies power to the loads and charges the batteries, as regulated by the Xantrex power inverter.[11] Once the batteries are recharged to their float level, the generator shuts down and the cycle begins again.[12] If the power inverter senses an outage, it automatically activates an internal transfer relay and converts battery power to provide ac to the loads. The process is virtually instantaneous and unnoticeable in the house.

Figure 4 shows the system along the garage wall. It does not interfere with using the garage for a car. Note the 2 × 4 platform for the batteries and the two toroidal transformers above the power inverter. Because the power inverter is designed for use at 120 V ac, the 240 V ac circuit from the breaker box had to be stepped down and the output of the power inverter stepped back up. A similar toroid is used for the 240 V ac output of the generator. The latest line of Xantrex power inverters no longer requires the toroids but they are more expensive (see Figure 5).

Special Considerations

The low voltage feature of the solar panel and battery system requires that low resistance links be used for all wiring, which means #4/0 AWG wire for battery connections and insulated #10 AWG for the panel to charge controller run. The copper wire used in this system is rather costly unless you can find it surplus. The output of the batteries may exceed 300 A so that the resistance of the wire must be extremely low.[12] When I explain the system to non technical people I note that I can put my fingers across the 24 V supply without danger but I tell them that were I to drop a wrench at the same point I'd probably be gravely injured in a surge of fire and brimstone. They tend to back away. [I once vaporized a wedding ring while it was on my finger doing this trick — the marriage is still holding at almost 47 years, however! — *Ed.*]

Results

This solar panel backup system has been in place for 3 years now and it has worked almost flawlessly. There were two occasions while running high power on 160 meters that RFI apparently caused the Xantrex power inverter to cut out and darken the house. It resets with a simple pushbutton. I installed

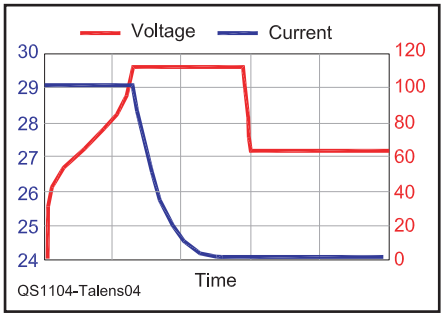


Figure 3 — AGM charge curve. The charge controller manages the three phases of the charge cycle required by the AGM batteries.

Figure 4 — System along the garage wall. It does not interfere with using the garage for a car. Note the 2 × 4 platform for the batteries. A movable ramp facilitates battery replacement.

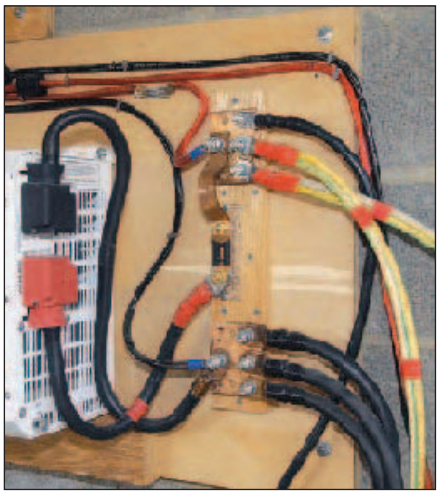


Figure 5 — Connections to the charge controller. Note the variation in wire size used.

toroids and bypass capacitors that seem to have cured the problem. More typically, I will get a call from a neighbor asking me if I have heard yet when the power will be restored in our neighborhood. I had no idea it was out. Best of all, there is really no maintenance required. I have done nothing other than wipe dust or snow off the solar panels, though of course checking voltage levels and connections is part of preventative maintenance. I anticipate the batteries will last 12 years and the rest of the equipment at least 20 years.

The cost of this system is hard to justify on the basis of utility cost savings, though the design applies equally to a more open area featuring greater sun exposure.[13] Having electricity for the ham station in the event of an emergency of some duration strikes me as worthwhile, not to mention the benefit of being the only one in the neighborhood with refrigeration, heat, lights and television when a storm knocks out commercial power.

Notes

[1]See **www.solarbuzz.com/Moduleprices.htm**.

[2]See **en.wikipedia.org/wiki/Photovoltaic_array**. "When even a small portion of a cell, module, or array is shaded, while the remainder is in sunlight, the output falls dramatically due to internal 'short-circuiting' (the electrons reversing course through the shaded portion of the p-n junction. Therefore it is extremely important that a PV installation is not shaded at all by trees, architectural features, flag poles, or other obstructions like continuously parked cars. Sunlight can be absorbed by dust, fallout or other impurities at the surface of the module. This can cut down the amount of light that actually strikes the cells by as much as half. Maintaining a clean module surface will increase output performance over the life of the module. Module output and life are also degraded by increased temperature. Allowing ambient air to flow over, and if possible behind, PV modules reduces this problem. However, effective module lives are typically 25 years or more."

[3]**www.solarexpert.com/Pvinsolation.html** provides a chart for many locations.

[4]This is also referred to as *grid tie* or *net metering*. See **www.dsireusa.org** for information on states' incentive programs, rules on net metering and other topics.

[5]Of course, the central air conditioning system consumes a large amount of power, but our oak trees and ceiling fans allow us to use it relatively sparingly.

[6]Here is a chart for figuring the total power consumption of home appliances: **www.wholesalesolar.com/pdf.folder/Download%20folder/Power-table.pdf**.

[7]Absorbent glass mat (AGM) is a class of valve-regulated lead-acid battery in which the electrolyte is absorbed into a mat of fine glass fibers. They are often used in high performance electrical vehicles due to their high power density. See **en.wikipedia.org/wiki/VRLA_battery**

[8]It is generally not necessary to provide voltage equalization of the two series-wired batteries. Each cell within a battery is nominally 2 V and ultimately when shorted will be noticeable with periodic battery voltage measurements.

[9]The PC has its own battery backup in the form of a robust UPS, but the router, telco-provided fiber converter and related items are either separately battery protected for 4 hours or consume little power and are part of the "assorted" category.

[10]The charge controller is a rather sophisticated device. See **www.blueskyenergyinc.com/products/details/solar_boost_6024hl**. There is a 300 A fuse in series with the battery output and a 20 A fuse in series with the solar panel line.

[11]See **www.xantrex.com/web/id/45/p/131/pt/18/product.asp**. Note that this model is discontinued but, as noted, there are newer models that perform the same functions and do not require the use of the transformers.

[12]The generator, a Honda 6500 W water cooled model, has been modified to run on natural gas, which is considerably less costly per kWh produced, facilitates starting because no choke action is required, and does not depend on availability of gasoline, which could be problematic. Note that the cycling of the generator varies as a function of discharge rate of the battery system. Running high power and a number of appliances will deplete the batteries quickly and require generator activation. The generator output is sufficiently robust to handle the loads and charging the batteries.

[13]See **www.powerstream.com/Wire_Size.htm**. Wire size #4/0 AWG is rated at 302 A. Looking closely at the interbattery wiring in the photo you may see that in some instances two #0 AWG wires are used in parallel. The #0 AWG wire is rated at 150 A.

[14]The total cost of the system, including batteries, charge controller, power inverter and panels was over $10,000. Some of that was recovered by a federal tax credit. Many states, as noted in an earlier footnote, offer additional incentives. Not Virginia.

Hamspeak

AGM (absorptive glass mat) battery — One technology of valve regulated sealed lead-acid (VRSLA) batteries. In AGM batteries, the electrolyte is kept in contact with the electrodes by being within a mat structure that is fixed between the electrodes. As with other VRSLA batteries, only a very small amount of gas is released during charge due to recombination that takes place near the electrodes, replenishing the electrolyte. Thus VRSLA batteries, unlike other lead-acid batteries are suitable for indoor use. They also can't spill and don't freeze in cold weather.

Bypass capacitor — Capacitor used to provide a low-impedance radio-frequency path around a circuit element.

Flooded cell battery — Rechargeable lead-acid battery in which the electrolyte is in liquid form.

kWh — Unit of energy or power used over time. 1 kWh represents the consumption of 1 kW for one hour, or 100 W for 10 hours. This is the unit upon which electric utilities base their usage charges.

Toroid — A circular donut shaped structure made from metal oxides in a ceramic material. It is used as the basis for inductors that have the property that they are self shielding in that the magnetic fields stay within the core.

ARRL Life Member Jim Talens, N3JT, was first licensed in 1960 as KN3MNJ (and soon K3MNJ) in Philadelphia, Pennsylvania. That ham radio interest kindled a career in communications that began with a BSEE from the University of Pennsylvania and several years as an engineer with Western Union and General Electric. Jim then got his MBA and law degrees from Temple University with the intention of going into patent law. But when the FCC recruited at law school and offered him a chance to combine his ham radio, technical and legal skills in a position of considerable responsibility he figured it would be good experience for a couple of years. After a succession of senior staff and management positions in telephone, wireless, satellite and international regulation, and 22 years later, he became Of Counsel for five years at the law firm of Steptoe & Johnson, specializing in satellite and wireless matters.

When he is not watching for power outages, Jim keeps busy as a telecom consultant and counsel for broadcast, wireless and satellite clients. He is also a Realtor™. Jim has operated from a number of locations during international contests, winning the ARRL DX Contest CW single-operator category as HKØ/N3JT in 1991. He lives in McLean, Virginia and is 97.73% CW. His website is **www.n3jt.com** *and he can be reached at 6017 Woodley Rd, McLean, VA 22101-3345 or via e-mail at* **n3jt@arrl.net**. *Jim thanks Bob Curry, KC3VO, whose system served as a model and who provided key guidance and assistance in this project.*

A Junk Box Power Line Frequency Monitor

Use this monitor to help keep the Field Day generator purring the right tune.

Arthur J. Glazar, W2NN

I bought a 4 kW emergency generator in 1986 and it has been in my garage ever since, ready to go when needed.[1] But before I could connect it to the house wiring, I had to make two safety modifications: an exhaust extension to route gases out of the garage, and a high-capacity remote fuel tank to replace the small onboard tank.

Because of these and later modifications, I've had to readjust the engine's speed regulator a few times. The way to do that is to monitor the generator's output frequency and set the speed regulator to obtain 60 Hz. Until now, I've used an HP5382A frequency counter for this purpose. But in the 60 Hz range, the HP requires a 10 second gate period. That means a 10 second display lag, which is cumbersome for real time observation and adjustment.

And so, after only 23 years, I decided to add a power line frequency monitor to the generator interface panel in my garage.[2] I decided to design and build the frequency monitor myself. I believe that this would be useful in any situation in which utility power is not being used — ARRL Field Day immediately comes to mind.

My design has some novel features. It is linear, accurate and 100% analog. Except for a three terminal regulator, it uses no integrated circuits. The display is a simple 0-1 mA moving-coil panel meter on which zero indicates 50 Hz, midscale is 60 Hz and full scale is 70 Hz. Calibration is simple and requires only a dc voltmeter. It is immune to line voltage variation from 100 to 140 V_{RMS}, and most of the components can be found in a well cultivated junk box.

Figure 1 — The Junk Box Power Line Frequency Monitor (center) during bench testing.

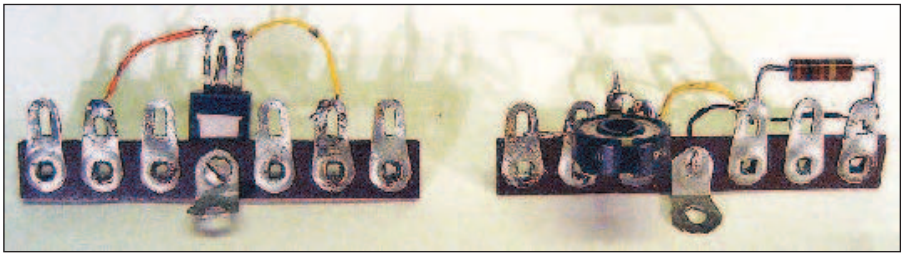


Figure 2 — Mounting of components on terminal strips.

Description

The Junk Box Line Frequency Monitor is shown in Figure 1 along with a Variac, an HP5382A frequency counter and an RCA line voltage monitor. The monitor's chassis is simply a piece of 1/16 inch aluminum, folded into a channel shape. The chassis sides are about 2 inches wide to accommodate the meter depth.

In building the monitor, I used a retro construction technique. The components are prewired onto terminal strips that are then wired together. Two prewired terminal strips are shown in Figure 2, and the underside of the complete monitor assembly is shown in Figure 3.

Principle of Operation

Figure 4 shows the schematic diagram of the power line frequency monitor. Notice the connection from one end of the transformer secondary to Q1's input resistor, R1. This connection provides a positive, half wave rectified pulse to the base of transistor Q1. Q1 squares up the pulse and drives the pulser circuit consisting of C1, R5, R6 and Q2. The pulser generates a precise 6 ms, 12 V pulse once every cycle of line frequency. Therefore, a continuous train of pulses appears at the collector of Q2 as long as line voltage is present.[3] Due to mechanical inertia, the analog meter averages the pulse train and displays an average current proportional to line frequency. The circuit parameters are chosen so that a change of line frequency from 50 to 70 Hz results in a voltage change of 1 V at the collector of Q2. We can say that the circuit "gain" is 1 V / 20 Hz, or 50 mV per Hz of line frequency. Therefore, at 50 Hz, the average voltage is (50 Hz) × (50 mV / Hz) = 2.5 V. Similarly, at 70 Hz the average voltage is (70 Hz) × (50 mV/Hz) = 3.5 V. But, since we'd like the meter needle to show 0 at 50 Hz, an offset bias of 2.5 V is applied to the cold end of the meter via voltage divider R8, R9, from the regulated 12 V dc.

[1]Notes appear on page 43.

Junk Box Component Considerations

Wall wart. An important component is the 12 V, 0.5 A wall wart, stripped of its plastic shell as seen in Figure 5 and in Figure 3 at the lower right corner of the chassis. The denuded wall wart is held in place by a metal strap and two long machine screws. The wall wart contains a transformer, a bridge rectifier and a filter capacitor, as indicated in the schematic. It is an unregulated power supply, and its unloaded output voltage is considerably higher than its rated value, which is attained only when rated current is drawn. My particular wall wart delivers 18 V dc to the input of the 7812 regulator. This gives the 7812 about 6 V of "headroom" voltage, between its input and output. Select a wall wart from your junk box that is rated at 12 V and at least 500 mA to deliver the necessary headroom.

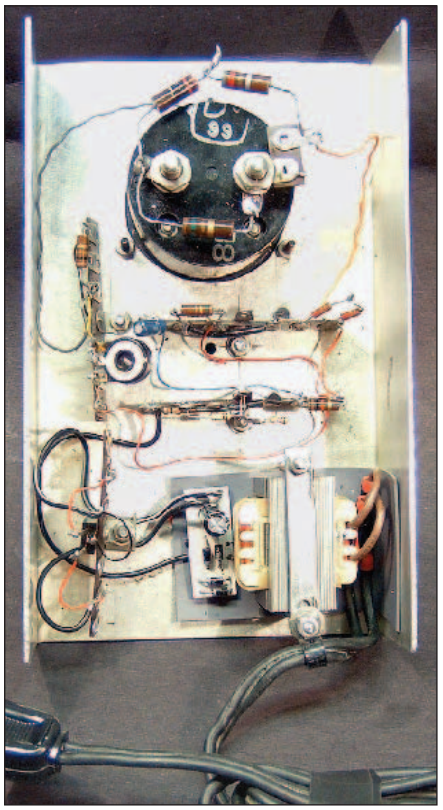


Figure 3 — Underside of the completed power line Frequency Monitor.

Meter. The full scale sensitivity of the milliammeter must be 1 mA, and its resistance must be known in order to calculate the value of R7, which is critical to accurate calibration. A more sensitive meter can be used, however. My meter was salvaged from an antique B&W grid dip meter. Full-scale current is 500 µA (0.5 mA). I shunted the meter terminals with a resistor equal to the internal meter resistance (160 Ω, measured with a handheld digital multimeter). The end result was a 1 mA full-scale meter, with Rm = 80 Ω equivalent internal resistance.

Transistors. The choice of transistors is not critical. Any silicon NPN audio transistor having decent current gain (beta of about 150) is suitable. My junk box yielded two 2N3904s with sufficiently long leads.

Resistors and capacitors. The critical 6 ms duration pulses are controlled by the time constant of R5 and C1. Normally, I would suggest using a temperature stable capacitor for C1. Even though I used a miniature electrolytic capacitor, however, I observed a positive error of less than 1 Hz after temperature soaking the monitor overnight in my refrigerator. So use your own judgment as to how important temperature stability is (I did not try baking in an oven). The calibration procedure will require trimming the value of R5. Therefore, I suggest that you "build" R5 from two resistors in series (say a 10 k and a 5 kΩ) and replacing the 5 kΩ as needed to obtain the final value determined during the calibration procedure.

R6 is a critical part of the gain determining network, so its actual value should be as close as practical to 440 Ω. Since 440 Ω is not a standard value, you will probably need to build it from two standard values.

If possible, the offset adjustment pot, R8, should be wirewound or cermet (composite of ceramic and metallic materials) for tem-

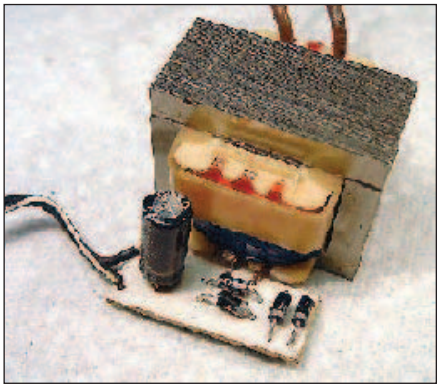


Figure 5 — The wall wart stripped of its shell.

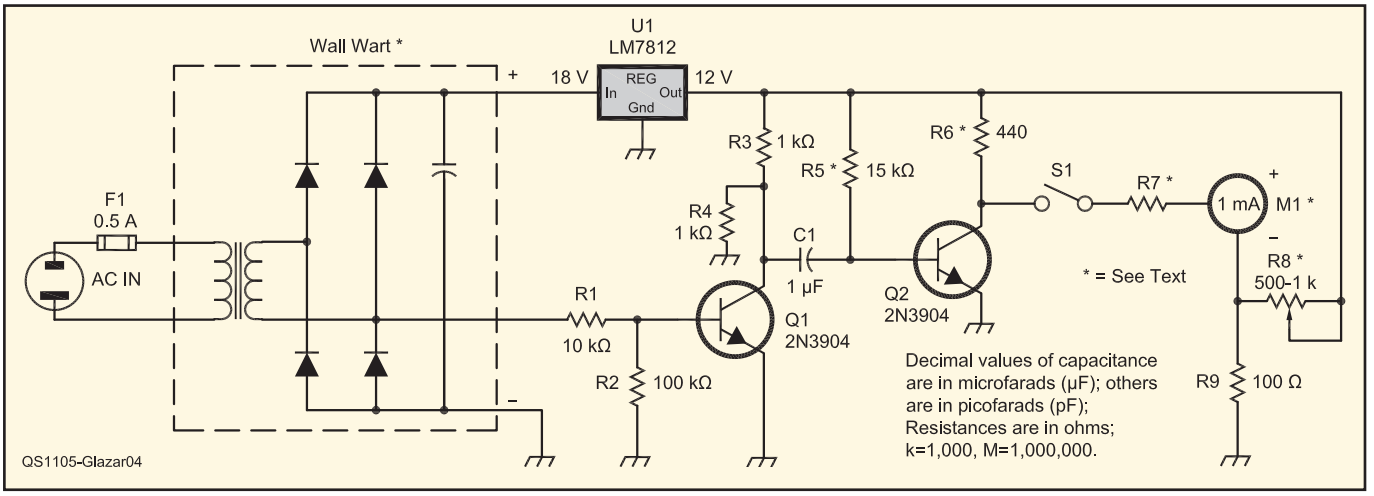


Figure 4 — Schematic diagram and parts list for the Frequency Monitor.

C1 — 1.0 µF capacitor (see text).
F1 — Fuse, 0.5 A.
M1 — Meter, 1 mA dc full scale (see text).
Q1, Q2 — 2N3904 or similar silicon NPN audio transistors.
R1 — 10 kΩ, ¼ W, 5% resistor.
R2 — 100 kΩ, ¼ W, 5% resistor.
R3, R4 — 1 kΩ, ¼ W, 5% resistor.
R5 — Approximately 15 kΩ (see text), ¼ W, resistor.
R6 — 440 Ω (see text), ¼ W, resistor.
R7 — Calculated value (see text).
R8 — 500 or 1000 Ω wirewound or cermet variable resistor (see text).
R9 — 100 Ω , ¼ W, 5% resistor.
S1 — SPST or SPDT switch (see text).
U1 — Voltage regulator IC, LM7812 or similar
Wall wart power supply, nominal 12 V dc at 500 mA minimum current rating

perature stability. Its nominal setting will be around 380 Ω (to obtain the 2.5 V offset voltage); therefore its value should be between 500 Ω and 1 kΩ.

The actual resistance needed for R7 depends upon the internal resistance of the meter, R_M. The sum of R7 + R_M + 79 must equal 1000 Ω; that is R7 = 1000 – R_M – 79, where 79 Ω is the parallel combination of R8 (380 Ω) and R9 (100 Ω), to a close approximation. Therefore, the required value of R7 is:

$$R7 = 921 - R_M\ (\Omega) \text{[Eq 1]}$$

R7 should be built from two resistors in series in order to obtain as close as practical to the exact value calculated in Equation 1. In my case, Rm was 80 Ω, so that R7 = 841 Ω.

Regulator. The key characteristic needed for the 12 V regulator is tight regulation, not precision voltage. My particular 7812 delivers 11.84 V, measured with a handheld DMM. This voltage must be known in order to perform the calibration procedure.

Calibration

If you've gotten this far you're ready to plug the monitor in. But before you do, temporarily open the connection between R7 and the collector of Q2 by means of switch S1. This serves two purposes: First, it will protect the meter against possible damage due to mis-wiring. Second, we need to unload the collector of Q2 to make a critical measurement.

(1) With the unit plugged into utility power, measure V_{CC}, the output of the 7812 regulator and record the number. We will assume the utility power is 120 V at 60 Hz.

(2) With a dc voltmeter, measure the voltage at the collector of Q2. That voltage will be equal to 0.36 times the voltage recorded in step 1, if, and only if, the pulse width at the collector is exactly 6 ms. If the dc voltage at the collector of Q2 is higher than 0.36 × V_{CC}, then R5 must be reduced proportionally. If the dc voltage at the collector of Q2 is too low, then R5 must be increased.

(3) Remove power, solder in the necessary value of R5, and restore the connection from R7 to the collector of Q2.

(4) Apply power, then adjust variable resistor R8 so that the meter reads exactly half-scale. That completes the calibration.

Notes and Observations

Switch S1 serves another purpose besides that of a calibration aid. The switch should be opened before unplugging the monitor from an ac source; otherwise, if the meter remains in-circuit, a transient reverse current would flow through the meter and peg the needle. It doesn't harm my meter, but conceivably it could bend someone else's needle. The reason for the transient is that unplugging causes the pulse train at Q2's input to cease immediately. When this happens, Q2 saturates (due to pullup resistor R5) while the filter capacitor (in the wall-wart) holds V_{CC} up for a short while. As a result, a reverse current temporarily flows from V_{CC} through R8, M1, R7 and Q2 to ground while the filter capacitor completes its discharge. I added switch S1 to my unit after the photos were taken.

A line voltage monitor function can easily be added by making S1 a SPDT switch. The added switch contact can be used to route the positive end of the meter through a multiplier resistor to the input side of U1 at which point the dc voltage is directly related to the ac line voltage. The multiplier resistor value can be selected so that the meter reads half-scale when the line voltage is exactly 120 V ac, analogous to the frequency display.

Or (if your junk box is deep enough), a second, independent meter could be mounted on the same chassis so that voltage and frequency are both visible at a glance.

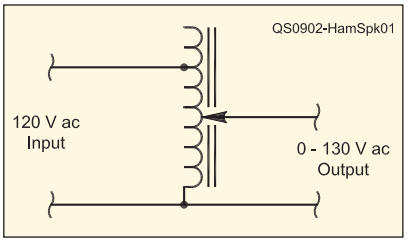
Hamspeak

Frequency counter — Measurement instrument that determines frequency or repetition rate by measuring the number of occurrences or cycles during a precise interval.

Grid dip meter — Test instrument designed to measure the resonant frequency of a inductance/capacitance tuned circuit. It does this by observing the feedback current of an oscillator that will be reduced if coupled into a resonant circuit. In the vacuum tube implementation, the indication was a reduction in measured grid current.

Multimeter — Basic test instrument that can be switched to measure the electrical voltage, resistance or current in different ranges. Originally an analog instrument, now more commonly available with a digital display.

Variac type variable autotransformer — An autotransformer is a single winding transformer with a tapped secondary, as shown in the figure. The Variac is a commonly encountered trade name of such a transformer designed to accept 120 V ac and deliver an adjustable output voltage typically from 0 to 130 V. See **www.variac.com**.



Notes

[1]My generator was part of a group purchase of 142 machines arranged by Richard Knadle, K2RIW, a few years after the great Long Island ice storm.

[2]My panel includes a voltmeter, four lamp load sockets and two replaceable MOV transient suppressors.

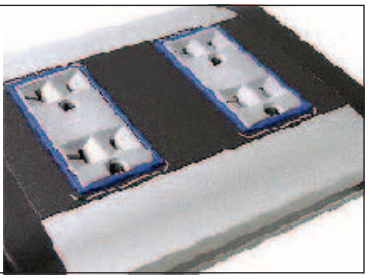
[3]For generating stable and precise pulses in the audio range, the 555 IC timer usually comes to mind. But a personal objective was to avoid using any ICs.

ARRL member and Amateur Extra class operator Arthur J. Glazar, W2NN, was first licensed in 1946 as W2TLX. In 1947 he obtained an FCC commercial radiotelegraph operator's license and made his first ocean voyage as a radio operator. He continued his seafaring career during the Korean War, and then served two years in the US Army. Upon discharge in 1956 he took advantage of the Korean War GI Bill to obtain his degree in electrical engineering.

From 1960 until retirement in 1991, he worked in the electronics industry on Long Island, New York, specializing in EMC analysis in the later years. Art presently puts his spare time to work at the Cradle of Aviation Museum in Garden City, New York, where he restores vintage avionics. You can reach Art at 31 Amapola Ln, Kings Park, NY 11754-3908 or at **w2nn@arrl.net**.

New Products

♢The Duet Power Center from PS Audio provides surge protection, common and differential mode filtering, and over and under voltage protection for connected devices. Designed to provide clean power for audio equipment, the Duet has two isolated zones and four outlets. Price: $249. For more information, or to order, visit **www.psaudio.com**. An Amateur Radio application is described at **www.psaudio.com/ps/newsletters/january-2011-ps-audio-newsletter**



Selecting the "Right" Antennas for Your Station

Your antennas may be the most important parts of your station — here's how to make them count.

Joel R. Hallas, W1ZR

Hams can spend hours poring over equipment catalogs dreaming about their next transceiver, but I would argue they might be better served trying to optimize their antenna system first. After all, the fanciest equipment won't do much good if you can't hear anyone and no one can hear you because your antenna isn't working well.

How Bad Can It Be?

Well, let's face it — every "antenna" will radiate somewhere. There are few hams who've been around a while who haven't either worked someone while accidentally connected to a dummy load, or worked that weak station who finds out the same is happening at their station. Any piece of wire tossed out a window should be an improvement over a dummy load, and such a wire can make some contacts and hear some folks, but chances are you can do better.

Everyone has some restrictions — real estate limitations, height restrictions or financial limitations that will limit antenna system flexibility. The point is, borrowing a page from the system engineer's book, to decide what your objectives are and then maximize your success at meeting them within your constraints.

Getting From Here to There

First — recognize that it is unlikely that a single antenna will support all the activities and interests you will ever have. Next — don't throw in the towel because you can't make it all happen at once — instead, divide and conquer.

Prioritize Your Interests

Decide which band(s) will offer you the best match to your objectives. Decide what the optimum antenna characteristics are that you will need along with azimuth and elevation patterns needed to effectively get your signals where you want them. If you want to work US counties, perhaps a medium height horizontal antenna on 80/75 and/or 40 meters will be the ticket. For DX, you might be better served by antennas for 20 meters and above — either horizontal antennas off the ground by a half wave or higher or, if not feasible, think vertical.

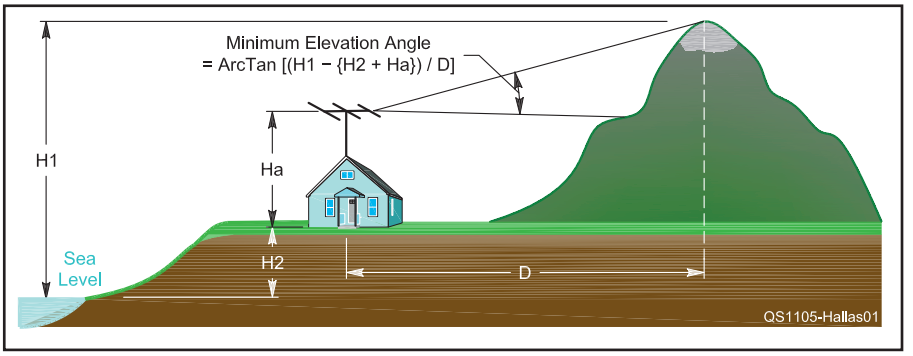


Figure 1 — Description of the method used to find an approximation of the minimum elevation angle available to clear a nearby obstruction. This is an approximation because it assumes a flat earth. The actual minimum elevation angle will be lower because of the earth's curvature. This is somewhat offset by the fact that the wave needs a bit of space to clear the obstruction (the Fresnel zone). If you make the obstruction one wavelength higher than the physical height, that should be a better approximation.

Match Your Objectives to Your Topography

If your initial goal is to work European DX and there's a mountain in your backyard between you and Europe, no matter what antenna you put up — unless it's on top of the mountain — is not likely to be successful. The mountain may be an obvious and extreme case, but the chances are good that you'll have some limitations in this regard in some directions unless you can stand on your roof and look down at a horizon at all azimuths.

There are a number of ways to get the answers, perhaps the easiest is to take a trip to town hall or your library and look at a topographic map of your region. Find your station location and its altitude. Look for taller land features and scale their distance and azimuth using a protractor, or navigation tool. Tabulate the data and at home use trigonometry to determine the lowest elevation angles that you will be able to clear at each azimuth as shown in Figure 1 with the example calculation on the QST-in-Depth website (**www.arrl.org/qst-in-depth**). Comparing those parameters to your topology, what elevation angles can your local infrastructure support?

Little can be gained by sending energy at lower angles than your minimal elevation angle — it will just heat up the hillside. On the other hand, this will provide a target for the elevation angles you can consider. If they aren't low enough to reach your destination in a reasonable number of hops, you may want to focus in other more productive directions.

Make a List and Check it Twice

Once you have figured out where your signals can reasonably go, you can establish a prioritized list of the bands you want to cover and where you want their signals to go. The medium range relatively low 80 and 40 meter dipoles will have patterns that are almost omnidirectional, as will single element vertical monopoles. Higher horizontal antennas for the DX bands — even a simple dipole — on the other hand, will have significant directivity and should be matched to your intended destinations taking into account any restrictions due to topography as determined earlier.

You now have enough ammunition to have a serious pathway towards meeting your operational objectives. As time and resources permit, you can grow your antenna farm to prepare for the activities you want to pursue. Now your search through equipment catalogs can have a different focus.

Or you can do what many hams have done over the years — put up whatever antenna seems to fit and then enjoy finding out how well it works. That's fun, too! QST

PRODUCT REVIEW

Kenwood TS-590S HF and 6 Meter Transceiver

Reviewed by H. Ward Silver, NØAX
QST *Contributing Editor*

The ads looked attractive — top class performance at a middle shelf price — so when asked about doing a review of the new Kenwood TS-590S transceiver, I enthusiastically accepted. I'm not really in the market for one of the "battlewagon" radios but I need a high quality receiver with DSP filtering, a good selection of the most useful operating features, ease of interfacing to PCs and accessories, and construction that will stand up to portable and mobile operating. At first glance, the TS-590's specifications met those requirements. This review covers the salient characteristics of the radio with additional features summarized in Table 1. Performance measurements made by the ARRL Lab are shown in Table 2.

First Impressions

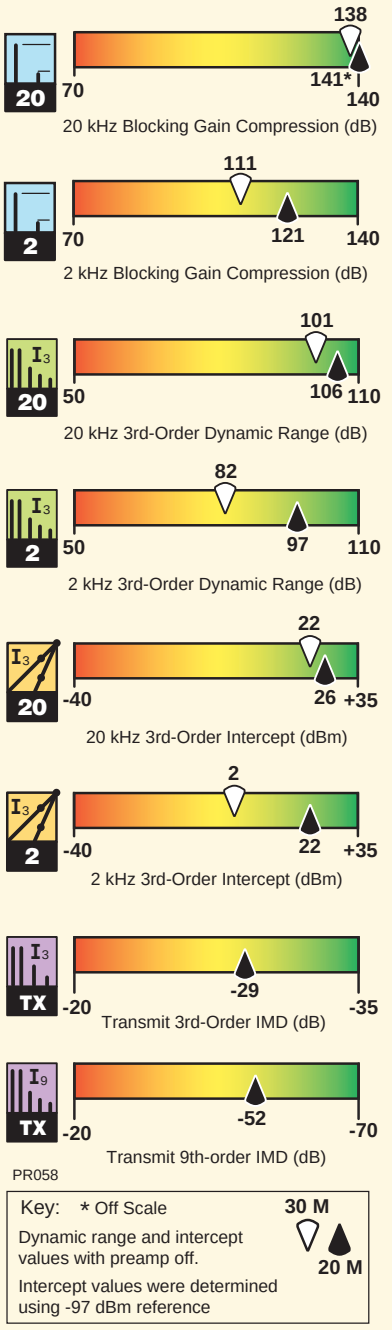
The radio is surprisingly compact — less than one foot across and deep and about four inches high, suitable for even small home stations and mobile operation. You can add it to your existing gear without overloading the shelves or desk. At 16 pounds, it is easy to pick up and carry to the car, to Field Day or to an airplane's overhead bin as carry-on luggage for an expedition. The 13.8 V radio can run from a switchmode power supply weighing less than 5 pounds, leaving plenty of spare baggage capacity for all of the other gear for a station on the beach.

It is easy to set up and start making QSOs. Only three connections are required: power supply, antenna and either a mic or key. If you have experience with modern transceivers, you'll quickly figure out the primary receiver and transmitter controls as they use common terms. For the unfamiliar buttons, you will look up their meaning in the user manual later like most hams. And yes, it has that new radio smell!

The default settings on most functions are reasonable (the CW sidetone setting was too loud) — I found no need to access the menu until I was setting up the radio for AFSK RTTY. Connecting to a PC was straightforward using an external USB to RS-232 adapter, although the radio defaults to 9600 baud while most software seems to assume the 4800 baud rate for the generic "Kenwood" interface. My contest logging software (*N1MM Logger*) recognized the radio right away and others using *Writelog*, *N3FJP Amateur Radio Software*, *CT*, *WinTest* and other packages would likely have no problems.

The receiver output audio sounds great in my headphones (both Yamaha CM500 and Heil Pro Set) with full bass response, crisp highs and no hiss. I'm dismayed at the lack of attention paid to this crucial stage of some other receivers — why spend all those resources creating a fabulous front end and IF system if you're not going to carry through to where the operator actually gets to hear it? (The same goes for operators — why spend

Key Measurements Summary



Bottom Line

Kenwood's TS-590S is a compact package of high-performance radio with an exceptional receiver for the price and well-suited for today's operating modes and styles. It has a useful package of features that are thoughtfully organized and easy to access.

Mark J. Wilson, K1RO ♦ Product Review Editor ♦ k1ro@arrl.org

Table 1
TS-590S Miscellaneous Features

General
TCXO available
Direct frequency entry
Variable tuning step rate with fine step setting
110 memory channels with 8-character alphanumeric labels
Quick access memories (10 channels)
Full scanning features (range or channels)
CTCSS and subtone scan
Configurable for crossband repeater operation

Receive
30 kHz – 60 MHz receive
Switchable 12 dB or 20 dB preamp
Switchable attenuator

Transmit
60 meter band transmit enabled
Paddle and key inputs, electronic keyer
Four CW messages (no external control)
Optional voice recorder and playback unit (VGS-1)
RIT/XIT with clear
Transmit monitor
CW auto tune
Eight character text tags for memories

many hundreds of dollars on RF functions and then use cheap audio input and output gear?) Similarly, I got reports of "excellent" and "natural" audio on both the Kenwood hand microphone and the boom mics. Switching to the contest element for the Heil microphone resulted in reports of more punch to the audio. (Audio equalizer functions are available for both receive and transmit.)

Most of the front panel labels follow common standards or are sufficiently literal as to be obvious. Although the TS-590 is relatively compact, the controls are easy to use and reasonably grouped. I could easily use the radio either right or left handed and didn't find myself making unintended changes from bumping too small or too close buttons. Although there are only six control knobs (the AF/RF GAIN, FILTER control, and NOTCH/SQUELCH controls are concentric) including the VFO, I did not find myself wishing for more. Most of the keys have a logical dual function, such as the VOX ON/OFF button that for "press and hold" brings up the VOX GAIN adjustment. In short, it was easy to use the radio effectively.

Receiver

The radio's top feature, undoubtedly, is the receiver performance. As you can see from the ARRL Lab measurements table and the comparative indicators in the Key Measurements Summary, you get a lot of receiver performance for your dollar. In fact, if you check Sherwood Engineering's ranking of receiver close spaced dynamic range (Rob Sherwood,

Table 2
Kenwood TS-590S, serial number B0900113

Manufacturer's Specifications	Measured in the ARRL Lab
Frequency coverage: Receive, 0.03-60 MHz; transmit, 1.8-2, 3.5-4, 5.25-5.45, 7-7.3, 10.1-10.15, 14-14.35, 18.068-18.168, 21-21.45 21-21.44, 24.89-24.99, 28-29.7, 50-54 MHz.	Receive and transmit, as specified.
Power consumption at 13.8 V dc: receive, no signal, <1.5 A; transmit (max), <20.5 A.	Receive, no signal, default lights, 1.19 A; receive, max volume and lights, 1.27 A, receive, no signal, no lights, 1.16 A; transmit 6.1 A at 5 W RF output, 15 A at 100 W RF output. Operation confirmed confirmed at 11.7 V dc (90 W output).
Modes of operation: SSB, CW, AM, FM, FSK.	As specified.
Receiver	**Receiver Dynamic Testing**
SSB/CW sensitivity: 10 dB S+N/N, 0.13-0.522 MHz, <0.5 µV, 0.522-1.705 MHz, <4 µV; 1.705-24.5 MHz, <0.2 µV, 24.5-54 MHz, <0.13 µV.	Noise floor (MDS), 500 Hz bandwidth, default roofing filter:* *Preamp Off* / *Preamp On* 0.137 MHz –130 dBm / –137 dBm 0.505 MHz –132 dBm / –140 dBm 1.0 MHz –114 dBm / –122 dBm 3.5 MHz –130 dBm / –139 dBm 10.1 MHz –132 dBm / –139 dBm 14 MHz –131 dBm / –139 dBm 28 MHz –133 dBm / –143 dBm 50 MHz –130 dBm / –143 dBm
Noise figure: Not specified.	14 MHz, preamp off/on: 16/8 dB. 50 MHz, preamp off/on, 17/4 dB.
AM sensitivity: 10 dB S+N/N: 0.13-0.522 MHz, <6.3 µV; 0.522-1.705 MHz, <32 µV; 1.705-24.5 MHz, <2 µV; 24.5-54 MHz, <0.13 µV.	10 dB (S+N)/N, 1-kHz, 30% modulation, 5 kHz filter, 15 kHz roofing filter: *Preamp Off* / *Preamp On* 1.0 MHz 13.2 µV / 6.1 µV 3.8 MHz 1.3 µV / 0.6 µV 29 MHz 1.3 µV / 0.4 µV 50 MHz 1.7 µV / 0.4 µV
FM sensitivity: 12 dB SINAD: 28-30 MHz and 50-54 MHz, <0.22 µV.	For 12 dB SINAD, preamp on: 29 MHz, 0.16 µV; 52 MHz, 0.18 µV.
Blocking gain compression: Not specified.	Gain compression, 500 Hz bandwidth, default roofing filter:* *20 kHz offset Preamp off/on* / *5/2 kHz offset Preamp off* 3.5 MHz 140**/136 dB / 140**/120 dB 10.1 MHz 138/136 dB / 125/111 dB 14 MHz 141**/136 dB / 141**/121 dB 28 MHz 140/120 dB / 125/109 dB 50 MHz 130**/141 dB / 130**/127 dB
Reciprocal mixing (500 Hz BW): Not specified.	20/5/2 kHz offset: –120/–106/–91 dBc.

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

Band/Preamp	*Spacing*	*Input Level*	*Measured IMD Level*	*Measured IMD DR*	*Calculated IP3*
3.5 MHz/Off	20 kHz	–26 dBm	–130 dBm	104 dB	+26 dBm
		–15 dBm	–97 dBm		+26 dBm
10 MHz/Off	20 kHz	–31 dBm	–132 dBm	101 dB	+20 dBm
		–18 dBm	–97 dBm		+22 dBm
		0 dBm	–44 dBm		+22 dBm
10 MHz/On	20 kHz	–39 dBm	–139 dBm	100 dB	+19 dBm
		–20 dBm	–97 dBm		+19 dBm
10 MHz/Off	5 kHz	–45 dBm	–132 dBm	87 dB	–1 dBm
		–28 dBm	–97 dBm		+7 dBm
		0 dBm	–14 dBm		+7 dBm
10 MHz/Off	2 kHz	–50 dBm	–132 dBm	82 dB	–9 dBm
		–31 dBm	–97 dBm		+2 dBm
		0 dBm	–12 dBm		+6 dBm
14 MHz/Off	20 kHz	–25 dBm	–131 dBm	106 dB	+28 dBm
		–15 dBm	–97 dBm		+26 dBm
		0 dBm	–56 dBm		+28 dBm
14 MHz/On	20 kHz	–36 dBm	–139 dBm	103 dB	+16 dBm
		–23 dBm	–97 dBm		+14 dBm
14 MHz/Off	5 kHz	–25 dBm	–131 dBm	106 dB	+28 dBm
		–15 dBm	–97 dBm		+26 dBm
		0 dBm	–56 dBm		+28 dBm

Band/Preamp	Spacing	Input Level	Measured IMD Level	Measured IMD DR	Calculated IP3
14 MHz/Off	2 kHz	–34 dBm	–131 dBm	97 dB	+15 dBm
		–18 dBm	–97 dBm		+22 dBm
		0 dBm	–65 dBm		+33 dBm
28 MHz/On	20 kHz	–33 dBm	–133 dBm	100 dB	+17 dBm
		–16 dBm	–97 dBm		+25 dBm
50 MHz/Off	20 kHz	–31 dBm	–130 dBm	99 dB	+19 dBm
		–17 dBm	–97 dBm		+23 dBm

Second-order intercept point: Not specified.	14 MHz, Preamp off/on: +63/+63 dBm.
FM two-tone, third-order IMD dynamic range: Not specified.	20 kHz offset, Preamp on: 29 MHz, 86 dB†; 52 MHz, 86 dB†. 10 MHz offset: 52 MHz, 100 dB.
S-meter sensitivity: Not specified.	S9 signal at 14.2 MHz, preamp off/on, 48.7/14.4 µV.
Squelch sensitivity: 28-30 & 50-54 MHz FM, <0.2 µV; at 14 MHz (SSB), <1.8 µV.	At threshold: 14 MHz SSB, 2 µV; FM (preamp on) 29 MHz, 0.08 µV; 52 MHz (preamp on), 0.12 µV.
Receiver audio output: >1.5 W into 8 Ω at 10% THD.	2 W at 10% THD into 8 Ω. THD at 1 V RMS: 0.6%.
DSP noise reduction: Not specified.	NR1/NR2, 10/20 dB.
Notch filter depth: Not specified.	Manual notch: 51 dB, auto notch: 60 dB. Attack time: 180 ms.
IF/audio response: Not specified.	Range at –6 dB points, (bandwidth):‡ CW (500 Hz): 315-927 Hz (612 Hz) Equivalent Rectangular BW: 596 Hz USB: (2.4 kHz): 53-2253 Hz (2200 Hz) LSB: (2.4 kHz): 52-2252 Hz (2200 Hz) AM: (5 kHz): 147-2350 Hz (4406 Hz).
IF rejection, >70 dB.	First IF rejection, 14 MHz, 84 dB; 28 MHz, 100 dB; 50 MHz, 100 dB.
Image rejection: >70 dB.	Image rejection, 14 MHz, 91 dB; 28 MHz, 100 dB; 50 MHz, 92 dB.

Transmitter

Transmitter Dynamic Testing

Power output: 5-100 W, (5-25 W AM);	CW, SSB, RTTY, FM, typ 4.8-99.0 W; AM, typ 4.8-25.5 W.
Spurious-signal and harmonic suppression: 1.8-29.7 MHz, >50 dB; 50-54 MHz, .60 dB.	Worst: 56 dBc, 1.8 MHz, 2nd harmonic. Meets FCC requirements.
SSB carrier suppression: >50 dB.	55 dB.
Undesired sideband suppression: >50 dB.	62 dB.
Third-order intermodulation distortion (IMD) products: Not specified.	3rd/5th/7th/9th order (worst on HF, 10 m): HF, 100 W PEP, –29/–32/–42/–52 dB; 6 m, 100 W PEP, –34/ –34/–48/–56 dB.
CW keyer speed range: Not specified.	4 to 55 WPM.
CW keyer iambic keying mode: Not specified.	A or B, menu selectable
CW keying characteristics: Not specified.	See Figures 2 and 3.
Transmit-receive turnaround time (PTT release to 50% audio output): Not specified.	S9 signal, AGC fast, 30 ms.
Receive-transmit turnaround time (tx delay): Not specified.	SSB, 14 ms; FM, 14 ms.
Composite transmitted noise: Not specified.	See Figure 1.

Size (height, width, depth): 3.8 × 10.6 × 11.4 inches; weight, 16.3 lbs.
Price: $1800

*The TS-590S operates as either a double down conversion receiver (RX1) or triple up conversion receiver (RX2) depending on the band of operation and filter bandwidth selected. See text for details. RX1 with 500 Hz roofing filter was used for receiver tests at 3.5 and 14 MHz; RX2 with 15 kHz 1st IF filter and 2.7 kHz 2nd IF filter was used for testing on other bands.
**Exceeded figures indicated; test results shown measured with +10 dBm maximum output from test fixture.
***ARRL Product Review testing now includes Two-Tone IMD results at several signal levels. Two-Tone, 3rd-Order Dynamic Range figures comparable to previous reviews are shown on the first line in each group. The "IP3" column is the calculated 3rd 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. For SSB, DSP set to 2600 Hz for "high" and 200 Hz for for "low" for a width of 2400 Hz.

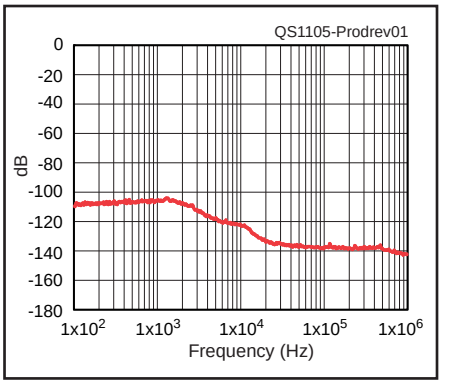


Figure 1 — Spectral display of the TS-590S transmitter output during composite noise testing. Power output is 100 W on the 14 MHz band. The carrier, off the left edge of the plot, is not shown. This plot shows composite transmitted noise 100 Hz to 1 MHz from the carrier. The reference level is 0 dBc, and the vertical scale is in dB.

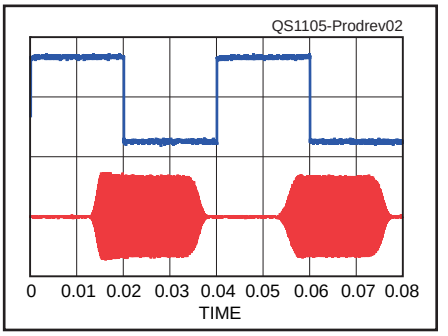


Figure 2 — CW keying waveform for the TS-590S showing the first two dits in full-break-in (QSK) mode using external keying and default settings. Equivalent keying speed is 60 WPM. The upper trace is the actual key closure; the lower trace is the RF envelope. (Note that the first key closure starts at 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.

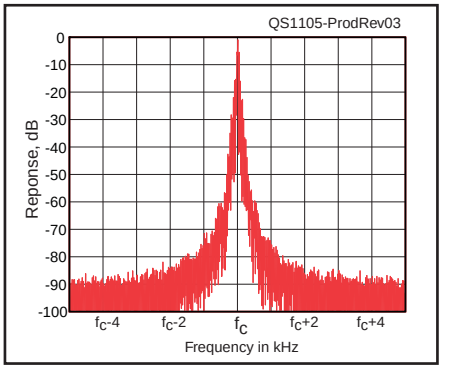


Figure 3 — Spectral display of the TS-590S transmitter during keying sideband testing. Equivalent keying speed is 60 WPM using external keying. Spectrum analyzer resolution bandwidth is 10 Hz, and the sweep time is 30 seconds. The transmitter was being operated at 100 W PEP output on the 14 MHz band, 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.

NCØB, **www.sherweng.com/table.html**), you'll find the TS-590 coming in ninth. Also tenth — what the heck?

The TS-590 is a very interesting superheterodyne that operates as either a double-down conversion (RX1) or triple up-conversion (RX2) depending on the band and filter bandwidth. This allows the radio to balance sensitivity (higher for RX2) with selectivity (better for RX1). Both modes are quite good, as evidenced by the ninth and tenth place position in the Sherwood results. Moving over to Rob's column of wide spaced dynamic range data you'll find the receiver has top class numbers there. Strangely, aside from a single table entry, this important aspect of the radio's operation is not mentioned at all in the owner's manual!

The more selective RX1 is used on the 160, 80, 40, 20 and 15 meter bands when the IF bandwidth is 2.7 kHz or less for SSB, CW and FSK. The crowded, large signal segments of these traditional DXing and contesting bands are where receiver dynamic range is most important. Depending on the mode selected, a 2.7 kHz or 500 Hz roofing filter follows the first mixer at the 11.374 MHz first IF stage.

On other bands, including 10 meters, and for wider IF bandwidths such as for AM and FM, the more sensitive RX2 is used. A 15 kHz roofing filter is used at the 73 MHz first IF, followed by 15, 6 or 2.7 kHz filters at the 10.7 MHz second IF. (The transmitter chain always uses the up-conversion mode.)

The final IF for both RX1 and RX2 is at 24 kHz where sharper filtering is performed by a 32 bit floating point DSP. The IF is where the AGC system is implemented — an important part of the radio's performance. I found the adjustable AGC action to be quite clean — no clicks, thumps or pops. It's possible for a very close signal to be inside the roofing filter but outside a narrower DSP filter, causing the audio level to fall dramatically, but the signal has to be really close. I did not try the receiver on the receiving end of a big pileup (I offered to fly to the Caribbean for the ARRL DX CW contest, but no…) so I can't speak to the radio's ability to handle many signals inside the passband at once.

Another feature is the use of a direct digital synthesizer (DDS) instead of a phase locked loop (PLL) for the main VFO. Since lower noise sidebands are generated by the DDS VFO, less reciprocal mixing occurs with adjacent signals to raise the apparent receiver noise floor. Kenwood has managed to minimize the spurious products often associated with DDS signal sources, as well. One small spur was noted during ARRL Lab receiver blocking testing at a level so low as to be inaudible in actual use. Transmit composite noise as seen in Figure 1 is very low — better than some radios costing quite a bit more — making your neighbors on the bands happy.

For those of you who don't chase DX or enter contests, why do dynamic range and reciprocal mixing and transmitted noise matter during noncompetitive operation? The answer is that it matters any time there are strong signals on the bands. Being able to carry on a contact even next to a strong local signal or in the middle of a big contest makes a lot of difference in your ability to operate under any conditions. If you can acquire that capability without having to spend top dollar to get it, you've made a good purchasing decision.

All users will appreciate the adjustable noise blanker (NB) and noise reduction (NR) systems. NB1 is an analog noise blanker based on the output of the first roofing filter. NB2 is a digital noise blanker that uses signal envelopes. I found both to be effective on different types of noise and neither responded excessively to strong in-band signals as with most analog noise blankers. NR1 is optimized for use with SSB signals and NR2 for use with CW and data signals. I found both to be quite effective, particularly when trying to dig weak DX signals out of the various noises an urban residence inflicts on the amateur. When either NR system is turned up to its most aggressive setting audible artifacts are created (NR2 artifacts sound like the band is "boiling") but both are far better than the noise they have replaced. The four (NB1/NB2/NR1/NR2) adjustable noise fighters are a pretty powerful tool box for fighting atmospheric noise.

If you haven't used good DSP IF filters, you are in for a treat. Response of the TS-590 filters is adjustable in steps — a little coarser than I would prefer, but perfectly adequate. Operation of the filter controls is linked to the mode in use. For SSB, AM and FM, filter adjustments are for the high and low cutoff frequencies. Using CW, FSK and data modes, the same controls adjust center frequency and bandwidth. This is a little odd but you get used to it right away. Two sets of filter settings can be stored as IF A and IF B, selectable by a front panel pushbutton, creating a pair of customizable narrow and wide filters. Along with the band pass filters there are a pair of filters that cancel steady tones plus manual and automatically tuned notch filters.

Basic Performance Elements

Mechanically, the radio is solid and compact. Built around a die cast frame, there are three PC boards: transmitter on top, receiver underneath and a front panel. Don't tell the folks at HQ, but I gave the TS-590 a casual "thump" test, setting it down abruptly on all sides except the front panel — no problems resulted. Even while I was *search and pouncing* on RTTY, the fans rarely came on and were quiet when they did.

Transmit output is 5 to 100 W and settable on a band-by-band basis — useful on 10 and 6 meters for setting drive to amplifiers. The microphone circuits offer adjustable high/low response cut and a six setting audio equalizer. IMD performance is very clean as shown in the ARRL Lab Measurements table, especially for a 13.8 V radio. The REMOTE connector on the back panel provides a complete amplifier control interface.

Low band enthusiasts will be glad to hear that CW waveform is nicely controlled with adjustable rise times as shown in Figure 2. The keying sideband performance in Figure 3 is really good — below –60 dBc at 1 kHz spacing. The radio features an internal antenna tuner with setting memories for 25 frequency ranges and that is specified to match up to SWR of 3:1. I found that it worked well with a nonresonant 105 foot doublet although at higher SWR my external tuner was needed. A separate receive antenna input is provided on the back panel. Transverter operation is supported by a 0 dBm (1 mW) output signal to extend coverage beyond 6 meters to the lower VHF and UHF bands. The radio's display can be configured to display the transverted signal's frequency, as well.

Another welcome feature is the USB serial data interface, in addition to the classic 9 pin RS-232 interface. Not only can you control the radio and use the USB interface for FSK data, you can also use the USB interface for send and receive audio. As with most USB implementations, however, the audio on the USB interface is delayed by many milliseconds and that may be unsuitable for certain modes or types of operating. The delay was quite noticeable, but tolerable, especially during RTTY operation. Using the USB interface requires the installation of a virtual COM port driver and the *ARUA-10 USB Audio Controller* software, both available at no cost from Kenwood.

I urge all radio manufacturers to offer a USB interface as soon as practical along with standard USB class definitions and implementations. It is bad enough that microphones aren't interchangeable but having to manage incompatible proprietary drivers would be a huge problem for most users and create customer service headaches. Please — standardize!

The radio has a generally uncluttered display, quite visible at all angles. I liked the choice of variable brightness green or amber backlight. While filters are adjusted, a temporary value is displayed and for menu selections, the scrolling labels long enough to be meaningful are a nice touch. Changing modes produces a Morse code annunciation, too.

There are two front panel programmable function keys (four on the optional MC-47

microphone) including a tune function. As with nearly every radio sold today, configuration of many items is menu driven and the TS-590 has 88 settable parameters. The items are logically grouped and easy to access. You can save two full sets of parameters and there is a "quick menu" for commonly adjusted settings.

Contest and DXing Performance

My first experience with the TS-590 was in the CW Sweepstakes from W1AW. Since the radio's main performance selling point was its receiver you can be sure that I gave it every opportunity to fold under the onslaught of S9+++ signals but it did not complain. Even deliberately tuning close to strong signals, I detected not a single receiver generated artifact or product with the preamplifier and noise blanker turned off. The DSP filtering could make adjacent signals disappear in most cases.

The only problem I encountered was a significant power overshoot on the leading edge of a first dot or dash before recovering to the intended level. That caused the ACOM 2000 amplifier to trip offline unless we reduced drive, dropping amp output to 800-1000 W. The problem was eliminated by a firmware upgrade from Kenwood and verified by testing with the same amplifier at W1AW at the legal limit. (See PC Host Software and Firmware.)

The radio was shipped to my home station where I tested it further, albeit without an amplifier. I was consistently pleased with the radio's performance on all bands. On SSB, using the Yamaha and Heil boom mics, audio reports were good, including contacts with the speech processing turned on. Note that it is possible to turn the compression up too far as on almost any radio, distorting your voice and making the power supply fan sound like a jet engine! The default microphone gain was a little high for competitive voice levels but no other adjustment was required for satisfactory reports.

On CW, I am pretty picky about not wanting to hear any switching transients during full QSK (full break in keying) at high speeds above 30 WPM. Both semi and full break in were fine during the Thursday night sprints and other CW contests. The radio has an amplifier keying delay (menu items 53 and 54) that can cause "choppy" keying if activated (default value is OFF) while operating in full QSK.

DXers will find TFSET to be a "why didn't I have this before" feature. While operating split, it's common to jump back and forth between the A and B VFOs to see what's happening on your transmit frequency, find a clear(er) spot in the pileup, or see who the DX is working. A common error in the heat of the moment is to forget to switch back or to press the A/B switch twice so that your call sign rings out loud and clear on the DX frequency (or worse, out of the US band) for all to hear (and comment upon). TFSET switches frequencies, too, but only until you take your finger off the button — it's *much* harder to make a mistake that way.

The radio's triple band stacking registers for search and pounce operating are very useful. It's easy to tune up and down the band loading the registers, then hop back and forth between three pileups until you get through. It can more than double your search and pounce contact rate over just using one VFO.

Getting all the various connections and software actors configured properly for operating in the CQ WPX RTTY Contest was a bit of a challenge. The radio's *User Manual* gives little guidance in the practical issues of getting the USB audio interface to work and I had to rely on third party websites — thank goodness for Google! Eventually, though, I was successful using *MMTTY* as my RTTY "engine" with audio connections to the radio over the USB interface, controlled by the TS-590 menu settings for DATA VOX and DATA GAIN, transmitting LSB AFSK. The radio's DATA mode selection configured the DSP filters correctly for the mark and space frequencies. This was definitely not plug and play operation but I was successful in making RTTY contacts. The rear panel ACC2 connector has all the analog signals you need for audio based data operation.

On 6 meters in the January VHF Sweepstakes, I made a limited number of contacts due to poor conditions but the radio was plenty sensitive and I received good audio reports on the band.

PC Host Software and Firmware

Kenwood also provides free PC host software — the *Radio Control Program* (ARCP-590) that provides a remote front panel and configuration of the radio, and the *Network Command System* (ARHP-590). See **www.kenwood.com/i/products/info/amateur/software_download.html**. VoIP software for voice over the remote link is available from third parties. I prefer to operate the radio directly but if you like using your PC, the software makes all controls easily available via the USB interface. You can also operate the radio from a VHF or UHF radio using Kenwood Sky Command II remote control.

The radio's firmware (the internal microprocessor's program) can be upgraded by downloading a compressed file from Kenwood's website and using either the RS-232 or USB interface with your PC. A stand-alone control program then leads you through the steps to load the new firmware and reset the radio — that's it! The ability to upgrade firmware in your shack will extend the useful life of the radio and allow Kenwood to provide better customer support without anyone having to ship radios back and forth. The review radio originally shipped with firmware rev 1.00 but was upgraded to firmware rev 1.02 for final testing.

What's Not There

This is a mid range radio so you won't find high end features such as a spectrum scope or a second receiver. The roofing filter selection is fixed by mode but with the DSP filtering this isn't a huge issue. It would have been nice to have separate control lines for individual HF and VHF amplifiers. FM repeater shift is accomplished by using dual VFOs in split mode. A USB memory stick interface for storing configurations or receive audio would be useful.

The ARRL Lab noted that 60 meter operation is not channelized. This rig transmits from 5.250 to 5.500 MHz on all modes. Other radios we have tested only operate USB on the five specific frequencies allocated for amateur use. It would be easy for an operator to operate on the wrong frequency or mode. We recommend that operators carefully program the 60 meter channels into memories to avoid accidentally transmitting on unallocated frequencies.

Summary

In summary, I'd say this radio gives the most bang for the buck I've seen in quite a while. Download the *User's Manual* from the Kenwood website and explore on your own. The TS-590S would make a good home station or mobile radio. With transverters it could be the foundation of a 160 through 432 MHz station. (Higher UHF bands really need a 144 MHz IF for transverters to be effective.) Stations using a top of the line radio would find the TS-590S a very cost effective second radio, as well.

Manufacturer: Kenwood USA Corp, 3975 Johns Creek Ct, Suite 300, Suwanee, GA 30024; tel 310-639-4200, fax 310-537-8235; **www.kenwoodusa.com**.

Heil Pro Set Elite Headset

Reviewed by Joel R. Hallas, W1ZR
QST *Technical Editor*

The new Heil Pro Set Elite headset is designed for either amateur or professional use. This Pro Set Elite represents a bit of a departure from recent Heil headsets in a number of ways. First, both the headphones and microphone are designed for wide frequency response with a flat response characteristic across the band — unlike the tailored communications response of earlier headsets. Second, the mechanical design is different from earlier models.

Transducers

The Elite headset employs the new HC-6 microphone element that we discussed in the review of the Heil Quiet Pro headphones and MB-1 boom microphone.[1] The HC-6's flat microphone response — instead of the choices of HC-4 (the pileup buster) or HC-5 with highly articulated response for regular communications — is in recognition of the fact that many modern transceivers have built-in transmit audio equalizers that can be used to set the response characteristics the way operating conditions, and voice characteristics, require. Its specified response, –3 dB points at 100 Hz and 12.5 kHz, should support most applications with appropriate equalization. The Heil website offers a set of starting point settings for many popular radio equalizers with all of its current mic elements.

In a similar vein, the headphone transducers are also full range "high fidelity" response type. Thus this headset can perform double duty as a stereo headset for music, if you wish. Again, for Amateur Radio or other communications use, this will be most useful if the receiver, or receive equalizer, can limit audio response to communications bandwidths. Some older equipment can provide audio hiss above communications bandwidths and it's better not to have to eliminate that with your gray matter. The Elite does continue to provide the popular phase reversal switch that can move the apparent sound source out from the middle of the operators head.

Mechanical Arrangement

Both the headphone and microphone mechanical designs are different from earlier Heil headsets, in ways that I found agreeable.[2,3]

Microphone Boom

The mic boom extends out from a fixed position on the left headphone transducer through a short gooseneck. Earlier headset mics had a swiveling fixture that allowed the mic boom to be moved out of the way for listening without transmitting or for CW or digital mode operation.

I suspect that the new arrangement provides a more reliable mic connection arrangement, with less fatigue applied to the mic wires. The new arrangement has a shorter boom — ending up near the corner of the operator's mouth, with easy adjustment for vertical or horizontal position from there. It is far enough from "front and center" that it doesn't take much change in position to have it out of the way and not be particularly noticeable — I was able to drink coffee, for example, without interference. This new arrangement seems to work well for me, and I wasn't bothered by it during my mostly CW operations.

Headphone Design

The headphones are also constructed differently from previous models. Other Heil headsets that I have encountered — perhaps all, but certainly most — used a ball and socket arrangement to attach the headphone transducers to the headband. The Elite uses a new dual hinge and pivot arrangement. This is more typical of what has been found on other headsets. As can be seen in Figure 4, an upper in and out hinge joint is followed by a pivoting connection and then a fork that attaches to each transducer. Somehow they managed to thread the wire for the right hand transducer through all that so that it all comes out, with the mic wiring, as a single coiled cable on the left side. It all works for me.

In my earlier review of the Pro Set Plus, I noted that the long uncoiled cord kept getting tangled in the wheels of my desk chair. I definitely prefer the coiled cord. I'm sure others prefer a non-coiled version — perhaps Heil will consider a version for those folk at some time in the future.

Connector Arrangements

The Elite comes equipped with a 3.5 mm stereo plug for the stereo headsets and a 3.5 mm mono plug for the mic. Also provided is a 3.5 mm to ¼ inch stereo adapter to allow the phones to plug into the usual ¼ inch front panel headphone jack. Heil offers their AD-1 series of adapter cables to match the miniature mic connector to the round or modular plugs used on the front panels of most radios. The adapter also includes a ¼ inch socket intended for a foot or hand switch for transmit-receive (TR) control if VOX isn't used.

Many will opt for the AD-1 adapters, but they are not needed for all radios. For example, my Elecraft K3 can accept the native plugs into rear panel connectors, making for a neat arrangement. It also has a rear jack that can be used for a foot or hand TR switch. The length of the coil cord is really a better fit to front panel connections, but it worked satisfactorily for me using the rear connection points.

Heil also offers a version for most modern ICOM radios, the Pro Set Elite iC. This uses a wide bandwidth electret mic element with similar response to the HC-6. The electret element requires +5 V dc bias, provided at the mic connector of ICOM radios. We did not test this model.

Bottom Line

The Heil Pro Set Elite is a worthy addition to the popular Pro Set line of headsets. It offers comfortable wider range earphones, combined with a wide range high fidelity dynamic mic element. The mic element is intended to be tailored by radio or external audio equalizers to provide just the desired voice characteristics.

[1] J. Hallas, W1ZR, and N. Hallas, W1NCY, "A Look at Noise Canceling Headphones," Product Review, *QST*, May 2010, pp 52-53.
[2] D. Patton, NN1N, "Heil Pro Set Quiet Phone Noise Canceling Headset," Product Review, *QST*, Jun 2006, pp 71-72.
[3] J. Hallas, W1ZR, "Heil Pro-Set Plus Headset with Boom Microphone," Product Review, *QST*, Dec 2003, pp 61-63.

On the Air

Since I am mostly a CW operator, the use of the headphones without the mic is of significant importance to me. I found the headphones quite comfortable and good sounding. The earpiece pads ride on, rather than around, the ear. I found them comfortable including during extending operating periods, such as some fairly long stints in the 2011 ARRL CW DX contest. I did not find the presence of the mic and boom bothersome, perhaps because it is at the corner of my mouth. Pushing it down just a bit avoided any encounters with my coffee cup.

Figure 4 — Close view of the left side showing the new headphone hinge and pivot arrangement. The structure of the new mic boom and its flexible gooseneck is also clearly visible.

In voice modes, the mic was just as advertised — a very flat response. Those who know what I sound like found this agreeable, since it sounded like me. A check-in on the Sunday afternoon 75 meter Antique Wireless Association 75 meter AM net got generally good — but flat — reports. Some broadcast sound oriented audio buffs reported a "lack of articulation," just as expected from a flat response.

I then tried using the communications oriented equalizer settings for the K3's eight band equalizer, as recommended on the Heil website — significant reduction below 400 Hz and even heavier boost above 1.6 kHz. I was fortunate to run into Dick Kalt, W1FYI, on 20 meter SSB. Dick, a professional broadcaster, lives about four miles away and, with his six element Yagi, we had excellent signal to noise ratios each way.

Dick agreed that the HC-6 without equalization sounded flat, and that with Heil's suggested K3 equalizer settings sounded much more articulated. He did talk me through some other settings that made it sound even nicer, picking up on the low and high ends and pushing down the middle. He played me recordings and I had to agree — careful adjustment can make a big difference — an advantage of using an equalizer, rather than a pre-equalized mic element.

During the adjustments, Dick thought I was using a desk mic. As we were wrapping up, he was quite surprised to find that I was using a boom mic headset. He stated that it was the best headset he had ever heard. He was not used to hearing a headset that didn't include close breathing and popping sounds. He attributed this to the design of the mic boom, which kept the mic a bit off to the side. One possible downside of this arrangement is that I found I had to move the K3's MIC GAIN to the high range to get sufficient drive — not a problem, just different from the settings of my straight-on mic with HC-5 element.

Manufacturer: Heil Sound, Ltd, 5800 N Illinois St, Fairview Heights, IL 62208; tel 618-257-3000; **www.heilsound.com**. Price: Pro Set Elite, $182; Pro Set Elite iC, $193; AD-1 radio adapter (if needed), $22; foot operated PTT switch, $44; hand operated PTT switch, $32. QST

Feedback

◊ *Clarification:* The review of the Shakespeare PL-259-CP-G Coax Connector [Short Takes, Mar 2011, p 64] was the result of an investigation undertaken and written up by ARRL Lab staff. It was triggered by a manuscript submitted by ARRL International Member John White, VA7JW, but we managed to overlook his manuscript when we prepared the item for publication. Our investigation should have been a sidebar to his submitted article. Our apologies to John for this oversight.

John offered some additional information about the connector line. He notes that while Shakespeare offers the solderless PL-259 connector, the manufacturer, CenterPin Technologies, offers other RF connectors using the same mechanical arrangement. Included are Type N (RG-58 size only), BNC, TNC and cable splicers. These products are distributed by Gemeco Marine Accessories at 1141 South Ron McNair Blvd, Lake City, SC 29560, or at **www.gemeco.com**. — *Joel R. Hallas, W1ZR, Technical Editor,* QST.

◊ In "Product Review — Wouxun KG-UV2D and KG-UVD1P Dual Band Handheld Trasceivers" [Nov 2010, pp 52-54], we stated "You can listen to two frequencies at once…." This is incorrect. The Wouxun handhelds are of dual band single receiver design. The user can monitor two different bands, but can only receive one band at a time. If a transmission is present on one band, the other band is muted until the first transmission ceases.

◊ In "Digital VOX Sound Card Interface" [Mar 2011, pp 34-36], the parts list in the caption of Figure 1 shows VR1 as a 10 kΩ unit. The correct value, as shown in the diagram, is 500 Ω. The listed Mouser part number is also correct. Kits are being supplied with the correct part.

◊ In "A Near End-Fed Antenna for Low Power 20 Meter Operation" [Mar 2011, pp 46-47], the next to last paragraph should have said, "A change in its (the coax) length also changes the *apparent* SWR *due to common mode current on the outside of the coax*." In the paragraph prior to that one, the 25 Ω represents the inductive reactance of the unloaded winding. As a loaded transformer, it should be expected to work as intended. In addition, the word "counterpoise" is not the best term to describe the short section of a very off-center fed antenna.

◊ A few errors crept into "The W7JI Low or Lower Power 40 Meter Transmitter" [Apr 2011, pp 33-37]:

In Figure 1, add a capacitor to the right of C2 and label it "as required to tune." It could be around 270 pF depending on the actual value of L1. Also in Figure 1, T2 should be flipped to the right so that the low impedance connection goes to the final output coupling capacitor C35. D1, the NTE618 varactor tuning diode is shown correctly on the schematic but is missing from the parts list. The Mouser part number is 526-NTE618.

In the paragraph entitled "Mixer and IF Amplifier" the mixer IC, U1, is identified as an SA612, while Figure 1 indicates it as an SA602. The SA612 is actually a newer version of the '602 and either can be used without change. The Mouser website indicates that the version of Q8, the IRF510 power FET specified in the parts list for the 7.5 W power amplifier, is now obsolete. They do list a number of other versions in non-lead configuration such as the 844-IRF510PBF. Similarly, D4, the 7.5 V Zener diode, listed part number has been superseded by 78-TZX7V5B.

◊ In "A Line Voltage Monitor for Your Shack" [Apr 2011, pp 43-44], Figure 1 is missing a ground symbol at the bottom of R2. If you wish to power the unit from a 12 V dc supply rather than from the ac line, as mentioned in the article, break the connection from the top of R1 to the top of R3 and pin 7 of the op amps. Connect the 12 V supply to the top of R3.

◊ In "2010 IARU HF Championships Results" [Apr 2011, pp 81-84], G3PSM, LA2RR and LZ1US were omitted from the IARU Administrative Council operator list on page 82. G3PSM made 312 QSOs with 144 multipliers for a score of 127,296. LA2RR made 297 QSOs with 138 multipliers for a score of 123,114. LZ1US made 27 QSOs with 15 multipliers for a score of 915.

◊ In "75, 50 and 25 Years Ago" [Apr 2011, p 102], the first paragraph under April 1986 should have said "The cover photo montage shows members Texas DX Society's Great Armadillo Run of 1986 — putting all Texas counties on the air during the Texas Sesquicentennial."

TECHNICAL CORRESPONDENCE

A NO-SPECIAL-TOOLS SMD DESOLDERING TECHNIQUE (AUG 2009)

◊While the technique that Wayne Yoshida, KH6WZ described in his August 2009 *QST* article will work, it subjects the circuit board to excessive heat, which can very easily lift pads. I much prefer a two fisted approach. I use two 25 W irons with 1/16 inch tips, and heat both ends of the component at the same time. Then I use the tips of the soldering irons to lift the part off the board. See Figure 1. — *73, Stephen Wimmer, WUØF, 21106 NW 70th St, Raymond, NE 68428;* **wu0f@windstream.net**

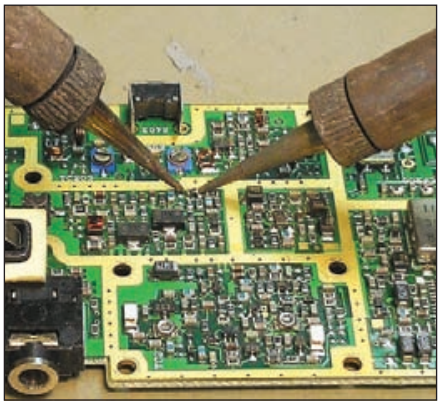


Figure 1 — Stephen Wimmer, WUØF uses a pair of 25 W soldering irons to heat both ends of a surface mount component at the same time to remove the component from the circuit board.

◊Thanks for your comments, Stephen. I agree that having two soldering irons is a good way to go. Even better are the SMD-dedicated, dual-tipped desoldering tweezer devices. Yes, there is a possibility of circuit board trace delamination because of excessive heat. This is true with any circuit board rework.

If one does not have two soldering irons, my method is a good trick. A lot of the boards I rework these days are extremely high quality and probably have multiple layers, and I have not experienced any delamination (yet). — *73, Wayne Yoshida, KH6WZ, 28181 Rubicon Ct, Laguna Niguel, CA, 92677;* **kh6wz@arrl.net**

A HIGH POWER RF SAMPLER

◊If one wants to measure characteristics of a transmitter or high-powered amplifier, some means of reducing the power of the device to 10 or 20 dBm must be used. The most straightforward way to do this is to use a 30 or 40 dB attenuator capable of handling the high power. A 30 dB attenuator will reduce a 100 W transmitter to 20 dBm. A 40 dB attenuator will reduce a 1 kW amplifier to 20 dBm. If further attenuation is needed, a simple precision attenuator may be used after the signal has been reduced to the 20 dBm level.

The problem with high-powered attenuators is that they are expensive to buy or build since the front end of the attenuator must handle the output power of the transmitter or amplifier. If one already has a dummy load, an RF sampler may be used to produce a replica of the signal at a reduced power level. This may be accomplished as simply as a voltage divider in parallel with the dummy load. Since we use 50 Ω systems, the resistor connecting to the center conductor of the load should be 2500 Ω in series with 50 Ω to ground to obtain 40 dB of attenuation. The ~2500 Ω load will not affect the impedance of the 50 Ω dummy load much, and the 50 Ω resistor at the bottom of the divider will provide a 50 Ω source impedance to the coax running to the test equipment. The problem with this method is that the 2500 Ω resistor must dissipate 30 W, if a 1500 W amplifier is being tested.

To avoid this problem, transformer RF samplers are used at the sacrifice of some bandwidth. The purpose of this Technical Correspondence letter is to share some of the parameters of several RF samplers that I have built and tested recently. A transformer sampler passes the center conductor of the coax, going from the transmitter or amplifier to the dummy load through a toroid as a single turn. The secondary of the transformer goes to a resistor network and then to the test equipment as shown in Figure 2. I have assumed that our source, whether a transmitter or amplifier, is a pure voltage source in series with a 50 Ω resistor. This most likely is not the case, but for analysis purposes, it will do.

If a current, I, flows into the dummy load, then a current, I / N flows in the secondary of the transformer, where N is the number

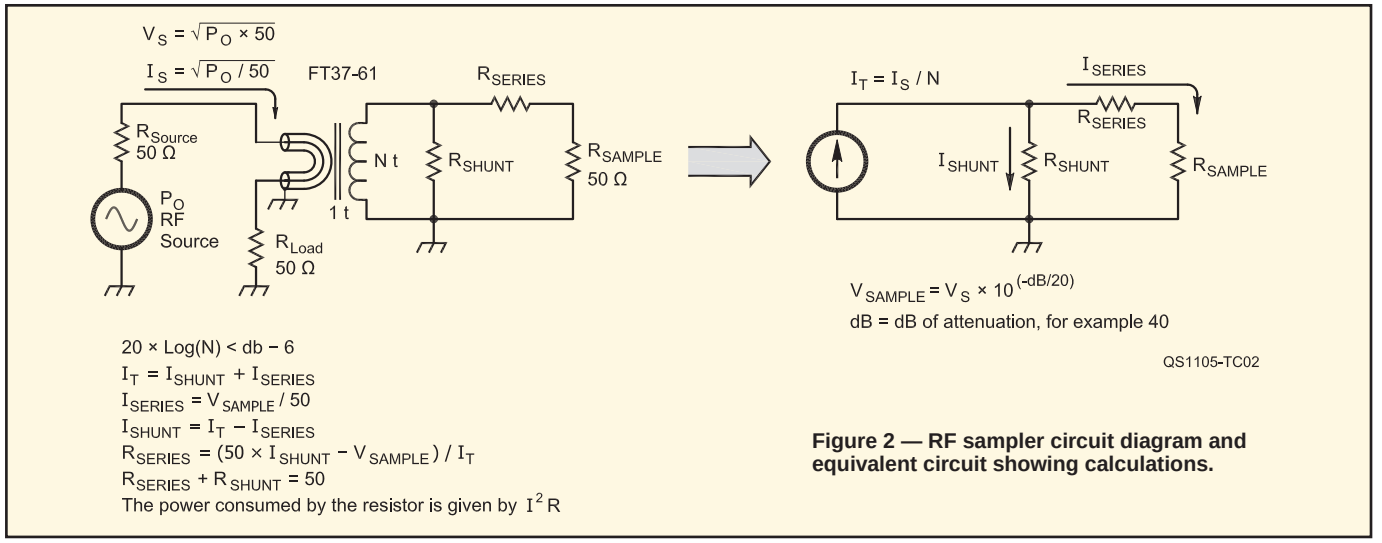


Figure 2 — RF sampler circuit diagram and equivalent circuit showing calculations.

Larry D. Wolfgang, WR1B ♦ Senior Assistant Technical Editor ♦ tc@arrl.org

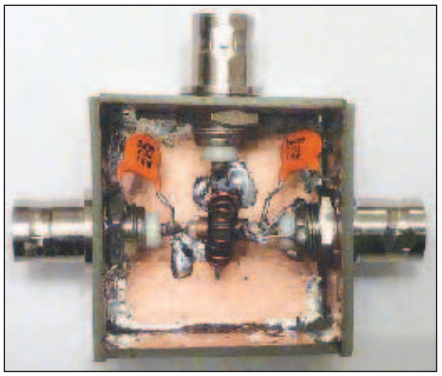


Figure 3 — RF sampler using box construction.

of turns on the secondary. Figure 2, also, shows the equivalent circuit, substituting a current source for the transformer. I have selected 40 dB for the attenuation and 15 turns for the secondary of the transformer. If R_{SHUNT} = 15 Ω, and R_{SERIES} = 35 Ω, then the voltage across a 50 Ω load resistor is 1/100 of the voltage across the dummy load, which is 40 dB of attenuation.

Reflecting this resistor combination back through the transformer yields 0.06 Ω in series with the 50 Ω dummy load impedance. This is insignificant. Furthermore, reflecting 25 Ω from the primary to the secondary places 5625 Ω in parallel with R_{SHUNT}, which does not significantly affect its value. That being said, looking back into the sampler from the test equipment, you see 50 Ω, which is what we want. Even at low frequencies, where the reactance of the secondary winding is lower than 15 Ω, the impedance looking back into the sample port is close to 50 Ω.

I built a sampler of sorts about 8 years ago as an integral part of a homebrew amplifier. I was focused on the amplifier, so the sampler is not as good as it could be. The sampler published in the sidebar on page 43 of "A Peak Reading RF Power Meter" in the March 2010 issue of *QST* was supposed to be a direct copy of that sampler circuit. That sampler uses a T50-2 powdered iron core with 33 turns followed by a 4 dB resistive attenuator. The resistor values on that schematic were for a PI-attenuator instead of the T-attenuator shown. This sampler has fair SWR looking through it, a bad SWR looking back into the sampled port, and a useful bandwidth extending from 1 MHz to 60 MHz. The new samplers described here use an FT37-61 ferrite core followed by two resistors as described above. The through-line SWR is good up to 200 MHz, the SWR is fair looking back into the sampled port, and the useful bandwidth extends from 0.5 MHz to about 100 MHz. If you are interested in an accurate representation of the

Figure 4 — RF sampler using tube construction.

3rd harmonic of your HF transmitter or amplifier, it is important for the sampler to give accurate attenuation into the VHF range.

Figure 3 shows a photo of a sampler built into a 1.3 × 1.3 × 1 inch (inside dimensions) box constructed from single-sided circuit board material. The through-line connection is made with a short piece of 141 semi-rigid coax with the shield grounded *only* on one side to provide electrostatic shielding between the toroid and the center conductor of the coax. R_{SHUNT} is hidden under the toroid, and R_{SERIES} is shown connected to the sample port. This construction technique looks like a short piece of 200 Ω transmission line in the through-line, which affects the SWR at higher frequencies. This can be corrected by compensating with two 3 pF capacitors connected to the through-line input and output connectors as shown in the photo. The compensation difference in through-line SWR was reduced from 1.43:1 to 1.09:1 at 180 MHz by adding the capacitors. This compensation, however, causes the attenuation to differ at high frequencies depending on the direction of the through-line connection, so a different design was explored.

Figure 4 shows a different approach using 9/16 inch diameter, 0.14 inch wall thickness, hobby brass tubing. The idea here is to lower the impedance of the through-line so no compensation is needed. The through-line SWR for the tube sampler is 1.08:1 at 180 MHz, which is as good as the box sampler, and the sensitivity to through-line direction is reduced. Although the high frequency attenuation is not as good as the box sampler, the construction technique provides a more consistent result.

Both samplers use 15 turns of no. 28 AWG wire on an FT37-61 core, which just fits over the 141 semi-rigid coax. R_{SHUNT} is a 15 Ω, 2 W, noninductive resis-

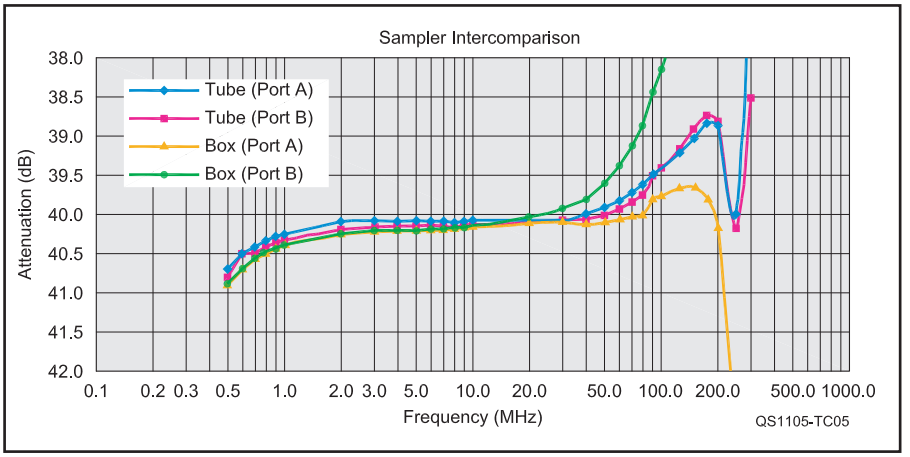


Figure 5 — Attenuation versus frequency of box and tube constructed RF samplers. The A B Port distinction refers to the direction of the through-line connection.

tor, and R_{SERIES} is a 34.8 Ω, ¼ W, 1% noninductive resistor. The power dissipation of the resistors and the flux handling capability of the ferrite core are adequate for sampling a 1500 W source. For those uncomfortable using BNC connectors at high power, an SO-239 version may be constructed using an FT50A-61 core and larger tubing.

The attenuation versus frequency of both samplers is shown in Figure 5. The A B port distinction is used to show the through-line direction dependency. The measurements shown on this graph were made using an HP 3335A signal generator with an HP 3586C selective level meter from 0.5 to 30 MHz, an HP 3335A with an HP 438A power meter and HP 8484A sensor from 40 to 80 MHz, and an HP8642A signal generator with an HP438A/HP8484A from 90 to 300 MHz. Thanks to NØQO for his help with these measurements. — *73, Tom Thompson, WØIVJ, 990 Toedtli Dr, Boulder, CO 80305;* **tlthompson@qwest.net**

SOLDERING SURFACE MOUNT COMPONENTS (JAN 2010)

♢Larry, thanks for your story in regards to soldering surface mount components in the January 2010 issue of *QST*. It has renewed my resolve to try again. It's sort of like those poker lessons with my pals; I paid for the lessons, and the teachers benefited. I have built three of the New Jersey QRP Club DDS VFO daughter boards. The first is still working, but I lifted the foil while soldering the second one.

The last one I paid to have soldered, but after a short play it quit. I, like you, set it aside for a sunny day. So, last night I rolled up my sleeves, got out my digital camera, headband magnifiers, and other tools. I managed to cleanly lift the old DDS chip and prepare the board for the new IC. The digital camera idea works great. I've ordered two new DDS chips (still cheaper than those "poker lessons") and can hardly wait to try again. Oh yes, wish me luck!

Update

I was successful with the DDS VFO. It did not work on my first attempt but it turned out my soldering was okay on the new 28 pin DDS IC. I had a poor solder connection on a board jumper. I fixed that and then had output on a few bands, but the frequencies were all wrong. After I downloaded the new HEX file from the AMQRP website (**www.amqrp.org/kits/kits.html**) and reprogrammed the controller PIC, I was home free.

I seem to get too much solder on the pins and have to rely on solder wick to remove the excess. I guess that's the way it's going to have to be.

I have had good success cutting the tip off of a cocktail toothpick and using instant glue to attach it to the surface mount part. Then I have a nice handle to hold it in place while I solder one side. After I solder the other side down, I break off the toothpick, trim it and glue it to the next part. The parts end up with glue on them but it beats tweezers.

If you have to trim a circuit, start with a higher value of resistor than you need, and then stack a second resistor on top of the first. It looks funny but cuts down on foil lifting. The technical articles are always my favorite in *QST*. — *73, Roger Monroe, K7NTW, PO Box 236, Clearlake, WA 98235;* **k7ntw@arrl.net**

MORE ON RESISTORS IN PARALLEL (JAN 2010 TC)

♢I would like to add some "interesting info" to the nice letter by Bob Raffaele, W2XM, in the January 2010 Technical Correspondence column.

Calculating parallel resistor equivalents by the conductance method is easier than it looks when you use a little-known quirk of many four-function calculators.

Virtually all of the cheap four-function calculators contain a logic error that implies a "1" left in the register after clearing. Try this on your calculator to see if it includes this logic error.

To take a reciprocal, enter the number and then "divide" then "equal."

Enter 5, ÷, = and see 0.2 on the display. [If your calculator displays 1 or something else, then it does not have this logic error. — *Ed.*]

The process of adding reciprocals to find the combination of resistors in parallel takes advantage of the Memory + (M+) and Memory Recall (MRC) functions.

Example: Suppose you want to know the total resistance of a 15 Ω resistor in parallel with a 30 Ω resistor. Enter 15, ÷, = to see 0.0666. Then use M+ (adds to memory) enter 30, ÷, = to see 0.0333 on the display. Then hit M+ and MRC, and see 0.09999. Finally, press ÷, = and see 10.00. The parallel combination of a 15 Ω and a 30 Ω resistor is 10 Ω.

Try it with three 30 Ω resistors of in parallel. The result will be 10 Ω. Of course clear the memory before starting each combination (press MRC twice).

I recall some discussion in the computer industry after the low cost four function units appeared. As I remember the explanation, a carry bit was left and it looked like a 1 when a divide was done. This causes no harm to any normal entry so the error was left and has been propagated to almost all four function units.

There are other "unknown" functions that are useful. The first number and first command entered stay in place until replaced. Example: 2 × = gives 4, then press = and get 8, it continues until the accumulator overflows.

Enter pi, 3.14159265, multiply and then any number entered followed by = will give the "pi times" function. — *Regards, Ralph Dieter, K1RD, 78 Olde Lantern Rd, Bedford, NH 03110;* **k1rd@k1rd.net**

WIRELESS ROUTER INTERFERENCE (DEC 2010 DOCTOR IS IN)

♢The December 2010 "Doctor is In" answer to the question about RFI related to a Linksys wireless router seemed to overlook the most likely source of the interference: the switching power supply (wall adapter) that is supplied with the router. The modern, lightweight switch-mode supplies provided with electronics today are notorious sources of RF interference. The description of the noise as spaced every 30 kHz is typical of the noise from these devices. The RFI is conducted back into the house wiring, helping to spread the pain. The noise is also carried into the load device, in this case the router. Connect the router to unshielded Ethernet wiring and the noise sprays everywhere!

The best fix is to replace the switch-mode power adapter with a linear type. A few minutes in a surplus or thrift store will turn up many suitable adapters for a buck or two. Many of these devices run on 12 V dc making it even easier for hams to find replacement supplies.

If replacement of the power adapter is not possible, then filtering the input and output of the switching power supply is the best bet using bypass capacitors, chokes and so on. Switching (pun intended) to a linear power supply can be much easier — and probably even cheaper.

Earlier in 2010 I presented a paper related to this topic to the National Association of Broadcasters Engineering Conference. If you'd like to read it, visit **www.wd8das.net/nab.pdf**. — *73, Steve Johnston, WD8DAS, 2309 Tulare St, Fitchburg, WI 53711;* **sbjohnston@aol.com**

Technical Correspondence items have not been tested by *QST* or the ARRL unless otherwise stated. Although we can't guarantee that a given idea will work for your situation, we make every effort to screen out harmful information.

Materials for this column may be sent to ARRL, 225 Main St, Newington, CT 06111; or via e-mail to **tc@arrl.org**. Please include your name, call sign, complete mailing address, daytime telephone number and e-mail address on all correspondence. Whether praising or criticizing a work, please send the author(s) a copy of your comments. The publishers of *QST* assume no responsibility for statements made herein by correspondents.

W1ZR

THE DOCTOR IS IN

Q Lance Elliott, KFØHC, asks: I would like to try dual diversity reception for weak signal work. I do have two older transceivers available. Is there a way I can try this out without committing to a fancy new transceiver that supports diversity?

A Absolutely! Diversity reception has been around since before WW2, so it does not require fancy new equipment. The basic idea of HF diversity is that as the ionospheric geometry changes with time, the arrival angle and polarization of incoming signals will change. With a single antenna and receiver, this generally results in the fading that we all have observed. By having two antennas — perhaps one vertical and one horizontal, or at two different heights, or in two locations — the chances are that while one experiences a fade, the other will not. So the first requirement is for two independent antennas and feeds.

The two antennas need to be connected to separate receivers so each can operate independently. The best configuration is to have the two receivers controlled by the same VFO so they tune together. Many early professional receivers were set up to do this, as were amateur receivers that were designed to work in transceiver mode with companion transmitters. I have a pair of '70s vintage Drake R4C receivers that can run that way, for example. But, if you just want to listen to a particular station, you can easily set both receivers to the same frequency.

The early systems also had a jack to provide a sample of the AGC voltage of each receiver that corresponded to received signal strength. These connections would route to a diversity control unit that would switch the loudspeaker — or more likely the teletype decoder — to whichever receiver had the strongest signal at the moment (see Figure 1). Note this only worked well if the operators were just worried about signal strength. In today's amateur environment, it could switch instead to the tuner-upper or an interfering station, defeating the purpose.

In today's amateur diversity systems, most run the two audio channels to two sides of a stereo headset, or to speakers on opposite walls, and let their gray matter deal with selecting the best signal. But note that if one side is always noisier than the other, your overall received signal to noise ratio at the brain interface can be degraded — not the best for weak signal work. Try to set the two gains to similar levels to make the best of it.

Another possibility, especially if you have a single multiband antenna, is to use frequency diversity. This works the same way, but only works with stations transmitting the same programming on two frequencies at the same time. While this is not usually done in the Amateur Radio milieu, it can be a great way to get solid copy on W1AW code practice, or the news from BBC. For data systems, the differences in the path length between the two frequencies can result in loss of code elements as they switch — resulting in errors — so frequency diversity may be best for audio programming.

Some military systems actually had diversity reception systems with up to six receivers — a pair with polarization diversity, two for different elevation angles and two offset geographically. *Something* just had to work!

One issue with the two independent

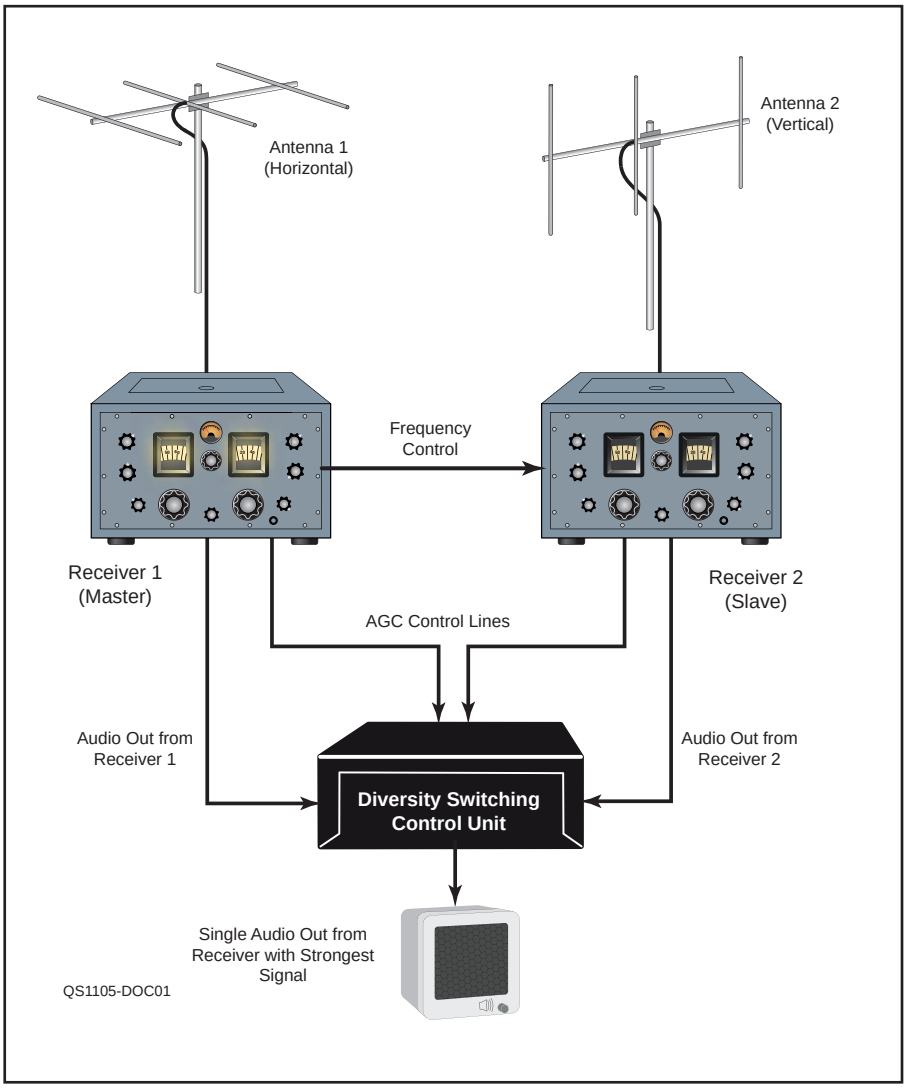


Figure 1 — Classic two channel polarization diversity receiving system. In this example, receiver 1 is setting both receivers to the same frequency. The action of the AGC will be to cause the diversity switching unit to route the audio from the receiver with the strongest signal to the speaker.

Joel R. Hallas, W1ZR ♦ *QST* Technical Editor ♦ jhallas@arrl.org

transceivers, rather than receivers, comes up if you actually want to *transmit*, rather than just listen. The second receiver on the same frequency will hear you quite well! Thus you will somehow need to link the TR switching so that the second receiver is muted while the first transmitter is transmitting. This is not necessarily a big issue, perhaps easily resolved with a relay driven by the first transceiver's amplifier keying line.

Q Jack, KC5DHD, asks: I am having trouble with squirrels gnawing through my antenna support ropes. Do you have any ideas as to how to discourage them other than a .22 caliber rifle and a frying pan? I don't have a taste for game.

A As far as I can tell, there is no accounting for what critters will take a liking to. Smearing your halyards with evil smelling stuff may work for my squirrels, but not yours. In fact with synthetic rope, probably ingesting enough will eventually be self correcting — but probably will take longer than you can wait.

The best solution may be to use something they can't chew through. I'm thinking wire rope. This is available in galvanized or stainless varieties — the latter will be best near salt water, or in areas with high air pollution. Either will require special thimbles and clamps — you can't just tie wire rope. The thimbles and clamps should be the same material as the rope — although I've been disappointed with the galvanized coating on some recent clamps — so perhaps stainless will be better in either case.

The good news is that you won't have to worry much about your halyards breaking again. Also your squirrels may end up with worn down teeth — a plus for the preservation of all the other things they might decide to eat. If you don't like the appearance of wire rope — it is often available in plastic coated versions. If you use a sturdy wire for your antennas, such as the insulated stranded copperweld that I like, another possibility is to use more of the antenna wire as the halyard.

Note that in either case, a wire halyard over a tree crotch will tend to saw through the tree over time if it can move in the wind — so a pulley arrangement may be a good investment.

Q Tom, N8CHR, asks: I live in the hilly section of southeast Ohio. I'm down in a pretty low valley. I have a dipole set up as an inverted V at about 30 feet, as high as I can get it. I have a multiband vertical on the side of a hill with radials for 20 meters. At present I'm listening to a ham in Colorado working into Europe. I hear him fine but I can't hear any of the European stations. What I would like to know is without putting up a high beam, which is not in the cards, what kind of antenna can I use to at least hear some of these stations? As they say if you can't hear them, you can't work 'em. I have plenty of tall trees. Would a long, long wire as high as I can get it be the answer?

A With our current ionospheric conditions, most DX paths are at low angles. Low angle paths will not propagate through or over your hills. That doesn't necessarily mean you can't work some DX. Being in a valley can make it tough, but there are two other factors to consider:

■ Most valleys have two open ends which might provide low angle paths out. They must point somewhere — check the bearings toward the openings and compare with an azimuthal map centered near your home or use a web-generated list of headings such as on **www.njdxa.org/dx-tools/beam-headings.php** (see also "Selecting the Right Antennas for Your Station," this issue).

They may not support Europe, but hopefully some continent, and if you point your antennas that way (usually bidirectional antennas will hit both openings if the valley is straight) you can maximize your possibility for those DX locations.

■ You say you are in a valley, fine, but what counts is how far away the mountain peaks are and how high they are. You can find out from a topographical map at your library or town hall. Noting the elevation of your house, adding the height of your antenna (yes, higher helps for horizontal antennas) determine the elevation angle to just above the peak at each azimuth. Compare those elevation angles to the DX targets, and you can figure how likely you will be able to get there over your obstructions. Angles in the 5 to 10° range should support fairly long haul communication. Again, maximize your chances by having antennas that point in the directions that support communications to interesting places.

Q David, W9WEL, asks: When an analog meter's tolerance is listed as *10% of full scale*, does that actually mean ±10% *of* full scale? In that case, for example, a meter with a 300 unit full scale would have a specified accuracy of the measured value of ±30. Thus a reading of 40 could actually be anywhere from 10 to 70. Or does that mean ±10% *at* full scale? For example at 300 full scale, an actual value of 300 could read 270 or 330 and every other reading on that scale would read ±10%? So an actual value of 40 could read 36 or 44?

A I'm afraid it is the former. This suggests that the scale selected be one with the reading near the top of the range for maximum accuracy. Keep in mind that the actual accuracy could be (and often will be) much better than that specified, just not worse.

Hamspeak

AGC — Automatic gain control. Circuitry, generally in a receiver, that adjusts the receiver gain automatically so that the output remains nearly constant in the presence of input signals of varying level. See J. Hallas, W1ZR, "Getting to Know Your Radio — Receiver Gain Control," *QST*, Jun 2006, pp 59-60 for more information.

Halyard — Originally *haul yard* — name of a line on a square rigged sailing craft that was used to haul up the yards, the horizontal members to which the square sails were attached. Now halyard refers to any line that is used to raise a sail, or most objects — including antennas.

HF — High frequency, the portion of the radio spectrum extending from 3 to 30 MHz, also called *shortwave* and including the 80 through 10 meter amateur bands. HF is above MF (300 kHz to 3 MHz, and includes the 160 meter amateur band) and below VHF (30 MHz to 300 MHz, which includes the 6 and 2 meter and 125 cm amateur bands).

Inverted V — Common name for a center fed dipole antenna in which the center is supported at a higher point than the ends, giving the appearance of an inverted letter V. Such antennas operate in a manner similar to a horizontal dipole at a height about ⅔ as high.

Multiband — An antenna or radio that operates on a multiple amateur bands of frequencies as contrasted to a *monoband* radio or antenna.

Transceiver — Radio transmitter and receiver combined in one unit. In many cases some circuitry is shared between the two functions.

VFO — Variable frequency oscillator. A circuit typically used in radios to generate a signal with an easily changeable frequency. The tuning knob on a radio is typically connected to a VFO.

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. QST

SHORT TAKES

Azio KB333BM Wireless Keyboard

Wireless computer keyboards have been around for years. They're popular because they are extremely convenient – no cords to tangle and lots of ergonomic freedom to sit and type in almost any position you desire. When it comes to Amateur Radio use, wireless keyboards offer another attractive feature: reduced interference to and from transceivers. Most amateurs have a horror story or two about a wired keyboard that suddenly locked up or went virtually insane due to RF pickup. Some wired keyboards can also have a tendency to radiate annoying interference from their connecting cables.

Lately, Bluetooth wireless keyboards have been all the rage. Keyboards using the ubiquitous Bluetooth digital protocol commonly operate between 2.402 and 2.480 GHz. They are relatively immune to RF interference and appear to generate little interference themselves. The only issue for ham applications is the size; a Bluetooth keyboard is usually the same size as a normal keyboard or even larger when you include a touchpad or trackball. That can be a bit unwieldy when you're using the keyboard in a crowded, busy environment such as an emergency operations center, a Field Day site, etc.

The Azio KB333BM keyboard offers an interesting alternative. It is a Bluetooth keyboard, but in a small, thin package. The KB333BM is only 13 inches long, 5 inches wide and less than an inch thick at its widest point. It weighs slightly more than a pound with batteries installed.

Not Just for Macs

The Azio package carries a label declaring that the keyboard is specifically for use with Macintosh computers. The instruction booklet states the same. This is certainly true, but the KB333M's usefulness extends much further. The KB333BM can also be used with Apple iPads, iPod Touches (if *iOS4* is installed) and...*Windows* computers.

My first experience with the KB333M was with my primary station computer, which runs the *Windows 7* operating system. All I had to do was plug in an inexpensive Bluetooth USB adapter (less than $15 on eBay). Once the adapter was installed, I instructed *Windows* to begin searching for devices and then pressed the recessed CONNECT button on the underside of the keyboard. *Windows* picked up the KB333BM in short order and asked me to type in a code to "pair" the keyboard to the computer (Figure 1).

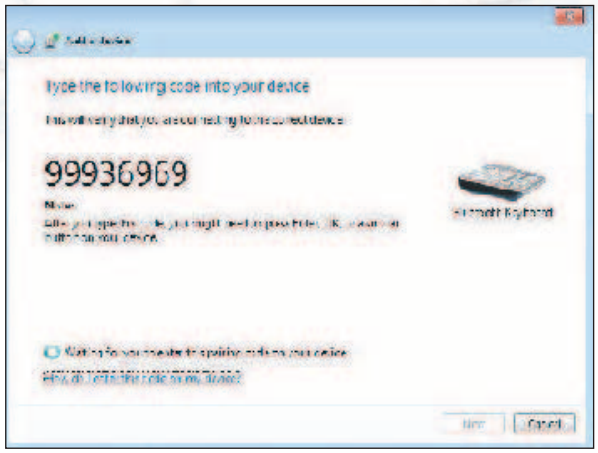


Figure 1 — Pairing the Azio keyboard to a *Windows 7* computer using a USB Bluetooth adapter.

Figure 2 — The Azio keyboard worked nicely with my iPad and my *Multimode* app to work PSK31 and RTTY.

After the units were connected, it was smooth sailing. In fact, this review was typed using the KB333BM keyboard.

Applications

The Azio keyboard is definitely small enough to toss into an Emcomm go-kit. The case is fairly rugged as well. The KB333BM is powered by two AAA batteries. Peak power consumption is only 6 mA, so you can expect to use it for quite a while on a fresh set of batteries. When you are not using the keyboard, it enters its "sleep" mode where it draws only 500 µA. An LED indicator on the top of the keyboard warns when battery power is waning.

This keyboard also has potential for portable digital operating. I paired the KB333BM with my iPad and used IW2NDH's new *Multimode* app (available in the iTunes store) to work low power PSK31 and RTTY. The keyboard worked flawlessly (Figure 2).

And, yes, I tried it with my primary station as well. Even when running 100 W to my antenna, which is somewhat close to my operating position, there were no problems whatsoever. That's in contrast to my wired keyboard, which carries a Type 43 ferrite core on its cable to keep RF from rendering it useless.

The only downside to the KB333BM is the fact that it lacks a mouse. You'll have to keep a mouse nearby, perhaps a wireless one, or if you are using an iPod or iPad you'll still need to tap the screen occasionally to toggle certain functions such as highlighting text, saving a file and so on. But that inconvenience seems a small price to pay for such a lightweight wireless keyboard.

Distributor: Azio USA, 19977 Harrison Ave, City of Industry, CA 91789; tel 909-468-1198; **www.aziocorp.com**. *Suggested list price $49.95. Available from retailers such as Amazon* (**www.amazon.com**) *and Newegg* (**www.newegg.com**). QST

Steve Ford, WB8IMY ♦ *QST* Editor ♦ sford@arrl.org

W1ZR

GETTING ON THE AIR

A Folded Skeleton Sleeve Dipole for 40 and 20 Meters

This design features a matched coax fed antenna with performance similar to a full size dipole on two bands, 40 and 20 meters. The mechanical and electrical design is such that it can be fabricated from a single piece of nominal 450 Ω window line. It offers a wider bandwidth and improved performance on the higher band, compared to the more commonly encountered parallel-fed dipoles made of window line.

The Design Concept

There have been many approaches to multiband operation — traps, parallel dipoles and others. This antenna is somewhat different in two regards:

- It uses the parasitic *skeleton sleeve* coupling from a single driven 40 meter dipole to a single higher frequency element to provide the second band — rather than the more common parallel connection.
- The ends of the lower frequency dipole are bent back to almost reach the higher frequency one. This results in an antenna about 10 feet shorter than the usual 40 meter dipole. This is independent of the sleeve coupling method.

The first change eliminates the narrow bandwidth usually encountered in closely spaced parallel wired dipoles. The close spacing employed allows the whole antenna to be constructed from a single piece of nominal 450 Ω window line. Additional structural integrity is provided because the 20 meter section is continuous across the center feed point, as shown in Figure 1.

Construction

Any of the usual antenna construction techniques can be used. To provide strength at the ends and the connection point, I suggest the use of standard antenna insulators or other mechanically sturdy fixtures. For my prototype, as shown in the lead photo, I just tied the halyards through "windows" near the ends and it has held up so far — but for long term use, I'd do something better. The connection of the coax to the driven dipole should be reinforced so that the hanging coax is not supported by the connections. The open end of the coax must be sealed so that water can not penetrate into the cable structure.

While good practice and to insure accurate SWR readings, but not essential in some installations, I formed a common mode choke by temporarily wrapping eight turns of the coax feed line through an FT-240-43 ferrite toroid. A better approach, particularly if foam coax is used, would be to use five 43 mix ferrite beads, with inner diameter selected to fit snugly on your coax just below the feed point.

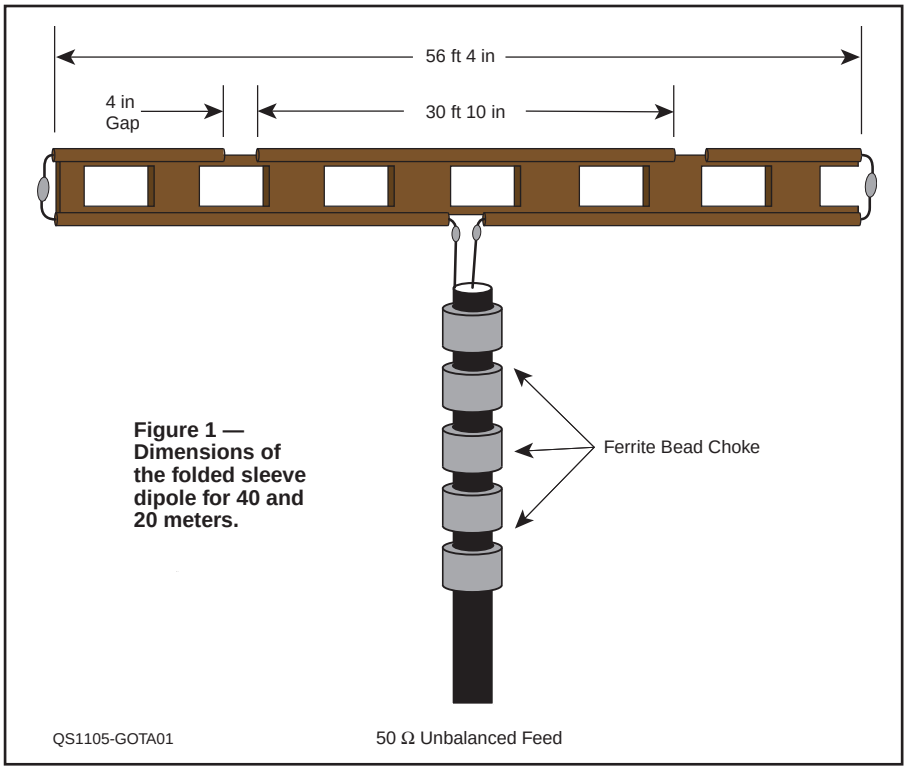


Figure 1 — Dimensions of the folded sleeve dipole for 40 and 20 meters.

Joel R. Hallas, W1ZR ♦ *QST* Technical Editor ♦ jhallas@arrl.org

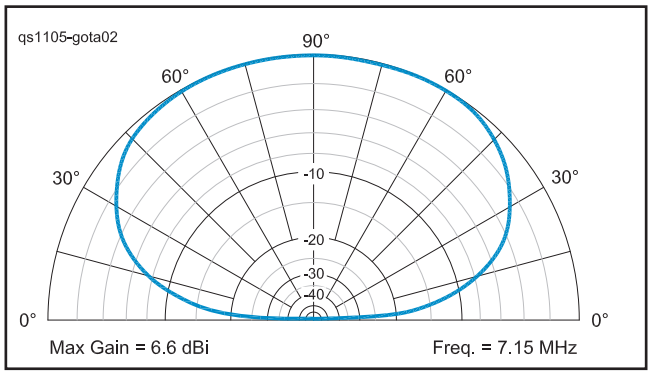


Figure 2 — *EZNEC* predicted elevation pattern of two-band dipole on 40 meters at a height of 30 feet.

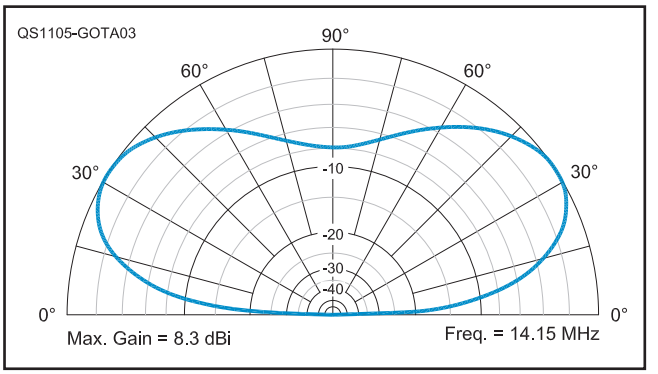


Figure 3 — *EZNEC* predicted elevation pattern of two-band dipole on 20 meters at a height of 30 feet.

They could be secured with shrink tubing or PVC pipe, if desired. A *QST* author described the use of five Palomar FB 56-43 beads over RG-58C coax. His measured results should prove satisfactory here.[1,2]

This design should be adaptable to any of the various parallel window lines. The line I used was marked "JSC WIRE & CABLE #1317 18 AWG 19 STRAND MADE IN USA."[3] The conductors were stranded copper plated steel — a good choice for both flexibility and strength. If a different type of cable is selected, I would expect that differences in wire dimensions and dielectric properties would necessitate some changes in the lengths shown in order to achieve resonance on each band.

One assembly caution should be noted. It is critical that the coax feed line be connected to the longer 40 meter wire. There is a mode in which it can be made to work the other way, feeding the shorter dipole instead. The dimensions will be different, however, and the system will not match 50 Ω.

I performed some sensitivity analysis using *EZNEC*, in case your antenna needs trimming to make it resonant within the band or desired segment. The good news is that unlike the case with close spaced parallel dipoles, there is almost no interaction between the bands. Changing the overall length of the antenna by 1 inch moves the 40 meter resonance about 130 kHz — keep in mind that, because it is folded on 40, it changes more rapidly than might be expected. The same adjustment in overall length makes a change to the 20 meter resonance by only about 10 kHz. Changing the length of the 20 meter dipole by 1 inch (by making a change to the inner edge of the 4 inch gap) results in a change of about 50 kHz with virtually no change to the 40 meter resonance — so start with the 40 meter adjustment, if needed. As expected, making either portion shorter results in a higher resonant frequency.

Performance

This antenna provides gain and directivity comparable to a full size dipole on both 40 and 20 meters. See Figures 2 and 3 for the *EZNEC* elevation patterns.[4] Note that on 20 meters, *EZNEC* predicts about a 1.5 dB gain over a half-wave dipole, as a result of narrowing the main beams by 4-5°. This is likely the effect of radiation from each side of the 40 meter antenna acting as 20 meter half waves in phase — a small bonus at no extra cost.

At its design height of 30 feet, the SWR across both bands is 2:1 or less to 50 Ω coax as shown in Figures 4 and 5. There is a small variation in resonance predicted at heights from 20 through 50 feet. At the end of 100 feet of RG-8X coax, however, it is still within a 2:1 SWR across both bands at any height within the range.

[1]L. Burke, W7JI, "An Easy to Build 500 W Mini Balun," *QST*, Mar 2009, p 74.
[2]Available from Palomar Engineers, PO Box 462222, Escondido, CA 92046, tel 760-747-3343, part number FB 56-43.
[3]Mine came from Davis RF, their part number LL450-553. See **www.davisrf.com/ladder.php**.
[4]Several versions of *EZNEC* antenna modeling software are available from developer Roy Lewallen, W7EL, at **www.eznec.com**.

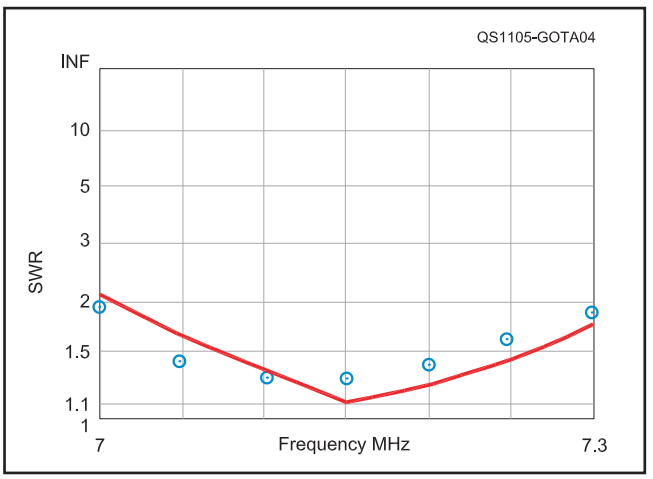


Figure 4 — *EZNEC* predicted SWR sweep of the two-band dipole on 40 meters. The Os indicate measured SWR at the end of 45 feet of RG-8X with a height of 25 feet.

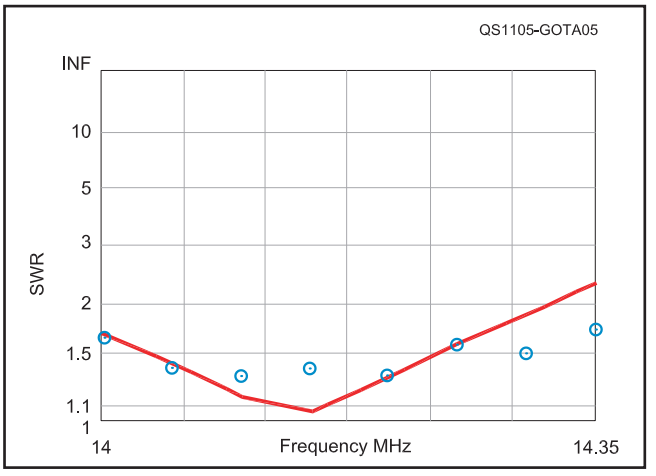


Figure 5 — *EZNEC* predicted SWR sweep of the two-band dipole on 20 meters. The Os indicate measured SWR at the end of 45 feet of RG-8X with a height of 25 feet.

Figure 6 — ARRL Test Engineer Bob Allison, WB1GCM, measuring twice and cutting once to make his own folded skeleton sleeve.

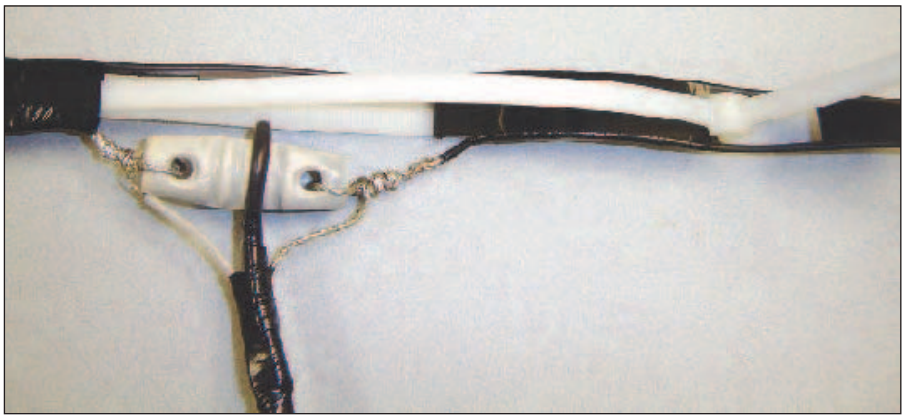


Figure 7 — Center insulator and common mode choke as built by ARRL Test Engineer Bob Allison, WB1GCM. Bob wrapped the RG-58 coax around the center insulator and taped it to provide strain relief and seal the end. The tape also holds the fertrite beads prior to application of heat shrink tubing.

On the Air

I used the antenna to make multiple contacts on each band with good results compared to my other antennas. With the antenna just below my second story roofline, I was surprised to find that my first contact on 20 meters in a late afternoon was from Connecticut to Australia with 100 W on 20 meter CW. The station was stronger on this dipole than on a one element rotary about 10 feet higher, in the clear and pointed at VK. On 40 meters, stations were just a bit lower in level than on my 100 foot center fed dipole fed with window line. This was expected since my 100 foot dipole is about twice as high, and it also provides some gain over a full size half wave dipole on 40.

ARRL Test Engineer Bob Allison, WB1GCM, tried the antenna from his house, just to keep me honest. He found that it was more effective on 40 than his inverted L, with much less noise pickup. It was also quieter on 20 meters, with similar signal levels from most directions compared to his ground plane at the same height. His first contact on 20 meter SSB was with Perth, Australia — not sure if VK contacts can be guaranteed, but it certainly seems to work well! Bob has made one of his own. See Figures 6 and 7.

Other Sleeve Dipole Possibilities

I have not made the antenna for any other bands, but I have tried some other band combinations successfully on *EZNEC*. There is nothing magic about the 2:1 frequency relationship. For example, a model for 20 and 17 meters seems to work fine, although the extra bit of gain on the higher band is not predicted for this case.

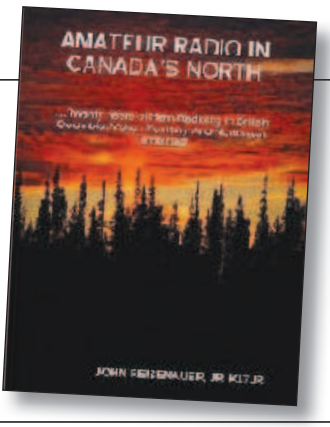
The folding of the lower band dipole is not fundamental to the design, and it will provide just a bit better performance on the lower band if it is unfolded and made full size. My objective was to have a *compact* two band antenna, hence the folded design, although it also makes nice use of the length of window line and avoids a pair of mid span connections.

If the full size dipole is used for 40 meters, it opens the possibility to also use it on 15 meters. Unfortunately, as with any 40 meter dipole, a single length doesn't provide a good match across both bands. If it is trimmed for ½ wavelength resonance at the top of 15 meters, it will also provide a reasonable match at the low end of 40. The SWR will be in the 3:1 range over a portion of both bands, so losses won't be very high with low loss coax. Both bands should be usable with most 3:1 range internal antenna tuners. QST

New Book

AMATEUR RADIO IN CANADA'S NORTH

◊*Amateur Radio in Canada's North* by *QST* author John Reisenauer Jr, KL7JR, chronicles 20 years of Amateur Radio adventuring in Canada's British Columbia, Yukon and Northwest Territories. *QST* readers have enjoyed occasional articles about KL7JR's exploits, and this book offers more detail about contesting, antenna homebrewing, mobile and portable operating including special event operations under the Northern Lights with all the challenges of Mother Nature in VE7, VY1 and VE8 (with some KL7 for spice)! Price: $10.75. Available from **www.lulu.com/product/paperback/amateur-radio-in-canadas-north/15055805**.



NØAX

HANDS-ON RADIO

Experiment 100
A Hands-On Hundred

"Why don't we try it for a few months and see how it works out?" reads the fall of 2002 e-mail from then ARRL Chief Operating Officer Mark Wilson, K1RO (now my partner in editing various ARRL publications). Armed with verified bits and pieces of my lab teaching experiences for Seattle University's Electrical and Computer Engineering Department, the first two page column featuring the common emitter amplifier was created and launched. I guess it's worked out okay since we have now reached Experiment 100, 8⅓ years along the Hands-On Trail. The response has been wonderful and I've enjoyed the challenge of coming up with a new topic each month — the to-do list seems far from empty, so I suppose I'll keep at it!

The Hundred

Naturally, this being the 100th column in the series, it should feature something to do with the century mark. After some consideration of what to write about, I came up with the idea of featuring the number 100 in a variety of different experiments gleaned from the history of Hands-On Radio. (All Hands-On Radio experiments are available to ARRL members from the Hands-On Radio website — **www.arrl.org/hands-on-radio**.) How many different ideas can be worked into a single column? Well, probably not 100.

One Hundred

Experiment 56 on Design Sensitivities explains the difference between the various types of values encountered while working with circuits — nominal, actual, typical and so forth. The experiment also covers tolerance — the allowed variation of a component's actual value around some nominal value. An awareness of tolerance in component value should also extend to tolerance in instrument readings. To demonstrate both, here's an experiment that illustrates both and is designed for a club or team.

Start by purchasing a batch of 100 resistors, all 100 Ω, ¼ W, 5% tolerance. They can be any type, but carbon film resistors are a good choice since they are inexpensive and they have leads that are easy to handle. Recruit 10 members to each bring a digital multimeter and 10 or more 100 Ω resistors of any type from their stock at home. Divide the batch of 100 resistors into 10 smaller batches of 10. Download the spreadsheet named "Tolerance Worksheet" from the Hands-On Radio website for this experiment. (It's an *Open Office* document that can be read by many different spreadsheet programs.)

Give each batch to a person with a multimeter and have them measure the value of each resistor and enter it into the spreadsheet's red box for individual resistor values (cells A10 through A20 — delete the sample values before beginning). You'll see the top chart, "Distribution of Values," create a *histogram* (also known as a *frequency distribution* chart) showing how the resistor values are distributed. An average value will be calculated in cell A8. With all 10 values entered, the average value should be close to 100 Ω and none of the resistors should have a value below 95 Ω (100 Ω × 95%) or above 105 Ω (100 Ω × 105%). Take a minute to look at the distribution of the resistor values — they should be centered on and closely packed around 100 Ω. Record the average value in the AVERAGE VALUES box (cells N10 through N20).

Now transfer the individual and average values into one of the BATCH boxes below the charts. You'll reuse those values later. Repeat the process of entering individual resistor values from each remaining batch into cells A10 to A20 in turn, entering the batch's average value in the AVERAGE VALUES box. Once all 10 batches are done, transfer all individual batch values back into column A, cells A10 through A110. Again, the top chart will show the distribution of all resistors but with a much higher set of samples. You'll see a classic bell curve centered near 100 Ω (see Figure 1).

What about the instrument tolerance? It's instructive to observe how much variation exists between meters. Save the spreadsheet under a different name for later reference and delete the values you entered. Now take one single batch of 10 resistors and measure it with all 10 meters, recording the numbers and averages as before. Look for variations from meter to meter. What was the maximum and minimum average value? Did the distributions look the same for each meter?

Your first set of measurements were taken on one batch of resistors that were probably made by the same machine within a few seconds of each other. In addition, they had been stored under identical conditions until you took them out of their package — that's the farthest they'd been from each other in their whole lives! As a result, they are closely matched with a minimum amount of manufacturing variation. Let's try a different scenario.

Save the spreadsheet under a different name for later reference and delete the values again. Now take the set of resistors each member brought and repeat the first part of

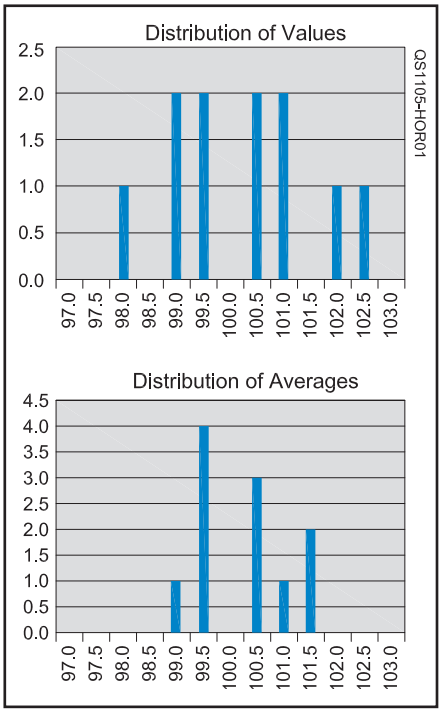


Figure 1 — A typical distribution of 5% resistor values from a batch of 10. By measuring more resistors, a better picture of component variation is obtained. The average value from different batches also varies in roughly the same way. If different measuring instruments are used, the values will also include variations in instrument accuracy.

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this experiment, comparing the resulting distributions to those of the siblings in the one big batch — you'll see a lot more variation!

Now that you've had a chance to observe variation between resistors and between measuring instruments, consider what the circuit designer must contend with. All of the components vary about some nominal value, yet the circuit has to meet its performance specifications every time. Even the instruments used to determine performance vary! The individual homebrewer has it easy — only the one copy of the circuit has to work!

Two Hundred

The venerable 555 timer IC is now in use in a fifth decade, having been invented in 1970 and sold by Signetics beginning in 1971. Happy 40th birthday! There are now hundreds of variants and it still occupies a useful niche in many areas of electronics. The 555 can be configured to operate in monostable (one shot or single pulse) and astable (free running oscillator) modes with pulse widths and frequencies controlled by the ratio of a capacitor and one or two resistors.

Review Experiment 5 and design circuits that use the same capacitor value — the first being a monostable circuit that outputs a 100 µs pulse and the second an astable circuit with a frequency of 100 Hz. Use the astable circuit to trigger the monostable circuit for a double 100! (Hint — in the original experiment, replace T with the appropriate values for time in Equation 1 and solve for C in terms of R. Pick a value of C, solve for R, and that's the sum of $R_1 + R_2$ in Equation 3.)

Three Hundred

The three terminal voltage regulator is so versatile that it can even be used to regulate current as explained in Experiment 19 on current sources. The regulator will do its best to maintain a constant voltage between its output and reference pin. You, the clever circuit designer, can use Ohm's law to change that constant voltage into a constant current as shown in Figure 2. Scramble around in your junk box and find a three terminal positive regulator and design a current source that supplies 100 mA. Be sure that the current setting resistor, R, is adequately rated for power dissipation, which is V_{REG}^2/R. Use a 100 Ω load and verify that the current source works by measuring the current directly with your meter or by measuring voltage and using Ohm's law.

Four Hundred

Experiment 33 featured the transformer — a simple but amazing component with many useful properties. Let's exercise our transformer know-how:

1) What turns ratio is required for an impedance transformation of 100? (10:1)

2) If the turns ratio is 10:1 (primary to secondary) and a 100 Ω load is connected to the secondary, what is the impedance seen at the primary winding terminals? (10,000 Ω = 100 Ω × 10^2)

3) If the primary winding has 100 V across it and 100 mA through it and the secondary winding has 10 V across it, if delivering the power, what is the current in the secondary winding? (100 V × 100 mA = 10 V × I_S; I_S = 100 × 0.1 / 10 = 1 A) What is the turns ratio? (100 V / 10 V = 10:1)

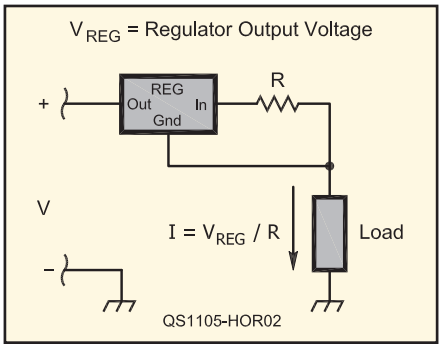


Figure 2 — The three-terminal regulator can be configured to regulate current by placing a current-set resistor between its output and reference terminals. The resulting current through the load is then the regulator's design voltage, V_{REG}, divided by the current set resistor, R.

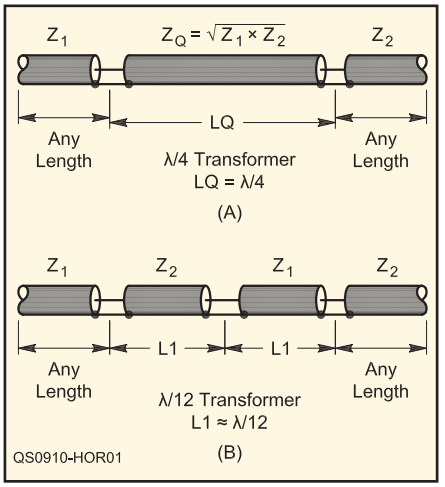


Figure 3 — The ¼ wave and 1/12 wave synchronous transformers. A series of carefully phased reflections create an impedance match. The ¼ wave version or Q section is often used to match the impedance of a loop antenna to 50 Ω coaxial cable.

Five Hundred

What else is there with a value of 100? Hmm…sounds like a transmission line's characteristic impedance and didn't we talk about that in Experiment 81 on Synchronous Transformers? A quarter wavelength of transmission line — or a *Q section* — transforms a load impedance at one end, Z_2, to an impedance Z_1 at the other by *inverting* Z_2 about the Q section's characteristic impedance, Z_Q. That is,

$$\frac{Z_2}{Z_Q} = \frac{Z_Q}{Z_1} \text{ or } Z_Q = \sqrt{Z_1 Z_2}$$

Putting that equation to work, if I have a loop antenna with a feed-point impedance of 100 Ω, what should the characteristic impedance of my Q section be to create a match to 50 Ω feed line?

$$Z_Q = \sqrt{Z_1 Z_2} = \sqrt{100 \times 50} = 70.7\ \Omega$$

Similarly, if I had a Q section with Z_Q = 100 Ω and connected a 150 Ω load to one end of it, what impedance would I see at the input?

$$Z_1 = \frac{Z_Q^2}{Z_2} = \frac{100^2}{150} = 66.7\ \Omega$$

See Figure 3.

The Next Hundred

Next month launches Column 101. While I can't say for sure that there will be a complete second century, we made it this far, didn't we? See you next month — keep your workbenches busy and your reading list full! QST

Strays

TRUMAN PRESIDENTIAL LIBRARY HAS HAM RECEIVER

◊John Caulfield, KØFUZ, an ARRL Life Member from Leawood, Kansas, recently visited the Harry S. Truman Library and Museum in Independence, Missouri (right), which features an exact replica of the Oval Office as it appeared in 1950. "I couldn't help but see the vintage Hallicrafters receiver behind his desk," he writes. "I wonder how he operated it. Setting on the floor? It did not seem to be too ergonomically friendly."

JOHN CAULFIELD, KØFUZ

President Truman's 1950 Oval Office, replicated at his Library and Museum in Independence, Missouri, features an SX-28A Hallicrafters receiver.

Multimode for the iPad, iPhone and iPod Touch

If you're the proud owner of an Apple iPad, iPhone or iPod Touch, you probably know that there are a number of Amateur Radio *apps* (applications) for these devices. When you shop through the apps in the iTunes store, it seems as though more appear every month.

Luca Facchinetti, IW2NDH, was among the first hams to harness the processing power of the iPod Touch and iPhone to send and receive HF digital transmissions. His *I-PSK31* app remains popular today and was recently updated to include a waterfall display. With his new *Multimode* app, Luca offers the ability to send and receive not only BPSK, but also QPSK and RTTY. Even though *Multimode* wasn't developed with the iPad in mind, it also functions well on this device when enlarged to take advantage of the iPad's display.

Getting Signals To and From

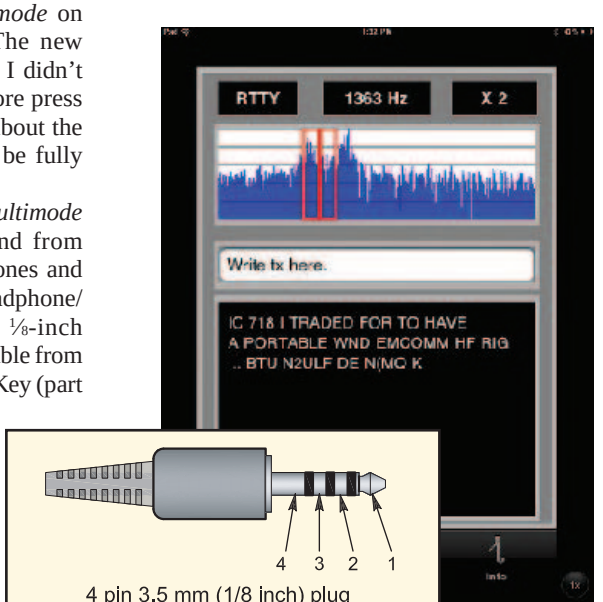
For this review I tested *Multimode* on both an iPod Touch and iPad. The new iPad 2 had just been released, but I didn't have an opportunity to try one before press time. Based on what I've learned about the iPad 2, I think *Multimode* should be fully compatible.

The trick to using an app like *Multimode* is routing the audio signals to and from the transceiver. iPod Touches, iPhones and iPads all feature a combination headphone/microphone jack that requires a ⅛-inch 4-conductor plug. This plug is available from a number of sources including DigiKey (part number CP-354S-ND). The wiring diagram for the plug is shown in Figure 1. Apple uses an odd configuration where the top portion of the plug sleeve — the part that is commonly ground — is actually the *audio input* connection.

Once you have the cable/plug assembly taken care of, you need an interface to handle transmit/receive switching. The Digital VOX Sound Card Interface by Skip Teller, KH6TY, described in the March 2011 *QST* (page 34) is ideal. Since it initiates the transmit/receive switching function when it "hears" audio from the device, you don't need to worry about supplying a separate switching signal, or dc power for that matter. Kits are available at **sites.google.com/site/kh6tyinterface/**.

One word of caution: These Apple devices are designed to sense when an external microphone has been plugged in and they automatically reconfigure the audio signal pathways accordingly. Depending on the interface you've chosen, its audio output circuitry may not be recognized as a "microphone," which means that the iPhone, iPod or iPad will not make the connection when you start *Multimode*. I ran into this issue with the KH6TY interface and the solution was to add a 2.2 kΩ resistor in series with the audio input line of the iPod Touch/iPad connector cable. That created a high enough impedance to "trick" the device into behaving as though a microphone had been connected.

If you are the owner of an iPad, you can take an entirely different approach. The Apple Camera Connection Kit (available for less than $20 on eBay and elsewhere) will allow you to use an external USB sound device such as the Griffin Technology iMic (**www.griffintechnology.com/products/imic**). I tried both approaches and the input and output signal quality seemed comparable.



Pin Number	Pin Name	Description
1	Tip	Left Audio Out
2	Ring	Right Audio Out
3	Ring	Common/Ground
4	Sleeve	Audio In

QS1008-Edec01

Figure 1 — Pin assignments for the Apple iPhone, iPod Touch and iPad headphone plug.

On the Air

Before you start *Multimode*, connect your interface cable or USB audio device. I discovered through trial and error that audio re-routing must be established before you fire up the application.

I used *Multimode* to make some contacts during a RTTY contest and it performed quite well. Contrary to the common technique of operating your SSB transceiver in LSB for AFSK RTTY, with *Multimode* you must operate in *USB*. *Multimode* inverts both the input and output signals so despite the unusual flip-flop, everything works normally.

To tune in a RTTY signal, you press and slide the tuning bar until the left hand portion is positioned over the lower of the two signals (the Space signal). Decoded text appears in the window below. If you tap twice on the spectrum display, the main window peels back to reveal a number of macro buttons, which are handy for contests and DX pileups.

Tuning PSK31 signals is a more delicate operation. I found that it helped if I zoomed the spectrum display before sliding the center of the tuning bar over my signal of choice. Once I was on target, *Multimode* decoded the signal well, even under somewhat noisy conditions.

Portable operating was a delight with *Multimode* — just a Yaesu FT-817ND QRP transceiver, the KH6TY interface and my iPad. Yes, typing on the iPad's on-screen keyboard can be a pain, but I soon became proficient. Later I used an Azio Bluetooth wireless keyboard. You'll find its Short Take review elsewhere in this issue.

Luca has a winner in *Multimode* and for $4.99 it is hard to beat. It is certainly preferable to lugging a laptop around the house, or into the field. Just go to the iTunes online store and enter "multimode" in the search window. QST

Steve Ford, WB8IMY ♦ *QST* Editor ♦ sford@arrl.org

AG1YK

HINTS & KINKS

LED MOUNT INSERTION TOOL

♢Mounting clips with press on retaining rings are convenient for mounting LEDs to a faceplate (see Figure 1), but getting the retaining ring on is not always easy. This is particularly true when there is limited access. The most common technique is to use two nut drivers, one from each side. This works well if space is available, but cannot be used with LEDs having attached leads. Another technique is to use needle-nose pliers. Because the pliers do not exert uniform pressure around the retaining ring, the typical result is scratches to the faceplate, a torn retaining clip finger or an occasional gouge to the clip face. Also, pliers are not usable for panels having lips.

I made a simple tool from two aluminum blocks that works on faceplates with or without lips, where there is limited access and with LEDs having attached leads. The tool is made from two blocks of 1⅛ inch long pieces of ½ × ¼ inch bar stock. The overall size is not critical. There are two pieces, a clip block and a ring block. The clip block is made by drilling a single hole with a number 7 drill bit. Make this hole centered, about a half inch from one edge.

The retaining ring block is made in three steps:

1. Use a 25/64 inch pilot point drill bit to make a flat bottomed recess slightly larger than the outer diameter of the ring approximately 12/64 inch deep (not critical). Make this hole centered, near one edge of the block, positioned to mate with the hole in the clip block.

2. Using a 9/32 inch bit, drill a through hole centered in the recess hole. This will leave a small lip to support the retaining ring.

3. Finally, saw and file smooth a slot between the hole and the narrow edge as a pass-through for any wire leads.

The operation is simple and quick. The retaining clip is inserted into the faceplate hole with the chamfered inner edge facing the panel. The faceplate hole should be deburred but not chamfered.

Place the retaining ring, chamfered inner edge facing outward, on the LED and insert the LED into the clip. The clip block is placed against the front of the retaining clip. If the LED has leads that are soldered at each end, the wires are passed through the slot in the tool before the ring. Slide the tool along the wires until the ring is seated in the tool. Now, with both tool blocks in place gently squeeze the blocks together (see Figure 2). A snap is heard and the job is done.

I can now mount an LED almost effortlessly in almost any panel (see Figure 3). — *73, John M. Franke, WA4WDL, 4500 Ibis Ct, Portsmouth, VA 23703,* **jmfranke@cox.net**

JOHN M. FRANKE, WA4WDL

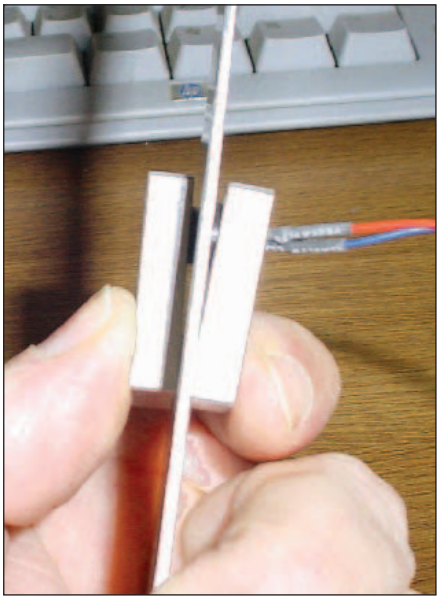


Figure 2 — Press-on mounts make make it easy to install LEDs in a faceplate.

FASTENING FACTS

♢I've worked in many industries over the years and a common problem I have encountered is the overtightening of fasteners and misuse of tools. This is true in the application of Dzus fasteners and shoulder screws used to secure electrical panels as well as stainless steel hose clamps.[1] Observing the difficulties with stripped fasteners the astronauts had to contend with when repairing the Hubble Space Telescope proves this out. Some assume "tight is good," not realizing that the fastener will fail, especially when tightened with a wrench, ratchet or ill-fitting screwdriver.

The popularity of the new 43 foot telescoping vertical antennas depends, in part, upon hose clamps, which simplify the raising

[1]Quarter-turn fasteners used to secure equipment panels that allow the panels to be opened and closed quickly. — *Ed.*

JOHN M. FRANKE, WA4WDL

Figure 1 — This tool makes it easy to snap an LED clip and retaining ring together even when the LED is located in a hard-to-reach location. Just position the two halves of the tool on either side of the LED retainer and press.

JOHN M. FRANKE, WA4WDL

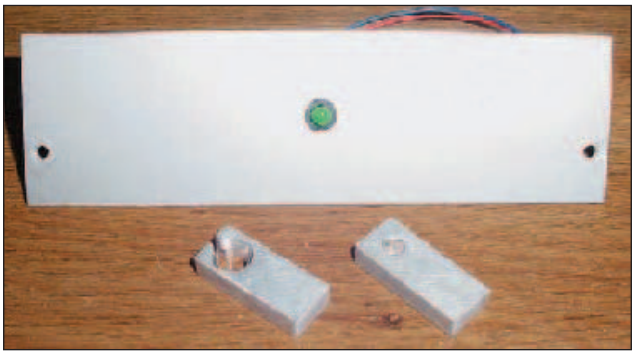


Figure 3 — Using this tool makes for a simple installation that avoids damage to your equipment's faceplate.

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

and lowering of the antenna. Hose clamps were designed to secure a rubber hose over a metal tube fitting. The clamp is properly tightened when the hose begins to bulge up through the helical cuts in the clamp. This doesn't happen with aluminum tubing. If you use a wrench, the correct torque is finger pressure. A slug that fits the slot will never allow you to overtorque and strip the helical screw. You can file a slug for a snug fit in the screw slot and secure it with a drop of superglue to use as a knob.

Size Matters

Hose clamps come in more than a dozen sizes and there is a reason for that. The anvil that contains the helical screw drive is bent for a specific diameter range. Many hams purchase larger clamps assuming they can cut off the excess band, but the anvil is too flat for the application and tightening to force it to conform stresses the housing and strips the drive screw. If you purchase clamps from a hardware or automotive store be aware of the design diameter range of the clamp and that the screw is the same color as the band (yellow means the screw is rustable steel).

It has been suggested that you use an electrical antioxidant joint compound between the antenna's sections. These compounds are made to connect soft aluminum and copper wire; that is, either aluminum to aluminum or aluminum to copper. They contain an abrasive to break oxides and an oil-based shield that can be messy. T6063 aluminum tubing is much harder and does not require it.

Another method to prevent oxidizing is to clean surfaces with a Scotch-Brite pad or fine wire brush, spray on WD-40 or CRC lubricant, wipe off any excess, then respray surfaces and reassemble. Also spray the screw drive to prevent metal to metal galling. This will make it easier to collapse the antenna.

Clean is good. I have used this process on automotive battery connections and high-current, cast iron, third rail railroad shoes wiping off the excess before assembly. Never use a lubricant that contains Teflon as it is an insulator. You could use an antiseize paste, *but* it must be compatible with the metal and if it drifts it could make a disastrous conduction path. Any slight oil traces will be forced away under pressure and have no effect on the connection, except to occupy surfaces that do not mate, which would attract oxidation. It is good practice to wipe off any excess. — *73, Peter Murricane, WB2SGT, 200 E 63rd St, New York, NY 10065,* **wb2sgt@arrl.net**

VELCRO CABLE HOLDER

♢I made this storage device for adapters and cables because I could never find what I needed in a timely manner and everything was always getting tangled up. So, in the interest of speed and organization I came up with this idea (see Figure 4).

JEANETTE DUNN, KI6AJJ

Figure 4 — A simple solution for storing your cables, wall warts and sundry small accessories.

JEANETTE DUNN, KI6AJJ

Figure 5 — A completed set of flaps all ready to hold whatever needs holding. Note the short piece of string glued to the "open" end to make it easy to open the flap.

JEANETTE DUNN, KI6AJJ

Figure 6 — Each of the short Velcro hook strips is glued to the long loop strip at one end creating a flap that can be closed over whatever small accessory you want to keep available but out of the way.

Take two pieces of sew-on Velcro and secure the loop strip to a piece of 1 × 12 × 24 inch pine with RTV. Then take the Velcro hook strips and cut them into 1½ inch long pieces. With a toothpick, place a little bit of the Aleene's Super Fabric Textile Adhesive on the upper left corner and attach a small piece of string. Then put some glue on the upper right corner of each hook strip, place it on the loop strip and let it dry. This creates a flap (see Figures 5 and 6).

Now just place the cable inside the flap, fold it over and press. — *73, Jeanette Dunn, KI6AJJ, 3380 Malibu Dr, Santa Cruz, CA 95062,* **cell_safe@yahoo.com**

SO-239 CENTER PIN PROBLEMS

♢I experienced intermittent connections with the SO-239 jacks on several pieces of equipment. I traced the problem to the center contact, which had rotated and damaged an inside connection when the PL-259 was inserted. The center contact is supposed to be fixed to prevent rotation but in some inexpensive connectors it apparently isn't.

Although the PL-259 has little antirotation pips on the shell, you always have to rotate the plug to line them up with the detents before screwing the shell on. If the center contact is not pinned, this rotation will put stress on the interior connection. Some of the imported connectors only have 4 detents, making it worse, and I have found they may be more easily damaged by soldering heat. My solutions in both cases were to first repair and align the center contact and then fix it in place with a drop of epoxy. — *73, Don Dorward, VA3DDN, 1363 Brands Ct, Pickering, ON, L1V 2T2, Canada,* **va3ddn@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 **h&k@arrl.org**. Please include your name, call sign, complete mailing address, daytime telephone number and e-mail address on all correspondence. Whether praising or criticizing an item, please send the author(s) a copy of your comments. QST

3B8EME — Moonbounce from the Indian Ocean

A very successful EME DXpedition to Mauritius generates a new world record contact rate.

Eltje Veen, PA3CEE; Johan Meezen, PE9DX, and René Hasper, PE1L

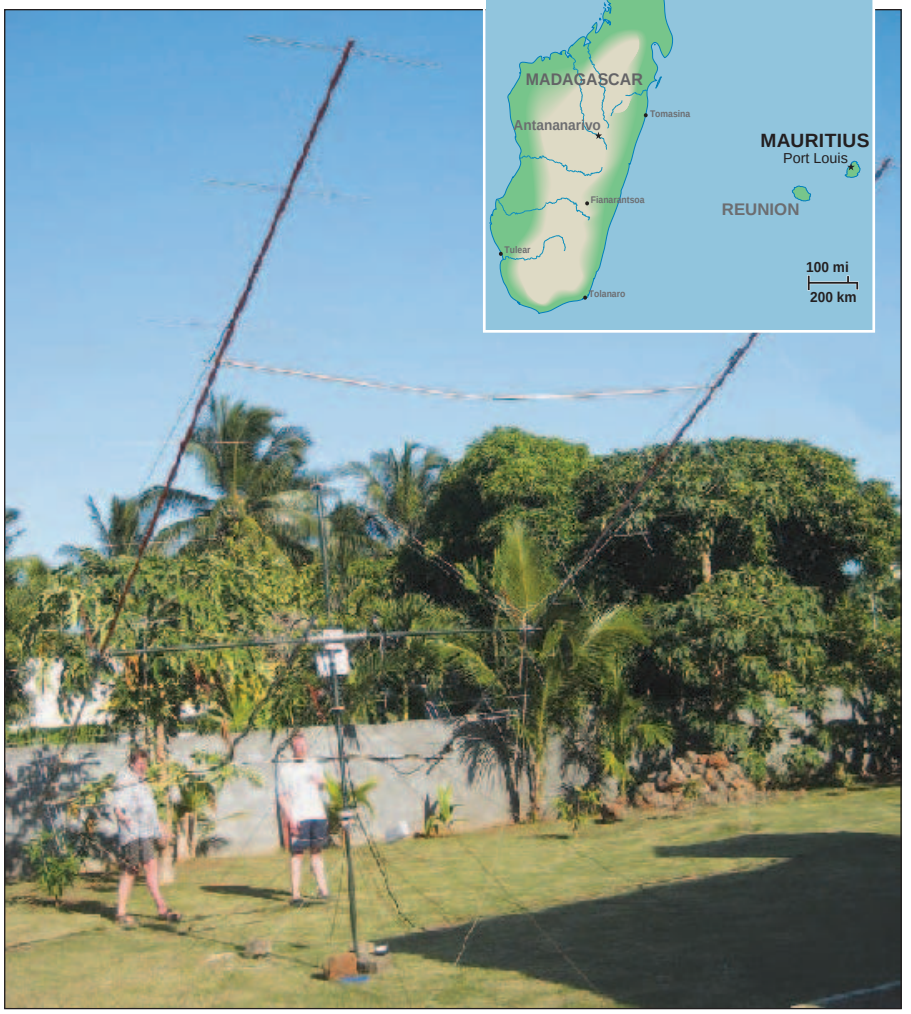
The story begins in May 2010 when René, PE1L; Eltje, PA3CEE, and Johan, PE9DX, headed to Mauritius to activate this entity on 144 and 432 MHz from grid square LG89qt. There had been some Earth-Moon-Earth (EME) activity previously in 1999 when 19 different stations were worked using CW.

A lot has changed in the last 10 years. By using the digital mode JT65 it's now possible to work small stations with a small station. JT65 has the advantage that extremely faint signals can be pulled out of the noise. Using JT65 we planned to give as many hams as possible a new entity — a nice challenge for us to face. René already had some experience, having operated from Bonaire as PJ4EME (2007), Svalbard as JW5E (2008) and Kenya as 5Z4EME (2009).

After a good discussion we decided to travel to Mauritius in the Indian Ocean. This island was first colonized in 1638 by the Dutch. Mauritius was populated over the next few centuries by waves of traders, planters and their slaves, indentured laborers, merchants and artisans. The island was named in honor of Prince Maurice of Nassau by the Dutch, who abandoned the colony in 1710. Mauritius is also famous for the Dodo bird (*Raphus cucullatus*), which became extinct in the 1690s.

Eltje had met René previously as co-operator of PI9CAM, which operated from the 25 meter dish of the Dwingeloo Observatory in northeastern Netherlands, and he joined him in 2009 on an EME DXpedition to Kenya as 5Z4EME. Both operators are proud to have 144 MHz DXCC, René #19 and Eltje #40. Johan, an experienced operator and VHF DXer completed the team.

We wanted a suitable call for EME purposes and thought it would be nice to get a real call sign from Mauritius. Thanks to Jacky, 3B8CF, the secretary and IARU liaison of the Mauritius Amateur Radio Society (MARS) and the Ministry we were issued the call sign 3B8EME.



Eltje, PA3CEE, and René, PE1L, with the 144 MHz antennas set up and ready to shoot for the moon.

Water Skis and Aerials

The EME aerials consisted of 2 × 10 element cross polarized (BVO 3 wavelength) DJ9BV design antennas with an approximate gain of 16.5 dBd and the ability to switch polarity for both transmitting and receiving. It is a good concept and turned out to be very effective. Our equipment also included a Kenwood TS-2000 transceiver, an IØJXX 400 W amplifier (**www.i0jxx.com**), a GaAsFET preamplifier for the receiver and various accessories and parts.

The first problem we encountered was that all together we had more than 200 kilograms of luggage — far too much for our travel budget. We stuffed all the aerials in waterskiing bags and golf bags pretending we were sportsmen. The excess baggage rates for sports equipment are cheaper than for ordinary baggage. By pretending to go waterskiing we saved some money.

Getting on the Air

Arriving May 14 we started to set up the station. The aerials were perfectly balanced and could be turned manually with the help of ropes. Once we had them assembled and mounted we calibrated them on the sun and the Southern Cross.

There was power, we never had failures. Our Internet connection was unstable affecting our ability to update our website logs (**www.emelogger.com/mauritius**) on a daily basis and to spot our location on the

JT65 EME-logger NØUK (**www.chris.org/cgi-bin/jt65emeA**). But we were able to chat with the EME community all over the world. It was important to tell people that we were operational and it was also wise to ask stations to try to contact us. In this way we could persuade many to point their aerials to the moon enabling them to contact us, which, in turn, allowed us to make more contacts than we thought possible.

The next morning everything worked well — we had enough power from the IØJXX amplifier and the moon started to rise. Our setup worked great right from the start. At some times we saw more than 22 stations calling us. We were in business. In the next days we worked 340 stations via the moon using K1JT's digital JT65b mode. Of these, 51 were DXCC and 44 were firsts on 144 MHz. This was a new record. Never has a DXpedition made so many EME contacts. The old record was set during the 5Z4EME expedition to Kenya, when we made 282 contacts. To best that record 3B8EME made 20 percent more contacts.

Many "small pistols" made it into our log — who didn't actually? Single-Yagi stations and stations with only 100 W or less could easily be worked. The ability to switch polarity turned out to be a big advantage and became our secret weapon. The most contacts, 77, were made with Germany. The USA was worked 33 times with the following stations appearing in the log: AA4SC, AD4TJ, K1CA, K1JT, K1OR, K1WHS, K2BLA, K4XR, K5GMX, K7MAC, K9MRI, KB8RQ, KD3UY, KE5GAQ, KI4TZ, KQ5E, N4BH, N5YA, N8GTI, W1ICW, W2TSL, W4RBO, W5UN, W5UWB, W7IUV, W8PAT, W8WN, WA2ODO, WA3BZT, WA3QPX, WA4EWV, WA4NJP and WB9PNU. A CW contact with Finn, LA8YB, and his large 32 element Yagi array was one of the highlights.

We decided to do some operating on 432 MHz, though our station was very modest on that band with only a single 23 element Yagi and 40 W output. When we mounted the aerial we found that one element was missing, so we had to operate with the 22 elements that were left.

A schedule with HB9Q was a big success as was a CW schedule with Jan, DL9KR. A contact with "our" big PI9CAM dish completed the party. But there was more. To our surprise, within 2 hours four more contacts would be completed. It was really due to our teamwork. One person operating and the other two were manually switching polarity following every transmit and receive sequence. Mostly, we transmitted vertically and listened horizontally but now and then even this was reversed.

The 3B8EME team QSL card.(Inset) Team members from the left are Johan, PE9DX; Eltje, PA3CEE, and René, PE1L.

High Moon

EME in the tropics has some challenges. Sometimes we did not hear a thing. It was like being in a black hole. Then, all of a sudden, there were many callers again.

It was a great experience to see the moon rising very high overhead. The azimuth was often right for many hours so we only had to adjust the elevation. It was also interesting to see the moon from a different angle looking from the southern hemisphere. We knew that the moon phase was first quarter, but it appeared as the last quarter. We also noticed that the man in the moon sometimes vanished or was turned around. After a few drinks of rum we decided to stand on our heads and then we concluded that not the moon but we were turned upside down.

We stayed in a beautiful country. The landscape varied from tropical beaches to tropical rain forest. The local population on Mauritius was very kind. We met a lot of locals and we were invited to visit their houses for dinner. In this way we enjoyed the real Mauritius in its purest way.

From the Moon to MARS

During our visit, we invited some of the local hams to a demonstration of Moonbouncing. In turn, they invited us for a club meeting of MARS (**www.qsl.net/mars/site.html**) and we were asked to give a lecture. Jacky, 3B8CF, the secretary and IARU liaison of MARS, was a very kind host and after some very tasty snacks we explained the reason for our traveling half way around the world.

Of particular interest was the fact that hams on Mauritius recently acquired the use of the 50 MHz band. We told them all about the propagation and possibilities on the Magic Band and decided to donate our 50 MHz beam to Patrick, 3B8GF, the president of MARS. They were very happy with our gesture and it's our hope that man 6 meters.

The Expedition in Review

Looking back we believe we had a very successful EME DXpedition. All our operating targets were reached and we believe that anyone who tried to contact us made it into our log. When the moon was down we took a catamaran trip, swam with dolphins, did some snorkeling and took a lot of pictures in this beautiful paradise.

We are already thinking about the next trip when we will point the shiny aerials toward the moon. Moonbouncing from Africa was an unforgettable experience. Africa is a continent to fall in love with. It is in our blood and we know we will return.

We would like to thank our sponsors: AA4SC, DG8NCO, DK4TG, Dolstra Elektronika, F1DUZ, G3LIV (sound card interface), G4CBW, IK1UWL, I3LDP, IW4ARD, JE1TNL, JHØMHE, JM1GSH, JM1WBB, KØKP, K5QE, KI4TZ, Make more Miles on VHF (**www.mmmonvhf.de**), N4BH, OZ1FDH, PAØT, PA1T, PA5MS, PE1DAB, PF7M, PI9CM, SP2OFW and SV8CS. Also our thanks to de Beuseborgh (**www.ashoma.eu**) for providing excellent accommoda-tions.

All QSLs for 3B8EME should be sent via PA3CEE. See QRZ.com.

73 on behalf of the 3B8EME team.

Photos courtesy of Eltje Veen, PA3CEE; Johan Meezen, PE9DX, and René Hasper, PE1L.

Eltje Veen, PA3CEE, has been a ham since 1978. His main interests are VHF and weak signal communication, especially WSJT. He is married and has two daughters. For Eltje, EME is the biggest challenge in ham radio. He has earned 144 MHz DXCC (#40). Eltje can be reached at Wirdumerweg 35, NL-9917 PB Wirdum Gn, Netherlands, **pa3cee@amsat.org**.

René Hasper, PE1L, has been a ham since 1984. He has participated in the 3A/PE1LCH, F/PE1LCH, PJ4EME, JW5E, PI9CAM and 5Z4EME DXpeditions and has earned 144 MHz DXCC (#19). He is a software programmer by profession. René can be reached at Reidfjild 25, 9255 JS Tytsjerk, Netherlands, **hasperrene@gmail.com**.

Johan Meezen, PE9DX, has been a ham since 1984. His main interests are VHF weak signal communication, EME and MS, and VHF contesting at PI4GN for almost 25 years. He also enjoys HF contesting at PA3DWD, PA7MM and PA1T. Johan has earned 50 MHz DXCC (#222). He can be reached at J. Meezen, Narcisstraat 3, 9675 MA Winschoten, Netherlands, **pe9dx@amsat.org**.

Youth DX Adventure #1, 2010

A group of teenagers learn about DX by being DX.

Don DuBon, N6JRL and Dave Kalter, KB8OCP

The Youth DX Adventure was a dream born at the end of the 2009 CQWW SSB contest. Don, N6JRL; Dave, KB8OCP; Todd, KD4YHY; Jim, AB8YK, and Keko, TI5KD had operated the contest at Guacima de Alajuela (TI5N), a DX vacation villa that Keko operates in Costa Rica. The purpose of the adventure would be to introduce youth operators to the world of DXing at a young age and early moment in their ham radio careers.

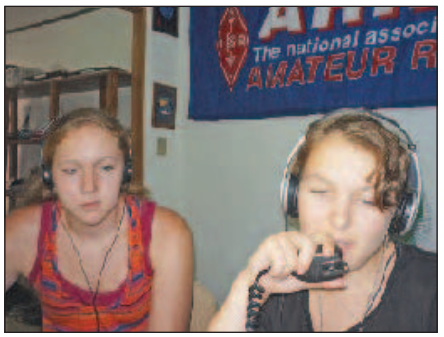
The Youth DX Adventure group arrives at the Guacima de Alajuela villa (TI5N) in Costa Rica.

The overarching idea was to bring youth operators from all over the country on a noncontest weekend to Costa Rica, allowing them the opportunity to create the pileups. This would give the youths a chance to see what it feels like to be "on the other end" instead of trying to bust through dozens, maybe hundreds, of stations fighting to make contact with the distant station.

During the first trip, Don and Dave, the two team leaders trained new mentors to lead future teams. This training consisted of planning, organizing and fundraising, with Don and Dave still serving as advisors for future trips.

Returning from the CQWW Contest, Don and Dave began their planning and recruiting of young operators from the Ohio and Kansas City areas. For 10 months they sent e-mails, created a website (**www.qsl.net/n6jrl**) and contacted many clubs, organizations and individuals for equipment and financial assistance. All of the youth members worked hard to raise funds for the adventure by holding a yard sale, giving presentations to many clubs for sponsorship and other activities.

July 15-19, 2010 were the dates for this adventure at TI5N. The group departed Dayton, Ohio and Kansas City, Kansas and met in Atlanta for the flight to San Jose, Costa Rica. During the selected dates, these youth operators would have the experience of being DX, working DX and learning about antennas, propagation and handling pileups. Included in the plans were some sightseeing, sampling the local cuisine and an evening performance of a local Marimba band at the villa. Since each of the young operators was between 15 and 17 years of age, a parent accompanied each one. On this first adventure, it just so happened that each parent was also a ham.



Andrea, KD8FNY (left) and Christi, KD8DGL, running a pileup on 20 meters.

Fly Away to San Jose

Twelve members of the team depart from the Dayton airport at 6 AM on July 15. The early morning flight arrived in Atlanta at 7:10 AM where we met two additional team members and all departed for San Jose, Costa Rica. Many of the youth operators and parents alike had never had a passport or traveled out of the United States. Arriving in San Jose, the team assembled, cleared immigrations and customs, and exited the airport. Within just a few minutes, we located our host, Keko, TI5KD, and our hostess, Sophia, TI2IY.

Loading the team in two cars and a rented taxi with all of our luggage, we were on our way to the station of TI5N for our long-awaited adventure. After a short drive, we were all at our host's lovely home and given room assignments and a tour of the shack and grounds. Kevin, W8KJ, describes the antennas: "The antenna farm was a site to see as well. Many Quad antennas, including a 40 meter Quad, are available to use. Operations were certainly made easier with tall towers and high gain antennas!"

A wonderful traditional Costa Rican meal was prepared by Sophia and all the team members were amazed at their first encounter with the local cuisine. After a great midday meal, unpacking and setting up radio equipment became the order of the day. Brian, KCØBS, enjoyed the Field Day experience: "You can't imagine how happy I was, when I found out we needed to set up radios, tweak antennas, and make the adjustments necessary for our particular operation. It was a lot like Field Day — and I really love the setup part of Field Day!" We set up radios, computers and digital interfaces, connected antennas and started to call CQ.

The pileups came quickly and each youth operator along with their custodial parent began logging on their own flash drive provided by Jim, AB8YK. Rachel, KD8FOB, describes one such pileup: "Once on the radio the band was booming. I was getting 100 contacts an hour. It was amazing." During spare seconds we called our families and friends at home to let them know we had arrived and were operational.

In the evening, a local Marimba band

arrived, set up their equipment and began to play. As the team members were able, they came outside to listen to the local music as they enjoyed a BBQ meal. The team members rotated as their shifts allowed. The band had originally planned to play for 2 hours, but must have enjoyed our company too as they stayed for 4½ hours and had dinner with us. We never knew the real name of the band, but we gave them some hats and called them "The DX Band."

The computer screens were full of logs and spots on the DX clusters were plentiful. Well into the night, the new DXers racked up the contacts. Andrea, KD8FNY, said: "I can't believe how much better I became as an operator and how much more interested I became in amateur radio." This was not a contest weekend and, after a very long day, the bands quieted down about midnight local time and the team retired for the night for some well needed rest. The next morning (Friday, July 16), it was up early and by now most of the youth operators were well into procedures and pileup etiquette and even logging their own contacts just like a seasoned contester. They set their own operating schedules and the only time the adult operators could get on a radio was when the youth operators went to eat or take a break. The contacts were climbing and the youth operators decided to have a friendly competition of who could get the most contacts in a shift or for the entire adventure.

Andrea, KD8FNY, and her dad Wynn, W6CDR, teaming up.

Mitchell, KD8JRS, operating 20 meter phone with the FT-450.

Keko held training classes for about an hour as Christi, KD8DGL, explains: "After breakfast on Friday morning, Keko taught a great class on the procedures of the radio and how to handle a pileup. Sunday morning Keko taught another class, this time on operating the radio. Both classes were very informative and useful. They helped me very much when I was operating, and without them I would have struggled."

Operating on the second day lasted most of the night with some of the young operators trying the local Costa Rican coffee to stay awake. Duncan, KUØDM, enjoyed late night CW on 40 meters. "Once the sun set," he said "I decided to try my hand at 40 and was greeted with a wall of Eastern Europe on CW, which didn't let up the entire time I was operating."

Cuisine and Culture

On Saturday morning, July 17, a private bus took the entire team for a 30 minute drive to the capital city, San Jose. In the city, the team did some shopping and sightseeing. They also tried some of the local cuisine and interacted with the locals, taking in some culture. "Having a local 'host' ham family" said Kevin, W8KJ, "and fine accommodations provided by them gave us all a genuine experience of the culture and typical lifestyles in Costa Rica. Eating authentic foods, learning about native birds, plants, and climate gave us insight and knowledge the typical tourist would miss."

Back to the station in the afternoon, the young operators attacked the airwaves once again. With the contact count climbing, we were hoping to reach 2000. As the youth operators continued to gain in confidence and their ability to handle the call signs and pileups, their enthusiasm was growing rapidly.

On Sunday morning after another wonderful breakfast, Keko held another class to gather input from our team members and answer any questions. Soon it was back to the awaiting masses of stations wanting to contact the youth group. Operating continued through the afternoon and evening, and the team amazed the leaders by surpassing 3300 contacts in the log including 88 countries and all of the 50 states. Late Sunday night the equipment was turned off and packed for the return trip.

Our flight left Monday at 7 AM and the tour bus took the team to the San Jose International Airport instead of Keko and Sophia having to make multiple trips. We said our goodbyes and departed for our flight at 4:30 AM. The plane departed on time, and we were in Atlanta some 3 hours and 23 minutes later. Clearing immigrations and customs, we rechecked our bags and proceeded to our departure gates, two team members heading for Kansas City and the rest going to Dayton.

Landing in Dayton, we were greeted by some family members and headed for home after a very successful and overwhelmingly rewarding experience with our new youth DXers. Mitchell, KD8JRS, sums it up: "This was an unforgettable, once in a lifetime experience that I will always remember. I saw people, places and things that I have never seen before and made great friendships with the other youth operators that also got the opportunity to participate in the first Youth DX Adventure!"

Our next Youth DX Adventure is coming up in July of 2011. For more information visit our website at **www.qsl.net/n6jrl**.

Photos courtesy of Don DuBon, N6JRL and Dave Kalter, KB8OCP.

Don DuBon, N6JRL, an ARRL member, became licensed in 1963 and now lives in the Dayton, Ohio area. Don is the current president of the Southwest Ohio DX Association and is involved in Forums with Hamvention. Don retired from the US Marine Corps after 23 years where he worked in the communications electronics field. Just returning from PJ7E Don likes DXing and contesting. He has also operated from 3YØX, TI5N, VP2EM, J68DD, FS and YI. Don is now working in the aviation mechanical inspection field. He can be reached at **n6jrl@aol.com**.

Dave Kalter, KB8OCP, an ARRL member, has been a ham since 1990. Dave enjoys RTTY DXing and contesting and has been to TI5N for the CQWW and the YDXA group. Dave is the vice president of the Southwest Ohio DX Association and was the 2010 Chairman of the Forums committee for the Dayton Hamvention. Dave can be reached at **kb8ocp@yahoo.com**.

Readability, Strength — and *Quality*?

The RSQ code is a signal report system designed for the eyes not the ears.

Steve Sant Andrea, AG1YK

Last month I talked about the RST code, how it originated and how it is used.[1] As I noted then, when we move to digital communications things change. The Readability and Strength elements are given new meanings more relevant to digital modes and the RST Tone element is replaced by a Quality element. This makes the RSQ code (see below) better adapted to digital modulation.

Hearing vs Seeing

"So what are you talking about here?" you ask. "Readability is Readability and Strength is Strength, so the difference is between Tone and Quality, right?"

The differences go deeper than that. Compare RST Readability (R) to RSQ Readability (R_D). R focuses on the *ability to understand what is heard* while for R_D it is on the *percentage of missing characters*. In other words, R is how clearly we hear while R_D is how well we get the message.

In digital operating the receiving operator reports to the sender the *percentage* of the message received. An R_D of 1 is 0 percent readable. None of the text could be deciphered. An R_D of 3 represents 40 percent readable. That is, about 40 percent of the text was understandable. For an R_D of 5, more than 95 percent of the text is readable.

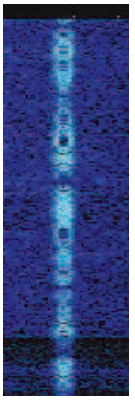
Not all S9s Are the Same

"Okay, I guess I never thought about readability that way but how can signal strength be different? S9 is S9, right?"

Again, we have a fundamental difference in the way analog and digital signals are received. In the RST code, Strength (S) is a measure of how well you hear the signal. The S-units displayed on your meter give a relative idea of the *average* signal level in your receiver's *whole* passband. So, if you're chewing the rag during a noisy night on 160 your contact may pass it back to you but your S-meter may stay at S4. That's because the passband noise level is still S4.

"I don't quite get it. If I tune a digital signal my S meter will still read the signal's strength. How is the RSQ Strength different?"

Most digital mode software generates a waterfall display of the receiver's passband. As you move from left to right across the waterfall you are moving from the lowest passband frequency to the highest. In the waterfall display, a digital signal appears as a narrow band (trace) running down the display (as shown above, right). This band represents the digital signal's bandwidth (horizontal width) against time (vertical flow). The actual signal strength is represented by the brightness of the trace.



An S_D signal of 1 indicates that the trace is just barely noticeable amid the noise of the passband. At an S_D of 5, the trace is bright enough to stand out against the noise. An S_D of 9 indicates a trace that is visually prominent on the waterfall display. When talking about S_D the operator is giving a report of the *visual* intensity of the trace alone, not an average of all the signals in the passband.

Clean and Narrow

This brings us to the Quality element (Q). In principle, the Q value and the RST T value are telling us the same thing — not how well we can hear the signal nor how strong the signal is but how "clean" the signal is. The T element was developed to describe how a Morse code signal sounds. T1 represents a signal that's rough and raspy and hard to copy.

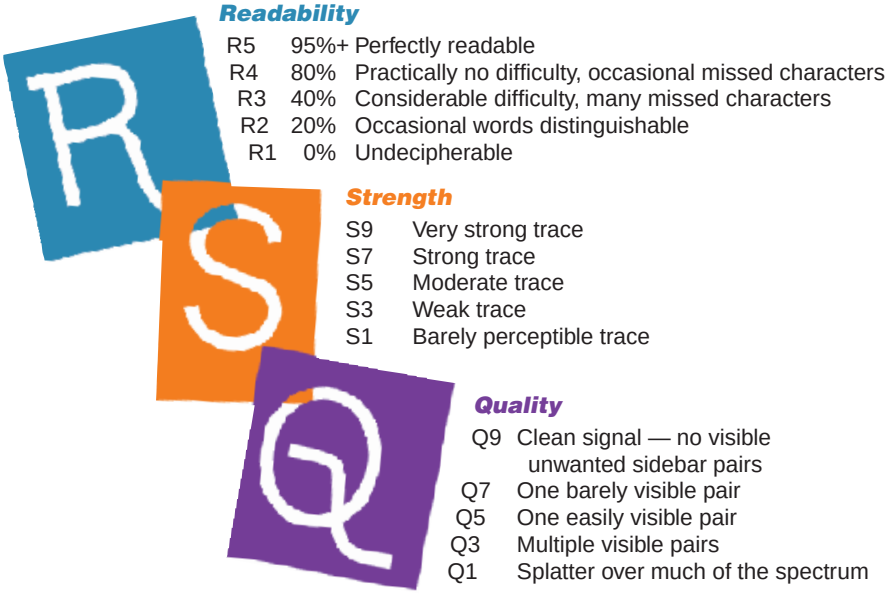
In the digital world, the Q element describes the digital analog of the tone element. A Q1 signal, being viewed on the waterfall display, will not be a clean, narrow trace running down the screen occupying only the minimum bandwidth. It will have one or perhaps several sideband pairs running parallel to it. These sideband pairs are splatter and indicate that the transmitter is being overdriven, which results in an expansion of the width of the digital signal. In fact, as in overmodulation of a phone transmitter, the splatter can "reach out" from one signal and interfere with adjacent signals. The bottom line — splatter is bad and a Q1 signal indicates a problem in the digital transmitter just as a T1 signal indicates a problem in the CW transmitter.

As the digital signal improves the number of parallel lines (splatter) goes down and the Q value goes up until a Q5 "clean as a whistle" signal is seen. A Q5 signal occupies the smallest bandwidth possible for the modulation type.

Just as with the RST code, it is important to understand the significance of the R, S and Q values and make the effort to provide an accurate RSQ report to stations you contact. For more information on the RSQ code see **www.rsq-info.net**.

Steve Sant Andrea, AG1YK, is an Assistant Editor at QST *and can be reached at* **ag1yk@arrl.org**.

[1]S. Sant Andrea, AG1YK, "Can You Read Me Now?," *QST*, Apr 2011, p 68.



ARRL EXPO 2011 — Get There!

Whether you get to Dayton or Plano, you'll find people, programs and products to spark new interests and ideas for you and your radio club.

Bob Inderbitzen, NQ1R

Get Involved! That's the mantra from the team of ARRL officials, staff and local arrangement volunteers gearing up to bring ARRL EXPO, a "show and tell" exposition, to two conventions this year. ARRL EXPO (**www.arrl.org/expo**) is returning to Dayton, Ohio for Hamvention in May and to Plano, Texas for Ham-Com in June. These events will attract thousands of active radio amateurs. Hamvention is billed as the world's largest annual gathering for Amateur Radio and Ham-Com as the biggest hamfest in Texas. Ham-Com will wear two hats this year, as it will also host the 2011 ARRL National Convention. Both conventions offer a full slate of forums, presentations, training sessions, manufacturer exhibits, radio club booths and a flea market.

ARRL EXPO will be the hub of activity in Dayton and Plano — a premier convention area filled with exhibits, activities and new resources. Now marking its 7th year, ARRL EXPO celebrates the very best of our Amateur Radio service. As you wander through the exposition's many booths, be prepared to get inspired by the extraordinary team of participants. Interact with representatives from across a variety of Amateur Radio interests and ARRL programs. You'll experience new ideas, gather educational and training materials, and view the newest publications and products. ARRL EXPO boasts a high level of peer-to-peer interaction. This is the place that brings leaders and experts together with every radio amateur seeking new ideas to get involved and get on-the-air.

Bob Inderbitzen, NQ1R, is the ARRL Marketing Manager. He can be reached at **nq1r@arrl.org**.

Dayton

When: May 20-22, 2011
Where: Hara Complex in Trotwood, Ohio
Program Highlights:

- Hamvention® (**www.hamvention.org**) — For 3 days, the population of Dayton swells as the Amateur Radio community converges for Hamvention. Besides the full program and sprawling exhibit areas, the event draws dozens of affiliated events — including interest groups with operating specialties such as low-power, contesting and amateur satellites.
- ARRL EXPO (**www.arrl.org/expo**)
- ARRL-sponsored forums and presentations
- Special Guest and Speaker, NASA Astronaut Doug Wheelock, KF5BOC, jointly sponsored by ARRL and AMSAT
- International exhibits (ARRL EXPO area) including representatives from Germany, Japan and the United Kingdom

While you're there:

- Dayton Aviation Heritage National Historical Park
- National Museum of the United States Air Force
- Boonshoft Museum of Discovery — Kids love this science/technology center and zoo!
- Shopping — Tour the charming neighborhood of shops in the Oregon Historic District
- Restaurants — Jay's Seafood Restaurant is a favorite among Hamvention goers
- Dayton/Montgomery County Convention & Visitors Bureau (**www.daytoncvb.com**)

See **www.hamvention.org** for more information including lodging options and travel information.

NASA

NASA Astronaut Doug Wheelock, KF5BOC, will share his experiences of using ham radio during his 163 days in space.

Plano

When: June 10-11, 2011
Where: Plano Convention Centre in Plano, Texas
Program Highlights:

- Ham-Com (**www.hamcom.org**) — This convention draws over 4000 attendees each year. Highlights include nearly 100 hours of speakers, workshops, training classes, dozens of commercial exhibitors and an indoor/outdoor flea market.
- ARRL EXPO (**www.arrl.org/expo**)
- Special Guest and Speaker, Riley Hollingsworth, K4ZDH, retired Special Counsel for the FCC's Enforcement Bureau
- ARRL VEC-sponsored license exam sessions
- ARRL-sponsored forums and presentations
- W1AW/5, sponsored by Dallas County REACT and the Dallas Amateur Radio Club
- ARRL Wouff Hong Ceremony

While you're there:

- Dallas Arboretum and Botanical Gardens
- Southfork Ranch — the fictional homestead from the hit TV show "Dallas"
- Six Flags Over Texas (Arlington)
- Shopping. Enjoy the shops, restaurants and entertainment of Legacy Town Center
- Restaurants. Historic Downtown Plano holds something for everyone — dining, shopping and culture
- Plano Convention & Visitors Bureau (**www.planocvb.com**)

See **www.hamcom.org** for more information including lodging options and travel information.

LOUDOUN AMATEUR RADIO GROUP (K4LRG.ORG)

Riley Hollingsworth, K4ZDH, retired Special Counsel for the FCC's Enforcement Bureau.

Save the Date! **The ARRL National Convention, including ARRL EXPO, is coming to Santa Clara, California in October 2012 — hosted by Pacificon, www.pacificon.org. Get there!**

Spectrum Management Bill Threatens 70 cm Band

Just a few weeks after HR 607 — *The Broadband for First Responders Act of 2011* — was introduced by Representative Peter King (R-NY-3), thousands of ARRL members have written their Representatives, telling them that they, as radio amateurs, oppose the bill in its current form. King, who is Chairman of the House Homeland Security Committee, introduced HR 607 on February 10. The bill addresses certain spectrum management issues, including the creation and maintenance of a nationwide Public Safety broadband network. As part of that network, the bill provides for the allocation of the so-called "D-Block" of spectrum in the 700 MHz range for Public Safety use. The bill has been referred to the House Energy and Commerce Committee, which handles telecommunications legislation.

HR 607 provides for the reallocation of other spectrum for auction to commercial users, in order to offset the loss of revenue that would occur as the result of the allocation of the D-Block. "Of serious concern to the ARRL is the inclusion of the 420-440 MHz amateur allocation in the list of frequencies to be cleared for auction," said ARRL Regulatory Information Manager Dan Henderson, N1ND. "The ARRL and the Amateur Radio community certainly support the work of public safety agencies and understand their desire for an interoperable network; however, the inclusion of most of the amateur 70 cm spectrum as one of the replacement bands is illogical and unacceptable. The 420-440 MHz band is not Public Safety spectrum and should never have been included in any spectrum swap of Public Safety allocations."

The ARRL Washington team quickly met with key Congressional staff on Capitol Hill. Henderson noted that Amateur Radio already shares the 70 cm band on a secondary basis with the governmental radiolocation services, such as the PAVE PAWS radar systems: "The 70 cm band is a critical and irreplaceable resource for Amateur Radio public service and emergency communications. The specification of the 420-440 MHz band in this legislation is ill-conceived. To be sure, the ARRL will vigorously oppose this legislation in its present form. It is, as evidenced by other legislation, completely unnecessary to the creation of a nationwide Public Safety broadband network or the use by Public Safety of the D-Block for that purpose. The role of the Amateur Service as a partner to Public Safety in the provision of public service and emergency communications necessitates the retention of full access to the entire 420-440 MHz band."

HR 607 is presently cosponsored by the Homeland Security Committee's Ranking Member, Representative Bennie Thompson (D-MS-2), as well as Representatives Shelley Berkley (D-NV-1), Leonard Boswell (D-IA-3), Yvette Clarke (D-NY-11), Keith Ellison (DFL-MN-5), Michael Grimm (R-NY-13), James Langevin (D-RI-2), Billy Long (R-MO-7), Candice Miller (R-MI-10), Laura Richardson (D-CA-37) and Mike Rogers (R-AL-3).

NPSTC Says HR 607 "Needs to Be Amended"

The National Public Safety Telecommunications Council (NPSTC) — a federation of more than a dozen public safety communications organizations — has gone on record as sharing the ARRL's concerns regarding HR 607. In a letter to ARRL President Kay Craigie, N3KN, and ARRL Chief Executive Officer David Sumner, K1ZZ, dated March 8, NPSTC Chair Ralph Haller said: "We want to let you know that NPSTC's Governing Board understands your serious concerns about Section 207 of this Act, and we share those concerns." While reiterating NPSTC's support for the remainder of the Act, Haller said that "NPSTC is very concerned about Section 207(d) of the Act and believes that the section needs to be amended to address the concerns of public safety and the Amateur Radio users."

Commenting on Haller's letter, Sumner said that "it is gratifying to have the support of the NPSTC Governing Board in our effort to remove this provision from Representative King's bill. Once our concerns have been satisfied, we hope Congress will proceed quickly to complete work on providing our First Responders with this important facility."

How You Can Help

The ARRL is asking its members to contact their US Representatives in opposition to the sections of HR 607 that could affect the Amateur Radio Service allocation at 420-440 MHz. Henderson clarified that the League opposes HR 607 *in its present form*. "We do not oppose the concept of dedicated spectrum for the development of a Public Safety infrastructure and wireless network. We object to the bill because of the inclusion of 420-440 MHz as part of the spectrum to be swapped and auctioned to commercial users."

Chwat & Co — the ARRL's legislative relations firm in Washington, DC — has received thousands of letters from League members in opposition to HR 607. Due to lengthy screening and security delays for regular US Mail to be delivered to congressional offices, the ARRL asks that when you send your letter opposing HR 607 in its current form, that you send or fax it directly to Chwat & Co. They will then deliver the letters to the appropriate congressional offices.

Henderson shared a few pointers for writing letters in opposition to HR 607. You can find these at **www.arrl.org/news/arrl-members-respond-to-hr-607**. You can also find the name of your Representative, a sample letter opposing HR 607 in its current form and the contact information for Chwat & Co at **www.arrl.org/sample-letters**.

S. Khrystyne Keane, K1SFA ♦ ARRL News Editor ♦ k1sfa@arrl.org

AMATEUR MF ALLOCATION MOVES ONE STEP CLOSER

Amateur Radio has moved a step closer to a medium frequency (MF) allocation below the AM broadcast band. During the first week of the Conference Preparatory Meeting (CPM) for the 2012 World Radiocommunication Conference (WRC-12) of the International Telecommunication Union (ITU), held in Geneva February 14-25, delegates completed the drafting of nine pages of analysis of the technical and regulatory issues related to WRC-12 Agenda Item 1.23: Consideration of a possible secondary allocation to the Amateur Service of about 15 kHz somewhere between 415 and 526.5 kHz. Two possible methods of satisfying the agenda item, along with the possibility of there being no change (and therefore no allocation), are set out in the CPM Report, along with the advantages and disadvantages of each.

What is now called Method A envisions an allocation of up to 15 kHz between 472 and 487 kHz. Method B calls for allocations of 461-469 kHz and 471-478 kHz. Another method that had been developed at earlier meetings of Working Party 5A of the ITU Radiocommunication Sector, for an allocation of about 15 kHz between 493 and 510 kHz, was dropped from the draft CPM Report because no support for this approach had developed among the administrations participating in the preparatory process. A new digital system centered on 500 kHz is being developed by the maritime radio community, and an amateur allocation, even on a secondary, not-to-interfere basis, was found to be incompatible with the planned system.

"The hard work of a team of radio amateurs led by the International Amateur Radio Union (IARU) — and with considerable help from friendly administrations — has gotten us to this point," said ARRL Chief Executive Officer David Sumner, K1ZZ, who attended the first half of the CPM on behalf of the IARU. "While more support will need to be developed among other administrations if we are to achieve an allocation at WRC-12, our prospects are better now than they were before." He gave particular credit to Ken Pulfer, VE3PU, who has coordinated the IARU effort and gained valuable support from the Canadian administration. "Ken and the IARU team have been working on this issue for three years," Sumner said.

ARRL Chief Technology Officer Brennan Price, N4QX, attended the CPM as a member of the United States delegation. The US supports what is now called Method B, which also has sufficient support among other administrations in the Americas to have become an Inter-American Proposal of the Inter-American Telecommunication Commission (CITEL). At this stage, what is now called Method A has support from several administrations in Europe, Africa, Asia and Oceania.

WRC-12 will be held in Geneva next year from January 23 to February 17.

MEET NEW ARRL YOUTH EDITOR STERLING COFFEY, NØSSC

The ARRL welcomes its new Youth Editor, Sterling Coffey, NØSSC, of Warrenton, Missouri. Coffey is a freshman at the Missouri University of Science and Technology in Rolla, where he is studying electrical engineering. He said that since he was five years old, he has been "intrigued and interested" in radio communication, crediting a gift of walkie-talkies with a button and a letter diagram for Morse code. "At the age of five, I learned my first lesson of radio electronics: Bigger antennas are better!"

COURTESY NØSSC

ARRL Youth Editor Sterling Coffey, NØSSC

After spending time on CB and FRS radios, Coffey began studying to get his Technician license when he was 13. When he was 16, he got his ticket and his new call sign, KDØBZE. Soon after his first exposure to HF during ARRL Field Day, Coffey studied the General class question pool and upgraded to General and then to Amateur Extra. "Over time, I worked many a contest and country. Soon I began looking for a college. I chose the Missouri University of Science and Technology in Rolla, Missouri (formerly University of Missouri at Rolla). Being exposed to Amateur Radio changed my mind from getting a psychology degree to majoring in electrical engineering. The university also had an Amateur Radio club — WØEEE — and I will admit that one of my deciding factors for where I would go to school was whether there was an Amateur Radio club on campus." Coffey serves as Vice President of the WØEEE Amateur Radio Club.

Coffey invites readers — both young and not-so-young — to contact him via e-mail at **n0ssc@arrl.net** to tell him their ham radio stories. You can find his column on the ARRL web page at **www.arrl.org**.

THREE YACHTSMEN KILLED BY SOMALI PIRATES WERE HAMS

Four Americans — including three Amateur Radio operators — who were being held hostage on their yacht by pirates off the coast of Oman were killed on February 22. Scott Adam, K9ESO, and his wife Jean, KF6RVB, along with Bob Riggle, KE7IIV, and Phylis Macay were on board the S/V *Quest* when pirates boarded their vessel on February 18. The Adams were based in the Los Angeles area; Riggle and Macay were from Seattle.

According to the US Central Command, the boat was in the Indian Ocean, headed toward the Somali coast when the 58 foot yacht sent a distress signal. The boat was being trailed by US Navy forces; it was about a two day sail from the Somali coast. They had begun tracking the yacht after being alerted that a Danish naval helicopter had seen the *Quest* off Oman under the pirates' control. The Central Command oversees US anti-piracy operations in the Indian Ocean.

Officials were in the process of negotiating for the Americans' release when gunfire was heard around 1 AM (EST) on February 22. "As (US forces) responded to the gunfire, reaching and boarding the *Quest*, the forces discovered all four hostages had been shot by their captors," a statement from US Central Command said. "Despite immediate steps to provide life-saving care, all four hostages ultimately died of their wounds."

THE ADAMS' WEBSITE

Scott Adam, K9ESO, and his wife Jean, KF6RVB, were killed by Somali pirates on their 58 foot yacht early in the morning of February 22.

FCC News

♦**FCC Issues California Man $7000 Forfeiture Order for Refusing FCC Inspection**: After a Merced, California man refused to let FCC investigators inspect his Citizens Band (CB) radio station, the FCC issued a *Notice of Apparent Liability for Forfeiture* (*NAL*) for $7000. The Commission found that Ira Jones "apparently willfully and repeatedly" violated Section 303(n) of the *Communications Act of 1934, as amended*, and Section 95.426(a) of the Commission's rules by failing to permit the inspection. On March 26, 2010 and August 27, 2010, agents from the FCC's San Francisco Office responded to a complaint regarding radio frequency interference within the radio communication system equipment of the Merced County Fire Department. On each of these dates — in an effort to determine the cause of the reported interference created within the Merced County Fire Department radio communication equipment and to resolve it — the agents requested an inspection of Jones' CB radio station. Jones denied both requests, despite the fact that at both inspections, the agents explained the violations to Jones and provided him with repeated verbal and written on-scene warnings of the consequences of refusing to allow an inspection of a radio station. Jones had until April 9, 2011 to pay the forfeiture or file a written statement by that date, seeking a reduction or cancellation of the proposed forfeiture.

FCC ADOPTS SPREAD SPECTRUM RULES CHANGES

In a *Report and Order* adopted February 22 and released March 4, 2011, the FCC eliminated the requirement that amateur stations transmitting Spread Spectrum use Automatic Power Control (APC) to reduce transmitter power. At the same time, the Commission has reduced the maximum power of a Spread Spectrum emission from 100 to 10 W PEP.

The *R&O* explains the Commission's actions this way: "We believe that these rules changes will (1) encourage individuals who can contribute to the advancement of the radio art to more fully utilize SS technologies in experimentation, and (2) balance the interests of all users in mixed-mode and mixed-service frequency bands until sharing protocols are sufficiently developed to avoid interference."

The ARRL filed a *Petition for Rulemaking* back in March 2006, asking that the APC requirement be eliminated. Since it was first imposed in 1999, the ARRL's *Petition* observed that the APC requirement has "been impractical of compliance; unnecessary in order to protect other Amateur Radio operations or the operation of any licensed radio service sharing certain Amateur Radio allocations; and it has served as an unintended, but effective deterrent to Spread Spectrum experimentation in the Amateur Service." While it did not propose the power reduction in its petition, in later comments the ARRL conceded that it has not been demonstrated that the proposed power limit would pose a substantial obstacle to SS experimentation, and stated that "it is willing to accept the restriction presently, subject to revisiting the matter after some reasonable experience is gained."

ARRL Chief Executive Officer David Sumner, K1ZZ, said that he is "pleased that this relatively minor matter finally has been resolved. We hope that as soon as the amended rules become effective, amateur experimenters will take advantage of the greater flexibility that has been afforded to them."

The changes to Sections 97.311 and 97.313 of the Commission's Rules will be effective 30 days after the *R&O* is published in the *Federal Register*.

SCIENTISTS OFFER EXPLANATION FOR SPOTLESS SUN

An article in the March 3 issue of the peer-reviewed journal *Nature* purports to explain the extended sunspot minimum from 2008-2010. According to one of the authors, Piet Martens, the last time a sunspot minimum lasted twice as long as usual was around 1913 and before that, 1810.

After simulating 210 previous sunspot cycles, Martens — along with Dibyendu Nandi and Andrés Muñoz-Jaramillo — discovered that extended solar minima have coincided with unusually weak magnetic fields at the Sun's poles.

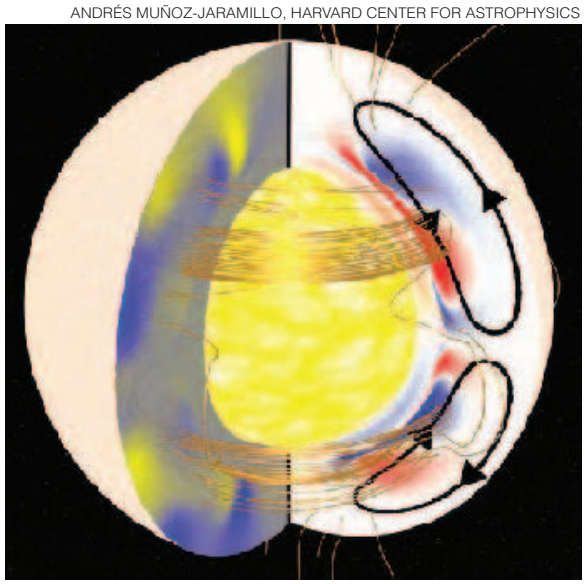
"Plasma currents deep inside the Sun interfered with the formation of sunspots and prolonged the solar minimum," said Nandi, who now is with the Indian Institute of Science Education and Research in Kolkata. The solar minimum has repercussions on the safety of space travel and the amount of orbital debris our planet accumulates.

For years, solar physicists have recognized the importance of the Sun's "Great Conveyor Belt." A vast system of plasma currents called meridional flows — akin to ocean currents on Earth — travel along the Sun's surface, plunge inward around the poles and pop up again near the Sun's equator. These looping currents play a key role in the 11 year solar cycle. When sunspots begin to decay, surface currents sweep up their magnetic remains and pull them down inside the star and 300,000 km below the surface, the Sun's magnetic dynamo amplifies the decaying magnetic fields. Re-animated sunspots become buoyant and bob up to the surface like a cork in water and a new solar cycle is born.

For the first time, the team believes that they have developed a computer model that gets the physics right for all three aspects of this process: the magnetic dynamo, the conveyor belt and the buoyant evolution of sunspot magnetic fields. "According to our model, the trouble with sunspots actually began in back in the late 1990s during the upswing of Solar Cycle 23," Muñoz-Jaramillo said. "At that time, the conveyor belt sped up."

The fast-moving belt rapidly dragged sunspot corpses down to the Sun's inner dynamo for amplification. At first glance, this might seem to boost sunspot production, but when the remains of old sunspots reached the dynamo, they rode the belt through the

ANDRÉS MUÑOZ-JARAMILLO, HARVARD CENTER FOR ASTROPHYSICS



In this artistic cutaway view of the Sun, the Great Conveyor Belt appears as a set of black loops that connect the stellar surface to the interior.

In Brief

• **Listen to the *ARES® E-Letter***: The *ARES® E-Letter* is now available in audio format. Edited for audio by Al Brown, KZ3AB, the *ARES® Audio E-Letter* is voiced by Tony Riggs, W1FHN. Brown was licensed in 1966. He was a member of the White House Press Corps before retiring from the International Broadcasting Bureau/Voice of America (IBB/VOA). Licensed since 1955, Riggs has worked in both the commercial and public broadcasting venues. He retired after 21 years as a staff announcer and news anchor with the VOA. With more than 35,000 subscribers, the *ARES® E-Letter* is written by Rick Palm, K1CE, and is published each month. Subscribe to the *ARES® E-Letter* at **www.arrl.org/ares-e-letter**. The audio version is available at **www.arrl.org/ares-e-letter-audio-version**.

• **Eugene Pressler, W3ZXV (SK)**: Eugene "Gene" Pressler, W3ZXV, of Gwynedd, Pennsylvania, passed away February 22. He was 80. Pressler, who served as an Assistant Director in the ARRL Atlantic Division, also served as the Public Information Coordinator and Assistant Section Manager for Eastern Pennsylvania, as well as the Division's representative on the Public Relations Advisory Committee for several years. He co-founded and served as Director Emeritus of the Area Repeater Coordination Council, the regional Amateur Radio repeater frequency coordinator for Eastern Pennsylvania and Southern New Jersey. ARRL President Kay Craigie, N3KN, fondly remembered Pressler: "I met Gene at my first Atlantic Division Cabinet meeting in 1986, when I was Section Manager-elect and he was an Assistant Director. Gene's devotion to Amateur Radio through local clubs, repeater coordination and the ARRL made it an honor to know him and work with him."

Gene Pressler, W3ZXV (SK)

amplification zone too hastily for full re-animation. Sunspot production was stunted.

Later, in the 2000s, according to the model, the Conveyor Belt slowed down again, allowing magnetic fields to spend more time in the amplification zone, but the damage was already done. New sunspots were in short supply and the slow moving belt did little to assist re-animated sunspots on their journey back to the surface, delaying the onset of Solar Cycle 24. "The stage was set for the deepest solar minimum in a century," Martens explained.

During this deep solar minimum, the Sun's magnetic field weakened, allowing cosmic rays to penetrate the solar system in record numbers, making space a more dangerous place to travel. At the same time, the decrease in ultraviolet radiation caused the Earth's upper atmosphere to cool and collapse. As a consequence, space debris stopped decaying and started accumulating in the Earth's orbit, due to decreased atmospheric drag.

ARRL SEEKS RULES CHANGE, WAIVER FOR CERTAIN VHF VOICE AND DATA EMISSIONS

On March 15, the ARRL filed a *Petition for Rulemaking* and a *Request for Temporary Waiver* to authorize the use of single-time-slot Time Division Multiple Access (TDMA) emissions in the amateur bands at and above 50 MHz, wherever multiple-time-slot TDMA is authorized.

The ARRL — which called its *Petition* "very narrow in scope" — seeks to facilitate the use of and experimentation by radio amateurs with existing narrowband spectrum-efficient digital voice and data technology. "Such technology is now in regular and increasing use in the private land mobile radio services, but its use in the Amateur Radio Service is now apparently unintentionally precluded by two specific Commission rules," the ARRL's *Petition* stated.

The *Petition* asks the FCC to allow those amateurs who are presently using a Motorola narrowband (12.5 kHz) digital land mobile system — commercially marketed as MotoTRBO — to be used legally. Because of some restrictions in the Part 97 rules, the TDMA repeaters (which are multiple-time-slot devices) are legal, but the mobiles and portables are not because the emissions used (single-time-slot TDMA) are not authorized anywhere, due to the emission designator.

The legality of the use of these systems, however, was drawn into question only recently. Calling it "urgent to allow these existing systems to continue to operate and to allow the sponsors of them to avoid losing their investment in them," the ARRL also submitted at the same time a *Request for Temporary Waiver* of the same rules sought to be modified in the *Petition*. This would, if granted, permit these systems to continue to operate (on a non-interference basis), while the *Petition* is under review and subject to its outcome.

SECTION MANAGER NOMINATION NOTICE

To all ARRL members in the 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. Photocopied signatures are not acceptable. No petition is valid without at least five signatures, and it is advisable to have a few more than five signatures on each petition. Petition forms FSD-129 are available on request from ARRL Headquarters but are not required. A sample nomination form is available on the ARRL website at **www.arrl.org/section-terms-nomination-information**.

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 10, 2011. If more than one member is nominated in a single section, ballots will be mailed from Headquarters on or before July 1, 2011, to full members of record as of June 10, 2011, which is the closing date for nominations. Returns will be counted August 23, 2011. Section Managers elected as a result of the above procedure will take office October 1, 2011.

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, 2011. If no petitions are received from a section by the specified closing date, such section will be resolicited in the October 2011 *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*

Boulder Hams Fight Forest Fires with Video

Jim Andrews, KH6HTV
kh6htv@arrl.net

Boulder County, Colorado, experienced its worst forest fire ever in September 2010. The Four Mile Canyon fire burned over 6400 acres and destroyed 166 houses. The fire started on Monday, September 6 at 10 AM. High winds that day caused the fire to spread very rapidly throughout the canyon. Residents and firefighters were forced to flee the rapidly advancing flames. The high winds also prevented any aerial attacks on the fire during the first day. The fire came extremely close to engulfing and wiping out the old historic, gold mining town of Gold Hill.

The intensity of the fire and the rapid destruction of property rapidly escalated this fire from local firefighting efforts to the Sheriff and Colorado Governor calling for assistance from the federal government. Starting on the second day, major federal resources were thrown into the battle against the raging fire. This included several federal aerial, slurry bombers, helicopters and 500 firefighters.

The Boulder County ARES® (BCARES) group was toned out on the afternoon of the first day to provide communications links between the emergency evacuation shelters and the Emergency Operations Center (EOC) located at the Boulder County 911 communications center. These communications were set up promptly using both 2 meter voice and packet radio.

Next BCARES was asked to provide live video feeds of the fire. Teams were dispatched with high definition cameras with long telephoto lenses, 70 cm TV transmitters and Yagi antennas to mountaintops outside of the immediate fire zone. The locations chosen provided excellent views of the fire, plus line of sight RF propagation paths to the EOC. From these locations, video images were soon beamed back to the Boulder EOC. These images were then presented to the large assembled staff in the EOC central command room on very large, high definition, video monitors. As many as three different BCARES camera views were presented simultaneously to the EOC.

UELI HAUSER, KB9TTI/HB9TTI

View of the fire in the mountains from the Boulder EOC at the City of Boulder airport.

ALLEN BISHOP, KØARK

BCARES video forest fire observation post on Magnolia Road.

BCARES video teams also functioned as fire spotters monitoring the progress of the fire. As new hot spots flared up, they would zoom their cameras in on them. They would call their observations into the EOC on their 2 meter voice channel, along with the compass bearing of the camera view. Other BCARES members at the EOC then plotted these compass bearings on computer topographic maps and were able to determine the GPS coordinates of the fire hot spots. This information was then relayed to the appropriate authorities in the EOC along with calling their attention to the live video of the hot spot being displayed on the large screen monitors. As a result, BCARES was later credited with saving several homes by their timely spotting of rogue fires and the prompt dispatch of fire crews to protect the structures.

The fire took over a week to be controlled. BCARES TV and shelter operations lasted for six days during which time 35 BCARES members put in over 686 hours of effort in support of the firefighting. Several members put in up to 18 hour days.

Only one month later, BCARES was again called into service when the Dome Rock fire broke out in Boulder Canyon extremely close to the western edge of the city of Boulder. Residents in the western part of the city were immediately evacuated. This time, within a very short time after the fire started, the EOC again requested BCARES to provide live video feeds of the fire from nearby mountaintops. Two camera teams were immediately sent up into the hills with cameras and 70 cm TV transmitters. This fire was rapidly contained with the aggressive use of a twin engine aerial bomber, a single engine slurry airplane and a water bucket carrying helicopter. The fire was limited to 100 acres and no houses were damaged, but it was an extremely close call for the city of Boulder.

BCARES has had a lot of experience over the last 20 years providing live TV coverage for the various police and fire agencies in Boulder County. TV has been the number one resource consistently requested by the local public safety authorities. In addition to forest fires, BCARES has provided live video for public safety of student riots at the University of Colorado, anti-war protest marches and rallies, Halloween, CU (Colorado University) football games, and SWAT team operations, in addition to numerous fire, police and hospital training exercises.

BCARES maintains its office along with a cache of radio equipment at the Boulder County EOC-911 center. This equipment

Steve Ewald, WV1X ♦ Public Service Specialist ♦ sewald@arrl.org

UELI HAUSER, KB9TTI/HB9TTI

Joe Stanford, NVØN (left), and Allen Bishop, KØARK, serve as fire spotters and video team members at the Magnolia Road site.

UELI HAUSER, KB9TTI/HB9TTI

BCARES forest fire spotter and video team member Jim Andrews, KH6HTV, on summit of Flagstaff mountain.

JIM ANDREWS, KH6HTV

Actual BCARES Flagstaff mountain video camera footage of slurry bombing runs on the forest fire.

includes portable HF, packet radio and TV. BCARES also has voice and TV installations in the police mobile command posts for the Boulder Sheriff, and the cities of Boulder and Longmont police departments. BCARES also supports the police department in the nearby city and county of Broomfield. TV operations are primarily on 70 cm, but direct point to point links are also established on the 23 cm band with FM-TV. BCARES has a 70 cm, TV repeater, WØBCR, in Chautauqua Park, 600 feet above the city of Boulder that provides good coverage of the heavily populated, eastern plains portion of Boulder County. For operations in the remote, western part of the county with mountains up to 14,000 feet, BCARES also has a portable 70 cm, 10 W, TV repeater.

IS CERT THE FUTURE OF ARES?

David Coursey, N5FDL
n5fdl@arrl.net

Here is a statistic I like to toss around, because it explains the future of the Amateur Radio Emergency Service,® at least in my part of the world. It starts with a question: "What is the largest, best-organized, and best-trained Amateur Radio emergency group in San Joaquin County? Is it ARES? RACES? A ham club?" No, it is the Community Emergency Response Team (CERT) in the City of Tracy, the California community of 80,000 where I live.

Tracy CERT, operated by the fire department, requires its volunteer team leaders to be licensed amateurs, capable of providing longer-distance communication when their teams are in the field. Individual CERT members who are not hams use short-distance Family Radio Service (FRS) radios to communicate with their leaders. Of the 45 responder-qualified members of Tracy CERT, more than two dozen have become licensed amateurs, most through a series of one day "HamCram" licensing events.

We follow the HamCram with training to get the new hams familiar with their radios, our frequency plan and net operation. (We have standardized on Yaesu FT-270, FT-60 and the discontinued VX-170 handheld transceivers.) No other group in our county has as many members that are as broadly trained. Almost all of the CERT hams are also ARES members. Since CERT is their primary affiliation, that's how I count them.

Every CERT member is required to participate in at least 24 hours of CERT training, attend meetings and training sessions at least occasionally. All members have basic Incident Command System (ICS) training and have been fingerprinted and passed background checks. Each member is also a State of California registered Disaster Service Worker.

Tracy is not the only city in our county with hams in its CERT program. In neighboring Manteca, the police department CERT group has several hams. We are in the process of training perhaps a dozen more. The fire department has its own group with a half-dozen ham members with some overlapping with CERT membership.

How is this the Future?

People get into CERT because they are interested in preparedness for their families and neighborhoods. Many have a strong "do-gooder" instinct looking for an outlet. CERT activities require communication. Whether day-to-day training, community events or an actual emergency, CERT members need to talk with one another, CERT leadership and their sponsoring agencies.

While some CERT groups have access to public safety radio systems, these don't offer the flexibility and "When All Else Fails" capability that Amateur Radio does. Members also don't get public safety radios to take home. I "sell" Amateur Radio to CERT members as a valuable tool for helping their community and CERT team that also happens to be a fun and interesting hobby if they choose to head in that direction.

The Role of the HamCram

Once sold, the CERT member needs a quick and easy way to get licensed and radio-trained enough to perform their CERT missions using ham gear. Enter the HamCram, a one day cram session — reading the question pools and answers repeatedly — that ends with the Technician exam.

I always — and only half-jokingly — warn attendees that they are likely to know less about radio when they leave the HamCram than when they arrived. Still, we have a 90 percent success rate, which makes it easy to build a cadre of hams within a CERT organization.

We follow up with training in how to use a radio and lots of ham propaganda to try to make these new HamCram hams more interested in the hobby. Probably 15 percent take the bait, and the other 85 percent have at least received a good introduction to the capabilities of Amateur Radio. Some of our CERT members are upgrading and starting to get onto HF.

Why ARES Needs CERT

One of the problems many ARES groups and clubs face is the graying of Amateur Radio. Our average age is somewhere in the mid-60s, meaning many hams aren't the active public servants they used to be. The pool of traditional "I am really interested in radio" young hams seems to have mostly dried up, our hobby replaced by the Internet and video games in the lives of people both young and old.

Our CERT members tend toward soccer moms and their husbands more than retirees. They are already signed-up for CERT activities, so getting some of them involved in non-CERT ARES activities is not much of a stretch.

Thus, Tracy CERT has created a pool of licensed operators who can respond either as CERT-trained ARES members or as ARES-trained CERT members, depending on the mission. The Tracy ARES group includes both CERT and non-CERT members, who work together in training and response operations.

Our non-CERT hams provide advanced ARES and communications capabilities that support CERT leadership and their members in the field. This works out quite well and without the friction that sometimes occurs in other locations. Does this mean CERT is taking over ARES, or vice versa? Hardly.

While our memberships overlap, each side has core members who think of themselves primarily as either a ham or a CERT member. They have their meetings, we have ours, and sometimes we meet together. Members of one can attend the other group's training.

This works out quite well, in no small part because Tracy CERT and the Tracy Amateur Radio Club are both young organizations that grew up side-by-side. More established organizations might have to work harder to make ARES and CERT behave as the sister organizations they should be.

GORDON GROVE, WA7LNC

Key Points

CERT organizations can provide the new blood that many ARES groups and ham clubs need. CERT members may be younger than the general Amateur population and come with a predisposition toward active community service. Amateur Radio provides communications that CERT needs. ARES can provide training, technology and communications leadership to CERT groups.

HamCrams are key to getting CERT members licensed easily and quickly, but must be followed by ongoing communications training. Having standardized radios, all programmed alike, makes it easier for ARES to support CERT members and their communications needs.

CERT and ARES working closely together expands the capabilities of both groups. While CERT is not a traditional entry to Amateur Radio, CERT members are naturals for carrying out our public service commitment to the FCC and the American people. This article is intended to introduce you to the possibilities of CERT and ARES working closely together. Your situation will surely be different from mine.

Still, Amateur Radio and CERT each have something the other needs — people and communications — so it's worth the effort to make the relationship work.

David Coursey, N5FDL, is Emergency Coordinator of San Joaquin County (CA) ARES, leader of the Tracy ARC, and a member of Tracy CERT. Visit his blog at **n5fdl.com**. *His e-mail address is* **n5fdl.arrl.net**.

Additional information on organizing a HamCram can be found at **www.n5fdl.com/hamcram**.

QUAD AT SUNRISE

Spokane County (Washington) hosted SKYWARN Recognition Day activities [on December 4, 2010] at the Spokane office of the National Weather Service. A pretty healthy snow storm preceded the event, so antennas had to be erected in much more early snow and than usual. That provided a great winter training activity (as it often does). Putting up a quad for 20 meters and delta loops for 40 meters and 80 meters in more than a foot of snow is an interesting experience in patience, tolerance and care (see photo).

The Spokane National Weather Service office is smothered in a high amount of RF noise from various sources. The 20 meter quad was *very* quiet, though all of the other bands used experienced high noise levels most of the time. Since the office is in the middle of a wheat field, several options for antenna set-ups exist, but getting far enough away for noise relief from the Doppler support shacks and the office building itself is quite difficult if not impossible. This is probably typical of most served agency installations and highlights the difficulty in dealing with those locations.

The event lead for this Spokane County ARES/RACES activity is Mary Qualtieri, AA7RT. — *Gordon WA7LNC, ARRL Section Emergency Coordinator, Eastern Washington,* **wa7lnc@arrl.net** QST

This Month in Contesting

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

TECHNOLOGY AND CONTESTING: GOOD OR BAD?

I'm writing this the weekend after the ARRL DX SSB contest. Conditions were excellent for both the CW and SSB runnings in 2011, with 10 meters being the surprise of both events. Oh, how we have missed you, 10 Meters! Welcome back to the fold.

It was pleasing to see so many folks operating with such good conditions. I received many a phone call the week after the contest from newer operators with a question about log submission. The universal comment I've heard has been, "I didn't know 10 meters could open like that." As good as it was in late February and early March, it will only get better as the solar flux rises from the 135 mark we saw on Sunday during DX SSB. To those newly licensed among us: Sit tight, it will get even better over the next couple of years.

I was able to put in good efforts at good stations this year in both events. Some things I observed (and comments read and overheard by others) caught my attention.

Questions arose over the role of technology in events. What is "spotting assistance," and is the use of it good or bad? Many Old Timers dislike the use of technology in competitive events, while the more tech savvy among us like having CW Skimmer and DX Summit integrated into our contest environment. I see both sides of the debate. Who, after all, can deny the benefits of spotting in Sweepstakes when going for that last-needed section for a Clean Sweep? But the use of technology is having an impact on the sport itself, regardless of category. It may be difficult for those licensed more recently to understand just how big an impact spotting assistance has had on contesting, or to fathom a time when it didn't exist.

Many operators are familiar with the Packet Pileup; you work somebody in a contest, they spot you on the packetcluster, and within seconds, you have a screaming horde of callers. The latest twist to this has been brought up on the contest reflectors after this year's DX CW; numerous people see a spot (either from the cluster or from their CW Skimmer), point their mouse, click a button in their logging program's band map and start calling the spotted station instantly. "I was able to maintain a 100-hour rate while search-and-pouncing doing this," one contester recently posted on the CQ-Contest reflector. The problem arises when multiple stations call perfectly zero-beat on the spotted station's frequency, starting and ending their calls at roughly the same time. It becomes very difficult, even for a seasoned CW operator, to discern a call among such cacophony. This affects *all* contest participants, regardless of their entry category.

Could we be seeing too much of a good thing? The bands are crowded on contest weekend, room to CQ is becoming tougher and tougher to find, and many ops are resorting to using assistance and high-speed search-and-pounce techniques as mentioned above to keep their rate up. This leads to another interesting byproduct: Stations don't ID as much as they used to. If you live and die by the packet pileup, why ID? Everybody knows your call already, right?

This method of operating has inherent drawbacks. Not everybody is using spotting assistance, and it's exceptionally frustrating to have to wait for many QSOs before hearing the station you're trying to work give their call, only to find out you've worked them already. Calling a station blindly without knowing their call can lead to being informed that you're a dupe, too. These scenarios are a waste of everybody's time; regular IDs by the running stations solve these problems. If lots of stations are asking for your call, you're not IDing enough.

Another issue with relying on spotting assistance is that the information in the spot can be incorrect. How many times has this happened to you: You see a spot for a nice juicy station…say BY7X in China. You excitedly go to the frequency listed in the spot, only to discover it's really 6Y7X in Jamaica…which you have already worked. This is, at minimum, a waste of time tracking a bad spot. At worst, if the station doesn't ID correctly and you log it based on the spotted information, you've just logged a bad QSO.

Spotting assistance is here to stay in contesting, but contest sponsors can (and should) offer different categories to cater to the participant's desired operating style. Have you ever operated an event without using spotting assistance? If not, try it a couple of times and see for yourself what you think. I've even heard rumblings from some of the higher-scoring Multioperator stations suggesting that they not use spotting assistance; I think that would be an interesting experiment.

Technology is great; it's the basis of our hobby. Maybe, though, it's time we recalibrate our views on technology's role in *competition*.

Sean's Picks

- **State QSO Parties this month:** 7th Area QSO Party (AZ, ID, MT, NV, OR, UT, WA, WY), New England QSO Party (CT, MA, ME, NH, RI, VT), Indiana, Nevada, Zeroland QSO Party (CO, IA, KS, MN, MO, ND, NE, SD).
- **QRP Contests This Month:** AGCW QRP-QRP Party (May 1), ARS Spartan Sprint (May 3), NAQPP Sprint (May 18), Flying Pigs Run for The Bacon (May 23), QRP-ARCI Hoot Owl Sprint (May 29), MI QRP Club Memorial Day CW Sprint (May 29-30)
- **MARAC CW & SSB Contest (May 1-2):** For all the county hunters! Coinciding with two multi-state QSO Parties, this is the weekend to go after those rare counties, or to go activate several of them from your mobile.
- **Volta RTTY DX Contest (May 8-9):** Work those zones! Exchange is a signal report, serial number and CQ zone.
- **50 MHz Spring Sprint (May 8-9):** 4 hours of fun on 6 meters, at the very beginning of the sporadic-E season. Exchange is your grid square.
- **CQ WPX CW Contest (May 29-30):** Call sign prefixes are the multiplier this weekend, making a KJ4 just as valuable as a 3DAØ. Dust off those rusty fists just one more time!

In the May/June "Contesting 101"

Following the sun. Kirk, K4RO, discusses basic propagation as it relates to contesting. Contesting 101 can be found in the *National Contest Journal*, published six times per year. For subscription information, visit **www.arrl.org/ncj**.

May 2011 W1AW Qualifying Runs

W1AW Qualifying Runs are 7 PM EDT (2300Z) Monday, May 2 and 9 AM EDT (1300Z) Friday, May 20 (10-40 WPM). The West Coast Qualifying Run will be transmitted by station K9JM on 3590 and 7047.5 kHz at 9 PM PDT Wednesday, May 11 (0400Z May 12). Unless indicated otherwise, speeds are from 10-35 WPM.

CONTEST CORRAL

in association with the *National Contest Journal*

MAY 2011

Start and Finish	HF	VHF+	Contest Title	Phone	CW	Digital	Exchange	Sponsor's Web Site or Contact
Apr 30, 1600Z - See website	7-28		Florida QSO Party	✘	✘		RS(T), FL county or S/P/C	www.floridaqsoparty.org
May 3, 0200Z - May 3, 0400Z	3.5-28		ARS Spartan Sprint		✘		RST, S/P/C, and power	www.arsqrp.blogspot.com
May 6, 0200Z - May 6, 0300Z	1.8-14		SNS and NS Weekly Sprints		✘		Serial, name, and S/P/C	www.ncccsprint.com/rules.html
May 7, 6 AM - May 7, 1 PM		902+	Microwave Spring Sprint	✘	✘	✘	Grid square (6-character preferred)	sites.google.com/site/springvhfupsprints
May 7, 0000Z - May 8, 2400Z		2.3G	Worldwide EME Contest	✘	✘		TMO/RS(T) and "R"	www.dubus.org
May 7, 0001Z - May 8, 2359Z	28		Ten-Ten Spring CW Contest		✘		Call sign, name, 10-10 number, state	www.ten-ten.org
May 7, 1300Z - May 8, 0700Z	1.8-28	50,144	7th Area QSO Party	✘	✘	✘	State and county code	7qp.org
May 7, 1600Z - May 8, 0400Z	1.8-28		Indiana QSO Party	✘	✘		RS(T) + S/P or IN county, DX RS(T) only	www.hdxcc.org/inqp
May 7, 1600Z - May 8, 0400Z	1.8-28		Zeroland QSO Party	✘	✘		S/P/C	www.zerolandqsoparty.com
May 7, 1700Z - May 8, 1700Z	1.8-28	50	Nevada QSO Party	✘	✘	✘	RS(T) and S/P/C or NV county	nv.arrl.org/nqp
May 7, 1700Z - May 8, 0459Z	3.5-21		Radio Club of America QSO Party	✘			RS, QTH, name, equipment	www.radio-club-of-america.org
May 7, 2000Z - May 8, 1959Z	1.8-28		ARI International DX Contest	✘	✘	✘	RS(T), serial or Italian province	www.qsl.net/contest_ari
May 7, 2000Z - May 8, 2400Z	3.5-28		New England QSO Party	✘	✘	✘	RS(T) and S/P or New England county	www.neqp.org
May 11, 1300Z - See website	3.5-14		CWops Monthly Mini-CWT Test		✘		Name, member number or S/P/C	www.cwops.org/onair.html
May 14, 0000Z - May 14, 2359Z	1.8-28		FOC QSO Party		✘		Name, FOC member number	www.g4foc.org
May 14, 1000Z - May 15, 2000Z	3.5-28		EUCW Fraternizing CW QSO Party		✘		RST, name, club, member number	www.agcw.org
May 14, 1200Z - May 15, 1200Z	3.5-28		Alessandro Volta RTTY DX Contest			✘	RST, serial, CQ zone	www.contestvolta.com
May 14, 1200Z - May 15, 2400Z	1.8-28		Armed Forces Comm'ns Test	✘		✘	RS(T)	www.netcom.army.mil/mars
May 14, 1200Z - May 15, 1200Z	1.8-28		CQ-M International DX Contest	✘	✘		RS(T) and serial	www.cq-m.andys.ru
May 14, 1500Z - May 15, 1500Z	3.5-28		Portuguese Navy Day	✘	✘		RS(T), serial, CQ zone	www.nra.pt
May 14, 1700Z - May 15, 2100Z	3.5-28		FISTS Spring Sprint		✘		RS(T), S/P/C, name, FISTS nr or power	www.fists.org/sprints.html
May 15, 1000Z - May 15, 1400Z	1.8-7		Worked All Britain - LF Phone	✘			RS, serial, and WAB nr or DXCC entity	www.worked-all-britain.co.uk
May 15, 2300Z - May 15, 0300Z		50	50 MHz Spring Sprint	✘	✘	✘	Grid square (6-character preferred)	sites.google.com/site/springvhfupsprints
May 19, 0030Z - May 19, 0230Z	3.5-14		NAQCC Monthly QRP Sprint		✘		RST, S/P/C, and NAQCC mbr nr or power	naqcc.info
May 20, 1500Z - May 20, 2000Z	1.8-28		Feld-Hell Hamvention Sprint			✘	RST, QTH, Feld-Hell number	www.feldhellclub.org
May 21, 0800Z - May 21, 1500Z	3.5-28		Portuguese Navy Day			✘	RST, serial, CQ zone	www.nra.pt
May 21, 1200Z - May 22, 1200Z	3.5-28		EU PSK DX Contest			✘	RST and EU area code or serial	www.eu.srars.org
May 21, 1200Z - May 22, 1200Z	1.8-28		His Majesty King of Spain Contest		✘		RST and serial or EA province	www.ure.es
May 28, 0000Z - May 29, 2400Z	3.5-28		CQ WW WPX Contest		✘		RST and serial	www.cqwpx.com
May 28, 2100Z - May 29, 0200Z	3.5		Baltic Contest	✘	✘		RS(T) and serial	www.lrsf.lt/bcontest/english/rules_html.htm
May 29, 8 PM - May 29, Midnight	3.5-28		QRP ARCI Hootowl Sprint		✘		RST, S/P/C QRP number or power	www.qrparci.org
May 29, 2300Z - May 30, 0300Z	1.8-28		MI QRP Memorial Day CW Sprint		✘		RST, S/P/C, MI QRP number or power	www.miqrp.org

All dates refer to UTC and may be different from calendar date in North America. Times given as AM or PM are local times and dates.
Refer to the contest websites for full rules, scoring information, operating periods or time limits, and log submission information.
No contest activity occurs on 60, 30, 17, 12 meters. 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.

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

www.arrl.org/fieldday

Field Day 2011 — Fun for All!

The largest on-air Amateur Radio event in the world is returning June 25-26. If you haven't already started planning your effort, now is the time to do so! Complete details and the official 2011 Field Day Kit can be downloaded at **www.arrl.org/fieldday**.

Is Field Day a contest, an emergency preparedness exercise, a public outreach event, or simply a fun day on the air away from home? As the largest, in terms of participation, on-the-air Amateur Radio operating event, Field Day is all of these things!

Field Day can take on many facets, depending on what you or your club wants to do with it. Whether you will be part of a large club effort in a city park or backpacking your way into the wilderness for a solo QRP effort, Field Day encompasses everything that is fun and good about Amateur Radio.

MILT COLEMAN, K4OSO

At W4ML, the Central Virginia Contest Club, Trey, son of Milt, K4OSO, just made a 15 meter SSB QSO at their GOTA station W4PM. Howard, W4PM, was the control operator.

VHF Stations and Field Day

For several years, ARRL has allowed Class 2A and higher stations to use a free VHF/UHF station to promote VHF/UHF activity. For 2011, this free station has been extended to *all* Class A stations!

Many Field Day participants see the event as an HF-only affair. Not so — thousands of VHF enthusiasts enjoy Field Day as well! With summer sporadic-E propagation, 6 and even 2 meters can have excellent openings hundreds of miles away. During such good conditions, 6 meters can be as packed as 20 meters. Both 144 and 440 MHz are the homes of many a satellite, which offers chances for bonus points.

VHF operation is perfectly tailored for Field Day. Antennas are small and portable, and QSOs are easy during a good opening. A 6 meter dipole is less than 10 feet long, and small beams or loops for 144 MHz or 440 MHz are easy to construct. See *The ARRL Handbook* or *The ARRL Antenna Book* for easy homebrew VHF antenna projects.

If you have never used VHF/UHF in your Field Day effort, the ARRL has created a PDF document to get you started. *Field Day VHF Operating Tips* gives frequency allocations and band plans, VHF/UHF operating techniques, antenna suggestions, brief propagation tutorials and other useful information for the VHF beginner. You can find the paper at **www.arrl.org/fieldday**. Like an employer's matching funds in a retirement account, don't miss this opportunity to get something for nothing.

JEFF HATTRICK PHOTOGRAPHY

Eight Boy Scouts from Troops 69, 2000 and 3000 joined the North Fulton ARL for Field Day and went for their Radio Merit badge at the site. After helping put up antennas during setup, the scouts got down to business to pass their merit badge qualifications under the direction of Wes, W3WL, at the rig. Pictured here are the scouts getting ready to make their first FD contacts under the eye of Georgia Senator Johnny Isakson (red shirt).

Don't Forget Public Relations Bonuses

How would you like to be a hero and bring in 500 FD points for your group before a radio contact is ever made? The whole purpose of Field Day is for Amateur Radio to tell its story to our friends, our neighbors, our communities and the leaders in our communities. As you plan Field Day, why not "think outside the box" and earn some bonuses for doing so?

✔Instead of heading to a mountaintop, how about a WalMart lot?

Being in a conspicuous public place is good for *100 points*

✔Instead of just telling your fellow hams and club members, how about telling the newspapers and local radio and TV? Press release samples are available at **www.arrl.org/pio** or in the Field Day Information Packet.

Having a media release or link is good for *100 points*

✔Instead of staffing a radio, how about manning a public information table with brochures, signs and a smile?

Having a public information table/center is good for *100 points*

✔Instead of glad-handing the mic, how about shaking hands with your area's elected officials and politicians? A sample invitation is in your Field Day packet.

If an *invited* elected local official visits, you earn *100 points*

✔Instead of talking *to* a served agency, how about inviting one of their leaders to come down and visit you, perhaps even getting to talk on your radio?

If an invited official served agency representative visits, it's another *100 points*

Total = 500 points!

Basic Info

When: 1800 UTC Saturday June 25 through 1759 UTC Sunday, June 26.

Setup: Stations may not begin setting up until 1800 UTC Friday, June 24. If you wait until 1800 UTC Saturday to begin setup, you may operate until 2100 UTC Sunday.

Reporting Your Score: All scores must be received at ARRL HQ no later than July 31, 2011. Participants are *strongly encouraged* to use the online Field Day score reporting system at **www.b4h.net/cabforms**. You get the instant satisfaction of your score summary being accepted, with a receipted copy e-mailed to you for verification — and you earn 50 bonus points!

Use the Field Day Locator! Want to tell the world where your club's Field Day effort will be? Going to be out of town and want to find a Field Day site to join? You can do both at the ARRL Field Day Locator page. Visit **www.arrl.org/field-day-locator** and get started!

New for 2011: All Class A stations (club/non-club portable) receive a *free* VHF+ station! Don't leave free points on the table! For ideas on VHF station implementation and operation, download the Field Day VHF Operating Tips PDF at **www.arrl.org/fieldday**.

Questions? E-mail Field Day Manager Dan Henderson, N1ND, at **n1nd@arrl.org**.

2010 ARRL November CW Sweepstakes Results

There's a first time for everything!

Kelly Taylor, VE4XT
ve4xt@mts.net

In Game One of the 1936 Stanley Cup finals, the Detroit Red Wings finally defeated the Montreal Maroons at 16:30 of the sixth overtime — the equivalent of nearly three full games. A minor-league baseball game in 1981 went 33 innings before a winner was declared.

In Sweepstakes there is no overtime, no playoff, no extra innings and no shootout. When the logs are checked and the numbers tallied, they are what they are. Ties at the top have never happened before in the single-op categories, but after 2010's November 6-8 running of the CW Sweepstakes, it's finally come about that Pat, N9RV, and Mark, AG9A (operating NØNI), shake hands as the cowinners of the contest.

Mark, AG9A, said that as rare as a tie may be, it is a sign that there's no time to rest when trying to win SS. "It goes to show that every decision you make, every QSO you lose (for whatever reason) and QSOs that you weren't quite able to complete can make the difference between winning and tying or dropping a spot," Mark writes. "I do know that Pat had more QSOs than I did at the end of the contest, so I assume that the (log checking) made the difference." That's something Pat humbly acknowledges. "The tie has to do with all of my logging errors."

Only 2200 points, or 14 QSOs, separated fourth-place WDØT from the cowinners. In third place, Dan, K1TO, actually finished with more QSOs than Pat and Mark, but with one fewer section. Missing Puerto Rico cost him the victory.

Regional Competition

One of the realities of any contest is that some parts of the world — or of the continent, in the case of Sweepstakes — have big advantages over others. Talk to a variety of East Coast operators and they'll tell you that it's easy to jump into the lead at the start, but as Sunday rolls around, "score compression" (as High Power cowinner Pat, N9RV, calls it) begins. Once that happens, the lead built up on the low bands by many East Coasters disappears. It's a key reason Sweepstakes has not been won by a W1 in a long time.

Talk to anyone who wins High Power from anywhere other than Puerto Rico and invariably they will thank their lucky stars there wasn't a competitive effort from that US possession. So for many operators, either because of geography or the reality of a just-average station, the ability to win their region or their division is an important achievement.

Earl, N8SS, says his goals for 2010 were to finish Top 10 (achieved), win the Great Lakes Division (achieved) and set the Michigan state record (achieved). On a regional basis, he came out on top of some top-notch operators, too. Steve, N9CK, missed snatching Earl's Central Region crown by a mere 14 QSOs. Also hot on Earl's and Steve's tails was Hal, W1NN, who is showing up more and more, it seems, from his Ohio location than from his adopted country of Japan.

"Next year will probably be different as now that I have a Top 10 finish I may have to slide my goals up a little higher. And since the overall (win) is very elusive, I may have to have a more realistic goal of a (top) Regional finish," Earl writes.

"I always look at the regional score charts for Sweepstakes. It's a good way to gauge how you do with others in your region," said Steve, N9CK. In many ways, Steve's approach is a healthy approach to a contest when your geography might preclude an overall win.

Some of the most interesting regional and divisional victories: Art, K1BX, who squeaked out a win in the Northeast Region over WY3A in Low Power by only three QSOs. NY3A eked out a tight victory in the Unlimited category over W1UJ in the Northeast Region by a mere 24 QSOs. In High Power, also in the Northeast Region, N2NT (operated by John, N2NC) beat Jeff, K1ZM, operating from his Prince Edward Island, Canada location as VY2ZM, by 91 QSOs.

Not surprisingly, some of the tightest regional battles involved those who won their categories. Ken, N6RO, edged perennial Unlimited favorite Dave, K6LL, by only three QSOs — not only overall but also in the West Coast Region. Pat, N9RV, the overall cowinner in High Power, beat his West Coast rival Tree, N6TR, operating at KL7RA, by only 34 QSOs and one section.

Kirk, NØKK, operating at NØAT, beat Syl, VE5ZX, for the second spot in the Low Power category for the Midwest Region by eight QSOs.

QRP (Q) Category

You would think that in a contest with as complicated an exchange as SS, a category limited to less power than lights the dial face

2010 ARRL Sweepstakes, CW

Single Operator, High Power

TIE: N9RV, NØNI (AG9A, op)	232,480
K1TO	231,628
WDØT	230,240
KL7RA (N6TR, op)	224,202
N2NT (N2NC, op)	223,360
W5KFT (K5PI, op)	222,560
WXØB (K5GA, op)	222,306
K5GO	222,080
K6LA	218,720

Single Operator, Low Power

KØEU	201,120
K7BG	196,552
N4OGW	192,480
K4XU	174,240
N8SS	171,746
N9CK	170,482
NØAT (NØKK, op)	168,640
VE5ZX	166,720
W1NN	165,742
N6ZFO	165,600

Single Operator, QRP

K8MM	157,120
K4RO	133,600
KØAV	117,552
KR2Q	113,256
NN7SS (K6UFO, op)	112,654
NC7W	110,126
NØUR	109,810
N7IR	105,456
W7YAQ	102,226
K9ZO	101,400

Single Operator, Unlimited

N6RO	207,680
K6LL	207,360
N4BP	204,480
KB7Q	195,840
N4ZZ	195,040
KY7M	190,240
W4MR (AA4NC, op)	189,440
K6TA (N6BV, op)	187,704
W6RK	187,360
N6DE (@ K6IDX)	185,440

Multioperator

W6YI	222,880
KP2M	214,400
W2FU	209,120
K5CM	202,720
K2NNY	201,280
W1AW	200,000
W2RE	197,440
ABØS	189,916
NC7J	187,040
W4RM	183,280

School Club

W6YX (N7MH, op)	203,200
KØHC (WØBH, op)	175,360
W1MX (KBØVVT, op)	131,840
W4UAL	73,440
N9UC (WO9S, op)	60,060
N5XU (AA5BT, op)	16,016
W8SH (WB8LZG, op)	8,232
W2DSC (WB2NVR, op)	1,664

Sponsored Plaque Winners for CW Sweepstakes

We are pleased to announce that the Overall and Division Leaders in each category receive a sponsored Sweepstakes plaque. ARRL is grateful to ICOM America and numerous clubs and individuals for sponsoring Sweepstakes awards. For more information on awards sponsorship, or to order a duplicate plaque, contact ARRL Contest Branch Manager Sean Kutzko, KX9X, at 860-594-0232 or by e-mail at **kx9x@arrl.org**. Plaques cost $75 each, which includes all shipping charges.

Division/Plaque Category	*Winner*	*Plaque Sponsor*
Overall		
Single Operator High Power CW	*TIE:* N9RV and NØNI (AG9A, op)	Trey Garlough, N5KO
Single Operator Low Power CW	KØEU	Sean Kutzko, KX9X
Single Operator QRP CW	K8MM	QRP Amateur Radio Club International
Single Operator Unlimited CW	N6RO	Joe, KO4RR and Victoria, N4WV
Multioperator CW	W6YI	In Memory of Jerry Grokowsky, WA9HCZ
School Club CW	W6YX (N7MH, op)	Straight Key Contest Club
Atlantic		
Single Operator High Power CW	AA3B	North Coast Contesters
Single Operator Low Power CW	WY3A	Potomac Valley Radio Club
Single Operator QRP CW	K2ZR	Milt Coleman, K4OSO
Single Operator Unlimited CW	NY3A	ICOM America
Multioperator CW	W2FU	North Coast Contesters
School Club CW	No Entrant	
Central		
Single Operator High Power CW	W9RE	Society of Midwest Contesters
Single Operator Low Power CW	N9CK	Society of Midwest Contesters
Single Operator QRP CW	K9ZO	Sean Kutzko, KX9X
Single Operator Unlimited CW	NE9U	Straight Key Contest Club
Multioperator CW	W9UX	ICOM America
School Club CW	N9UC (WO9S, op)	ICOM America
Dakota		
Single Operator High Power CW	WDØT	Minnesota Wireless Association
Single Operator Low Power CW	NØAT (NØKK, op)	Minnesota Wireless Association
Single Operator QRP CW	NØUR	Tod Olson, KØTO
Single Operator Unlimited CW	K1KD	Minnesota Wireless Association
Multioperator CW	KØHB	Minnesota Wireless Association
School Club CW	No Entrant	
Delta		
Single Operator High Power CW	K5GO	ICOM America
Single Operator Low Power CW	N4OGW	ICOM America
Single Operator QRP CW	K4RO	ICOM America
Single Operator Unlimited CW	N4ZZ	ICOM America
Multioperator CW	W5RU	ICOM America
School Club CW	No Entrant	
Great Lakes		
Single Operator High Power CW	W5MX	North Coast Contesters
Single Operator Low Power CW	N8SS	Mad River Radio Club
Single Operator QRP CW	K8MM	Mad River Radio Club
Single Operator Unlimited CW	K4FXN	KD8LL and K4EQ — N8CVH Memorial
Multioperator CW	W8EDU	ICOM America
School Club CW	W8SH (WB8LZG, op)	In memory of Raleigh Wert, W8QOI
Hudson		
Single Operator High Power CW	N2NT (N2NC, op)	ICOM America
Single Operator Low Power CW	W2LK	ICOM America
Single Operator QRP CW	KR2Q	ICOM America
Single Operator Unlimited CW	K2QMF	ICOM America
Multioperator CW	WT4Q	Stuart Silverstein, K3UEI, Memorial
School Club CW	W2DSC (WB2NVR, op)	ICOM America
Midwest		
Single Operator High Power CW	NØNI (AG9A, op)	ICOM America
Single Operator Low Power CW	KØVBU	Society of Midwest Contesters
Single Operator QRP CW	NC7W	ICOM America
Single Operator Unlimited CW	NØXR	ICOM America
Multioperator CW	ABØS	ICOM America
School Club CW	KØHC (WØBH, op)	ICOM America
New England		
Single Operator High Power CW	K1RX	Mark Olsen, KF1V
Single Operator Low Power CW	K1BX	Michael McKaughan, K1DM
Single Operator QRP CW	W1ECH	Mark Olsen, KF1V
Single Operator Unlimited CW	W1UJ	Mark Olsen, KF1V
Multioperator CW	W1AW	Mark Olsen, KF1V
School Club CW	W1MX (KBØVVT, op)	Mark Olsen, KF1V
Northwestern		
Single Operator High Power CW	N9RV	ICOM America
Single Operator Low Power CW	K7BG	Paul Beringer, NG7Z — Western Washington DX Club
Single Operator QRP CW	NN7SS (K6UFO, op)	Phil Yasson, AB7RW
Single Operator Unlimited CW	KB7Q	ICOM America
Multioperator CW	K7OX	ICOM America
School Club CW	No Entrant	
Pacific		
Single Operator High Power CW	K6XX	The Carroll Dean Jensen Memorial (K6CDJ)
Single Operator Low Power CW	N6ZFO	Robert A. Wilson, N6TV
Single Operator QRP CW	W6JTI	Jim Davis, NN6EE
Single Operator Unlimited CW	N6RO	ICOM America
Multioperator CW	K6SU	Straight Key Contest Club
School Club CW	W6YX (N7MH, op)	ICOM America
Roanoke		
Single Operator High Power CW	N4AF	Potomac Valley Radio Club
Single Operator Low Power CW	W4IX	ICOM America
Single Operator QRP CW	W7IY	ICOM America
Single Operator Unlimited CW	W4MR (AA4NC, op)	ICOM America
Multioperator CW	W4RM	ICOM America
School Club CW	No Entrant	
Rocky Mountain		
Single Operator High Power CW	WØUA	Grand Mesa Contesters of Colorado
Single Operator Low Power CW	KØEU	ICOM America
Single Operator QRP CW	KØAV	Colorado QRP Club
Single Operator Unlimited CW	WØZA	ICOM America
Multioperator CW	NC7J	ICOM America
School Club CW	No Entrant	
Southeastern		
Single Operator High Power CW	K1TO	Tom Alderman, W4BQF
Single Operator Low Power CW	N4WW (KØLUZ, op)	David Brandenburg, K5RQ
Single Operator QRP CW	N4JF	Straight Key Contest Club
Single Operator Unlimited CW	N4BP	Charlie Wooten, NF4A
Multioperator CW	KP2M	ICOM America
School Club CW	W4UAL	David Brandenburg, K5RQ
Southwestern		
Single Operator High Power CW	K6LA	ICOM America
Single Operator Low Power CW	K8IA	Larry Serra, N6NC
Single Operator QRP CW	N7IR	N6HE and W6DLD
Single Operator Unlimited CW	K6LL	ICOM America
Multioperator CW	W6YI	ICOM America
School Club CW	No Entrant	
West Gulf		
Single Operator High Power CW	W5KFT (K5PI, op)	David Brandenburg, K5RQ
Single Operator Low Power CW	N5DO	David Brandenburg, K5RQ
Single Operator QRP CW	N5NA	In Memory of Mick Lange, WB5RSS
Single Operator Unlimited CW	N5JB	ICOM America
Multioperator CW	K5CM	ICOM America
School Club CW	N5XU (AA5BT, op)	David Brandenburg, K5RQ
Canada		
Single Operator High Power CW	VY2ZM (K1ZM, op)	ICOM America
Single Operator Low Power CW	VE5ZX	ICOM America
Single Operator QRP CW	VA3SB	QRP Amateur Radio Club International
Single Operator Unlimited CW	VE7XF	ICOM America
Multioperator CW	VE6EX	Straight Key Contest Club
School Club CW	No Entrant	

on a Ham-IV rotator control box would be a tough sell. Yet, QRP is the fourth-most popular category for CW Sweepstakes with 143 logs. (Low Power — 649 logs, Unlimited — 356 logs, High Power — 256 logs, QRP — 143 logs, Multioperator — 57 logs and School Club — 8 logs was the order of popularity.)

Ian, K8MM, leads the way with 982 QSOs, 80 sections and 157,120 points. On his heels are Kirk, K4RO; Alan, KØAV; Doug, KR2Q; Mark, K6UFO (@NN7SS); Dave, W7FB operating NC7W; Jim, NØUR; Gary, N7IR; Bob, W7YAQ, and Ralph, K9ZO.

Low Power (A) Category

The very busy A category, with some 649 logs, was won by Randy, KØEU, with Matt, K7BG, right behind. Randy has won four out of the last five CW Sweepstakes in Low Power, surrendering first place in 2009 to N5AW. It's shaping up to be quite the friendly rivalry between Randy and Matt. For his part, Matt, having had his 10th straight year in the Top 5, says he needs to improve his accuracy after developing some skills at two-radio contesting (SO2R). Tor, N4OGW, continues to bear Mississippi's flag well, placing third and only about 4000 points behind Matt. Because Matt lost one section to log checking, Tor's sweep means he needed just 28 more QSOs to claim Number 2. Once again, it's crowded at the top.

From there, the gap widens. Fourth place went to Dick, K4XU, in Oregon while Earl, N8SS, and Steve, N9CK, battled for fifth place, separated by just eight QSOs. You can read more about Steve and Earl in the Regional Competition section.

Kirk, NØKK, rode NØAT to eighth place while Syl, VE5ZX, and Hal, W1NN, fought for the last two Top 10 positions. Hal actually

beat Syl's 1042 QSOs by 7 but Syl's sweep made the difference to Hal's 79 sections.

Category Winners

Category	Call	Score	QSOs	Mults	Section
Single Operator High Power — TIE!	N9RV	232,480	1,453	80	MT
Single Operator High Power — TIE!	NØNI (AG9A, op)	232,480	1,453	80	IA
Single Operator Low Power	KØEU	201,120	1,257	80	CO
Single Operator QRP	K8MM	157,120	982	80	MI
Single Operator Unlimited	N6RO	207,680	1,299	80	EB
Multioperator	W6YI	222,880	1,393	80	SDG
School Club	W6YX (N7MH, op)	203,200	1,270	80	SCV

High Power (B) Category

There is no tiebreaker in the rules for SS if for no other reason than there's never been a need for one. But if there were, about the only metric that would have made any difference is minutes operated. Cowinners Mark, AG9A (operating from NØNI), and Pat, N9RV, had the same number of QSOs (1453) and the same number of sections (80). The only thing separating the two was minutes operated. Mark achieved his score operating 1436 minutes to Pat's 1438.

Like Low Power, High Power is also crowded at the top, with fewer than 100 QSOs spread across the Top 10. After the cowinners are Dan, K1TO, with Todd, WDØT, right behind. Because of Dan's 79 sections to Todd's sweep, Todd would have needed just seven more QSOs to take second (or third, depending on how you look at it) place.

Tree, N6TR, traveled to KL7RA for fifth place, followed by John, N2NC (operating at N2NT); Robert, K5PI (operating atW5KFT); Bill, K5GA (operating WXØB); Stan, K5GO, and Ken, K6LA.

Unlimited (U) Category

Dave, K6LL, who regularly appears at or near the top of Unlimited, once put it best why the category is popular, "Who wants to be 'Limited'?" So it's no surprise that U is the second-most popular category after A. Because it allows for the use of spotting networks, rare is the U operator who doesn't get a sweep and that's certainly true for the Unlimited Top 10, where none of the operators missed a section.

Ken, N6RO, won Unlimited, beating K6LL by only three QSOs. Ken's station is a multi-multi powerhouse, with towers for 40, 20, 15 and 10, loops and four-squares for 80 and a four-square for 160. As such, it's actually suited well to two-radio (SO2R) contesting, with lots of separation between towers to cut down on interference.

Only 18 QSOs behind K6LL was Bob, N4BP. Rounding out the heavily western Top 10 were Gene, KB7Q; Don, N4ZZ; Lee, KY7M; W4MR, operated by Will, AA4NC; K6TA, operated by Dean, N6BV; Risto, W6RK, and Dean, N6DE, operating at K6IDX. All told, seven of those stations were from the west, from Montana to East Bay to Sacramento Valley and Arizona.

COURTESY GEORGE WAGNER, K5KG

George Wagner, K5KG, traveled to Dickinson, North Dakota to break that section's Single Operator, Low Power record set back in 1992 by long-time North Dakota mult WBØO. With 966 QSOs and a Sweep from the NØUD club station, George walked away with the new record!

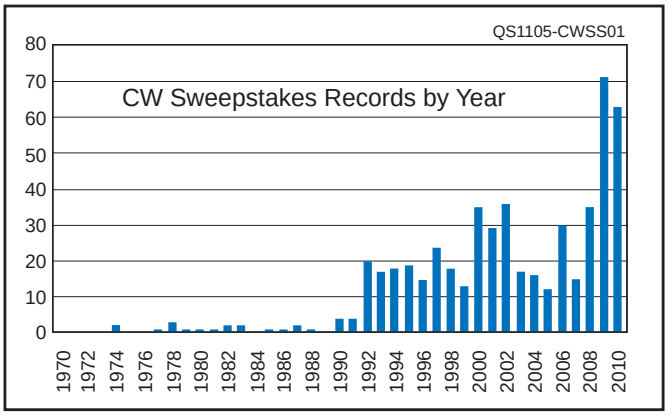


Figure 1 — A histogram showing the number of records set in each year of CW Sweepstakes since 1970. The oldest current records are a pair from 1974. There are only 18 records still standing from before 1990. Seventy-one records were set in 2009 and 63 in 2010.

Multioperator (M) Category

A short contest such as SS doesn't cry out for a Multioperator category the way a 48 hour contest might, yet it remains a popular entry category with 57 logs submitted for 2010. Like most stations, the Multioperator winner W6YI team is always looking to improve. For 2010, they added a new 15 meter beam and Elecraft K3 transceivers. Jim, W6YI, says operating from California is a challenge without the natural 80 meter cluster of stations that stations farther east might enjoy. "We have both lost and won by small margins (as little as one QSO)," he writes.

KP2M, operated by Dave, N3XF, and Bob, W1EQ, took second, followed by W2FU (watch those phonetics on SSB, okay?). K5CM and K2NNY round out the Top 5.

The most famous station in history, W1AW, took sixth place, piloted by ARRL Contest Branch Manager Sean, KX9X, regular *QST* contributor Ward, NØAX, and ARRL Emergency Preparedness Manager Mike, W5MPC. W2RE, ABØS, NC7J and W4RM rounded out the Top 10.

School Club (S) Category

One thing that's proven true year after year is that everybody makes Top 10 in School Club. And that's a shame, because it means there are usually fewer than 10 logs submitted. Rule changes that opened up the category to allow alumni to "Elmer" students and staff should help boost some interest in the category, so get the word out. Plus, there are a *lot* of records to be set in the School Club category.

For the first time in a long time, KØHC, operated by Bob, WØBH, is not Number 1. That honor belongs to Mike, N7MH, who drove W6YX at the Stanford Amateur Radio Club to a very respectable 1270 QSOs and 80 sections for 203,200 points. It isn't often that the School Club winner has scores above the leading Low Power category score.

Bob, WØBH, is Number 2 at 1096 QSOs and is followed by another respectable score put in by Rebecca, KBØVVT, operating at W1MX, the club station of the Massachusetts Institute of Technology Radio Society.

The University Amateur Radio Club in Tuscaloosa, Alabama, W4UAL, took fourth while Jon, WO9S, operating at the University of Chicago Amateur Radio Society's N9UC, was fifth. Derek, AA5BT, operating at N5XU, the Amateur Radio Club of Texas was sixth; Gregg, WB8LZG, at the Michigan State University's W8SH was seventh and the eighth spot went to Robert, WB2NVR, who operated NYU Amateur Radio Club W2DSC.

Online Extended Version

For more about the contest including conversations with the leaders, please log onto the ARRL website at **www.arrl.org/contest-results-articles**. You'll find photos and comments from the contest entrants on the ARRL Soapbox page at **www.arrl.org/soapbox**.

2010 ARRL International EME Competition Results

The best DX on Earth...and the moon, too.

Jeremy Alexander, W7EME
jeremy@w7eme.org

The 32nd annual 2010 ARRL International EME Competition once again provided vigorous activity and produced incredible scores. As technologies continue to offer new ways to aid the EME station, QSO rates are increasing. Smaller stations are scoring higher and bigger total scores have been logged by most participants. Portable operators made a larger appearance in the competition this year, too.

Portable EME operations are becoming more significant during this contest, often being from rare and even First Activations of new grids, zones and DXCC entities. I have personally seen the first three Worked All Zones (WAZ) occur on 144 MHz during my portable operations.

The event features three separate weekends of competition. For the accomplished microwave contester, the initial weekend of September 4-5 offered operation on the 2.3 GHz and up microwave bands. Competition on 50 MHz through 1296 MHz is always held on two separate weekends. This year, the "good Moon" rose on October 2-3 and 30-31.

The overall highest score and the first-place winner of the Multioperator, All Mode, All Band category went to Team K1JT with a new All-Time record of 6,643,200 points. The first-place winner of the Single Operator, All Mode, All Band category was Kozlov, UA3PTW, who also produced the second-highest overall score of 2,575,800 points. Very closely trailing Kozlov in the same category was Viljo, ES5PC, with 2,488,800 total points. Turning in a huge score in the Single Operator, CW Only, All Band category was Dimitris, SV1BTR, with 2,208,900 total points. A very close finish to Dimitris was Stig, OZ4MM, with 2,147,300 points. The table shows the top scores for each category.

Top Scores by Category

Category	Call	Score	Phone/CW	Digital	Mults
Single Operator CW Only All Band	SV1BTR	2,208,900	199	0	111
Single Operator All Mode All Band	UA3PTW	2,575,800	76	168	106
Single Operator All Mode 50 MHz	3D2LR (W7GJ, op)	10,800	0	12	9
Single Operator CW Only 144 MHz	OK1MS	80,500	35	0	23
Single Operator All Mode 144 MHz	RK3FG	1,405,800	0	198	71
Single Operator CW Only 432 MHz	I1NDP	103,200	43	0	24
Single Operator All Mode 432 MHz	OK2POI	33,600	7	14	16
Single Operator CW Only 1.2 GHz	SM4IVE	503,100	117	0	43
Single Operator All Mode 1.2 GHz	OK2DL	401,800	96	2	41
Single Operator All Mode 2.4 GHz	OK1CA	116,100	43	0	27
Single Operator All Mode 10 GHz	ON5TA	4,800	8	0	6
Multioperator CW Only All Band	SP6JLW	666,400	119	0	56
Multioperator All Mode All Band	K1JT	6,643,200	129	255	173
Multioperator All Mode 144 MHz	RU1AA	2,184,000	12	254	84
Multioperator CW Only 432 MHz	OH2PO	134,400	56	0	24
Multioperator CW Only 1.2 GHz	DLØSHF	492,800	112	0	44
Multioperator All Mode 1.2 GHz	DL6SH	280,800	63	15	36
Multioperator All Mode 2.4 GHz	SP6OPN	86,400	36	0	24
Multioperator All Mode 5.7 GHz	OK1KIR	8,000	10	0	8

MARC FRANCO, N2UO

Marc, N2UO, in North Carolina used his new homebrew 20 foot dish and 350 W on 1296 MHz to make 91 QSOs, earning second place in the Multi-operator CW Only, 1.2 GHz category.

Statistics and Observations

A total of 109 logs were received this year. There were many more participating stations than there were logs received on every band.

Another huge turnout on 1296 MHz and 2.4 GHz: these two bands see more activity every year and the scores continue to rise.

There were very close races in these categories:

- Single-Operator, CW Only, All Band: SV1BTR and OZ4MM
- Single-Operator, All Mode, All Band: UA3PTW and ES5PC
- Single-Operator, All Mode, 144 MHz: RK3FG and IK1UWL
- Multioperator, All Mode, 144 MHz: RU1AA and IK3MAC
- Single-Operator, CW Only, 1296 MHz: SM4IVE

Looking at the scores, it is apparent the 2010 ARRL International EME Competition brought out the contesting mood. Large scores were once again seen through the use of increasingly user-friendly wideband reception techniques, improvements in the digital modes and the likely contribution from the large population on Internet chat websites. This phenomenon illustrates that the collective mass of the chat environment is adding more than just a few points to the contest log.

See You on the Moon

Please plan to participate in the 33rd Annual ARRL International EME Competition in September and October (watch the contest website for date announcements — **www.arrl.org/eme-contest** — and give yourself a challenge in a demanding contest.

Line Scores On the Web

The complete listing of all contest scores and a breakdown of activity by band is available online at **www.arrl.org/contests**.

Outdoor Hams Scholarship Approved

Earlier this year the ARRL Foundation Board of Directors unanimously approved The Outdoor Hams Scholarship. This newest award is generously supported by the Outdoor Hams, Inc of North Carolina. The annual award will be $1000 to a young active radio amateur who incorporates Amateur Radio into outdoor activities. Preference will be given to applicants from North Carolina or the ARRL Roanoke Division who plan higher education studies in a technical field. As with all ARRL Foundation Scholarships, the award will be sent directly to the winner's college of choice to be applied to tuition, books, fees or other educational expenses.

The ARRL Foundation manages a robust scholarship award program. In 2011 more than 240 applications were received. A total of 79 scholarships will be awarded valued at $83,450. The awards are announced each May and June and the winners are notified by letter. The complete list of scholarship winners will be posted on the ARRL website.

The 2012 application period for students opens October 1, 2011 and closes promptly on February 1, 2012. All the information about the scholarship program is available only on the ARRL website at **www.arrl.org**, including descriptions of the awards, application forms and instructions.

Individuals or Amateur Radio organizations interested in establishing a scholarship to assist young hams who are pursuing higher education should contact the ARRL Foundation Secretary by e-mail at **foundation@arrl.org** or by telephone at 860-594-0397.

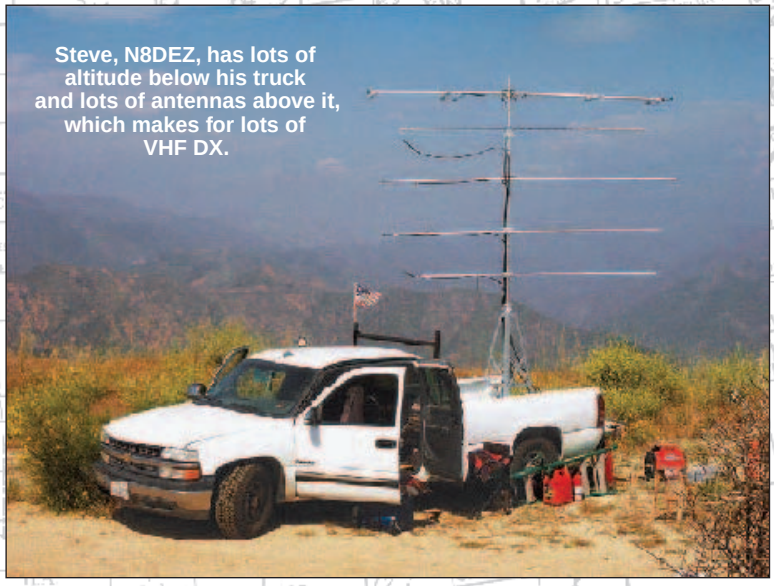
Mary M. Hobart, K1MMH ♦ Secretary, ARRL Foundation Inc ♦ mhobart@arrl.org

2011 ARRL June VHF QSO Party

1800Z Saturday, June 11 – 0259Z Monday, June 13

- Sporadic-E propagation peaks in the Northern Hemisphere between May and August. For VHF action, this means excellent openings on 6 and even 2 meters. The ARRL June VHF QSO Party capitalizes on the sporadic-E season. If ole Sol and the ionosphere cooperate, we will have excellent propagation, which, combined with heavy contest activity, is the recipe for some serious fun!
- Many all-band rigs made today come equipped with a VHF band or two. Take your rig, and an antenna for 6 or 2 meters and set them up in your backyard or on a nearby hilltop; operate from your car or operate portable from a rare grid square and be the DX!

COURTESY STEVE SMITH, N8DEZ



Steve, N8DEZ, has lots of altitude below his truck and lots of antennas above it, which makes for lots of VHF DX.

E-mail logs to junevhf@arrl.org or submit paper logs to ARRL June VHF QSO Party, 225 Main St, Newington, CT 06111. Logs must be postmarked by 0259 UTC Wednesday, July 13, 2011.

Want more information? Go to www.arrl.org/june-vhf-qso-party for all the rules.

W3UR

HOW'S DX?

A Holiday Style Operation to Barbados

A journey to a rare or somewhat rare foreign location using Amateur Radio is called a DXpedition. It could be to a remote island or to a country with few or no ham radio operators. The main purpose of the DXpedition is to work as many stations as possible. A DXpedition can be done by one or more Amateur Radio operators called DXpeditioners. Not every Amateur Radio operator gets a chance to go on a DXpedition.

Holiday Style Operation

A holiday style operation is when an Amateur Radio operator goes away from his or her home location for a little rest and relaxation and takes along Amateur Radio equipment in order to get on the air and have some fun. It can be to the beach or the mountains but can also be to another country or an island getaway. The operator doesn't feel the need to be on the air 24/7 and can operate at his or her own pace. That is, they can get on the air when they want and close when they want as they are under no obligations to anyone but themselves and their family. Many Amateur Radio operators have the opportunity to go on such a holiday style operation.

Destination 8P — Barbados Island

Until about 5 years ago my Mom and Dad, N3ME, would go away once a year for a week or 10 days to the Caribbean. It is a great way to get away from the cold dreary winter and to enjoy the fun and sun down south. Dad would always take his rig and a dipole and get on the air in his spare time.

Shortly after his last trip I mentioned to him that Becky, my wife, and I would be interested in joining them the next time they went. In the late fall of 2010 Dad (Tony) mentioned he and Mom were going to Barbados for 3 weeks and asked if we might be interested in joining them. We said yes and my wife immediately went online and found the best flights at the best rates.

Due to our work schedules we could only stay for 10 days. Dad had made arrangements for a rental house through Dr Peter Cross, 8P9NX/WØSA. Peter has two friends who rent out houses. Dad chose Surfsong, located in Wellhouse, St Philip Parish on the southeast side of the island near Cave Bay. Arrangements were made with Amy Beam, a newly licensed Amateur Radio operator who is awaiting issuance of her call sign.

Equipment

We were very fortunate that Peter had some spare equipment and loaned it to us during our stay. He supplied two verticals. One was a homemade 43 foot vertical (80-10 meters) and the other was a Cushcraft MA160, specifically for 160 meters. He also had an MFJ high power tuner and a Tokyo High Power amplifier along with coax and other miscellaneous items.

About a week before departing I ordered a new Pelican suitcase, in which we would be able to hand carry an Elecraft K3 transceiver and Astron SS-25 switching power supply. Dad packed his Heil headset and I my Bencher BY-1 paddle. Having never traveled with a rig as my carry-on since 9-11 I was a little concerned about the Transportation Security Administration (TSA). When we got to the security check the Pelican went right through the X-ray machine. They then asked whose luggage this was and then took it over to do a chemical analysis and then handed it back with no problems.

LoTW

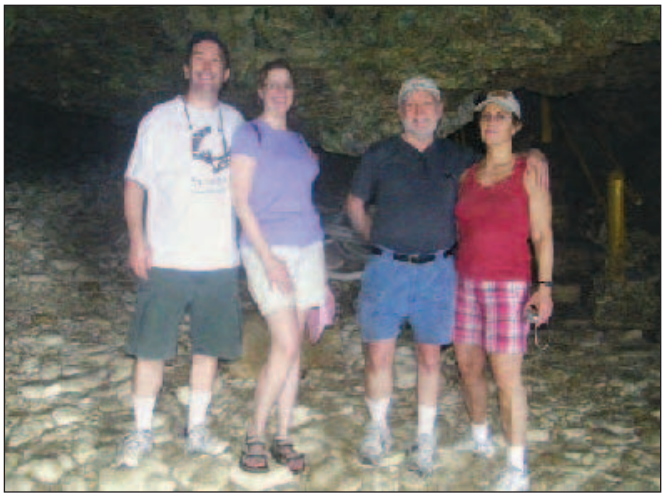
Before leaving for Barbados we received our Bajan call signs, again thanks to the

A Pelican iM2450 will house an Elecraft K3 and Astron SS25 switching power supply with no problems as a carry-on.

Taking a rig along for your holiday style operation can be a lot of fun, especially operating around sunrise and sunset. Here your editor is enjoying a 20 meter run into Europe and the Middle East.

Surfsong is less than 100 feet from the Atlantic Ocean sitting on a cliff some 30 feet above the sea. My antenna was a simple 43 foot home made vertical for 80-10 meters, which can be seen to the right of the house.

Bernie McClenny, W3UR ♦ 3025 Hobbs Rd, Glenwood, MD 21738-9728 ♦ w3ur@arrl.org



Here we are on an adventure inside the limestone cave. From the left: Bernie, W3UR; Becky, N3OSH; Tony, N3ME, and Mom.

Dr Peter Cross, 8P9NX/WØSA was a big help to our successful Amateur Radio operations from Barbados. Amy Beam, who passed her Amateur Radio test and is awaiting her 8P6YL call, is the driving force behind Surfsong.

support of Peter. Dad was issued 8P9ME and I received 8P9UR. Several days before departing I e-mailed the ARRL Logbook of The World (LoTW) help desk asking for a certificate and approval for 8P9UR. In no time at all I had the needed file and approval. I having done previous DXpeditions and holiday style operations but this time I wanted to try and minimize the number of QSL card requests and to allow those who worked me the opportunity to confirm their contacts as soon as possible.

Arrival

When we arrived in Bridgetown, the capital, and after clearing customs we were met by Peter and Amy who drove us to Surfsong (**www.bajan.info/rental**), which is located on a cliff overlooking the Atlantic. It was late afternoon and we began to unpack. The boys set up the station and the ladies organized the kitchen. Before departing for Barbados my wife was worried this was going to be a "DXpedition." Wishing it was but not wanting to overdo it I decided I would get up early each morning starting on 160 meters and working my way up the bands as the sun rose following propagation. Once Becky and my parents were awake it was time for breakfast and our adventures for the day, which included a visit to a limestone cave.

Prior to leaving for Barbados Greg, ZL3IX, asked if I could schedule a contact with him on 160 meters. Being a Topband enthusiast I said absolutely and made arrangements via the ON4KST chat page (**www.on4kst.com**). We made it on our first attempt with very good signals both ways.

During the daylight hours we went to the beach and toured the island. We would get back to the house before sunset and I would get on the air for an hour or so before and after sunset. Conditions both during sunrise and sunset were optimum times to be on the air. It was very easy to get a pileup going that would last for several hours. After most sessions on the air I would upload my logs to LoTW. It was easy to do and I knew those who worked me and who use LoTW were most appreciative by the notes I received via e-mail.

Rare — Maybe Not

I'll admit Barbados is not rare nor in the top 100 most wanted list, but you can have a lot of fun in a place like 8P or many other destinations. Many JA, VK, ZL, Pacific and South East Asian stations definitely were looking for a contact with 8P. I would highly encourage anyone taking a vacation outside their home country to take a rig. Kenny, K2KW, has a terrific website called DX Holiday (**www.dxholiday.com**) for anyone considering such an adventure. Make sure you have a license (**www.qsl.net/oh2mcn/license.htm** *or* **www.arrl.org/select-countries-a-d**) and find out what is needed in order to get your rig in and out of the country.

Once you know where you are going, look on the globe and figure out for yourself the areas that are one third to half way around the world from your destination. Most likely this is the area that will have the biggest demand for your location. The key is to know what areas of the world need where you are going. Once you know you can concentrate on finding out when are the best times to be operating and on which bands by using software, by checking DX Summit (**www.dxsummit.fi**) or by asking DXers from those areas that you will be concentrating on.

Check each band to find the optimum times. Most likely the best times are going to be right around your local sunrise and sunset. Don't hesitate to tell your pileup to stand by while you check propagation to the selected area you are looking toward. If the opening is not there go back to working everyone and try again in a few minutes. The bottom line is to have fun.

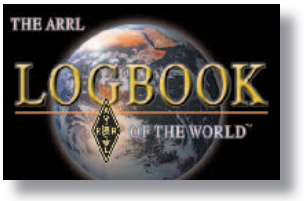
All photos courtesy of Bernie McClenny, W3UR.

NEW COUNTRY

In last month's column we talked about the potential new country that will most likely spin off from the lower (southern) section of Sudan. It probably won't be given a name that's any variation of Sudan but will be the autonomous region formerly known as Southern Sudan. Shortly after writing last month's column two groups announced their plans to activate this impending new country in early July of this year. The first group's announcement can be found at **www.dailydx.com/future_country_of_southern_sudan.htm** and the second at **www.dx-friends.com/SouthernSudan2011**. Keep an eye on your favorite DX newsletter to keep up with the latest news on this budding new country.

WRAP UP

That's it for this month. Don't forget to send your DX news (whether DXpedition or holiday style operation) to your editor at **w3ur@arrl.org**. Until next month, see you in the pileups! — *Bernie, W3UR (8P9UR)*



W3ZZ

THE WORLD ABOVE 50 MHz

Apples, Oranges and Other Oddities

Over the years many VHF contesters have told me that somehow VHF contesting is very different from all other kinds of contests, particularly HF contesting. I have told them that I disagree with their opinion. Essentially every contest I know, including VHF+ contests, have the same purpose — to work as many stations as possible that meet the constraints imposed by the contest rules. Almost all contests have a primary purpose — work as many stations as you can: all stations encompassed by the ARRL field organization (the HF Sweepstakes for the 50 states and certain US possessions); the US and Canada work foreign countries (the ARRL DX contest); all stations can work each other anywhere in the world (the CQ WW DX Contest); work only stations on 50 MHz and above (VHF contests), etc.

There are almost always some other conditions that make some contacts more valuable than others and make certain contacts act as multipliers: the 80 ARRL sections are multipliers (HF SS); DXCC/WAE entities are multipliers and contacts outside your own IARU region are worth more points than contacts within your region (the CQ WW DX Contest); grids are multipliers and microwave contacts count four to six times more than 6 or 2 meter contacts (ARRL VHF contests); and grids are multipliers and 2 meter contacts count twice as much as 6 meter contacts (CQWW VHF contest).

In addition, essentially every contest limits the transmission modes to like modes: there are SSB contests, CW contests, RTTY contests, etc. Occasionally while SSB and CW are mixed during the same contest (the ARRL 10 Meter Contest, Field Day and most VHF contests are examples) completely incompatible modes like digital and analog, or FM and SSB, where the operating conditions are quite different, are never mixed. Some examples of such incompatible modes are listed in Table 1. We will return to them later in our discussion.

There is now a serious exception to that general practice: ARRL VHF contests. And it is not the first time that has happened. I thought for a long time that I was the only one who noticed this, but recently Rick Rosen, an active East Coast rover and the past President of the Mt Airy VHF Society (Pack Rats), contacted me with an interesting observation that came from a respected source. Rick was clear that this did not necessarily represent his own thinking but he thought it was something that I should see. Here's what that source said:

> Let me just say that my problem with digital contacts is that they should be separated from CW and Phone both for a contest and awards just like they are on the low bands. And I don't buy the case that these are really phone or CW. They separate modes on the low bands (for both contests and awards) and the digital modes there (so far) offer no distinct advantage such as is clearly the case with JT modes. A category should be created just for digital modes just as there has been for unlimited rovers and these entries should not be eligible for club scores. When someone organizes a huge digital effort and mixes that with what we normally do, all conventional scoring and activity will be useless. In VHF contesting the effect will be like that of the west coast pack-roving — it will destroy contesting as we know it unless it is separated into its own category.
>
> I am not against digital technology and the science that underlies it. What I am against is mixing it on an even level with all conventional modes. What has taken me 45 years to scratch out with tropo openings and scatter contacts can be wiped away in a single weekend using computer to computer communications.

Pretty strong words! Rick told me that this came from a long established VHF operator and his sentiment is echoed by several others who have been operating VHF contests for almost 50 years. Rick also said that he has listened to the debate about it ever since the EME Conference in Prague when Joe Taylor, K1JT, presented his new WSJT modes.

I have a great deal of respect for the Pack Rats and their leadership. If there is a significant concern from members of a group that has defined VHF contesting for decades, it is a concern the VHF community should discuss. So I asked who said these words. It was Ron Whitsel, W3RJW. For those of you who are newcomers, Ron was formerly WA3AXV, one of the most dominant of the VHF contesters and someone

Table 1

Examples of Incompatible Mode Pairs

Modes	*Contact Speed**	*Generation*	*Findable***	*Special*
SSB	Short	Human	Yes	
FM	Medium	Human	Yes	Channelized Capture effect
CW	Short	Human	Yes	
RTTY	Long	Machine	No	
SSB	Short	Human	Yes	
WSJT	Long	Machine	No	Schedules

*Short = few seconds; medium = many seconds; long = minutes
**Copiable by human senses without machine intervention

This Month

April 30-May 1	2 GHz and Up Club Contest
May 7	Microwave Spring Sprint
May 14	50 MHz Spring Sprint
*May 15	Good EME conditions
May 20	Dayton VHF Weak Signal Group Banquet

*Moon data from EA6VQ

Gene Zimmerman, W3ZZ ♦ 33 Brighton Dr, Gaithersburg, MD 20877 ♦ w3zz@arrl.org; (301-948-2594)

who almost owned the January VHF SS. His enormous signal from 6 meters on up was one of the loudest from the Philadelphia area. So when Ron speaks I think all of us should stop and think.

Unusual Practices in VHF Contesting

The nature of VHF contesting is somewhat unusual. Whereas in most other contests, the competitors are kept so busy that they don't have time to think about doing anything except working people as fast as they can and the people to work never stop calling. VHF contests, however, naturally have significant periods of inactivity because the numbers of stations operating is limited. Thus many practices that are unknown in other contests either occur or occur much more frequently in VHF contests. Some of these, while not banned by rule, are strongly looked down upon and considered unethical in other contests. Let's look at an example.

The best known is the practice of scheduling by nonamateur means *before* the contest. This practice has never been banned by rule because — frankly — in the heat of most contests most of such schedules are forgotten and the station never shows up. Not so in a VHF+ contest where schedules are often made in large numbers and many of the stations do show up. Moreover real time scheduling on-the-air is endemic in VHF+ contests.

Except under unusual conditions like a massive tropo opening, for all intents and purposes there are no contacts made on 222 MHz and above that are not scheduled during the contest on 6 or 2 meters. For that matter, on 902 MHz and above a 2 meter or 70 cm frequency is usually used as a liaison and, if the truth be told, sometimes the contact is made on the liaison frequency and not the microwave frequency.

Moving people from band to band in other contests does happen but it is orders of magnitude less frequent and important to one's final contest score than it is in VHF contests. Thus the whole idea of manufacturing a contact by schedule is generally considered an anathema in other forms of contesting but is a common practice in VHF+ contests.

Incompatible Modes and VHF Contesting

Let us now return to how and why VHF contesting has attracted the desire to use modes that are by no means compatible. First and foremost is the lack of activity during a VHF+ contest. These occur randomly throughout the contest and in particular the period from local midnight until 7 AM yields almost no contacts. In the summertime conditions may improve after dawn before 6 AM but nonetheless activity does not resume until at least an hour later. I guess an extra hour's sleep is more important. So given that an ARRL VHF contest is only 33 hours long, what should you be doing during these hours of inactivity?

Originally the major incompatible modes were SSB/CW and FM. Here were hundreds of thousands of potentially valuable contacts on FM if only there were some way to reach them. Well the incompatibility here is several-fold. The vast majority of FMers could care less about contesting and many were clueless as to what grid they were in. Thus contacts were slow, requiring a complete explanation and a determination of where the stations were located. Contacts were further hampered by the nature of the FM mode itself. Armstrong detectors guarantee that the strongest signal is the only one heard first time and every time. Finally, channelized operation that at best seemed an odd way to tune.

Still every serious VHF contester had at least to be aware that he ignored FM at his peril. A Q is a Q after all! FM in VHF contesting never became popular enough to disturb the playing field seriously although at least one multioperator used to make a few hundred FM contacts and eventually the problem solved itself. FM was the backbone of local communications but with the advent and spread of cell phone technology around the turn of the century, mobile FM went into a severe decline such that the local repeaters now sound like empty graveyards. It has now gotten to the point where FM yields only a handful of VHF contest contacts.

Yet we still have all that inactive time. Enter the most powerful digital modes in creation — the digital modalities in *WSJT*. From a contesting standpoint these come in two flavors: FSK441 for meteor scatter and JT65a, b, c for EME. Although by following a specific protocol (calling CQ and indicating precisely how far off frequency you will be listening and responding to callers) you can work stations randomly on FSK441, almost no one in North America does this. Instead they make schedules in advance of the contest and follow a highly stylized procedure of calling and listening described in the schedule.

EME is even a further deviation from normal analog contesting. Large antennas with narrow beamwidths are necessary (high gain, wide beamwidth stacks of antennas are optimal for contesting) and high power is the rule rather than the exception (low power is the dominant choice in VHF contests). Digital EME can be done randomly using either the MAP65 or MAP65I/Q protocols but the requirements are not trivial technically. In addition the former requires cross-polarized antennas that independently send down polarization information.

To a first order of approximation EME is propagation independent (but dependent on Earth-Moon conditions) whereas analog modes are completely dependent on tropospheric and ionospheric propagation. Distance on the Earth's surface means nothing on EME so long as both stations can see the moon at the same time. Given the power of the WSJT modes, these digital approaches seriously tilt the playing field. I would estimate that successful meteor scatter is a good order of magnitude more effective using the digital modes vs SSB. For EME the deviation is much greater.

Making 50 or more digital EME contacts via MAP65, if you can get it to work, or via massive numbers of schedules is well within reach. Each of these contacts is likely to be a new multiplier as well. These modes are so powerful that unless you are in an extremely well populated VHF area, you can operate a VHF contest mainly by digital and manufacture not only a good score but a nationally winning score.

Solutions

Is this a problem? And if so what could we or should we do?

So long as these incompatible modes conveyed nothing more than a few more contacts, this was not an issue. But the WSJT modes allow one to do quite a bit more than analog modes. Not because the operators are any better but because the software is so powerful.

Many dozens of extra Qs and extra multipliers cannot be ignored. Even someone with a bevy of captive microwave rovers that provide high point Qs and will work no one else but that single station would be hard pressed to overcome the extra contacts/multipliers that the *WSJT* software can produce. It would be the same as saying that there are 75 band countries workable only on RTTY in an SSB DX contest that only those who have RTTY capability will be able to work them in an SSB contest. But imagine that it is much more difficult and complex to work RTTY than it actually is.

The standard solution is to provide contests geared toward these powerful digital modes and towards EME. The latter already exist: EME contests sponsored by ARRL, DUBUS and ARI. At least in the case of the ARRL EME contest, the competition is hampered somewhat by controversy about how digital EME should be differentiated from analog EME and by issues involving the use of passive assistance, which is now

banned. Digital Meteor Scatter contests ought to exist but they really don't. The exception is the North American Meteor Scatter Contest sponsored by the WSJT Group at **groups.yahoo.com/group/wsjtgroup,** which is focused on the Geminids meteor shower in mid-December, but no national, well-advertised meteor scatter FSK441-oriented contest exists — and it should.

I tend to take a traditional view that apples and oranges should not be mixed particularly when the oranges are potentially so much more powerful than the apples. Yet I would like to further the newest technologies so long as it does not produce a significantly unlevel playing field. One way to do this, as W3RJW suggests, would be to have separate categories for the use of digital technologies. I have not even touched upon the issue of awards but this is a topic that should be investigated as well. The use of separate categories for digital here is even more compelling.

All of these topics are well worth discussing. The Pack Rats have begun an internal discussion and I hope going forward the VHF+ community thinks long and hard about them.

AIBONITO CW CONTEST CLUB, WP3CW

Figure 1 — E_S season is coming. Here are four of the most active Puerto Rican 6 meter stalwarts: (from the left) Julio, NP3CW; Carlos, WP4U; Jose, KP4EIT, and Carlos, WP4N at a recent hamfest in the city of Hatillo.

ON THE BANDS

Our first X class flare of the new Cycle developed at 0156Z Feb 15 associated with an Earth-directed coronal mass ejection (CME). While it did not produce any 2 meter or above aurora it did generate what appears to be some F2 in the Pacific. The solar flux index (SFI) rose to over 100 and the daily sunspot number temporarily hovered around 100. Let's take a look.

6 meters. On Feb 15 Bob, ZL1RS, heard NH6P/B and also heard but did not work Fred, KH7Y. Fred was also heard at E51WL on Penrhyn Atoll (North Cook Island). The Niue ionosonde indicates the possibility of F2 at that time. (Thanks ZL4AAA for that information.) Otherwise the only 6 meter activity reported was some transequatorial (TEP) reports. John, N4QQ, was operating from Curaçao (PJ) Feb 19 when he heard a number of LU beacons on 6 meters. A quick CQ at 0015Z yielded 16 stations in 14 grids in the next 15 minutes in PY, LU, CE and ZP. Jon, NØJK, reports LU into XE, KP4 and HR Feb 21.

Tropospheric ducting. Tropo continues to be scarce this winter. On Feb 17-18 Todd, N4QWZ (EM66) worked into TX — EL09, EM00, 20 on 2 meters but heard nothing above 2 meters.

Meteor scatter. FSK441 continues to show its power on MS. John, W5UWB (EL17) worked K7MAC portable in DM22 (1649 km) on 222 MHz, Feb 27 at ~0017Z, a poor time of day for MS. John was running 1 kW but K7MAC had only 125 W.

EME. Bill, KØAWU (EN37) worked the Gambia C56EME DXpedition Feb 13 with his single Yagi in spite of some very high path degradation. He followed that with three European EME initials. His advice is not to give up on EME when the degradation is high.

HERE AND THERE

Spring Sprints. These popular short duration contests continue with the Microwave/902 MHz & Up Sprint on Saturday, May 7, from 6 AM until 1 PM local time. This is Microwave Activity Day, MAD, for May. The 50 MHz Sprint will be from 2300Z Saturday, May 14, until 0300Z Sunday, May 15, 2011. Full details were given last month.

2011 2 GHz and Up Club Contest. The San Bernardino Microwave Society (SBMS) sponsors an innovative microwave contest that extends from 0600 local Apr 30 to 2000 local May 1. Exchange six digit grid squares. Stations can be worked from more than one location after a change of location (a move of at least 16 km) and are encouraged to operate accordingly. Scoring is derived from distance points from the center of the six digit squares between stations in km; 1 km = 1 pt. Band multipliers and bonus points are applied. Complete information is at **www.ham-radio.com/sbms/2011_2ghzup_test.pdf**.

VHF Weak Signal Group Banquet at Dayton Hamvention. The 16th annual VHF Weak Signal Group Dinner at the Dayton Hamvention will be held Friday evening, May 20 at the Doubletree Dayton Downtown Hotel at 11 South Ludlow St, Dayton, OH 45402. This is one of the largest gatherings of VHF+ enthusiasts of the year and the VHF+ highlight of the Dayton Hamvention. Additional information is available from Tony Emanuele at **wa8rjf@arrl.net**.

Beacon updates. Dave, N9HF (EL99) reports a constellation of Florida Weak Signal Society beacons in EL98gk operating on 50.067, 144.277, 222.060, 432.307, 902.400, 1296.000, 2304.050, 3456.075 and 10,367.980 MHz. Clem, W8VO, reports that his beacon, W8VO/B, operates 222.051 MHz from EN82mn.

Results: North American High Speed Meteor Scatter 2010 Geminids Test. Forty logs were received for the 2010 HSMS Geminids Test. Top 5 scores were W5ZN, W5WVO, N3LL, N4QV and WA5UFH. Joel, W5ZN, had 6741 points with 51Q/43G on 6 meters and 22Q/20G on 2 meters. (Thanks VE1SKY)

SPECIAL EVENTS

Contact these stations and help commemorate history. Many provide a special QSL card or certificate!

Apr 1-Apr 15, 0000Z-0000Z, KØN, Branson, MO. 4State QRPGroup. 6th Annual OzarkCon QRP Forum. 14.060 7.040 7.030 3.856. QSL. Bart Lawson, 711 E 31st St, Pittsburg, KS 66762. *All contacts 5 W or less and CW.* **www.4sqrp.com**

Apr 16-Apr 17, 1400Z-2100Z, TM9ØLH, Le Havre, France. F6KOH Club SHTSF. 90th Anniversary of the Radio Club Le Havre. 3.690 7.090 14.190 14.070 (PSK). QSL. SHTSF, 25 rue des Iris, Le Havre 76610, France. *Event running several weekends.* **www.shtsf.com**

Apr 23-Apr 24, 1500Z-0000Z, W5E, Earth, TX. Ransom Canyon Amateur Radio Club. Earth Day. 21.275 21.035 18.120 14.270 14.035 10.120 SSB CW Digital. QSL. Robert C. Boyd, 98 S Lakeshore Dr, Ransom Canyon, TX 79366. **wa5vsk@gmail.com**

Apr 25-Apr 30, 0900Z-0900Z, GB5RST, Exeter, Great Britain. RSGB. Rockbeare Shutter Telegraph over 200 years. 14.190. QSL. RSGB BURO or John Wakefield, 'Oakhurst' Lower Common Rd, West Wellow, Romsey, Hampshire SO51 6BT, Great Britain. **www.qrz.com/db/gb5rst**

Apr 30, 1400Z-1800Z, W5AUU, Conway, AR. Faulkner County Amateur Radio Club. Toad Suck Daze Special Event Station. 14.270 7.270. Certificate & QSL. Faulkner County Amateur Radio Club, PO Box 324, Conway, AR 72033. **www.w5auu.org**

Apr 30-May 14, 0000Z-0000Z, W7B, Great Falls, MT. Great Falls Area Amateur Radio Club. World's Oldest Living Man Special Event. 28.405 21.350 14.245 7.230. *Certificate & QSL. George Forsyth, PO Box 1763, Great Falls, MT 59403. *Celebrating Walter Breuning's life, age 114.* **w7eca.org**

May 1, 0000Z-1700Z, K6M, Carmel by the Sea, CA. ECTAR Group. 25th Big Sur International Marathon. 21.300 14.240 7.240. QSL. John Worthy, KJ6AGX, 366 Reservation Rd #F6, Marina, CA 93933. **ectar.org**

May 1-May 15, 0800Z-1600Z, N4A, Pensacola, FL. Naval Aviation Museum/NAS Pensacola. Naval Air Centennial Celebration. 29.111 21.311 14.311 7.211. QSL. N4A HAM Radio Station, Naval Aviation Museum, 1750 Radford Blvd, Pensacola, FL 32508.

May 1-May 31, 0000Z-2359Z, WV7T/40, Colorado Springs, CO. Rocky Mountain Navy Amateur Radio Club. 40 Years as a Ham Operator. 28.400 14.295 14.090 14.070. Certificate. Mike Anderson, 510 W Polk St, Colorado Springs, CO 80907.

May 1-May 31, 0000Z-2359Z, VC2CQ85, Quebec, Canada. Club Radio Amateur de Quebec Inc. 85th Anniversary of CRAQ. 14.150. QSL. VE2CQ, CP 70021 succ Quebec-Centre, QC G2J 0A1, Canada. **www.craq.qc.ca**

May 5, 1400Z-2100Z, KA1SKY, Concord, NH. Contoocook Valley Radio Club. 50th Anniversary of Alan Shepard's First Manned Space Flight. 28.400 21.300 14.250 144.200. Certificate. Wayne Santos, 163 Hartshorn Rd, Barnstead, NH 03218. *From the McAuliffe-Shepard Discovery Center; a collaborative project of CVRC, NEAR-Fest and the Discovery Center*. **www.k1bke.org/planetarium/ka1sky.htm**

May 6-May 8, 1200Z-2100Z, W1ACT, Chilmark, MA. Fall River Amateur Radio Club. Martha's Vineyard DXpedition, Team HAMCOW, IOTA & NEQP. 14.280 14.040 7.280 7.035. QSL. Roland Daignault Jr, 19 Davis Rd, Westport, MA 02790. **www.qsl.net/bcra** *or* **hamcow.net**

May 6-May 8, 1300-1800Z, K1R, Northfield, MA. 72 Rag Chew Group. 7th Anniversary. 7.272. QSL. Robert W. Lobenstein, 1958 E 36th St, Brooklyn, NY 11234. *Fri 1300-1800Z; Sat-Sun 1215-1800Z.* **www.ragchewers.net**

May 7, 0900Z-1630Z, N4P, Twin City, GA. Southeastern Amateur Radio Association. 66th Annual Pinetree Festival. 28.400 14.228 7.191. QSL. **N4P@e-qsl** or Ron Hill/N4P, 51 Bobwhite Rd, Twin City, GA 30471. **www.kj4mks.com**

May 7, 1400Z-2100Z, W5CCW, Liberty, MS. Amateur Radio Club of Amite County. Liberty Heritage Days. 21.240 14.240 7.240. QSL. Paul J. McGehee, 4044 Hwy 567N, Liberty, MS 39645. **w5ccw.net**

May 7, 1500Z-1900Z, W1RRC & WR1VT, Westminster, VT. West River Radio Club. Kurn Hattin Spring Fling. 14.270 14.070 7.270. QSL. John Borichevsky, N1TOX, PO Box 8087, Brattleboro, VT 05304. **westriverradio.org**

May 7, 1500Z-2300Z, WE7GV, Green Valley, AZ. Green Valley Amateur Radio Club. Titan Missile Museum 25th Anniversary Special Event. 14.245 14.242. Certificate & QSL. Green Valley Amateur Radio Club, 601 N La Canada Dr (SAV), Green Valley, AZ 85614. **gvarc.us**

May 7, 1600Z-2200Z, K5VC, Brownsville, TX. Charro Radio Club/South Texas ARES District 15. Palo Alto Battle Field Anniversary. 28.310 21.280 14.230 14.070 PSK-31 2 m Rio Grande Valley Rep. Certificate & QSL. Clifford Wareham, 32086 Share 28 Rd, Los Fresnos, TX 78566. **cliffordwareham@hotmail.com**

May 8, 1300Z-2200Z, W1QI, Brookfield, CT. Candlewood Amateur Radio Association. Candlewood Amateur Radio Association Celebrates 80 Years. CW 28.040 21.040 14.040 7.035 3.540 SSB 28.380 21.380 14.280 7.280 3.850. Certificate & QSL. Daniel Fegley, 121 Candlewood Lake Rd, Brookfield, CT 06804. *In conjunction with the New England QSO Party*. **www.danbury.org/cara**

May 13-May 29, 1500Z-2200Z, W9IMS, Indianapolis, IN. Indianapolis Motor Speedway Amateur Radio Club. 100th Indy 500 Anniversary. 21.340 14.240 7.240 3.840. Certificate* & QSL. W9IMS, PO Box 18495, Indianapolis, IN 46218. *Must work all three races in one year to qualify for certificate.* **www.qrz.com/db/w9ims**

May 14, 1500Z-1900Z, W1RRC & WR1VT, Townshend, VT. West River Radio Club. Grace Cottage Hospital Health Fair. 14.270 14.070 7.270. QSL. John Borichevsky, N1TOX, PO Box 8087, Brattleboro, VT 05304. **westriverradio.org**

May 14, 1600Z-2359Z, NI6IW, San Diego, CA. USS *Midway* (CV-41) Museum Radio Operations Room. Armed Forces Day, National Maritime Day, Navy Nurse Corps Established 1908, MARS Amateur Radio Crossband Operations Event. SSB 14.320 7.250 PSK31 14.070 D-STAR 012C and 2 m/70 cm SOCAL rptrs; Crossband (kHz) 4003.0/3935.0 7351.5/7250.0 14463.5/14320.0 20936.0/21275.0 80 40 20 15 m. QSL. USS *Midway* Museum Radio Room, 910 N Harbor Dr, San Diego, CA 92101. **kk6fz@arrl.net**

May 14-May 15, 1400Z-2100Z, TM9ØLH, Le Havre, France. F6KOH Club SHTSF. 90th Anniversary of the Radio Club Le Havre. 14.290 7.090 3.690 14.070 PSK. QSL. SHTSF, 25 rue des Iris, Le Havre 76610, France. *Event running several weekends*. **www.shtsf.com**

May 15, 1400Z-1900Z, NU6DE, Encinitas, CA. Pacific Area Naturists Amateur Radio Society. Bare to Breakers Footrace 2011. IRLP reflector 9553 and EchoLink node VK3RTL-L. Certificate & QSL. Jim Campbell, PO Box 232445, Encinitas, CA 92023. *IRLP/EchoLink only special event*. **www.inaro.com**

May 16-May 21, 0900Z-0900Z, GB2LST, Nr Exeter, Devon, Great Britain. RSGB. Lee Shutter Telegraph over 200 Years. 14.190. QSL. John Wakefield, 'Oakhurst', Lower Common Rd, West Wellow, Romsey, Hampshire SO51 6BT, Great Britain. **www.qrz.com/db/gb2lst**

May 18-May 22, 2100Z-2300Z, W7AIA, Vancouver, WA. Clark County Amateur Radio Club. Mt St Helens QSO Party. 14.245 7.240 3.840. Certificate & QSL. W7AIA Special Events, PO Box 1424, Vancouver, WA 98668. **www.w7aia.org**

May 19-May 21, 0000Z-2359Z, N4G, Woodbury, TN. Dekalb/Cannon County Amateur Radio Club. Cannon County Good Old Days. 14.228 14.028 7.228 7.028. QSL. Jerry Elkins, N4LZY, 108 Bellehill Ln, Woodbury, TN 37190. **geode@heartoftn.net**

May 21, 1400Z-2000Z, W9DUP, Westmont, IL. DuPage Amateur Radio Club. Armed Forces Day. 28.400 14.290 7.250 3.885 CW Rover gen bands 2 m on 145.430 50.40 AM. Certificate. DuPage Amateur Radio Club, PO Box 71, Clarendon Hills, IL 60514. **www.w9dup.org**

May 21-May 22, 1220Z-1220Z, W2GSB, Farmingdale, NY. The Great South Bay Amateur Radio Club. The American Airpower Museum. 14.255 7.175 3.850 14.070 PSK. Certificate & QSL. W2GSB/Air Power, PO Box 1356, West Babylon, NY 11704. **www.gsbarc.org**

May 22, 1600Z-2000Z, K2A, Sandy Hook, NJ. Roseland Amateur Radio Club. Coastal Defense Day. 14.270 7.270. QSL. Roseland ARC, 300 Eagle Rock Ave, Roseland, NJ 07068. **www.qsl.net/k2gq**

May 22-May 28, 1400Z-2300Z, N4Y, St Simons Island, GA. American Yankee Associa-

Maty Weinberg, KB1EIB ♦ Special Events ♦ events@arrl.org

tion. International Grumman American Pilots Association Convention. 28.340 21.340 14.240 7.240. QSL. John Garman, 2036 Young Farm Pl, Montgomery, AL 36106. **www.aya.org**

May 28-May 29, 0900Z-1500Z, W4K, Jupiter, FL. Jupiter Tequesta Repeater Group. Peanut Island Activation. 28.400 14.315 7.635 3.905. QSL. Jupiter Tequesta Repeater Group, PO Box 7751, Jupiter, FL 33468. **www.jtrg.org**

May 29-May 31, 1400Z-2100Z, NWØAA, Angle Inlet, MN. Northwest Angle Amateur Radio Club. Annual activation of NWØAA, the northern most ARC in 48 contiguous states. 14.240 14.040 7.240 3.940. Certificate & QSL. Dan Whipple, WAØFJJ, 11726 Norway St NW, Minneapolis, MN 55448.

May 30, 1500Z-2245Z, W5KID, Baton Rouge, LA. Baton Rouge and USS *Kidd* Amateur Radio Clubs. Memorial Day. Gen class bands CW in QRP freqs 20 m SSB 40 m CW preferred, other bands possible. QSL. W5KID, 305 S River Dr, Baton Rouge, LA 70802.

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 Web site.

Special Events Announcements: For items to be listed in this column, use the ARRL Special Events Listing Form at **www.arrl.org/special-events-application**. A plain text version of the form is also available at that site. You can also request a copy by e-mail or send a self-addressed, stamped envelope (SASE) (Special Requests, ARRL, 225 Main St, Newington, CT 06111; write "Special Events Form" in the lower left-hand corner.) Off-line completed forms can be mailed, faxed (Attn: Special Events) or e-mailed.

Submissions must be received by ARRL HQ no later than the 1st of the second month preceding the publication date; a special event listing for **July** *QST* would have to be received by **May 1**. In addition to being listed in *QST*, your event will be listed on the ARRL Web Special Events page. Note: All received events are acknowledged. If you do not receive an acknowledgment within a few days, please contact us.

Special Events listed in this issue include current events received through March 10. You can view all received Special Events at **www.arrl.org/special-event-stations**. QST

Life Members Elected March 19, 2011

William K. Adams, **KB4NEI**
Charles A. Albrecht, **AE7CA**
Dwayne Allen, **WY7FD**
Steven C. Allred, **K6SCA**
Randy A. Baer, **KI7QW**
Eugene L. Barksdale, **K9ELB**
Donald J. Barnes, **KS8ZEB**
Tim C. Barrett, **K9VB**
Tim P. Barrett, **K6BIV**
Donald R. Beach, **N8DDD**
Craig L. Beardsley, **AB9MH**
William T. Bentley, **N5POB**
David Black, **WO5I**
Edward G. Bradley, **KC4WYD**
Gregory F. Braun, **N9CHA**
David B. Bremer, **W6DVE**
Tom L. Bunch, **WO7I**
Steven A. Caesar, **NH7C**
Glen D. Clayton, **W4BDB**
Kelly Cochran, **KJ6HFL**
Rick Connor, **WC2K**
William J. Crielly, **K3KZG**
Alan B. Curson, **WD9GMK**
Norman E. Davis, **WB4BKO**
Shalae M. De Jarnatt, **K9KAP**
Jacob S. Dilles, **KG4AUW**
David M. Dowdle, **KJ6BNR**
Robby J. Dunkerson, **K5RJD**
Lee M. Dusbabek, **N7LD**
Clay A. Duval, **KE5OZL**
Karen M. Famiglio, **N3SKW**
Robert B. Famiglio, **K3RF**
James C. Fetterman, **KE4ITK**
John A. Ficke, **WT4M**
Ann Flory, **KG6LGK**
Jerry B. Goldman, **KC6JSO**
Dave Goodwin, **VO1AU**
Jon E. Gordon, **K3QE**
Robert D. Greenwald, **WB2YQO**
Kenneth G. Hagans, **K8DQ**
Roddy Hailey, **KA5POW**
Stephen N. Hall, **KD4RHO**
James F. Hammesfahr, **KT4DG**
Christopher R. Hanslits, **W4VX**
George T. Hargrove, **KI4HEG**
Michael J. Hauan, **ACØG**
Sean M. Heaton, **K7HTN**
Richard W. Hemingway, **N5XRD**
David K. Higdon, **KD4ICT**
Matt T. Holden, **KØBBC**
Bruce J. Howes, **W1UJR**
Mike Hudson, **KE4FMH**
Masahiko Ikeshita, **KD5OEH**
Yousuke Ishikawa, **7N1XAP**
Tommy G. James, **KD7KUW**
Dana C. Jones, **K6BRR**
Richard J. Josephson, **WØELT**
Andreas Kalthoff, **AB1LH**
Michael L. Keithley, **KJ6CBW**
Max Kelley, **KC2SPY**
Sean T. Kelly, **KT5QQ**
Charles Kennamer, **K4ERG**
Joseph L. Konczyk, **N3NWI**
Joseph J. Koppi, **WØSU**
David H. Lance, **NF8R**
Thomas R. Laye, **N6XCT**
S. Leidy, **KF3G**
Diana G. Levine, **KE5RRI**
Michael C. Lewis, **W6MCL**
William R. Liporace, **WC2L**
Joshua J. Long, **W9HT**
John C. Luce, **WØWY**
Nelson D. Ludlow, **W7LUD**
Ronald A. Malone, **WB4MRF**
Michael McGinty, **W6MVM**
Jonathan O. McKeown, **KQ4EQ**
Ian McLean, **W6ILM**
Marvin D. Meinders, **NØGTV**
Philipp Mekler, **HB9EYO**
Timothy A. Messer, **W9TAM**
Eric R. Meyers, **W5ERM**
Clifford W. Miller, **KF7BFX**
David W. Miller, **KE4JQW**
Lynn Miller, **W5WOX**
Kevin R. Minor, **N8EGA**
Mark A. Mireles, **AD5CA**
Rocco Moretto, **KC2HRG**
Stephen W. Morton, **AA8HH**
Mark V. Muller, **N5KNG**
Ronald L. Munro, **KC8ZGB**
Kevin Noah, **KAØQVN**
James Olson, **KE7RCS**
John D. Orella, **KL7LL**
Gregory J. Orr, **KE7YFT**
John R. Otte, **K6JRO**
Richard K. Palm, **K1CE**
Peter A. Perkins, **WA1OWH**
Robert G. Pleak, **N6OOD**
Christopher W. Pollnow, **KC9QOJ**
John H. Potts, **KK6JP**
Andrew W. Protigal, **KB3UFT**
Dan S. Pueppke, **AAØYN**
Gregory Ramsey, **KB5OS**
Vincent Randazzo, **W7VTR**
James R. Repetti, **WJ1R**
William Rouse, **KM4Z**
Theodore B. Royster, **N4JOG**
Paul F. Ryan, **NØKIA**
Donald E. Sachnoff, **KX9Q**
Paul K. Schmidt, **K6PKS**
Ladd M. Seaberg, **WØNCU**
Ronald L. Settle, **KK7Z**
John L. Shaw, **KG6JUU**
JoonHo Shin, **DS5TUK**
David M. Slemp, **KUØH**
Philmore H. Smith, **W1EME**
RB Smith, **WW6RB**
John V. Spillman, **KT4CB**
David E. Spitz, **N3SOI**
Theodor Stathis, **KA3EGV**
William G. Stefancik, **AE6FN**
Joseph Steiner, **NO6N**
John Stephenson, **N7TWU**
Matthew W. Stofle, **W7MWS**
Gary W. Stolzenburg, **WD8RVZ**
Mark E. Studer, **KC8FQV**
Michael S. Suhar, **WAØAM**
Michael P. Sweeney, **K7MPS**
Ernest W. Swenson, **WB6VVA**
Ronald D. Talley, **AE7FT**
Jerry G. Taylor, **KDØBIK**
Charles N. Tedeschi, **AF6YS**
Christopher H. Terkla, **N1XS**
Michael Thomas, **KI4GCI**
Michael R. Van Voorhis, **N8VIQ**
Rodney W. Waln, **KCØZHF**
Monte H. Weisheimer, **N8KHO**
David P. Weller, **W6XW**
Jeremy J. Weller, **KJ6MGL**
Gunnar Wieking, **DL5BO**
Ulrike Wieking, **DL5ULI**
Ken Williams, **KB6N**
Bruce E. Wilson, **KY7B**
Randall R. Wing, **NØLD**
Maurice R. Woodrow, **K6AFK**
Gregory M. Zenger, **N2GZ**

Strays

QST congratulates...

♢ARRL blind member Major Junior Lolley, KG4ITD, who was honored recently for his 32 years of service to the Liberty County (FL) sheriff's office. Sheriff Donny Conyers proclaimed February 28 as Junior Lolley Day. The only licensed Amateur Radio operator in the county, Lolley serves as chief dispatcher. In addition, he participates in many VHF and HF nets, is involved in ARES as an ARRL Emergency Coordinator and works HF. — *Paul Eakin, KJ4G, ARRL Section Manager, North Florida section*

♢*QST* Technical Editor Joel Hallas, W1ZR, who recently received a pin and certificate for having been an ARRL member for 50 years.

♢Theodore Cohen, N4XX, of Langhorne, Pennsylvania, who earned a Second Place award in the 2010 Reader Views Literary Awards competition. *Frozen in Time* won for General Fiction, Historical Fiction and Mystery/Thriller/Suspense/Horror, while *Death By Wall Street* and *Unfinished Business* also won for Mystery/Thriller/Suspense/Horror.

♢ Earl Reilly, W7HFO, of Seattle, Washington, whose book, *According to Earl*, is available from Amazon or Barnes and Noble. The lighthearted autobiographical book describes the adventures of a young ham who went on to become a successful broadcaster.

FIRST PRESIDENTIAL SKYPE-IN

♢On March 1, ARRL President Kay Craigie, N3KN, took part in a Q&A session with members of the ARA of Bloomington (Minnesota) — while she was in Windsor, Connecticut. Dakota Division Director Greg Widin, KØGW, noted that "as far as we can tell, this was the first time an ARRL President held a two-way video conference with a local radio club."

During her "virtual" Skype-to-Skype visit to the club meeting, President Craigie updated members on House bill HR 607, reiterated the importance of communicating with their representatives and discussed a variety of other issues. She concluded by reminding members not to lose the sense of fun in ham radio.

"There's no substitute for in-person conversations between ARRL officials and League members. But when that's impractical," Craigie commented after the session, "isn't it great that we now have inexpensive or free technology that allows us to have virtual visits sometimes?"

WB8IMY

ECLECTIC TECHNOLOGY

Open Source QRP

If you are a CW operator you're probably familiar with the call sign K1EL. It belongs to Steve Elliot, the creator of the famous WinKeyer.

Steve has taken on another project that has interesting potential: an Open Source QRP transceiver. We usually tend to think of Open Source in a software context, but Steve is taking the idea to the next level. The "openQRP" transceiver would, at least in the beginning, be a microprocessor controlled rig designed not by one individual, but by many amateurs through online collaboration. The collaboration would apply to the firmware as well as the hardware.

The beta version is already in the hands of select builders at the time of this writing. You'll find more information at **openqrp.org/**.

V4 Keyboard Protocol

Rick Muething, KN6KB, one of the creative minds behind the invention of WINMOR, has released the alpha version of his new V4 protocol. Unlike WINMOR, which is intended for semi-automatic access of the Winlink network on the HF bands, V4 is designed for keyboard-to-keyboard live QSOs. Like WINMOR, however, V4 is a sound-card protocol, so all you need is the usual sound card interface that you may already have for PSK31 and other modes. V4 uses 4FSK modulation and strong Viterbi FEC encoding for excellent performance even under poor conditions.

You can download the software and join the discussions online in the free V4Protocol group at **groups.yahoo.com/group/V4Protocol**.

The Reinvention of the NE555

I have many fond memories of the Signetics NE555 timer IC. It was among the first integrated circuits I got my grubby hands on as a high school electronics student in the early '70s.

Ward Silver, NØAX, recently alerted me to the fact that both Advanced Linear Devices and Semtech have redesigned the chip, improving it in many ways and extending its usefulness for years to come. The ADL7555 and ALD7556 from Advanced Linear Devices are single and dual analog IC timers that offer significant benefits over the original bipolar chips. They provide lower power consumption and wider time/frequency ranges in addition to improved timing accuracy and temperature stability. You can use these chips to create astable multivibrators running as high as 2.5 MHz. Each timer has an operating voltage range of 2 to 10 V, a high discharge sinking output current of 80 mA, and the same pin-outs as the original 555 chips. The ALD7555 and ALD7556 are available in eight- or 14-pin small-outline IC (SOIC), plastic dual-inline package (DIP), and ceramic DIP (CERDIP) options.

Semtech's entry is the SX8122, an analog timer that implements the 555 architecture for use in low-voltage, battery-operated devices. The SX8122 operates between 0.9 V and 2 V, so you can power it easily from one AA or AAA alkaline, NiMH, or NiCd battery. The device has a continuous output that can be activated by the press of a button to control either a dc motor or other continuous low-voltage function.

Of course, the good old NE555 is still very much with us, but that's not to say that it can't be improved upon.

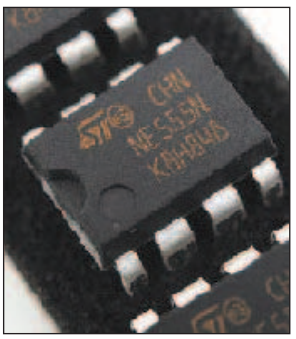
Russia Says "Nyet" to *Windows*

Russian Prime Minister Vladimir Putin signed an order in January calling for the federal government to switch to *Linux* from proprietary operating systems such as Microsoft *Windows*. The changeover is supposed to start by the middle of next year and be completed by 2015. The order affects all Russian federal agencies and any organizations funded by the federal budget.

You'd think motivation behind such a sweeping change would be increased security since *Linux* is far less vulnerable to computer viruses and other forms of cyberwarfare. But Alexei Smirnov, CEO of Russian *Linux* distribution company ALT Linux, says that the impetus is economic since most *Linux* distributions are free. They also want to funnel any remaining software expenditures to Russian firms instead of foreign software companies (read: Microsoft).

Russia and other countries making similar changes say they want more independence from US control (or at least US corporate control). For example, Cuba recently developed its own version of Gentoo *Linux* last year called *Nova* and hopes to have the majority of its government agencies switched over from *Windows* by the end of this year.

The new V4 Sound Card TNC running under *Windows*.



The venerable NE555.

Cuba has developed its own *Linux* alternative to *Windows* known as *Nova*. QST

Steve Ford, WB8IMY ♦ *QST* Editor ♦ sford@arrl.org

K2TQN

VINTAGE RADIO

Mary Texanna Loomis, 3YA

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Class photo taken in the radio lab.

The Loomis Radio College at 401-411 Ninth St, NW, Washington, DC, was founded and conducted by Miss Mary Texanna Loomis. This rather remarkable lady has been the subject of much discussion by radio historians over the years because of her activities in the field of radio and also for her efforts to secure recognition for her champion and distant cousin, Dr Mahlon Loomis.

Mary Texanna Loomis was born in Goliad, Texas, on August 18, 1880, the second of eight children. Her family moved to Buffalo, New York and she spent her formative years there. She married Turner Erwin Howard on October 26, 1898 and later lived for a time in Holyoke, Massachusetts. Sometime after 1909 she moved to Washington, DC and at first studied and then taught during the years 1918 and 1919 at the Service Radio School there.

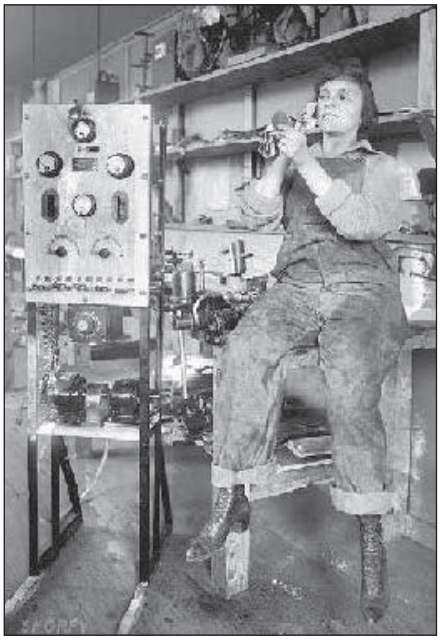
The Loomis Radio College

On January 1, 1920, having resumed her maiden name, Miss Mary Texanna Loomis opened the Loomis Radio School, which was later renamed the Loomis Radio College, in Washington, DC, and personally conducted the instruction in theory and lecturing. By 1920 the college was offering a 6 month course enabling the graduate to obtain a first grade commercial radio license and by January of 1922 the college was offering a 4 year course with a degree in radio engineering.

In addition to a radio laboratory with equipment constructed almost entirely by Mary herself, the school maintained a complete shop capable of teaching carpentry, drafting and basic electricity. She reasoned that many of her graduates might find themselves at sea or in other challenging situations and she wanted them adequately prepared. "No man," Ms Loomis said, at the time, "can graduate from my school until he learns how to make any part of the apparatus. I give him a blueprint of what I want him to do and tell him to go into the shop and keep hammering away until the job is completed."

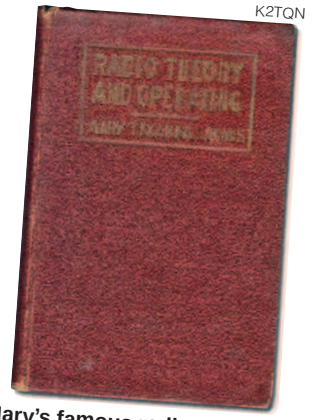
In August 1925 she completed and published the first edition of a textbook of some 850 pages called *Radio Theory and Operating*, which went through five editions with copyrights of 1925 through 1930. She had such a profound respect for her distant cousin Dr Mahlon Loomis that she devoted considerable space in her textbook to his accomplishments, hoping thereby to bring about public interest in some form of national recognition for his invention and patent of the world's first wireless communication system.

SHORPY.COM



Mary Texanna Loomis in a publicity photo.

K2TQN



Mary's famous radio textbook.

W3YA and the IRE

The Loomis College ham radio station first operated under the radio call letters "3YA" in 1924 and 1925, and in 1926 the prefix "W" was added making it W3YA.

In 1927 Mary Texanna Loomis was elected one of the first female members of the Institute of Radio Engineers, New York.

According to some graduates of the Loomis Radio College who were interviewed by Thomas Appleby during research for his book about Dr Mahlon Loomis, Mary Texanna Loomis was very much the executive type. She was apparently quite stern and appeared to be brusque in her dealings with most men. She managed the business, but depended largely upon the competent instructors she employed, some of whom had previously held important positions in connection with government radio activities. Many of the graduates became com-

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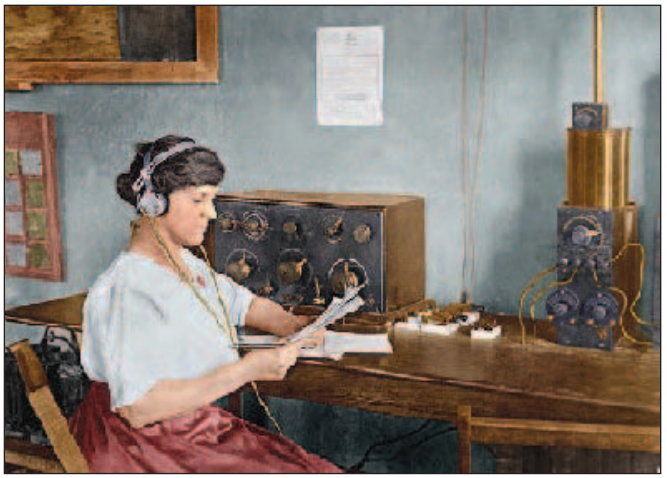
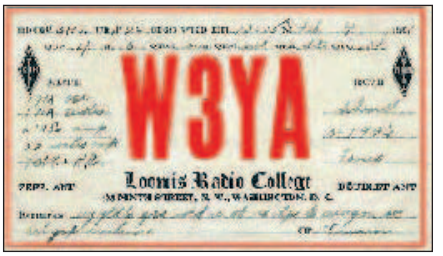


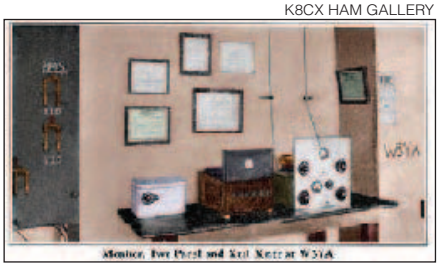
Mary seated at an early wireless station at the college. (Photo and QSL card colorized by John Schneider, W9FGH.)

K8CX HAM GALLERY, W8SU



A 1931 Loomis Radio College QSL card.

K8CX HAM GALLERY



The 1931 QSL card reverse.

mercial radio operators working in many parts of the world, others became radio broadcast station operators and some were employed as radio engineers by the Radio Corporation of America.

In an interview on December 31, 1921 with H. O. Bishop, a newspaper reporter for the *Dearborn Independent*, she was asked the origin of that odd middle name — Texanna? She replied, "That was given me by my mother in honor of the state where I first saw the light of day. You see, I happened to be born in a homesteader's shack away down in Texas, some miles from the historic town of Goliad."

Mary Texanna had, previous to engaging in radio work, taken music and languages. She could speak French, Italian and German and was also quite a mechanic and electrician. She was an excellent swimmer making many notable swimming records and a fine horsewoman often seen cantering along the beautiful bridle paths in the nation's capital.

Rosie the Telegrapher

She was asked how she happened to get the idea of starting a radio school. Her reply was, "There were two reasons why I launched into this fascinating work. In the early stages of the First World War, I was eager to do something useful for my country and therefore mastered wireless telegraphy. The United States Department of Commerce thought sufficiently well of my ability to grant me a first grade radio license and by the time the armistice was signed I was so fascinated with the work that I just hated to give it up and return to what seemed like ordinary everyday endeavors.

"Recalling the fact that a cousin of mine, Dr Mahlon Loomis, was really responsible for giving to the world wireless telegraphy, having invented and demonstrated it some years before Marconi was born, the happy thought came to me that right now was my opportunity to do something worthwhile in honor of his memory. I, therefore, dug right down to the bottom of my bank account and founded a school in honor of that pioneer electrical inventor who, in 1865, sent the first aerial telegraph message between two peaks of the Blue Ridge Mountains in Virginia. My great ambition is to obtain the world-wide credit that is due to his memory."

Later on Mary said, "My students are not only enrolled from various sections of the USA and Canada but from many foreign countries, such as Sweden, Ireland, England, Poland, Russia, Austria, Rumania and the Philippines. One of the brightest pupils I ever had was Prince Walimuhomed of Far-away Afghanistan. He was an extremely modest young man, keeping his real identity a secret until after graduating. He said he had no idea of earning his living by working at radio but just wanted to know all about it. He does.

"You have no idea how much happiness I get out of the success of each individual graduate. My boys keep in touch with me from all parts of the world. Scarcely a day goes by that I do not get some trinket or postcard from some remote section of the world. I have made the wonderful discovery that the only way for me to get happiness for myself is to make someone else happy. I find that I am making these young men happy by teaching them every phase of the radio business so that they can earn a comfortable living for themselves and their dependents and at the same time, see the great big beautiful world."

The Loomis Radio College appears to have been in existence at least through the middle 1930s. Research has not turned up any further information regarding its later history, but it is thought that competition from other nearby schools and the Depression put her out of business. Her legacy does live on in the form of her textbook.

It is known that she moved to San Francisco after leaving Washington, DC. Mary Texanna Loomis died at the age of 80 on June 7, 1960, at her home in San Francisco and was buried at Woodlawn Memorial Park, Colma, San Mateo County, California.

Information for this article came from Robert Ballantine, W8SU, and from the book *Mahlon Loomis, Inventor of Radio*, by Thomas Appleby, W3AX (SK), available from **n3rf.home.netcom.com**. For more on Mary Texanna Loomis please visit my web page, **www.k2tqn.com**. QST

The impressive Loomis Radio School building. Note the antenna on roof.

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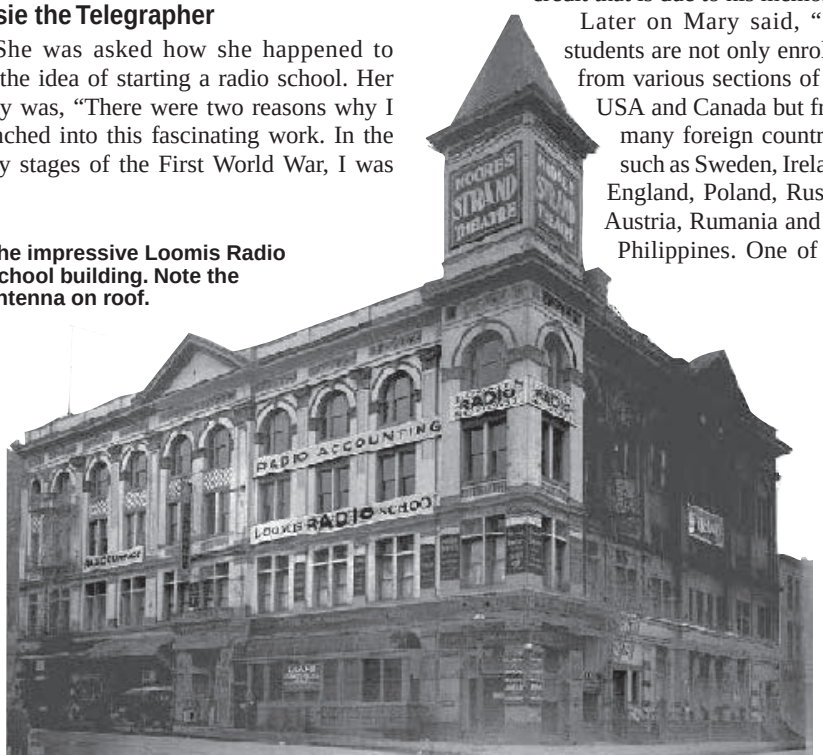

OP-ED

The Serious Business of Ham Humor

Eric P. Nichols, KL7AJ

Let's face it. I'm a nut. Long ago I gave up all hope of being taken seriously. Oh, sure, I've written dozens of technical articles for *QST* and *QEX* over the years and occasionally I attain a certain level of temporary credibility in so doing, but I inevitably revert to my default MO, what my middle daughter in her toddlerhood once referred to as being "a funny silly little man."

Ham radio needs more funny silly little men. Our tendency is to get cloistered in our exclusive little ham camps and lob rotten cucumbers at the guys across the moat over our petty projects and doctrines.

Of course, this is nothing new. Hiram Percy Maxim, W1AW, the original funny silly little man (aka The Old Man, or TOM), showed us how to handle this — with crotchety humor.

This doesn't mean that humor has to be insipid, or even *nice*. Humor can be sharp tongued, sardonic, ironic, sarcastic or subtle. But it always has to have one ingredient — humility.

You see, humor comes from the same root as human, humility and humus — the stuff they bury you under when you lose your sense of humor.

I've been spending the past several weeks poring over decades of ham humor that's graced *QST*'s pages since 1915. Humor was *central* to ham radio at one time; it was hard to find an issue that didn't have some tongue-in-cheek offering. Their authors were geniuses, the likes of whom we haven't seen in decades: Phil "Gil" Gildersleeve, W1CJD (SK); Larson E. Rapp, WIOU (Byron Goodman, W1DX (SK); John Troster, W6ISQ; The Old Man, of course, and countless other occasional, one-time and repeat offenders.

I should mention that *all* the above named personalities were *world class* technical experts as well as funny silly little men. But even more, their offerings grabbed us by the funnyglands because their stories came out of *real life* ham experiences. Troster's hilarious stories of DXing could *only* have come out of someone in the trenches. (Every story John wrote was accompanied by a Gil cartoon that was *perfect* for the occasion).[1] There was a mutual, unspoken understanding, an unwritten *subculture* of Amateur Radio that exuded from those articles and cartoons that is largely missing today. Our funny silly little men grabbed the *spirit* and *vibe* of ham radio as well as the facts.

Oh, sure, *QST* publishes the obligatory "joke article" in the April issue nowadays, but confining it to April sort of gives away the punch line. Back in the better-greased days, you never knew *when* Larson E. Rapp would show up. And even when he *did*, you never knew for sure if he was kidding or not (another sinister benefit of being technically astute well beyond the call of duty).

Minister of Mirth

The ham radio "Minister of Mirth" has a sobering responsibility. He must be a chronicler and a prophet. He needs to step on toes without breaking them. He needs to "comfort the afflicted and afflict the comfortable."

Court jesters in days of old had an audience with the king. As long as they were in a clown suit they could say whatever needed to be said without losing their heads. The only capital offense was not being funny enough. But it's also interesting to note that many court jesters in the Dark Ages became close confidantes and advisors of the king.

I wonder who will be the next Gil or Larson E. Rapp in the court of ARRL or the court of the FCC. I'm sure they're waiting in the wings somewhere.

Now, I've been around the loop enough times to realize that there are a certain number of hams (and people at large) who just *have* no sense of humor. I suppose there might be a time and a place for humorless people: IRS agents (as long as they're collecting someone *else's* taxes), the guys who pack parachutes for skydivers (especially if they're packing *mine*) — that sort of thing.[2] As I grow older, I find these special cases become fewer and fewer.

If you're an ARRL member, I recommend that you explore the dungeons and detours of the ARRL archives for the wealth of historical ham humor lurking therein. It will remind you of who you are as a radio amateur, more than anything I can think of. Who knows — maybe you will be the next Old Man (even if you're still young!).

[1]Check out some ham humor history in the *Gil Cartoon Book*. Available from your local ARRL dealer, or from the ARRL Bookstore, ARRL order no. 0364. Telephone toll-free in the US 888-277-5289, or 860-594-0355, fax 860-594-0303; **www.arrl.org/shop**; **pubsales@arrl.org**.

[2]Just for the record: No, I have never, nor do I ever intend to jump out of a perfectly good plane.

Eric Nichols, KL7AJ, an ARRL member, obtained his Novice license, WN6TEE, in Manhattan Beach, California in 1972. His first station was a Johnson Adventurer and a pair of brand new surplus ARC-5 receivers (one for 80 meters and one for 40) for which he paid a grand total of $20.

Eric eventually moved to North Pole, Alaska, to become chief engineer of KJNP Radio. He spent the next 17 years crawling around inside transmitters. He now works at Eielson Air Force Base and does consulting work at HIPAS Observatory, an aurora research facility just outside of Fairbanks. Eric is a fanatic homebrewer and CW freak. He enjoys all aspects of low band operation and fiddles around with some 1750 meter operation as well as PSK31. He can be reached at **kl7aj@arrl.net**.

Op-Ed Policy

The purpose of Op-Ed is to air member viewpoints that may or may not be consistent with current ARRL policy.

1) Contributions may be up to 900 words in length.

2) No payment will be made to contributors.

3) Any factual assertions must be supported by references, which do not necessarily have to be included in the body of the article to be published.

4) Articles containing statements that could be construed as libel or slander will not be accepted.

5) The subject matter chosen must be of general interest to radio amateurs, and must be discussed in a way that will be understandable to a significant portion of the membership.

6) With the exception that the article need not be consistent with League policy, the article will be subject to the usual editorial review prior to acceptance.

7) No guarantee can be made that an accepted article will be published by a certain date, or indeed, that it will be published at all; however, only articles that we intend to publish will be accepted, and any article we have decided against publishing will be returned promptly.

8) Send your contributions to ARRL Op-Ed, 225 Main St, Newington, CT 06111 or via e-mail to **qst@arrl.org** (subject line Op-Ed).

CONVENTION AND HAMFEST CALENDAR

Abbreviations
Spr = Sponsor
TI = Talk-in frequency
Adm = Admission

Arizona (Show Low) — Jun 4 D H R S T V
7 AM-1 PM. *Sprs:* Kachina ARC and ARCA. Northland Pioneer College, 1001 W Deuce of Clubs. *TI:* 145.31 (110.9 Hz), 146.52. *Adm:* $1. Tables: $5. Richard Gurk, KE7EDP, 1020 N 22nd Ave, Show Low, AZ 85901; 928-242-1178; **ke7edp05@cableone.net**; **www.whitemountainhamfest.com**.

Arkansas (Rogers) — Jun 4 D F H R S V
8 AM-2 PM. *Spr:* Benton County Radio Operators Club. Rogers First Church of the Nazarene, 4911 W Pleasant Grove Rd. *TI:* 145.29 (110.9 Hz). *Adm:* advance $5, door $7. Tables: $5. Loren Lawrence, N5PUV, 2300 Pleasant Ridge Rd, Rogers, AR 72756; 479-531-8169; **n5puv@arrl.net**; **www.nwahamfest.com**.

California (Sacramento) — May 22 D F H R
7 AM-noon. *Spr:* North Hills RC. Natomas High School, 3301 Fong Ranch Rd. *TI:* 145.19, 224.4 (both 162.2 Hz). *Adm:* Free. Tables: $20 (2 car spaces). Kim Scheidel, KE6RKX, 6257 S Brewer Rd, Pleasant Grove, CA 95668; 916-417-4864; **k6is@arrl.net**; **www.k6is.org**.

Colorado (Delta) — Jun 4 H R T
9 AM-3 PM. *Spr:* Montrose ARC. Lions Club Pavilion at Confluence Park, Gunnison River Dr. 10th Annual Tailgate Party. *TI:* 147.195. *Adm:* Free. Tables: $5. Bill Meyers, WBØCQG, 27434 Cedar Mesa Rd, Cedaredge, CO 81413; 970-856-3990; **wb0cqg@arrl.net**.

Connecticut (Goshen) — Jun 4 D F H R T V
8 AM-1 PM. *Spr:* Southern Berkshire ARC. Goshen Fairgrounds, 116 Old Middle St (Rte 63). 20th Annual Hamfest. *TI:* 147.285 (77 Hz). *Adm:* $4. Tables: 10-ft $10 (first table); $5 (each additional table). Lee Collins, K1LEE, 5 White Hollow Rd, Lakeville, CT 06039; 860-435-0051 (phone and fax); **k1lee@arrl.net**; **www.w1baa.org**.

Connecticut (Vernon) — May 28 D F H R T
8 AM-noon. *Spr:* Natchaug ARC. Tolland County Agricultural Center, 24 Hyde Ave. The Hartford Hamfest. *TI:* 145.11. *Adm:* $5. Tables: $20. Wayne Rychling, N1GUS, 59 Clint Eldredge Rd, Willington, CT 06279; 860-487-1921; **n1gus@arrl.net**; **www.na1rc.org**.

Florida (Pinellas Park) — May 28 H R T
8 AM-noon. *Spr:* The Glorious Society of the Wormhole. Freedom Lake Park, 9990 46th St N. WormFest 2011. *TI:* 146.85 (146.2 Hz). *Adm:* Free. Bill Williams, AG4QX, 3215 W Tambay Ave, Tampa, FL 33611; 813-837-3833; **ag4qx@arrl.net**; **www.thewormholesociety.org**.

Georgia (Ellijay) — May 14 D H R S T V
7 AM-2 PM. *Spr:* Ellijay ARS. Ellijay Lions Club, 1729 S Main St. *TI:* 145.17 (100 Hz). *Adm:* advance $5, door $7. Paul Craft, KE4GC, 11 Amy Creek Cir, Ellijay, GA 30540; 770-597-7005 or 706-698-7200; **ke4gc@arrl.net**; **www.ngamtn.com/w4hhh/index.php**.

GEORGIA STATE CONVENTION

June 4, Marietta
D F H Q R S T V

The Georgia State Convention (83rd Annual Hamfest), sponsored by the Atlanta Radio Club, will be held at Jim Miller Park, 2245 Callaway Rd. Doors are open 8 AM-3 PM. Features include indoor air-conditioned flea market, exhibitors, dealers, new and used equipment, vendors, tailgating, forums, VE sessions, handicapped accessible, Friday RV camping, refreshments. Talk-in on 146.82 (146.2 Hz). Admission is $5 (17 and under are free when accompanied by a paying adult). Tables are $15 (early bird), $20 (after May 28). Contact John Talipsky, N3ACK, 385 Madison Chase Dr, Lawrenceville, GA 30045; 678-618-2190; fax 678-985-2906; **n3ack@atlantaradioclub.org**; **www.atlantahamfest.com**.

Coming ARRL Conventions

April 15-17
International DX, Visalia, CA*

April 16-17
Communications Academy, Seattle, WA*

April 22-24
Idaho State, Boise*

April 23
Louisiana State, Monroe*
North Carolina State, Raleigh*

April 29-30
Southeastern VHF Society, Huntsville, AL*

May 6-8
EMCOMMWEST, Reno, NV*

May 7
South Carolina State, Spartanburg*

May 20-22
Dayton Hamvention®, Dayton, OH

June 3-5
Northwestern Division, Seaside, OR
Wyoming State, Cheyenne

June 4
Georgia State, Marietta
Atlantic Division, Rochester, NY

June 10-11
ARRL National, Plano, TX

June 11
Tennessee State, Knoxville

July 2
Eastern Pennsylvania Section, Marysville

*See April *QST* for details.

Illinois (Princeton) — Jun 5 D F H R T V
8 AM-3 PM. *Spr:* Starved Rock RC. Bureau County Fairgrounds, Peru St (Rte 6). Red Cross or Homeland Security Communications Vehicles on site if available. *TI:* 146.955 (103.5 Hz). *Adm:* advance $7, door $8. Tables: $13. Matthew Weaver, KB9VZH, 319 Desoto St, Ottawa, IL 61350; 815-313-5924 (phone and fax); **kb9vzh@mchsi.com**; **www.qsl.net/w9mks/hamfest.htm**.

Kentucky (Louisa) — May 14 D F H Q R T V
8 AM-1 PM. *Spr:* Big Sandy ARC. Louisa Senior Citizens Center, 109 W Pike St. *TI:* 147.39. *Adm:* $2. Tables: $4. Fred Jones, WA4SWF, 511 N Lackey Ave, Louisa, KY 41230; 606-483-1109; **wa4swf@bellsouth.net**; **www.bsarc.org**.

Louisiana (Many) — Jun 4 D H R V
7 AM-3 PM. *Sprs:* ARC of Sabine and Gulf Coast Hurricane Net. EOC Homeland Security Bldg, 1756 San Antonio St. *TI:* 147.28. *Adm:* $5. Tables: $10. Cecil Harper, W5CQG, 294 Balleycastle Dr, Milam, TX 75959; 409-625-1565; **wd5cqg@windstream.net**; **www.k5mny.com**.

Louisiana (Ruston) — Apr 30 D F H R S T V
8 AM-noon. *Sprs:* Piney Hills ARA and Louisiana Tech ARC. Cook Park, 2800 Kavanaugh Rd. Swapfest/Hot Dog Social/Crawfish Boil. *TI:* 147.12 (94.8 Hz). *Adm:* Free. Tables: $5. Jerry Darnell, AD5AQ, 1412 E Mississippi Ave, Ruston, LA 71270; 318-255-5200; fax 318-255-1755; **ad5aq@yahoo.com**; **www.phara.us**.

Maine (Hermon) — Jun 4 D F H Q R T V
Set up 6 AM; public 8 AM-1 PM. *Spr:* Pine State ARC. Hermon High School, Rte 2. 24th Bangor Hamfest. *TI:* 146.94 (100 Hz). *Adm:* $5. Roger Dole, KA1TKS, 852 Bog Rd, Hermon, ME 04401; 207-848-3846; **rdole@hermon.net**; **www.n1me.com**.

Maryland (West Friendship) — May 29 D F H R T
8 AM-2 PM. *Spr:* Maryland FM Assn. Howard County Fairgrounds, 2210 Fairgrounds Rd. *TI:* 146.76, 224.76, 444.0 (107.2 Hz). *Adm:* $6. Tables: $20. John Elgin, WA3MNN, 518 Copley Ln, Silver Spring, MD 20904; 301-641-5313; **wa3mnn@verizon.net**; **www.marylandfm.org**.

Massachusetts (Cambridge) — May 15. Nick Altenbernd, KA1MQX, 617-253-3776 (9 AM-5 PM); **w1gsl@mit.edu**; **www.swapfest.us**.

Michigan (Chelsea) — Jun 5 D F H R
8 AM. *Spr:* Chelsea ARC. Chelsea Fairgrounds, 20501 Old US Hwy 12. Overnight camping (no hookups). *TI:* 145.45 (100 Hz). *Adm:* advance $4, door $5. Tables: $10. Frank Pohs, KD8ABW, 636 W Main St, Manchester, MI 48158; 734-945-1915; **frank.pohs@gmail.com**; **wd8iel.net**.

Michigan (Hudsonville) — Jun 4 D F H Q R S T V
8 AM-2 PM. *Spr:* Independent Repeater Assn. Hudsonville Fairgrounds, 5235 Park Ave. "Good Old Days" W8IRA Hamfest, foxhunt. *TI:* 147.16 (94.8 Hz). *Adm:* advance $5, door $6. Tables: $8. Don Andrews, K8YES, 562 92nd St SE, Byron Center, MI 49315; 616-532-7769; **IRA-Hamfest@w8hvg.org**; **w8hvg.org**.

Minnesota (Maplewood) — Jun 4 F T
7 AM-1 PM. *Sprs:* TwinsLAN and Mining ARCs. 3M Center, 5th St. *TI:* 147.12. *Adm:* buyers $8 (under 16 free with paying adult), sellers $18 per vehicle (includes 1 admission). Anders Johansson, KBØPJV, 8201 32nd Ave N, Crystal, MN 55427; 763-208-7493; **kb0pjv@arrl.net**; **www.twinslan.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

Gail Iannone ♦ Convention and Hamfest Program Manager ♦ giannone@arrl.org

New Jersey (Township of Washington) — May 28 D F H Q R T V
8 AM-2 PM. *Spr:* Bergen ARA. Westwood Regional High School, 701 Ridgewood Rd. *TI:* 146.79 (141.3 Hz). *Adm:* $5 (buyers), $15 (vendors/parking lot spaces). Jim Joyce, K2ZO, 286 Ridgewood Blvd N, Township of Washington, NJ 07676; 201-664-6725; **k2zo@arrl.net**; **www.bara.org**.

New Mexico (Albuquerque) — Apr 30 D F H R T
Sunrise-noon. *Sprs:* AR Caravan Club and Albuquerque ARC. Transcorp, 8600 Jefferson NE. *TI:* 145.33, 444.0 (both 100 Hz). *Adm:* Free. Tables: Free. Steve Richey, KD5RHR, 8220 Fairmont Dr NW, Albuquerque, NM 87120; 505-899-0034; **kd5rhr@arrl.net**; **www.abqcaravanclub.org/**.

New York (Rensselaer) — May 14 D F H R T
Set up 6 AM; public 8 AM-1 PM. *Spr:* East Greenbush ARA. East Greenbush Fire Company, 68 Phillips Rd. 8th Annual Hamfest. *TI:* 147.27 (94.8 Hz). *Adm:* $6. Tables: $6 (Pavilion); $6 per 8-ft tailgate space. Thomas Scorsone, KC2FCP, 1310 10th Ave, Watervliet, NY 12189; 518-272-1494; **kc2fcp@nycap.rr.com**; **www.w2egb.org**.

ATLANTIC DIVISION CONVENTION

June 4, Rochester, NY
D F H Q R S T V

The Atlantic Division Convention (Annual Rochester Hamfest and Technology Expo), sponsored by the Rochester ARA, will be held at the Barnard Park, 360 Maiden Ln. Doors are open 8 AM-4 PM. Features include unlimited outdoor flea market spaces ($5 per space); commercial vendors; buy and sell new and used radio and electronic equipment; inside exhibit areas for clubs, dealers, and tech hobby groups; programs, forums, and meetings; QSL card certification; VE sessions; refreshments. Talk-in on 146.61 (110.9 Hz). Admission is $5 (free for RARA members). Contact Frank Schramm, WB2PYD, Box 93333, Rochester, NY 14692; 585-210-8910; **hfproducer@rochesterham.org**; **www.rochesterhamfest.org**.

North Carolina (Bahama) — May 28 D F H R T V
8 AM-2 PM. *Spr:* Durham FM Assn. Little River Community Complex, 8307 N Roxboro Rd. 38th Annual DurHamFest. *TI:* 147.225. *Adm:* $5. Tables: $12. Paul Van Doren, KE4OXN, 5309 Falkirk Dr, Durham, NC 27712; 919-309-2457; **elivand@aol.com**; **www.dfma.org**.

North Carolina (Reidsville) — May 14 D F R T
8 AM-noon. *Spr:* Rockingham County ARC. Calvary Baptist Church, 7860 NC Hwy 87. 7th Annual Swapfest. *TI:* 146.85 (103.5 Hz). *Adm:* advance $4, door $5. Tables: $5. George Brewer, WN4LTY, 5190 NC Hwy 700, Eden, NC 27288; 336-635-1261; **wn4lty@rcarc.com**; **www.rcarc.com**.

DAYTON HAMVENTION®

May 20-22, Dayton, OH
D F H Q R S T V

The Dayton Hamvention® (60th consecutive year), sponsored by the Dayton ARA, will be held at the Hara Arena, 1001 Shiloh Springs Rd (Trotwood). Doors are open Friday 8 AM-6 PM, Saturday 8 AM-5 PM, Sunday 8 AM-1 PM. Hamvention's 2011 theme is *"Global Friendship."* Features include exhibitors and vendors showing their latest products and equipment; huge outside flea market/vending area; forums and presentations on all facets of Amateur Radio; awards; Ham Radio Class (Saturday, 9 AM-4 PM, in hallway behind main arena; attend class and get your AR Technician Class license by the end of the day); VE sessions (Friday 2:30 PM, Saturday 9:30 AM and 1:30 PM; first-come, first-served basis, no pre-registration is available, no fee for exams; **exams@hamvention.org**); awards; Special Event Station W8BI; visit the "ARRL EXPO" area (located in the Hara Ballarena, near the 400-numbered booths) for exhibits and activities to enhance your ham radio experience, ARRL bookstore, meet the ARRL staff and volunteers, DXCC card checking, ARRL Youth activities, and many other ARRL services and programs representing a wide variety of Amateur Radio interests (**www.arrl.org/expo**). Talk-in on 146.94, 146.91, 146.64, 223.94, 442.1. Admission is $20 in advance, $25 at the door (good all 3 days); age 12 and under are free when accompanied by a paying ticket holder. Contact Michael Kalter, W8CI, c/o Dayton Hamvention®, Box 964, Dayton, OH 45401-0964; 937-276-6930, fax 937-276-6934; **info@hamvention.org**; **www.hamvention.org**.

Ohio (Tedrow) — Jun 4 D F H R T V
8 AM-1 PM. *Spr:* Fulton County ARC. Roth Family Park, 101 Hill Ave. *TI:* 147.195. *Adm:* $3. Lindsay Infante, K8LI, 7649 County Rd L, Delta, OH 43515; 419-822-4382; **lindsayinf@yahoo.com**; **k8bxq.org**.

NORTHWESTERN DIVISION CONVENTION

June 3-5, Seaside, OR
D F H R S V

The Northwestern Division Convention (29th Annual SeaPac Event), sponsored by the Oregon Tualatin Valley ARC, will be held at the Seaside Convention Center, 415 1st Ave. Doors are open for setup on Friday 11AM-8 PM and Saturday 7:30-9 AM; public Saturday 9 AM-4 PM, Sunday 9 AM-1 PM. Features include flea market (Saturday and Sunday only); commercial exhibitors; new equipment dealers; Friday Workshop (1-5 PM, $15; Radio Wave Propagation with Carl Luetzelschwab, K9LA); All You Can Eat Spaghetti Dinner (Friday, 4-8:30 PM, Seaside Fire Hall, 150 S Lincoln); seminars and forums on Saturday and Sunday; VE sessions (Saturday 9 AM-noon, Our Saviour's Lutheran Church-East Parish Hall; pre-register with Carl Clawson, WS7L, 503-629-5796; **ws7l@arrl.net**); RAGS Country Store; SeaPac Collector's Pins ($5); DX and YLRL luncheons ($15.50); Saturday eve happy hour and banquet featuring special guest speaker Mr E. E. "Van" Valkenberg, retired Chief Communicator of Air Force One, CMSgt, USAF (6:30-9:30 PM, $25); handicapped accessible; refreshments. Talk in on 146.66. Admission is $8 in advance, $10 at the door (under 12 free when accompanied by paying adult). Tables are $15 each for 1 day and $25 each for 2 days. Contact C. Wayne Schuler, AI9Q, 16414 NE 21st St, Vancouver, WA 98684; 360-892-5580; **ai9q@arrl.net**; **www.seapac.org**.

Pennsylvania (Butler) — Jun 5 D F H Q R S T V
8 AM-3 PM. *Spr:* Breezeshooters ARC. Butler Farm Showgrounds, 627 Evans City Rd. 57th Annual Hamfest and Computer Show. *TI:* 147.3. *Adm:* $5. Tables: $20 (some with electricity). Robert Benna, N3LWP, 1010 Willow Dr, Pittsburgh, PA 15237; 412-366-0488; fax 412-366-0486; **n3lwp@verizon.net**; **www.breezeshooters.net**.

Pennsylvania (Newtown/Wrightstown Twp) — May 1 D F H Q R T V
Set up 6 AM, public 7 AM. *Spr:* Warminster ARC. Middletown Grange Fairgrounds, 576 Penns Park Rd. D-Star Demo, Kit Building. *TI:* 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; **hamfest@k3dn.org**; **www.k3dn.org/hamfest.htm**.

South Carolina (Columbia) — Apr 23 F H
8:30 AM-noon. *Spr:* Columbia ARC. South Carolina ETV Center Parking Lot, 1101 George Rogers Blvd. *TI:* 147.33 (156.7 Hz). *Adm:* Free. Tables: Bring your own or sell out of your trunk. Thom Ashton, W4THA, 500 Pickett Thomas Rd, Camden, SC 29020; 803-420-8888; **w4tha@itc.net**; **www.w4cae.com**.

Tennessee (Mountain City) — May 28 D H R V
8 AM-noon. *Spr:* Johnson County ARC. National Guard Armory, 1923 S Shady St. *TI:* 146.61 (103.5 Hz). *Adm:* $3. Tables: $5. Erik Iddings, KF4KRK, 802 Rhea Rd, Mountain City, TN 37683; 423-727-7793; **erikwiddings@embarqmail.com**.

Texas (Amarillo) — May 14 F H R T
9 AM-2 PM. *Spr:* Panhandle ARC. Thompson Park (Area 17), 24th St and US Hwy 287 N. 11th Annual Swapfest/Picnic. *TI:* 146.94 (88.5 Hz). *Adm:* Free. Tables: Free. Carl Jeans, N5YXN, 6112 Calumet Rd, Amarillo, TX 79106; 806-352-6987; **carl.jeans@att.net**; **www.w5wx.org**.

Washington (Dryden) — Jun 10-12 R T V
Friday noon-Sunday late morning. *Spr:* Apple City ARC. Dryden Gun Club, 7653 Saunders Rd. Wenatchee Hamfest, bunny hunt. *TI:* 146.68 (156.7 Hz). *Adm:* $7. Tables: Free (tailgate). Judy Chrisco, KA7ZNA, 1812 SE Soden St, E Wenatchee, WA 98802; 509-884-1251; **ka7zna@msn.com**; **www.qsl.net/w7td**.

Washington (Stanwood) — May 7 D F H R V
9 AM-3 PM. *Spr:* Stanwood-Camano ARC. Stanwood Middle School, 9405 271st St NW. 20th Annual Hamfest. *TI:* 145.19 (127.3 Hz). *Adm:* $5. Tables: before Apr 25 $15, after Apr 25 $20. Jim Ruble, KE7MHF, Box 941, Stanwood, WA 98292; 360-629-4713; **ke7mhf@arrl.net**; **scarcwa.org**.

West Virginia (Ripley) — May 15 D F H R V
8 AM-2 PM. *Spr:* Jackson County ARC. Ripley Middle School, School St and Klondike Rd. *TI:* 146.67. *Adm:* $5. Tables: $5. Roy Moore, KB8ZSG, 25 Daniels Run Rd, Spencer, WV 25276; 304-927-4412; **morning_glory114@hotmail.com**.

WYOMING STATE CONVENTION

June 3-5, Cheyenne
D H Q R S T V

The Wyoming State Convention, co-sponsored by the Shy-Wy and University ARCs, will be held at the Little America Hotel and Resort, 2800 W Lincoln Way. Doors are open Friday 5-9 PM, Saturday 8 AM-8 PM, and Sunday 8 AM-noon. Features include dealers, tailgating, forums, QSL card checking, VE sessions, handicapped accessible, refreshments. Talk-in on 146.775 (114.8 Hz). Admission is $30 in advance, $35 at the door ($20 Saturday only). Tables are $35. Contact Mike Whitmore, W7MEW, 1043 Road 218, Cheyenne, WY 82009; 307-214-0741; **w7mew@arrl.net**; **www.shywyarc.net**.

QST

75, 50 AND 25 YEARS AGO

May 1936

■ The cover photo shows a 'phone ham literally "burning the midnight oil."

■ The editorial praises the many hams who provided emergency communication following the "Great Flood of 1936."

■ Then, in the 13-page lead article, Clinton B. DeSoto, W1CBD, reports that "Amateur Radio Rises to Greatest Emergency Need of All Time." Flooding occurred in 14 states, isolating 20 large cities!

■ R. O. Williams, W8FUQ, describes "A Novel Low-Cost Ultra-High-Frequency Receiver" for 56 Mc. that uses one of the new pentagrid tubes.

■ In "A Meter-Type Modulation Monitor," D. C. Summerford, W9AYH, describes his monitor that indicates both carrier shift and modulation percentage.

■ A. L. Budlong, W1JFN, and Clinton B. DeSoto, W1CBD, show us a practical method for rapid switching across all bands, by using "Separate Transmitters on Five Bands."

■ "1936 DX Contest Hits New Highs" reports that a DX station has the top score for the first time ever!

■ "Dual-Diversity 'Phone Reception with Single-Control Tuning," by J. L. A. McLaughlin and James Lamb, describes an advanced receiver that minimizes the effects of fading.

■ John Pool, W3ZZ, tells about "A Three-Feeder Double-Antenna System" that uses two antennas oriented at right angles to each other — either separately, or together as a V beam.

May 1961

■ The cover photo shows some of the CW machines that make those sweet sounds — a hand key, Vibroplex bug, Autronic paddle, Hallicrafters "TO" keyer, and the "Codamite" Morse keyboard described in this issue.

■ The editorial quotes from recent articles in *Saturday Review* and *The New Yorker* that support the value of the non-professional in scientific endeavor...think "radio amateurs"!

■ "Codamite," by R. W. Johnson, W6MUR, describes his homebrew typewriter-like keyboard that sends Morse.

■ Irwin Wolfe, W6HHN, tells us how to build a compact near-kilowatt final, using "UE572s in Grounded Grid."

■ Rolf Dyce, K6DSJ, explains why lunar echoes of radio signals sound the way they do, in "The Appearance of the Moon at Radio Frequencies."

■ "Twins on Twenty," by Walter Stead, VE3DZL, describes his simple but effective bidirectional array of two grounded quarter-wave elements.

■ D. H. Gieskieng, K9CFE, tells us about his design for "A Roof-Top Mobile Antenna." He does not tell us how he talked his wife into drilling holes in the roof of their car.

■ In "Balanced Detector in a T.R.F. Receiver," James White, W2WBI, presents his novel tuner for 40 and 80 meter C.W. and S.S.B.

■ Daniel Meyer explains how to use TV-tuner transistors and etched circuits to make a "Transistor Two-Meter Converter."

■ The inimitable John Troster, W6ISQ, explains amateur VOX operating techniques on S.S.B. in "Real Ahhhhhh Swell QSO, Charlie."

May 1986

■ The cover photo shows the EME array used by KB8RQ, with great success — a massive multi-bay Yagi array that can be steered in azimuth and elevation!

■ The editorial reports "Good News for Packeteers" — success in clearing an F.C.C. regulatory hurdle.

■ Wes Hayward, W7ZOI, explains his new RF-measurement system, in "Beyond the Dipper."

■ Doug DeMaw, W1FB, educates us about "Learning to Work with Preamplifiers."

■ Eugene Ruperto, W3KH, urges hams to get away from the overcrowded HF bands, in "A Mode-L Parabolic Antenna and Feedhorn for OSCAR 10."

■ Then Dick Jansson, WD4FAB, and Mark Wilson, AA2Z, tell us how to get started with OSCAR, in "Adventures in Satellite DXing."

■ Getting back to HF, Jerry Hall, K1TD, looks at current propagation conditions and expectations for the near future, in "Spots before Your Eyes."

■ In "Getting into Field Day Form," Mike Bellinger, KØUAA, gives us tips for the next Big Event, coming next month!

Al Brogdon, W1AB ♦ Contributing Editor

Field Organization Reports

FEBRUARY 2011

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**.

984
AD4BL
460
KØIBS
370
KI4KWR
355
KT2D
347
WB8RCR
330
NX8A
325
KA2ZNZ
321
N4HUB
300
K2DYB
290
WB9YBI
280
W8ERV
270
KT5SR
KB2ETO
266
WB9FHP
262
AL7N
260
K8RDN
250
K2HAT
240
K8OLY
230
W2MTA
224
W4CAC
220
WB9JSR
217
WD8USA
215
KØLQB
210
AK2Z
N7CM
200
WD8BCS
192
K2ABX
191
K7OAH
187
WA2BSS

184
N9AL
181
N9DVL
175
K2HJ
170
AG9G
KB5SDU
161
KK5NU
160
KB2RTZ
KGØGG
158
W4LHQ
156
N4EJF
155
WD9FLJ
W5DY
KE5HYW
150
KK3F
W9LW
149
KC2SFU
147
KA8ZGY
145
N9VC
140
K7BFL
N1UMJ
KB2BAA
138
N9WLW
135
K9LGU
W3CB
W3YVQ
WM2C
N2JBA
134
W7JSW
132
W4AVD
131
KI4FUS
130
K6JT
WB2FTX
KW1U
WØLAW
K7EAJ
K4IWW
129
KC5MMH
125
NN7H

NX9K
N1IQI
K3CSX
KB8RCR
KF7GC
124
KB5PGY
120
KA4FZI
N2GS
N8IO
WB8HHZ
W1GMF
WA2NDA
K4GK
K8VFZ
WB8WKQ
W4DNA
117
NC4VA
115
N1IQI
KD1LE
K2TV
113
N3RB
112
K4BEH
110
W7QM
W7GB
K6HTN
KB5KKT
KE4CB
KC5OZT
K3RC
N8CJS
KA3OCS
N1LKJ
K1YCQ
N9MN
K1REV
K4BG
WI2G
KB1NMO
N1QLN
N7XG
N7YSS
WA5LOU
WB6OTS
WE2G
W2EAG
109
KD7OED
107
WS6P
WA4UJC
106
N2VC
105
KØVTT
102
W9WXN

100
W6WW
K4SCL
N5OUJ
N1JX
N8OD
WD8Q
WG8Z
WA3EZN
NR2F
AA3SB
WB4FDT
K2AN
N3SW
W3TWV
WØCLS
NIØI
NØMEA
WAØVKC
K8AE
WB4UZX
KC2UVQ
W4TTO
K5MC
97
W8CPG
96
KJ7NO
95
KCØM
W5CU
KI4AAN
K4JGA
WK4P
94
W4QAT
93
KF5CRX
K2GW
91
N7EIE
WDØGUF
90
KA5AZK
N8DD
WB8SIQ
N9VT
N4ELI
W3GQJ
KA1G
K1JPG
NU8K
KZ8Q
KT4YA
WA2CUW
AA2SV
N3ZOC
K3IN
KB3LNM
WB4BIK
NM1K
KD8CYK
W9MBT
88
W5GKH
W2CC

86
KK7DEB
83
W1PLK
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K5GLS

The following stations qualified for PSHR in previous months, but were not properly recognized in this column: (Jan) KT2D 360, N4HUB 311, W4AVD 267, KT5SR 197, KC4PZA 132, WØLAW 130, W4LHQ 128, K3CSX 120, KØVTT 120, KI4FUS 105, WB4FDT 100, KC2UVQ 100, WDØGUF 79. (Dec 2010) KØVTT 100. (Nov 2010) KØVTT.

Section Traffic Manager Reports

The following Section Traffic Managers reported: AK, AL, AZ, CO, CT, EB, EMA, ENY, EPA, EWA, GA, IL, IN, LA, LAX, MDC, ME, MI, MN, MS, MT, NC, NFL, NLI, NNJ, NNY, NTX, OH, OK, OR, ORG, SD, SFL, SJV, SNJ, STX, TN, UT, WCF, WI, WNY, WV, WY

Section Emergency Coordinator Reports

The following ARRL Section Emergency Coordinators reported: AK, AZ, EWA, GA, IA, IN, KS, ME, MDC, MI, MN, MO, OH, NC, NLI, NM, SD, SFL, STX, SV, TN, WTX, WV, WWA.

Brass Pounders League

The BPL is open to all amateurs in the US, Canada and US possessions who report to their SMs a total of 500 or more points or a sum of 100 or more origination and delivery points for any calendar month. Messages must be handled on amateur radio frequencies within 48 hours of receipt in standard ARRL radiogram format. Call signs of qualifiers and their monthly BPL total points follow.

N1IQI 2366, WB5NKD 1799, KK3F 1786, W1GMF 1360, WB9JSR 1035, WB9FHP 1020, KW1U 938, WB2FTX 911, N8IXF 744, WB8WKQ 683, NX9K 673, WB5NKC 670, N1JX 663, W6WW 625, W4WNE 618, N9VC 616, N1UMJ 601, KZ8Q 578, K4JGA 540, K4IWW 536.

Stations earning BPL by Originations plus Deliveries: NM1K 110, K8LJG 109.

SILENT KEYS

It is with deep regret that we record the passing of these amateurs:

W1GJN	**Guilbault**, Jean P., Woonsocket, RI
KB1GPH	**Hansen**, Neil C. Sr, Monson, MA
N1HOR	**Smith**, William, West Haven, CT
N1HPG	**Clay**, Helen M., Freedom, ME
N1HXC	**Scott**, Wayland, Townshend, VT
♦ W1JJO	**Coburn**, Robert A., The Villages, FL
N1QPT	**Fennessey**, Raymond F., Hanover, MA
W2ADV	**Dacey**, Leo T., Erin, NY
WA2ELE	**Meirowitz**, Richard L., White Plains, NY
W2JB	**Burgio**, John, Stanhope, NJ
KB2MDO	**O'Connell**, Harry E. Jr, Roselle, NJ
W2OMB	**Vahle**, Julius "Bud," Baldwinsville, NY
W2WTV	**Horn**, Gordon J., Windsor, CT
N3GKZ	**Ziecheck**, L. N., Silver Spring, MD
N3MWZ	**Weber**, David R., Erie, PA
♦ WA3OHI	**Doyle**, Joseph H., Mount Airy, MD
N3YJZ	**Hamilton**, Miriam P., Beaver, PA
W3ZXV	**Pressler**, Eugene C. Jr, Gwynedd, PA
WB4BEH	**Yancey**, Edgar C., Huntsville, AL
KE4DXF	**Stevens**, Dorothy M., Stephens City, VA
♦ K4HXC	**Rhein**, Clarence R., Pfafftown, NC
W4KEW	**Hastings**, James C., Birmingham, AL
W4KGU	**Perry**, David G., Independence, MO
W4NDJ	**Stilo**, Frank G., Columbia, SC
WA4SGI	**Pitts**, Ronald P., Birmingham, AL
W4TBL	**Lucas**, Thomas B., Alexandria, VA
W5ADH	**Shaffer**, Charles F., Richardson, TX
W5ADL	**Lindsey**, Nathan, Corpus Christi, TX
N5KS	**Matheny**, Gene D., Winston, OR
♦ W5NK	**Garner**, Robert E., Mandeville, LA
AE5RN	**McBride**, Robert J., New Orleans, LA
K6AWS	**Rodner**, W. H., Priest River, ID
KD6BYI	**Noll**, Ralph, Ventura, CA
AH6HB	**Kaneshiro**, Isamu, Las Vegas, NV
W6HXS	**Mallory**, Lloyd R., Norco, CA
WA6VMD	**Schultz**, Ray A., Pinole, CA
KE6YHI	**Peterson**, Joseph F., Sunnyvale, CA
K7EXQ	**Heath**, Richard I., Kalispell, MT
KL7GHB	**Greene**, Guy H., Anchorage, AK
♦ N7UVL	**Altig**, Gary L., Reno, NV
K8MAR	**Youngman**, Terrill L., Utica, MI
W8WRB	**Bond**, William R., Sterling Hts, MI
N9BRL	**Spies**, Rolf, Streamwood, IL
W9NLE	**Huftel**, Roger T., Altoona, WI
KØBEJ	**Chambers**, George W., Coffeyville, KS
KAØDEJ	**Eastby**, Marcus S., Sinai, SD
WØFDY	**Ellington**, Almon L., Florissant, CO
KCØWCN	**Cheek**, Harold J., Springfield, MO

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Note: Silent Key reports must confirm the death by one of the following means: a letter or note from a family member, a copy of a newspaper obituary notice, a copy of the death certificate, or a letter from the family lawyer or the executor. Please be sure to include the amateur's name, address and call sign. Allow several months for the listing to appear in this column.

Many hams remember a Silent Key with a memorial contribution to the ARRL Foundation or to ARRL. If you wish to make a contribution in a friend or relative's memory, you can designate it for an existing youth scholarship, the Jesse A. Bieberman Meritorious Membership Fund, the Victor C. Clark Youth Incentive Program Fund, or the General Fund. Contributions to the Foundation are tax-deductible to the extent permitted under current tax law. Our address is: The ARRL Foundation Inc, 225 Main St, Newington, CT 06111. QST

Gail Iannone ♦ Silent Keys Administrator ♦ sk@arrl.org

Strays

ARMSTRONG PAPERS AVAILABLE TO RESEARCHERS

◊ In 1909, Edwin H. Armstrong began his undergraduate studies in Columbia University's Department of Electrical Engineering. While Armstrong was a junior, Professor Michael I. Pupin, an esteemed professor and an inventor in his own right, took to the young inventor and gave him use of his laboratory in the basement of Philosophy Hall. It was during the break between his junior and senior year that Armstrong would develop his first invention, the regenerative circuit, in 1912. Armstrong's first invention was just the beginning of a long career — Armstrong was to remain a fixture on campus until his death in 1954.

Armstrong is credited with a multitude of inventions in the radio communications field. He secured 42 patents throughout his career, the best known of which are the regenerative circuit, the superheterodyne circuit in 1918, the super-regenerative circuit in 1922 and his commercially viable FM Radio System in 1933.

The Edwin H. Armstrong Papers have been in Columbia's Rare Book and Manuscript Library for decades. Due to lack of description, poor arrangement and its large size, the collection has been exceedingly difficult to use for research purposes. Professor Mischa Schwartz, Charles Batchelor Professor Emeritus of Electrical Engineering at Columbia, had begun to write a paper on Armstrong's invention of noise-suppressing FM for the *IEEE Communications Magazine* not long ago. He found the collection so difficult to use that he became determined to have it put into better order and made more accessible to researchers. Thanks to Professor Schwartz, the Armstrong Memorial Research Foundation and generous grants from the IEEE Foundation, the IEEE Communications Society, the IEEE Circuits and Systems Society, Alcatel-Lucent Foundation, Columbia University's Department of Electrical Engineering and Fu Foundation School of Engineering and Applied Science, the collection has been reprocessed, and fully described, finally making it far more usable to researchers, and properly preserving the papers of a great scientist and a great man, Edwin Howard Armstrong. — *Jennifer S. Comins, Rare Book & Manuscript Library, Columbia University*

BEN GUION, GREENWICH, CONNECTICUT

Dedication ceremonies of the 1BCG Monument in Greenwich, Connecticut, October 21, 1950. From the left: ARRL Special Representative Paul F. Godley, 2ZE; Edwin H. Armstrong, George E. Burghard, First Selectman Wilbur M. Peck, Orestes H. Caldwell and Ernest V. Amy. The ceremony commemorated the first shortwave transatlantic radio transmission, sent from 1BCG in Greenwich to 2ZE in Ardrossan, Scotland. — *Edwin H. Armstrong Papers, 1886-1982, Rare Book and Manuscript Library, Columbia University Libraries*

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- 60 Watt, 200 Mems, CTCSS/DCS
- Mil-Std specs, Hi-Quality Audio

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NEW!

TH-D72A

2m/440 HT with extended RX

- 5W TX, RX 118-524 Mhz, VxU, VxV, UxU
- APRS w built-in 1200/9600 TNC
- Built-in GPS, Built-in USB, digipeater
- Echolink compatible, Mil-Spec STD810

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TS-2000 $225. Kenwood Coupon
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- 100W HF, 6M, 2M • 50W 70CM
- 10W 1.2 GHz w/opt UT-20 module
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TS-480SAT/HX HF+6M Transceiver

- 480SAT 100w HF & 6M w/AT
- 480HX 200w HF & 100w 6M (no Tuner)
- DSP built in
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TS-480SAT $275. Kenwood Coupon
TS-480HX $275 Kenwood Coupon

TH-F6A

2M/220/440

- Dual Chanel Receive
- .1 - 1300 mHz (cell blocked) Rx
- FM, AM, SSB
- 5w 2M/220/440 TX, FM
- 435 Memories
- Li-Ion Battery

Call For Low Price!

TM-V71A 2m/440 Dual Band

- High RF output (50w) • Multiple Scan
- Dual Receive on same band (VxV, UxU)
- EchoLink® memory (auto dialer)
- EchoLink® Sysop mode for node terminal ops
- Invertible front panel
- Choice of Amber/Green for LCD panel
- 104 code digital code squelch
- "Five in One" programmable memory
- 1,000 multifunction memory

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NEW!

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- Fully Solid-state 1 KW HF 650W 6m
- Built-in Power supply (110 or 220v)
- 2 Ant ports selectable
- auto band switched w/ most ICOM/Kenwood/Yaesu tcvrs

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KAM XL

- DSP modem offers great performance on Packet 300/1200,G-tor,Pactor, Amtor,PSK-31
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High-performance, low power TNC. Great for packet, and APRS compatible.

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RRC-1258 MkII-S-Set

NEW!

This set of interfaces allows remote control of your Amateur Radio Station via Internet in a user-friendly and cost effective way!

RemoteRig gives you control of the radio coupled with crystal clear TX & RX audio and sending CW with your own Paddle!

New! Now Stereo Version for Dual Receiver radios.

Works with all Computer-controllable radios from:
Alinco - Elecraft - ICOM - Kenwood - Yaesu

For radios with detachable front panels *no PC is required* for:
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Just simply insert your control box in place of your front panel interconnect cable, place the body of the radio on the remote end and you are on the air as if you are there!

Extra Controller and Remote interface units sold individually for multiple sites/users.

Available exclusively from all HRO Locations!

GEOCHRON

Detailed illuminated map shows time, time zone, sun position and day of the week at a glance for any place in the world.Continuously moving – areas of day and night change as you watch.
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US TOWER

Shown with Optional Rotor Base

MA-40

40' Tubular Tower

Call For Latest Pricing!

MA-550

55' Tubular Tower

Handles 10 sq.ft. at 50mph
Pleases neighbors with tubular streamlined look

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55' Freestanding Crank-Up
Handles 18 sq. ft. @ 50 mph
No guying required
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Can add raising and motor drive acces.

Towers Rated to EIA Specifications
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Phone Hours: 9:30 AM – 5:30 PM
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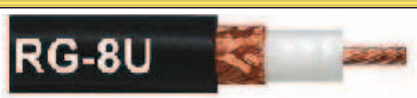
  19 Strands of 29 AWG Bare Copper



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- 78% Velocity Factor
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- Black Vinyl Jacket .405" O.D.
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  7 Strands of 21 AWG Bare Copper

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Full Size Performance 80M, Only 43 ft. Tall
Now Only **$349.95**

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8 Bands 40-6M, 25 ft.
No Radials
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From **$194.95**

Stainless steel tilt and mount, strongest Extren® base insulator—standard equipment

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DXE-MBVE-1	43 ft. 160 to 10 Meter Multi-Band	$194.95
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DXE-MBVE-1-4UP	43 ft. Multi-Band Vertical/ UNUN Package *SPECIAL*	$289.95
DXE-MBVE-1-4UPR	43 ft. Multi-Band Vertical/Radial Plate/UNUN Package	$349.95
DXE-MBVE-1-3ATP	43 ft. Multi-Band Vertical/ Remote Tuner Package	$579.00
DXE-MBVE-2-4UP	33 ft. 80 to 10 Meter Multi-Band UNUN Package	$279.95
DXE-4030VA-1	THUNDERBOLT™ 40/30 Meter Dual Band	$199.95

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DXE-7580VA-1	THUNDERBOLT™ Design 75/80 Meter Monoband 55 ft.	$549.95
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DXE-60VA-1P	THUNDERBOLT™ Design 60 Meter 43 ft. Vertical	$259.50
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DXE-40VE-1	Fast Taper, High Performance 40 Meter	$179.95
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DXE-60VE-1P	Fast Taper High Performance 60 Meter	$229.50

Accessories

DXE-VRW-1	Manual Winch Add-on Raising Kit for 7580 and 8040	$169.99
DXE-8040-30AOK	30 Meter Add-on Kit for 8040VA-1	$129.95
DXE-7580-THK	CW Optimizer Capacity Hat Kit for 75/80 and 80/40 Antennas	$59.95
DXE-MBV-ATU-1	Multi-Band 43 ft. Vertical Automatic Tuner Add-on Kit	$399.00
DXE-UN-43-R	UNUN Complete Add-on Kit for 43 ft. Vertical Antennas	$129.95

NEW - UNSLIT TUBING— OR SLIT ONE END EXACT TELESCOPING SIZES!

6063-T832 Aluminum Tubing

- Smoothly telescoping sections
- Drawn - not extruded tubing
- Better than the other guys - guaranteed lowest price
- Custom made just for DX Engineering
- Use DXE Stainless Steel Element Clamps to assemble slit lengths

New!

.058" wall x 36" long	DXE-AT#	Unslit	DXE-AT#	Slit one end
0.375" O.D.	1240	$1.45		NA
0.500" O.D.	1494	$2.05	1241	$3.75
0.625" O.D.	1495	$2.35	1242	$4.05
0.750" O.D.	1496	$2.65	1243	$4.35
0.875" O.D.	1497	$2.75	1244	$4.45
1.000" O.D.	1498	$2.95	1245	$4.65
1.125" O.D.	1499	$3.25	1246	$4.95
1.250" O.D.	1500	$4.15	1247	$5.85
1.375" O.D.	1501	$4.45	1248	$6.15
1.500" O.D.	1502	$5.25	1249	$6.95
1.625" O.D.	1503	$6.05	1250	$7.75
1.750" O.D.	1504	$6.85	1251	$8.55
1.875" O.D.	1505	$7.65	1252	$9.35
2.000" O.D.	1506	$8.45	1253	$10.15
2.125" O.D.	1507	$9.25	1254	$10.95

.058" wall x 72" long				
0.375" O.D.	1189	$2.95		NA
0.500" O.D.	1480	$4.15	1205	$6.05
0.625" O.D.	1481	$4.75	1206	$6.65
0.750" O.D.	1482	$5.35	1207	$7.25
0.875" O.D.	1483	$5.65	1208	$7.55
1.000" O.D.	1484	$5.95	1209	$7.85
1.125" O.D.	1485	$6.55	1210	$8.45
1.250" O.D.	1486	$7.75	1211	$9.65
1.375" O.D.	1487	$8.45	1212	$10.35
1.500" O.D.	1488	$8.95	1213	$10.85
1.625" O.D.	1489	$9.75	1214	$11.65
1.750" O.D.	1490	$10.65	1215	$12.55
1.875" O.D.	1491	$11.55	1216	$13.45
2.000" O.D.	1492	$12.45	1217	$14.35
2.125" O.D.	1493	$13.35	1218	$15.25

Also available 6061-T8 .120 wall - 1.5" to 3" O.D.
Unslit for booms and HD element designs!

DXE-AT1311	6' x 1.5" O.D.	$23.85
DXE-AT1312	6' x 1.75" O.D.	$28.20
DXE-AT1313	6' x 2.0" O.D.	$33.00
DXE-AT1314	6' x 2.25"O.D.	$37.45
DXE-AT1315	6' x 2.5" O.D.	$42.50
DXE-AT1316	6' x 2.75" O.D.	$46.95
DXE-AT1317	6' x 3.0" O.D.	$51.40
DXE-AT1325	12' x 3.0"O.D.	$103.95

See DXEngineering.com for specs and additional tubing.DX Engineering Has All-Stainless Steel Element Clamps That Fit Exact Tubing Sizes!

65 Ft. Telescoping Antenna Kit

- Eleven telescoping sections from 2" to 7/8" O.D.
- Stainless steel element clamps

DXE-ATK65	Telescoping Antenna Kit	$194.50
DXE-VE-BASE	Fixed Vertical Insulated Base Kit	$99.50
DXE-VA-BASE	HD Vertical Insulated Tilt Base Kit	$159.50

High Quality Performance Grade Cables

- Heat shrink weatherproofing/strain relief
- All assemblies Hi-Pot high voltage tested
- Silver/Teflon® crimped and soldered connectors

RG-213/U JSC-3780 Cable Assemblies with PL-259 Connectors

DXE-CBC-213JU003	3 ft.	$12.88
DXE-CBC-213JU006	6 ft.	$15.88
DXE-CBC-213JU012	12 ft.	$20.88
DXE-CBC-213JU025	25 ft.	$29.88
DXE-CBC-213JU050	50 ft.	$52.88
DXE-CBC-213JU075	75 ft.	$71.88
DXE-CBC-213JU100	100 ft.	$91.88
DXE-CBC-213JU125	125 ft.	$112.88
DXE-CBC-213JU150	150 ft.	$133.88

RG-8/U JSC-3030 Cable Assemblies with PL-259 Connectors

DXE-CBC-008JU002	2 ft.	$12.88
DXE-CBC-008JU003	3 ft.	$13.88
DXE-CBC-008JU006	6 ft.	$16.88
DXE-CBC-008JU012	12 ft.	$24.88
DXE-CBC-008JU025	25 ft.	$39.88
DXE-CBC-008JU050	50 ft.	$61.88
DXE-CBC-008JU075	75 ft.	$85.88
DXE-CBC-008JU100	100 ft.	$108.88
DXE-CBC-008JU125	125 ft.	$139.88

RG-8X JSC-3060 Cable Assemblies with PL-259 Connectors

DXE-CBC-8XJU002	2 ft.	$10.88
DXE-CBC-8XJU003	3 ft.	$11.88
DXE-CBC-8XJU006	6 ft.	$13.88
DXE-CBC-8XJU012	12 ft.	$16.88
DXE-CBC-8XJU025	25 ft.	$23.88
DXE-CBC-8XJU050	50 ft.	$32.88
DXE-CBC-8XJU075	75 ft.	$40.88
DXE-CBC-8XJU100	100 ft.	$47.88

FREE SHIPPING on $50.00 or more Coax order!

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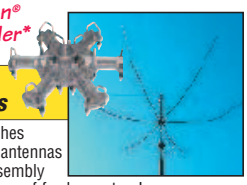
*Complete 5-Band Kit with NEW Stainless/Teflon® Balanced RIGID Feeder**



MARK II Hexx 5-Band HF Beam Antenna Kits

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- Pre-slit fiberglass—easy assembly
- Patented, balanced weather-proof feeder system!
- Small 11 ft. turning radius, weighs less than 25 pounds
- Full gain on 20, 17, 15, 12, 10 meter bands
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- Has full length elements—no lossy coils or traps
- Requires no matching network—direct single 50 Ω coax feed
- Good results at 20 to 30 feet above ground

New!

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DXE-HEXX-5WRP-2	5-Band Element & Wire Guide Package	$149.95
DXE-HEXX-5FFP	5-Band Rigid Feeder* Package	$194.95
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- High efficiency, low loss—W8JI design
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- Center Conductor 13 AWG
  7 Strands of 21 AWG Bare Copper

All cable assemblies are built with silver plated (Teflon®) connectors, sealed with adhesive lined shrink tubing for a weather-resistant bond between the connector body and the coax and then 100% hi-pot high voltage tested to guarantee a quality brand name cable assembly you can count on.

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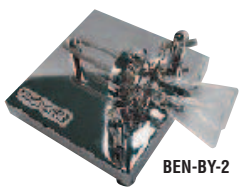

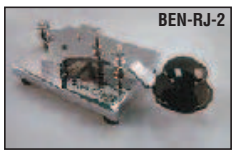

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High Strength Stainless, Aluminum & Polymer Clamps

Building an antenna from scratch? Refurbishing a well-used "old friend" or experimenting with your own project? We have the best hardware for your application.

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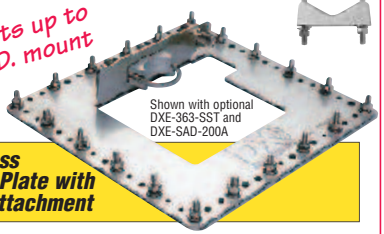
Now fits up to 3" O.D. mount



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GUARANTEES BEST RADIAL SYSTEM CONDUCTIVITY OVER TIME

Makes radial attachment a snap!
- Fits 3" pipe, 4x4 and 6x6 posts
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Biodegradable Anchor Pins Also Available

8 Circle Super Receiving Array!

New!

160-80-40 Meters 8 Switchable Directions

The latest version of DX Engineering's sophisticated receiving systems with time delay phasing. Use with your own eight identical antennas for monoband operation. Use DX Engineering's Active Receive verticals for easier installation.
- Directivity equal to phased Beverage antennas
- Switchable in eight 45 degree spaced directions
- Excellent directivity for better signal-to-noise ratio
- Includes 8 AVA Active Voltage Amplifiers with relay
- Much less area than an equivalent Beverage system
- Rugged stainless steel enclosure
- Described as "best performing" in ON4UN's Low Band Dxing
- See website for various package configurations

DXE-RCA8-SYS-2P	Controller and Switch Only	$449.95
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ARR-8560	ARRL ON4UN's Low Band DXing, 5th Ed	$44.95

Four Square Receiving Array!

100 kHZ - 30 MHz 4 Switchable Directions

A sophisticated receiving system with time delay phasing for broadband performance. Optimized to produce wider and deeper rear nulls and a narrower main lobe. Noise and undesirable signals are greatly reduced by a superior front-to-rear ratio (F/R). Better control of phase and currents provides a cleaner pattern than found on available TX four square arrays.
- Less susceptible to high angle signals compared to EWE, Flag, Pennant, and K9AY antennas
- Excellent directivity with better signal-to-noise ratio
- Switchable in four 90 degree-spaced directions
- Usable over a very wide frequency range with DXE-ARAV3 active elements
- Much less area than an equivalent Beverage system
- Active elements require minimal ground system
- Enhanced relay contact reliability
- Incudes 4 AVA Voltage Amplifiers with relay
- See website for various package configurations

DXE-RFS-SYS-2P	Controller and Switch only	$389.95
DXE-RFS-SYS-3P	160/80/40m Electronics	$799.00

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Thick, Laser Cut Stainless Steel Tilt Base

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DXE-TB-3P	For Hustler BTV verticals	$62.50
DXE-TB-4P	For DX Engineering 40VA-1, Butternut, most Hy-Gain 1/4-wave verticals	$87.50
DXE-TB-6P	For Hy-Gain 14AVQ	$87.50

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- Software CD ROM included
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- USB port powered
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- Supports all sound card digital and voice modes
- Requires radio interface cable

Green Heron Digital Rotor Controller

Replaces your existing rotor control system. Preprogrammed for Hy-Gain HAM series and T2X rotors. Solderless setup for other rotor types (with jumpers) and field programmable. Fully user-programmable including reversal and brake delay, maximum/minimum speed, limits, ramps, etc.
- RS-232 and USB interface for computer control
- Master/slave for stacked arrays—turn together or separately
- PWM variable speed control
- FREE Software for easy setup
- Precision heading accuracy up to 720° of travel
- Fully supports side-mounted antennas
- Offset control for multiple directions on one mast
- High visibility display with adjustable backlight

GHE-RT-21	Green Heron Rotor Controller	$559.00
HYG-HAM-IVRLC	HAM-IV rotor only	$499.95
HYG-T-2XRLC	T2X rotor only	$599.95

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Call us or log-on today!

- ***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 Icom interface cable, DC power cable and coax jumper. ***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 Icom interface cable, DC power cable and coax jumper.
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. A coax jumper cable is also induced for fast hook up.
Suggested Price $129.99.

Did you know that we have tuner that will work for you?

Some people don't know that we make tuners that will work with any transceiver. Don't know which one is right for you? Give us a call or see the Tuner Comparison Chart on our web site for more selection help!

radio not included

AT-897Plus for the Yaesu FT-897

If you own a Yaesu FT-897 and want a broad range automatic antenna tuner, look no further! The AT-897Plus Autotuner mounts on the side of your FT-897 just like the original equipment and takes power directly from the CAT port of the FT-897 and provides a second CAT port on the back of the tuner so hooking up another CAT device couldn't be easier. ***Suggested Price$199.99***

AT-600Pro

The AT-600Pro handles up to 600 watts SSB and CW, 300 on RTTY (1.8 – 30 MHz), and 250 watts on 54 MHz. Matches virtually any kind of coax-fed antenna and will typically match a 10:1 SWR down to 1.5:1 in just a few seconds. You can also use it with longwires, random wires and antennas fed with ladder line just by adding a balun. Two antenna ports with a front-panel indicator, and separate memory banks for each antenna. LED bar-graph meters shows RF power, SWR and tuner status, tactile feedback control buttons and an LED bypass indicator. Operates from 11 – 16 volts DC at 750 mA. Includes Icom interface cable, DC power cable and coax jumper. ***Suggested Price $359.99***

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 Icom interface cable, DC power cable and coax jumper.
Suggested Price $159.99

LDG Electronics, Inc. 1445 Parran Road, St. Leonard, MD 20685 ***Phone 410-586-2177 • Fax 410-586-8475***

The #1 Line of Autotuners!

AT-1000Pro

The AT-1000Pro has an Automode that automatically starts a tuning cycle when the SWR exceeds a limit you set. Operates at any power level between 5 and 1,000 watts peak. RF Relay protection software prevents tuning at greater than 125 watts. Tunes from 1.8 to 54.0 MHz (inc. 6 meters), with tuning time usually under 4 seconds, transmitting near a frequency with stored tuning parameters, under 0.2 seconds. 2000 memories. 2 Antenna connections. Includes Icom interface cable, DC power cable and coax jumper. ***Suggested Price $599***

- ***RF Sensing***
- ***Tunes Automatically***
- ***No Interface Cables Needed***

AT-200Pro

The AT-200Pro features LDG's new "3-D memory system" allowing up to eight antenna settings to be stored for each frequency. Handles up to 250 watts SSB or CW on 1.8 – 30 MHz, and 100 watts on 54 MHz (including 6 meters). Rugged and easy-to-read LED bar graphs show power and SWR, and a function key on the front panel allows you to access data such as mode and status. Includes Icom interface cable, DC power cable and coax jumper. ***Suggested Price $249***

NEW! YT-450

LDG's newest tuner is specially designed for Yaesu's newest 100 watt radios. The YT-450 interfaces directly with the Yaesu FT-450 and FT-950 radios, making integration easier than ever. Simply connect the tuner to the radio with the supplied cables and you are ready to operate. DC power and all control is done through the interface cable. Just press the tune button on the tuner and the rest happens automatically: mode and power are set, a tune cycle runs and the radio is returned to its original settings. 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! An extra CAT port on the back allows seamless connection to a PC. You have the newest radio, now get the newest tuner to go with it! ***Suggested Price $249.99***

IT-100

Matched in size to the IC-7000 and IC-706, the new IT-100 sports a front panel push-button for either manual or automatic tunes, and status LEDs so you'll know what's going on inside. You can 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. It's the perfect complement to your Icom radio that is AH3 or AH-4 compatible. ***Suggested Price $179.99***

KT-100

LDG's first dedicated autotuner for Kenwood Amateur transceivers. Easy to use - just right for an AT-300 compatible Kenwood transceiver (except TS-480HX). The KT-100 actually allows you to use the Tune button on the radio. The LEDs on the front panel indicate tuning status, and will show a match in seconds, or even less of you've tuned on or near that frequency before. Has 2,000 memories for instant recall of the tuning parameters for your favorite bands and frequencies. If you have an AT-300 compatible Kenwood radio, you can simply plug the KT-100 into your transceiver with the provided cable; the interface powers the tuner, and the Tune button on the radio begins a tuning cycle. The supplied interface cable makes the KT-100 a dedicated tuner for most modern Kenwood transceivers. ***Suggested Price $199.99***

YT-100

An autotuner for several popular Yaesu Radios. An included cable interfaces with your FT-857, FT-897 and FT-100 (and all D models) making it an integrated tuner, powered by the interface. Just press the tune button on the tuner, and everything else happens automatically: mode and power are set, a tune cycle runs, and the radio is returned to its original settings. It's the perfect complement to your Yaesu radio. ***Suggested Price $199.99***

Meters!

FT Meter 2.5" face with calibrated scales for signal strength, discriminator reading on receive, and power output, SWR, modulation, ALC action and supply voltage on transmit, all selectable from the radio's menu. ***Still Only $49***

FTL Meter For Yaesu FT-857(D) and FT-897(D). 4.5" face with calibrated scales for signal strength, discriminator reading on receive, and power output, SWR, modulation, ALC action and supply voltage on transmit, all selectable from the radio's menu. ***Suggested Price $79.99***

NEW! M-7600 For IC-7600. It will display S-meter on receive, or power out, SWR, ALC level or supply voltages, all selectable from the radio's menu. What's more, the M-7700 and the virtual meter on your radio can work together. ***Suggested Price $79.99***

NEW! 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! The mode is set to carrier and the RF power is reduced, a tune cycle runs and the radio is returned to the original settings. Also includes coax jumper cable. ***Suggested Price $249.99***

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LDG

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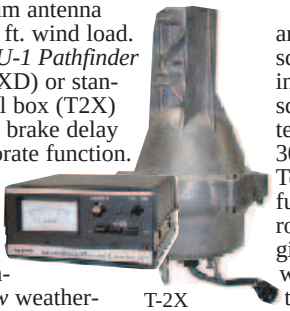
HAM-IV

HAM-IV
$649.95

The most popular rotator in the world! For medium communications arrays up to 15 square feet wind load area. *New* 5-second brake delay! *New* Test/Calibrate function. *New* low temperature grease permits normal operation down to -30 degrees F. *New* alloy ring gear gives extra strength up to 100,000 PSI for maximum reliability. *New* indicator potentiometer. *New* ferrite beads reduce RF susceptibility. *New* Cinch plug plus 8-pin plug at control box. Dual 98 ball bearing race for load bearing strength and electric locking steel wedge brake prevents wind induced antenna movement. North or South center of rotation scale on meter, low voltage control, max mast size of $2^{1}/_{16}$ inches.

HAM IV and HAM V Rotator Specifications	
Wind Load capacity (inside tower)	15 square feet
Wind Load (w/mast adapter)	**7.5 square feet**
Turning Power	800 in.-lbs.
Brake Power	**5000 in.-lbs.**
Brake Construction	Electric Wedge
Bearing Assembly	**dual race/96 ball bearings**
Mounting Hardware	Clamp plate/steel U-bolts
Control Cable Conductors	**8**
Shipping Weight	26 lbs.
Effective Moment (in tower)	**2800 ft.-lbs.**

TAILTWISTER SERIES II



For large medium antenna arrays up to 20 sq. ft. wind load. Available with *DCU-1 Pathfinder* digital control (T2XD) or standard analog control box (T2X) with *new* 5-second brake delay and *new* Test/Calibrate function. Low temperature grease, alloy ring gear, indicator potentiometer, ferrite beads on potentiometer wires, *new* weatherproof AMP connectors plus 8-pin plug at control box, triple bearing race with 138 ball bearings for large load bearing strength, electric locking steel wedge brake, North or South center of rotation scale on meter, low voltage control, $2^{1}/_{16}$ inch max. mast.

T-2X
$799.95

T-2XD
$1229.95
with DCU-1

TAILTWISTER Rotator Specifications	
Wind load capacity (inside tower)	20 square feet
Wind Load (w/ mast adapter)	**10 square feet**
Turning Power	1000 in.-lbs.
Brake Power	**9000** in.-lbs.
Brake Construction	Electric Wedge
Bearing Assembly	**Triple race/138 ball brngs**
Mounting Hardware	Clamp plate/steel U-bolts
Control Cable Conductors	**8**
Shipping Weight	31 lbs.
Effective Moment (in tower)	**3400 ft.-lbs.**

CD-45II

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
$449.95

CD-45II Rotator Specifications	
Wind load capacity (inside tower)	8.5 square feet
Wind Load (w/ mast adapter)	**5.0 square feet**
Turning Power	600 in.-lbs.
Brake Power	**800 in.-lbs.**
Brake Construction	Disc Brake
Bearing Assembly	**Dual race/48 ball brings**
Mounting Hardware	Clamp plate/steel U-bolts
Control Cable Conductors	**8**
Shipping Weight	22 lbs.
Effective Moment (in tower)	**1200 ft.-lbs.**

HAM-V

HAM-V
$1099.95
with DCU-1

For medium antenna arrays up to 15 square feet wind load area. Similar to the HAM IV, but includes *DCU-1 Pathfinder* digital control unit with gas plasma display. Provides automatic operation of brake and rotor, compatible with many logging/contest programs, 6 presets for beam headings, 1 degree accuracy, auto 8-second brake delay, 360 degree choice for center location, *more!*

AR-40

AR-40
$349.95

For compact antenna arrays and large FM/TV up to 3.0 square feet wind load area. Dual 12 ball bearing race. Automatic position sensor never needs resetting. Fully automatic control -- just dial and touch for any desired location. Solid state, low voltage control, safe and silent operation. $2^{1}/_{16}$ inch maximum mast size. MSLD light duty lower mast support included.

AR-40 Rotator Specifications	
Wind load capacity (inside tower)	3.0 square feet
Wind Load (w/ mast adapter)	**1.5 square feet**
Turning Power	350 in.-lbs.
Brake Power	**450 in.-lbs.**
Brake Construction	Disc Brake
Bearing Assembly	**Dual race/12 ball bearings**
Mounting Hardware	Clamp plate/steel bolts
Control Cable Conductors	**5**
Shipping Weight	14 lbs.
Effective Moment (in tower)	**300 ft.-lbs.**

HDR-300A

HDR-300A
$1499.95

King-sized antenna arrays up to 25 sq.ft. wind load area. Control cable connector, *new* hardened stainless steel output shaft, *new* North or South centered calibration, *new* ferrite beads on potentiometer wires reduce RF susceptibility, *new* longer output shaft keyway adds reliability. Heavy-duty self-centering steel clamp and hardware. Display accurate to 1°. Machined steel output.

HDR-300A Rotator Specifications	
Wind load capacity (inside tower)	25 square feet
Wind Load (w/ mast adapter)	**not applicable**
Turning Power	5000 in.-lbs.
Brake Power	**7500 in.-lbs.**
Brake Construction	solenoid operated locking
Bearing Assembly	**bronze sleeve w/rollers**
Mounting Hardware	stainless steel bolts
Control Cable Conductors	**7**
Shipping Weight	61 lbs.
Effective Moment (in tower)	**5000 ft.-lbs.**

ROTATOR OPTIONS

MSHD, $109.95. Heavy duty mast support for T2X, HAM-IV and HAM-V.
MSLD, $49.95. Light duty mast support for CD-45II and AR-40.
TSP-1, $34.95. Lower spacer plate for HAM-IV and HAM-V.

Digital Automatic Controller

DCU-1
$749.95

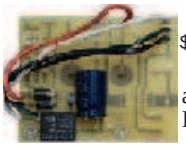
Automatically controls T2X, HAM-IV, V rotators. 6 presets for favorite headings, 1° accuracy, 8-sec. brake delay, choice for center of rotation, crisp *plasma* display. Computer controlled with many logging/contest programs.

AR-35 Rotator/Controller

AR-35
$89.95

For UHF, VHF, 6-Meter, TV/FM antennas. Includes automatic controller, rotator, mounting clamps, mounting hardware. 110 VAC. One Year Warranty.

NEW! Automatic Rotator Brake Delay



RBD-5
$29.95

Provides automatic 5-second brake delay -- insures your rotator is fully stopped before brake is engaged. Prevents accidentally engaging brake while rotator is moving. Use with HAM II, III, IV, V, T2Xs. Easy-to-install. Includes pre-assembled PCB, hardware.

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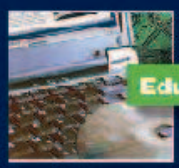

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FT-250R 2M FM HT

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VX-7RB Tri-band Submersible FM HT

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- RX: 0.5-999 MHz (cell blkd) • Memories: 900
- Power: 5/2.5/1/0.05W (0.3/0.05W on 220 MHz)

VX-8DR Quad-band FM HT

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- RX: 0.5-999 MHz (cell blocked) • Memories: 1200+
- Power: 5/2.5/1/0.05W (1.5W on 220 MHz)
- Optional GPS Unit FGPS-2 with either CT-136 adapter or MH-74A7A hand mic provides you with APRS® data

VX-8GR 2M/440 FM HT w/Built-in GPS

- TX: 144-148, 430-450 MHz • RX: 108-999 MHz (cell blocked) • Memories: 1200+ • Power: 5/2.5/1/0.05W
- GPS unit and antenna is built-in for APRS® data

FT-1900R 2M FM Mobile

- TX: 144-148 • RX: 136-174
- Power: 55/25/10/5W • Memories: 221

FTM-10R FTM-10SR

FTM-10R 2M/440 FM Dual Bander

- TX: 144-148, 430-450 • RX: 0.5-1.8, 76-222, 300-999 (cell blkd) • Power: 50/20/5W (2M), 40/20/5W (440 MHz)
- Memories: 500 • Microphone & PTT button are built-into the waterproof front panel • Bluetooth capable

FTM-10SR Same as FTM-10R except RF output is 10W (2M), 7W (440 MHz) • Body is smaller & waterproof

FT-450D HF/6M Compact Transceiver

- TX: HF/6M • RX: 0.03-56 MHz • Power: 10-100W
- Memories: 500 • Auto Tuner • Same as the FT-450AT with new features: Key illumination, Foot stand, Selectable 300 Hz/500 Hz/2.4 kHz CW IF Filters, Classically designed main dial and knobs, dynamic microphone

FT-950 HF/6M Transceiver

- TX: HF/6M • RX: 0.03-56 MHz • Power: 10-100W
- Memories: 100 • Auto Antenna Tuner
- 32-bit Floating Point DSP • Built-in high stability TCXO

FT-2000 HF/6M Transceiver

- TX: HF/6M • RX: 0.03-60 MHz • Power: 10-100W
- Memories: 99 • Auto Antenna Tuner • 32-bit Floating Point DSP • Dual In-Band Receive • Internal Power Supply
- Optional DMU-2000 Data Management Unit displays various operational conditions
- Optional MTU tune units for 160M, 80/40M and 30/20M bands allowing you to pull through weak signals

FT-2000D RF output is 200W, PS is external

FTDX-5000MP

FTDX-5000 Series – Covers HF and 6M;

Three different configurations all running 10-200W on CW, SSB, FM, RTTY & PKT and 5-50W on AM • RX: 0.03-60 MHz • Memories: 99 • The "D" and "MP" model comes with SM-5000 Station Monitor that features an excellent bandscope • The "MP" comes with high stability ±0.05ppm OCXO & 300 Hz roofing filter

FTDX-5000 Basic Model & ±0.5ppm TCXO
FTDX-5000D With Station Monitor & ±0.5ppm TCXO
FTDX-5000MP With Station Monitor, ±0.05ppm OCXO & 300 Hz Roofing Filter

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IC-V80/SPORT

RX-7-05

IC-V80 2M FM Handheld
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• Power: 5.5/2.5/0.5W • Memories: 207
• Comes with NiMH Battery and Wall Charger

IC-V80 SPORT 2M FM Handheld
• No NiMH Battery and Charger • Has AA Battery Case

RX-7-05 Wideband Receiver
• RX: 150 kHz - 1300 MHz (cell blkd) • Memories: 1650
• AM, FM Narrow & Wide Mode • Scans 100 Channels per second • 1100mAh Lith-Ion Battery & Charger

IC-V8000 2M FM Mobile
• TX: 144-148 MHz • RX: 136-174 MHz
• Power: 75/25/10/5W • Memories: 207

IC-2200H 2M FM Mobile
• TX: 144-148 MHz • RX: 118-174 MHz
• Power: 65/25/10/5W • Memories: 207
• D-Star upgradable with optional UT-118

IC-208H 2M/440 FM Mobile
• TX: 144-148, 430-450 MHz • Memories: 512
• RX: 118-173, 230-549, 810-999 MHz (cell blk)
• Power: 55/15/5W (2M), 50/15/5W (440 MHz)

IC-706MK II-G HF/VHF/UHF Mobile
• TX: HF/6M/2M/440 MHz • RX: 0.03-199, 400-470 MHz
• Power: 100W (HF/6M), 50W (2M), 20W (440 MHz)
• Memories: 107 • AF-DSP • IF Shift • Preamp/attenuator
• RMK-706 included • Quantities are limited!

IC-718 HF Transceiver
• TX: HF (except 60M) • RX: 0.03-30 MHz
• Power: 5-100W • Memories: 101 • DSP built-in
• SSB, CW, RTTY and AM (2-40W)

IC-7200 HF/6M Portable Transceiver
• TX: HF/6M • RX: 0.03-60 MHz • Power: 2-100W
• Memories: 201 • Rugged design for outdoor use
• 32-bit IF-DSPs + 24-bit AD/DA Converters
• USB Port for CI-V Format PC Control and Audio In/Out

IC-7410 HF/6M Transceiver
• TX: HF/6M • RX: 0.03-60 MHz • Power: 2-100W
• 15kHz 1st IF Filter and optional 3kHz & 6kHz filters to protect against strong unwanted adjacent signals
• Much faster DSP unit compared to the IC-746PRO
• Automatic antenna tuner • USB connector for PC control

IC-7600 HF/6M Transceiver
• TX: HF/6M • RX: 0.03-60 MHz • Power: 2-100W
• Memories: 101 • 5.8 inch color screen
• High-resolution real time spectrum scope using a dedicated DSP unit • Automatic antenna tuner

While at Dayton Hamvention May 20-22 visit AES Booths 26-29 for the Hottest Deals of the show!

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"In performance terms the Excalibur sets new standards in several areas. It is the most sensitive SDR we have yet measured."

"Conclusion: All in all, Excalibur is already the best SDR we have used - and knowing WiNRADiO we imagine that future software releases will only serve to make it even better."

Overall rating: 5 stars
WRTH category award winner: Best SDR 2011

And many other independent reviewers agree:

"The Excalibur receiver is a top rate performer supported by excellent software and the spectrum displays are a superb bonus. The 16-bit analogue to digital converter results in unsurpassed strong signal performance and once again my league table of close-in dynamic range receiver performance has a new No. 1." — *Peter Hart, RadCom*

"In my professional lifetime in communications electronics, I've never seen anything with such shortwave receiving and processing power at such a low price. In the time it took me to write this review, I have changed from a digital skeptic to a true believer. This is one amazing radio!" — *Bob Grove, Monitoring Times*

Shouldn't you have a look, too?

www.winradio.com

MFJ HF/VHF/UHF Antenna Analyzer
1.5-185 MHz plus 300-490 MHz*

New! ***Get all the basic RF-diagnostic functions you need and more with MFJ's new easy-to-use MFJ-266 digital analyzer!***

The MFJ-266 covers HF, VHF, plus UHF amateur and commercial frequencies with digital precision. It also displays SWR, Complex Impedance, and Impedance Magnitude simultaneously -- all on the same easy-to-read LCD screen. Use it to measure Capacitance, Inductance, Field Strength, Frequency, plus generate test signals. You can also fine tune stubs, analyze coax, test baluns and RF transformers, and perform many other important RF-related tasks around the shack or on the road!

MFJ-266 **$349.95**

When it comes to simplicity and convenience, MFJ-266 is a clear winner. Not only is it easy-to-use, but fits comfortably in one hand for on-the-fly measurements on the bench or in the field. Here's the rundown of what this compact powerhouse can deliver:

Frequency Coverage

The MFJ-266 covers all bases -- from 160 Meters through 6 Meters, the FM broadcast band, Airband, 2 Meters, 70 cm, plus VHF/UHF commercial 2-way frequencies:

Band A: 1.5 to 2.7 MHz
Band B: 2.5 to 4.8 MHz
Band C: 4.6 to 9.6 MHz
Band D: 8.5 to 18.7 MHz
Band E: 17.3 to 39 MHz
Band F: 33.7 to 65 MHz } gap*
Band V: 85 to 185 MHz }
Band U: 300-490 MHz

The velvet-smooth 10:1 vernier drive and solid state varicap makes fine tuning a breeze, and a built-in dial lock prevents accidental detuning while making measurements. Switched backlighting makes LCD screen easy-to-read in any light.

SWR, Impedance Magnitude, and Complex Impedance

In SWR Mode, the MFJ-266 reads SWR 1:1 to 9.9:1, Impedance Magnitude 10-500 Ohms and Complex Impedance (resistance and reactance). Best of all, it displays all three parameters *simultaneously* and operating frequency with one quick glance. *No other low-cost handheld analyzer offers this!* (Note: Z-mag and R+jX not displayed on UHF).

Capacitance and Inductance

Find values for unknown capacitance in pF or unknown inductance in uH quickly. Measurements are made at RF frequencies rather than at the low audio frequencies used by many handheld L/C meters.

Frequency Measurement, Field Strength Readings

In Frequency-Counter Mode, MFJ-266 becomes an accurate 500-MHz counter with a choice of 1-kHz or 100-Hz resolution. The counter mode also features a high-resolution *digital field-strength meter* for measuring the relative intensity of incoming signals. Together, these functions are extremely useful for checking the operation of oscillators, transmitters, as well as assessing the strength of radiated signals from antenna arrays.

Built-in Interference Detection

In Frequency-Counter Mode, the MFJ-266 also tracks down powerful local signals that can disrupt accurate SWR measurements. When picked up by an antenna under test, these signals may compete with the analyzer's internally generated test signal to make SWR readings appear artificially high. All handheld antenna bridges are subject to additive interference, but *only* the MFJ-266 can detect the presence of an offending signal, display its severity, and identify the operating frequency!

Powerful Signal Source

The MFJ-266 also functions as a tunable signal source, supplying about 2 Volts peak-to-peak across the entire tuning range. You can use this signal to drive mixers, low-power amplifier stages, or filters, and use it as a source for checking antenna patterns on a range. Add a step attenuator, (**MFJ-762, $89.95**) and it becomes a low-level signal source for testing receivers and pre-amps.

Take it With You!

You'll especially appreciate the compact size and bantam weight of the MFJ-266 when up on a roof or perched on a tower. Also, push-button band switching lets you toggle across the spectrum with ease when tucked into cramped spaces.

User-Friendly Layout

MFJ-266 is ergonomic, with the antenna N-connector positioned on top of the case and everything else carefully arranged and clearly marked on the front panel -- right in front of your eyes.

MFJ-266's operating manual was professionally written and illustrated to help you understand and master every function quickly. It also includes a guide for ensuring accurate results and getting the most from the unit's advanced features. In the back, you'll find a one-page *"Quick Guide"* that reviews all controls and functions.

Many Instruments in One

Having the MFJ-266 is like owning several pieces of test equipment. You get a powerful wide-range signal source, Inductance/Capacitance meter, network analyzer, RF field-strength meter and a 500-MHz frequency counter all-in-one small package. The more you use it, the more uses you'll find for it!

Bullet Proof Construction

Features like the rugged aluminum case, solid-state band switching, robust internal construction, and solid-state LCD display ensure that minor bumps and drops won't faze your unit in the least. In fact, you can expect it to hold calibration and deliver reliable service for years to come.

Vital Statistics

MFJ-266 can be powered from eight internal AA *alkaline* batteries or from optional 12VDC/110 VAC adapter, MFJ-1312D, $15.95. With the long storage life of alkaline batteries, your analyzer will always be ready to go when you are.

Compact $3^{3}/_{4}$Wx$6^{1}/_{2}$Hx$2^{3}/_{4}$D inches. Weighs 1.32 lbs. Draws 30-mA in counter mode and 140-mA in analyzer mode. Includes N-to-SO-239 adapter.

Protected by MFJ's famous *No Matter What*™ one year limited warranty.

MFJ Analyzer Accessories

MFJ-66, $24.95. Plug these MFJ dip meter coupling coils into an MFJ *SWR Analyzer*™ and turn it into a sensitive and accurate *band switched* dip meter. Two coils cover HF/VHF.

MFJ-5510, $9.95. 12 VDC Cigarette lighter adapter cord for using your MFJ SWR Analyzers *on-the-road*. 18 inches retracted curly cord, 60 in. fully stretched.

Free MFJ Catalog

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

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

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MFJ . . . The World Leader in Amateur Radio!

MFJ TUNERS

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.

***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.

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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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/feed-point 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

Fully *weather-sealed for remote Outdoor/Marine use*! Tough, durable, built-to-last the elements for years.

MFJ-926 **$399.95**

200 Watt...Remote

Coax/Wire Ant, No pwr cable needed

Weather protected fully automatic *remote* auto tuner for wire ***and*** *coax* antennas -- an MFJ exclusive. Powers through coax -- No separate power cable needed.

MFJ-927 **$259.95**

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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
$299.95

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.

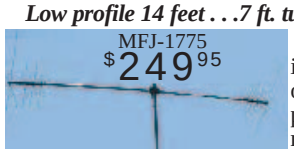
MFJ-1796W, $229.95. WARC band version for 12, 17, 30, 60 Meters only.

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.

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

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FAX:(662)323-6551 8-4:30 CST, Mon.-Fri. ***Add shipping.***

MFJ 160-6 Meter Antenna

Self-supporting 43 foot vertical -- no guy wires required . . . 1500 Watts . . . exceptional performance . . . low-profile . . . includes base mount and legal limit balun . . . assembles in an hour . . .

MFJ-2990
$359.95

New!

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

Exceptional Performance

The entire length radiates to provide exceptional low angle DX performance on 160 through 20 meters and very good performance on 17 through 6 Meters. You can shorten it by telescoping it down for more effective low angle radiation on higher bands if desired.

With an automatic antenna tuner there's no fuss -- just talk!

A wide-range automatic or manual antenna tuner *at your rig* easily matches this antenna for all bands 160-6 Meters. There's no physical tuning adjustments on the antenna -- you simply put it up!

An optimized balun design allows *direct coax feed* with negligible coax loss (typically less than 1/2 dB 60-6 Meters and less than 1 dB 160-80 M with good quality, low-loss coax).

Fully self-supporting, Extremely low wind loading, Very low visibility . . .

With just 2 square feet wind load, the fully self-supporting MFJ-2990 -- *no guy wires needed* -- has the lowest wind-loading and lowest visibility of any vertical antenna! The key is a six foot section of tapering diameter *stainless steel* whip that flexes in strong wind instead of stressing the bottom sections. Its 2-inch O.D. and .120 inch thick walled tubing bottom section makes it incredibly strong -- it'll stay up!

Weighs just 20 pounds -- you can easily put it up by yourself because its corrosion resistant *6063 aircraft aluminum* tubing and stainless steel construction make it light *and* super-strong.

Assembles in an hour

You can easily assemble it in an hour! Ground mounting lets you completely hide its antenna base in shrubbery. Includes ATB-65 high-strength antenna mount. Requires ground system -- at least one radial. More extensive ground system will give much better performance.

Great for Stealth Operation in antenna restricted areas

This very low-profile antenna is perfect for stealth operation in antenna restricted areas. Hide it behind trees, fences, buildings, bushes. Use it as a flagpole. Telescope it down during the day. Put it up at night and take it down in the morning before the neighbors even notice!

Quick and easy installation makes it great for DXpeditions, field day and other portable and temporary operations.

MFJ *Automatic* Tuners

MFJ-998
$699.95

For legal limit 1500 Watt SSB/CW amplifiers. Auto-ranging LCD and Cross-Needle SWR/Wattmeter, antenna switch, amp bypass, matches 12-1600 Ohms, 1.8-30 MHz.

MFJ-993B
$259.95

Dual power range -- 300 Watt range matches 6-1600 Ohms. 150 Watt/6-3200 Ohms. Auto-ranging LCD and Cross-Needle SWR/Wattmeter, antenna switch, 1.8-30 MHz.

MFJ *Manual* Tuners

MFJ-989D
$389.95

1500 Watts SSB/CW, 1.8-30 MHz. Active peak-reading Cross-Needle SWR/Wattmeter, balun, dummy load, antenna switch, aircore roller inductor.

MFJ-949E
$179.95

World's most popular tuner! 300 Watts, 1.8-30 MHz. Peak/Average Cross-Needle SWR/Wattmeter, 8 pos. antenna switch, dummy load, 1kV capacitors.

Window Feedthru

MFJ-4602
$69.95

Bring 3 coaxes, balanced line, random wire, ground thru window. Connectors mounted on *stainless steel* panel. 3/4" thick *pressure-treated* weather-proof wood.

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MFJ All-Band G5RV Antennas

Operate all bands through 10 Meters, even 160 Meters, with a single wire antenna!

MFJ-1778
$44.95

The famous G5RV *antenna is the most popular ham radio antenna in the world!* You hear strong signals from G5RVs day and night, 24/7.

And it's no wonder . . . it's an efficient, *all band* antenna that's only 102 feet long -- shorter than an 80 Meter dipole. Has 32.5 foot ladder line matching section ending in SO-239 connector for your coax feedline.

Use as Inverted Vee or Sloper, and it's even more compact and needs just one support.

With an antenna tuner, you can operate all bands 80 Meters through 10 Meters and even 160 Meters with an antenna tuner and a ground.

MFJ's fully assembled G5RV handles 1500 Watts. *Hang and Play™* -- add coax, some rope to hang and you're on the air!

MFJ-1778M, $39.95. *Half-size*, 52 foot *G5RV JUNIOR* covers 40-10 Meters with tuner. Handles full 1500 Watts.

MFJ All Band Doublet

MFJ-1777
$59.95

MFJ-1777 is a 102 foot *all band* doublet antenna that covers 160 through 6 Meters with a balanced line tuner. Super strong custom fiberglass center insulator provides stress relief for ladder line (100 ft. included). Authentic *glazed ceramic* end insulators. Handles full 1500 Watts.

MFJ *Dual Band* 80/40 *or* 40/20M Dipoles

MFJ-17758
$89.95
80/40 Meters

MFJ-17758 is a short 85 foot long *dual band* 80/40 Meter dipole antenna. It's *full-size* on 40 Meters and has ultra-efficient end-loading on 80 Meters. Handles full 1500 Watts. Super-strong injection-molded center insulator with built-in SO-239 connector and hang hole. Solderless, crimped construction. 7-strand, #14 gauge hard copper wire. Connect your coax feedline directly, no tuner needed.

MFJ-17754, $59.95. Short coax fed 42 foot long *dual band* 40/20 Meter dipole antenna. *Full-size* on 20 Meters, ultra-efficient end-loading on 40 Meters. Same construction as MFJ-17758.

MFJ *Single Band* Dipole Antennas

Ultra high quality center fed dipoles will give you trouble-free operation for years. Custom injection-molded UV-resistant center insulator has built-in coax connector and hanging hole. Heavy duty 7-strand, 14-gauge hard copper antenna wire. Extremely strong solderless crimped construction. Authentic *glazed ceramic* end insulators. Use as horizontal or sloping dipole or inverted vee. Handles full 1500 Watts. Simply cut to length for your favorite frequency with cutting chart provided.

MFJ-1779A
$69.95
160M, 265 ft.

MFJ-1779B
$49.95
80-40M, 135 ft.

MFJ-1779C
$29.95
20-6M, 35 ft.

True 1:1 Current *Balun & Center Insulator*

MFJ-918
$24.95

True *1:1 Current Balun/ Center Insulator* forces equal antenna currents in dipoles for superior performance. Reduces coax feedline radiation and field pattern distortion -- your signal goes where *you* want it. Reduces TVI, RFI and RF hot spots in your shack. *Don't build a dipole without one!* 50 hi-permeability ferrite beads on high quality RG-303 *Teflon*® coax and *Teflon*® coax connector. Handles full 1.5kW 1.8-30 MHz. Stainless steel hardware with *direct* 14 gauge stranded copper wire connection to antenna. 5x2 inches. Heavy duty weather housing.

RF Isolator

MFJ-915
$29.95

MFJ-915 *RF Isolator* prevents unwanted RF from traveling on the outside of your coax shield into your transceiver. This unwanted stray RF can cause painful RF "bites" when you touch your microphone or volume control, cause your display or settings to go crazy, lock up your transceiver or turn off your power supply. In mobile installations, stray RF could cause your car to do funny things even blow your car computer. Clear up these problems, plug an MFJ-915 between your antenna and transceiver. 5x2 in. Handles full 1500 Watts. Covers 1.8-30 MHz.

MFJ-919, $59.95. 4:1 current balun,1.5 kW.

MFJ-913, $29.95. 4:1 balun, 300 Watts.

Antenna Switches

MFJ-1704
$79.95
4-Positions

MFJ-1704 heavy duty *antenna switch* lets you select 4 antennas or ground them for static and lightning protection. Unused antennas automatically grounded. Replaceable lightning surge protection. Good to 500 MHz. 60 dB isolation at 30 MHz. 2.5 kW PEP. Less than .2 dB insertion loss, SWR below 1.2:1. SO-239 connectors. Handy mounting holes. 6¼Wx4¼Hx1¼D in.

MFJ-1702C
$39.95
2-Positions

MFJ-1702C Like MFJ-1704, but for 2 antennas. 3Wx2Hx2D"

MFJ-1700C
$99.95

MFJ-1700C *Antenna/ Transceiver Switch* lets you select one of six antennas and one of six transceivers in any combination. Plug in an antenna tuner or SWR wattmeter and it's always in-line for any antenna/transceiver combination. Has lightning surge protection. Handles 2 kW PEP SSB, 1 kW CW, 50-75 Ohm loads. Unused terminals are automatically grounded. 1.8 to 30 MHz. SO-239 connectors. 4¾W6½Hx3D inches.

MFJ-1701
$69.95

MFJ-1701 *Antenna Switch* like MFJ-1700C but lets you select one of six antennas only. 10Wx3Hx1½D inches.

33 ft. Telescoping fiberglass Mast

3.8 feet collapsed, 3.3 lbs.

MFJ-1910
$79.95

Super strong fiberglass mast has huge 1¾ inch bottom section. Flexes to resist breaking. Resists UV. Put up *full size* inverted Vee dipole/vertical antenna in minutes and get *full size performance!*

Make your own antennas

Dipoles, G5RV, Random Wire, Doublets, Beverage Antennas, etc.

MFJ-16C06, $4.56. 6-pack authentic *glazed ceramic* end/center antenna insulators.

MFJ-16B01, $19.95. Custom injection-molded UV-resistant center insulator has built-in coax connector and hanging hole.

MFJ-18G100, $24.95. 100 ft. of flexible, 7-strand, 14-gauge solid copper antenna wire.

MFJ-58100X, $49.95. 100 ft. 50-Ohm RG-8X with PL-259s on each end.

MFJ-18H100, $34.95. 100 feet, 450 Ohm ladder line, 18 gauge copper covered steel.

Lightning Surge Protectors

Ultra-fast gas discharge tube shunts 5000 amps peak. Less than 0.1 dB loss. Up to 1000 MHz. SO-239s. **MFJ-270, $29.95.** 400W PEP. **MFJ-272, $39.95.** 1500W PEP.

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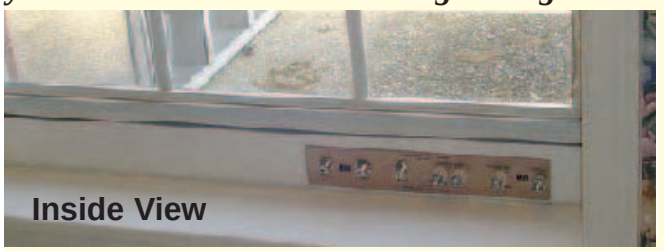
MFJ Weather-Proof *Window Feedthrough Panels*

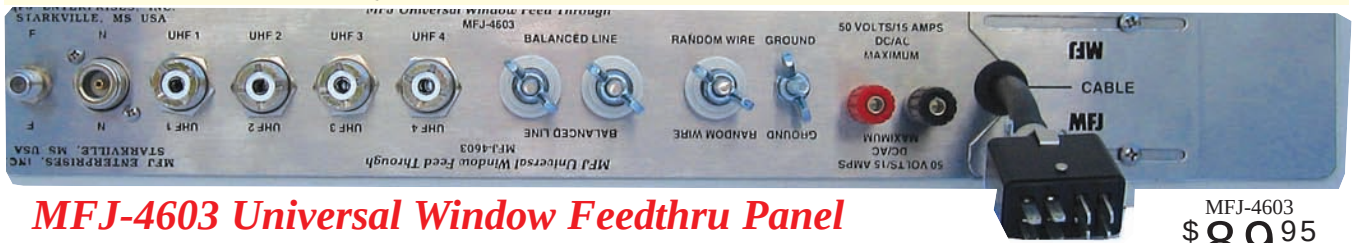
Weather-proof window feedthrough panels bring coax, balanced lines, HF/VHF/UHF antennas, random wire antennas, ground, rotator/antenna switch cables and DC/AC power into your hamshack without drilling through walls!



MFJ Weather-Proof *Window Feedthrough Panels* mount in your window sill. Lets you bring all your antenna connections into your hamshack *without* drilling holes through walls.

Simply place in window sill and close window. One cut customizes it for any window up to 48 inches. Use horizontally or vertically. Connectors are mounted on inside/outside stainless steel plates and attached to a 4 foot long, 3½ inch high, ¾ inch thick *pressure-treated* wood panel. Has excellent insulating properties. Weather-sealed with a heavy coat of long-lasting white outdoor enamel paint. Edges sealed by weather-stripping. Seals and insulates against all weather conditions. Includes window locking rod.

Inside/outside stainless steel plates ground all coax shields. Stainless steel ground post brings ground in.



MFJ-4603 Universal Window Feedthru Panel

MFJ-4603 $89.95

Four 50 Ohm *Teflon*(R) SO-239 coax connectors lets you feed HF/VHF/UHF antennas at full legal power limit.

A 50 Ohm *Teflon*(R) coax *N-connector* lets you use any antenna up to 11 GHz, including 450 MHz, UHF, satellite, moon bounce and 2.4/5.8 GHz Wi-Fi antennas.

A 75 Ohm, 1 GHz *F-connector* makes it easy to bring in television, Satellite, HD, cable TV and FM radio signals.

A pair of high-voltage *ceramic feedthru insulators* lets you bring in 450/300 Ohm balanced lines directly to your antenna tuner.

Has random/longwire antenna *ceramic feedthru insulator*.

***5-way** binding posts* lets you supply 50 Volts/15 Amps DC/AC power to your outside antenna tuners/relays/switches.

Stainless ground post brings in ground connection, bonds inside/outside stainless steel panels together and drains away static charges.

MFJ's exclusive *Adaptive Cable Feedthru*™ lets you bring in rotator/antenna switch cable, etc. without removing connectors (up to 1¼X1⅝ in). Adapts to virtually *any* cable size. Seals out rain, snow, adverse weather.

3 Coax, Balanced Line, Random Wire

Best Seller! 3 *Teflon*(R) coax connectors for HF/VHF/UHF antennas. Separate high voltage *ceramic* feed-thru insulators for balanced lines and longwire/random wire, Stainless steel ground post.

MFJ-4602 $69.95

6 Coax

6 high quality *Teflon*(R) coax connectors for HF/VHF/UHF antennas. Stainless steel ground post. Full 1500 Watt legal limit.

MFJ-4601 $59.95

4 Balanced Line, 2 Coax

4 pairs of high-voltage *ceramic* feed-thru insulators for balanced lines and 2 coax connectors.

New! MFJ-4600 $79.95

5 Cables, any-size

5 *Adaptive Cable Feedthrus*™. Pass any cable with connector: 2 cables with large connectors up to 1¼x1⅝ inches and 3 cables with UHF/N size coax connectors. Seals out weather.

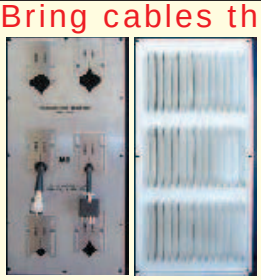
MFJ-4604 $99.95

All-Purpose FeedThru/CableThru™

***Stacks** MFJ-4603 **and** MFJ-4604!* Gives you every possible cable connection you'll ever need through your window without drilling holes in wall -- including UHF, N and F coax connectors, balanced lines, random wire, ground, DC/AC power and cables of any size for rotators, antenna switches, etc.

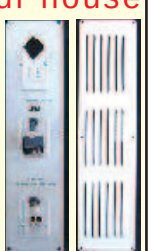
MFJ-4605 $159.95 New!

Bring cables thru eave of your house



MFJ-4616 shown with standard full-size vent (not included) it replaces. For *6 Cables* $26.95

MFJ-4613 shown with standard half-size vent (not included) it replaces. For *3 Cables* $14.95



Replace your standard air vents on the eave/sofitt of your house with these *MFJ AdaptiveCable*™ *Air Vent Plates* and…

Bring in coax, rotator, antenna switch, power cables, etc. *with connectors* up to 1¼x1⅝ inches!

Sliding plates and rubber grommets adjust for virtually any cable size to seal out adverse weather, insects and varmints. Use existing vent hole, mounting screws and screw holes.

AdaptiveCable™ *Wall Plates*

MFJ-4614 *For 4 Cables* $34.95

Bring nearly any cable -- rotator, antenna switch, coax, DC/ AC power, etc. -- through walls *without removing connectors* (up to 1¼x1⅝ inches). Sliding plates and rubber grommets adjust hole size to weather-seal virtually any size cable.

Includes *stainless steel* plates for each side of wall, sliding plates, rubber grommets, weather stripping and screws.

MFJ-4612 *For 2 Cables* $24.95

MFJ-4611 *For 1 Cable* $14.95

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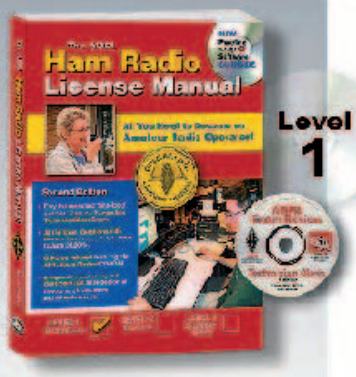

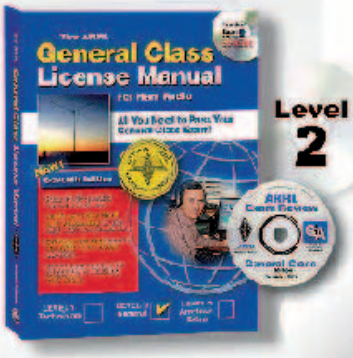

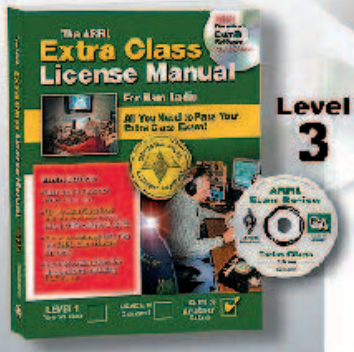

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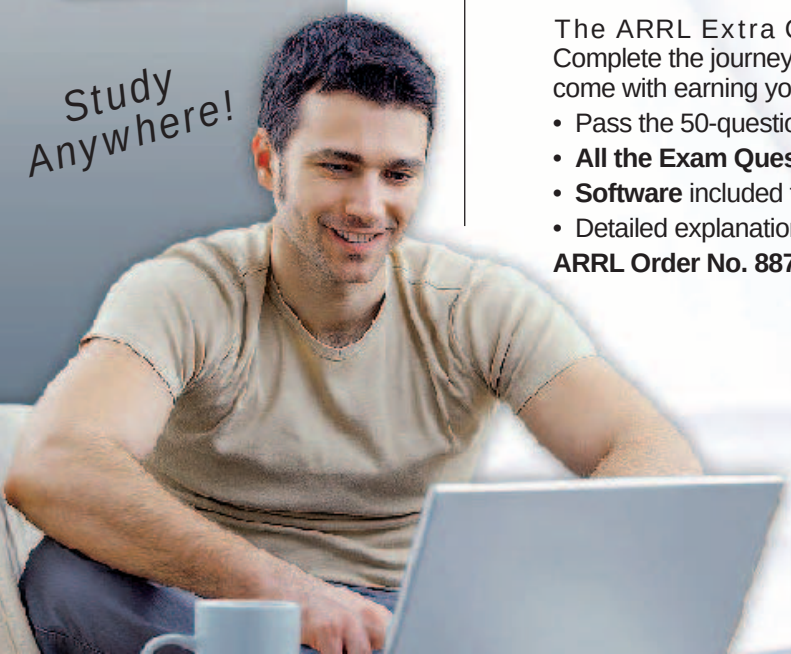

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Turn your mobile, base or handheld into 160 Watt powerhouses and talk further, longer, clearer. . . All modes: FM, SSB, CW . . . Superb GaAsFET preamp . . . Overdrive, high SWR, Over-temperature protection . . . Remote controllable . . .

The MIRAGE B-5018-G gives you 160 Watts output for 50 Watts input on all modes -- FM, SSB, or CW!

Ideal for 25-50 Watt 2 Meter mobile or base. Weak signals pop out with its low noise *GaAsFET* preamp and its excellent 0.6 dB noise figure. Selectable 5, 8 or 14 dB preamp gain.

Exclusive MIRAGE *ActiveBias*™ circuit gives *crystal clear SSB* without splatter or distortion.

B-5018-G is legendary for its ruggedness and is fully protected -- high SWR or excessive input power automatically bypasses the B-5018-G to prevent damage.

Heavy-duty heatsink spans entire length of cabinet. Power transistors protected by MIRAGE's *Therm-O-Guard*™.

Has adjustable delay *RF sense* Transmit/Receive switch *and* remote external keying. 16-20 Amps at 13.8 VDC.12x3x5½ inches.

B-5018-G $329.95

B-1018-G, $409.95. MIRAGE's most popular *dual purpose* HT or mobile/base amplifier. 160 Watts out for 10 Watts in. For 0.25-10 Watt rigs.

B-2518-G, $329.95. Same as B-5018-G but for 10 to 25 Watt mobile or base. 160 Watts out for 25 Watts in.

RC-2, $49.95. Remote Control. On/Off,pre-amp On/Off, selects SSB/FM. With 25 foot cable.

Power Curve -- typical output power in Watts

B-1018-G	25	50	140	150	160	160	--	--	--	--
B-2518-G	5	7	40	60	80	100	125	160	160	160
B-5018-G	--	2	15	25	40	50	70	100	130	160
Watts In	.25	.5	3	5	8	10	15	25	35	50

35 Watts for 2 Meter HT

For handhelds up to 8 Watts. 35 Watts out for 3-8 Watts in (18 W out/1W in)! 18 dB *GaAsFET* preamp. All modes: FM, SSB, CW. RF sense T/R switch. Reverse polarity protection. Includes mobile bracket, 1 year warranty. 5¼Wx1¾Hx4¾D in.

B-34-G $119.95

35 Watts, $99.95, FM only

B-34, $99.95. 35 Watts out for 2 Watts in. Like B-34-G, FM only, less pre-amp, mobile bracket. 3⅛Wx1¾Hx4¼D in.

MIRAGE Dual Band 144/440 MHz Amp

Boost your *dual band* 144/440 MHz handheld to a powerful mobile/base -- 45 Watts on 2 Meters/ 35 Watts on 440 MHz! Works with all FM handhelds to 7 Watts. Includes *full duplex* operation -- lets you talk on one band, listen on other at same time. Auto band selection, RF sense T/R switch, single connector, reverse polarity protection, 5Wx1¾Hx5D in. Mobile bracket. One year warranty.

BD-35 $179.95

100 Watts for 2M HT

100 Watts out for 2-8 Watts in! Great for HTs up to 8W. FM, SSB, CW. 15 dB *GaAs-FET* preamp, RF sense T/R, high-SWR protected.

B-310-G $229.95

http://www.mirageamp.com

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the *finest* antenna tuner made!

. . . the VECTRONICS HFT-1500

- ***High Current Roller Inductor***
- ***SSB*Analyzer Bargraph™***
- ***Cross-Needle Meter***
- ***6 Position Antenna Switch***
- ***Built-in 4:1 Balun***
- ***Gear driven Turns Counter***

The VECTRONICS HFT-1500 is not just an antenna tuner . . . it's a beautifully crafted work of art, using the finest components available and the highest quality construction.

Every HFT-1500 aluminum cabinet is carefully crafted with a super durable paint that won't scratch or chip.

Attractive two-color Lexan front panel is scratch-proof. Take a quarter. Scratch the front panel. You won't leave a mark!

Arc-Free Operation

Two 4.5 kV transmitting variable capacitors and a massive roller inductor gives you arc-free operation up to 2 kW PEP SSB.

Precision Resetability

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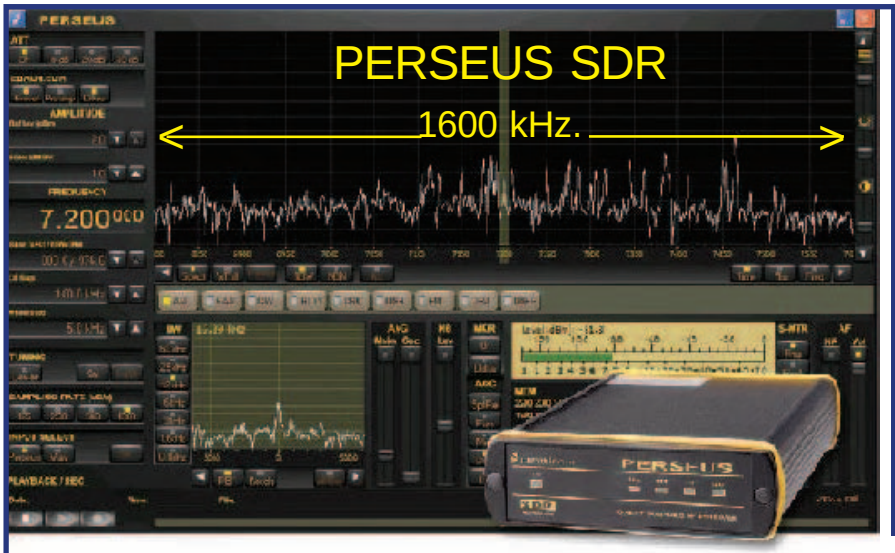

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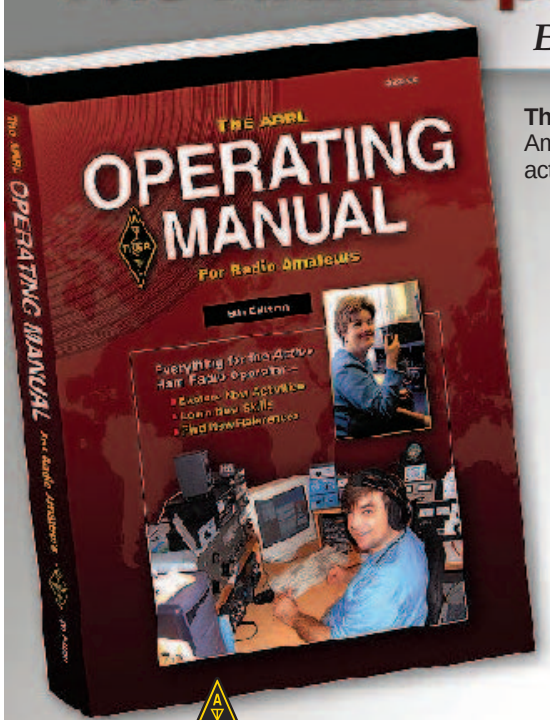

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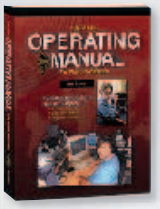

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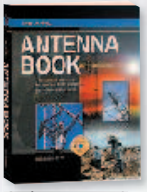

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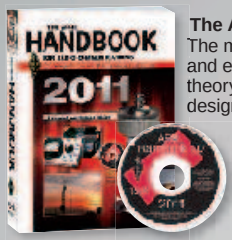

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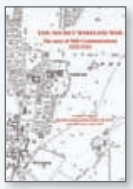

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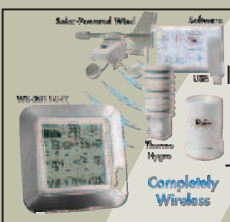

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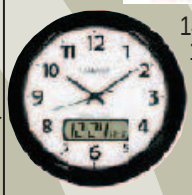

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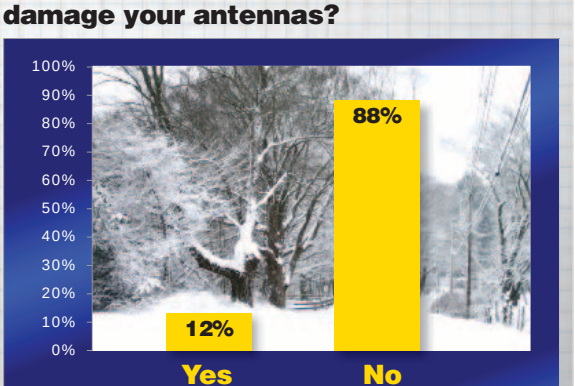

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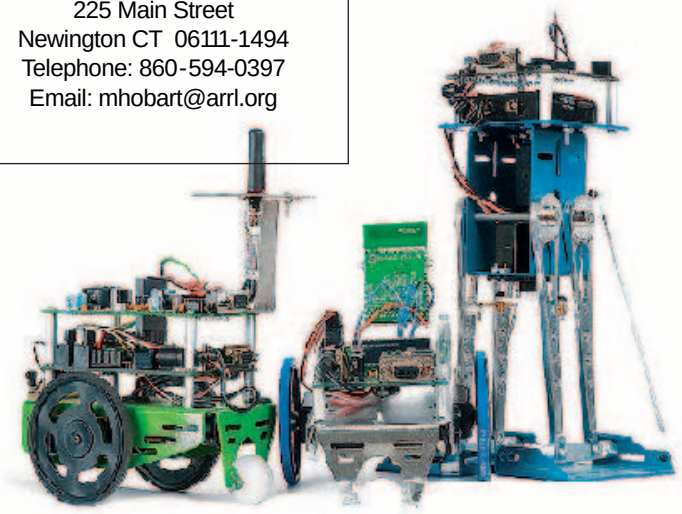

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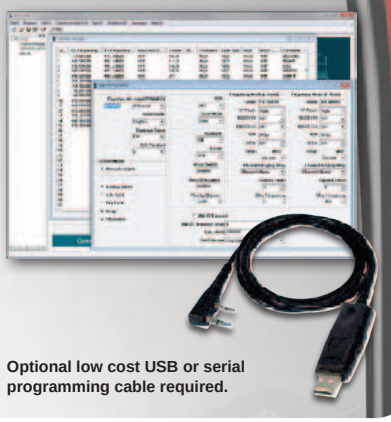

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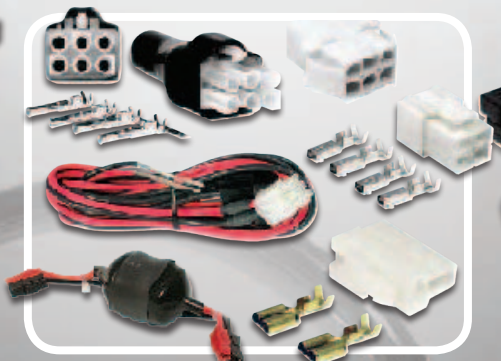

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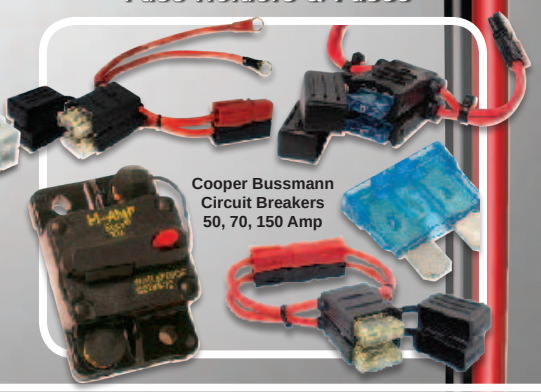

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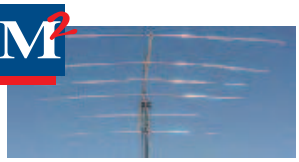

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M2, OR-2800PX	$1329
Yaesu, G-450A	$289
Yaesu G-550	$399
Yaesu, G-800SA	$409
Yaesu, G-800DXA	$489
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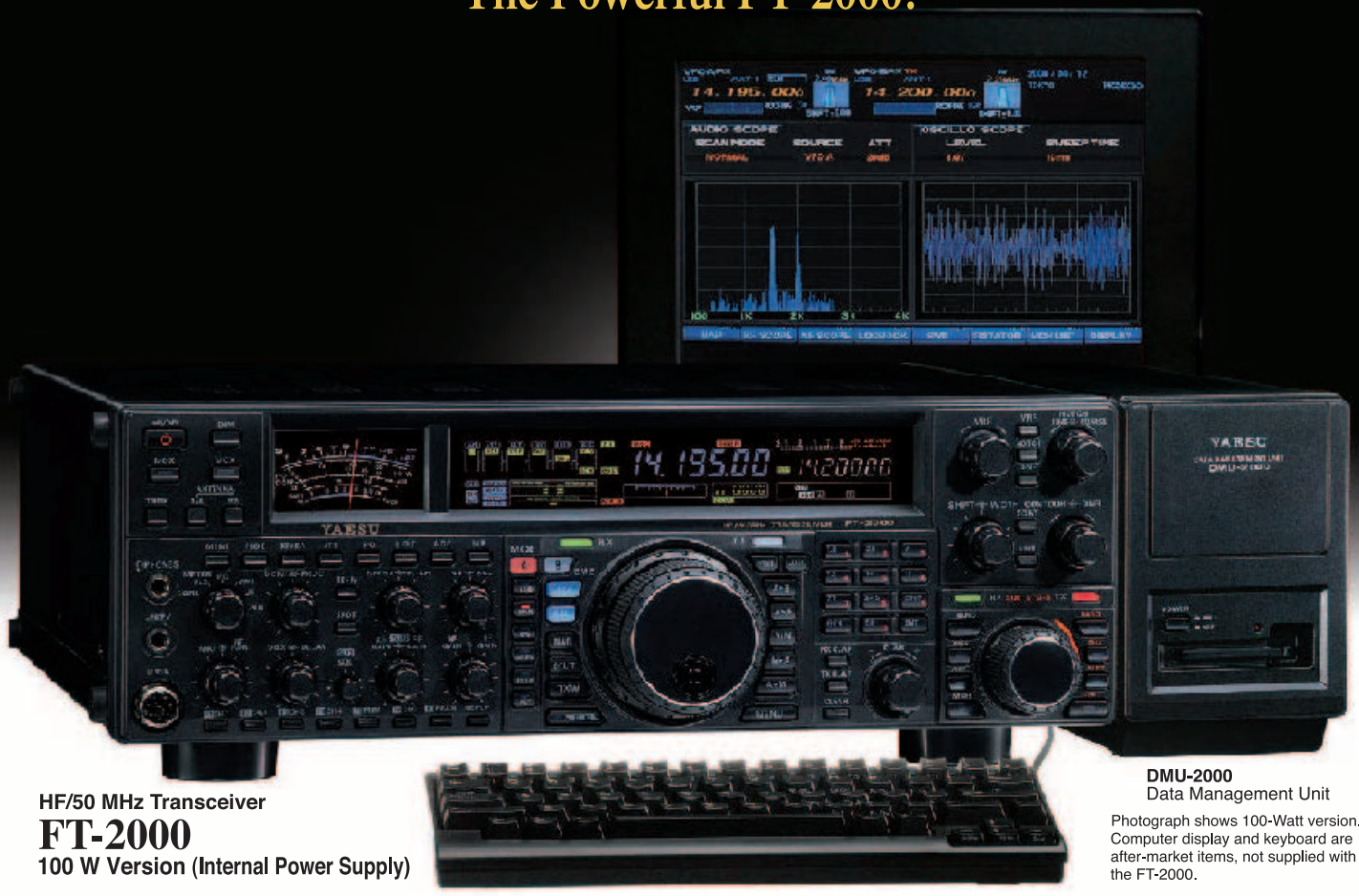

HF/50 MHz Transceiver
FT-2000
100 W Version (Internal Power Supply)

DMU-2000
Data Management Unit

Photograph shows 100-Watt version. Computer display and keyboard are after-market items, not supplied with the FT-2000.

HF/50 MHz Transceiver
FT-2000D
200 W Version
(External Power Supply)

Options

SP-2000
External Speaker
with Audio filters

RF µ-Tune Kits

160m Band RF µ-Tune Kits A	80/40m Band RF µ-Tune Kits B	30/20m Band RF µ-Tune Kits C

- Up to three µ-Tune Kits may be connected.
- µ-Tune Kit is included in purchase price of µ-Tune Unit.

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Introducing the new FT-2000 Series with PEP-2000 (Performance Enhancement Program)
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Specifications subject to change without notice. Some accessories and/or options may be standard in some areas. Frequency coverage may differ in some countries. Check with your local Yaesu dealer for specific details.

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*** For 1.8/3.5/7/14/21 MHz Amateur bands, when receiving in CW/FSK/SSB modes, down conversion is automatically selected if the final passband is 2.7KHz or less.**