QST

DEVOTED ENTIRELY TO AMATEUR RADIO

April 2011 WWW.ARRL.ORG

QST reviews:

Inside:

And Now... The W7JI 40 Meter Transmitter, the Perfect Companion to February's Receiver

$4.99 US $6.99 Can.

19260 04 0 843655 9

Visit the ARRL Web site at www.arrl.org

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

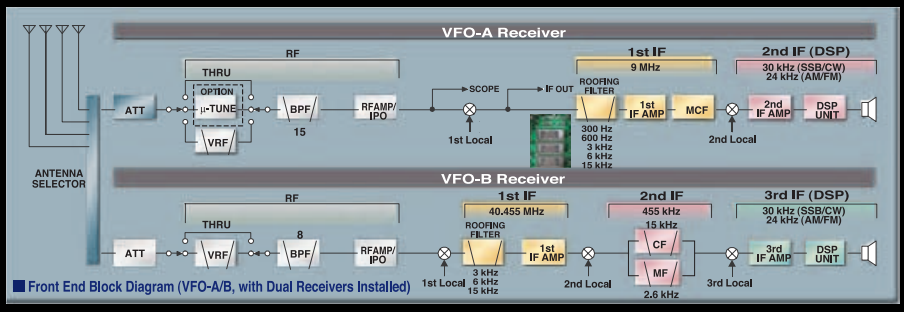
The New Premium HF/50 MHz Transceiver
FT DX 5000 Series

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

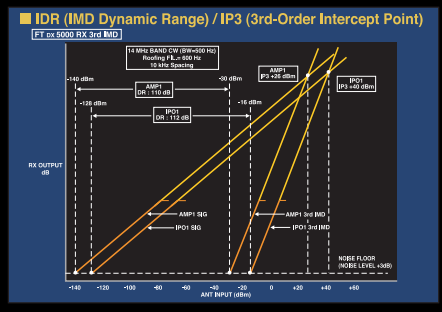
The tight shape factor 6 pole crystal filters and D Quad Double Balanced Mixer design afford incredible improvement in 3rd – Order dynamic range and IP3 performance

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)



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



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

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

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

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

HF/50 MHz 200 W Transceiver NEW
FT DX 5000

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

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

Specifications subject to change without notice. Some accessories and/or options may be standard in 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

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

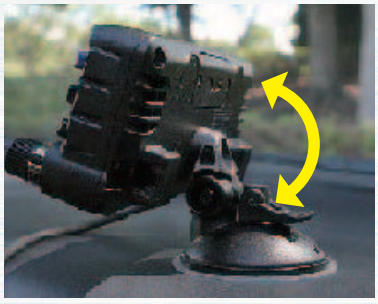
FTM-350AR NEW

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**

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

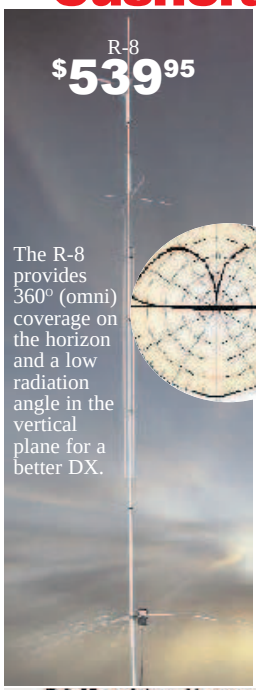
For the latest Yaesu news, visit us on the Internet:
http://www.vertexstandard.com

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℠

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

Cushcraft R8 *8-Band Vertical*



The R-8 provides 360° (omni) coverage on the horizon and a low radiation angle in the vertical plane for a better DX.

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!

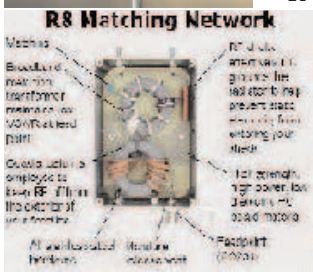
Rugged Construction: Thick fiberglass insulators, all-stainless hardware, and 6063 aircraft-aluminum tubing that is double or triple walled at key stress points handle anything Mother Nature can dish out.

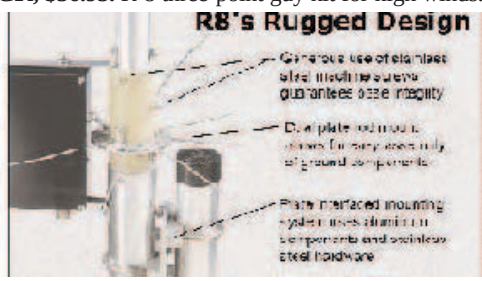
Compact Footprint: Installs in an area about the size of a child's sandbox -- no ground radials to bury and all RF-energized surfaces safely out of reach.

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.

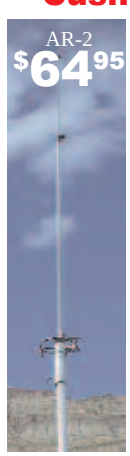
The 3-element A3S/A3WS and 4-element A4S are world-famous for powerhouse gain and super performance. **A-3WS**, **$499.95,** 12/17 M. **30/40 Meter** *add-on kits* available.

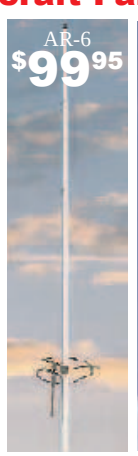
Cushcraft Dual Band Yagis

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!

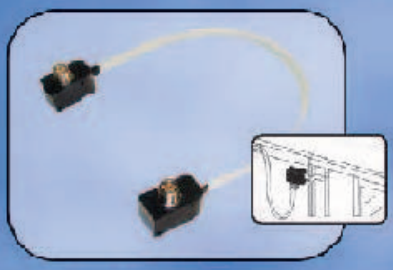
***Free* Cushcraft Catalog**
and Nearest Dealer . . . 662-323-5803
Call your dealer for your best price!

Cushcraft
Amateur Radio Antennas
308 Industrial Park Road, Starkville, MS 39759 USA
Open: 8-4:30 CST, Mon.-Fri. ***Add Shipping.***
• **Sales/Tech:** 662-323-5803 • **FAX:** 662-323-6551
http://www.cushcraftamateur.com

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

Visit www.cushcraftamateur.com

Life is a JOURNEY. Enjoy the ride!



NEW! COMET CTC-50M
Window Gap Adapter!

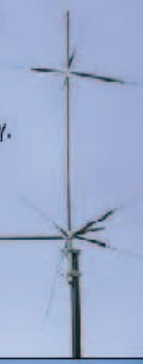
Max Power: HF 100W PEP
VHF: 60W FM
UHF: 40W FM
90CMHz - 1.3GHz: 10W
VSWR: <500MHz 1.3:1
>500MHz 1.5:1
Impedance: 50Ohm
Length: 15.75"
Conn: 24k Gold Plated SO-239s

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



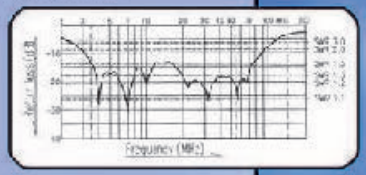
COMET CHA-250B
Broadband HF Vertical!

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" 33' 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

Public Service
Advocacy
Education
Technology
Membership

Contents

This Month in QST

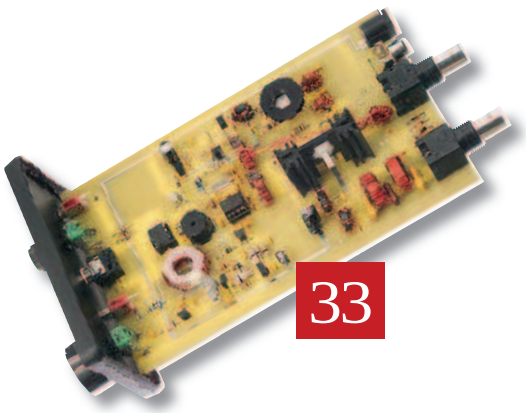
April 2011 ■ Volume 95 Number 4

Technical

News and Features

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

Radiosport



Our Cover
Who says life's too short for QRP? This month, we feature a versatile homebrew transmitter — a companion piece to the QRP superhet receiver featured in February. Lou Burke, W7JI, wanted a low power 40 meter transmitter with a VFO, a CW keyer and automatic antenna switching to match his receiver. In the first two weeks of use, Lou worked 25 states with the 1.5 W version. See "The W7JI Low or Lower Power 40 Meter Transmitter," beginning on page 33.

Departments

April 2011 ■ Volume 95 Number 4

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.

US & Possessions: Membership in the ARRL, including a one year subscription to *QST*, is available to individuals at $39. Licensed radio amateurs age 21 and under and the eldest licensee in the household may qualify for the rate of $20. Life Membership, including a subscription to *QST* is available at $975.* Membership includes $15 per year for subscription to *QST*. Membership and *QST* cannot be separated. Libraries and institutions, $39 per year. Single copies $5.

International
To compensate for additional postage for mailing outside the US, the following rates apply:

Canada: Membership in the ARRL, including a one year subscription to *QST*, $49, payable in US funds. Life Membership, including a subscription to *QST* is available at $1225.* Libraries and institutions, $49 per year.

All Other Countries: Membership in the ARRL, including a one year subscription to *QST*, $62, payable in US funds. Life Membership, including a subscription to *QST* is available at $1550.* Libraries and institutions, $62 per year.

Membership without *QST* is available to the immediate family of a member living at the same address, and to anyone who is legally blind, for $8 per year.

Foreign remittances should be by international postal or express money order or bank draft negotiable in the US and for an equivalent amount in US funds.

QST is available to blind and physically handicapped individuals on audio cassette from the Library of Congress, National Library Service for the Blind and Physically Handicapped. Call 1-800-424-8567.

Indexed by Applied Science and Technology Index, Library of Congress Catalog Card No: 21-9421.

*Payment arrangements available. Please write for details.

In order to ensure prompt delivery, we ask that you periodically check the address information on your mailing label. If you find any inaccuracies, please contact the Circulation Department at **circulation@arrl.org** or **860-594-0200** immediately. Thank you for your assistance.

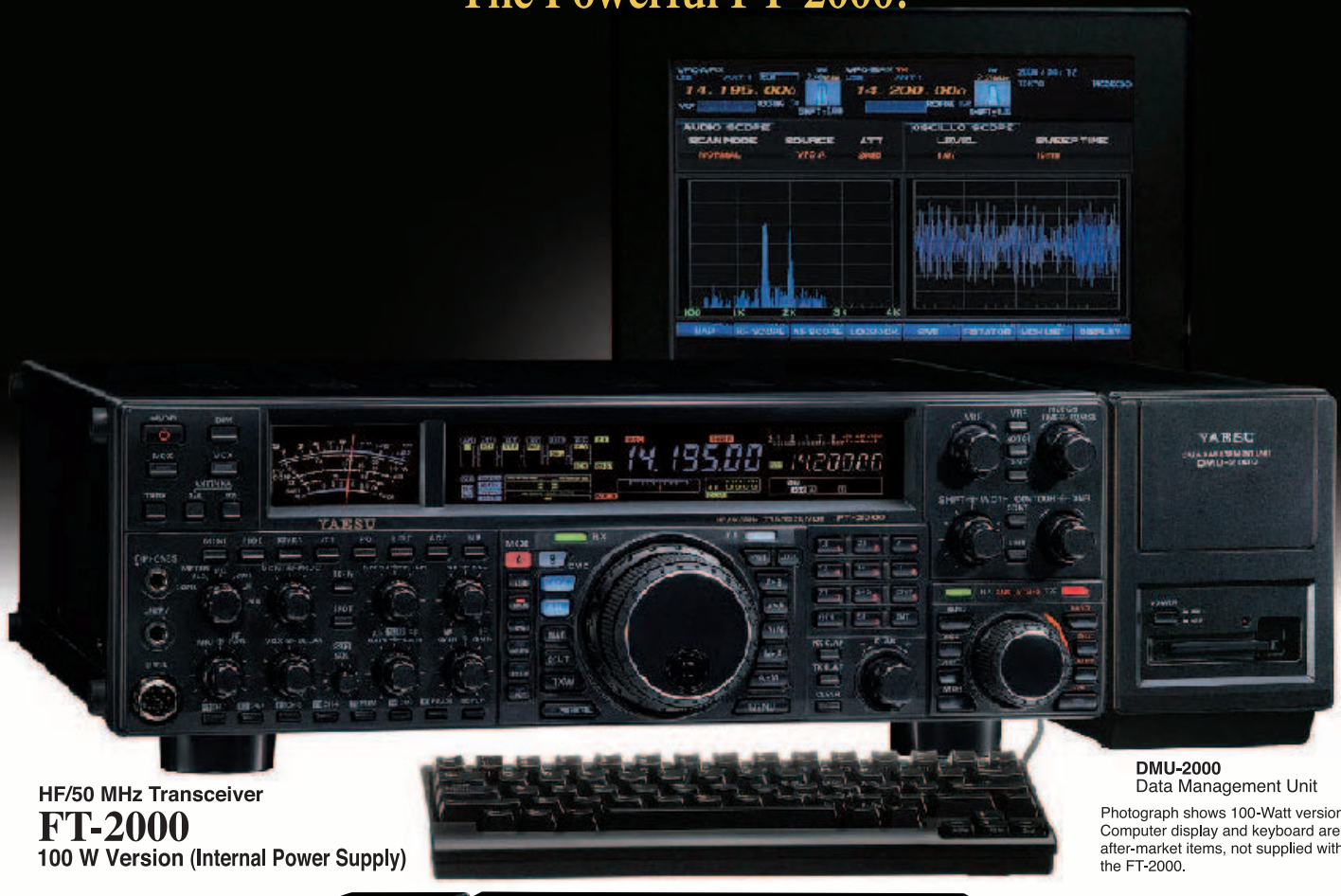
Reprints and permissions: **permission@arrl.org**

See page 14 for detailed contact information.

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

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

Loaded with Leading-edge Performance Capabilities. . .
The First Triumph in the 2nd Generation of the FT DX 9000 Lineage:
The Powerful FT-2000!



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.

"The Best of the Best Just Got Better"

Introducing the new FT-2000 Series with PEP-2000 (Performance Enhancement Program)
Contact Dennis Motschenbacher K7BV at k7bv@vxstdusa.com for details

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

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

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

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

The radio... FT DX 9000

DISTINGUISHED

Experience 400 imposing Watts, and call with confidence!

Photograph depicts after-market keyboard, keyer paddle, and monitor, not supplied with transceiver. Display image simulated and may differ in actual use.

The FT DX 9000MP's Power Amplifier stage utilizes SD2931 MOS FET devices in a parallel, push-pull configuration, a conservative design that permits ultra-clean Class-A operation at a full 100 Watts of output, with continuous bias adjustment between Classes A and AB available on the front panel. If you have a professional microphone with a balanced "Cannon" (XLR) connector, you may connect it directly to the matching connector on the front panel, then use our exclusive three-band Parametric Microphone Equalizer to adjust the center frequency, bandwidth, and equalizer gain in the bass, mid-range, and treble frequency ranges.

YAESU engineers take signal quality seriously, because we know you do, too!

HF/50 MHz Transceiver

FT DX 9000MP

400 W Special Order Version

Two Pairs of Meters, plus LCD Window; Data Management Unit and Flash Memory Slot Built In. Main/Sub Receiver VRF, plus Full Dual Receive Capability, External 50 V/24 A Switching Regulator Power Supply and Speaker with Audio Filters

Display color (Umber or Light Blue) may be selected at the time of purchase. Modification from 400 to 200 W not possible.

HF/50 MHz Transceiver

FT DX 9000D 200 W Version

Large TFT, Data Management Unit and Flash Memory Slot Built In, Main/Sub Receiver VRF, plus Full Dual Receive Capability, Three μ-Tuning Modules for 160 - 20 M, 50 V/12 A Internal Switching Regulator Power Supply

HF/50 MHz Transceiver

FT DX 9000 Contest 200 W Custom-Configurable Version

Two Pairs of Meters, plus LCD Window, VRF Input Preselector Filter, Three Key Jacks, and Dual Headphone Jacks, 50 V/12 A Internal Switching Regulator Power Supply

Display color (Umber or Light Blue) may be selected at the time of purchase. Modification from 200- to 400-Watt version not available.

"The Best of the Best Just Got Better"

Introducing the new FT DX 9000 Series with PEP-9000 (Performance Enhancement Program)

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

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℠

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

A TECHNOLOGY BREAKTHROUGH

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

50/144/(222)*/430 MHz
FM 5 W/AM 1W (50 MHz) Triple Band Handheld
VX-8DR * 222 MHz/1.5 W (USA version)
(7.4V 1,100 mAh Lithium Ion battery/FNB-101LI and battery charger/NC-86A included)

Actual Size

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

Actual Size

VX-8DR NEW

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

Optional GPS and antenna unit for GPS/APRS® operation

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

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

Bluetooth®

VX-8GR NEW

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

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

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

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

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

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

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

Public Service
Advocacy
Education
Technology
Membership

"It Seems to Us"

Our Social Network

"For the past 30 years the International Amateur Radio Union has marked April 18, the anniversary of the founding of the IARU in 1925, as World Amateur Radio Day."

Every year the IARU Administrative Council determines a theme for World Amateur Radio Day. The theme is intended to assist the IARU member-societies in focusing public attention on the benefits that their countries and communities derive from the Amateur Radio Service.

Here in the United States we have not taken much advantage of this occasion to promote Amateur Radio. The reason is that just ten weeks later we have a time-tested event — ARRL Field Day — that has proved to be an effective platform for demonstrating our capabilities to our neighbors and the media. This is not the case in some other parts of the world, and in a number of places April 18 has become an important date on the Amateur Radio calendar.

Some historians might quarrel with this year's theme, "Amateur Radio: The first technology-based social network." Without using the term "social network," in his 1998 book *The Victorian Internet*, Tom Standage offers illuminating and occasionally amusing evidence that in the latter half of the 19th century, landline telegraph operators had one of their own. "Telegraph operators were members of a closed, exclusive community," he writes. "They had their own customs and vocabulary, and a strict pecking order, based on the speed at which they could send and receive messages." Later on he notes, "There was also a dark side to telegraphic interaction; the best operators often felt nothing but scorn toward the small-town, part-time operators they often encountered on-line, who were known as 'plugs' or 'hams.'"

Of course, not just anyone could hook themselves up to a commercial telegraph wire. While there were private telegraph lines constructed and operated for the personal amusement of their owners, they were not generally able to form networks covering more than a neighborhood. Early telephone operators got to know their customers as well as one another, but their technology-based social network did not extend much beyond a town or city. It was not until the advent of wireless telegraphy that it became possible for individuals to span significant distances and communicate instantaneously with one another without a costly intermediary. Thus was born the first open, technology-based social network — the one we now call Amateur Radio.

While no one will ever make a zillion dollars from *our* social network — or from making a movie about it — there are many other reasons for us to celebrate its past, present, and future. The ARRL owes its existence to the desire of pioneering radio amateurs to extend their reach by organizing themselves into a network of stations willing to relay messages for one another, free of charge. Barely a decade later Amateur Radio became a global phenomenon and our social network grew to include like-minded experimenters in countries and cultures with which ordinary people seldom had the opportunity to interact. Even through the Great Depression it continued to grow. It took the Second World War to interrupt this upward trajectory, which resumed with even greater vigor afterwards.

The social network created and maintained by "hams" continues to grow, even as the landline telegraph operators who coined the epithet have disappeared. Today there is so much going on in Amateur Radio that it's impossible for one person to take it all in. Just as it isn't possible to interact meaningfully with hundreds of "friends" on Facebook, even the most dedicated of us must choose among the dozens of subgroups that are pursuing specific interests within Amateur Radio. There isn't even room here to list them all. Experience teaches us that the ones that will flourish are those that actively welcome newcomers, whether they are newly licensed or just new to this particular pursuit. One of the beauties of our social network is that there are no internal barriers; one can move from chasing low-band DX in the winter to microwave hilltopping in the summer, from public service one weekend to a contest the next, from trying out the latest digital mode in the morning to tapping a straight key after dinner.

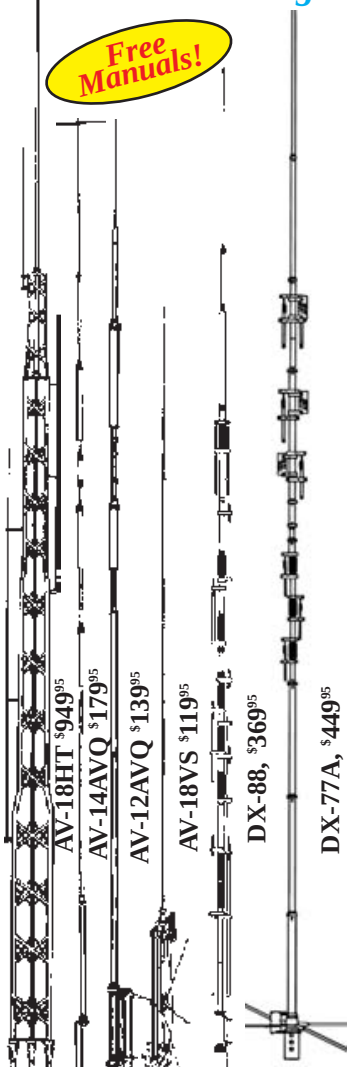
And what about the future? There can be no doubt that the scope of Amateur Radio will continue to expand, and the complexity of our social network along with it. Fortunately, as a community we are comfortable with using a wide variety of communications media — not just our radios — to exchange information and ideas in pursuit of our common passion. We also enjoy getting together in person, especially when we can learn something in the process; the hamfests and conventions that are growing are the ones with strong educational components.

Every social network has someone or something that acts as a gatekeeper. In our case it's earning — or wanting to earn — an Amateur Radio license. Holding a call sign means that you have had an experience and share an interest in common with anyone on the planet (or orbiting around it) who is similarly tagged. It's always a joy to encounter another radio amateur in an unexpected setting, such as at an airport or in a meeting on an unrelated subject. Even if our interests in Amateur Radio are quite different there is always something to talk about!

David Sumner, K1ZZ
ARRL Chief Executive Officer

hy-gain HF VERTICALS

Self-supporting -- no guys required . . . Remarkable DX performance -- low angle radiation, omnidirectional . . . 1500 Watts . . . Low SWR . . . Aircraft quality aluminum tubing . . . Stainless steel hardware . . . Recessed SO-239 connect . . . Two year limited Warranty . . .



hy-gain(R) Classics

All hy-gain multi-band vertical antennas are entirely self supporting -- no guys required.

They offer remarkable DX performance with their extremely low angle of radiation and omnidirectional pattern.

All handle 1500 Watts PEP SSB, have low SWR, automatic band-switching (except AV-18VS) and include a 12-inch heavy duty mast support bracket (except AV-18HT).

Heavy duty, slotted, tapered swaged, aircraft quality aluminum tubing with full circumference compression clamps is used for radiators. Includes all stainless steel hardware. Recessed SO-239 prevents moisture damage. Hy-gain verticals go up easily with just hand tools and their cost is surprisingly low. Two year limited warranty.

AV-18HT, $949.95. (10,12,15,20,40,80 M, 160, 17 Meters optional). 53 ft., 114 lbs.

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

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

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

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

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

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

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

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

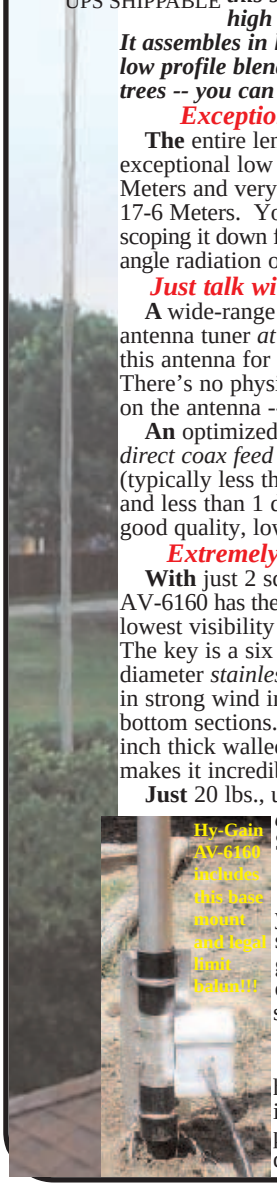
Model #	Price	Bands	Max Power	Height	Weight	Wind Surv.	Rec. Mast
AV-18HT	$949.95	10,15,20,40,80	1500 W PEP	53 feet	114 pounds	75 MPH	------
AV-14AVQ	**$179.95**	**10,15,20,40**	**1500 W PEP**	**18 feet**	**9 pounds**	**80 MPH**	**1.5-1.625"**
AV-12AVQ	$139.95	10,15,20 M	1500 W PEP	13 feet	9 pounds	80 MPH	1.5-1.625"
AV-18VS	**$119.95**	**10 - 80 M**	**1500 W PEP**	**18 feet**	**4 pounds**	**80 MPH**	**1.5-1.625"**
DX-88	$369.95	10 - 40 M	1500 W PEP	25 feet	18 pounds	75 mph no guy	1.5-1.625"
DX-77A	**$449.95**	**10 - 80 M**	**1500 W PEP**	**29 feet**	**25 pounds**	**60 mph no guy**	**1.5-1.625"**

Hy-Gain 160-6 Meters Self-Supporting Vertical

Full 1500 Watts, 43 feet, includes base mount

New! AV-6160 **$399.95** UPS SHIPPABLE

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



Exceptional Performance

The entire length radiates to provide exceptional low angle radiation 160-20 Meters and very good performance on 17-6 Meters. You can shorten it by telescoping it down for more effective low angle radiation on higher bands.

Just talk with automatic tuner!

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 ½ dB 60-6 Meters and less than 1 dB 160-80 Meters with good quality, low-loss coax).

Extremely low wind loading

With just 2 square feet wind load, the AV-6160 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.

Just 20 lbs., uses super-strong *6063 aircraft aluminum tubing.* Stainless steel hardware.

Assembles in an hour

Ground mounting lets you hide antenna base in shrubbery. Requires ground system -- at least one radial. More extensive ground work better.

Stealth Operation

Low profile. Hide behind trees, fences, buildings, bushes. Use as flagpole. Easily telescopes down during the day.

Free Hy-Gain Catalog

and Nearest Dealer . . . 800-973-6572

Call your dealer for your best price!

hy-gain

Antennas, Rotators & Towers

308 Industrial Park Road, Starkville, MS 39759 USA

Toll-free Customer Sales Hotline: 800-973-6572

• **TECH:** 662-323-9538 • **FAX:** 662-323-6551

http://www.hy-gain.com

YAESU

Choice of the World's top DX'ers℠

Coupons and free items expire March 31, 2011.

It's Here! NEW!

FTDX-5000/D/MP Series
Shown above withSM5000 Station Monitor (optional on some versions).

$100 Coupon

FT-2000/FT-2000D
HF,6M, 100W/200W

$50 Coupon

FT-950
100 Watts of power output on SSB, CW, and FM (25 Watts AM carrier).

FREE FPR-1 with Purchase

FTM-350AR
2M/440 50W
220MHz 1W
APRS & WIRES Ready
GPS (optional)

FT-450D
state of the art IF DSP technology, world class performance, easy to use

FT-897D
HF/6/2/440 all mode Portable 100W HF/6, 50W 2M, 20W, 440MHz

FT-817ND
HF/6/2/440

FREE YSK-857 with Purchase

FT-857D
HF/6/2/440 all mode

FREE MH-68B6J — $20 Coupon

FTM-10R
144/440MHz 50/40W

FREE YSK-8900 — $10 Coupon

FT-8800R
2M/440MHz

FREE YSK-8900 — $10 Coupon

FT-8900R
10M/6M/2M/440MHz

$20 Coupon

FT-1900R
144-148MHz

$20 Coupon

FT-2900R
2 meter transceiver

FREE YSK-7800 — $20 Coupon

FT-7900R
Dual bander

$25 Coupon

FT-60R
Dual band

$15 Coupon

FT-250R
2 Meter

$15 Coupon

FT-270R
2M 5W

$30 Coupon — NEW!

VX-8GR
Full 5 watts 144/440MHz

$10 Coupon

VX-3R
2M/440MHz

$20 Coupon

VX-7R/RB
Triple Band

VX-8DR
Full 5 watts

FTDX-9000C/D/MP
400 watts, dual analog meter sets, LCD display, memory card installed, main and sub receiver VRF, full dual rx, external power supply.

ICOM

Coupons and free items expire March 31, 2011.

$500 Gift Certificate with Purchase*

IC-7700
No compromise RX performance

$200 Gift Certificate with Purchase*

IC-7600
USB, LSB, CW, RTTY, PSK31, AM, FM

$500 Gift Certificate with Purchase*

IC-7800
HF/6m @ 200 Watts, HF/50 MHz All Band

IC-7200
HF/6 100W

INCLUDED WITH YOUR PURCHASE RMK-7000

IC-7000
HF/6M/2M/440 IF DSP

$25 Coupon

IC-718
HF 100W on HF, VOX operation

D-STAR Compatible — $20 Gift Certificate with Purchase*

ID-880H
2M/440 Dual Band

NEW!

IC-T70A
2M/440MHz 5W HT

IC-2200H
2M 65W FM Mobile

IC-R9500
144/430(440) MHz and above 2GHz band, +5dBm IP3 capability

D-STAR Compatible — $40 Gift Certificate with Purchase*

IC-2820H
2M/440 dual bander

NEW!

IC-V80
2M 5.5W

* Restrictions apply, contact your HamPROS Dealer for details.

KENWOOD

Coupons good thru May 31, 2011

NEW!

TS-590S
160-6 meters

NEW!

TH-D72A
144/440 MHz 5W HT/GPS/TNC

$275 Coupon

TS-480HX/TS-480SAT
HF/6M All-Mode Transceiver

TM-V71A
1000 Alpha Memories, Dual Display

$30 Coupon

$225 Coupon TS-2000S

$275 Coupon TS-2000X

TS-2000S/ TS-2000X
High performance true IF/stage DSP on main band.

TH-F6A
2/220/440 HT

$30 Coupon

$40 Coupon

TM-D710A
2M/70cm Mobile 50W/50W, Optional Voice Synthesizer,

$25 Coupon

TM-271A
2M FM Transceiver

samlexamerica

SEC-1212 – 10 Amp Switching Power Supply
This AC-DC power converter provides a highly regulated output DC voltage of 13.8 Volts at 10 Amps with an AC input of 120 Volts, 60 Hz

This Just In

Joel P. Kleinman, N1BKE
jkleinman@arrl.org

In Brief

- The ARRL Board of Directors held its 2011 Annual Meeting January 21-22, 2011 in Windsor, Connecticut. See the article that starts on page 69.
- Deployment of the ARISSat-1 satellite from the International Space Station will be delayed until July. See Happenings, this issue, for details.
- The California Court of Appeals issued a decision in an antenna case that is a win for Amateur Radio in some respects but not all.
- Atlantic Division Director Bill Edgar, N3LLR, hosted two webinars for ARRL members during February.
- The ARRL has filed a *Petition for Partial Reconsideration*, urging the FCC to reconsider rules changes to the vanity call sign system and call signs for clubs.
- The rock band Arcade Fire, with ham radio connections, won a Grammy award for best album of 2010.
- The Boy Scouts of America and the ARRL have signed a Memorandum of Understanding.
- The 2011 Field Day packet is available on the ARRL website, **www.arrl.org**.
- In January, engineers at Marshall Space Flight Center in Huntsville, Alabama asked Amateur Radio operators to listen for the signal from a just-launched nanosatellite.
- The winner of the *QST* Cover Plaque Award for February 2011 is "A Compact 40 Meter Receiver," by Lou Burke, W7JI.

Media Hits

Allen Pitts, W1AGP
Media & Public Relations Manager

- 2011 began with a bang for media coverage, and a lot of it was quite unexpected. Dozens of very good local media hits were in newspapers and TV news, including some front page stories. Three national-level pieces stood out during January. "Why Ham Radio Endures in a World of Tweets" by David Rowan appeared in many places including *Wired News.* "Creative inspiration transforms new tech beyond original intentions" in FCW.com expanded it by saying "Too often, we allow users simply to be passive vessels for our IT applications rather than active formulators of new uses for them that their initial developers never conceived…..They didn't foresee the generation of teenage ham radio operators…" And then there was WEDU-TV's "A Gulf Coast Journal with Jack Perkins" showing the W4SMA students at The Sarasota Military Academy Amateur Radio Club.
- All of this would have been plenty for one month, but then a request came from NASA. This wasn't their usual ISS radio contact info or a story like Adobe Bluffs Elementary School's "Kids Chat With Astronauts Via Ham Radio" that was on NBC in San Diego or the Foster Heights' school contacts. Mighty NASA needed our help. "NASA-Seeks-Ham-Operators-Help-To-Test-NanoSail-D" and "NanoSail-D Ejects - NASA Seeks Amateur Radio Operators' Aid" were not ARRL but NASA's own .gov press releases. The story quickly appeared in Slashdot.com and "Urgent — help find 'lost' solar sail via radio" was on the Science 2.0 webpage. Over the next days, Amateur Radio's role in finding and determining the health of the satellite appeared in *Wired News*, TMC Net, *Universe Today*, *Spaceflight Now*, msnbc.com, AL.com, CNN, *Popular Science*, *Scientific American*, the Associated Press and dozens more stories popping up all over the country.
- And then came Egypt.

We may never know where the problem really started, but suddenly "Getting news out of an unplugged Egypt" was on CNET saying Egyptians were finding ways around the Internet blockage "using old-fashioned landlines, faxes and even ham radio. Telecomix News Agency posted …" Then came Gearlog claiming "Protesters in Egypt are adopting a number of outdated pieces of tech, from dial-up modems to ham radio…" ComputerWorld had "…turning to landline telephones, fax machines and even ham radio to keep information flowing in and out." Sci-Tech Today, Home Daily News, DVICE, Reviews of Electronics, *Huffington Post* and many more joined in the rumor-as-fact claim. Even the BBC reported that "Fax machines, ham radio and dial-up modems are helping to avoid the net block imposed on Egypt."

- *But we weren't!* All these stories, parroting each other, were wrong. This is where PR people really go into overdrive — killing a false and potentially damaging report. People were called, some e-mails made, PIOs were alerted and within 48 hours we had "Allen Pitts, a spokesman for the National Association for Amateur Radio, said no one has picked up any voice transmissions from Egypt for the past couple of days..." appearing in *PC World*. More reasoned and accurate stories appeared soon after, such as "Ham Radio Not a Viable Option for Egypt" in *PC World* and NPR came in with a story that was quite complimentary to hams — and factual.

New Station at the South Florida Science Museum

The West Palm Beach Amateur Radio Club, in a joint venture with the South Florida Science Museum, is proud to announce the opening of their new Amateur Radio station, WS4FSN. During the first six weeks the facility was on the air, several hundred youngsters and their parents and teachers viewed and participated in the station's operation. Volunteers from the West Palm Beach ARC have been kept busy explaining the basics of radio and have watched in absolute delight as the youngsters make a contact and speak to a ham from elsewhere in the US or, in quite a few cases, in another country. The look of amazement on the visitors' faces can't be described. — *Jerry Grant, KI4NUV, secretary, West Palm Beach Amateur Radio Club and chairman of the Science Museum Radio Project*

DAVID FOWLER, K4DLF

Jerry Grant, KI4NUV, with some members of the WPM Amateur Radio Club of Kids at the South Florida Science Museum.

Special Event Station N6R Commemorates President Reagan's 100th Birthday

Peter Heins, N6ZE, Public Information Officer, Ventura County Amateur Radio Society

Between February 5 and 7, the Ventura County (CA) Amateur Radio Society and the Simi Settlers ARC activated special event station N6R to commemorate the birth of the 40th President of the US. Because the Ronald Reagan Presidential Library & Museum in Simi Valley had scheduled several events, as well as extensive news media coverage, VCARS leadership decided to conduct this event from club members' homes and other local facilities.

Many hams who contacted N6R shared anecdotes of their memories of President Reagan from his movie days through the rest of his life. Several others passed along their personal reminiscences and prior associations from his younger years. Additionally, many Amateur Radio operators thanked the operators who volunteered to operate N6R during Super Bowl Weekend. Contacts were made with 48 US states, several US possessions, all Canadian provinces, several Latin American countries, Japan, Australia, Peoples Republic of China and the Russian Federation, among others.

More than 1600 contacts were made on 20 meter SSB, while 15 meter SSB placed second with 117 QSOs. The N6R logs show a total of 131 SSB contacts on 75, 40, and 17 meters. Some 100 stations were logged on various CW bands, 71 digital contacts were completed on PSK, in addition to several FM contacts on the VHF bands. Additional information is available at **www.qrz.com/db/n6r**.

CHARLIE PEMBER, KG6CLT

Al Febraro, W6AAX, a member of Simi Settlers ARC, made a series of 20 meter SSB QSOs on President Ronald Reagan's 100th Birthday. VCARS PIO Pete Heins, N6ZE, looks on.

RICK GALBRAITH, W6DQE

Frank Valdez, KI6OQ, vice president of Simi Settlers (CA) ARC made a string of 40 meter SSB contacts as special event station N6R on February 5.

Rick Galbraith, W6DQE, president of Simi Settlers ARC, put N6R into the logs of 130 20-meter SSB operators.

Inside HQ

ARRL 2010 Highlights — *Part 1*

This month I am going to review some of our 2010 accomplishments. First, despite a sluggish and uncertain economy, the ARRL had a pretty good year in 2010. We ended the year with 156,475 members—a gain of 350 members.

We launched our new website in April of 2010. We spent much of the latter part of the year shaking out the bugs, improving its functionality and upgrading its 30,000 plus pages of content. Major content upgrades included the VEC, Education Services, Hamfests, and Awards sections of the site. The web, as always, is a work in progress and we plan to add more features and upgrades in 2011.

We made further inroads in the digital publications and social media areas in 2010. The ARRL Audio News was restored and it is now available on an RSS feed on iTunes and the *ARES E-Letter* also went online with an audio version: **www.arrl.org/ares-e-letter-audio-version**. The ARRL Facebook page now has about 17,000 fans. Our e-mail newsletter subscribers increased in 2010, a hopeful sign of increased interest and activity.

In the Emergency Communications Department, Mike Corey, W5MPC, joined us in June as our new Emergency Preparedness Manager. Ken Bailey, K1FUG, also joined the Membership and Volunteer Programs Department primarily to work with the Ham-Aid program and to provide additional support to our more than 8000 ARRL Field Organization appointees. Our monthly EmComm publication, the *ARES E-Letter*, now has 37,000-plus readers. The 2010 ARRL Simulated Emergency Test (SET) was held in early October and the annual SKYWARN Recognition Day operating event, co-sponsored by ARRL and the National Weather Service, was held in early December. The new online EmComm course designed specifically for Amateur Radio Emergency Communications managers debuted in April.

Along with launching the new EmComm course, the Education Services Department conducted seven sessions of the Teachers Institute. These included two advanced TI-2 sessions, one on "Space in the Classroom" and one on "Basic Electronics." Eighty-eight teachers participated in these workshops. To date, 525 schools and/or teachers have received curriculum resources, grants or professional development through the Education & Technology Program. The Department helped coordinate 48 ARISS (Amateur Radio on the International Space Station) QSOs in 2010, the year that ARISS celebrated its 10th anniversary of school contacts. They also developed a new *Instructor's Manual for Technician License Courses* that coordinates with the 2nd edition of the *Ham Radio License Manual.* It is now available to approximately 5000 ARRL registered license instructors and classroom teachers.

Finally, the ARRL Lab provided technical support for regulatory and technical issues including addressing interference to the military PAVE-PAWS radar systems; supporting ARRL's *Petition for Reconsideration* of an FCC Waiver for Recon Robotics and supporting further pleadings in the BPL *Further Notice of Proposed Rulemaking*. The ARRL Lab tested 35 items for *QST* Product Review in 2010 and assisted more than 300 members with RFI problems.

I'll be reviewing more of the 2010 highlights next month.

73,

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

ARRL Member Services

Get Involved
www.arrl.org/get-involved

Join or Renew
www.arrl.org/join

Donate
www.arrl.org/donate

Shop
www.arrl.org/shop

ARRL Membership Benefits

Your ARRL membership includes ***QST*** magazine, plus dozens of other services and resources to help you **Get Started**, **Get Involved** and **Get On the Air**. ARRL members enjoy Amateur Radio to the fullest!

Members-Only Web Services

Create an online ARRL Member Profile, and get access to ARRL members-only Web services. Visit **www.arrl.org/myARRL** to register.

- ***QST* Archive and Periodicals Search** – **www.arrl.org/qst**
  Browse ARRL's extensive online *QST* archive (1915-2007). A searchable index for *QEX* and *NCJ* is also available.
- **Free E-Newsletters**
  Subscribe to a variety of ARRL E-newsletters and e-mail announcements: ham radio news, radio clubs, public service, contesting and more!
- **Product Review Archive** – **www.arrl.org/qst**
  Search for, and download, *QST* Product Reviews published from 1980 to present.
- **E-Mail Forwarding Service**
  E-mail sent to your **arrl.net** address will be forwarded to any e-mail account you specify.
- **Customized ARRL.org home page**
  Customize your home page to see local ham radio events, clubs and news.
- **ARRL Member Directory**
  Connect with other ARRL members via a searchable online Member Directory. Share profiles, photos and more with members who have similar interests.

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

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

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

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

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

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

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

ARRL Programs

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

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

Radiosport

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

Community

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

Licensing, Education and Training

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

Quick Links and Resources

QST – ARRL members' journal – **www.arrl.org/qst**
QEX – *A Forum for Communications Experimenters* – **www.arrl.org/qex**
NCJ – *National Contest Journal* – **www.arrl.org/ncj**
Support for Instructors – **www.arrl.org/instructors**
Support for Teachers – **www.arrl.org/teachers**
ARRL Volunteer Examiner Coordinator (ARRL VEC) – **www.arrl.org/vec**
Public and Media Relations – **www.arrl.org/media**
Forms and Media Warehouse – **www.arrl.org/forms**
FCC License Renewal – **www.arrl.org/fcc**
Foundation, Grants and Scholarships – **www.arrl.org/arrl-foundation**
Advertising – **www.arrl.org/ads**

Interested in Becoming a New Ham?

www.arrl.org/newham
e-mail **newham@arrl.org**
Tel 1-800-326-3942 (US)

Contact Us

ARRL – The national association for Amateur Radio™
225 Main Street
Newington, CT 06111-1494 USA
Tel 1-860-594-0200, Mon-Fri 8 AM to 5 PM ET (except holidays)
FAX 1-860-594-0259
e-mail **hqinfo@arrl.org**
Web site – **www.arrl.org**

Facebook
www.facebook.com/ARRL.org

Twitter
twitter.com/arrl · twitter.com/w1aw · twitter.com/arrl-youth

The American Radio Relay League, Inc.

The American Radio Relay League, Inc. is a noncommercial association of radio amateurs, organized for the promotion of interest in Amateur Radio communication and experimentation, for the establishment of networks to provide communication in the event of disasters or other emergencies, for the advancement of the radio art and of the public welfare, for the representation of the radio amateur in legislative matters, and for the maintenance of fraternalism and a high standard of conduct.

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

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

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

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

Officers, Division Directors and Staff

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

Officers

Founding President (1914-1936)
Hiram Percy Maxim, W1AW

President
KAY C. CRAIGIE,* N3KN
570 Brush Mountain Rd
Blacksburg, VA 24060
540-552-3903; n3kn@arrl.org

First Vice President
RICK RODERICK, K5UR*
PO Box 1463, Little Rock, AR 72203
501-988-2527; k5ur@arrl.org

Vice President
BRUCE FRAHM, KØBJ
1553 County Rd T, Colby, KS 67701
785-462-7388; k0bj@arrl.org

International Affairs Vice President
JAY BELLOWS, KØQB
1925 Bidwell St,
West St Paul, MN 55118
651-238-4444; k0qb@arrl.org

Chief Executive Officer
DAVID SUMNER,* K1ZZ

Secretary
DAVID SUMNER, K1ZZ

Treasurer
JAMES McCOBB Jr, K1LU

Chief Financial Officer
BARRY J. SHELLEY, N1VXY

Chief Operating Officer
HAROLD KRAMER, WJ1B

Chief Development Officer
MARY HOBART, K1MMH

Chief Technology Officer
BRENNAN PRICE, N4QX

Staff

General Counsel
Christopher Imlay, W3KD

Business Services Manager
Debra Jahnke, K1DAJ

Education Services Manager
Debra Johnson, K1DMJ

Laboratory Manager
Ed Hare, W1RFI

Marketing Manager
Bob Inderbitzen, NQ1R
Amy Hurtado, KB1NXO
Circulation Manager
Diane Petrilli, KB1RNF
Membership Manager

Media and Public Relations Manager
Allen Pitts, W1AGP

Membership & Volunteer Programs Manager
Dave Patton, NN1N
Mike Corey, W5MPC
Emergency Preparedness Manager

Production & Editorial Manager
Steve Ford, WB8IMY

Regulatory Information Manager
Dan Henderson, N1ND

VEC Manager
Maria Somma, AB1FM

Business Staff

Business Manager
Barry J. Shelley, N1VXY

Controller
Diane Middleton

Information Technology Manager
Jon Bloom, KE3Z

*Executive Committee Member

Atlantic Division

Bill Edgar, N3LLR
22 Jackson Ave, Bradford, PA 16701
(814-362-1250); **n3llr@arrl.org**

Vice Director: **Tom Abernethy, W3TOM**
PO Box 73, Accokeek, MD 20607
(301-292-6263); **w3tom@arrl.org**

Central Division

George R. Isely, W9GIG*
736 Fellows St, St Charles, IL 60174
(630-584-3510); **w9gig@arrl.org**

Vice Director: **Kermit Carlson, W9XA**
1150 McKee St, Batavia, IL 60510
(630-879-0983); **w9xa@arrl.org**

Dakota Division

Gregory P. Widin, KØGW
13457 Sixth St N, Stillwater, MN 55082
(651-436-8811); **k0gw@arrl.org**

Vice Director: **Kent R. Olson, KAØLDG**
148 Ironwood Dr, Horace, ND 58047;
(701-298-0956); **ka0ldg@arrl.org**

Delta Division

Mickey D. Cox, K5MC
754 Cheniere Drew Rd, West Monroe, LA 71291
(318-397-1980); **k5mc@arrl.org**

Vice Director: **David A. Norris, K5UZ**
640 Josephine Dr, Batesville, AR 72501
(870-793-6431); **k5uz@arrl.org**

Great Lakes Division

Jim Weaver, K8JE
5065 Bethany Rd, Mason, OH 45040-8130
(513-459-1661); **k8je@arrl.org**

Vice Director: **Gary L. Johnston, KI4LA**
3056 Hergott Dr, Edgewood, KY 41017
(859-391-6399); **ki4la@arrl.org**

Hudson Division

Joyce Birmingham, KA2ANF
235 Van Emburgh Ave, Ridgewood, NJ
07450-2918 (201-445-5924); **ka2anf@arrl.org**

Vice Director: **William Hudzik, W2UDT**
111 Preston Dr, Gillette, NJ 07933
(908-580-0493); **w2udt@arrl.org**

Midwest Division

Cliff Ahrens, KØCA
65 Pioneer Trail, Hannibal, MO 63401
(573-221-8618); **k0ca@arrl.org**

Vice Director: **Rod Blocksome, KØDAS**
690 Eastview Dr, Robins, IA 52328-9768
(319-393-8022); **k0das@arrl.org**

How to Find an ARRL HQ Staff Member

Can't find the department you're looking for? Call 860-594-0200 or e-mail **hq@arrl.org**. Sending e-mail to any ARRL Headquarters staff member is a snap. Just put his or her call sign (or first initial and last name) in front of **@arrl.org**. For example, to send to Allen Pitts, W1AGP, Media Relations manager, use **w1agp@arrl.org** or **apitts@arrl.org**. If all else fails, send a message to **hq@arrl.org** and it will get routed to the right person or department.

New England Division

Tom Frenaye, K1KI*
PO Box J, West Suffield, CT 06093
(860-668-5444); **k1ki@arrl.org**

Vice Director: **Mike Raisbeck, K1TWF**
85 High St, Chelmsford, MA 01824
(978-250-1235); **k1twf@arrl.org**

Northwestern Division

Jim Fenstermaker, K9JF
10312 NE 161st Ave, Vancouver, WA 98682
(360-256-1716); **k9jf@arrl.org**

Vice Director: **Grant Hopper, KB7WSD**
PO Box 3318, Everett, WA 98213
(425-238-1433); **kb7wsd@arrl.org**

Pacific Division

Bob Vallio, W6RGG*
18655 Sheffield Rd, Castro Valley, CA 94546
(510-537-6704); **w6rgg@arrl.org**

Vice Director: **Jim Tiemstra, K6JAT**
13450 Skyline Blvd, Oakland, CA 94619;
(510-569-6963); **k6jat@arrl.org**

Roanoke Division

Dennis Bodson, W4PWF
233 N Columbus St, Arlington, VA 22203
(703-243-3743); **w4pwf@arrl.org**

Vice Director: **Dr James Boehner, N2ZZ**
525 Barnwell Ave NW, Aiken, SC 29801-3939
(803-641-9140); **n2zz@arrl.org**

Rocky Mountain Division

Brian Mileshosky, N5ZGT*
PO Box 20186, Albuquerque, NM 87154-0186
(505-463-9468); **n5zgt@arrl.org**

Vice Director: **Dwayne Allen, WY7FD**
82 Wenger Dr, Devils Tower, WY 82714
(307-756-9439); **wy7fd@arrl.org**

Southeastern Division

Greg Sarratt, W4OZK
230 Latigo Loop, Huntsville, AL 35806;
(256-337-3636); **gsarratt@arrl.org**

Vice Director: **Andrea Hartlage, KG4IUM**
PO Box 608, Grayson, GA 30017
(404-509-4054); **kg4ium@arrl.org**

Southwestern Division

Richard J. Norton, N6AA
21290 West Hillside Dr, Topanga, CA 90290
(310-455-1138); **n6aa@arrl.org**

Vice Director: **Marty Woll, N6VI**
21301 Candice Pl, Chatsworth, CA 91311-1404
(818-773-9655); **n6vi@arrl.org**

West Gulf Division

Dr David Woolweaver, K5RAV*
2210 S 77 Sunshine Strip, Harlingen, TX 78550
(956-425-3128); **k5rav@arrl.org**

Vice Director: **John Robert Stratton, N5AUS**
PO Box 2232, Austin, TX 78768-2232
(512-282-7851); **n5aus@arrl.org**

*Executive Commitee Member

ARRL Section Managers

www.arrl.org/sections

The 15 divisions of ARRL are arranged into 71 administrative *sections*, each headed by an elected *section manager* (SM). Your section manager is the person to contact when you have news about your activities, or those of your club. If you need assistance with a local problem, your section manager is your first point of contact. He or she can put you in touch with various ARRL volunteers who can help (such as technical specialists). Your section manager is also the person to see if you'd like to become a section volunteer. Whatever your license class, your SM has an appointment available. Visit your section page on the Web at **www.arrl.org/sections/**.

Atlantic Division (DE, EPA, MDC, NNY, SNJ, WNY, WPA)

Delaware: Frank T. Filipkowski, Jr, AD3M, 1130 N Hilton Rd, Oak Lane Manor, Wilmington, DE 19803-5216 (302-656-0409); **ad3m@arrl.org**
Eastern Pennsylvania: Eric Olena, WB3FPL, 284 Blimline Rd, Mohnton, PA 19540 (610-775-0526); **wb3fpl@arrl.org**
Maryland-DC: James E. Cross III, WI3N, 16013 Dorset Rd, Laurel, MD 20707-5314 (301-725-6829); **wi3n@arrl.org**
Northern New York: Thomas Dick, KF2GC, 11 Jenkins St, Saranac Lake, NY 12983 (518-891-0508); **kf2gc@arrl.org**
Southern New Jersey: George Strayline, W2GSS, 10 E Pacific Ave, Villas, NJ 08251-2630 (609-741-8322); **w2gss@arrl.org**
Western New York: Steve Ryan, N2ITF, 3036 Route 394, Ashville, NY 14710-9734 (716-763-7555); **n2itf@arrl.org**
Western Pennsylvania: John Rodgers, N3MSE, 803 S Main St, Butler, PA 16001 (724-287-0424); **n3mse@arrl.org**

Central Division (IL, IN, WI)

Illinois: Tom Ciciora, KA9QPN, 1887 Irene Rd, Sandwich, IL 60548 (815-498-4929); **ka9qpn@arrl.org**
Indiana: John Poindexter, W3ML, 204 S Main St, Knox, IN 46534-1620 (574-772-2772); **w3ml@arrl.org**
Wisconsin: Donald Michalski, W9IXG, 4214 Mohawk Dr, Madison, WI 53711 (608-274-1886); **w9ixg@arrl.org**

Dakota Division (MN, ND, SD)

Minnesota: Richard H. "Skip" Jackson, KSØJ, 1835-63rd St E, Inver Grove Heights, MN 55077 (651-260-4330); **ks0j@arrl.org**
North Dakota: Lynn A. Nelson, WØND, 6940 4th St SW, Minot, ND 58701 (701-839-8200); **w0nd@arrl.org**
South Dakota: Scott Rausch, WAØVKC, 15362 Canyon Trl, Piedmont, SD 57769-7286 (605-787-7566); **wa0vkc@arrl.org**

Delta Division (AR, LA, MS, TN)

Arkansas: J. M. Rowe, N5XFW, 128 Carnation Pl, Hot Springs, AR 71913-9012 (501-767-9492); **n5xfw@arrl.org**
Louisiana: Gary L. Stratton Sr, K5GLS, 8424 Kaw Court, Shreveport, LA 71107 (318-309-0023); **k5gls@arrl.org**
Mississippi: Malcolm Keown, W5XX, 64 Lake Circle Dr, Vicksburg, MS 39180 (601-636-0827); **w5xx@arrl.org**
Tennessee: Glen Clayton, W4BDB, 238 Old Parksville Rd NE, Cleveland, TN 37323; (423-472-7751); **w4bdb@arrl.org**

Great Lakes Division (KY, MI, OH)

Kentucky: Jim Brooks, KY4Z, 7099 Louisville Rd, Cox's Creek, KY 40013 (502-349-2099); **ky4z@arrl.org**
Michigan: Dale Williams, WA8EFK, 291 Outer Dr, Dundee, MI 48131 (734-529-3232); **wa8efk@arrl.org**
Ohio: Frank J. Piper, KI8GW, 496 Hillview St, Pickerington, OH 43147-1197 (614-589-4641); **ki8gw@arrl.org**

Hudson Division (ENY, NLI, NNJ)

Eastern New York: Pete Cecere, N2YJZ, 329 W Saugerties Rd, Woodstock, NY 12498 (845-246-4359); **n2yjz@arrl.org**
NYC-Long Island: Mike Lisenco, N2YBB, 1635 E 46th St, Brooklyn, NY 11234-3604 (718-258-7830); **n2ybb@arrl.org**
Northern New Jersey: Richard Krohn, N2SMV, 23 Sweetmans Ln, Manalapan, NJ 07726; **n2smv@arrl.org**

Midwest Division (IA, KS, MO, NE)

Iowa: Tom Brehmer, NØLOH, 1114 East Tenth St, Muscatine, IA 52761 (563-263-3097); **n0loh@arrl.org**
Kansas: Ronald D. Cowan, KBØDTI, PO Box 36, LaCygne, KS 66040 (913-757-3758); **kb0dti@arrl.org**
Missouri: Dale C. Bagley, KØKY, PO Box 13, Macon, MO 63552-1822 (660-385-3629); **k0ky@arrl.org**
Nebraska: Art Zygielbaum, KØAIZ, 6601 Pinecrest Dr, Lincoln, NE 68516-3573 (402-421-0839); **k0aiz@arrl.org**

New England Division (CT, EMA, ME, NH, RI, VT, WMA)

Connecticut: Betsey Doane, K1EIC, 92 Mohegan Rd, Shelton, CT 06484-2448 (203-929-7759); **k1eic@arrl.org**
Eastern Massachusetts: Phil Temples, K9HI, 125 Coolidge Ave, Apt 803, Watertown, MA 02472-2875 (617-331-0183); **k9hi@arrl.org**);
Maine: William Woodhead, N1KAT, 68 Madison St, Auburn, ME 04210 (207-782-4862); **n1kat@arrl.org**
New Hampshire: Alan K. Shuman, K1AKS, PO Box 681, New Boston, NH 03070-3520 (603-487-3333) **k1aks@arrl.org**
Rhode Island: Bob Beaudet, W1YRC, 30 Rocky Crest Rd, Cumberland, RI 02864 (401-333-2129); **w1yrc@arrl.org**
Vermont: Paul N. Gayet, AA1SU, 11 Cherry St, Essex Junction, VT 05452 (802-878-2215); **aa1su@arrl.org**
Western Massachusetts: Ed Emco, W1KT, 37 Bullard Ave, Worcester, MA 01605 (508-853-3333); **w1kt@arrl.org**

Northwestern Division (AK, EWA, ID, MT, OR, WWA)

Alaska: Jim Larsen, AL7FS, 3445 Spinnaker Dr, Anchorage, AK 99516-3424 (907-345-3190); **al7fs@arrl.org**
Eastern Washington: Mark Tharp, KB7HDX, PO Box 2222, Yakima, WA 98907-2222 (509-965-3379); **kb7hdx@arrl.org**
Idaho: Edward Stuckey, AI7H, 2300 W Polo Green Ave, Post Falls, ID 83854-9680 (208-457-0354); **ai7h@arrl.org**
Montana: Doug Dunn, K7YD, 216 Fiddle Creek Rd, Livingston, MT 59047-4116 (406-686-9100); **k7yd@arrl.org**
Oregon: Bonnie Altus, AB7ZQ, 7770 Harmony Rd, Sheridan, OR 97378 (971-237-0711); **ab7zq@arrl.org**
Western Washington: Jim Pace, K7CEX, PO Box 1602, Centralia, WA 98531 (360-508-8437); **k7cex@arrl.org**

Pacific Division (EB, NV, PAC, SV, SF, SJV, SCV)

East Bay: James Latham, AF6AQ, 1798 Warsaw Ave, Livermore, CA 94550-6140; (925-447-6136); **af6aq@arrl.org**
Nevada: Joe Giraudo, N7JEH, 720 Holyoke Dr, Spring Creek, NV 89815-5306 (775-738-7110); **n7jeh@arrl.org**
Pacific: Bob Schneider, AH6J, PO Box 131, Keaau, HI 96749-0131 (808-966-8146); **ah6j@arrl.org**
Sacramento Valley: Ronald D. Murdock, W6KJ, 998 Bogue Rd, Yuba City, CA 95991-9221 (530-674-8533); **w6kj@arrl.org**
San Francisco: Bill Hillendahl, KH6GJV, PO Box 4151, Santa Rosa, CA 95402-4151 (707-544-4944); **kh6gjv@arrl.org**
San Joaquin Valley: Dan Pruitt, AE6SX, 4834 N Diana St, Fresno, CA 93726 (559-779-2974); **ae6sx@arrl.org**
Santa Clara Valley: Bill Dale, N2RHV, 142 N Milpitas Blvd #264, Milpitas, CA 95035 (408-263-5325); **n2rhv@arrl.org**

Roanoke Division (NC, SC, VA, WV)

North Carolina: Bill Morine, N2COP, 101 Windlass Dr, Wilmington, NC 28409-2030 (910-452-1770); **n2cop@arrl.org**
South Carolina: Marc Tarplee, N4UFP, 4406 Deer Run, Rock Hill, SC 29732-9258 (803-327-4978); **n4ufp@arrl.org**
Virginia: Carl Clements, W4CAC, 4500 Wake Forest Rd, Portsmouth, VA 23703 (757-484-0569); **w4cac@arrl.org**
West Virginia: L. Ann Rinehart, KA8ZGY, 1256 Ridge Dr, South Charleston, WV 25309 (304-768-9534); **ka8zgy@arrl.org**

Rocky Mountain Division (CO, NM, UT, WY)

Colorado: Jeff Ryan, KØRM, 9975 Wadsworth Pky K2-275, Westminster, CO 80021 (303-432-2886); **k0rm@arrl.org**
New Mexico: Donald D. Wood, W5FHA, 9100 Wimbledon Dr NE, Albuquerque, NM 87111 (505-828-0988); **w5fha@arrl.org**
Utah: Mel Parkes, NM7P, 2166 E 2100 North, Layton, UT 84040 (801-547-1753); **nm7p@arrl.org**
Wyoming: Garth Crowe, N7XKT, 1206 Avalon Ct, Gillette, WY 82716-5202 (307-686-9165); **n7xkt@arrl.org**

Southeastern Division (AL, GA, NFL, PR, SFL, VI, WCF)

Alabama: David Drummond, W4MD, 5001 Lakehurst Dr, Northport, AL 35473 (205-339-7915); **w4md@arrl.org**
Georgia: Gene Clark, W4AYK, 1604 Lynwood Lane, Albany, GA 31707 (229-888-1090); **w4ayk@arrl.org**
Northern Florida: Paul L. Eakin, KJ4G, PO Box 625, Panacea, FL 32346 (850-591-0442); **kj4g@arrl.org**
Puerto Rico: Roberto Jimenez, KP4AC, PO Box 360536, San Juan, PR 00936-0536 (787-567-7373); **kp4ac@arrl.org**
Southern Florida: David Fowler, K4DLF, 2702 Starwood Ct, West Palm Beach, FL 33406-5145 (561-676-3007); **k4dlf@arrl.org**
Virgin Islands: John Ellis, NP2B, PO Box 24492, Christiansted, St Croix, VI 00824 (340-773-9643); **np2b@arrl.org**
West Central Florida: Dee Turner, N4GD, 10132 64th St N, Pinellas Park, FL 33782 (727-548-7474); **n4gd@arrl.org**

Southwestern Division (AZ, LAX, ORG, SDG, SB)

Arizona: Thomas J. Fagan, K7DF, 10650 E Bridgeport St, Tucson, AZ 85747-5925 (520-574-1129); **k7df@arrl.org**
Los Angeles: David Greenhut, N6HD, 21781 Ventura Blvd, #243, Woodland Hills, CA 91364 (818-992-5507); **n6hd@arrl.org**
Orange: Carl Gardenias, WU6D, 20902 Gardenias St, Perris, CA 92570 (951-443-4958); **wu6d@arrl.org**
San Diego: Stephen M. Early, AD6VI, 4724 Maple Ave, La Mesa, CA 91941 (619-461-2818); **ad6vi@arrl.org**
Santa Barbara: Robert Griffin, K6YR, 1436 Johnson Ave, San Luis Obispo, CA 93401-3734 (805-543-3346); **k6yr@arrl.org**

West Gulf Division (NTX, OK, STX, WTX)

North Texas: Jay Urish, W5GM, 1711 Buckeye Dr, Flower Mound, TX 75028-1259 (972-691-0125); **w5gm@arrl.org**
Oklahoma: Kevin O'Dell, NØIRW, 464 Majestic Hills Rd, Ardmore, OK 73401-8362 (580-220-9062); **n0irw@arrl.org**
South Texas: Lee H. Cooper, W5LHC, 2507 Autrey Dr, Leander, TX 78641 (512-260-7757); **w5lhc@arrl.org**
West Texas: John Dyer, AE5B, 9124 County Road 301, Cisco, TX 76437 (254-442-4936); **ae5b@arrl.org**

AMERITRON *True Legal Limit*™ Tuner

Easily handles 1500 Watts continuous carrier even on 160 Meters . . . High-current edge-wound silver plated Roller Inductor . . . Two 500 pf high capacitance tuning capacitors with 6:1 vernier reduction drives . . . 3 core choke balun . . . Six position antenna switch . . . True peak reading Cross-Needle SWR/Wattmeter . . .

Call your dealer for your best price!

AMERITRON ATR-30

$599.95

Suggested Retail

- ***Handles 1500 Watts carrier***
- ***Super High Current edge-wound silver plated Roller Inductor***
- ***500 pf tuning capacitors with 6:1 vernier reduction drives***
- ***3 core choke balun***
- ***6 position antenna switch***
- ***True peak reading meter***

AMERITRON's ATR-30 *True Legal Limit*™ roller inductor antenna tuner is ham radio's toughest! It'll handle 1500 Watts *continuous carrier output* on *all* modes and *all* HF bands into most antennas -- even on 160 Meters where most antenna tuners fail.

It's perfect for Ameritron's most powerful amplifiers where the ATR-30 just loafs.

All band coverage lets you operate 1.8-30 MHz including all MARS and WARC bands.

Super High Current Roller Inductor

You'll see Ameritron's new *super high current* air core roller inductor. It's *edge wound* from a thick solid copper strip and silver plated. This produces a large surface area and a massive conductor. It can carry huge circulating RF currents and withstand tremendous heat that'll melt or burn ordinary roller inductors.

A gear driven turns counter and crank knob gives you precise inductance control.

Two 500 pf Tuning Capacitors

Two 500 pf -- *the highest of any antenna tuner* -- variable transmitting capacitors give you no-arc wide range impedance matching for true high power performance.

6:1 vernier reduction drives makes capacitor tuning smooth and easy.

Super Balun, 6 position Antenna Switch

Super heavy duty three core choke balun lets you match virtually any balanced feedline antenna without core saturation.

A 6 position antenna switch lets you select your desired operating antenna.

Read *true* Peak Power

Ameritron's active electronic *true* peak reading meter accurately reads forward and reflected power and SWR *simultaneously* on a lighted Cross-Needle meter.

Roomy Cabinet maintains High-Q

Roomy extra-strong .080 inch thick aluminum cabinet gives highest efficiency and lowest loss. 13¼Wx5⅝Hx17½D inches.

AMERITRON ATR-20 Antenna Tuner

ATR-20, $459.95 Handles a full 1.2 kW SSB and 600 Watts CW. It's designed to safely handle the full SSB power of Ameritron's AL-811/811H/80B, ALS-500M/600 and other 1.2 kW SSB amplifiers.Has vernier reduction drives.

Ameritron has the best selection of *True Legal Limit*™ HF Amplifiers

AMERITRON's legal limit amplifiers use super heavy duty Peter Dahl Hypersil(R) power transformer capable of 2500 Watts!

Ameritron's *most powerful* Amp

with 3CX1500/8877 ceramic tube

AL-1500

$3795

Eimac(R) tube

AL-1500F

$3195

Imported tube

TrueLegalLimit™

Ameritron's *most powerful* amplifier uses the *herculean* 3CX1500/8877 ceramic tube. 65 Watts drive gives you full output power -- and it's just loafing because the power supply is capable of 2500 Watts PEP. All HF bands, all modes. 77 lbs., 17Wx10Hx18½ in.

Ameritron's *toughest* Amp

with Eimac(R) 3CX1200A7 toughest tube

AL-1200

$3459

Suggested Retail

TrueLegalLimit™

Get ham radio's *toughest* tube with AL-1200. The *Eimac*(R) 3CX1200A7 has a 50 Watt control grid dissipation and the lowest history of field replacement of any modern transmitting tube that we use. 90 Watts in gives you full power out. All HF bands, all modes. 76 pounds, 17Wx18½Dx10H in.

Ameritron's *classic* Amp

with 2 graphite plate classic (R) 3-500G tubes

AL-82

$2745

Suggested Retail

TrueLegalLimit™

Most linears using 3-500Gs *can't* give you 1500 Watts because their lightweight power supplies *can't* use these tubes to their full potential. AL-82 is ham radio's *only* super 3-500G amp! 100 Watts in gives you full power out. All HF bands, all modes. Hefty 76 pounds, 17Wx10Hx18½D inches.

Desktop Kilowatt

with classic 3-500G tube

AL-80B, $1495. Gives you full kilowatt SSB PEP output (85 Watts in) from a whisper quiet compact desk-top linear. 14Wx8½ Hx 15½D inches. Plugs into 120 VAC outlet. Graphite plate *genuine* 3-500G tube. Nearly 70% efficiency. Weighs 48 lbs.

AMERITRON no tune Solid State Amplifiers

500 Watt Mobile Amp

ALS-500M, $849. 500 Watts PEP/400W CW output, 1.5-22 MHz, instant bandswitching, no tuning, no warm-up. SWR, load fault, thermal overload protected. Remote on/off control. DC amp meter. Extremely quiet fan. 13.8 VDC. 9W x3½Hx15D in., 7 lbs. **ALS-500RC, $49,** Remote Head.

600 Watt FET Amp

ALS-600, $1499. ***No tuning****, no fuss, no worries -- just turn on and operate.* 600 Watts PEP/500W CW, 1.5-22 MHz, instant bandswitching, SWR protected, extremely quiet, SWR/Wattmeter, ALC control. 120/220 VAC. Inrush protected. 9½Wx6Hx12D in. **ALS-600S, $1599,** ALS-600 with 10 lb., very low RF noise switching power supply.

Precision SWR/Wattmeter

AWM-30, $149.95 suggested retail. Active circuit gives *true* peak/average readings on lighted Cross-Needle meter. 3000/300 Watt ranges. Remote sensor.

Call your dealer for your best price!

Free Catalog: 800-713-3550

AMERITRON

. . . the world's high power leader!

116 Willow Road, Starkville, MS 39759

TECH (662) 323-8211 • **FAX** (662) 323-6551

8 a.m. - 4:30 p.m. CST Monday - Friday

For power amplifier components call (662) 323-8211

http://www.ameritron.com

Ameritron . . . the world's high power leader!

Top rated. Affordable. Great support.

The K3 meets *all* of your toughest specs.

It's no secret: the Elecraft K3 has become the clear choice of contesters, DXers, and discriminating operators worldwide. Topping the charts in receiver test categories, it has powered some of the largest, most successful DXpeditions in history, and helped operators notch record-breaking wins in CW, RTTY, and SSB contests.

Our new P3 Panadapter adds an exciting visual dimension to the K3. Its high resolution color LCD provides both spectral and waterfall displays, with very fast screen refresh, signal averaging, point-and-click tuning of the K3, and bandwidths from 2 kHz to over 200 kHz. With the P3, you'll be able to see an entire band segment all at once—and find weak signals you might never have heard.

No matter how you choose to outfit your K3, you'll have outstanding performance. Elecraft's high-dynamic range, down-conversion architecture accommodates first-IF roofing filters as narrow as 200 Hz for CW and data modes. RF speech compression and 8-band graphic equalization offer clean, crisp SSB. The optional sub receiver, identical to the main receiver, provides true, dual-antenna diversity receive, ideal for digging out weak signals on noisy bands.

The K3 is also the only high-performance transceiver that's truly portable. It runs from 11-15 V, has low current drain, and is right-sized for DXpeditions or Field Day. You *can* take it with you!

- 100 W model starts at $1949; upgradeable 10 W model, $1499
- 160-2 m; SSB/CW/AM/FM/data modes (2m with K144XV internal option)
- 4"H x 10"W x 10"D; only 8 pounds (K3/10)
- Factory-assembled or *no-soldering* kit (all circuit boards pre-built and fully tested)
- Built-in PSK31/RTTY for data-mode QSOs with or without a computer
- NEW! APF (Audio Peaking Filter) for digging weak signals out of QRM

ELECRAFT®

Elecraft is a registered trademark of Elecraft, Inc.

www.elecraft.com • 831-763-4211

P.O. Box 69, Aptos, California 95001-0069

Up Front in QST

upfront@arrl.org

A Fist by Phone

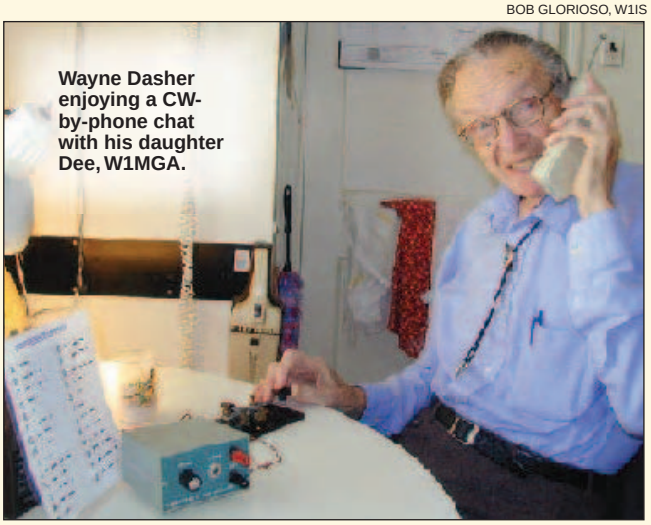
Bob Glorioso, W1IS

CW seems to be holding its own and even growing since the code requirement was dropped. I got hooked on CW back in the "dark ages" as a young Novice, WN1EBW. I was recruited to log at my first Field Day for Walt, W1VB, a crusty old commercial CW operator, long since a Silent Key. He not only got the message through but his code had a magical rhythm — it was music. Shortly after that first Field Day I met Dee Dasher who would not only become my wife but also W1MGA, another CW operator.

As our parents aged we were faced with a problem that only a CW operator could solve. Dee's father, Wayne, contracted ALS, amyotrophic lateral sclerosis, also called Lou Gehrig's disease. As the disease progressed he began to lose control of some of his faculties. He had trouble walking but could still play his banjo. The worst thing that happened was he lost his ability to speak.

Being the proud independent person he was, he refused to move in with us. The problem we had was communications as Dee had spoken with her dad on the phone every day. A computer would do it but he would have none of that, either. The solution was right in front of us. Wayne was a musician, had a great sense of rhythm and was familiar with our ham radio antics, so *Morse code* was the answer. I pulled out an old code practice oscillator I had been saving for the day our son became interested in ham radio and an antique J-38 key. I printed the code in *big* letters on a sheet of paper and encapsulated it in plastic for him.

BOB GLORIOSO, W1IS



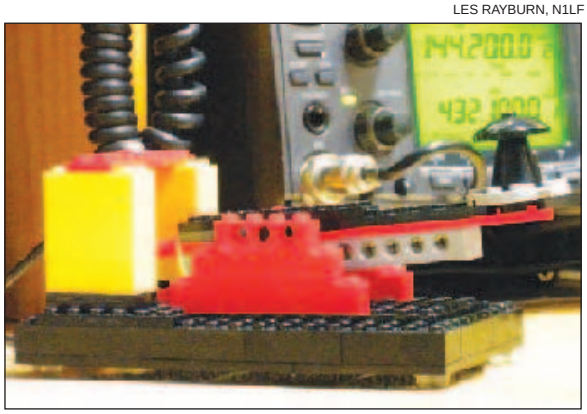
Wayne Dasher enjoying a CW-by-phone chat with his daughter Dee, W1MGA.

Every night from then on the phone would ring and we would pick it up to hear — *dit dit dit dit – dit dit*. Dee and her Dad would carry on a code conversation for an hour or so with Wayne pecking out the code and Dee talking back. It worked great and he loved it. As time went by he became quite a good CW operator. Unfortunately, as ALS goes, Wayne passed away in 2002 but he left us with many happy memories of the music of his fist over the phone.

Lego Key

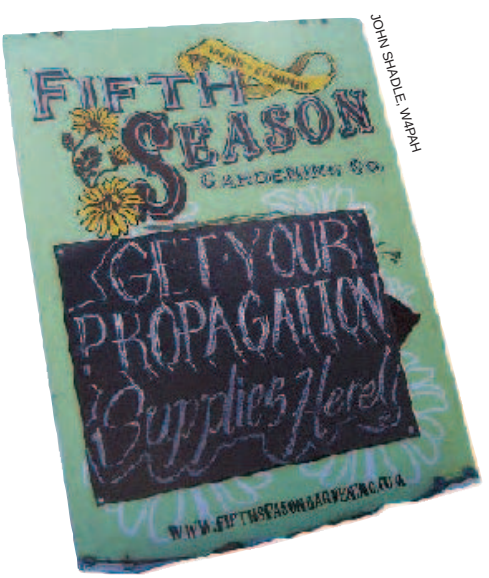
Les Rayburn, N1LF, of Maylene, Alabama and his wife Abby spent three weeks building a unique kitchen island consisting entirely of Lego blocks — 27,000 of them! It wasn't inexpensive, but it is unique — and colorful. While watching Les make a 6 meter CW contact with an old Navy straight key, the idea for his next Lego project "just came to me," according to Abby. The Lego key Les built "actually sends quite well," he reports. "I used it to make several contacts in the January VHF Sweepstakes."

LES RAYBURN, N1LF



This straight key was Les Rayburn's second Lego project.

JOHN SHADLE, W4PAH



Sunspots? Who needs 'em? **Why wait for the DX to return when you can just buy it? John Shadle, W4PAH, found this source in his hometown of Carrboro, North Carolina.**

Heavy-Duty FM Dual Band Mobile with Exceptionally Wide Receiver Coverage*

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

• Separation Kit for Remote Mounting
(optional separation kit YSK-7800 requires)

2m 70cm DUAL BAND

2 m/70 cm DUAL BAND FM TRANSCEIVER
FT-7900R new

The King of Mobile

75 WATTS

Commercial Grade Field Radio Submersible Construction

HEAVY-DUTY 75 W 2 m FM TRANSCEIVER
new **FT-2900R**

2m MONOBAND

Compact Field Radio with Top Mounted LCD and Loud Audio

2m MONOBAND
new

ULTRA-COMPACT
5 W 2 m FM HANDHELD
TRANSCEIVER
FT-250R

Best Selling, Reliable Mobile

55 WATTS

ULTRA RUGGED 55 W 2 m FM TRANSCEIVER
new **FT-1900R**

2m MONOBAND

2m MONOBAND
new

VHF FM 5 W COMPACT
HANDHELD TRANSCEIVER
FT-270R

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

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

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

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

Does Your Rig Speak Digital?

Explore the exciting world of digital mode communication with the leader in sound card interfaces. RIGblasters are the easiest way to interface your radio and computer. Operate in more than 20 digital modes with over 150 radio sound card software programs.

RIGblaster Duo

A complete dual-radio station Integration console

$349.00

RIGblaster Pro

Our top of the line single radio interface

starting at: $289.95

NEW!

RIGblaster Advantage

Internal Sound card with only one USB cable for rig control and all audio.

$200.00

RIGblaster Plus II

Automatic switching between voice and digital modes with CAT/CI-V

$159.95

RIGblaster Nomic

Small, simple, rugged, portable and inexpensive

$59.95

RIGblaster Plug & Play

Direct USB to radio data jack connections

$119.95

West Mountain RADIO

Learn about digital mode communications at: www.westmountainradio.com/digital

sales@westmountainradio.com ***262-522-6503***

Fly with the EAGLE risk-free for 30 days

HEAR MORE STATIONS. MORE CLEARLY.

GUARANTEED.

Introducing the Ten-Tec Eagle – the world's first *Advanced Signal Reception™* Down Conversion HF Transceiver

ASR opens up the airwaves for you
Advanced Signal Reception™ [ASR™] will change forever your ham radio experience. You'll hear more stations, more clearly. You'll have more reliable communications. And your ham radio hobby will be more rewarding than ever.

High performance in a compact package
The new Ten-Tec Eagle is a high-performance HF +6 transceiver with a host of features. The Eagle's small 2.9 x 8.5 x 10.25-inch case (HxWxD) makes it the perfect multi-use radio – use it at home or take it on the road in your car or RV. State-of-the-art Digital Signal Processing chips and proprietary circuits insure maximum transmit and receive performance. According to many reviewers, the Eagle can outperform transceivers costing two to three times as much. See our web site for specifications.

HDTV, Blu-Ray, & ASR
You've seen the improvement HDTV brought to television, you've seen the improvement Blu-Ray brought to DVDs – now it's time to take a look at what Advanced Signal Reception is bringing to ham radio.

Fly with the Eagle risk-free for 30 days
The good news is that it couldn't be easier to be the first on the block to test fly the Eagle ASR transceiver. Here's what to do. Order the Eagle (financing available). Test it for 30 days in your home, shack, car, or club. Compare it to any other amateur radio you or your friends have used. If you do not agree that the Eagle ASR transceiver enables you to hear more stations, more clearly than ever before, simply return the Eagle to us for a full refund of your purchase price. And there's more good news for you "early birds".

The Eagle Early Bird Special
When you order your new Eagle Advanced Signal Reception transceiver, we will include at no additional charge a new Ten-Tec Model 709A desk microphone & stand. **(Our supplies of the microphones are limited, so you will want to order early.)** The microphone and stand are yours to keep – even if you decide to return the radio.

Order Hotline
800-833-7373
or mail the coupon below to take advantage of the Eagle Early Bird special.

Microphone supplies are limited.

I would like to take advantage of your Eagle Early Bird Special. I am placing my order for the new Eagle Advanced Signal Reception transceiver and I would like to receive the free desk microphone and stand.

Name: _____

Address: _____

City, State: _____

Call me to discuss shipping & payment details.
My number is: _____

TEN-TEC
voted #1 in Quality and Customer Service & Support [2010]
www.tentec.com/survey

Ten-Tec Direct • 1185 Dolly Parton Pkwy • Sevierville, TN 37862
www.tentec.com/eagle • 800-833-7373

CORRESPONDENCE

LARKING ON LOGBOOK

♦ Having been a ham for roughly 34 years, I'm now looked upon as an OT — almost. But just recently, I started earning ARRL awards. Part of the reason has to do with finally getting my WAS award. After that, my CW WAS award, and now I am well on my way to my 160 meter, 80 meter and 40 meter WAS awards, as well as racking up several countries for my DXCC. It's like popping popcorn!

And why am I excited about this? Well, because it's so easy to do with Logbook of The World (LoTW)! Years before, I collected cards; I have books and books of QSL cards. I still know what my first card from Norway looked like, and I still have that 1977 card. But being the casual operator that I am, the cards just sat and collected dust. But not anymore. And, it's all because I use LoTW. I keep track of my QSOs through a logging program and then I upload my QSOs to LoTW almost daily. As my fellow hams upload theirs, matches take place automatically!

I've heard the criticism of the LoTW process. But I am writing this letter to tell you that LoTW is working and serving its purpose. It's working and it's working well for this OT. How can we get more hams to use the system? The more people use it, the more benefit it will be to all ARRL members. If some refuse, it only stands to hurt our fellow hams.

SEAN DORAN, W8OKN
Williamsburg, Michigan

GREAT RESOURCE

♦ I want to thank the ARRL for the great tool for researching old *QST* articles on the ARRL Periodicals and Archive Search web page (**www.arrl.org/arrl-periodicals-archive-search**). Back in the 1960s, I built a keyer from a March 1962 *QST* article by W2VYO. It worked great, but when I got a rig with a built-in keyer, I put the homebrew one on the shelf. A short time ago I was going to give the keyer to a new ham, but when I tested it, I found that it no longer worked. I went to the archives and there I found the issue and was able to download the article! Thanks all involved for this great member resource.

JOHN VOELKEL, W3ROO
Baltimore, Maryland

WHO NEEDS FACEBOOK?

With the abundance of social networking avenues available, I was recently reminded of the magic and spark that ham radio still provides in connecting old friends from the past. In this case, the friendship was between my father, WØBQV, now a Silent Key, and a fellow Air Force MARS operator from the early 1950s, Gerald Peterson, W7LEB. Both were stationed in 1950 at Hill Air Force Base in Utah as radio operators at the K7FAH MARS station. My dad often spoke of the great times he had there, and the good friendships that developed — one in particular was with W7LEB, "little eager beaver."

Nostalgia prompted me to take my dad's old Drake C-Line out of storage and I fired it up for the first time in many years. I had not been on 20 meters in quite some time and was happy to hear many signals coming in, including one that sparked a memory of conversations with my dad: Could it really be the same W7LEB that he often spoke of? That was 1950, after all. I gave him a quick call and asked him if he had been stationed at Hill with WØBQV. Wow! Jerry instantly recalled my dad's name and we had a 30 minute conversation that was absolutely wonderful. Jerry was disappointed to hear that my dad is now gone, but a connection has been rekindled and I look forward to many more conversations and maybe even a visit.

To top off the evening, I did a search of K7FAH on the Internet and the first hit was a book written by Danny Gregory, *Hello World: A Life in Ham Radio*. There on page 95 was a picture of a QSL card from K7FAH signed by the operator — my dad, WØBQV! Ham radio *is* a wonderful hobby!

RON OSTMAN, WØNYQ
Mountain Iron, Minnesota

LOW POWER IS HIGH FUN

♦ High power can be, and sadly often is, used to trample down weaker signals. Amateurs are good at accepting challenges and I think that QRP is a technical and operating challenge of the highest order. So here is a friendly challenge: QRP — are you up to it?

My dad, VE4FF, was annoyed when Canada was assigned "VE" because he was sure the "E" would go unheard. But in the 1920s he worked Australia with 2 W to a one tube battery-powered transceiver, using one of the (back then) newfangled vacuum tubes.

I have a Worked All Continents certificate on my wall, earned with a homebrewed transmitter running 8 W to a 6F6 vacuum tube, mostly on CW. It drove a tribander atop a folding mast that was in *QST* in 1962 and in the *Antenna Book* for some years.

A ham in Quito, hearing that same little AM transmitter, exclaimed, "I don't get it! You are barely moving my meter, but you're Q5! How do you do that?" I did that using homebrewed clipping, filtering and AGC in the modulator. The modulator still sits behind my operating position.

The QRP operator learns how to compete in contests; certainly not at a five contacts per minute pace, but using little dodges like calling enough off frequency that she has a heterodyne a wee bit different from the others, or sending at a different speed and by using the techniques so well explained by Bernie McClenny, W3UR ["How's DX?" Sep 2010, pages 83-84].

Some amateurs have opined that a legal limit of 50 W would force the opening of a brand new vista of technical innovation and improvement in ham radio. It will never happen, but is fun to think about.

FRANK GUE, VE3GUE
Burlington, Ontario, Canada

THE LION ROARS

♦ Are bragging rights for "America's Oldest College Amateur Station" up for grabs? Perhaps the MIT Radio Society, W1MX, should reconsider their claim [" 'Rah for Technology: America's Oldest College Amateur Radio Club Turns 100," Apr 2009, pages 57-58], given the predecessor of their modern club was established in 1909; the predecessor of Columbia University's Amateur Radio Club, W2AEE, was founded in New York City in November 1908. Gintautas Gaidamavicius, LY2YR, recently found an article in the November 24, 1908 issue of the *New York Sun* entitled "Wireless Club at Columbia: Disputes with the Aero Club the Monopoly of Morningside Air."

The article states in part: "The new organization is the 'Wireless Telegraph Club of Columbia University,' capital stock subscribed and fully paid by the students of Columbia. The wireless people burst out over night and took the airship navigators by surprise. 'What in blazes is that?' demanded Grover Cleveland Loening, the father of the Aero Club, as he rounded the corner of the library yesterday morning and saw outlined against the foggy sky between Havemeyer and University Halls the double wires that the wireless club was stringing up…

"Prof. Michael Pupin is very much interested in the new club and so is Prof. Crocker, in whose laboratory the receiving and transmitting apparatus is to be installed. Both said yesterday that the scope of the electrical engineering department in the university would have to be enlarged shortly to admit of a course in wireless telegraphy, which, according to them, is quite as important as instruction in the construction and use of airships, for which some of the other professors on campus are agitating."

ALAN CROSSWELL, N2YGK
Station Manager, Columbia University Amateur Radio Club, W2AEE

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.

brick wall /brĭk wôl/ ▪ *noun*

anything or anyone that is impenetrable, unrelenting, or unyielding

FlexRadio's PowerSDR™ Brick Wall DSP Filters let you **HEAR THE DX** - not the QRM

FLEX-5000A™
HF-6m Transceiver
+2M&70CM

FLEX-3000™
HF-6m Transceiver

FLEX-1500™
HF-6m Transceiver

Order Now!

Tune in Excitement.™

www.flex-radio.com
sales@flex-radio.com 512-535-5266

FlexRadio Systems®
Software Defined Radios

High Sierra

www.hamcq.com

Our secure online ordering gives you updates via email, notification of shipment, tracking numbers and lower prices.

Now More than 500 Products on the Website!

Announcing the Andy Crimp Pro

The Best Powerpole Crimper

The only professional ratcheting crimp tool for 15, 30, 45, 50 and 75 Amp Anderson Powerpoles. It will also crimp Molex type connectors. Over a year in development, our new Andy Crimp Pro is the most versatile crimping tool ever with its 4 die cavities.
Regular Price $100

Introductory Price Just $49.73

Professional Coax Crimp Connector Tool Set

Includes Our Professional Coax Crimper with 2 Dies, Coax Cutter, Screwdriver, 2 Coax Cable Strippers and Carrying Case.
Regular Separate Price $240
Online Sale
Sale $94.73
Less Than Half Price!

Professional Crimping Tool for Coax Connectors

Does Most Sizes. Includes 2 Dies
Online Sale
Sale $49.73

New Coax Connector Adapter Kit

Professional Unique adapter kit to connect N, Mini-UHF, UHF, BNC, SMA and TNC. For example, you can make an adapter from PL259 to a TNC female or an SMA male to a SO239. There are hundreds of possible combinations with our new Coax Connector Adapter Kit.
Regular Price $150
Introductory Price Just $89.73

Soldering Station

Variable Temperature & Rubber Grip
Regular $50
Online Sale
Sale $24.73

Limited Quantities

SIGN UP for Our Special Deals Club on the Website

KENWOOD

Listen to the Future

All-Terrain Performance

On or off the road, Kenwood's new TM-271A delivers powerful mobile performance with 60W maximum output and other welcome features such as multiple scan functions and memory names. Yet this tough, MIL-STD compliant transceiver goes easy on you, providing high-quality audio, illuminated keys and a large LCD with adjustable green backlighting for simple operation, day or night.

144MHz FM TRANSCEIVER

TM-271A

▮ 200 memory channels (100 when used with memory names) ▮ Frequency stability better than ±2.5ppm (-20~+60°C) ▮ Wide/Narrow deviation with switchable receive filters ▮ DTMF microphone supplied ▮ NOAA Weather Band reception with warning alert tone ▮ CTCSS (42 subtone frequencies), DCS (104 codes) ▮ 1750Hz tone burst ▮ VFO scan, MHz scan, Program scan, Memory scan, Group scan, Call scan, Priority scan, Tone scan, CTCSS scan, DCS scan ▮ Memory channel lockout ▮ Scan resume (time-operated, carrier-operated, seek scan) ▮ Automatic repeater offset ▮ Automatic simplex checker ▮ Power-on message ▮ Key lock & key beep ▮ Automatic power off ▮ Compliant with MIL-STD 810 C/D/E/F standards for resistance to vibration and shock ▮ Memory Control Program (available free for downloading from the Kenwood Website: ***www.kenwoodusa.com***)

KENWOOD U.S.A. CORPORATION
Communications Sector Headquarters
3970 Johns Creek Court, Suite 100, Suwanee, GA 30024
Customer Support/Distribution
P.O. Box 22745, 2201 East Dominguez St., Long Beach, CA 90801-5745
Customer Support: (310) 639-4200 Fax: (310) 537-8235

www.kenwoodusa.com

ADS#15608

JQA-1205 091-A
ISO9001 Registered
Communications Equipment Division
Kenwood Corporation
ISO9001 certification

Which SteppIR Product is Best for You?

How about the NEW SteppIR DB42 MonstIR Pro Dream Beam Series Yagi!

DB42 DreamBeam Yagi Specifications:

- 42 foot boom
- 3 elements on 40m
- 3 elements on 30m
- 5 elements on 20m, 17m, 15m, 12m, 10m
- 8 elements on 6m with optional 6m passive kit
- 80m dipole option available
- Includes connector junction box

$5,795.00

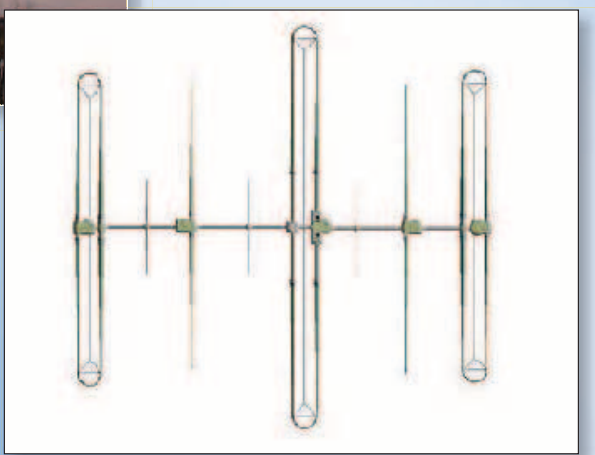
See the DB42 MonstIR Pro debut at the 2011 Visalia DX Convention

The Dream Beam series offers antennas for both space limited Hams as well as the "Big Guns" who have the space and want the very best.

The SteppIR design is made possible by the convergence of determination and high tech materials.

The availability of new lightweight glass fiber composites, Teflon blended thermo- plastics, high conductivity copper-beryllium and extremely reliable stepper motors has allowed the SteppIR to be a commercially feasible product.

The current and future SteppIR products should produce the most potent single tower antenna systems ever seen in Amateur Radio!



SteppIR

2112 116th Ave NE Suite 1-5
Bellevue, WA 98004
www.steppir.com
Tel: (425) 453-1910 Fax: (425) 462-4415

KENWOOD
Listen to the Future

TS-480

The Perfect Remote Base Transceiver

Straight Out of the Box!

- **The perfect internet base transceiver - straight out of the box!**
- **Easy to operate.**
- **The size makes it great for base, mobile or portable operation.**
- **Free VoIP/Control software downloads at Kenwoodusa.com.**
- **Incredible RX specifications.**
- **No expensive sound card interface needed.**

KENWOOD U.S.A. CORPORATION
Communications Sector Headquarters
3970 Johns Creek Court, Suite 100, Suwanee, GA 30024
Customer Support/Distribution
P.O. Box 22745, 2201 East Dominguez St., Long Beach, CA 90801-5745
Customer Support: (310) 639-4200 Fax: (310) 537-8235

www.kenwoodusa.com
ADS#24008

JQA-1205 091-A
ISO9001 Registered
Communications Equipment Division
Kenwood Corporation
ISO9001 certification

Nested Full Wave Delta Loops for 20 and 10 Meters

A full wave delta loop has less width and provides more gain than a dipole.

Don McMinds, K7DM

I moved from Oregon to my present location in Ocean Shores, Washington 3 years ago. In Oregon, I had over 2 acres to work with and was blessed with a five element tribander at 55 feet as well as a full wave delta loop for 40 meters. Unfortunately, my present location is situated on a very narrow lot that does not have adequate room for the tower. After considering several antennas, I decided that a delta loop would be the best solution. I built my previous 40 meter delta loop based on an excellent 1984 *QST* article by Doug DeMaw, W1FB (SK), and Lee Aurick, W1SE (SK).[1] The authors pointed out several advantages of a delta loop:

- It doesn't require a ground screen.
- It doesn't need to be perfectly vertical.
- It provides some gain over a dipole.
- It's much less noisy than a vertical.
- It can be fed at any of several points.
- Its segment lengths don't have to be equal.

Design

My original plan was to orient a 20 meter loop in an apex up configuration on a 30 foot mast mounted in a 5 foot A-frame tower on the roof. I chose the apex up configuration because a second supporting mast is not possible at my house. I then decided that adding a 10 meter loop would be fairly easy from a mechanical standpoint and would provide another band. The 10 meter loop fits inside the 20 meter loop and is supported by a short length of rope, one end of which tied to its apex insulator and the other end tied to the 20 meter loop apex insulator. The loops are raised and lowered by a halyard rope looped through a pulley at the top of the mast.

The feed point for both loops is at the lower left hand corner which, according to DeMaw and Aurick, provides vertical polarization and a low angle of radiation. *The ARRL Handbook*, 1984 edition, states that "…the main consideration for a good DX antenna is a low angle of radiation. It should be said, however, that most DX antennas for HF work are horizontally polarized." This suggested to me that an apex up corner fed delta loop would be good for DX. [The corner feed provides a mix of both horizontal and vertical polarization. Feeding in the center of the horizontal section will provide

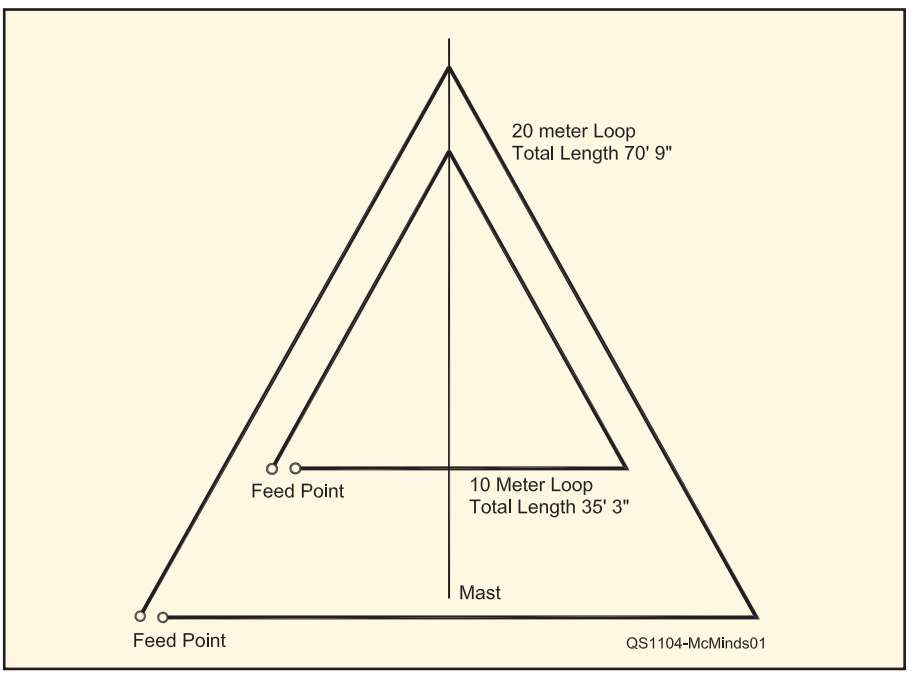


Figure 1 — Design layout of the 10 and 20 meter delta loops.

Hamspeak

Delta loop — Name used to describe a full wave loop antenna configured in triangular shape. The antenna can have its apex either pointing up or down. If fed in the center of its horizontal section it will have horizontal polarization. Often used by itself, it can also be part of a multielement directive array.

Q section — Popular name for a one quarter wave section of transmission line used to transform impedances.

Tribander — Antenna that works on three bands, usually 20, 15 and 10 meters through the use of separate elements per band, traps or a combination. Term is typically applied to commercial Yagi arrays for the three bands.

Yagi — Multielement directive antenna in which many of the elements are not directly connected to the driven element(s). The other elements are parasitic and receive and reradiate energy due to electromagnetic coupling. Often used as a rotatable antenna system in the upper HF through UHF regions.

[1]D. DeMaw, W1FB (SK), and L. Aurick, W1SE (SK), "The Full-Wave Delta Loop At Low Height," *QST*, Oct 1984, pp 24-26.

primarily horizontal polarization resulting in higher gain at low angles if the bottom is a reasonable height above ground, at least ½ wavelength. — *Ed.*]

The DeMaw-Aurick article gives formulas for determining the overall length of the loops and for the length of the matching Q section, a quarter wavelength of 75 Ω, RG-59/U coax. The formula for the loop length is L (feet) = 1005/f (MHz). For the design frequencies I used 14.2 MHz for 20 meters and 28.5 MHz for 10 meters. After rounding off, this yields loop lengths of 70 feet 9 inches for 20 meters and 35 feet 3 inches for 10 meters. The original design is shown in Figure 1.

The Q section impedance needs to be between the loop impedance (~100 Ω) and the feed-line impedance (50 Ω). The formula for the Q section is L (feet) = 246 × V/f (MHz), where V is the relative velocity factor of the RG-59U. With the design frequency of 14.2 MHz and a velocity factor of 0.66 for polyethylene dielectric coax, the 20 meter Q section length is 11 feet 5 inches. For 28.5 MHz, the Q section length is 5 feet 8 inches.

The loops are supported at the top of the mast by a stainless steel pulley bolted to a short length of reinforced thick walled PVC. An ultraviolet resistant rope with a length twice the mast height is passed through the pulley to raise and lower the loops. The PVC is bolted to a ⅛ inch thick aluminum plate at a right angle to the mast and the plate is bolted to the mast, a scheme identical to most Yagi boom to mast arrangements. Figure 2 shows a sketch of this assembly. I had the aluminum plate made at a local sheet metal shop and the cost was quite reasonable.

The Washington coast often has some violent winter storms, so guying the mast was a requirement. I didn't like the idea of wire guys, so I decided that a UV resistant Dacron rope would be sufficient.

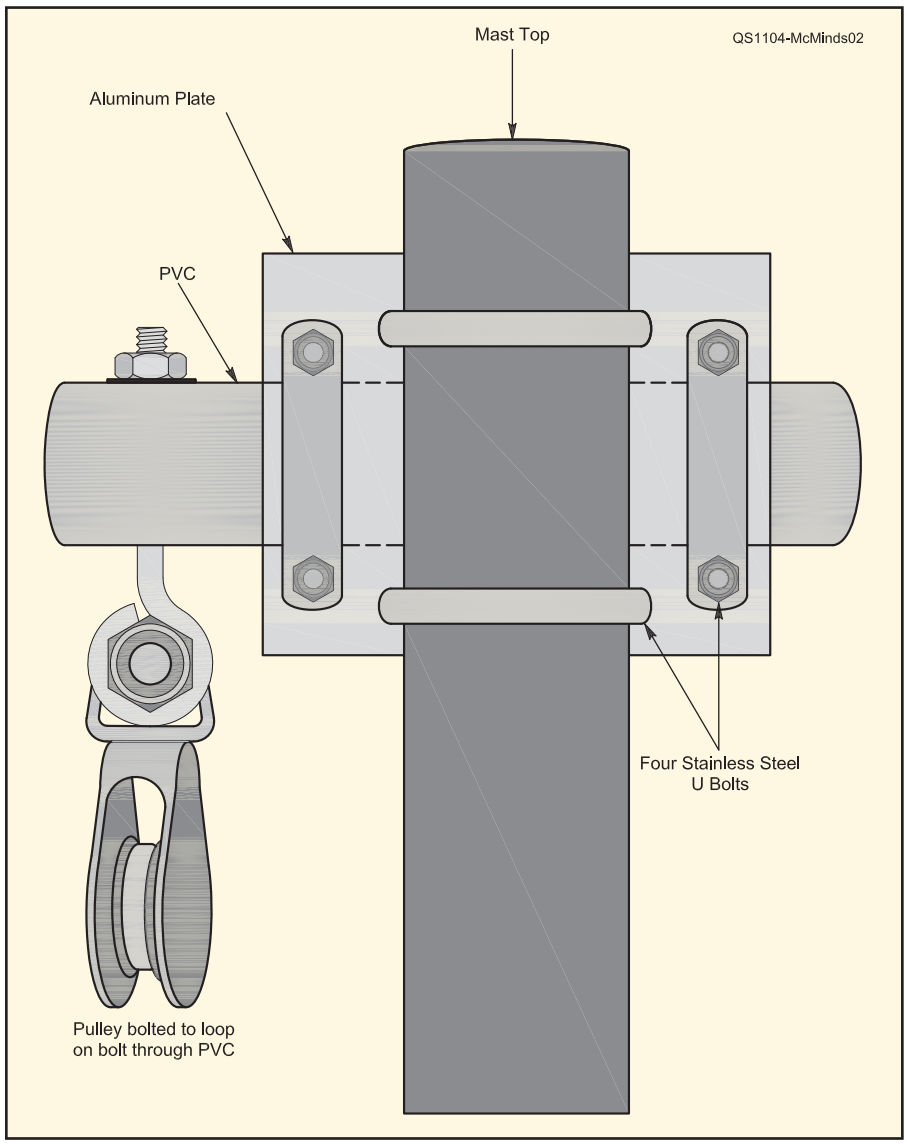


Figure 2 — Design of the mast plate and pulley assembly.

Materials

My location is less than a mile from the Pacific Ocean so I decided I needed high quality rust resistant wire for the loops. The Wireman (**www.thewireman.com**) offers a product called *Toughcoat Silky*, an insulated #13 AWG 19-strand 40% copper clad steel wire that fit my requirement. I decided to use a Budwig (**www.budwig.com**, also available from The Wireman) HQ-1 dipole center at each feed point. This comes with an SO-239 coax connector and I felt that would be a better way to connect the Q section coax to the loop. I soldered terminal lugs to the center conductor and outer shield of the Q section coax and to the heavy wires of the dipole center. I connected the Q section terminals to the dipole center terminals with #10 stainless steel screws and nuts. The Wireman also has a 3⁄16 inch UV-resistant Dacron rope with a 770 pound breaking strength that fit my requirement for the guys and the haul rope. The cost of the materials I used, including the mast plate, was less than $200.

Construction and Testing

After assembling the required materials, I decided it would be prudent to erect the mast and antenna on the ground before raising it on the roof. This proved a wise decision because I encountered some mechanical issues that I had overlooked. I started by anchoring the little A-frame tower to the ground using six 1-foot steel tent stakes. The mast consists of three 10-foot sections of steel mast from RadioShack. I bolted the aluminum plate assembly to the top section of the mast (see Figure 3), then bolted the guy supports to the mast just below the aluminum plate.

The first problem occurred when I tried to raise the mast to the top of the tower. There was no way I could do this by myself, and even enlisting the help of a neighbor proved fruitless. At that point I decided it might be a good idea to just use two of the three mast sections, reducing the mast height to 20 feet. Even this shorter length proved difficult to raise, so I pulled up the stakes and placed the tower on its side on the ground. I placed the mast in the tower and then successfully raised this assembly. After staking the tower, I used a large carpenter's level to get the mast as vertical as possible and then secured it to the tower. I staked the guy ropes at 120° intervals and secured them.

Assembling the loops was not a problem. I assembled the 20 meter loop first and connected the Q section at the feed point. After raising it, I checked the assembly with an antenna analyzer. Results were quite good. The analyzer had a reactance of only 2 Ω at 14.2 MHz and the SWR was no more than

Figure 3 — Aluminum plate and pulley assembly shown bolted to the mast.

Figure 4 — Loops up!

1.8:1 at any point in the band. I obtained similar results with the 10 meter loop. Both loops were oriented so the plane of the loop was on a line of 010-190°. This placed the centers of the major lobes of the loops at about 115 and 295°, perfect for both stateside contacts and Asian DX.

The second problem occurred after I raised both loops together. With both loops taut, the amount of stress on the mast was more than the guy ropes could handle and the mast was bowed significantly toward the loops. It was obvious that I needed more support on the back side of the mast, the side opposite the loops. Fortunately I had enough Dacron rope to accomplish this and adding an additional guy just above the mid-point of the mast solved the problem.

Final Assembly

The final assembly on the roof occurred a few days later and went without any problems, thanks to the ground testing. I enlisted the help of several friends and we began by positioning the A-frame tower on the roof and aligning it to vertical. We drilled holes in the roof through the holes in the tower's footpads, then laid the tower on its side and inserted the mast with all its ropes attached. It's a good idea to coil the ropes a bit to keep them out of the way, but be sure that you don't coil them so far that you can't reach them after the mast is raised. We raised the tower and mast assembly, positioned the tower so that the holes in its footpads lined up with the holes in the roof, and bolted it securely with 3 inch lag bolts. Using my trusty GPS, I aligned the mast so that the mounting plate at its top was on the desired 010-190° line and then secured it to the tower. We positioned the guy ropes and secured them to 2 inch stainless steel screw eyes screwed into the roof. I used a stainless steel turnbuckle on each guy to aid in adjusting the tension.

Arranging the loops was easy with my friends' help. I tied the haul rope to the 20 meter loop apex insulator and raised the loop so that the apex insulator was at eye level. I tied a 3 foot piece of rope to the 20 meter loop apex insulator and then tied the other end of the rope to the 10 meter apex insulator. I raised the assembly to the top of the mast and my friends, who were holding opposite corners of the horizontal segment of the 20 meter loop (at this point the 10 meter loop was just hanging straight down and out of the way), positioned themselves so the loop was taut, and marked the spots on the roof where the eyebolt anchors should be placed. With the eyebolts in place, the support ropes at the corner apex insulators were secured and the tension was adjusted using turnbuckles.

The same procedure was used to secure the 10 meter loop. The 10 meter loop has equal segments and is slanted about 10°. Because of the narrow width of the roof, the length of the 20 meter loop horizontal segment is 15 feet 9 inches. The lengths of the other two segments are 27 feet 6 inches and the loop is slanted about 40°. I connected the Q sections to both loops' feed points and checked the loops with the antenna analyzer. The results were slightly better than the ground test. The analyzer showed a reactance of only 2 Ω at 14.2 MHz and the SWR was no more than 1.6:1 at any point in the band. The reactance at 28.5 MHz was 3 Ω and the SWR was never more than 1.7, that occurring at 28.75 MHz. I then applied roof sealant around all the screws entering the roof, connected the 50 Ω coax feed lines to the Q sections and tacked the coax down. Mission complete! Figure 4 shows the loops mounted on the roof.

Performance

The loops have been up for over a year and the performance has been all that I could ask. Although they don't compare to the five element tribander I had at my previous station, considering the low cost I'm well-pleased. I've had many stateside contacts on 20 meters and even worked Russia and Japan on 20 meter SSB with excellent reports from both. I'm anxiously awaiting a 10 meter opening to see how that loop will perform. You could use this plan with any combination of loops depending on limitations imposed by your location. So, if space and/or budget constraints are giving you trouble, consider a delta loop or two or even three. I think you'll be happy you did.

Photos by the author.

ARRL member and Amateur Extra class operator Don McMinds, K7DM, has been licensed since 1963. He has previously held calls W6EBI, WAØLGS, KB7JI, WD7X and ZF2QK. He is an avid SSB and CW County Hunter and holds USACA 656. He also has been active in the 10-X International and holds 10-X number 3779. Don earned a BSEE and MA in management from the University of Nebraska. He served 23 years in the US Air Force, retiring in 1982 as a Lieutenant Colonel.

Following his USAF service, he was an engineer at Hewlett-Packard for 17 years before retiring in 1999. While at HP he published two books on UNIX *user interface software* (Mastering OSF/Motif Widgets *and* Writing Your Own OSF/Motif Widgets).
You can reach Don at 535 E Chance Ala Mer NE, Ocean Shores, WA 98569 or at **k7dm@coastaccess.com**.

The W7JI Low or Lower Power 40 Meter Transmitter

This compact transmitter makes a good companion to the author's superhet receiver described in the February issue.

Lou Burke, W7JI

I am a firm believer in using printed circuit boards for my projects. Of course this drives up the cost on the front end of the project, but provides some lasting rewards. The first and most obvious advantage is the ability to sell the PC boards or to actually kit the project and sell the kits. I do not have any desire to sit around all day counting and packaging little bags of parts, so why would I go to the expense of using PC boards?

I love all aspects of homebrewing, including the design of the PC boards. I use *ExpressPCB* software, which is available without cost from **www.expresspcb.com**. After finishing the board layout you simply upload the file to ExpressPCB and in a few days you will receive your professionally manufactured circuit boards with plated through holes and tinned backplane all ready to build. Just to set the record straight, my only affiliation with ExpressPCB is that of a satisfied customer.

Aside from the fact that I enjoy designing the parts layout on the PC board, the real advantage is that the circuit is 100% repeatable every time I build it. This is not always true with other construction methods. If, for example, I want to build a version of a transmitter for use on several different bands, I know the layout will work if I use the proper parts. If your club wants to build a transmitter or receiver project, a circuit board would certainly go a long way toward a successful completion of the project. While this may seem extravagant to some, I feel it is an appropriate use of resources.

By the time you actually get to mount and solder parts on your board, you feel as though you've built the project so many times that you know it inside and out.

Defining the Project

After building and using a basic crystal controlled low power (QRP) transmitter, I realized how much I missed not having a variable frequency oscillator (VFO) along with several other features such as a CW keyer and automatic antenna switching. So it was time to begin planning a second QRP transmitter that would incorporate these additional features. I wanted to keep the design straightforward and use through-hole leaded components in order to generate interest among potential builders in the QRP community. With these new features in mind I began the design process.

The first step was to browse through every article available on QRP transmitters and check out what others have done so I wouldn't have to reinvent any wheels. Usually after finding an idea from one article, another from another source, along with some of my own, I ended up at the starting point in the design process. Before you know it I was sitting at the computer drawing up a schematic. I wanted the VFO to be as stable as possible and decided to breadboard several different circuits before arriving at the circuit that would be incorporated into the design.

After several days of experimenting, using a Colpitts oscillator as a VFO circuit, I concluded that it appeared to be the best choice to achieve reasonable stability. The optimum frequency of the VFO is in the 2 MHz range. VFO stability is achieved by using a combination of NPO disc ceramic and polystyrene capacitors along with the proper toroid core. The use of a VFO spot button is a throwback from the good old days when most transmitters had a spot button to aid in tuning the VFO to your receiver frequency without putting the transmitter on the air. I've always liked this feature while using separate transmitters and receivers and decided to incorporate it into this rig. The lead photo shows the 7.5 W version beneath the companion receiver.

The Mixer and IF Amplifier

Having achieved a stable, drift free VFO design, I next needed to use a transmit mixer to shift the transmitted signal to the 7 MHz band. The SA612 is especially appealing as a mixer since it can also incorporate a crystal oscillator circuit with just a few parts — all contained in one single package.

In order to generate a 7.0 MHz signal the VFO must be tuned to 2.0 MHz. The mixer oscillator is crystal controlled at 5.0 MHz. The output of the mixer contains the VFO frequency and the other frequencies generated by mixing the 5 MHz crystal with the VFO. It is necessary to use a filter to select our desired 7 MHz signal from the other mixing products. This is accomplished with a simple band-pass network tuned to 7 MHz.

The output of the band-pass filter is fed to the input of the IF amplifier. The output of the IF amplifier is a broadband transformer that feeds the input of the RF driver. It is easier to use a broadband transformer in the output if you want to build the transmitter for use on different bands. This way I wouldn't

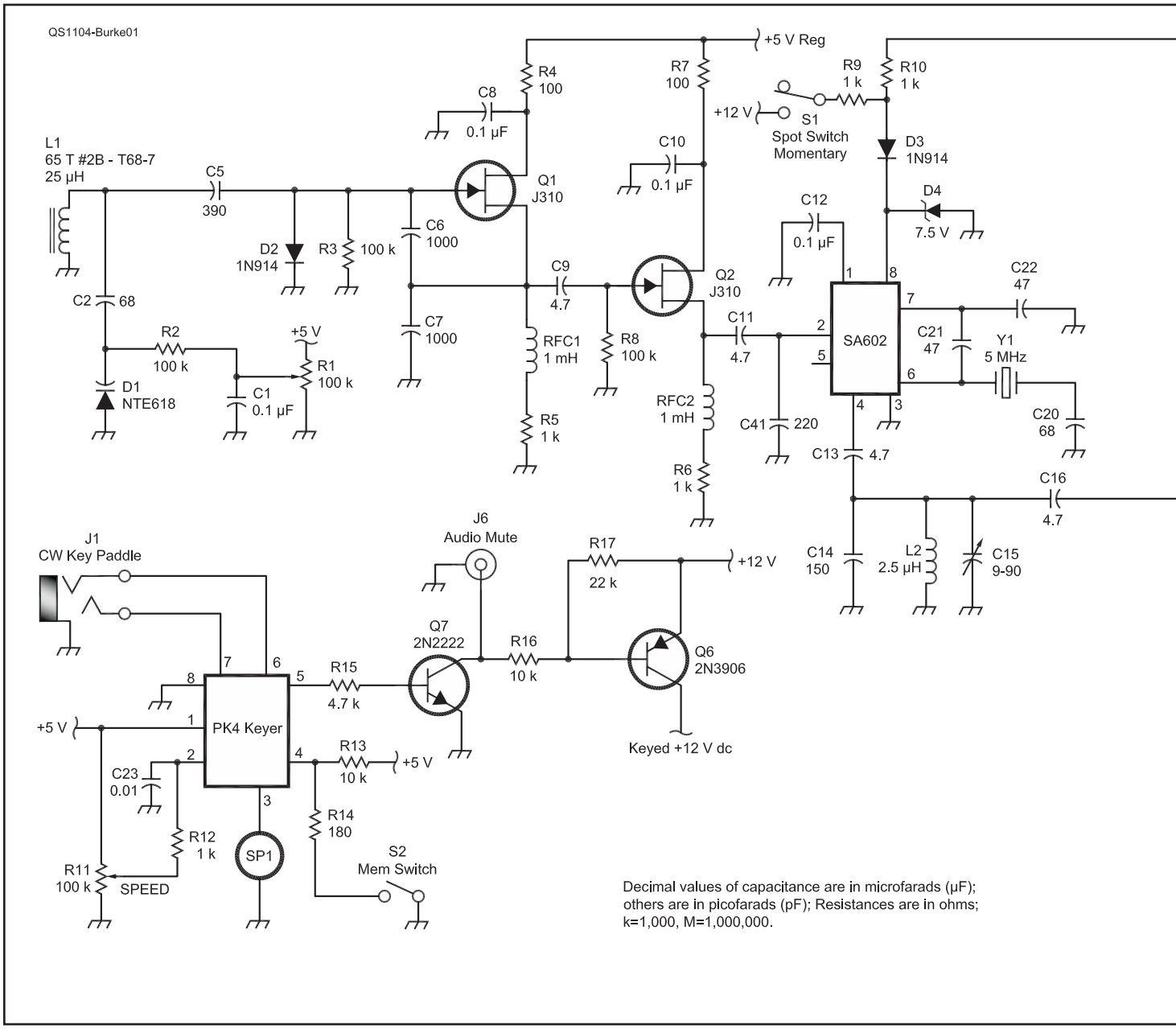
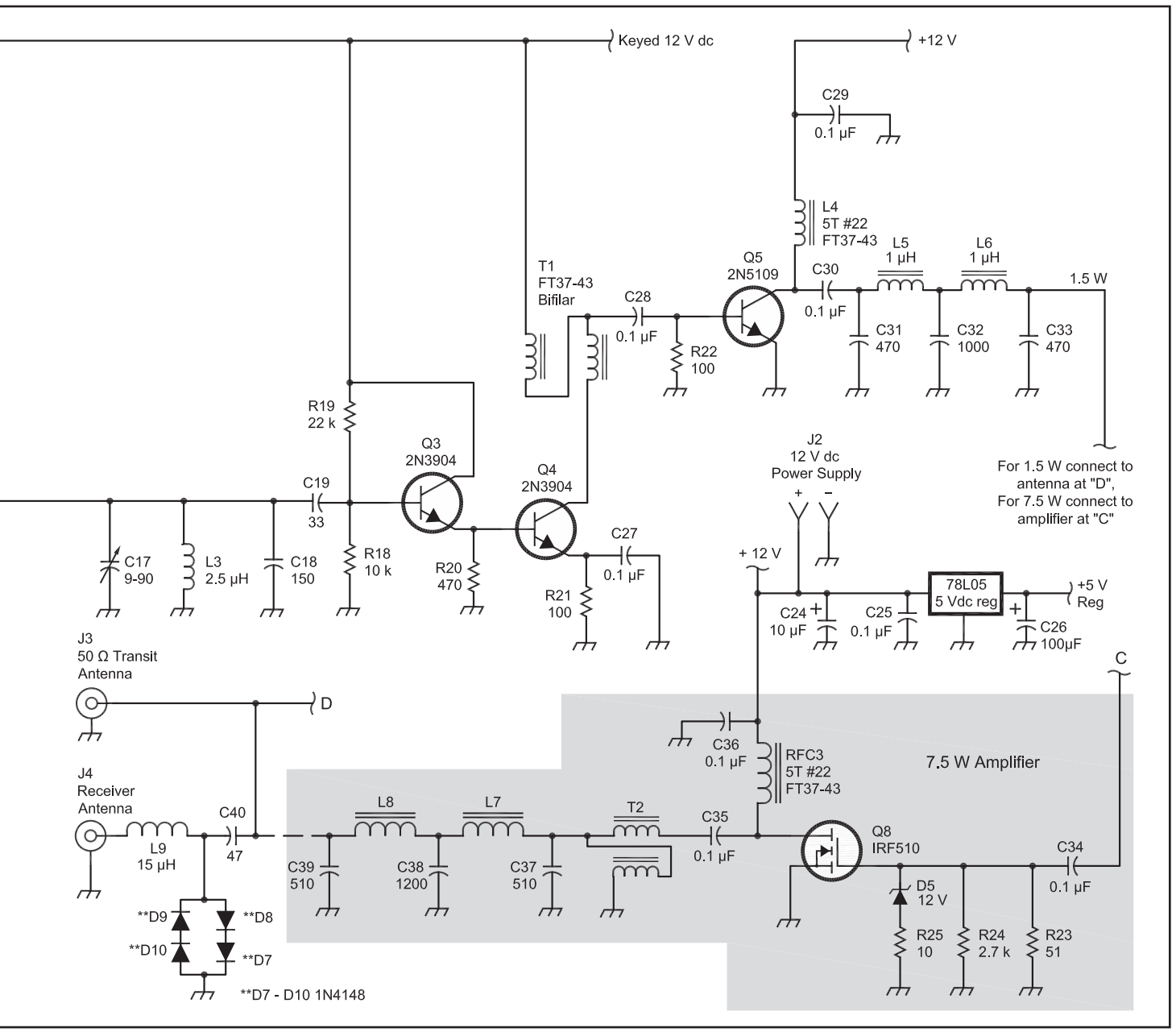


Figure 1 — Transmitter schematic with a complete parts list. Although parts are available from most dealers, Mouser Electronics (www.mouser.com) part numbers are provided where appropriate to aid in gathering parts. Jackson Harbor Press parts are available from wb9kzy.com/ham.htm, while Palomar Engineers parts are available from www.palomar-engineers.com. Missing part numbers were not used in the final version.

C1, C8, C10, C12, C25, C27-C30, C34-C36 — 0.1 µF disc ceramic capacitor (80-C320C104K5RCA7301).
C2, C20 — 68 pF disc ceramic capacitor (80-C315C680J1G).
C5 — 390 pF disc ceramic capacitor (80-C315C391J1G).
C6, C7 — 1000 pF vertical polystyrene capacitor (23PW102).
C9, C11, C13, C16 — 4.7 pF disc ceramic capacitor (80-C315C479D2).
C14, C18 — 150 pF disc ceramic capacitor (80-C315C151J1G).
C15, C17 — 9-90 pF variable capacitor (81-TZ03R900F169B00).
C19 — 33 pF disc ceramic capacitor (80-C315C330J1G).
C21, C22, C40 — 47 pF disc ceramic capacitors (80-C315C470J1G).
C23 — 0.01 µF disc ceramic capacitor (SR151C103KAR).
C24 — 10 µF electrolytic capacitor (647-UVR1E100MDD).
C26 — 100 µF electrolytic capacitor (647-UVR1E101MED).
C31, C33 — 470 pF disc ceramic capacitor (80-C315C471J1G).
C32 — 1000 pF disc ceramic capacitor (80-C315C102J1G).
C38 — 1200 pF silver mica capacitor (598-CD15FA122FO3F).
C37, C39 — 510 pF silver mica capacitor (598-CD15FD511GO3F).
C41 — 220 pF disc ceramic capacitor (80-C315C221J1G)
D2, D7-D10 — 1N4148 diode (621-1N4148T).
D4 — 7.5 V, ½ W Zener diode (78-TZX7V5B-TR).
D5 — 33 V, ½ W Zener diode (78-1N4752A).
D6 — 12 V, ½ W Zener diode (78-TZX12C).
J1 — Stereo jack (161-MJ2735-3-E).
J2 — 2.1 mm dc power jack (163-7620-E).
J3, J4 — BNC connector (571-5227161-7).
J5 — DIP socket (571-26404634).
J6 — RCA jack.
Q1, Q2 — J310 FET (512-J310).
Q3, Q4 — 2N3904 transistor (610-2N3904).
Q5 — 2N5109 transistor (610-2N5109).
Q6 — 2N3906 transistor (512-2N3906TF).
Q7 — 2N2222 transistor (863-P2N2222AG).
Q8 — IRF510 power MOSFET (512-IRF510)
R1, R11 — 100 kΩ, ½ W potentiometer (317-2091F-100K).



R2, R3, R8 — 100 kΩ, ¼ W resistor (660-CF1/4CT52R104J).
R4, R7, R21, R22 — 100 Ω, ¼ W resistor (660-CF1/4CT52R101J).
R5, R6, R9, R10, R12 — 1 kΩ, ¼ W resistor (660-CF1/4CT52R102J).
R13, 16, 18 — 10 kΩ, ¼ W resistor (660-CF1/4CT52R103J).
R14 — 180 Ω, ¼ W resistor (660-CF1/4CT52R181J).
R15 — 4.7 kΩ, ¼ W resistor (660-CF1/4CT52R472J).
R17, R19 — 22 kΩ, ¼ W resistor (660-CF1/4CT52R223J).
R20 — 470 Ω, ¼ W resistor (660-CF1/4CT52R471J).
R23 — 51 Ω, ¼ W resistor (660-CF1/4CT52R510J).
R24 — 2.7 kΩ, ¼ W resistor (660-CF1/4CT52R272J).
R25 — 10 Ω, ¼ W resistor (660-CF1/4CT52R100J).
RFC1, RFC2 — 1000 µH RFC (434-23-102).
RFC3 — 15 µH RFC (434-23-150).
S1, S2 — Push button switch (107-3025-EVX).
SP1 — Piezo speaker (665-AT1224TWTR).
U1 — SA602 mixer IC (771-SA602AN/01).
U2 — PK-4 keyer IC (Jackson Harbor Press).
Y1 — 5.0 MHz crystal (HC49US-5.000MABJ-UB).

Ferrite cores for inductors and transformers:
L1 — T68 mix 7 toroid core. (Palomar Engineers T68-7).
L2, L3, L5, L6 — T37 mix 2 toroid core (Palomar Engineers T37-2).
L4, RFC3, T1, T2 — FT37 mix 43 toroid core (Palomar Engineers FT37-43).
L7, L8 — T50 mix 2 toroid core (Palomar Engineers T50-2).
Enclosure, black aluminum (546-1455L1601BK).
Heat sink for final transistor (637-10ABP).
Insulating kit for T220 (567-175-6-230P).

Table 1

Coil Winding Data for 80 Meter Version

Part Number	*Toroid Core*	*Turns*	*Enamel Wire Size (#AWG)*	*Inductance (µH)*
L1	T68-7	65	26	21
L2, 3, 5, 6	T37-2	21	26	2
L4, 7	FT37-43	5	22	10
L8, 9	T50-2	23	22	2.5
T1	FT37-43	8	26	Bifilar 4:1 ratio
T2	FT37-43	8	26	Bifilar 1:4 ratio

Table 2

Coil Winding Data for 40 Meter Version

Part Number	*Toroid Core*	*Turns*	*Enamel Wire Size (#AWG)*	*Inductance (µH)*
L1	T68-7	65	26	21
L2, 3, 5, 6	T37-2	25	26	2.5
L4, 7	FT37-43	10	22	22
L8, 9	T50-2	25	22	2.5
T1	FT37-43	4	26	Bifilar 4:1 ratio
T2	FT37-43	5	26	Bifilar 1:4 ratio

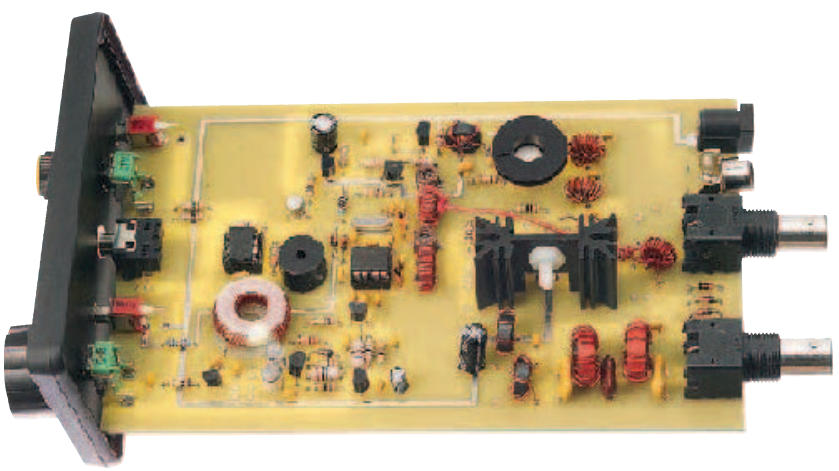


Figure 2 — Photo of the completed PC board with all parts mounted for the 7.5 W power level version.

have to bother with different component values for tuned circuits. At this point you have a choice of making the transmitter as a 1.5 or 7.5 W version.

RF Driver and Final Amplifier

The RF driver or final, depending on the power level you decide to build, utilizes a simple five element low-pass output network designed for a 50 Ω impedance. To use the transmitter as a 1.5 W rig, simply run a short piece of wire from the output of the low-pass network to the output connector and you're ready to call CQ.

The RF driver/final is a 2N5109 that delivers up to 7.5 W output. This final stage RF amplifier is derived from the "Mini-Boots" amplifier that Wayne McFee, NB6M, published some time ago.[1] The output network is a typical low-pass filter designed for 50 Ω input and output impedances. The output impedance of the IRF510 is approximately 12 Ω at the 5 W level so it is necessary to use the 1:4 transformer to get the impedance close to 50 Ω to provide a good match to the output network. Figure 1 is the transmitter schematic with detailed parts list.

CW Keyer

For the CW keyer, I use the PK-4 chip and the entire keyer circuit from Jackson Harbor Press.[2] I have used their circuit with the PK-4 chip in other projects and have always been pleased with the performance. The PK-4 keyer is very powerful, with a wide range of menu functions and the keying action feels very solid and smooth.

Building the Board

To keep the cost of the PC boards as low as possible, I never buy them with the optional parts legend silk-screened on the top of the board. Instead, I simply print a full page drawing of the board with the holes and parts shown and use this drawing as a guide for mounting the parts. This is available on the QST-in-Depth website.[3]

Figure 2 is a photo of the completed PC board with all parts mounted for the 7.5 W power level. The 7.5 W version uses a heat sink on the RF final transistor, which is too tall to allow the PC board to be packaged in a 1 inch high enclosure. The front view is shown in Figure 3. A smaller size enclosure is used for the lower powered unit making it even more portable and the same size as my receiver.[4]

I like to build one stage at a time and get each stage working properly before advancing to the next stage. With all parts soldered to the board you can apply 12 to 13.8 V dc to J1, the 2.1 mm power jack (see Figure 4 for the rear view showing connector layout). You should see the output of the oscillator on pin 2 of the SA602 socket. Simply push a small piece of wire, such as a lead from a ¼ W resistor, into pin 2 and put your scope probe onto the wire and you should see a sine wave.

You will have to experiment with the values of capacitors necessary to bring the oscillator to 2 MHz. You may also have to remove turns from L1 depending on your capacitor values. Always make sure that you have the VFO potentiometer fully counterclockwise in order to display the lowest frequency of the VFO. I set mine at 2.0 MHz. When mixed with the 5 MHz crystal oscillator you get 7.0 MHz. You may wish to adjust your VFO to a different frequency depending on what portion of the band you want to operate.

In order to key the transmitter on, while making the following adjustments, it will be necessary to take an approximately 4 inch length of wire and ground one end of it to the board. Use the other end to temporarily ground the end of the 10 kΩ resistor farthest from the base of the 2N3906. Any time you need to key the transmitter simply touch the ground to the resistor or you could tack solder the ground wire to this point during testing.

Once the VFO is operating on the frequency of your choice, install the SA612 IC and connect your scope probe to the base of Q3. Key the transmitter while observing the signal as you tune the variable capacitors of the band-pass filter for maximum amplitude. Once you have peaked the signal, remove the scope probe and connect your frequency counter (or couple to a calibrated receiver) to make sure you are on the correct frequency.

At this point it's a simple matter of installing the remaining parts and doing the

[1]Notes appear on page 37.

Figure 3 — Front view of the compact 7.5 W transmitter. Note that the cabinet needs to be higher than that of the lower power version.

Figure 4 — Rear view of the 7.5 W transmitter showing connector arrangements.

final test. The 7.5 W version will produce 55 V_{P-P} while the 1.5 W version will produce around 25 V_{P-P} across the 50 Ω load.

Connection to Receiver

Connect the RECEIVER BNC jack to the ANTENNA INPUT jack of the receiver using a short length of RG-58 cable. You will be able to push and hold the SPOT button while tuning the VFO to the frequency of the receiver within the 65 kHz limit of the transmitter VFO. Tune the receiver to 7040 kHz and then hold the SPOT button while tuning the transmitter VFO until you hear a beat note in the receiver headphones or speaker. The tuning rate of the VFO is rather sharp, so tune slowly or you may miss the tone.

In the first two weeks of use I have worked approximately 25 states with the 1.5 W version of this transmitter using a inverted V dipole at a height of 55 feet. I hope you enjoy building and operating your QRP transmitter as much as I have enjoyed this project.

Notes

[1]See **www.amqrp.org/kits/miniboots/miniboot.htm**.
[2]**wb9kzy.com**
[3]**www.arrl.org/qst-in-depth**
[4]L. Burke, W7JI, "A Compact 40 Meter Receiver," *QST*, Feb 2011, pp 37-40.

Amateur Extra class operator Lou Burke, W7JI, was first licensed as a Novice in 1954 as WN8QJH and later as a General class operator as W8QJH, in Hamilton, Ohio. An intense interest in ham radio and electronics led to a career spanning 42 years as a broadcast engineer in Phoenix, Arizona. Now retired, Lou is an ARRL member and is very active in ham radio. He recently became interested in CW contesting. His son Randy is licensed as KE7AZM and lives in Phoenix. You can reach Lou at 30163 Hillcrest Dr, Arkansas City, KS 67005 or at **w7ji@wildblue.net**.

Hamspeak

Colpitts oscillator — Classic oscillator circuit in which the feedback is provided by a signal from a portion of the tuned circuit set by a capacitive voltage divider.

Crystal oscillator — Circuit that generates a signal at a precise fixed frequency. The crystal is one of quartz, sliced and ground until it responds to electrical stimulation by mechanically vibrating at the desired frequency (the *piezoelectric* effect).

CW Keyer — Electronic device that generates dots when a lever is pushed in one direction, dashes in the other. Generally it provides precision relative timing and self-completion resulting in the ability to send perfect Morse code characters.

Mixer — Circuit that accepts two signals in the radio frequency spectrum and outputs signals at their sum and difference frequencies.

Printed circuit board (PCB) — Wiring methodology in which a copper clad board is etched to remove undesired copper leaving connection paths for electrical connections between parts.

QRP — Strictly speaking, an operating shorthand for "I am sending with low power." In common use it refers to low power, typically under 5 W output, operation viewed as a special challenge by many amateurs.

RG-58/U coaxial cable — Coaxial cable type with typically 50 Ω (some variants at 52 or 53 Ω) characteristic impedance and 0.195 inch outer diameter. Compatible with a PL-259 coaxial plug with the use of a sizing adapter.

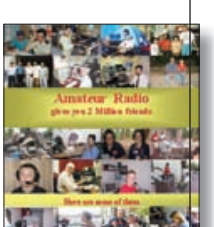
Toroid core — Circular donut shaped structure made from metal oxides in a ceramic material. It is used as the basis for inductors that are self shielding in that the magnetic fields stay within the core.

VFO — Variable frequency oscillator. Oscillator with frequency established by resonant inductor-capacitor circuit. One or the other elements is adjustable to vary the frequency over a range, typically as wide as an amateur band. The tuning knob on a radio is typically connected to a VFO.

New Products

ENCYCLOPEDIA OF HAM RADIO CD

♢Behind every call is an interesting person. Also known as *Amateur Radio Gives You 2 Million Friends*, this CD by Stan Gulich, SM7WT, gives you a chance to get to know the people behind familiar call signs. The CD presents more than 340 active hams and 23 Silent Keys in 1400+ pages with several thousand photos. Read about their DXpeditions, their personal and professional lives, their interests outside ham radio, and so on. The PDF file format makes it easy to find information and to magnify photos to look for details. Price: $20 postpaid. For more information, visit **www.sm7wt.n.nu** or email the author at **sm7wtstan@gmail.com**.



Does Your Ground Radial Kit Measure Up?

An inexpensive and easy to build ground radial system for temporary vertical antenna installations.

Ron Harger, WD8BCS

Since I reside on a treeless landscape, a good choice for a multiband HF antenna has been the trap vertical. I've used roof mounted versions at previous locations with good success, but for aesthetic reasons performing such an "extra vehicular installation" on the recently built two story home is prohibited. I purchased a Hy-Gain DX-88 with optional ground radial kit that included 16 copperweld wires size #16 AWG. The antenna was installed in my backyard. It works very well, but the radial kit cost nearly $100.

ARRL Field Day is my favorite ham radio activity and this antenna system has made the trek to our club's effort for the past several years, radials and all. Breaking down the antenna itself is a snap, but winding up and then untangling and unwinding the radials can be quite a test of patience. I searched for a better way.

My inspiration was found at a Central Michigan Amateur Radio Club meeting. One of our members had brought his 2 meter

Figure 1 — New tape measure, ready for paint removal.

Figure 2 — Tape measure undergoing paint removal.

Figure 3 — Bare metal area exposed after paint removal.

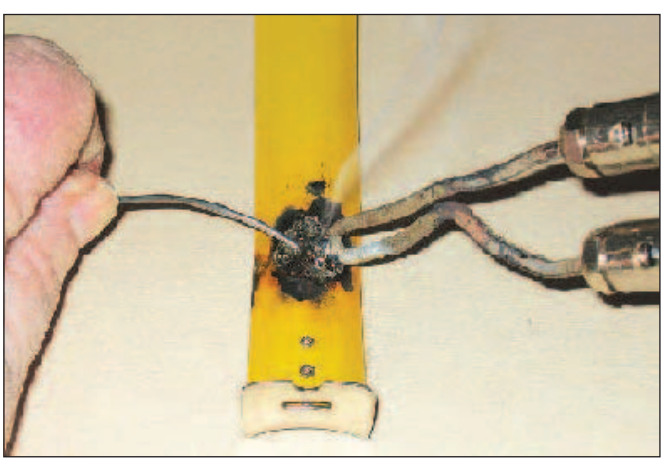


Figure 4 — Tinning the exposed metal area with solder.

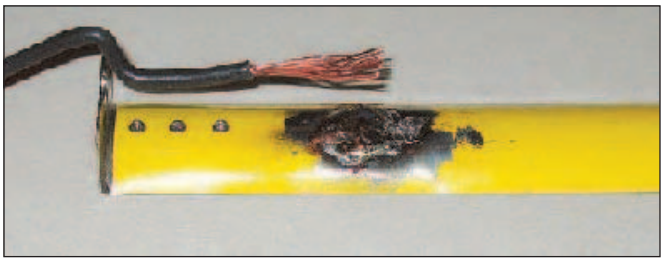


Figure 5 — Stranded hookup wire, #14 AWG, flattened out ready for soldering.

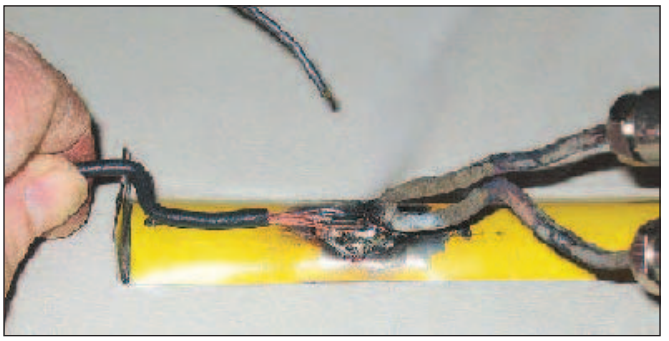


Figure 6 — Soldering the #14 AWG stranded hookup wire to bare metal area.

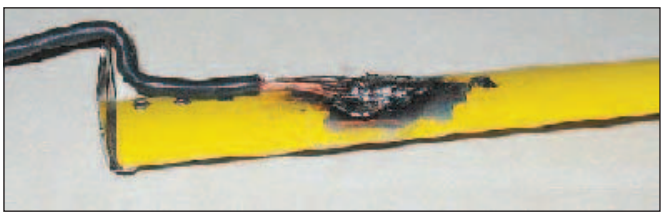


Figure 7 — Stranded hookup wire, #14 AWG, soldered to bare metal area.

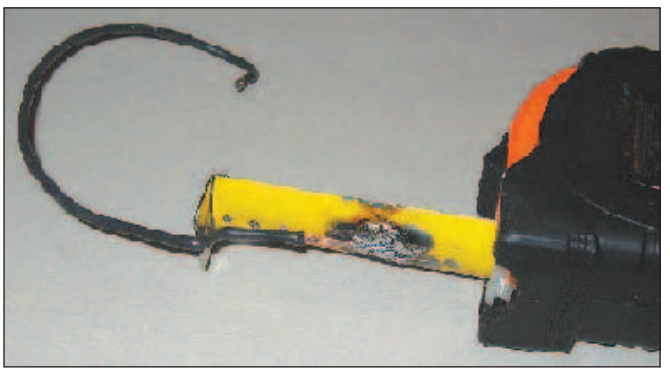


Figure 8 — Stranded hookup wire, #14 AWG, ready for ring terminal.

Figure 9 — Tape measure with soldered wire, fully retracted, ready for ring terminal.

"tape measure" Yagi antenna to show. This antenna has been featured in a recent issue of *QST*.[1] It occurred to me that if I could find a relatively inexpensive source for a large quantity of metal tape measures, I might just have something that would be quick to deploy, and even quicker to tear down! The other benefit is that the bright yellow paint on the tape measure is highly visible. This would be a definite plus in temporary installations such as Field Day, where the occasional errant observer may wander into your radial "trap." In addition, many times I have tripped on my own radials while setting them out or retrieving them (Copperweld is nearly invisible once laid on the ground).

After the meeting, I hit the web and quickly found what I was looking for — a 25 foot × 1 inch tape measure for around $2 at **harborfreight.com**. I placed an order for 16 of them and then set out to figure how to connect them to the base of the antenna. When the tape measures arrived, I began by carefully buffing the paint off of a small area on the underside about 2 inches from the end, using the wire brush on my bench grinder (see Figures 1-3). The exposed area was tinned (Figure 4), and then I stripped ½ inch of insulation from one end of a 5 inch long piece of #14 AWG stranded hookup wire. The strands were flattened out (Figure 5) and soldered to the exposed bare metal area (Figure 6), and kept as close as possible to the tape (Figures 7 and 8). Even with the wire soldered on, the tape will still fully retract (Figure 9). I found that as long as I didn't over flex the tape measure in that area, the solder stayed solidly bonded. I finished it off by soldering a small ring

[1]Notes appear on page 40.

Hamspeak

ARRL Field Day — An ARRL operating event in June of each year in which hams typically operate for 24 hours from temporary locations using emergency power and portable equipment to simulate emergency conditions and have fun. See **www.arrl.org/field-day** for details.

Copperweld wire — Kind of antenna wire with a steel core for strength and a copper outer plating for low resistance at RF frequencies.

HF — High frequency. That portion of the radio spectrum between 3 and 30 MHz. Often called *short waves*, these frequencies are characterized by long range propagation via ionospheric refraction.

Radials — the 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.

Trapped vertical — Kind of multiband vertical antenna in which parallel resonant traps are used to electrically isolate sections of the antenna to provide resonant operation on more than one frequency range.

J. ERVIN BATES, W8ERV

Figure 10 — Connecting the tape measure radial wires to a ⅜ inch U bolt at base of trap vertical.

J. ERVIN BATES, W8ERV

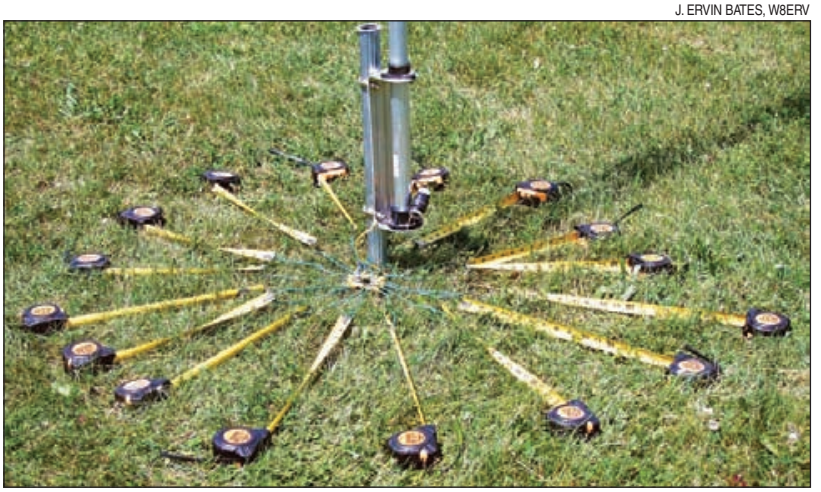


Figure 11 — Tape measure radials connected to base of trap vertical, ready for deployment.

terminal to the other end of the wire (not shown).

When ready to deploy, each tape measure is first connected at the base of the antenna with stainless hardware (Figures 10 and 11), and then extended out as far as possible maintaining even spacing (Figure 12). The built in tape lock is used to keep things in place. It doesn't appear to be necessary, but one could use large metal staples at each of the far ends to anchor the tape measure housings to prevent movement of the radials in the wind. The weight of the housings themselves (in most weather conditions encountered) has been enough to keep them in place. To tear down, I just unbolt the ring terminals at the base of the antenna first, then release each tape lock one at a time and box them up, ready for the next Field Day or other temporary installation.

As reported by Rudy Severns, N6LF, if fewer than 16 radials are used, trimming to resonance can increase efficiency by as much as 3 dB over not trimming.[2] If 25 foot tapes are connected to the end of 10 foot wires, each radial could be easily tuned back and forth regardless of the band in use (for 7 MHz and up). Also taking note of the length seen on the tape and reusing this value on future deployments could increase setup speed and repeatability. This approach will also cut down on your copper wire bill as you will be able to reuse your radials regardless of frequency. Rudy's work does indicate that when using 16 or more ¼ wavelength radials, pruning does not significantly increase efficiency.

How did the system play? Operating with club call W8MAA from Lansing, Michigan, we made 366 contacts on HF phone in 64 sections. I recall tripping only once during deployment. Retrieval was even easier, and no one needed rescuing from our radials!

J. ERVIN BATES, W8ERV

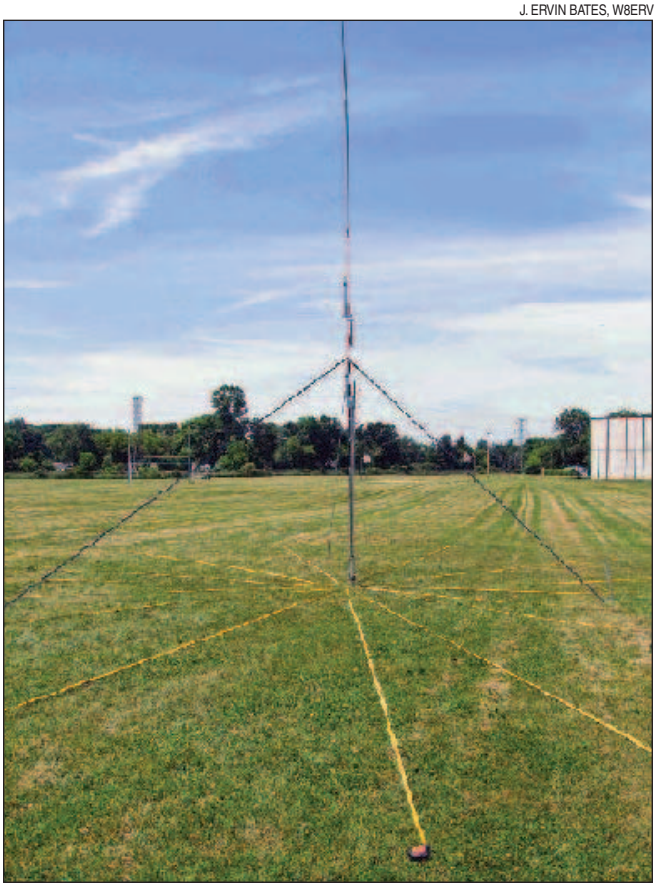


Figure 12 — Tape measure radials, fully deployed at 2009 ARRL Field Day, on the grounds of Gardner Middle School, Lansing, Michigan.

Notes

[1]J. Hanson, W1TRC, "Adapting a Three Element Tape Measure Beam for Power Line Noise Hunting," *QST*, May 2007, pp 28-30.

[2]R. Severns, N6LF, "Experimental Determination of Ground System Performance for HF Verticals — Part 1 and 2," *QEX*, Jan/Feb 2009, pp 21-25 and pp 48-54; also R. Severns, N6LF, "An Experimental Look at Ground Systems for HF Verticals," *QST*, Mar 2010, pp 30-34.

Photos by the author except Figures 10-12.

ARRL member Ron Harger, WD8BCS, earned his Novice class license in 1974 under the tutelage of his father Dan Harger, W8BCI (SK). He upgraded to General a year later and to Amateur Extra in 2009. Ron is active in the Lansing/Ingham County (MI) ARPSC/RACES® group, as well as serving as the primary net control station for the Lansing area SKYWARN nets. Other than ARRL Field Day, his favorite Amateur Radio activities are 40 meter CW ragchewing and antenna experimenting. Because of his association with Bob Berger, K8RDN, he is now experiencing the digital modes and traffic handling. He is employed as a data and RF engineer by a cable television company in Michigan, is happily married to a very patient wife, and has two lovely "tweens." Ron can be reached by email at **wd8bcs@arrl.net** *or 5685 W Columbia Rd, Mason, MI 48854.*

Sounding Good on the Air — Setting Your Audio Controls

Too much of a good thing can be really bad — set up your SSB transceiver with proper audio levels.

Joel R. Hallas, W1ZR

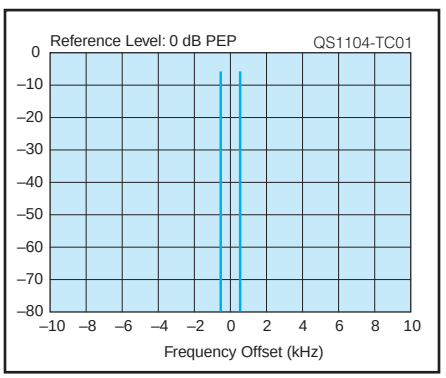


Figure 1 — Transmitted spectrum of an ideal SSB transmitter simultaneously sending tones at 700 and 1900 Hz. This could represent a portion of the components of your speech.

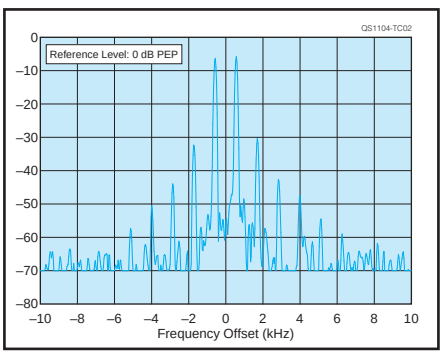


Figure 2 — ARRL Lab measured spectrum of a commercial transmitter with a real life spectrum resulting from the same two input tones. The added spikes represent distortion products caused by transmitter nonlinearity.

Single sideband transmission relies on the use of linear amplifiers — amps that produce a larger copy of their input signal at the output. Such an amplifier, in the ideal case, produces no new signals in the process, just a larger version of what it sees. So far so good — but ideal amplifiers are hard to find!

Real amplifiers, on the other hand, provide an amplified signal along with some quantity of distortion products. Each real amplifier is designed to operate within a *linear range*, the amplitude range over which the distortion products meet design standards. If the amplifier's input signal exceeds the bounds of the linear range, the distortion products increase rapidly. The distortion can take many forms, but the two most commonly observed results are:

- Production of out of channel signal elements that interfere with other spectrum users. This manifests itself as the "buckshot" noise products often heard on our ham bands. The term *splatter* is frequently used to describe this.
- Audible distortion that makes your signal hard to understand.

Figure 1 shows the transmitted spectrum of an ideal SSB transmitter sending two tones at the same time. This could represent the components of your speech. Figure 2 shows the spectrum of a commercial transmitter with a real life spectrum. All those additional lines represent intermodulation distortion products generated *within* the transmitter while trying to linearly amplify the two tones. In a real transmitter with a microphone input there would be many more desired frequency components and every combination of them and their harmonics would result in many distortion products. If the ones in the channel are more than 30 dB down from the peak signal, they may not be too noticeable. If the out of channel products were down 50 dB from the peak of a station being received at S-9 +50 dB, however, the products in the next channel would be at S-9 — not a nice neighbor, but fairly typical of a properly designed transceiver. Turn up the GAIN so that the products are stronger and you can quickly become very unpopular.

But Not Distortion of *My* Signal?

You bought a fine state-of-the-art SSB transceiver — how could this happen to you? Easy! The biggest culprit is often the result of an operator misinterpreting his POWER OUTPUT meter. Push down your telegraph key in CW mode and the POWER OUTPUT meter of your 100 W transceiver reads 100 W, as you would expect. Talk into the mic of the same radio and the power meter might read 10 W. What happened to the other 90 W I paid for?

The problem is that the transmitter's 100 W rating is a *peak envelope power* (PEP) output specification. PEP refers to the RF average power that happens during the peak of the voice waveform. Those peaks don't last long enough for most meters to respond to them — although you can see them on an oscilloscope or even the S-meter of a receiver with automatic gain control (AGC) designed for SSB.

Enter Automatic Level Control

Most current SSB transceivers include *automatic level control* (ALC), a circuit function intended to reduce the mic gain automatically if the input is too strong. This can be very helpful with splatter reduction but, as with most protective systems, it isn't always as good as we'd hope. First, all automatic control systems have a finite response time — hit it with a blast, and part may get through and cause splatter until the control system catches up. Second, to operate quickly, it tends to act much like a hard limiter. This can result in distorted sounding and hard to understand speech.

ALC is also used in some linear amplifiers that follow your transceiver. In some, a connection is provided that feeds the detected amplifier ALC signal back to the transceiver to reduce the gain. This can be effective if the two are compatible. Not all amplifier manufacturers use the system, however, and those that do may have different operational characteristics from a different manufacturer's transmitter.

If your linear amplifier doesn't have an ALC output, or if you don't have it connected or if they are not compatible, there is another way to avoid amplifier overload — make sure the transceiver output will never exceed the amplifier's maximum drive level. If the amplifier's rated drive is equal or higher than the transceiver's maximum output, this is usually not an issue. Some amplifiers, however, achieve full output with a drive level of perhaps 60 W. Hit that amplifier with 100 W PEP and you have splatter. Note that it won't be obvious on your metering if they read average power, but it will happen during your voice peaks. Note also that if your amplifier is rated

near the legal limit, there is a good chance that the peak power output in this case will exceed 1500 W, making your operation illegal.

To make sure that this doesn't happen to you, set the transceiver POWER OUT control so it puts out less than the amplifier's rated drive whenever it is fully driven. Usually, a key down CW signal will provide the right level for this adjustment. This is a good idea even if you have ALC between amplifier and transceiver, for the reasons cited above. If you can't remember to do this when you use your amplifier, another option is to use an attenuator between the two, as described in a recent *QST* article.[1]

Setting Up Your Audio Controls for Great Sounding Signals

Amateurs who want to sound good on the air don't rely on ALC to set up their audio. It's a bit analogous to cooking supper by listening for the smoke alarm. It is better to use the available audio controls to set up a signal that sounds good and let the ALC come into play only if you accidentally hit things too hard. Most transceivers have two transmit audio controls: TRANSMIT AUDIO LEVEL or sometimes MIC GAIN and another called COMPRESSION or COMPRESSION LEVEL.

The MIC GAIN Control

The MIC GAIN acts very much like the VOLUME control on a receiver, except it adjusts the level of the signal from your mic going into the transmitter. This often gets folks in trouble because if the station at the other end is having trouble hearing you, there is a tendency to either talk louder or turn up the MIC GAIN — either of which can result in moving your transmit signals out of the linear operating range. Now you have distortion. It may or may not cause splatter, depending on your ALC effectiveness, but it will surely result in a distorted signal that is hard to understand.

Look in your transceiver's instruction manual for how to set the MIC GAIN. It is likely that there will be a specific recommendation such as "adjust the MIC GAIN while talking in a normal voice so that the ALC indicator reads a value less than 3, except on occasional voice peaks." Make sure that while you do that you have the mic the same distance from your mouth as when you operate. If you tend to shout, pretend you are trying to work that rare DX station on the tenth try while you set it.

The COMPRESSION Control

Early transceivers just had the MIC GAIN control. Aftermarket suppliers took a cue from the makers of portable tape recorders by offering external voice compression boxes that promised "increased talk power." They did this by automatically adjusting the compression box gain to compensate for changes in the incoming mic signal level — increasing the gain during periods of low voice level and then reducing the gain back to where it had been on peaks. This served to increase the average power, while maintaining the same peak power output — it was thus really higher "talk power."

Radio manufacturers saw the writing on the wall and started including compression within their transceivers. This has been called by a number of different names and may be implemented in a number of different ways and in different parts of the transmitter (some are somewhat more effective than others), but it's generally referred to as speech processing or speech compression.

Compression can increase the gain of the transceiver during times you are speaking softly so that the average power is increased. This can make the transmitter sound almost like one that isn't compressed, but runs two or three times the peak power — not a bad deal. Compression acts a lot like having a second operator with a hand on the MIC GAIN control. Your electronic assistant turns up the gain when you aren't speaking very loudly and turns it down when you shout.

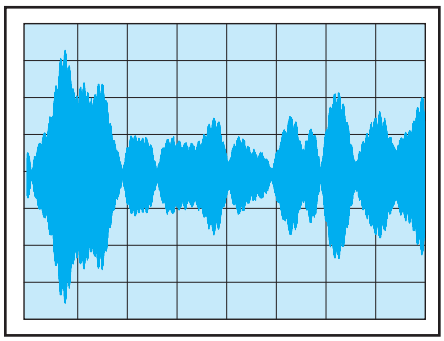


Figure 3 — Oscilloscope display of the output of a 100 W transmitter with recorded real speech and no compression.

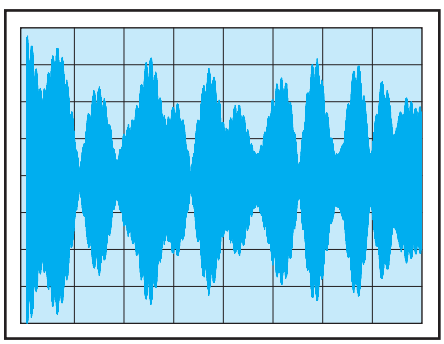


Figure 4 — Oscilloscope display of output of the same 100 W transmitter with the same recorded speech as in Figure 3, but with moderate compression. The increase in output is evident on both the 'scope and the transceiver's OUTPUT POWER meter.

The results of such a system are shown in a comparison of Figures 3 and 4. Figure 3 shows the detected RF envelope of an SSB transmitter without compression. The same recorded voice is used in Figure 4 with the compression turned on. It's clear from the figure that additional power is being delivered during non-peak periods even though the peak level is the same 100 W.

Can Compression Be This Good?

Compression works well but it too has its limits. If it is set too high, your voice will always sound at the same amplitude, reducing intelligibility somewhat and sounding a bit monotonous. Even more of a problem comes up when you aren't talking. In that case the gain is increased significantly so the TV in the next room comes through loud and clear, or your noisy amplifier fan suddenly sounds like a wind tunnel all the way to Africa! This can be very disconcerting to the listener at the far end!

An even more serious problem occurs if the levels are turned up too high. Without compression, if your voice peaks produce splatter because you have too much gain in the system, at least it won't happen very often. With compression, it will likely happen a lot and there may be splatter and distortion products up and down the band the whole time you're transmitting! In addition to making your channel neighbors angry, this is also illegal under FCC rules.

Check it Out

Take a few minutes to listen on one of the popular phone bands and you will likely hear all possible combinations of proper and improper use of speech compression and audio gain level settings.

Next, take out the manual for your transmitter and set up the MIC GAIN and COMPRESSION controls just as the manufacturer suggests. Spend some time heating up your dummy load, listening (with headphones) in another receiver with the receiver's RF GAIN turned way down to avoid overload (an overloaded receiver can sound a lot like an overdriven transmitter) and experiment with the settings. Make note of the average power on your OUTPUT meter, and if you don't believe the radio's putting out 100 W PEP, buy a peak reading meter to put your mind at ease. Have the TV on in the next room and see what happens with too much compression between your spoken words.

When you think you have it about right, make some contacts with friends who know what you sound like. Get their opinion of how you sound.

Getting these two controls set correctly will make a big difference in how your station sounds on the air!

Joel R. Hallas, W1ZR, is QST *Technical Editor. You can reach him at* **jhallas@arrl.org**. QST

[1]P. Salas, AD5X, "Simplify Transceiver to Amplifier Interfacing with an In-Line Attenuator," *QST*, Aug 2010, pp 39-41.

A Line Voltage Monitor for Your Shack

Your power company may deliver 120 Vac…or they may deliver something else.

Paul Danzer, N1II

I recently noticed that we seemed to be losing a large number of light bulbs in our house. In addition, the lighting dimmer in one room no longer was able to reduce the light to a minimum. Finally, a homebrew power supply in the shack started to run unusually warm and was beginning to give off a strange odor.

Out came my voltmeter and I was surprised to find the line voltage measured 129 V! I really didn't believe the reading, so I borrowed two other voltmeters and a few hours later checked again — this time I measured 136 V.

What Could be Happening?

A quick call to the power company and to their credit, a truck was down in 15 minutes. The lineman verified the problem, made one phone call and 30 minutes later the voltage was back to normal. It seems that local substation uses a mechanically tapped transformer, apparently motor driven, for regulation and occasionally it gets stuck.

The result of this experience suggested that I had better keep an eye on the power company, with its over 50 year old regulator.

What to Do About It?

The circuit in Figure 1 was the result. This circuit is straightforward. The only new twist is we finally found a use for one of those wall chargers we all have from old cell phones and other electronic devices — often called wall warts. These units have various ratings, and since only a few milliamperes of current are needed, any unit with a rated output from 6 to 12 V may be used. Although your wall wart may be marked 6 V, with a very light load the output is probably over 12 V. Generally the output is dc, but if you have an ac unit, you can use the alternate circuit of Figure 1.

How it Works

The circuit uses a 741 operational amplifier or op amp. A full description of op amps is provided in the 2011 edition of *The ARRL Handbook* on pages 3.43-3.48 as well as in most earlier editions. In this case there is no feedback resistor connected from the output (pin 6) to the input (generally pin 2). Therefore in this configuration the op amp acts as a comparator, and the voltage difference between pins 2 and 3 is amplified by the full gain of the unit.

Capacitors C2 and C3 reduce the op amp gain so high frequency noise doesn't trigger the alarm.

If the voltage on pin 2 (the negative input) is greater than the voltage on pin 3 (the positive input) the op amp output is driven very close to ground. If the opposite occurs (pin 3 voltage greater than pin 2) the output goes close to the supply voltage, +12 V. An LED with series limiting resistor lights when the output is driven to ground.

The two circuits are wired reverse — when the input voltage on pin 2, set by R1, exceeds the Zener voltage, D2 lights. Alternately, when the Zener voltage on U2 exceeds the input voltage set by R2 then D3 lights.

Two almost identical circuits are shown in Figure 1. If you only want to detect overvoltage just build the U1 section. When the input voltage to the wall wart exceeds the threshold set by R1, the red LED, D2, lights up.

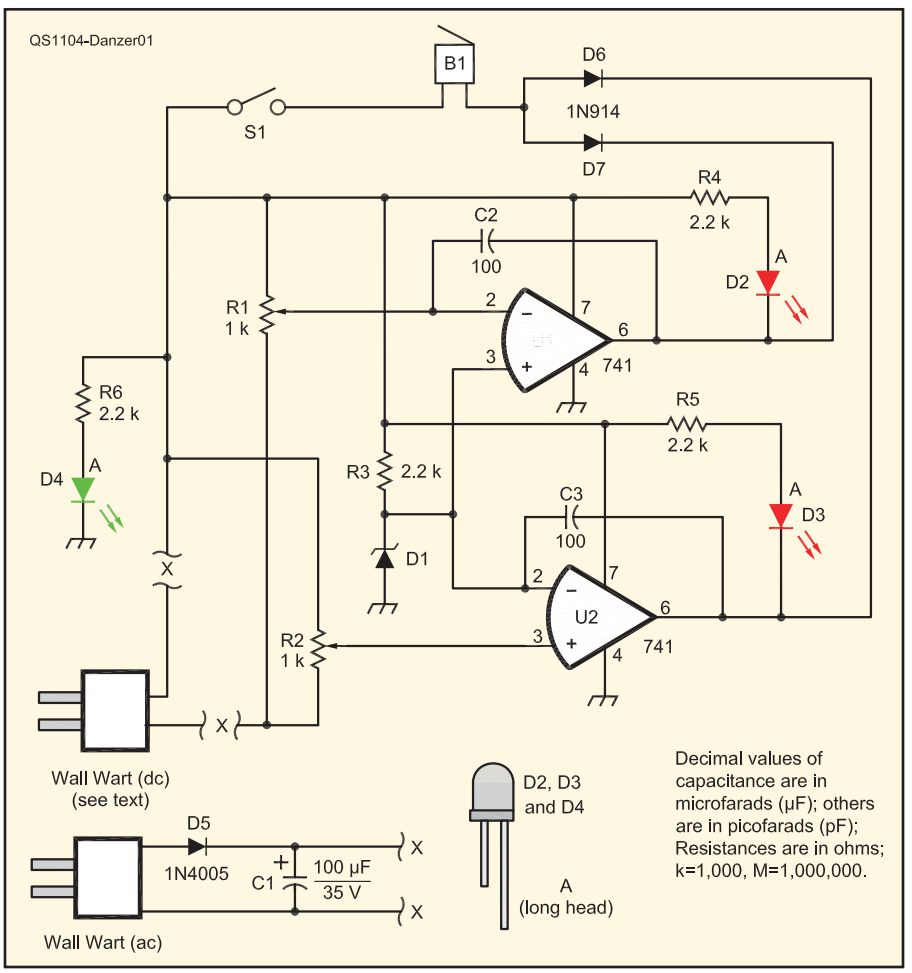


Figure 1 — Schematic diagram and parts list for the ac mains monitor circuit. C1 and D5 are needed for ac wall wart only.

B1 — Piezoelectric buzzer, 12 V (RadioShack 273-0059).
C1 — 100 µF, 50 V electrolytic capacitor.
C2, C3 — 100 pF, 50 V ceramic capacitor.
D1 — 1N4731 Zener diode (see text).
D2, D3 — Red LED.
D4 — Green LED.
D5 — 1N4005 or equivalent low voltage, 1 A rectifier.
D6, D7 — 1N914 silicon diode.
R1, R2 — 1 kΩ potentiometer.
R3, R4, R5, R6 — 2.2 kΩ, ½ W resistor.
S1 — SPST toggle switch (RadioShack 275-612).
T1 — Salvaged charging transformer. See text.
U1, U2 — 741 op amp (various manufacturers' prefixes such as LM741).

Hamspeak

Autotransformer — Transformer with a single tapped winding rather than two or more separate windings. One end of the inductance is typically common to both input and output while the two other connection points determine the turns and voltage ratio.

Feedback — Application of a fraction of the output of an amplifier back to the input. If in phase with the input signal, it is called *positive* feedback or *regeneration* and, if sufficient in amplitude, will result in the amplifier becoming an oscillator. If out of phase with the input signal, it is called *negative* feedback or *degeneration* and will reduce the gain and provide additional stability and linearity.

LED, light emitting diode — Semiconductor device from which light is emitted when current flows. These were originally used in place of incandescent bulbs as indicator lights. They now can be used in place of larger light bulbs and form the basis of some display screens. See **hyperphysics.phy-astr.gsu.edu/hbase/electronic/leds.html**.

Operational amplifier (op amp) — An integrated circuit that contains a symmetrical circuit of transistors and resistors with highly improved characteristics over other forms of analog amplifiers.

Wall wart — Small power supply unit for low power equipment with integral plug for standard ac wall socket. Colloquially named due to its appearance as a protrusion from a wall socket.

Zener diode — A diode that conducts in the reverse direction after a certain specified voltage is exceeded. Used for voltage regulation. See **hyperphysics.phy-astr.gsu.edu/hbase/solids/zener.html**.

PAUL DANZER, N1II

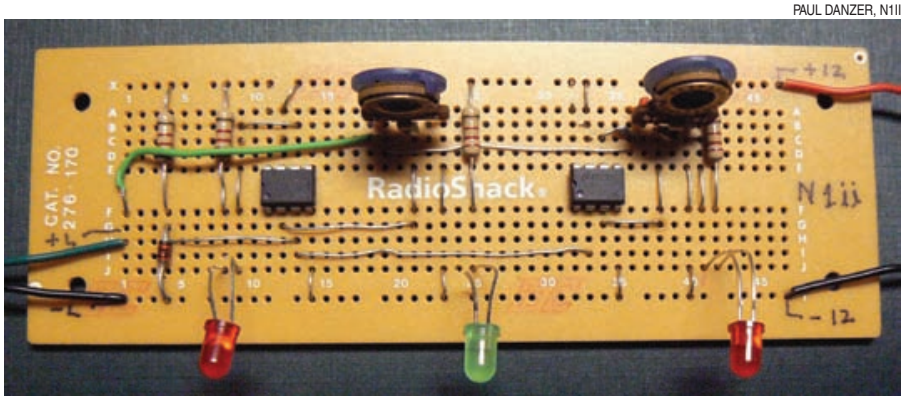


Figure 2 — The unit was built on a RadioShack 276-170 PC board. The three LEDs are bent forward to fit though holes in the front of the enclosure used. The 12 V power leads are connected on the right and the leads from the wall wart on the left. R1 and R2 shown here are miniature trimmers; any 1 kΩ unit may be used. The alarm unit and switch are mounted on the enclosure.

The second unit is set to show under voltage. Here R2 sets a threshold, and if the ac line voltage is less than this threshold, LED D3 lights. Since under normal conditions neither red LED is on, D4, a green LED, was added to tell you that the unit is on — connected to its 12 V power supply. B1 and associated circuitry provide an optional audible alarm.

Construction and Adjustment

There is nothing critical about any of the values shown or the construction methodology used. All voltages after the wall wart are low. As an example, Zener diode D1 can be changed to any voltage rating near half of the wall wart output. However, in order to set the values of R1 and R2 a variable voltage autotransformer often called a Variac (and an ac voltmeter) is needed. Set the Variac output voltage to the lower limit (108 V is typical) you want to detect and then adjust R2 so D3 just lights. Then increase the voltage to the upper limit (128 V as an example) and adjust R1 so D2 just lights. If both lights are off, the line voltage is between the lower limit and the upper limit and all is well.

Since most ham shacks are now wired for 12 V dc no power supply is shown for the circuit but the wall wart, depending on its rating, might also be able to provide the needed voltage.

ARRL Member Paul Danzer, N1II, was first licensed in 1953, and now holds an Amateur Extra class license. Paul has been operating 40 meter CW almost constantly since he first started. He uses his years of experience as an electronic engineer to design and build small, one-night ham radio projects. He recently retired as Professor of Computer Science at Housatonic Community College in Connecticut, but continues part time as an adjunct professor. You can reach the author at **n1ii@arrl.net**.

Testing and Calibrating a Voltage Monitor

Variable transformers such as Variacs are often found in the shacks of old timers, at flea markets or in the shack of most hams who restore vintage equipment. In place of a Variac you could wire a 12 V filament transformer in series with the ac line (called the boost mode) such that the total output is now nominally 120 plus 12 or 132 V ac. [If wired the wrong way, the voltage will be lower by 12 V or 108 V. Just reverse one pair of leads of T1 in Figure A. — *Ed.*] Since the wall wart draws very little current, potentiometer R1 across the 132 V result would provide a variable source to calibrate the overvoltage and undervoltage detectors.

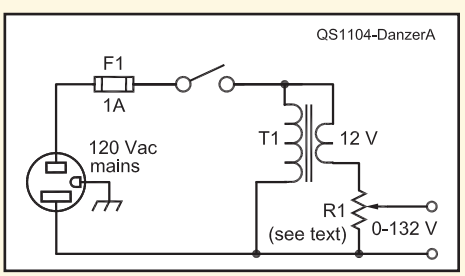


Figure A — Schematic of temporary calibration fixture for voltage monitor.
J1 — Standard 120 V ac duplex outlet in 2 × 4 inch electrical box.
R1 — 10 kΩ, or higher, 2 W potentiometer. See text.
T1 — 120 to 12 V filament transformer.

Be very careful. Both ends of the potentiometer, its shaft and the potentiometer case may be hot at 120 V ac. Install the potentiometer so it is in an insulated project box and use an insulated knob to avoid any possibility of contact. Make sure any surface you touch while adjusting the potentiometer is well insulated.

JT65 — The "Musical" Mode

If you've been hearing something that sounds like music on the HF bands lately, it may not be your imagination.

Steve Ford, WB8IMY

"I'm hearing a strange signal on several HF bands. It sounds like someone sending random tones or music. It plays slowly for almost a minute, stops for a while, and then plays again. What is it?"

At the time this article was written, this question was arriving in e-mail IN boxes of the ARRL Headquarters Regulatory Branch at a rate of about one per week. Some amateurs even send audio recordings of the suspicious signals. Chuck Skolaut, KØBOG, our Field and Regulatory Correspondent, always smiles as he listens to the recordings because he knows the answer by heart: *JT65*.

By now amateurs are used to the sounds most digital modes create. They've learned to recognize the constant warbling tones of PSK31, the rhythmic pulses of PACTOR, the scratchy rumbles of Hellschreiber or the multi-tone music of RTTY, MFSK16, Olivia and others.

But JT65 is unique. It marches, as Thoreau said, to the beat of a different drummer. If you've never heard it before it will stop you cold. As you tune across a JT65 signal you'll hear tones of varying pitch that "play" slowly, like someone lazily blowing on an electronic flute.

Cryptic and strange as the tones may be, you might be surprised to learn that they carry call signs, signal reports and other bits of information. Even more surprising is the fact that this information can be extracted even if the JT65 signal is almost inaudible.

The "JT" in JT65

JT65 debuted as part of the *WSJT* software suite created by Dr Joe Taylor, K1JT. As a Nobel Prize winning scientist who studies pulsars and other distant astronomical objects, Joe has a keen interest in weak signals. Joe's software exploits the power of modern desktop and laptop computers to separate weak signals from noise and decode the information they contain. With just a transceiver and a sound-equipped computer or an external sound device, *WSJT* makes it possible for hams with modest stations to enjoy VHF meteor scatter communication and even moonbounce, in which signals are literally bounced off the surface of the Moon and returned to Earth.

Soon after its debut, JT65 attracted the attention of the moonbounce community and it was an instant success. Thanks to JT65, amateurs with single long boom Yagi antennas and 150 W of RF output could experience the thrill of communicating over the longest "long path" of all.

But it wasn't long before someone wondered what would happen if JT65 were used on the HF bands. Digital communication on HF isn't nearly as challenging as getting a signal to the Moon and back, so it stood to reason that there would be plenty of "performance margin" to provide fascinating results here on Earth. To no one's surprise, this turned out to be true. Using a variant of JT65 known as JT65A, even a few watts of JT65 modulated RF applied to a wire dipole antenna resulted in transcontinental and even global communication.

Dedicated JT65 Software

JT65 is one of several modes in the *WSJT* package, available for free downloading on the web at **physics.princeton.edu/pulsar/K1JT/Download.htm**. However, Joe Large, W6CQZ, thought more amateurs might try JT65 on HF if it were available in a form designed to appeal to the less computer savvy among us. The result was his *JT65-HF* application and it soon proved John's hunch correct.

Since Joe's software appeared, JT65 activity on the HF bands has increased substantially. As with *WSJT*, *JT65-HF* is also free for downloading at **jt65-hf.sourceforge.net/**.

So What is JT65 Anyway?

The short and simplified answer to this question is that JT65 is a weak signal digital mode that uses precisely timed transmit-receive sequences. You transmit for about one minute and listen for one minute. Transmission actually begins 1 second after the start of a UTC minute and stops precisely 46.8 seconds later. There is a 1270.5 Hz synchronizing tone and 64 other tones. The combination gives JT65 its unusual musical quality.

Tight time and frequency synchronization is critical to JT65. Your SSB transceiver needs to be reasonably stable, although I've yet to see a modern commercial radio that is too "drifty" for JT65. Drifty computer time is a different matter, however. *Windows* PCs are notorious for sloppy timekeeping. You can't always rely on the *Windows* Internet time application to keep you in sync. Instead, I recommend the free time-synchronizing application *Dimension 4* that you can download at **www.thinkman.com/dimension4/**. Install the application and set it up so that it

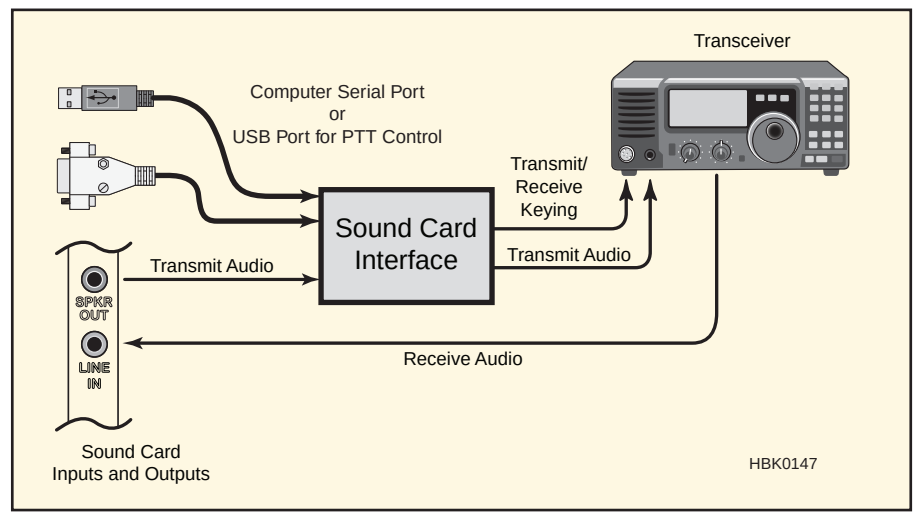


Figure 1 — To operate JT65, you'll need an interface between your computer and your transceiver.

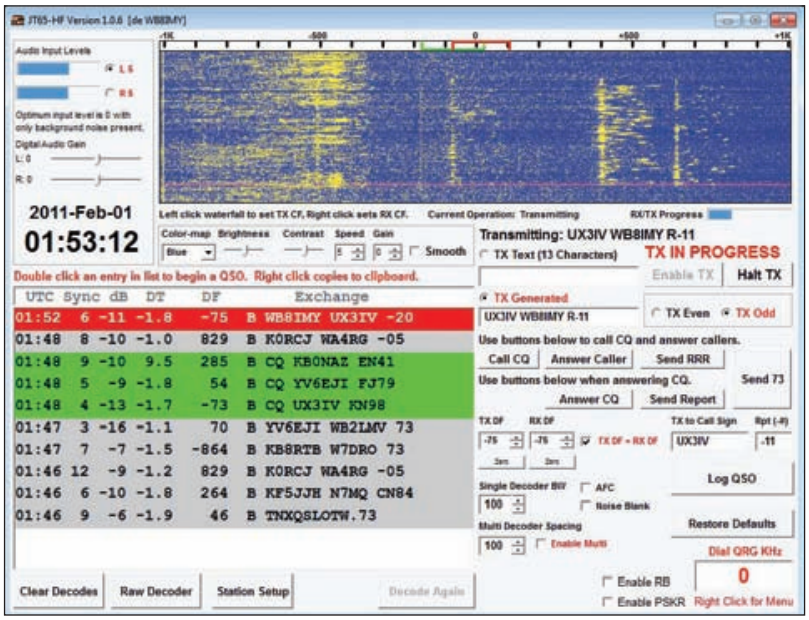


Figure 2 — *JT65-HF* in action on 20 meters. Note the green painted text. These are stations calling CQ. See the red line? That's UX3IV giving me a signal report. I'm –20 dB at his end, which is pretty weak. Then again, I was only running 5 W on 40 meters to a vertical antenna!

loads and runs constantly in the background whenever you start your computer.

JT65 is not a "conversational" mode as, for example, PSK31. Instead, the idea is to exchange just the basic information required for a valid contact — call signs and signal reports. This isn't to say that you can't send other information. I've occasionally seen stations send such things as brief descriptions of their antennas, or how much power they were running.

JT65 contacts count for many awards such as Worked All States or the DX Century Club. Aside from the fun of award chasing, it is amazing to see who you can contact with JT65 while using miniscule amounts of power. Some JT65 enthusiasts are using output levels in the *milliwatt* range.

JT65 performs so well, it has been a boon to hams living with severe antenna restrictions. Amateurs running 5 W to indoor antennas are making DX contacts on a daily basis with JT65, even with our less-than-stupendous band conditions.

Getting Started

Most amateurs trying JT65 on the HF bands are using W4CQZ's software. If you're already set up for digital modes such as PSK31 and RTTY, getting on the air with *JT65-HF* is as easy as installing and configuring the program. Step-by-step instructions about how to configure and use *JT65-HF* would require more *QST* pages than I have available, so the best course of action is to download and read W4CQZ's excellent setup guide at **hfradio.org.uk/jt65-hf_setup.pdf**.

If you are starting entirely from scratch, you'll need an interface to route the audio from your computer to (and from) your HF transceiver. This same interface also controls transmit/receive switching (Figure 1). Some interfaces also have sound devices built-in and use USB cables to attach to your computer; they're virtually plug-and-play. Check with your favorite dealer or the advertising pages of *QST* and you'll find interfaces from MFJ, microHAM, Rig Expert, Tigertronics, West Mountain Radio and others.

It is important to stress that you must avoid overmodulating your transceiver while transmitting JT65. If you see any movement of your ALC meter, or if the ALC meter indicates that the modulation level is edging out of the normal range, you'll need to decrease the audio from your computer. Overmodulated signals are not only difficult if not impossible to decode, they'll also obliterate nearby signals, making you very unpopular very quickly.

To properly configure the *JT65-HF* software, you'll need to know your Maidenhead grid square designation. If you don't know your grid square, you can find out online by using K2DSL's handy calculator at **www.levinecentral.com/ham/grid_square.php**. Just enter your postal ZIP code.

Regardless of the sound device you're using, compensating for sample rate errors is important for getting the best performance from JT65. Fortunately, most *JT65-HF* users can simply check the setup box labeled ENABLE AUTOMATIC RX/TX SAMPLE RATE CORRECTION and the software will take care of it.

Speaking of the *JT65-HF* software, once you have it correctly configured, using the program is surprisingly easy. In Figure 2 you'll see a typical on-air screen. Text from any station calling CQ is highlighted in green. If you want to make contact, just double click your mouse on one of the green lines. *JT65-HF* will automatically generate the exchange text and will determine when to transmit.

Stations take turns transmitting, depending on whether it is an "even" or "odd" minute. For example, let's say that you decoded my CQ at 2144 UTC. That's an even minute since 44 is an even number. If you double click on my CQ line, you'll notice that *JT65-HF* automatically sets itself up to transmit on the odd minute because it "knows" that I am transmitting on even minutes. If you waited until 2146 to click on my text, *JT65-HF* won't begin transmitting until the next odd minute: 2147. When you call CQ, you can choose to transmit on either odd or even minutes.

When the other station replies with your call sign, the line will be painted in red. Double click that line and *JT65-HF* will set up the next exchange. In theory, you can complete an entire contact by just clicking your mouse on the decoded lines, so long as *JT65-HF* can make sense of what the other station is sending. If not, you'll have to switch to manual.

JT65 contacts aren't rapid fire affairs. You can putter around your station, work on a project, carry on a conversation and do other things while occasionally glancing at the screen and clicking your mouse as necessary.

Table 1

Common JT65 Frequencies

All frequencies (kHz) assume a transceiver display in USB mode.

1838
3576
7076 (European stations often use 7039)
14,076
10,139
18,102
21,076
24,920
28,076

Where to Find JT65

Most JT65 activity appears to be taking place on 20 meters at the time of this writing. Even so, I've heard JT65 on 40 and 80 meters as well. A list of common JT65 frequencies appears in Table 1.

And if you've never heard JT65 on the air, go to the *QST* In Depth page on the ARRL web at **www.arrl.org/qst-in-depth**. Scroll down to the 2011 files section, expand it and look for the audio file *JT65.mp3*. When you find it, click on the file name and either open it or save it to your hard drive. When you play the file you'll hear an example of JT65 activity recorded on 20 meters in late January.

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

PRODUCT REVIEW

Elecraft P3 Panadapter

Joel R. Hallas, W1ZR
Technical Editor, QST

The Elecraft P3 Panadapter is a self contained, single channel, software defined receiver with a visual display. While designed to match the appearance and control functionality of the companion Elecraft K3 transceiver, it can be used with almost any receiver or transceiver with a wideband 455 kHz to 21.7 MHz IF output connection. We evaluated the P3 with a K3. While the P3 can work with most transceivers, the P3 provides digital handshaking to the K3 via their interconnected serial ports that supports some point and click and other control and display functionality.[1,2]

The P3 is available either as a factory built unit or as a modular, no soldering required, mechanical assembly only kit. Our unit was the factory built version, so we can't comment directly on building the kit. Reports from those who have put one together indicate that there are no surprises, and assembly can be completed in less than 2 hours.

The K3 capabilities keep expanding and expanding. Our first look at the K3 described a 10 W HF and 6 meter compact field or home transceiver with a top notch receiver, available at a moderate price as a kit or factory built. The next view was of a 100 W competition grade transceiver with a second receiver and many additional functions, now at about twice the price. Later, 2 meter capability and other options were added.[3] The one prominent item missing from Elecraft's K3 feature menu was a panadapter or spectrum scope. That didn't keep others from filling the void — we reviewed the Telepost LP-PAN software defined panadapter for the K3 about two years ago.[4]

[1]J. Hallas, W1ZR, "Elecraft K3/100 HF/6 Meter Transceiver," Product Review, *QST*, Jan 2009, pp 43-49. Past *QST* reviews are available to ARRL members at **www.arrl.org/product-review**.

[2]B. Prior, N7RR, "First Look: Elecraft K3 HF/6 Meter Transceiver," Product Review, *QST*, Apr 2008, pp 41-45.

[3]J. Hallas, W1ZR, "Elecraft Accessories for the K3 HF/VHF Modular Transceiver," Product Review, *QST*, Aug 2010, pp 43-49.

[4]J. Hallas, W1ZR, "Telepost LP-PAN Panadapter for the Elecraft K3 Transceiver," Product Review, *QST*, Feb 2009, pp 44-47. More information is available at **www.telepostinc.com**.

Hooking it Up

The P3 requires only three connections to operate with the K3 — IF signal, power and a serial data connection. The data connection is not actually required, but you will want it in order to take advantage of the features discussed below. Each interface comes with an included cable, and each connects to an appropriate mating socket on the K3, *if* you have the required KXV3 or KXV3A transverter interface board installed in your K3. The power cable terminates in an RCA phono plug designed to plug into the K3's AUX 12 V socket. The K3 provides a maximum of 0.5 A at this port, just about what the P3 needs — so don't plan on powering much else from this source. I had to make other arrangements for the pilot lights in my manual antenna tuner, for example, but could power both the P3 and the PR6 6 meter preamp simultaneously from the AUX 12 V socket.

So, What's it Do?

The P3 can display a slice of spectrum adjustable from ±1 to ±100 kHz wide. The default display mode has the scan centered on the receive frequency of the K3's primary receiver. Alternately, a number of fixed range span options can be chosen, as discussed below. It provides a viewable dynamic range of up to 80 dB on the usual spectrum scope type display (see Figure 1). It can also display the same spectrum on a waterfall display, in which amplitude is indicated by color and time is shown on the vertical axis. You can have one or the other, or a split between the displays with the waterfall adjustable to any desired fraction of the screen (see Figure 2).

The amplitude display is adjustable to place the noise floor at the bottom of the screen, using the REF LVL control. Settings generally will be different for different bands or antennas. The viewable amplitude range is adjustable in 1 dB increments from 10 to 80 dB. By using the REF LVL control, the 10 dB view can be placed on any portion of the range for fine measurements. By default, the scale is calibrated directly in dBm, so –73 dBm will correspond to an S-9 indication on the K3 S-meter, for example, if you choose the K3's absolute S-meter calibration. A recent P3 firmware upgrade allows the choice of having the amplitude display calibrated directly in S-units — probably more meaningful in typical operation, while the dBm calibration would be more appropriate for taking spectrum measurement data.

I found the amplitude resolution of the P3 such that antenna selection or aiming,

Bottom Line

The P3 adds a high performance standalone panadapter functionality to the Elecraft K3. If you want to see what's happening on the band, this will provide the needed view, as well as another way to control radio tuning if you wish.

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

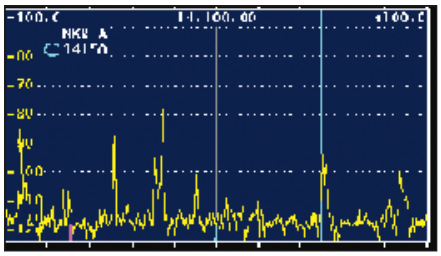


Figure 1 — Wideband panoramic view of a 200 kHz portion of 20 meters.

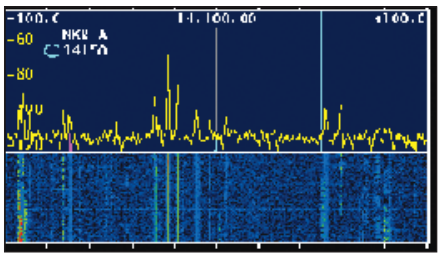


Figure 2 — Spectrum of Figure 1 with both waterfall and spectrum display. The waterfall portion can be set from 0 to 100% of the screen.

for example, could be accomplished with more precision while watching the P3 than while using the K3's S-meter. Under low noise conditions, for example on 2 meters using the K144XV internal transverter, I could see weak signals with an 8 dB S/N on the P3 that I could barely copy and that didn't register on the K3's S-meter. The lab measured the absolute accuracy of the amplitude scale to 1 dB, which makes the K3/P3 combination useful as a test instrument as well as a reception aid.

In addition to the real time display formats, holding the AVERAGE button for a ½ second provides a screen that allows setting of an averaging time from 2 to 20 update periods using the multipurpose SELECT knob. I found this most useful if I didn't have my eyes on the screen constantly. I could then see what *had* been happening over time, rather than just what was happening at the moment.

Menu Selections

In addition to the primary controls on the right side of the front panel, there is a set of selections that are available using the MENU button. Some of the menus are for setup type operations such as selecting the IF frequency (default is the 8215 kHz of the K3), transceiver type, LCD brightness, RS-232 data rate, display text size or various test modes.

Other menu selections are useful in regular operation. Those include selecting dBm or S-units for the amplitude display, setting the span to either one of the fixed modes or to be centered on the receive frequency, the ability to FREEZE the display for future reference, to set the fraction of the screen used in waterfall mode or to select the PEAK HOLD mode. Up to eight menu items can be assigned to the four FUNCTION buttons along the bottom of the screen for instant selection. A hard button allows display of the functions associated with the soft keys, in case your memory gets as stale as mine. This is shown along the bottom of Figure 3.

I set the PEAK HOLD into one of the soft function keys. It is particularly useful if you wish to work on something else for a while. It will accumulate a display of the peak amplitude that has occurred on each frequency within the selected span until you hit the button again. Thus you can find out what activity has transpired over the selected span width while you were otherwise occupied. During the accumulation of peak data (blue trace), the instantaneous data is seen simultaneously (yellow trace) as shown in the main portion of Figure 3.

Operation with an Elecraft K3

While all of the above functionality is usable with any connected radio, the P3 was designed with the K3 in mind. By connecting the supplied serial data cable between the P3 and the K3, the two interchange information in a number of helpful ways. The most obvious is that the P3 knows what frequency the K3 is tuned to and can display it along with the center cursor. While this is probably not a mystery anyway, the more dramatic uses of information interchange are in two other areas.

Frequency Markers

A button in the main control group allows the selection of marker A or B (MKR A, MKR B). Once selected, the SELECT knob is used to move the marker frequency across the screen to any signal of interest. The marker display provides a readout of the frequency as you move it. Now tapping the SELECT knob changes the K3 tuned frequency to that of the marker — kind of a *mouseless* point-and-click operation. Once you listen to the signal to see if it is of interest, you can return to your original received frequency if you like by pushing in (holding) the SELECT knob for less than a second. This is very slick, and perhaps one of the most useful operational features of the K3/P3 combination — no more tuning back and forth across a dead band looking for interesting signals!

If the K3 is not providing frequency data, the markers will still operate, but will provide relative frequency information instead of the actual marker frequency. There is currently no mechanism for the P3 to control the frequency of other transceivers, or be controlled by them. If other transceivers can supply frequency data and be controlled via a serial port, there is no fundamental reason that it couldn't happen. This could be accomplished by additional Elecraft firmware development, or even using an external interface adapter from a third party.

A second marker (MKR B) can be selected. While both can be viewed simultaneously, one will be active at a time to allow changing its frequency or moving the receiver to its position. Pushing the MKR button toggles between them. In normal operation, MKR A is associated with VFO A, while MKR B is associated with VFO B.

The two markers are of different colors matching the color of the respective VFO cursor. The markers appear as a narrow vertical line, making it easy to see them against the white spectrum display. Since a steady signal on the waterfall display is also a single vertical line, the markers are less distinct there. Marker use on the waterfall display is thus an operator preference using a menu selection.

Bandwidth Cursors

Squared off U shaped marks on the spectrum display baseline indicate the bandwidth and relative location of the receiver at each of the VFO A and B frequencies, if they are tuned within the span. If you are looking at a fixed span that doesn't include the receive frequency, an arrow indicates which direction the curser would be.

With a wide frequency span the bandwidth curser is mainly useful to tell you where VFO B is so you can quickly move to that frequency either with the K3's A/B button, or using a P3 marker. For narrow spans, however, it can give you a good indication of how your passband is matched to adjacent channel interference or the information frequency range of a transmitted SSB signal, so you can set the K3 DSP WIDTH and OFFSET to match. You could even use it as an aid in setting the receive equalizer.

If you are operating in SPLIT mode, the B bandwidth indicator shows what's happening on your transmit frequency while the main cursor shows activity on the receive frequency, if both are within the selected scan. Thus if a DX station, for example, is listening over a range of frequencies, you can slide your transmit frequency into a quiet spot, at least at your end of the path. You can then use the B marker to move your B VFO to the spot. Of course, if you have a sub receiver, you can also listen as you tune. If the DX station tends to call a station on the same frequency as the last one worked, you can often spot the station on the P3 and move the B cursor to the frequency much more easily than if you were tuning by ear.

Those *Fixed* Span Modes

A new firmware version, 1.00, was released just when we thought we had finished the review. I'm glad we had time to include it because it offers some features that I think make the P3 an even more useful tool. The earlier firmware provided a display that was always centered on the receive signal frequency with a selected span on either side. As you tuned the receiver, the displayed frequency span moved with it. This is certainly useful, especially if you want to know what's happening on frequencies near to where you are operating.

Another important panadapter application is to know what's happening on frequencies on which you aren't operating. For example, you might want to watch the spectrum from 14,010 to 14,030 kHz waiting for an expected DXpedition to appear at around 14,020. With the STATIC FIXMODE option selected, you can set the desired range and even be operating on 20 meter SSB while watching the range of interest (Figure 4). Other FIXMODE options allow you to have a fixed span that shifts just enough to keep your receive frequency on the screen or jumps a half or a full increment as your tuned frequency reaches the edge of the screen. Selecting TRACKING mode goes back to the original receive frequency in the center configuration. As with some other menu items, this is one that wants to be set into one of the eight soft keys.

Monitoring Your Transmit Signal Characteristics

In normal operation, the P3 display is frozen to the last view before the K3 switches to transmit. A useful, and apparently unintended, feature can be used by temporarily disconnecting the data cable from the P3. The P3 then doesn't know if the radio has gone to transmit mode, and there is enough transmit IF signal present at its input that it will display the transmit signal spectrum. This is the display shown in Figure 3. The yellow trace shows the instantaneous transmit spectrum of me speaking into the mic at the moment of capture (the provided *P3 Utility* program can capture the display with a mouse click if the system is connected to a PC). The blue trace on Figure 3 shows the maximum spectrum at each frequency point since I selected PEAK HOLD.

An examination of the peak spectrum in comparison to the receive bandwidth shown along the bottom indicates that I am transmitting lower frequencies than I feel the need to listen to, and also that my mid and upper ranges might benefit from a boost with the K3's transmit equalizer function. Perhaps a future upgrade will allow using this function via a menu rather than requiring the disconnection of a cable, although it's not likely that this function will be needed often.

Connection to the PC

The P3 is designed to interface with the serial port in your K3 via a dedicated cable that is provided. The serial connection between the P3 and K3, however, lets the P3 know what frequency and bandwidth each of the K3 VFOs is tuned to, and supports the dual markers discussed above, so you will want to provide that connection.

While a PC in not required for operation of either the K3 or the P3, there is another serial connector on the P3 that can connect to your PC's serial port. If your PC supports USB rather than a serial interface, a USB-to-serial converter is available as an option from Elecraft or from electronic retailers.

The P3 only needs the PC connection to download new firmware or to capture screen shots such as those used in the illustrations here. During the review, we downloaded the P3 utility software and updated the P3 firmware to version 0.41 that we operated throughout the evaluation until 0.50 became available. There were no difficulties in the download or upgrade processes — they work very much in the manner of upgrades for the K3.

While serial connections are designed to exchange data between a single device, such as the radio and the PC, the P3 provides a clever pass-through router function to allow both the P3 and the K3 to work with the PC. Thus, if you want to run your contest logger, or other radio management software on your PC, the P3 acts like a virtual pass through router for traffic between the PC and K3. That connection can also be used to download new firmware to the K3 or control the K3 without making any changes to the connections.

Performance

As shown in Table 1, taken using the usual ARRL Lab receiver Product Review testing suite, the P3 provides very competent performance. Because its wideband input is taken before the K3's roofing filters, its dynamic performance is somewhat limited by the wide bandwidth, as to be expected. I found that the minimum detectable signal of the K3 and P3 were about the same, although spotting a new weak signal in the noise was not always easy on the time domain display, it was very easy on the waterfall — perhaps a good reason for having both running.

Yet to Come

As with all SDRs, the P3 features will continue to expand with new firmware releases. In addition, Elecraft has left space inside the unit, as well as additional connector cutouts in the rear — one can only imagine what else the P3 will do in the future. I was reminded of the difference between the first 10 W K3 that we reviewed with its mostly empty box as compared to my current model with 100 W amplifier, second receiver, voice memory, antenna tuner and 2 meter transceiver, all added as time went on.

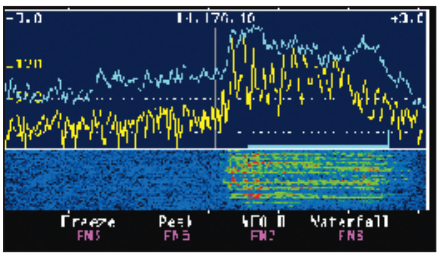


Figure 3 — View of P3 screen showing the assignment of the programmable front panel keys along the bottom. This narrow span view is of a transmitted signal spectrum showing both the instantaneous spectrum (yellow) and the peak since last reset (blue).

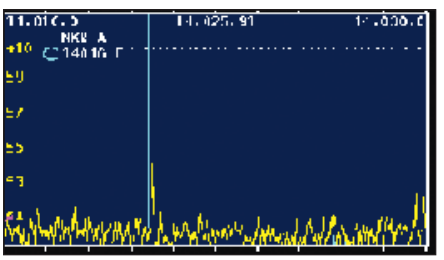


Figure 4 — View of P3 screen operating with the new STATIC FIXMODE option selected. The selected fixed span is from 14,010 to 14,030 kHz, the tuned frequency is shown in the upper middle, 14,025.19 kHz, and visually by the blue cursor in the lower right. One of the markers is used to pinpoint another station. Note that the amplitude scale is now shown directly in S-units, a menu option.

Standalone, or PC Based

An obvious question that will occur to many is whether they would be better off with a P3 or a PC based SDR as a panadapter, such as the previously reviewed LP-PAN. Actually, you need not choose — you can do both since the P3 provides a pass-through IF connection that I used to drive my LP-PAN panadapter at the same time as the P3 for comparison purposes. Frankly, for most operations, I didn't see a great difference in capability, although some of the P3 features are not available on my SDR. With either, any perceived deficiencies may disappear in a subsequent firmware release — although, I must say, Elecraft has a well deserved reputation for quickly responding to customer suggestions and coming out with new releases as needed.

I think the decision between P3 and a PC

Table 1

Elecraft P3 Panadapter, serial number 653

Manufacturer's Specifications	Measured in the ARRL Lab
IF Frequency range: 0.455-21.7 MHz.	0.455, 0.5, 3.180 (I), 3.395 (I), 4.915, 5.645, 6.144, 6.298 (I), 8.215 (I), 8.830 (I), 9.0, 10.55 (NI), 10.7, 21.4 MHz*.
Power requirement: 10-15 V dc, 500 mA (maximum).	317 mA (maximum brightness), 250 mA (minimum brightness).
Spectral sensitivity: Not specified.	With Elecraft K3, averaging rate 20 (max):

Span	*Preamp off*	*Preamp on*
2 kHz	–139 dBm	–149 dBm
100 kHz	–127 dBm	–135 dBm

Blocking gain compression: Not specified.

Gain compression, with Elecraft K3:

	20 kHz offset	*5/2 kHz offset*
Span	*Preamp off/on*	*Preamp off*
2 kHz	129/134 dB	123/118 dB
100 kHz	124/115 dB	109/** dB

ARRL Lab Two-Tone IMD Testing, with K3, 14 MHz:

Span/Preamp	*Spacing*	*Input Level*	*Measured IMD Level*	*Measured IMD DR****	*Calculated IP3*
2 kHz/Off	20 kHz	–63 dBm	–139 dBm	76 dB	–25 dBm
		–43 dBm	–97 dBm		–16 dBm
2 kHz/On	20 kHz	–65 dBm	–149 dBm	84 dB	–23 dBm
		–45 dBm	–97 dBm		–19 dBm
2 kHz/Off	5 kHz	–63 dBm	–139 dBm	76 dB	–25 dBm
		–43 dBm	–97 dBm		–16 dBm
2 kHz/Off	2 kHz	–63 dBm	–139 dBm	76 dB	–25 dBm
		–43 dBm	–97 dBm		–16 dBm
100 kHz/Off	20 kHz	–49 dBm	–127 dBm	78 dB	–14 dBm
		–42 dBm	–97 dBm		–14 dBm
100 kHz/On	20 kHz	–60 dBm	–135 dBm	75 dB	–22 dBm
		–46 dBm	–97 dBm		–20 dBm
100 kHz/Off	5 kHz	–49 dBm	–127 dBm	78 dB	–14 dBm
		–43 dBm	–97 dBm		–14 dBm
100 kHz/Off	2 kHz	–49 dBm	–127 dBm	78 dB	–14 dBm
		–43 dBm	–97 dBm		–16 dBm

Size (height, width, depth): 4.4 × 6.18 × 11.8 inches, including protrusions. Weight, 5.5 lbs.
Price: P3 kit, $699.95; fully assembled $749.95.

*(I): Inverting only; (NI): Non-inverting. These frequencies are available on the P3's XCVR DEF menu. Other frequencies can be user defined.
**Blocking signal obscured the desired signal; no measurement made.
***IMD dynamic range of software defined receivers is generally a function of signal level. See the sidebar on testing software defined radios in the February 2010 Product Review of the RFSpace SDR-IQ.

based SDR will likely be based on operating style. Many photos of contest stations show the PC as the main focus item from which all operation is accomplished. Those stations probably have PCs with plenty of horsepower to run SDR software along with logging, spotting and radio control software. With this arrangement, the PC based SDR seems a logical way to go.

On the other hand, if you are more of a radio operator than computer fan, the P3 may feel more natural. At my station, the radio is in front of me with the PC to the side for support tasks. In addition, my station PC seems to always be the lowest on the totem pole of household PCs and has trouble just keeping up while running the latest SDR software, let alone everything else. For me having the P3 next to the K3 seems like a more natural arrangement. My frequent PC crashes just require me to do contest logging on paper until the PC gets the bones out of its throat.

Documentation

The P3 comes with a detailed documentation package that you can download and examine at the Elecraft website before you decide to purchase a P3. The 45 page document includes 25 pages on operation of the P3 followed by 17 pages of assembly instructions for those building the kit version and then three pages on service. All are well described and illustrated with color photos, where applicable.

In addition to the manual itself, as with the K3 documentation, updates resulting from P3 firmware releases are documented in the firmware release notes supplied with the firmware and incorporated in the manual at the next manual revision.

Manufacturer: Elecraft, PO Box 69, Aptos, CA 95001; tel 831-662-8345; **www.elecraft.com**.

Uniden HomePatrol-1 Scanning Receiver

Reviewed by Curt Phillips, W4CP
ARRL Contributing Author
w4cp@arrl.net

The new Uniden HomePatrol-1 (HP-1) scanner makes listening to the public safety bands easier than ever. In an era of scanners that could be considered almost user hostile, the HP-1 provides a friendly color touchscreen (Figure 5) to guide the user through the steps needed to scan their local agencies after just minutes out of the box.

Finding Local Frequencies

Listening to public safety communications and the like has always required a degree of dedication. You had to determine the frequencies that your local agencies used, buy a radio that would cover these frequencies and then program in the frequency (or buy and install a crystal in the old days). Only then were you ready to listen. If you had a lot of agencies on your listening wish list, that meant taking time to program lots of frequencies, or lots of crystals to buy.

And then a few years ago it got *really* complicated. As trunking and digital transmission methods were implemented to provide better efficiency in frequency usage, would-be public safety listeners had to research even more frequencies and worry about programming their scanners with such esoteric concepts as "talk groups" and "affiliations."

Bottom Line

Uniden's HomePatrol-1 scanner brings user friendliness to a new level. It performs complicated scanning functions with ease, and loading local frequencies is a snap.

Memories Made Easy

With the HP-1, a computer built into the radio handles all of these complica-

tions for the user. Almost all new radios now are computer/radio combinations, but with the HP-1 a large part of the computer horsepower is dedicated to making the radio easier to use.

All the HP-1 needs to know is where you are located. If you know the postal ZIP code at your location, that's all you need to get the HP-1 scanning your local services. When using the ZIP code, the HP-1 assumes that you are within a 10 mile radius of the center of that ZIP code. Based upon this location, the HP-1 first loads every known channel that should be able to be monitored at that location (*almost* every channel — more on this later). With the HP-1, a "channel" includes all of the information needed to scan local services whether they are conventional analog systems, digital systems or complicated trunked systems.

Note that conceptually, the HP-1 uses exactly the opposite of the procedure most scanners use. With most scanners, you start with a blank slate and then add in the frequencies and services you want to monitor. With the HP-1, it loads every channel it knows for the area (which is almost always a lot), then you subtract or skip the frequencies and services that you don't care about.

The HP-1 also has an AUTO-LOCATE function to determine its location by searching frequency bands for known radio systems. Or the location can be entered by city name, manual input of latitude and longitude or interfacing with a GPS unit. If you plan to use a GPS, be sure to check its compatibility before you purchase the HP-1 since it cannot be interfaced with all GPS units.

Narrowing the Field

Once it knows where you are, you can be scanning a new location in seconds, but you may be scanning a lot *more* things than you really want. It is not unusual for the HP-1 to load over 1000 channels into its active memory. Even for a modern state-of-the-art scanner, the cycle of scanning over 1000 channels can take a few seconds to complete. To lessen the cycle time, you may want to reduce the number of channels scanned.

You can begin to winnow down the number of channels to be monitored by deselecting on a service-by-service basis things that you don't want to hear. Choices include business, fire, ham, media, military and so on. You also can narrow the range from a 10 mile radius in ½ mile increments to ½ mile. In actual practice, however, changing the range does very little to lessen the number of frequencies loaded by the HP-1.

As it scans, you can choose to deselect individual frequencies on a case by case basis. In an attempt to be more user friendly, you don't "lock out" or "skip" frequencies you aren't interested in hearing, you "avoid" them. The "avoiding" can be temporary (until the scanner is restarted) or permanent. Also, along the same user friendly theme, instead of pressing an ENTER key, the terminology used here is ACCEPT.

Once you get a set of frequencies set up the way you like them, you can save them to a FAVORITES list. The HP-1 allows for up to 256 FAVORITES lists. Beyond this, there is very little custom programming you have to or can do. There is a provision to punch in a single frequency through the ADVANCED menu, but that is for simply monitoring one frequency at a time. When you resume scanning, that frequency is not in the scanning rotation.

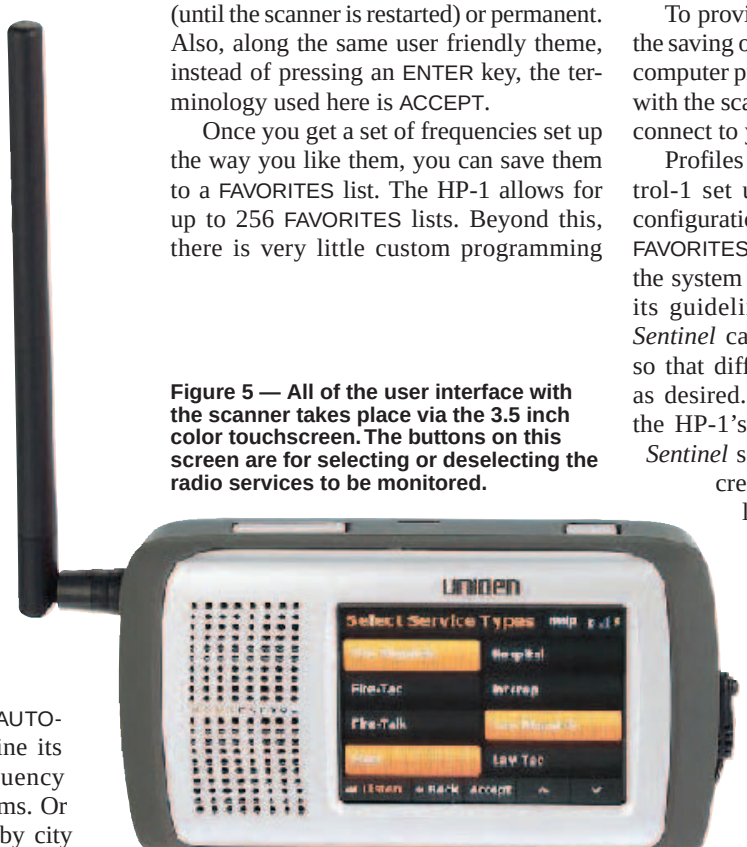


Figure 5 — All of the user interface with the scanner takes place via the 3.5 inch color touchscreen. The buttons on this screen are for selecting or deselecting the radio services to be monitored.

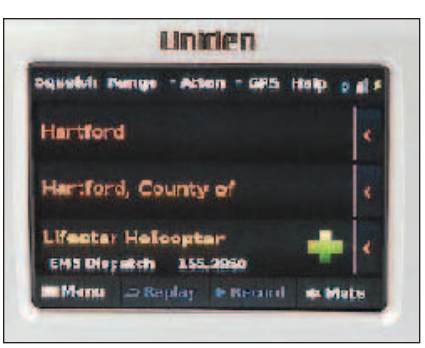


Figure 6 — As the radio stops on a scanned frequency, the screen shows the name of the system and department being heard, as well as the channel and frequency.

User Interface and Software

All of this user interface with the scanner takes place via the aforementioned 3.5 inch color touchscreen. As the radio stops on a scanned frequency, the screen shows the name of the system and department being heard, as well as the channel and frequency (Figure 6). Also on the screen are menu buttons for setting operational choices.

To provide for updates to the HP-1 and the saving of various user profiles, there is a computer program called *Sentinel* included with the scanner, as well as a USB cable to connect to your computer.

Profiles are snapshots of the HomePatrol-1 set up. A profile contains all the configuration settings as well as all of the FAVORITES lists, frequencies to avoid, and the system settings (settings that establish its guidelines, ranges and limitations). *Sentinel* can save multiple HP-1 profiles so that different profiles can be restored as desired. Profiles can be created from the HP-1's touchscreen, or by using the *Sentinel* software. For example, you can create a separate profile for each location from which you operate the scanner. Favorite lists are a subset of the profiles in that each profile can have several Favorite lists.

Profiles and Favorite lists provide for a substantial amount of customization, *within the HP-1 universe*. Again, beyond this there is little additional programming you can do, even through the *Sentinel* program. That also means that there is little you can do to disrupt the operation of the HP-1, which is another side to its user friendliness. But as you get more involved in scanning, you may want a greater level of control.

For instance, marine frequencies are not included in the HP-1 universe. So if you want to monitor the Coast Guard, out of the box the HP-1 isn't for you. Wouldn't it be nice to be able to create your own custom frequency "bank" with the marine frequencies in them?

As of this writing, there are several aftermarket programs that will allow the user to do exactly that. However, be aware that these programs will also allow programming modifications that may cause the

HP-1 to cease to operate as it was designed.

The programs are *Arc-Patrol* by Butel ($29.95, **www.butel.nl**; *ScanCat* ($29.95, **www.scancat.net**) and *PowerPatrol* from the **scannow.org** website (free). These programs allow the user to do such things as add a frequency or talkgroup that is not in the built-in database, add/modify a control channel frequency, add a trunked system that is not in the built-in database, change alpha tags or search a frequency range. Typically, the *Sentinel* software can reset the HP-1 to its original state, but with these programs it is possible that you may cross a bridge too far… so user beware.

Table 2

Uniden HomePatrol-1, serial number 363Z04002755

Manufacturer's Specifications	Measured in the ARRL Lab
Frequency coverage: 25-53.995, 108-512, 758-823.985, 849.0125-868.9875, 894.0125-960 MHz.	As specified.
Modes of operation: AM, FM, NFM	As specified.
Power requirement: 4 × AA 2300 mAh NiMH batteries (included) or 4 × AA alkaline batteries), ac adapter (120 V ac to 9 V dc, 800 mA regulated, included), dc adapter (12 to 9 V dc, 800 mA regulated, included).	2300 mAh NiMH AA batteries: 251 mA (max audio, no signal), 295 mA (max audio with signal, 228 mA (standby), 210 ma (scanning), at 5.45 V dc (full charge); 13.8 V dc supply with dc power cord: 169 ma (max audio, no signal), 190 mA (max audio with signal), 158 mA (standby), 148 mA (scanning).
AM sensitivity: 0.3 µV (manual specifies AM sensitivity as 0.3 µV, 12 dB SINAD).	10 dB (S+N)/N, 1-kHz, 30% modulation; 25 MHz, 0.56 µV; 29 MHz, 0.54 µV; 50.4 MHz, 0.48 µV; 120 MHz, 0.51 µV; 144 MHz, 0.51 µV; 222 MHz, 0.56 µV; 366 MHz, 0.51 µV; 420 MHz, 0.57 µV; 902 MHz, 0.59 µV.
FM sensitivity: for 12 dB SINAD, 0.3 µV, 0.2 µV at 197.45 MHz.	For 12 dB SINAD: 29 MHz, 0.20 µV; 40 MHz, 0.20 µV; 49 MHz, 0.21 µV; 52 MHz, 0.21 µV; 146 MHz, 0.20 µV; 162.5 MHz, 0.20 µV; 197.45 MHz, 0.22 µV; 223 MHz, 0.20 µV; 440 MHz, 0.22 µV; 465 MHz, 0.26 µV; 800 MHz, 0.27 µV; 902 MHz, 0.32 µV.
IF rejection: Not specified.	29 MHz, 82 dB; 40 MHz, 83 dB; 52 MHz, 84 dB, 146 MHz, 83 dB; 223 MHz, 81 dB; 440 MHz, 54 dB, 800 MHz, 101 dB, 902 MHz, 95 dB.
Image rejection: Not specified.	29.0 MHz, 57 dB, 40 MHz, 55 dB, 52 MHz, 55 dB, 146 MHz, 63 dB, 223 MHz, 63 dB, 440 MHz, 60 dB, 800 MHz, 56 dB, 902 MHz, 72 dB.
FM adjacent channel rejection: Not specified.	20 kHz offset: 29 MHz, 38 dB; 40 MHz, 42 dB; 52 MHz, 36 dB; 146 MHz, 38 dB; 223 MHz, 41 dB; 440 MHz, 40 dB; 902 MHz, 46 dB.
FM two-tone third order dynamic range: Not specified	20 kHz offset: 29 MHz, 38 dB*; 40 MHz, 42 dB*; 52 MHz, 36 dB*; 146 MHz, 38 dB*; 223 MHz, 41* dB; 440 MHz, 40 dB*; 902 MHz, 46 dB*. 10 MHz offset: 29 MHz, 61 dB; 52 MHz, 64 dB; 146 MHz, 62 dB; 223 MHz, 63 dB; 440 MHz, 63 dB; 902 MHz, 68 dB.
Squelch sensitivity: Not specified.	29 MHz, 0.35 µV; 40 MHz, 0.34 µV, 52 MHz, 0.36 µV; 146 MHz, 0.32 µV; 223 MHz, 0.35 µV; 440 MHz, 0.37 µV, 800 MHz, 0.38 µV; 902 MHz, 0.37 µV.
S-meter sensitivity: Not specified.	For full scale indication: 29 MHz, 2.9 µV; 40 MHz, 3.0 µV; 52 MHz, 2.8 µV; 146 MHz, 2.9 µV; 223 MHz, 3.0 µV; 440 MHz, 3.1 µV, 800 MHz, 3.2 µV; 902 MHz, 5.2 µV.
IF/audio response: Not specified.	Range at –6 dB points, AM: 352-2077 Hz.

Size (height, width, depth): 3.3 × 5.9 × 1.5 inches (without antenna); weight,15.8 oz (with antenna and batteries).

Price: $500.

*Measurement was noise limited at the value indicated.

Software and Database Updates

The included *Sentinel* software also allows for updating the frequency database and updating the HP-1 firmware (see Figure 7). The firmware may be updated at any time, and rumors of Uniden adding programming flexibility are rampant. So far, Uniden has been very conservative in the amount of flexibility allowed in order to maintain the HP-1's resistance to malfunctions caused by user input error and thus retain its user friendliness.

Speaking of frequency database updates, where do all the frequencies come from? They come from RadioReference (**www.radioreference.com**), reputed to be the world's largest radio communications database. The data from RadioReference is updated on a weekly basis, and you can choose to update the data in the HP-1 at your convenience. The RadioReference website also features numerous on-line forums, including ones covering the operation of the HP-1. With a radio with as vast and evolving capabilities as the HP-1, participating in the appropriate forums can expand your usage and enjoyment of the radio. And RadioReference is accessible to anyone, independent of Uniden and the HP-1, so customized advice regarding the HP-1 is available before and after your purchase of the radio.

Uniden also hosts forums dedicated to the HP-1 at **www.homepatrol.com** (click on COMMUNITY).

Record and Playback

Another great feature of the HP-1 is its recording and replay capability. If you've ever listened to any type of radio, you have experienced the phenomenon of "what did they just say?" Especially with scanner listening, in which its intermittent transmissions tend to be listened to in the background, often by the time you realize that a transmission is of interest to you the transmission is over. With the replay function, you just tap the button and the last 30 seconds of reception is replayed. And the replay length can be adjusted to record up to 240 seconds (4 minutes.)

Or, you can choose to record everything. Because it records on a voice-activated basis, there are only slight pauses between transmissions. The 128 kbps .wav files can be played on your computer, but if you replay them using the scanner, the screen will show the system/department/channel information just as when it was recorded. The supplied 2 GB microSD card can hold

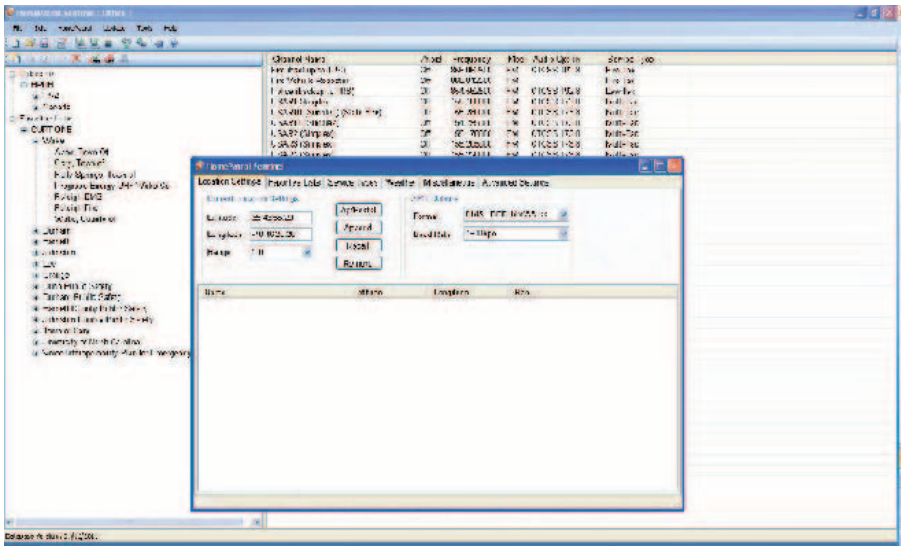


Figure 7 — Uniden's Sentinel software can be used to manage a number of the HP-1's functions.

up to 1000 sessions, but the radio will stop recording when the free memory is 512 MB or below. Also, low battery power disables the recording function.

Wish List

For a first generation product, the HP-1 gets an amazing number of things right, but there is room for improvement with any radio.

Although it is nominally a handheld scanner, its odd form factor doesn't hang well from a belt, even if an appropriate case is found. And it is not a particularly small scanner (partially because of the big nice touchscreen), so why does it use the fragile SMA antenna connecter rather than the more common and robust BNC connector? Given that its operating orientation is horizontal (by the orientation of the screen), placing the antenna connector on top rather than on the side would have allowed a greater variety of antennas to be used. The possibility of being able to alter the orientation of the display on the touchscreen also presents itself as a worthwhile future feature.

It is a bit of a battery hog, but this is probably to be expected given the nice, bright screen. Depending upon the amount of radio traffic, the batteries will last around four or five hours. It does use four AA batteries, so replacements can readily be found if the supplied NiMH rechargeable batteries run out. Both an auto and ac adapter are provided for maximum flexibility in keeping the NiMH batteries charged.

Something you should know if you are looking at any trunked system scanner is that there are a few proprietary trunked radio systems than cannot be monitored by any commercial scanner. To avoid disappointment, check the type of trunked systems in your area before purchasing any scanner.

Conclusion

The word "revolutionary" is used so often in advertising today as to render the term almost meaningless, but the HP-1 truly is revolutionary in the same sense as the first programmable scanners were. It performs complicated scanning functions with ease, requiring a bare minimum of input and knowledge by the user.

In the first two months after purchasing this scanner I traveled from my home in Raleigh, North Carolina, to Boston (twice), Washington, DC (twice) and Philadelphia. Even as an advanced scanner user, my work schedule wouldn't have allowed me to do the research and programming required to monitor at all of these locations. With the HP-1, I was up and scanning the local frequencies within minutes of getting to my hotel room with no prior research or programming needed.

For more advanced users, use of third party software is required. But this is a small price to pay to get the out-of-the-box friendliness and power of the HP-1.

In addition to being generally interesting to a large number of radio hobbyists, the ability to monitor public safety frequencies can be very useful during emergencies. The HP-1 provides the easy ability to do this, even for hams who are not interested in delving into the nuts and bolts of how and what they are scanning. It's not inexpensive, but for these users as well as travelers, beginners and gadgeteers, it is well worth the money.

Manufacturer: Uniden America Corp, 4700 Amon Carter Blvd, Fort Worth, TX 76155; tel 817-858-3300; fax 817-858-3300; **www.uniden.com**. QST

Feedback

◊ The map on page 73 of the February 2011 issue ["YI9PSE Iraq 2010 — An Extreme Adventure"] includes territory incorrectly labeled "Kurdistan." In fact, the generally accepted area of the Kurdistan Autonomous Region is in northern Iraq only. The portion of the map labeled Kurdistan shows territory with a significant Kurdish population but should not be interpreted as meaning anything more than that. *QST* apologizes for the error.

◊ In "A Compact 40 Meter Receiver" [Feb 2011, pp 37-40] in Figure 1, the symbol for the J310 should be that of an N channel junction FET. In the Testing and Alignment section, it should say "tune C13 and C15 for a peak in background noise." Crystals Y1-Y5 are actually at 4.9152 MHz. The Mouser part number is 520-HCA491-SX. The correct part number for C18, 10 pF capacitor is 80-C315C100J1G. C13, C15 and C29 should be 9-90 pF variables, part number 81-TZ03R900F169B00. Add a 33 pF capacitor (C45) to pin 1 of U3. Voltage regulator U2 should be shown on the schematic as a LM78L05 as reflected in the parts list. An LM7805 can be used but the pinouts are different. A corrected schematic and parts list have been posted to the QST-in-Depth website.

◊ In "Hands-On Radio" [Feb 2011, pp 64-65] the last paragraph of the Getting Wired section says "U2A's $\overline{Q}$ output is also connected to U1's reset input…" It should say "U2A's Q output that is connected to both U1's reset input and the clock input of U2B…"

W1ZR

THE DOCTOR IS IN

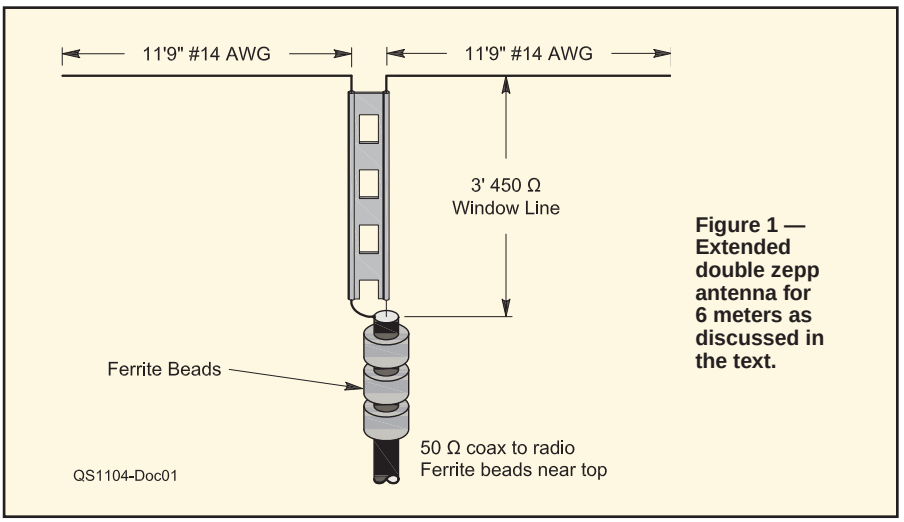


Figure 1 — Extended double zepp antenna for 6 meters as discussed in the text.

Q Cliff, KC4AIF, asks: I decided to give 6 meters a try. I thought an extended double zepp (EDZ) antenna would be a simple and straightforward antenna to try. I got out my books and researched online. Now I am thoroughly confused. Different sources gave different lengths for each leg as well as for the matching section of 450 Ω window line. Can you tell me what the correct dimensions are?

A This is a situation in which there is no exact single answer. Unlike many antennas, this one is not resonant — by design it has a complex impedance that will require matching, and exactly what that impedance is does not matter too much, nor is the exact length critical. The basic EDZ is just two 0.625 or ⅝ wave end fed antennas fed at their junction. Somewhat different lengths can provide higher gain, or lower sidelobes, so it depends on what your objectives are.

The EDZ provides the most gain from a simple linear antenna resulting in a narrower beamwidth than a dipole broadside to the axis of the antenna. It is just similar to two 43 foot monopoles as used on 20 meters.

You didn't specify the conductor size, nor the height — each of which will effect the antenna dimensions. For #14 AWG bare wire, at a height of 35 feet above typical ground, a length about 11.9 feet on a side gives the best results (see Figure 1). It has a gain of about 10.4 dBi (almost 3 dB more than a half wave dipole), sidelobes are down about 9.7 dB and its beamwidth is 33° on each side of the wire (see Figure 2). *EZNEC* predicts that the impedance at 50.25 MHz is 152.6 –*j*691.9 Ω.[1] A matching section of 3 feet of typical 450 Ω window line will transform that to 38.3 Ω for a 1.3:1 SWR to 50 Ω. Do use some balancing — perhaps a row of ferrite beads, to keep currents off the outside of your coax. Another possibility is to use window line all the way back to the shack and use an antenna tuner. It should work very well but with a more complex pattern on all bands from 20 meters up, and likely 17 meters as well.

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

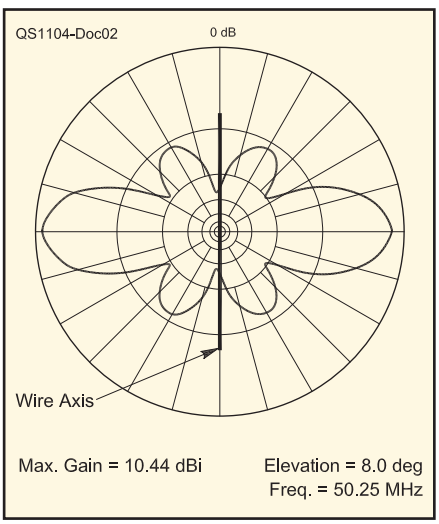


Figure 2 — *EZNEC* computed azimuth pattern of the extended double zepp antenna in Figure 1.

Q John, WA2QQF, has two questions to ask:

First, he notes that he inserts his in-line wattmeter into his transmission line after doing antenna repairs or adjustments to check the results and he then removes it. He wonders that if he were to leave it in circuit, should it be located between the radio and the antenna tuner or between the tuner and coax feed line going to the antenna?

Second, he hears the prosign BK used instead of K at the end of a transmission on CW and wonders if this is proper procedure.

A Since you feed your antenna system with coax, you can leave your in-line meter at either location, depending on what you want to find out. If it is positioned between the tuner and antenna, it can monitor the SWR (or reflected power, depending on the type of meter) of the antenna system itself. It is unlikely to show an SWR of 1:1 (reflected power of 0), or you wouldn't need a tuner at all. This is a good location to allow observation of changes in your antenna system without them being masked by the tuner. If you leave it between the radio and tuner, it will indicate how well the tuner is doing at transforming the antenna impedance to that desired at the radio — typically 50 Ω. This can also be beneficial, since it can be important to know how well matched your radio's load is. In many radios, an SWR meter is provided, if so, the wattmeter at this location is probably redundant.

In my operations, I use K to indicate the end of a transmission and that I am changing to receive mode. To me BK means *break*. I use that to indicate the beginning and the end of a short comment interspersed in the middle of a transmission — particularly if operating full break-in CW, as I usually do. I also use it after a question requiring just a short answer. After I receive the answer and a BK from the other station, I continue with my transmission.

Q Chris, WA8IGN, asks: I have a 1000 foot spool of Belden 9292 that was basically free. I want to put up several

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

Hamspeak

Antenna tuner — Device that sits between an antenna and a transmission line, or a transmission line and a radio, and transforms the impedance to match the radio or line.

Characteristic impedance — The impedance of a transmission line of any length line that will be seen at the input if the far end is terminated in the same impedance. This is the impedance that the line is designed to work at and at which it will exhibit the least loss.

Full break-in (QSK) — Radiotelegraph operation in which the sending operator can listen to the channel in between sent dots and dashes. This enables the other operator to "break in" to ask for a repeat or a clarification. It also allows the sending operator to adjust speed or suspend operation in the presence of noise or interference.

Ground plane antenna — A kind of antenna in which the primary element is a quarter wave vertical monopole located above an artificial ground of typically three or four quarter wave *radials*.

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, which 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).

Prosign — In Morse code, combination of two code characters into a single special character without a space between. These are indicated in written text by an overstrike. For example, $\overline{\text{AS}}$ means *please wait*.

Sidelobe — Generally undesired radiation from an antenna in directions different from the intended direction(s) or main lobes.

SWR — Standing wave ratio. Measure of how well a load, such as an antenna, is matched to the design impedance of a transmission line. An SWR of 1:1 indicates a perfect match. Coaxial cables, depending on length, type and frequency can often work efficiently with an SWR of 3:1, sometimes higher. Solid state transmitters frequently require an SWR of 2:1 or less for proper operation.

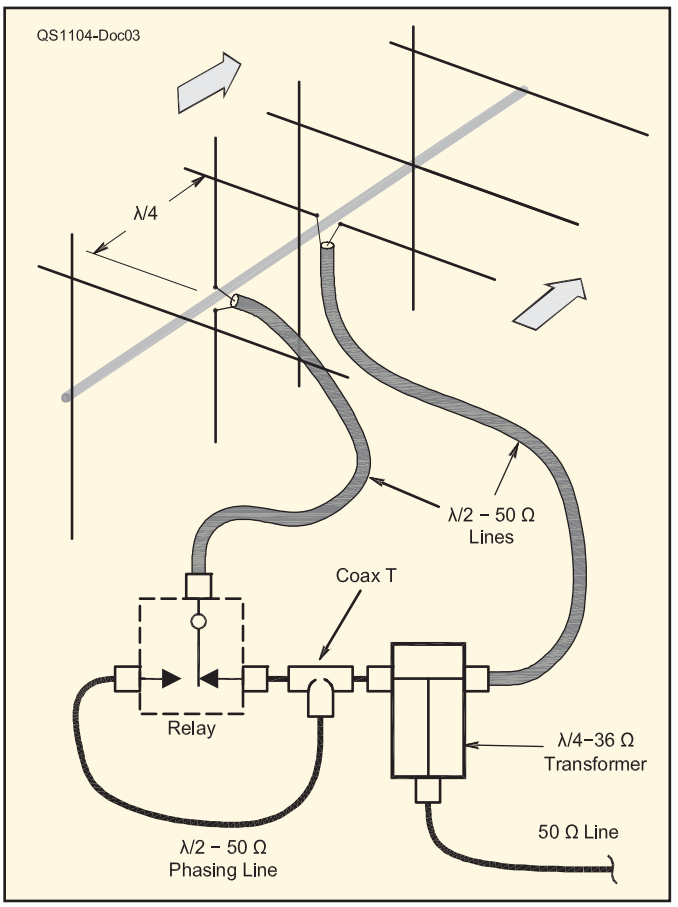


Figure 3 — Vertical and horizontal Yagis offset by ¼ wavelength on a single boom. The relay can be used to remotely switch from right hand to left hand circular polarization.

antennas. I will be using 40 and 80 meter inverted Vs, a commercial trap triband beam and a 2 meter ground plane.

The question is what impedance coax can be used with my antennas? I see that there are several methods by which I could transform impedances to get a better match to the coax, but are they worth the trouble? What are the pluses and minuses of 75 versus 50 Ω coax?

A Your Belden 9292 is a foam dielectric low loss 75 Ω coax similar in size to RG-11. It can definitely be made to work with your antennas. The issue is how does the characteristic impedance line up with your antennas and what are the results of any mismatch.

The triband beam may provide the greatest challenge — since its typical 2:1 or less 50 Ω SWR will tend to be on the low side — perhaps 25 Ω at resonance. This would be a 3:1 SWR on the 75 Ω cable. The loss in 100 feet of the cable would be about 0.8 dB if matched on 28.3 MHz (worst case for that antenna). With a 3:1 SWR it would be around 1.3 dB. You would likely lose more than the 0.5 dB in two transformers to make it match at both ends so I don't think the additional complication is warranted. If you spent the money for very low loss 50 Ω cable, such as LMR-400 you would have about 0.5 dB less loss on 10 meters, less on the lower bands. I would go with the free cable.

At the station end of the coax, the SWR could appear higher to your radio that is looking for a 50 Ω load. It could see a 50 Ω SWR of as high as 4:1. If you have an internal tuner in your radio, it could probably handle it. By adjusting the length, you could probably find a length that gives a lower SWR on each band.

So worst case on HF, you might need to add an antenna tuner to your station. If it were me, I'd go for it and make any needed adjustments at the station end. If your 2 meter ground plane is designed to provide a 50 Ω load, the cable SWR will be 1.5:1 — hardly noticeable for the usual 2 meter FM setup.

Q Jack, K4WY, asks: I am building a satellite antenna system and wonder if a multielement quad antenna system will give me circular polarization (CP) or should I use crossed Yagis?

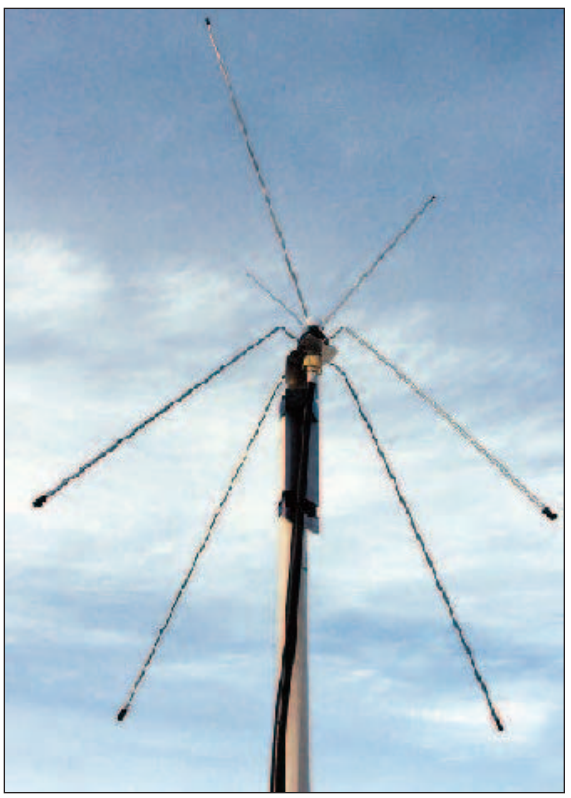
A In spite of its appearance, a quad is a linearly polarized antenna, just like a Yagi. If a quad is fed at the center of the bottom (or top) it is a horizontal polarized antenna. If it is fed from the center of either side it is a vertical. So you could feed two quads, just as you would two perpendicular Yagis phased 90° apart or offset by ¼ wavelength to provide CP. An advantage of the Yagis is that they can share a boom because they are perpendicular and won't couple. The two quads would need to be separated to avoid interaction. Thus, Yagis would be easier if you're starting over. Although there are other inherently CP antennas, if you need to switch sense the pair of Yagis with a remote switch on the phasing line is hard to beat (see Figure 3).

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

MP Antenna Super-M Classic Base

The Super-M Classic Base by MP Antenna is essentially a VHF/UHF ground plane antenna with multiband coverage. Like many antennas in this category, the Super-M Classic Base is intended to appeal not only to amateurs but also to scanner enthusiasts.

According to published specifications the antenna covers 25 to 1300 MHz, which includes a number of Amateur Radio bands from 10 meters through 1296 MHz. However, the Super-M Classic Base is designed to provide a low SWR for transmitting purposes on three bands: 144, 222 and 450 MHz.



Assembly

The Super-M is extremely easy to assemble. All you need is an Allen wrench, which MP conveniently includes in the package. There is no tuning or pruning required.

The first task is to unscrew the mounting hub to reveal eight holes and setscrews (Figure 1). While there may be eight holes, there are only four equal-length radials. So, you choose holes and insert radials to create a symmetrical pattern around the base of the antenna. You simply tighten the setscrews to secure the radials and then reattach the rest of the hub assembly. The three vertical radiating elements attach to the top of the hub using similar setscrews. The entire operation takes about 10 minutes.

Figure 1 — The first step in the assembly process is to unscrew the two halves of the mounting hub to reveal the holes and set screws for the radials.

The hub is attached to a flat steel bracket for mast mounting (Figure 2). MP includes two hose clamps that will allow you to fasten the bracket to any mast up to about 2 inches in diameter. The bracket also offers two holes in case you care to try an alternative method such as using twin nuts and bolts to attach it to a support.

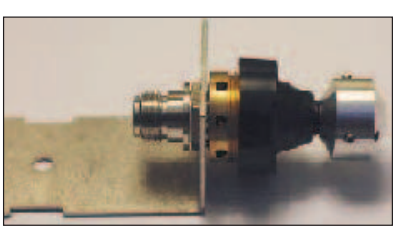


Figure 2 — The mounting hub is attached to a flat steel bracket. Notice the Type N coaxial connector.

For my temporary test setup I lashed the bracket to a PVC tube using standard electrical tape. (The antenna weighs less than 1.5 pounds so the tape held it securely.) I attached a length of 9913 coaxial cable to the Type N connector at the base of the hub.

The finished antenna is 34 inches tall and 21 inches across at its widest point. With the oddly angled elements the Super-Classic Base resembles an insect from outer space.

Testing On the Air

A sweep with an antenna analyzer produced some interesting results. The MP Super-Classic Base is indeed resonant in three amateur bands. The 2:1 SWR bandwidths extended from 130 to 152 MHz, with a dip to 1.5:1 throughout the 2 meter band. A low-SWR valley also appeared from 200 to 230 MHz, followed by another sharp drop between 436 to 460 MHz.

In my crude tests the antenna pattern appeared to be more-or-less omnidirectional. MP literature refers to the antenna polarity as "multipolar" rather than strictly horizontal or vertical. The antenna seemed to perform best with vertically polarized signals, although I did use it to make several contacts during the ARRL VHF Sweepstakes with good reports from stations using horizontally polarized antennas. Overall, I was pleased with the performance on each band. I even used the Super-Classic Base to make several satellite contacts with ease. It is worth noting that the antenna is rated at 200 W continuous output power.

The Super-Classic Base may be easy to assemble, but this is a very rugged antenna. The steel elements, for example, withstood my clumsy efforts to drag the antenna out of my house, banging them repeatedly along the walls and door jambs as I did so. Although the Super-Classic could function well as a quick-setup antenna for public service events and emergency communications, it is just as well suited for permanent installations.

The Super-Classic Base gives you access to three popular VHF/UHF amateur bands with a single coaxial feed line. That fact, coupled with its durable construction and easy assembly, makes this antenna well worth the price.

Manufacturer: MP Antenna, 7887 Bliss Parkway, North Ridgeville, OH 44039; tel 877-678-3243; **www.mpantenna.com**. *Suggested list price: $119.95. Available from Universal Radio,* **www.universal-radio.com**; *tel 800-431-3939.* QST

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

NØAX

HANDS-ON RADIO

Experiment 99

Cascode Amplifier

If you begin digging into RF amplifier circuits you'll soon encounter a strange looking beast referred to as the *cascode* amplifier. Looking a little like a totem pole, the circuit combines two single transistor amplifiers into a useful combination that's especially useful in amplifying the weak signals in receivers.

Cascade or Cascode?

At first glance, it's easy to think the name of the circuit is *cascade* which refers to stages connected with the output of one feeding the input of the next, as shown in Figure 1. Amplifier stages are often cascaded to increase total gain. That's not the function of the cascode circuit shown in Figure 2. True, the circuit has two stages and the output of the first is connected to the input of the second but there is a special requirement to qualify as a cascode.

The name hails from the days of vacuum tubes and is derived from cascade. In fact, it means "cascade to cathode", coined in 1939 to describe a circuit in which a pair of triode tubes replaced a single pentode.[1] The circuit's input stage is a common emitter or common source amplifier as was described in Hands-On Radio experiments 1 and 2.[2] The output of the first stage is then connected to the input of a common base or common gate amplifier, both described in experiment 28. (The circuits are also covered in Chapter 3 of *The ARRL Handbook*.[3]) This corresponds to the original common cathode input amplifier and common grid (or grounded grid) output amplifier. Figure 2 shows two different forms of the cascode amplifier — one is made from bipolar transistors and the other from FETs.

What Problems Make the Cascode Attractive?

Let's back up and discuss what the designers of cascode amplifiers are trying to accomplish. There are five basic needs (1-5). In many receiver circuits signal amplitude is very small, so high gain (1) is needed at high frequencies (2). The tuned circuits used in receivers are very sensitive to loading, so the circuits connected to them should have high input and output impedances (3 and 4) to avoid altering the tuned circuit's response. (You can find more information about the effects of loading on tuned circuits in Chapter 2 of *The ARRL Handbook*.) Finally, the circuit should be as stable as possible (5) to prevent oscillation or other spurious responses. That is a tall order for a circuit with only one transistor. Here's how the cascode circuit does its job — we'll use the FET version with the understanding that the bipolar junction transistor (BJT) version

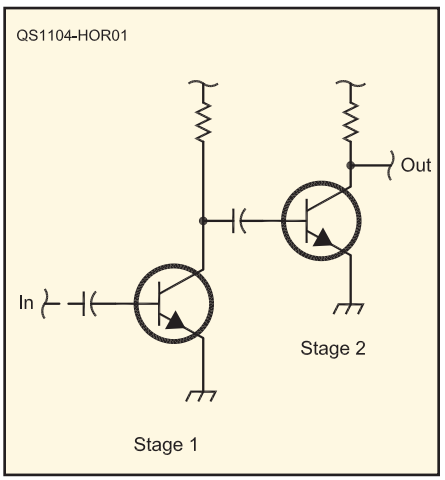


Figure 1 — Example of a two stage cascade amplifier circuit.

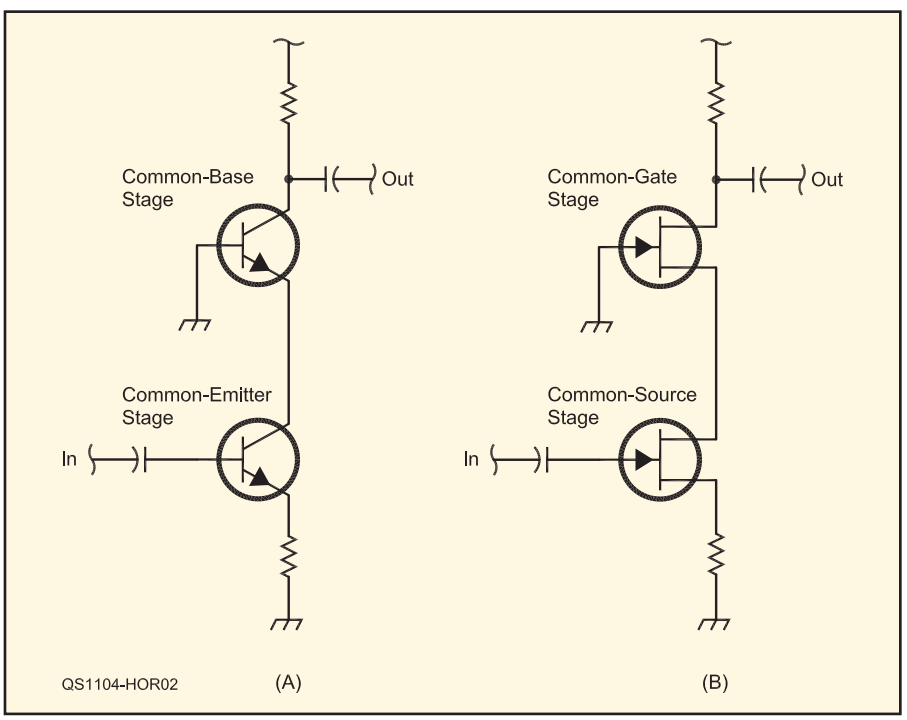


Figure 2 — Cascode amplifier using bipolar transistors (A) and FETs (B). The cascode configuration consists of an input common emitter (or common source) amplifier driving a common base (or common gate) amplifier. The combination results in a stable amplifier with wide bandwidth and high input and output impedances.

[1] **en.wikipedia.org/wiki/Cascode**

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

[3] *The ARRL Handbook for Radio Communications*, 2011 Edition. Available from your ARRL dealer or the ARRL Bookstore, ARRL order no. 0953 (Hardcover 0960). Telephone 860-594-0355, or toll free in the US 888-277-5289; **www.arrl.org/shop**; **pubsales@arrl.org**.

H. Ward Silver, NØAX ♦ 712 Jefferson St, St Charles, MO 63301 ♦ n0ax@arrl.org

operates similarly.

If you go back and study the common source amplifier, you'll find that it has medium-to-high input impedance — that's a good thing. Its output impedance, though, is approximately equal to the impedance connected to the drain and the voltage gain of the circuit is proportional to that impedance. That means the requirement for low output impedance and high gain are in conflict. In addition, the input and output terminals of any single-transistor amplifier are close together, creating stability problems at very high frequencies from stray capacitance.

The Miller Effect

There is another problem with the common source amplifier caused by the *Miller effect*. In a nutshell, the Miller effect describes what happens in a high gain common source (or common emitter) amplifier because of the internal capacitance between the drain (the output) and the input (the base), C_{DG}. (Replace C_{DG} with C_{CB} — collector to base capacitance — for a bipolar transistor.) If you measure C_{DG} with a capacitance meter it is very small — in the pF range — so you might not expect it to affect circuit performance very much. In a high gain common source amplifier, however, the output voltage at the drain is much larger and out-of-phase with the input voltage. That effectively multiplies C_{DG} by the circuit's voltage gain, A_V, creating negative feedback to the input. Feedback due to the Miller effect increases with frequency as the reactance of C_{DG} decreases, so high frequency gain is greatly reduced.

Why Two Different Amplifiers?

We could just use two common source amplifiers in regular cascade, but the Miller Effect would eat up high frequency gain just as for a single transistor. How do we get around the Miller effect and still have high gain? Instead of trying to get all of our power gain in one stage, we can use two stages that combine to give us the right type of performance.

The cascode amplifier's input stage is a common source amplifier, but with low voltage gain so that the Miller effect doesn't magnify C_{DG}. That gives us the high input impedance and some current gain at high frequencies. So far, so good!

To keep voltage gain of the input stage low, the input impedance of the second stage must be low. A common gate amplifier has that property. The output impedance of the common gate amplifier is high, satisfying another of our design criteria. While the common gate configuration's current gain is just under unity, it has voltage gain over a wide bandwidth. Thus, the current gain of the input stage multiplied by the voltage gain of the second stage results in high power gain overall. We've solved the input and output impedance problems, the bandwidth problem, and the power gain problem.

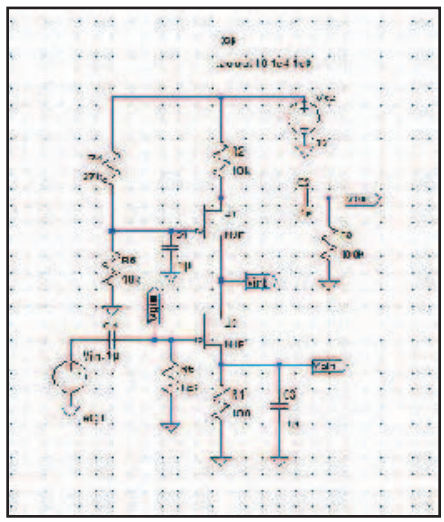


Figure 3 — Screen shot of cascode amplifier schematic using the *LTspice* circuit simulator.

There is one more property the circuit must have and that is stability. Solving the first four problems in a single-transistor circuit — particularly high gain at high frequency — makes it hard to prevent feedback from causing oscillation. Shielding the output from the input is also difficult when the transistor's input and output terminals are just a millimeter or two apart!

The cascode circuit has three attributes that promote stability. The first is that the input stage has low voltage gain so feedback through stray capacitance is minimized. The second is that the grounded gate of the output stage serves to isolate the circuit's output electrically. The third is that by using two separate transistors, the physical distance between the output and input is much greater, reducing stray capacitance between them. If needed, shielding can be installed between the two transistors, as well. We now have a circuit that satisfies all five of our performance requirements. Let's build one, shall we?

Building a Cascode Amplifier

The circuit in Figure 3 is an *LTspice* simulator circuit that you can also build on your workbench. (The use of *LTspice*, a free circuit simulation program, was described in experiments 83-86.) The *LTspice* schematic for this circuit is available as cascode.asc on the Hands-On Radio website. I recommend that for practice you construct the schematic yourself using the *LTspice* schematic editor. Use the "njf" component from the schematic library of models for the transistors. To build the circuit prototype, almost any N-channel JFET transistors will give good results for experimental purposes. The J310 and MPF102 are inexpensive, widely available and popular with homebrewers.

The simulation of the circuit illustrates why the cascode is a popular wideband amplifier. The input and output impedance are high while at the same time, the circuit's gain is nearly 12 dB from below 100 kHz up to many MHz. Start with the DC OPERATING POINT simulation (see the earlier experiments for instructions) and be sure that bias voltages and quiescent currents are reasonable.

Set up the AC SWEEP simulation by first making sure that the voltage source, V_{in}, is configured as an ac source with an amplitude of 1. Then select EDIT SIMULATION COMMAND in the SIMULATION menu and select the AC SWEEP tab. Enter the number of points to evaluate per octave and the minimum and maximum frequencies for the sweep. Click the RUN symbol, then use the cursor to select voltages V_{in} and V_{out}. You should see around 11 dB of gain over a wide range. Add a trace to show V_{int}, the voltage between the first and second stages. You'll see 0 dB of gain, confirming the technique of minimizing the Miller effect.

To experiment with the cascode circuit, change the quiescent currents by changing the ratio of R4 to R5 to change the gate bias for J1. Changing R1 will change the drain current for both FETs. Vary the ratio of R2 and R3 to see the effect of changing load impedance. You can also change the transistors to an NPN type, such as a 2N3904, although you'll have to add biasing for the common emitter amplifier at the bottom and adjust biasing for the common base amplifier at the top.

Parts List

Capacitors, 4 each 0.1 µF ceramic.
FET, 2 each J310 or MPF102.
Resistors, all ¼ W; 100 Ω, 2 each 10 kΩ, 27 kΩ, 100 kΩ, 1 MΩ.

Additional Reading

The cascode circuit is discussed in many circuit design textbooks and in *The Art of Electronics*.[4] You can find many practical working designs on line and in the December 2007 *QST* article "The Hybrid Cascode — A General Purpose AGC IF Amplifier" by W7ZOI and WA7MLH. There are Feedback items by the authors in the January and February 2008 issues, as well.

[4]Horowitz and Hill, *The Art of Electronics*, 2nd edition, Cambridge University Press. See **frank.harvard.edu/aoe/** for more information.

AG1YK

HINTS & KINKS

BIG SLING ANTENNA RAISER

♢Sling shot and spinning reel, bow and arrow, and crossbow and bolt all seemed like good ways to get a line up into a tree to pull an antenna into the nirvana above 45 feet.

Ha!

Monofilament and a weight can be projected by a wrist rocket to adequate heights but the weights get themselves wrapped around any handy branch and you can't readily tell where the they end up; they are nearly invisible above 25 feet.

I found crossbow bolts much too light to tow a nylon mason's string any useful height. More than a few yards of both yellow and pink string dangle from the other of my target maples. A bow and arrow is just dangerous. In desperation I even contemplated purchasing a little RC helicopter to fly the cord over the target trees but I couldn't figure out how to release the cord onto the tree top.

Then genius set in — water balloon launchers (WBL). Their ads claim a range of 25 yards to a ¼ mile and one with a modest range is cheaper than any of those other machines I mentioned. I bought a 150 yard WBL for $15 from Think Fast Toys (**www.thinkfasttoys.com**). **Amazon.com** and **www.sillytown.com** also have WBLs. I suspect that any retail toy store with an adult section would have them. They are very popular at the beach. The added cost would have been worth it since, with a softball and mason's twine, the 150 yard model cleared a maple tree about 60 feet high and several other trees behind it.

The oak at the other end is taller and I never could get even the baseball over the top of it. After five or six tries I settled for a high branch 10-15 feet below the top at about 70 feet. So I gauge that the 150 yard launcher can reach about 60 feet with a softball, maybe 70 with a baseball. It'll launch a grapefruit with bright pink cord attached over a 60 foot maple tree with ease and a couple of the trees behind it as well. An orange is easily launched over an 80 foot maple in a grove of interfering maple, pines and birches. For my purpose, a fake baseball was adequate. Brightly colored projectiles and line were invaluable. Figure 1 shows my first attempt to get that yellow softball over the oak.

DUNCAN MORRILL, KB1THS

Figure 1 — Duncan's first attempt to get that yellow softball over the oak. Note his use of a launcher frame to support the WBL.

In using the WBL you do need to be careful. On my second launch I was seated on the ground and pulled until I was almost flat on my back. My Super Golden Slingshot backfired — the two stakes holding the launcher's restraining ropes pulled out of the damp ground — and it slammed back at me almost breaking a couple of my ribs. [Careful! As Duncan notes this is an *adult* toy and can cause injury if misused. — *Ed.*] Take note that a water balloon launcher with any appreciable range requires a launch team of two men and a boy (a strong boy, that is), or absent these, build a launcher frame of 1½ inch PVC, as I did.

I've finally gotten the wire, balun, etc, rigged up. Right now the antenna rig is all in rope, essentially a prototype so I can work out the details, like feed line positioning, before committing to wire. Oh, yes, my antenna will be a Len Carson 120 foot Windom (**www.hamuniverse.com/k4iwlnewwindom.html**) running from 55-70 feet. Watch out ether, I'll be on the air momentarily. — *73, Duncan Morrill, WV1J, Old Kings Rd, Merrimack, NH 03054,* **wv1j@qsl.net**

HOT GLUE FIX-IT

♢We all have some sort of kit we keep handy for repairs. Here's an idea you'll learn to value like a Swiss Army knife. Go to a hardware or craft store and buy a small box of hot glue sticks. They come in various diameters and lengths. Also, if you don't carry one, get a couple of ordinary butane cigarette lighters. Keep the glue sticks and the lighters close at hand.

Simply rotate the stick's end in the flame of the lighter until the blob at the end is soft enough to apply and then dab it on where you want. If you're fast, you can stick a second item on top of the glue, but if it has cooled, simply reheat it with the lighter flame.

Hot glue is reusable, waterproof, works as an insulating coating, fills holes and large cracks and can be removed from most hard surfaces either hot (with a flat screwdriver blade) or cold (with fingernails, etc). You can use it as a grommet to protect wires that pass through a chassis hole. It can be used to "tack down" wires to a chassis or to attach a small project box to the outside of another plastic, wood or metal object. (It can be removed later, though expect it to leave smudges or minor heat markings.) It can be used to affix signs and labels, to seal pots from external moisture or to secure twisted wires when you don't have solder available.

To fill an unwanted hole in most chassis material, stick a piece of electrical tape over the outside of the hole. Now, using the lighter liberally, heat the glue stick until it runs in a small string into the hole, overfilling it just slightly. Once the hot glue has cooled, remove the tape from the outside and use a permanent marker to color-match the repair.

You can shape hot glue, while it's still hot, if you put a good layer of saliva on your fingertip to both shield your skin from the heat and prevent the glue from sticking to your skin. I've used this technique hundreds of times to form moldings around a repaired miniplug for headphones, patch cords, etc. You can also trim hot glue with a sharp

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

knife blade, thread small screws into it and thumbtack into it. Small globs of hot glue make excellent shock bumpers, too.

Just use good sense and a little caution. Hot glue can catch fire and when it's hot enough to melt, it's hot enough to burn unprotected skin and delicate materials. Also, don't use it to hold any object that heats up during its normal use. Keep it *off* the soldering iron, too. — *73, Paul Schlueter III, KB3LIC, c/o DLARC, PO Box 3026, Easton, PA 18043,* **twelvevdc@aol.com**

MICROPHONE CLAMP

◊I use a wire clamp known as an Adel loop clamp for my microphone holder (see Figure 2). It is a metal strap with a protective rubber shell that will not scratch what it is hanging on. It bends to any shape hook you might need. It's cheap, it works, it's very available and can be used on any brand microphone.

If you're operating mobile, you can hang the clamp on your hand and still have most of it available to hold the wheel with your small finger keying the microphone. I have two fingers missing from my hand and only 50 percent use of what's left. Using the Adel clamp I don't have to hold onto the microphone. The hanger also easily hangs on anything so you're not distracted when trying to hang up the microphone.

LEE GEORGE, KE4VYN

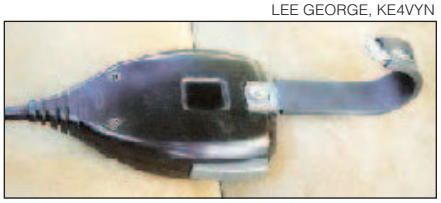


Figure 2 — An Adel loop clamp attached to the back of your mobile microphone allows you to "hang" the microphone from your hand, leaving your fingers free to grip the wheel.

With all the collateral damage hams are receiving from people using cell phones, this hint actually makes for safer travel. Your hand does not hold the microphone, so you can still grip the wheel. You do not have to hang up the microphone when finished and so your eyes never leave the road. Your primary fingers do not press the PTT, only your pinky.

If you do have to hang the microphone, the wide hook allows for hanging on most any surface. No looking for the hole. Finally, its home engineered look fits with most hams. — *73, Lee George, KE4VYN, 3420 Deerwood Cir, Vestavia Hills, AL 35216-4816,* **ke4vyn@msn.com**

CRACKING WALL WARTS — A BETTER WAY

◊"Hints and Kinks" has published many methods for opening wall warts. I have been servicing wall warts for many years and offer the following method:

1. Put on some safety goggles. Place the wall wart on the work bench on top of a leather glove or similar cushioning with the seam side up.

2. Using a dull pocketknife, lay the edge of the blade lengthwise along the seam. Use the edge of the blade — not the point.

3. Give the blade a few taps with the hammer along the seam, then flip the wart over and repeat the process. The case will easily and neatly open along the seam.

After making your repairs, apply plastic model cement to the seam and clamp the case together till the glue dries. The repair is barely noticeable, since the case is undamaged.

I have used this method for several years and have not had mechanical difficulties or electrical problems since there is less chance of damage to the case and internal parts. Give this a try the next time that pesky little power supply needs repair. — *73, Steve VanSickle, WB2HPR, 3010 Tibbits Ave, Troy, NY 12180,* **wb2hpr@arrl.net**

ASK YOUR DENTIST

◊While going to the dentist with my daughter, I struck up a conversation with him as he was cleaning my daughter's teeth. As he was using an assortment of stainless steel picks and other tools, I made the mention of how handy they would be for working on radios and soldering. He generously offered an assortment of used dental tools that have lived past their use in a dental office.

He said that these tools cannot be resharpened and he is always buying replacements, leaving him with many items that he must dispose of. As I was graciously accepting his gift and telling him of the uses that I will have with them in working on my radios, he began telling me that his uncle was a ham operator when he was a kid. So for all those people who fear the dentist, next time think of the new (to us) tools we can take home for our hobby. — *73, Jim Derra, KF6HYD, PO Box 106, Grenada, CA 96038,* **kf6hyd@arrl.net**

GREEN ENERGY IN THE SHACK

◊We are all trying to move to a greener environment. Many hams have experimented with green energy solutions such as solar, wind and hydrogen fuel cell technologies. Most of these experiments have focused on Field Day and Emcomm applications. Up till now green energy devices for the shack have been expensive and complex.

I have happened upon a new green energy technology solution that is perfect for use right next to your rig. A company called Thermoelectric Ultra Seebeck Hybrid Equipment is marketing a thermoelectric charging unit (TCU) designed to be applied to the underside of the typical office chair.

As we all know, the human body has a temperature of 98.6°F (even higher during contests) and the average shack air temperature is about 68°F. The TCU utilizes the Seebeck effect [the direct conversion of a temperature difference into electricity. — *Ed.*] to generate about 4 V dc, a voltage sufficient to charge a lithium-ion (Li-ion) battery.

The TCU comes complete with the thermoelectric module, mounting components and a battery charging unit able to hold 4 AA Li-ion batteries (batteries not included). I found the installation to be simple and straightforward. Apply a coating of thermal grease to both the chair bottom and the TCU, mount the TCU to the chair using the adjustable brackets that attach to the chair edges. Plug in the battery charger and you are good to go. Once installed the TCU will silently charge your AA batteries, hour after hour, as you operate.

A couple of notes are in order. As explained in the instructions, charge time is gender dependent. Since heat transfer is related to surface area, and typically female hams have a smaller footprint when operating, a 37 percent reduction in power output can be expected for such operators. The TCU is designed to maintain a constant charging voltage for varying thermal input but charging current will drop and, therefore, charging time will increase.

Second, a problem I found in my early production model is that the battery charging unit was supplied without a polarized connector. This should be replaced with a polarized connector before use. While plugging in the battery pack with polarity reversed will not harm the batteries or the TCU, the nature of thermoelectric devices is such that, with polarity reversed, the TCU will draw power from the batteries and convert that power into heat, which will then be applied through the thermal grease to the bottom of the chair. This can become uncomfortable. — *73, Steve Sant Andrea, AG1YK,* **ag1yk@arrl.net**

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

QST invites you to share your hints with fellow hams. Send them to "Attn: Hints and Kinks" at ARRL Headquarters, 225 Main St, Newington, CT 06111, or via e-mail to **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

Canadian Club Digs PICAXE

Good planning combined with a good project equals great club interest.

Dave Green, VE3TLY; David Conn, VE3KL, and Mike Kelly, VE3FFK

Most of us are aware of how common microcontrollers have become in our daily lives. We find them under the hoods of our cars, in our kitchen appliances, in our home entertainment systems and of course in our Amateur Radio equipment. But how many of us have had a chance to actually sit down and program one of these devices and apply it to one of our own projects?

For the past 2 years, the Ottawa Amateur Radio Club (OARC) has been running projects designed for the beginner to introduce its members to microcontrollers and their use in Amateur Radio applications (see Figure 1). In this article we briefly outline microcontroller devices and describe our project, explaining how we organized it and what we achieved. We also offer some comments that might be helpful for those of you who are considering a project of this sort for your own club. Of course, club projects are more than just learning experiences. They're a great opportunity for club members to get together informally to socialize. It's a great way to stir up enthusiasm.

DAVE GREEN, VE3TLY

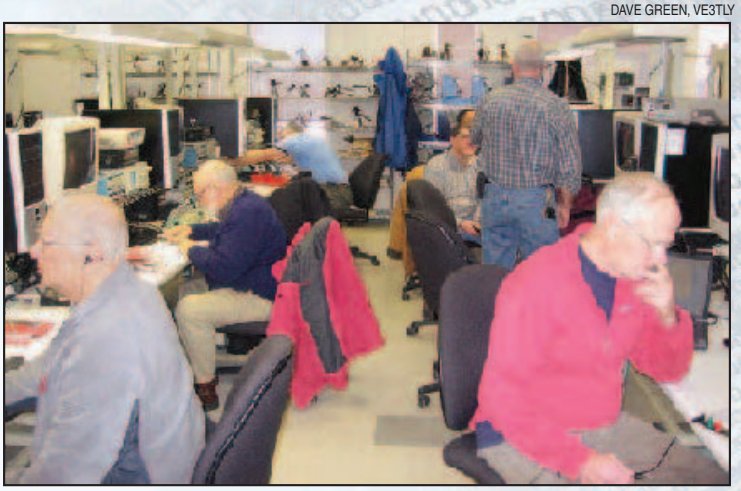


Figure 1 — Members of The Ottawa Amateur Radio Club hard at work programming their PICAXE microcontrollers.

What is a Microcontroller?

Microcontrollers are single-chip microcomputers that are designed for control applications. They contain many input and output lines for interfacing to digital hardware and analog-to-digital converters (ADC) so that analog voltages can be sampled directly by the chip. They also include programmable counters and timers, serial interfaces for communicating with other computers and serial buses for interfacing easily with other peripherals such as displays and external memory chips. Internally, microcontrollers may consist of 8-bit, 16-bit or 32-bit architectures and some more advanced examples even include digital signal processing (DSP) capability.

Although our project was based on an entry-level processor, club members were able to demonstrate a variety of interesting microcontroller-based applications. These included an iambic keyer, a low-power RF wattmeter, a simple digital voltmeter, a battery charge control system and an antenna tuner. Not bad for a bunch of "amateurs." The microcontroller we used is a slow speed device that is well suited to the beginner; it is not adequate for more advanced applications such as software defined radio (SDR).

Fortunately, there is an easy way to learn about microcontrollers. In the past few years, a number of microcontroller devices have been introduced to the hobby/education market. These devices are inexpensive, easy to program and surprisingly functional. While there are a variety of devices to choose from, our club selected the PICAXE for its project. [The ARRL store has an experimenter's kit "What is a Microprocessor?" that includes a book and kit of parts for learning about the BASIC Stamp microprocessor.[1]]

The PICAXE Microcontroller

PICAXE is a family of microcontrollers with a built-in language interpreter to vastly simplify program development. Revolution Education Ltd developed the PICAXE and provides a great deal of support information on their website.[2] You can choose from a variety of PICAXE chips ranging from 8-pin to 40-pin devices.

Programming the PICAXE

As a beginner, you will find the PICAXE far easier to program than a "raw" microcontroller. It uses a programming language similar to *BASIC*. Both the *BASIC* language and the software development tools are easy to learn and, best of all, they're free.

The PICAXE programming language consists of a set of commands that perform a wide variety of actions. For example, you can use commands to set digital output lines *high* or *low*, to sample the digital input lines, to read an analog voltage and convert it to a binary number, to control motors using pulse-width modulation (PWM), to count pulses and so on. The PICAXE also provides serial input and output commands that can be used for a number of purposes such as rig control, communications with a PC or to drive a serial liquid crystal display (LCD) device. The language also supports many simple programming primitives like looping, branching and subroutines.

To program the PICAXE, you first have to download and install the free *PICAXE Programming Editor* from Revolution Education website. The *Programming Editor* is a *Windows* application and provides tools for editing and compiling user programs. *Linux* and Mac users can find other development toolsets on this website. The *Programming Editor* includes a full documentation set explaining the operation of the PICAXE and gives numerous examples of how to interface the PICAXE for a variety of applications. It also contains a complete reference guide to the command language. No other documentation

[1]Notes appear on page 63.

or tools are necessary to get started.

The *Editor* also includes a simulator that allows you to explore the detailed step-by-step operation of a program during development. In fact as a starting point before buying any hardware, you can download the *Editor* and build programs that run on the simulator without any hardware at all. This can be very instructive. Some "debugging" tools are also provided to help isolate programming errors that always arise. Like it or not, you will become familiar with the operation of the debugger.

You will find the program development cycle to be quite simple using the tools provided. After you have written a program and compiled it on the PC with the *Editor*, you download it directly to the PICAXE using either a serial or serial/USB cable. After download, the program runs on the PICAXE. At this point, you can assess how well the program behaves and what changes have to be made. You will probably have to repeat the process a number of times until you have caught all the "bugs" in your program.

DAVE GREEN, VE3TLY

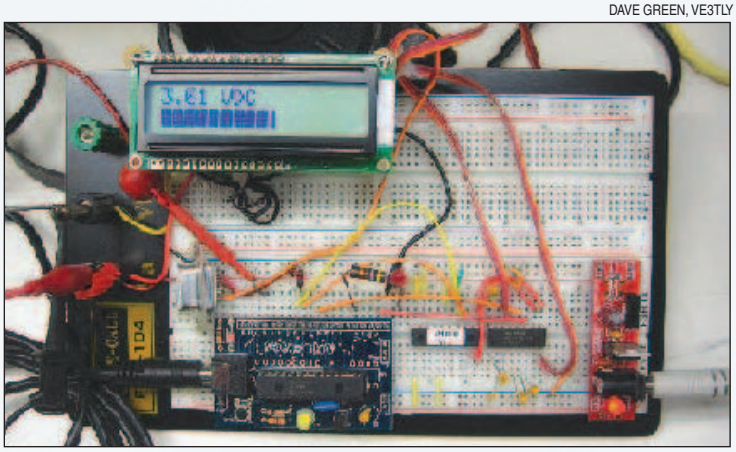


Figure 2 — The PICAXE Starter kit is shown here with an additional LCD display and other components demonstrating a simple digital voltmeter. The PICAXE circuit board is at the lower center of the photo and the regulator board is at the right. The serial download cable is visible at the lower left of the photo and connects the PICAXE board to the development PC.

The Club Project Part I

We began the project by announcing the idea at club meetings early in the fall season. By this time, the project leaders had done their homework. They reviewed different processor types and checked kit availability and prices. The leaders each ordered sample kits and spent some time exploring their use before making final recommendations to the club. This involved building some sample demonstrations and becoming familiar with the software development tools. We decided the project would run every other Saturday morning during the winter months, for a total of six 3-hour sessions.

We also lined up a suitable meeting place for the group. In our case, we were fortunate that one of our club members, Richard, VE3UNW, could arrange access to labs at Algonquin College, a local community college in Ottawa. This facility proved to be ideal. Apart from bench space, the lab included white boards that were often used to discuss concepts and an LCD projector that was used for giving short presentations. The lab space also encouraged club members to mingle and to assist each other during the learning process. It really was a good learning environment. As a social event, some members made a point of meeting for breakfast before each session and often reconvened for lunch afterward.

For this project, we selected the PICAXE-28X1 device that comes in kit form. The kits are reasonably priced, can be assembled in a couple of hours and are readily available.[3] The kit we chose is the PICAXE Starter-28 kit that retails for about $50. The kit (see Figure 2) includes a small circuit board containing the PICAXE chip and support devices. It also includes a 5 V regulator circuit board, a two-panel solderless breadboard, a serial download cable and a set of jumper wires for building experimental circuits. The kit does require some assembly and soldering but it really is good value for the money. The website lists a large assortment of optional extras that can be easily interfaced to the basic PICAXE chip.

This project grabbed the attention of the club membership from the beginning. We had about 25 people sign up in each of the 2 years we have run this project. We began the first session by assembling the kits and verifying their operation. At the next session, we introduced everyone to the program development tools and the documentation. At the conclusion of the second session most people were already running programs.

So what did we do after that? In the first year of the project, we introduced more advanced concepts as we went along. At first, we explored simple programs to toggle digital output lines to blink LEDs. We also explored the use of digital inputs for detecting switch closures and the use of the on-chip ADC for sampling external analog voltages. Finally,

Helpful Project Thoughts

Leadership

The project leaders need not be computer experts but they must explore the technology carefully in advance. This will prevent the group getting in over its head. The leaders must plan to introduce the technology in a step-by-step manner to maintain the interest of the participants. It is also the responsibility of the leaders to select a suitable processor and kit.

Administration

We found it helpful to have a volunteer willing to handle the paperwork associated with collecting the money and ordering the kits for the project. The project leaders wish to thank Mike Kelly, VE3FFK, who looked after that for this project.

Meeting Location

Project sessions work best if the room provides adequate workbench space, access to convenient electrical outlets and an LCD projector and screen, if available. The space should allow people to easily mingle and exchange ideas.

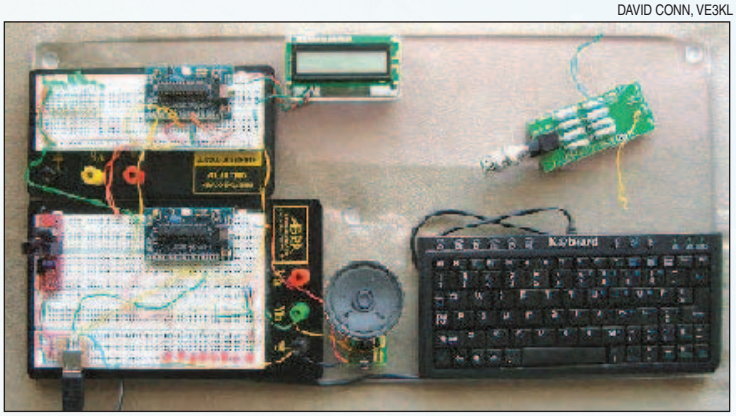
Hands-on

The project should balance "doing" along with concepts and theory. A well thought out project will lead the participants through the important aspects of processor architecture and interfacing fundamentals without going into a lot of painful detail. The project leaders should provide goals and demonstrations to maintain the momentum. The group should always be encouraged to contribute ideas as to where the project might go.

Communication

We found it important both before and during the project to use e-mail to keep everyone up to date. We reported progress in the club newsletter and at our regular meetings.

DAVID CONN, VE3KL



Shown are two PICAXE kits used in the second year of the project to illustrate interfaces for LEDs, an LCD display device, an ASCII keyboard, a speaker and an Elecraft DL1 20 W dummy load (upper right). The dummy load includes a diode detector whose output was interfaced to the ADC input of the PICAXE to demonstrate a simple RF power meter.

we built a basic iambic keyer that interfaced a paddle to a Yaesu FT-857D transceiver.

The Club Project Part II

In the second year, we organized the project differently by dividing it into three sections. The first section repeated the first year's project for newcomers. The second section, the largest group, continued from the first year's project. The third section consisted of a small group that wanted to move ahead and explore a raw PIC microcontroller rather than continue with the PICAXE.

For those in the second section who had followed the project the previous year, we explored a variety of tasks in Part II. For example, we looked at adding peripherals to the microcontroller using the built-in I2C serial bus. Using the I2C bus, we added an LCD display device and a clock calendar chip. We were now able to demonstrate a working clock/calendar.

This group also learned how to interface a standard PC keyboard directly to the PICAXE and to interpret the scan codes produced by the keyboard. This provides a runtime user input device to the PICAXE for other applications. In the process, we learned how to use the PICAXE onboard EEPROM (electrically erasable programmable read-only memory) to provide a convenient translation between keyboard scan codes and standard ASCII characters.

Finally, we demonstrated a simple RF power meter. The meter uses a dummy load that handles 10 W of RF input and an envelope detector to provide a dc output to the PICAXE. Software in the PICAXE then translated the dc voltage into the equivalent input power level that was displayed on the LCD. The power level was derived either by calculation or by using an EEPROM lookup table.

The third section used a PIC evaluation module ("Debug Express") from Microchip Technology Inc.[4,5] This device is programmed using either *assembly language* or *C* and the kit includes a complete Integrated Development Environment (IDE) and a limited compiler. A full-blown compiler adds considerable cost. The main advantage of the PIC environment is that it provides a complete software library that includes most standard *C function calls*. This includes a lot of math functionality not available in the PICAXE. Also, programs written in *assembler* or in *C* for the PIC tend to run significantly faster than similar programs written for the PICAXE. The downside is that software development for the PIC is not for beginners.

Using the PIC, we were able to demonstrate the low power RF power meter. In addition to displaying power in watts, the meter displays power in dBm and presents a bar graph. While this is a nice little demonstration, writing the functions for calculating logarithms using fixed point arithmetic as required for the dBm measurement is not for the faint of heart.

Conclusions

Without a doubt this project was a terrific success. Not only was it technically interesting but also it stimulated interest in the club itself. We were gratified by the enthusiastic response of the participants and we were frequently encouraged with ideas and suggestions. A number of people developed their own demonstrations during the project. Later in the year, our club held a "PICAXE Show-and-Tell" at one of its regular meetings. This gave everyone in the club a chance to see how much could be accomplished with these simple microcontrollers. Processors like the PICAXE are an easy and inexpensive entry point into the world of microcontrollers. Why not give it a try?

Acknowledgments

The authors wish to thank several members of the Ottawa Amateur Radio Club for their contributions to the project. Richard Hagemayer, VE3UNW, arranged the use of the lab facilities at Algonquin College. Bryan Campbell, VE3ZRK, and Wayne Getchell, VE3CZO, provided technical assistance in preparing some of the interface components used during the project. Thanks are also offered to Graham Ide, VE3BYT, for some of his early suggestions that helped formulate the project. Without all of this assistance the project would never have happened. An expanded version of this article originally appeared in January/February edition of *The Canadian Amateur* (**www.rac.ca**).

Notes

[1]Available from your local ARRL dealer, or from the ARRL Bookstore, ARRL order no. 1217. 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]**www.picaxe.co.uk**

[3]**www.hvwtech.com**

[4]**www.microchip.com**

[5]*PIC Programming for Beginners* (order no. 0892) and its companion *PIC Programming Kit* (order no. 0030) are available from your local ARRL dealer, or from the ARRL Bookstore. Telephone toll-free in the US 888-277-5289, or 860-594-0355, fax 860-594-0303; **www.arrl.org/shop**; **pubsales@arrl.org**.

Dave Green, VE3TLY, obtained his certificate in 2002. He holds a Master of Engineering in Electrical Engineering and is now retired after a career in the design and application of real-time multiprocessor systems at the National Research Council of Canada. He has broad interests in Amateur Radio. Dave is a member of RAC, ARRL, RSGB and the IEEE and is president of the Ottawa Amateur Radio Club. He can be reached at 410 Hamilton Ave S, Ottawa, ON K1Y 1E1, Canada, **ve3tly@rac.ca**.

David Conn, VE3KL, an ARRL member, is Professor Emeritus, Department of Electrical and Computer Engineering at McMaster University. He received his Amateur Radio license in 1952. He is the vice president of the Quarter Century Wireless Association Chapter 70 in Ottawa and is the author of the "Antennas & Transmission Lines" column in The Canadian Amateur *magazine. David also writes for the New Zealand Amateur Radio magazine* Break-In. *David is an active member of the Ottawa Amateur Radio Club where he organizes annual club projects, gives technology talks and takes part in ham radio community events. He can be reached at 24 Terrace Dr, Ottawa, ON K2H 9H2, Canada,* **dave@ve3kl.com**.

Mike Kelly, VE3FFK, was licensed in 1970. He is an Accredited Examiner for Industry Canada. Mike's Amateur Radio interests include operating under "adverse conditions" and bike mobile operation (HF, VHF). Mike is a well-known Elmer in Ottawa and is a keen home-brewer. He is also very active in Amateur Radio public service activities. He is a Life Member of RAC, a member of Bicycle Mobile Hams of America, AMSAT, the Emergency Measures Radio Group and of the Ottawa Amateur Radio Club. He can be reached at 25 Stevenson Ave, Ottawa, ON K1Z 6M9, Canada, **ve3ffk@rac.ca**.

Amateur Radio at Nanjing Wu Tang Middle School

Ham radio forms an essential part of Chinese middle school education.

Xu Hui, BA4RM

Wu Tang Middle School is located in the northern part of Nanjing, the capital of Jiangsu province in east-central China and serves about 500 students. Amateur Radio is a traditional part of the school's science and technology activities. Our school's Amateur Radio club has been awarded the Advanced Collective Prize in Nanjing twice and the Science Education School Award by the Nanjing Educational Bureau in 2008.

A Slow Start

The Amateur Radio club was created along with the Wu Tang Middle School in 1992, but it was not until 1993 that we obtained our first receiver, a second-hand model 239 (a military radio produced in the 1970s).

I start by teaching the students how to listen to Amateur Radio stations. I also collected plans for building homemade receivers and designed some simple kits suitable for teenagers to assemble, such as a simple HF receiver, which the committee of the Jiangsu Youth Radio Communication Contest (JYRCC) selected as the contest kit, and an SWR power meter.

During the 10th Jiangsu Middle School Students Work Concerning Telegraphing and Radio Operation Contest in 2007, we learned that the Jiangsu Provincial Military Command planned to build a telegraphy and radio operation training base for middle school students. After some effort, Wu Tang Middle School was chosen and received donations of equipment worth 40,000 yuan.

The Wu Tang Middle School Amateur Radio Station, BY4RWT, began operations in March 2001 (see Figure 1). At present, the station owns an ICOM IC-910H VHF/UHF transceiver, an IC-725A HF transceiver, a Yaesu FT-817ND transceiver and an MFJ-269 antenna analyzer. Besides routine communication, we have also experimented with RTTY, SSTV and satellites.

School-based Amateur Radio Curriculum

Wu Tang offers Amateur Radio courses in grades 7 and 8. Students in grade 7 learn basic radio communication, including using the phonetic alphabet, making QSL cards and using handheld transceivers. Students in grade 8 learn electronic construction skills,

Figure 1 — Students operating at Wu Tang Middle School station BY4RWT.

Figure 2 — Students in Grade 8 learn electronic construction techniques.

including how to solder and use a volt-ohm-milliammeter (see Figure 2).

I have designed some simple kits for students to assemble, such as an electromagnetic detector, a wireless microphone and a CW transmitter. Students took great interest in the kits and learned electronic construction skills through them.

I also wrote two textbooks, *Entering Amateur Radio* and *Electronic Construction*, to help students study Amateur Radio systematically. *Entering Amateur Radio* won first prize for the Best Teaching Case in a Nanjing Middle School. Mr Chen Ping, BA1HAM, Secretary General of the Chinese Radio Sports Association, wrote the preface for the book and made valuable suggestions for revision.

Science and Technology Contest

Students are fond of taking part in different kinds of science and technology contests. Every year our students participate in the Nanjing Middle School Students' Science and Technology Innovation Contest (STIC), the JARCC and the National Youth Radio Communication Championship Contest (NYRCCC).

The STIC requires students to make a technical device by themselves. The award goes to the device that is the most innovative. The JARCC requires competitors to communicate over a certain distance using a handheld transceiver. The accuracy of the message and the elapsed time is taken into account when judging their performance.

Students showed great enthusiasm during the contest. A simple field strength meter, made by Ye Xiaolan, won the second prize in the 2009 STIC. The Wu Tang Middle School team was awarded first prize in eight categories in the JARCC. In the 2009 NYRCCC, Wu Tang Middle School won the second prize in the handheld transceiver routine communication competition and two students, Ye Pin and Wu Huachao, were awarded the silver medal.

Amateur Radio brings us into a marvelous and mysterious world of radio communication and has brought great pleasure to my life as well as my students'. In the future, I plan to design an automatic FM broadcast receiver, combined with a computer to record signal strength automatically. The goal is to study the characteristics of long-distance VHF propagation, including the appearance of sporadic E. I would like to exchange information with other radio amateurs who have similar interests.

Finally, I'd like to thank Emil Pocock, W3EP, who sent me materials to prepare a laser communication experiment for next term.

Photos courtesy of Xu Hui, BA4RM.

Xu Hui, BA4RM, graduated from the Department of Physics, Nanjing Normal University, has been a member of Chinese Radio Sports Association since 1992 and holds a first-class license. He now teaches science at the Nanjing Wu Tang Middle School. Xu Hui has published nearly 50 articles in journals like Wireless. *You can reach Xu Hui at* **ba4rm@126.com**.

Radio from the Lowest of the Highs

Brian and his trusty K2 challenge the lowest of America's high points.

Brian Wingert, N7RVD

Figure 1 — Brian setting up his antenna on Woodall Mountain in Mississippi.

If you read Mark Volstad's "QRP from the Top of the Maritimes" article in *QST*, you are familiar with the Adventure Radio Society Top-of-the-World challenge.[1] The idea is to operate a ham radio station from the 50 highest points in the United States and Canada. I first discovered Top-of-the-World 10 years ago, when I lived in an "antennas prohibited" Seattle apartment and operated primarily from parks, beaches and mountains.

The high points near Seattle are Mt Rainier, 14,410 feet; Oregon's Mt Hood, 11,239 feet; Borah Peak in Idaho at 12,662 feet and Montana's Granite Peak at 12,799 feet. These aren't just high points. These are mountain climbing expeditions and too ambitious for a cubicle-dwelling desk-jockey. I decided to forget Top-of-the-World.

Ten years later, my wife and I were traveling around the country and spending the winter in the southeastern United States. We have some time on our hands and no specific plans. I accidentally stumbled across the Top-of-the-World web page for a second time, which started me thinking. The Southeast doesn't have mountains like the Rockies or Cascades. Maybe there are high points that would entail a short hike. Perhaps one could even drive to a summit. This might be fun.

Checking the Web there appeared to be high points in Florida, Georgia, Missouri, Mississippi and South Carolina that I could reach without breaking my back or going too far out of the way.

Gearing Up — The Radio

My Elecraft K2 transceiver was a good choice for this adventure with batteries, speaker, keyer and tuner built right in for a one box solution. Attach the antenna and a paddle and you're ready to play.

Weighing 6.6 pounds, the Elecraft is large for a hike, but, the toughest trail I anticipate is Georgia's Brasstown Bald, 6/10 of a mile uphill on a paved asphalt trail. More importantly, the K2 has significant advantages over my other low power rigs: multiband operation, built-in antenna tuner, DSP noise reduction and power output up to 15 W. Although I plan on running 5 W, it's nice to know there is more power available if conditions warrant.

Antenna Selection

Since I don't know what conditions will be like at the summits, I need to plan for a self supporting antenna with reliable multiband performance. Additionally, it should be light enough to hand carry and rugged enough to survive the trip.

My family and I enjoyed these outings, especially Brasstown Bald, which was the toughest hike and the toughest operating conditions — in a nutshell, it was the biggest adventure.

The screwdriver antenna on our motor home's ladder has produced amazing results. It has made me a real fan of center loaded whips. I have a heavy camera tripod for a support base and I decided to build a center loaded whip.

At the local hardware store I spent a lot of time walking the aisles. My antenna project came together using two motor shaft pulleys, some PVC conduit pipe and fittings, a length of ½ inch aluminum tube, an alligator clip and some hook-up wire. Finally, after some experimentation, I added a 66 inch rod from Buddipole.

The finished antenna has a 30 inch lower support shaft, a 12 inch long by 1⅞ inch diameter loading coil and the Buddipole telescoping whip. It extends from 4½ feet to 8½ feet, tunes 40-10 meters and attaches to the tripod in seconds.

Taum Sauk, Missouri, 1772 Feet

Taum Sauk State Park (pronounced Tom Sock) is located in an area of forested gentle-rolling hills. There was a gravel parking area for 40 cars. Rain had soaked the area for the past 3 days and more was forecast. I lucked into a dry afternoon sandwiched between days of rain. I strapped on my pack and took off with the antenna in one hand and the tripod in the other. A nearly level concrete path leads to the high point. I made it after a brisk 4 minute walk.

I was delighted to find a bench so there was no need to operate on the damp ground. The setup went smoothly and I was on the air in 10 minutes. Right away on 20 meters I contacted a Denver station and had a lengthy ragchew. Then I jumped up to 17 meters. Still running 5 W, on the third call I reached

[1]M. Volstad, AI4BJ, "QRP from the Top of the Maritimes," *QST*, Aug 2009, pp 63-64.

a CT1 station 4200 miles away in Portugal. Next, I dialed around on 15 meters alternating between sending CQ and calling several European stations. No luck. I jumped down to 30 meters and had a nice chat with a ham in Pennsylvania.

Woodall Mountain, Mississippi, 806 Feet

What a difference a week makes. My next trip was a perfect radio day, calm, sunny and 71°F. Reports on the web suggested that Woodall Mountain was drivable along a rough, narrow, steep road — perfect for my Jeep. When we reached the intersection of highways 72 and 25, signs directed us to the top. I was somewhat disappointed that the road wasn't any worse than your typical Forest Service road.

I got to work (see Figure 1). Starting on 40 I alternated between scanning the bands and sending CQ on the low power calling frequencies. Nada. The bands were open but nobody was there. I worked my way through 30, 20 and 17 meters hearing three contacts in progress but made no CQs.

So I switched back to 20 meters. An XE3 blew me out of my lawn chair (see Figure 2). Manuel and I had a brief chat in which he gave me a 579 report. Not bad. More scanning on 20 produced zilch. Back down to 30. At 10.111 MHz I just caught the tail end of a DX RST exchange. What the heck? I jumped in with a ?? de N7RVD K. A T7 (San Marino) came back with a 5NN report. This rocks! Next, I fire up 40 meters again, respond to a CQ and get into a nice chat with a ham in Illinois.

Brasstown Bald, Georgia, 4784 Feet

It was December and the weather was kind of sketchy. After it had poured all day the day before, we woke up to a beautiful morning with azure blue skies and wispy white clouds. The temperature was 40°F with a steady 10-12 mi/h wind — not exactly ideal for hanging out on a mountain top.

Toward the end of our 40 minute drive to the Bald from below it almost looked like the summit was cloaked in a cloud. Unfortunately, this was true. We hit a thick fog bank just before arriving in the trailhead parking lot. Worse, the temperature had dropped while the wind had picked up.

These days, I favor a fanny pack. Expecting to heat up on the hike and rapidly cool off at the summit, I strap all my outerwear to the pack. My wife has my antenna in one arm and the puppy's lead in the other. I've got the fanny pack, our 11 year old dog and the heavy tripod. We set off toward the top.

Forty minutes later we arrive. The State of Georgia has built an excellent visitors center/museum/observation deck/snack bar with restrooms. All closed. Fortunately, the stairs to the roof deck were unlocked (see Figure 3). Temperature at the top is 32°F.

I set up on the east side since it affords the best wind break but puts my antenna a few steps away from a dozen permanent ones. I've had some practice now, so the station set up goes quickly. As I switch on the radio, my spouse and I agree that I would make a quick contact or two then dash back to the car.

It's about 11:40 AM EST. Seventeen meters seemed like a good place to start. Hot coffee was a good idea, too. I broke open the coffee and started dialing up and down 17. Nothing happening.

Down to 20 meters. There are a couple of DX stations down in the noise. The only other station on the band is a WØ calling CQ at 30 WPM. I give him a pass. Thirty WPM is a real push for me on a good day. Today, using a mini paddle and thick gloves, it would be impossible to accurately send that fast. Ice chunks form on the feed line. The antenna is growing white frost. I pour more coffee.

I dial up 14.060 MHz, the low power calling frequency, and use the K2's memory keyer to send CQ eight times. No takers. Something is not right. The radio is not behaving properly. On every band today the background noise seems a bit muted and the SWR is off.

I drop down to 30. Bingo. As soon as I hit the band change button, I hear a CQ right on frequency. The antenna tap is still clamped on 20 meters. I throw off the headphones, leap up and move the alligator clip down. The SWR here is 6.8:1. Quickly, I switch in the auto tuner and turn it on. The CQing station is a 9A1, Croatia. I give him a call. Nothing. I zero beat a little better and try again. N? I crank it up to 10 W. N7 AGN PSE. I turn the power knob to 14 W. Bingo. Ogi and I exchange names, 5NN reports and 73s. Then I look up and realize that the three antenna radials are in a rumpled, knotted wad at the base of the tripod. Duh.

Our puppy is shivering. The Thermos is empty and my spouse and I are turning blue while the antenna grows whiter. We pack up and sprint to the parking lot.

Sassafras Mountain, South Carolina, 3560 Feet

It was another frigid, overcast day. Since Internet reports stated that the high point was 100 yards from the parking lot, I expect to set up, play for an hour, then turn around for home.

I'd gotten a late start and was winding my

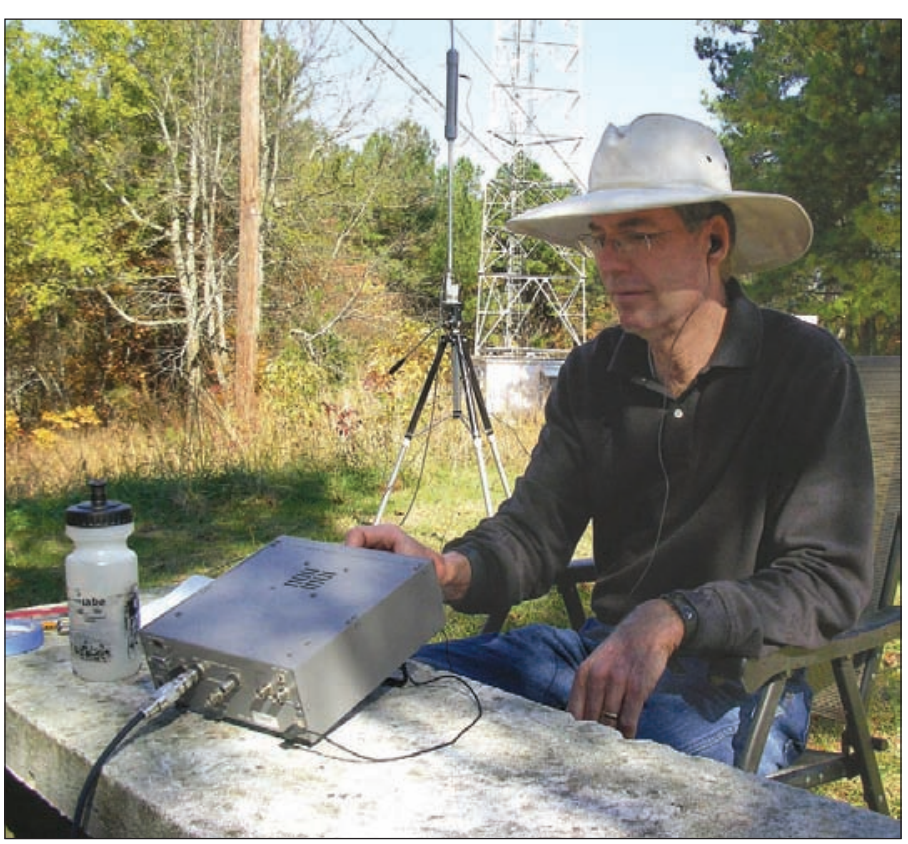


Figure 2 — Brian and his trusty K2 at his cement bench operating position on Woodall Mountain.

way up to the summit about 2 PM. I came upon a sign "Sassafras Mt, 3 miles that way." Less than a quarter mile later, a locked gate barred the road. You cannot imagine my disappointment. Drive all that way and end up 2¾ miles short. Sure, I could hike it, but there wasn't enough daylight left. I'd end up traipsing out in the dark.

What the heck, I was there. Let's find out. I strapped on my fanny pack, grabbed my gear and sidestepped the gate. Two minutes later, I'm standing on the summit. Tada! The sign fibbed. It was ⅗ of a mile, not 3 miles.

While I work setting up the antenna *and spreading out the radials*, I can't help but notice that ice crystals glue down the fallen leaves. Cozy isn't the adjective that came to mind. I hoofed it back to the Jeep for two blankets, one to sit on and another to sit under. At the other high points, I had to really work to make contacts. This time, I did Sassafras on a Sunday. Weekend activity is usually greater and it should be easier to make contacts. Not so.

The first band I tried was 10 meters. After all, the 10 meter contest is the following weekend and a few folks must be playing around to get a feel for propagation. Not a signal on the band. 15 meters — the same. 17 meters had some signs of life, and of course, 20 meters was busy. It was a fun challenge. Few hams called CQ and nobody came back to mine. I stuck at it. Despite the 35°F temperature, I was toasty warm at the end of an hour. With perseverance, I managed Caribbean DX contacts with a VP5 and an FM5, and a ragchew with a VA7 in Vancouver, British Columbia.

Britton Hill, Florida, 345 Feet

Britton Hill is the lowest high point in the country. It's the first week of January and a cold front grips the entire country. Midmorning, it's sunny and 28°F when I head out. Five minutes and 2 miles later, I pull into a roadside park. The Jeep isn't even warm. I can see the summit no more than 70 feet away. Fortunately, it is surrounded by trees and sheltered from the wind.

Within minutes I've got the antenna and K2 up on 20 meters. For a Tuesday morning there is a lot of activity. All weak signals, though. I respond to several CQs. No come backs. I am operating from one of two park benches that circle a marble cube elevation marker. I get off the bench, go over to the antenna tripod and extend the last section of the legs, raising the antenna another 2 feet. Then I walk around and stretch out the three radials a bit tighter and straighter. Maybe that will help.

Back at the radio, I dial up 14.060 MHz, the low power calling frequency, and send out a quick CQ. Instantly I get a *loud* reply from an ABØ station in Iowa. I'd set the keyer speed down to 18 WPM so I could work the paddle with heavy gloves on and not make too many errors. We have an enjoyable ragchew for about 30 minutes.

After I sign off, I realize the cold is taking hold. While I was sending or copying, I hadn't noticed. Now, I did. What to do? Pull the plug or keep going? Just for grins, how about a quick DX contact?

Toward the low end of 20 meters, an EA8 in Spain is CQing with no replies. It's a very low signal. My meter isn't budging. I call. Zip. Again…. N7?? Again… We go back and forth a few times. No go. He sends N7 SRI and goes back to sending CQ. Well, he kind of heard me, right? I spin the K2's power knob fully clockwise, perhaps 15 W, and dial the keyer speed down from 25 WPM to 18, then send my call again. Bingo. We swap reports. With that, I wrap it up.

Figure 3 — Braving a fog bank and December weather to operate from the Brasstown Bald observation deck.

Conclusions

It was really cool to work DX from a portable field station. The overall performance of the rig and antenna vastly surpassed anything I'd lugged into the field before. The K2 was rock solid.

The center loaded whip went together in a snap every time. I marked the band tap locations with permanent marker. Moving the alligator clip to the proper winding tap made band changes a breeze. In most cases, I got the best SWR on the first attempt. For ease of use, fast setup and versatility, this antenna has been a welcome surprise. Future modifications include telescoping the whip and shaft into the loading coil to reduce the collapsed length to 2½ feet and replacing the heavy tripod.

This was fun. It was an opportunity for us to visit places we wouldn't have seen otherwise. My family and I enjoyed these outings, especially Brasstown Bald, which was the toughest hike and the toughest operating conditions — in a nutshell, it was the biggest adventure. I'd like to thank the operators on the other end who pulled out my low power signal and made these outings possible. Tnx es 73 de N7RVD.

Photos courtesy of Brian Wingert, N7RVD.

Brian Wingert, N7RVD, an ARRL member, is an Extra class operator originally licensed in Lakewood, California in 1975. An avid CW operator, he enjoys tinkering with radios and antennas. His radio station consists entirely of kits and homebrew equipment. Other interests include fly fishing, action pistol shooting, hiking, biking and kayaking. He and his wife Deb took off in September 2008 to travel the country in a motor home. Their travel blog is at **www.raincityhome.com/RAWH/index.htm**. *You can reach Brian at 7312 NE 143rd St, Kenmore, WA 98028 or at* **n7rvd@arrl.net**.

Can You *Read* Me Now?

The RST code — more than just a signal report.

Steve Sant Andrea, AG1YK

Communication is a two-sided affair. When you send out a CQ you can't know how it is being received by another station far out across the ether. This problem became evident early on in radio. Once a signal leaves the antenna it moves from the clean and orderly environment inside your station to the wild and woolly wilderness of the ionosphere. Signals lose strength as they travel, become mixed with all sorts of noise and our fickle friend the ionosphere can cause all kinds of mischief.

Early in ham radio a number of schemes were devised for a receiving station to quantify how well they were hearing an incoming signal. By the 1930s this makeshift system resulted in what one writer described as "a mixture of plain language questions, QSA, R and T reports, and international abbreviations."[1]

It was in October of 1934 that Arthur Braaten, W2BSR, proposed the RST system (see sidebar) as a simple, less confusing and more accurate method for reporting the usability of a received signal.[2] His system consisted of three elements: readability, strength and tone.

A Measure of *Understanding*

One of the problems with earlier systems was confusion between how readable a signal was and its strength. The readability part of the RST code is used to define how *understandable* a signal is, not how *strong* it is. Readability is meant to describe to the transmitting station how well the receiving operator can understand what he is saying. It is not a matter of signal strength.

"How so," you ask? "If I'm receiving a 20-over signal it should be perfectly readable." It might not be readable if your neighbor's air conditioner is coming in 40-over. If the signal you are receiving is an R1 or R2, then you can't complete the contact regardless of how strong it is.

Signal strength is the second element of the RST system. Using nine steps it describes conditions from "Faint, barely perceptible" to "Extremely strong." The difference between an R1 and an S1 signal is worth considering. We have all been cruising a band, headphones on, listening intently for a certain DXpedition or special event when we come upon a frequency and stop short. You close your eyes and concentrate. You know you hear a signal. It's there down below the rush and rumble of the noise, the faintest trace of organization in the chaos.

From a readability standpoint this signal doesn't exist. Even though you are sure there is a signal there, you can't make out even the slightest scrap of information about it. From the signal strength standpoint, the signal is S1. You know it's there; there just isn't enough of it. Again an S1 or S2 signal is too weak to permit you to complete a basic contact.

"Then why have them at all?" you ask. Well, R and S values of 1 and 2 are useful in situations such as a net, roundtable or scheduled contact. Let's say you contact a DX station on 20 CW and arrange to meet on 40 phone. Down on 40 you can just barely make him out, an RS 21 signal. When you return to 20 meters you report this back to the DX, which lets him know that 40 meters isn't open to your area from his location.

Crystal Clear or For the Birds

The third element is tone. This is used for CW to describe how "clean" the Morse dits and dahs are. Tone is not that meaningful today using modern transmitters. But for those who like to "roll their own," or who like to operate using vintage equipment, the tone of the CW note can vary widely and values below T7 can indicate a problem.

What about digital? The RST code was developed long before the digital modes arrived. Some digital operators have proposed a new system for digital contacts, the RSQ system, replacing T (tone) with Q (quality). For more information go to **www.rsq-info.net**.

The RST system can provide you and the hams you contact with a useful description of the quality of the communications channel between you. For this reason, don't just parrot a "59" or 5NN" report. Take the time to listen and give an honest assessment of the quality of a signal. Be aware that the RST report you receive is telling you much about the usability of that frequency for whatever type of contact you wish to make, whether it is a long ragchew or a quick meteor scatter.

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

The RST System

Readability

1 Unreadable
2 Barely readable, occasional words distinguishable.
3 Readable with considerable difficulty.
4 Readable with practically no difficulty.
5 Perfectly readable.

Signal Strength

1 Faint signals, barely perceptible.
2 Very weak signals.
3 Weak signals.
4 Fair signals.
5 Fairly good signals.
6 Good signals.
7 Moderately strong signals.
8 Strong signals.
9 Extremely strong signals.

Tone (CW only)

1 Sixty cycle ac or less, very rough and broad.
2 Very rough ac, very harsh and broad.
3 Rough ac tone, rectified but not filtered.
4 Rough note, some trace of filtering.
5 Filtered rectified ac but strongly ripple-modulated.
6 Filtered tone, definite trace of ripple modulation.
7 Near pure tone, trace of ripple modulation.
8 Near perfect tone, slight trace of modulation.
9 Perfect tone, no trace of ripple or modulation of any kind. If the signal has the characteristic steadiness of crystal control, add the letter X. If there is a chirp add the letter "C" and for a click, add "K."

[1]Lt D. C. Redgrave, KA1NA, "A New System of Signal Reports," *QST*, Aug 1934, p 55.
[2]A. M. Braaten, W2BSR, "A New Standard System of Reporting Signals," *QST*, Oct 1934, pp 18-19, 106, 108.

STEVE FORD, WB8IMY

ARRL Board Sets Legislative Agenda at 2011 Annual Meeting

Joel P. Kleinman, N1BKE and S. Khrystyne Keane, K1SFA

The ARRL Board of Directors meets in Connecticut's frigid winter to plan the League's goals for the coming year.

The ARRL Board of Directors held its 2011 Annual Meeting January 21-22 in Windsor, Connecticut under the chairmanship of President Kay Craigie, N3KN. The Board considered and acted on a number of recommendations from committees, as well as motions by Directors. International Amateur Radio Union (IARU) Secretary Rod Stafford, W6ROD, and Radio Amateurs of Canada (RAC) President Geoff Bawden, VE4BAW, were guests of the Board. Two recently elected vice directors — Andrea Hartlage, KG4IUM, of the Southeastern Division, and John Robert Stratton, N5AUS of the West Gulf Division — attended their first Board meeting.

Legislative and Regulatory

ARRL Legislative Consultant John Chwat of Chwat & Company reported on the legislative program in the 111th Congress and plans for the 112th. Of particular note was the reintroduction of the *Amateur Radio Emergency Communications Enhancement Act* — HR 81 — into the House of Representatives and the expected similar Senate bill; the Senate bill — S 191 — was introduced just days after the conclusion of the meeting. The Board voted to adopt seven legislative objectives for the 112th Congress:

- Expansion of the "reasonable accommodation" of Amateur Radio antennas to all forms of land use regulation.
- Opposition to the reallocation of amateur spectrum.
- Opposition to legislation that diminishes the rights of federal licensees in favor of unlicensed emitters.
- Seeking recognition of the unique attributes of the Amateur Radio Service in any legislation addressing communications in emergencies, disasters and homeland security matters.
- Supporting the legislative objectives of other radiocommunication services that require spectrum access and protection from interference for noncommercial purposes that benefit the public.
- Opposition to distracted driving legislation that does not exempt two-way mobile transmitters operated by FCC licensees.
- Supporting *The FCC Commissioners' Technical Resource Enhancement Act.*

Organizational

National Broadband Plan: In response to FCC and NTIA studies that aim to allocate 500 MHz of spectrum between about 225 MHz and 4.4 GHz to mobile broadband applications, the Board established the Ad-Hoc National Broadband Plan Committee. The Committee will assess the current threat levels to the applicable Amateur Radio bands and recommend strategies to the Board to protect these bands. A preliminary report is due July 1, 2011.

ARRL General Counsel Chris Imlay, W3KD, discussed the pressure for additional spectrum for mobile broadband services, as well as an FCC *Notice of Proposed Rulemaking* that could amend the CORES registration system.

Financial Matters: ARRL Treasurer Jim McCobb, K1LU, reported that the recovery in the League's portfolio continues. Coupled with bequests, the portfolio is at an all-time high. ARRL Chief Financial Officer Barry Shelley, N1VXY, noted that ARRL finances have fared well, even during the past two years of economic uncertainty.

Electronic Publishing: The Board directed staff to prepare a marketing plan for electronic publishing of *QST* and other ARRL periodicals. If the report is accepted by the Board's

STEVE FORD, WB8IMY

President Craigie presented Hudson Division Director Frank Fallon, N2FF, with his recently earned 160 Meter Worked All States award. Midwest Division Director Cliff Ahrens, KØCA — who provided Fallon with his final QSL — is on the left.

Title photo: ARRL President Kay Craigie, N3KN — flanked by Vice President Rick Roderick, K5UR (left) and Secretary and Chief Executive Officer David Sumner, K1ZZ — presides over the 2011 Annual Meeting of the ARRL Board of Directors.

Summary of Major Board Actions

S. Khrystyne Keane, K1SFA

The *Minutes* of the 2011 Annual Meeting of the Board, Moved and Seconded, are now only published on the ARRL website at **www.arrl.org/board-meetings**. If you do not have Internet access, you may request a written copy of the *Minutes* by writing to ARRL Secretary, 225 Main St, Newington, CT 06111.

Minute	Purpose	Action
Elections and Appointments		
8	**Executive Committee** Elected Directors to the Executive Committee.	**Elected**
9	**ARRL Foundation Directors** Elected Director Jim Fenstermaker, K9JF; Vice President Bruce Frahm, KØBJ, and Eugene Hastings, W1VRK	**Elected**
39	**Committee Appointments** *Ethics and Elections*: Chairman Greg Sarratt, W4OZK, Southeastern; Bob Vallio, W6RGG, Pacific, and Tom Frenaye, K1KI, New England. *Amateur Radio Legal Defense and Assistance:* Chairman Cliff Ahrens, KØCA, Midwest; Brian Mileshosky, N5ZGT, Rocky Mountain; Vice Director David Norris, K5UZ, Delta; Vice Director Mike Raisbeck, K1TWF, New England; Jim O'Connell, W9WU, and General Counsel Chris Imlay, W3KD. *RF Safety:* Chairman Dr Greg Lapin, N9GL; Vice Director Rod Blocksome, KØDAS, Midwest (Board liaison). *EMC:* Chairman Vice Director Kermit Carlson, W9XA, Central. *Historical:* Chairman Joyce Birmingham, KA2ANF, Hudson; Tom Frenaye, K1KI, New England; Dick Norton, N6AA, Southwestern; Vice Director Gary Johnston, KI4LA; Art Goddard, W6XD; Charles Griffen, W1GYR, and Mike Marinaro, WN1M. *Ad Hoc Committee on Scouting:* Chairman Brian Mileshosky, N5ZGT, Rocky Mountain; Jim Fenstermaker, K9JF, Northwestern; Vice Director Kent Olson, KAØLDG, and Larry Wolfgang, WR1B. *HF Band Planning Committee:* Vice President Bruce Frahm, KØBJ; Tom Frenaye, K1KI, New England; Dick Norton, N6AA, Southwestern; Steve Ford, WB8IMY, and Chuck Skolaut, KØBOG. *Public Relations Committee:* Vice Director Dr Jim Boehner, N2ZZ, Roanoke (liaison). *Nominating Committee for the Centennial Campaign Committee:* Chairman First Vice President Rick Roderick, K5UR; Tom Frenaye, K1KI, New England; ARRL Chief Executive Officer David Sumner, K1ZZ, and Chief Development Officer Mary Hobart, K1MMH. *Ad Hoc Narrowband Study Committee:* Chairman Greg Sarratt, W4OZK, Southeastern; Brian Mileshosky, N5ZGT, Rocky Mountain; Vice Director Kermit Carlson, W9XA, Central; Chief Technology Officer Brennan Price, N4QX; Dan Henderson, N1ND, and Steve Ford, WB8IMY *ARDF Coordinator:* Joe Moell, KØOV	**Announced**
Organizational		
25	**By-Law Change** Changed By-Law 42 to allow the review of decisions made of the Ethics and Elections Committee upon the written request of any candidate for that office or five or more Directors.	**Approved**
26	**Electronic Recording** Adopted a policy regarding the recording of meetings of the ARRL Board of Directors and committee meetings.	**Approved**
28	**Microwave Band Planning Committee**	**Dissolved**
31	**ARRL Investment Policy** Approved the revised investment policy.	**Approved**
32	**2011-2012 Plan** 2011-2012 budget and operating plan approved.	**Approved**
36	**VHF-UHF Advisory Committee** Renewed the committee's charter through July 2012.	**Renewed**
40	**Ad-Hoc National Broadband Plan Committee** Established a committee to assess current threat levels to certain parts of the Amateur Radio spectrum and report to the Board their preliminary findings by July 1, 2011.	**Approved**
41	**Digital Publishing** Staff will prepare a comprehensive marketing plan for electronic publication of *QST* and other ARRL periodicals.	**Approved**
43	**Changes to Executive Committee Proceedings** Would have modified Article 6 of the *ARRL Articles of Association* regarding the scope of the Executive Committee.	**Defeated**
Legislative and Regulatory		
27	**Legislative Objectives for 112th Congress** Adopted seven legislative objectives for the 112th Congress.	**Approved**
Awards		
15	**The George Hart Distinguished Service Award** President Craigie announced that with the approval of the Programs and Services Committee and the Executive Committee, the George Hart Distinguished Service Award was presented to John Thomas, W3FAF, in December 2010.	**Announced**
37	**The 2010 ARRL International Humanitarian Award** The Board voted to bestow the 2010 ARRL International Humanitarian Award on Ron Tomo, KE2UK.	**Conveyed**
38	**The 2010 Bill Leonard, W2SKE, Professional Media Award** The Board voted to bestow the 2010 Bill Leonard, W2SKE, Professional Media Award on Phillip Lucas (print), Jennifer Crompton (video) and Bill Colley (audio)	**Conveyed**

Administration and Finance Committee, the Board will consider the report at its July 2011 meeting.

Development and The ARRL Foundation: ARRL Chief Development Officer Mary Hobart, K1MMH, reported that the Diamond Club performed well during 2010, but contributions to the Education and Technology Program were down. The ARRL received the largest bequest to date during 2010, a $1.4 million donation from the Charles (W8KGD) and Iona Mathias Joint Trust. ARRL Foundation President Tom Frenaye, K1KI, reported that four new scholarships were added during 2010, and that the Foundation is willing to work with any club or group wishing to establish a new scholarship.

By-Law Change: The Board voted unanimously to modify By-Law 42 to read: "Decisions of the Ethics and Elections Committee may be reviewed by the Board of Directors upon the written request of any candidate for that office or five or more Directors." This provides for an appeal by any candidate who may be affected by a decision regarding eligibility for office.

Microwave Band Planning Committee: The Board voted to dissolve this committee and offered its appreciation to those who volunteered.

VHF-UHF Advisory Committee: The Board voted to renew the charter of this committee until July 2012.

Ad Hoc Committee on Scouting: Rocky Mountain Division Director Brian Mileshosky, N5ZGT, announced the expected signing of a *Memorandum of Understanding* between the ARRL and the Boy Scouts of America. [ARRL President Craigie, along with BSA Chief Scout Executive Bob Mazzuca signed the *MoU* on January 31.]

Field Organization

Submission of Petitions for Section Manager: The Board voted to amend the Rules and Regulations of the ARRL Field Organization to allow nominees for Section Manager to submit their nominating petitions either by fax or via e-mail. The Board added the following sentence to the end: "Nominating petitions may be made by facsimile or electronic transmission of images, provided that upon request by the Membership & Volunteer Programs Manager the original documents are received by the Manager within seven days of the request."

Committee Elections and Appointments

ARRL Executive Committee: As ARRL President, Craigie also serves as Chairman of the Executive Committee; its other voting members are elected by their fellow Directors. Elected for one-year terms were George R. Isely, W9GIG, Central; Tom Frenaye, K1KI, New England; Bob Vallio, W6RGG, Pacific; Dr David Woolweaver, K5RAV, West Gulf, and Brian Mileshosky, N5ZGT, Rocky Mountain. ARRL Chief Executive Officer David Sumner, K1ZZ, and First Vice President Rick Roderick, K5UR, also serve on this committee, but do not have a vote. There is no change to the composition of the committee.

Administration and Finance: Chairman Cliff Ahrens, KØCA, Midwest; Greg Widin, KØGW, Dakota; Dennis Bodson, W4PWF, Roanoke; Greg Sarratt, W4OZK, Southeastern; Jim Weaver, K8JE, Great Lakes, and Vice Director Marty Woll, N6VI, Southwestern. ARRL Treasurer Jim McCobb, K1LU, also sits on this committee.

Programs and Services: Chairman Bill Edgar, N3LLR, Atlantic; Mickey Cox, K5MC, Delta; Joyce Birmingham, KA2ANF, Hudson; Jim Fenstermaker, K9JF, Northwestern; Dick Norton, N6AA, Southwestern, and Vice Director Jim Tiemstra, K6JAT, Pacific.

Ethics and Elections: Chairman Greg Sarratt, W4OZK, Southeastern; Bob Vallio, W6RGG, Pacific, and Tom Frenaye, K1KI, New England. Members of this committee are Directors not up for re-election in 2011. Per the ARRL By-Laws, this committee applies guidelines for ethical conduct by ARRL officials, determines eligibility of candidates for Director and Vice Director, certifies a nominee's eligibility to fill a Vice Director vacancy and supervises the balloting for Director and Vice Director.

STEVE FORD, WB8IMY

From left: Chief Technology Officer Brennan Price, N4QX; International Affairs Vice President Jay Bellows, KØQB; RAC President Geoff Bawden, VE4BAW; Atlantic Division Director Bill Edgar, N3LLR; Central Division Director Dick Isely, W9GIG, and Dakota Director Greg Widin, KØGW.

HAROLD KRAMER, WJ1B

Newly elected West Gulf Division Vice Director John Robert Stratton, N5AUS, receives his Board of Directors pin from West Gulf Division Director Dr David Woolweaver, K5RAV.

HAROLD KRAMER, WJ1B

Newly elected Southeastern Division Vice Director Andrea Hartlage, KG4IUM, receives her Board of Directors pin from Southeastern Division Director Greg Sarratt, W4OZK.

Awards and Recognitions

Hudson Division Director Frank Fallon, N2FF, who had announced his resignation from the Board effective at the close of the meeting, was given a standing ovation for his years of service to the ARRL. Vice Director Joyce Birmingham, KA2ANF, became Director at the close of the meeting.

The ARRL Board of Directors had the pleasure of bestowing four awards at the 2011 Annual Meeting: the ARRL International Humanitarian Award and the print, video and audio winners of the Bill Leonard, W2SKE, Professional Media Award.

The next meeting of the ARRL Board of Directors is scheduled for July 15-16, 2011.

Joel P. Kleinman, N1BKE, is QST *Managing Editor. He can be reached at* **qst@arrl.org**.

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

ARRL Board Bestows Awards at 2011 Annual Meeting

S. Khrystyne Keane, K1SFA
ARRL News Editor

The ARRL Board of Directors had the pleasure and distinction of bestowing five annual awards at its 2011 Annual Meeting — the ARRL International Humanitarian Award, the George Hart Distinguished Service Award and the video, audio and print categories of the Bill Leonard, W2SKE, Professional Media Award.

The ARRL International Humanitarian Award

Ron Tomo, KE2UK, of North Bellmore, New York, is the recipient of the 2010 ARRL International Humanitarian Award. Tomo's life exemplified Public Service through Amateur Radio, from providing phone patches during the Vietnam War, and providing communications support during 9/11 with MARS and the United States Service Command, as well as serving in the US Coast Guard Auxiliary as a Communications Officer where he played a pivotal role during Hurricanes Katrina and Rita. Tomo also is a part of the Emergency Preparedness Team at the Nassau University Medical Center where he is the hospital's Chief Information Officer.

During the Haitian earthquake in January 2010, Tomo — at his own expense — served with a team of doctors, providing communication support between the on-site doctors and hospitals. According to Jack Satterfield, W4GRJ — one of his many nominators — Tomo provided critical communication links at multiple levels, "from coordinating helicopter relief to a stranded village, to handling emergency evacuations to the nearby USS *Comfort* hospital ship. Ron even provided the extra hands needed to hold flashlights at the operating table when the power went out at night. He went on a rescue mission to help carry stretchers, bringing back patients to their facility. His efforts while in Haiti were undoubtedly and directly attributable in the saving of so many lives."

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

COURTESY RON TOMO, KE2UK

Ron Tomo, KE2UK (left), is the recipient of the 2010 ARRL International Humanitarian Award. At his own expense, He went down to Haiti and helped provide communication and medical support to the doctors caring for those injured in the massive earthquakes in January 2010.

The George Hart Distinguished Service Award

John Thomas, W3FAF, of Mahtomedi, Minnesota, is the recipient of the George Hart Distinguished Service Award. He was selected for this honor by the ARRL Executive Committee. Licensed since 1956, Thomas — an ARRL Life Member — has been an ARRL Official Relay Station since 1959 and was a part of the National Traffic System from 1959-2004. An ARRL Official Observer for 20 years, he also served as the Official Observer Coordinator for the Minnesota Section for six years.

According to ARRL Minnesota Section Manager Skip Jackson, KSØJ, Thomas has always been willing to serve the Minnesota Section: "When I first became Minnesota Section Manager, John told me that he would serve in whatever capacity I needed help. That is John. He has served the ARRL for more than 50 years and been in the NTS for almost that long. He has helped and taught many people about the radio sciences and his list of accomplishments is long indeed."

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

The 2010 Bill Leonard, W2SKE, Professional Media Award

This year marks the second year in which the Bill Leonard Award has been restructured to include the three categories to represent the broadest possibility of submissions from traditional and emerging media. This year the following media professionals won the Bill Leonard Award in their respective categories:

- **Audio**: Bill Colley, host of the afternoon drive time talk show on WGMD-FM in Rehoboth Beach, Delaware. His guest was Bill Duveneck, KB3KYH, of the Sussex Amateur Radio Association. Through a well-modulated and even flow, Colley and Duveneck entertained and educated listeners about Amateur Radio and greeted callers with questions on why ham radio is a great hobby.
- **Video**: Jennifer Crompton, producer for *New Hampshire Chronicle* on WMUR-TV of Manchester, New Hampshire. The weekday half-hour news magazine featured a seven minute segment that followed the 2010 ARRL Field Day for the Contoocook Valley Radio Club. Her excellent video news piece was acclaimed by members of the ARRL's Public Relations Committee as "possibly the best TV coverage on Amateur Radio ever."
- **Print/Text**: While a staff writer for *The Washington Post*, Phillip Lucas covered 2010 ARRL Field Day with the Loudoun (Virginia) Amateur Radio Club in his article "Loudoun Radio Fans Dash to Test Their Skills." Members of the ARRL's Public Relations Committee felt that Lucas captured the essence of Field Day. The article was picked up by wire services, appearing across the globe. Lucas now works at *The News Journal* in Wilmington, Delaware.

The Bill Leonard, W2SKE, Professional Media Award is a national level award given each year to honor three professional journalists whose outstanding coverage best reflect the enjoyment, importance and public service value the Amateur Radio Service. This award was created as a tribute to the late CBS News President Bill Leonard, W2SKE, an avid Amateur Radio operator. QST

Court of Appeals Offers Mixed Opinion in Palmdale, California Antenna Case

On January 27, the California Court of Appeals, Second Appellate District, issued its Opinion in the antenna case of Alec Zubarau, WB6X. In several respects, it is a win for Amateur Radio in California. Working with his ARRL Volunteer Counsel, Len Shaffer, WA6QHD, Zubarau is now considering the next course of action.

The Court found that the Palmdale antenna ordinance — as it pertained to the height limit for vertical antennas — was "unenforceable" because it allowed a radio amateur to have a vertical antenna up to 75 feet high when measured from the ground, but limited the "active element of the antenna array" to 30 feet. The ordinance did not define "array" or "active element" and did not specify from where the 30 permitted feet for such an "array" was to be measured. The Court found that if even one reasonable interpretation of the ordinance could be found, the ordinance could be upheld, but that in this case, no one could understand what the limitations were and how they could be applied. That portion of the City's ordinance was therefore unconstitutional and unenforceable.

The Court also held that the ordinance was unenforceable to the extent that it attempted to regulate radio frequency interference. The City maintained that it could regulate RFI, but the Court, citing case law and argument in ARRL Amicus Curiae brief, held that only the FCC could regulate RFI; any state or municipal law that attempts to regulate RFI is preempted.

Of some concern to Shaffer, however, is that the Court held that Palmdale properly ordered Zubarau to remove his permitted 55 foot crank-up tower. The Court opined that the small VHF/UHF vertical on the roof constituted "reasonable accommodation" under PRB-1 and California's PRB-1 statute (California Government Code Section 65850.3). The Court said that leaving Zubarau with a VHF/UHF antenna constituted a reasonable accommodation because it allowed him to be active in some part of Amateur Radio. There was no analysis of the "minimum practicable regulation" test in PRB-1 and the California statute, so that part of the three-prong PRB-1 test was left unexamined. Because the Court reversed the trial court on this finding, Zubarau had no longer clearly "substantially prevailed" in this case and so the Court remanded the case to the trial judge to re-examine the issue of attorney's fees claimed by Zubarau.

The Court's application of the "reasonable accommodation" standard of PRB-1 in this case is, in the view of Shaffer and ARRL, both unique and very narrow. "While this decision is positive for Amateur Radio in California in two significant respects, the record in this case shows that the small, roof-mounted VHF/UHF antenna at WB6X was insufficient to conduct any international communications," said ARRL General Counsel

Chris Imlay, W3KD. "Alec's tower is necessary in order to conduct international communications and to permit even a 50/50 chance of contacting Alec's native Belarus on any given day. The Court ignored this evidence and it did not apply the 'reasonable accommodation' test articulated by FCC and in prior case law, and it did not apply PRB-1's 'least practicable restriction' test at all. In essence, the Court applied a balancing test which FCC and several Federal courts have said is improper in conducting the PRB-1 analysis. It is not true that any accommodation for a radio amateur is reasonable accommodation, and it is not sufficient to simply permit a radio amateur 'some participation' in our avocation. Instead, PRB-1 permits effective, reliable amateur communications. It is hoped that the Court will revisit this portion of its otherwise favorable decision and get it right the second time."

SENATE VERSION OF AMATEUR RADIO LEGISLATION INTRODUCED

On January 26, Senator Joe Lieberman (ID-CT), along with Senator Susan Collins (R-ME), introduced Senate Bill 191, *The Amateur Radio Emergency Communications Enhancement Act of 2011*. This bill is similar to HR 81 — also called *The Amateur Radio Emergency Communications Enhancement Act of 2011* — that was introduced by Representative Sheila Jackson Lee (D-TX-18) on January 5. If passed, the bill, would direct the Department of Homeland Security (DHS) to undertake a study on emergency communications. S 191 has been referred to the Committee on Homeland Security and Governmental Affairs. Lieberman is the Chairman of the committee, while Collins is the Ranking Member.

The objective of the bill — which is supported by the ARRL — is two-fold. It calls for the Secretary of Homeland Security to study the uses and capabilities of Amateur Radio communications in emergencies and disaster relief, and to identify and make recommendations regarding impediments to Amateur Radio communications, such as the effects of private land use regulations on residential antenna installations.

In April 2009, Representative Jackson Lee introduced HR 2160 in the House, *The Amateur Radio Emergency Communications Enhancement Act of 2009*. The bill gained an additional 41 cosponsors, but did not progress out of the committee of jurisdiction. In October 2009, Senators Lieberman and Collins introduced the Senate version of the bill, S 1755, in that chamber. That bill made it all the way through the Senate in December 2009, but likewise was not taken up by the House.

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

Like HR 81, S 191 calls on DHS to undertake a study on the uses and capabilities of Amateur Radio Service communications in emergencies and disaster relief and then to submit a report to Congress no more than 180 days after the bill becomes law. The study shall:

- Include a review of the importance of Amateur Radio emergency communications in furtherance of homeland security missions relating to disasters, severe weather and other threats to lives and property in the United States, as well as recommendations for enhancements in the voluntary deployment of Amateur Radio licensees in disaster and emergency communications and disaster relief efforts and improved integration of Amateur Radio operators in planning and furtherance of the Department of Homeland Security initiatives.
- Identify impediments to enhanced Amateur Radio Service communications, such as the effects of unreasonable or unnecessary private land use regulations on residential antenna installations; and make recommendations regarding such impediments for consideration by other federal departments, agencies and Congress.

Read the complete text of S 191 at **www.gpo.gov/fdsys/pkg/BILLS-112s191is/pdf/BILLS-112s191is.pdf**.

ARRL AND BOY SCOUTS OF AMERICA TEAM UP TO HELP SCOUTS LEARN COMMUNICATIONS SKILLS

After working together for nearly a century to provide Scouts with the ability to learn radio communication skills, the ARRL and the Boy Scouts of America have officially teamed up by signing a *Memorandum of Understanding*. This MoU designates the ARRL as a key resource for K2BSA and Radio Merit Badge training at the BSA National Scout Jamboree and establishes the ARRL as the go-to source for Scouts interested in learning about and becoming involved in radio communication.

BSA Chief Scout Executive Bob Mazzuca and ARRL President Kay Craigie, N3KN, launched the partnership January 31 by holding a unique communications meeting. Mazzuca joined Craigie virtually during an Internet video conference and document signing ceremony. From separate locations, the pair took the opportunity to talk about the importance of each organization to the ongoing development of the other.

"Throughout the years, going all the way back to the Wireless Merit Badge in 1918, the ARRL has worked hand-in-hand with Boy Scouts of America to help teach Scouts the skills and joys of radio communication," Mazzuca said during the meeting. "Today, we are making official a relationship that has been beneficial for both of our organizations for nearly a century."

BSA, by virtue of its active membership and its outdoor program, represents a significant source of potential new radio operators looking to utilize Amateur Radio for emergency communications while in the field, as well as for education, experimentation and friendship. As part of this strategic alliance, BSA will encourage Scouts and Scouters to become familiar with opportunities for public and community service, learning and personal growth through involvement in Amateur Radio.

"We're excited by the opportunity to make official a relationship that has existed informally for many years," said Craigie. "Scouts and Scouters have been some of the strongest proponents and practitioners of radio communication and we know they will continue to help foster a love and understanding for the essential nature of radio communication for generations to come." Craigie also noted the number of people whose early interests in Amateur Radio led them to electronics and engineering careers in areas that were never foreseen when they were young.

The BSA established the strategic alliance with ARRL because the mission of the ARRL is complementary to the mission and goals of the BSA. Specifically, the ARRL is organized for the establishment of networks to provide communications in the event of disasters or other emergencies, the advancement of the radio art and of the public welfare, the fostering of education, the promotion and conduct of research and development, as well as the dissemination of technical, educational and scientific information relating to electronic communication, the representation of radio amateurs in regulatory matters, and the promotion of fraternalism and high standards of conduct among radio amateurs.

In addition to its National Scout Jamboree involvement, the ARRL will continue to promote participation in the annual Jamboree on the Air (JOTA) event. The ARRL will serve as contributing editor to the Radio Merit Badge publication, will assist with the review, creation and modification of requirements as necessary, and will assist in developing course material, lesson plans and other resources for teaching the Radio Merit Badge to Scouts. The ARRL also will contribute to the content of the Electricity, Electronics, and Emergency Preparedness and Communications merit badge publications.

IEEE COMMITTEE WITHDRAWS AS COSPONSOR OF IEEE BPL EMC STANDARD

Citing concerns about parts of its technical content, the IEEE EMC Society Standards Development Committee (SDCom) has voted to withdraw as the cosponsor of *IEEE Standard for Power Line Communication Equipment — Electromagnetic Compatibility (EMC) Requirements — Testing and Measurement Methods* (IEEE Standard 1775-2010). According to ARRL Laboratory Manager and BPL guru Ed Hare, W1RFI, this decision came about soon after the IEEE Standards Board approved publication of the standard over the technical concerns of the SDCom. Hare is an SDCom member and is a member of the IEEE Working Group that developed the standard.

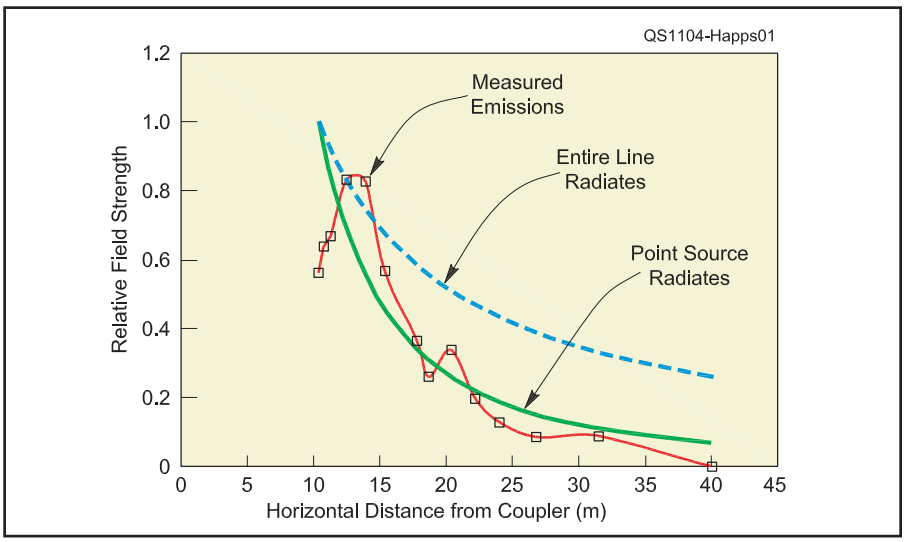
Although it was a cosponsor of the standard, Hare said that SDCom had concerns about its technical content and tried unsuccessfully to influence the content throughout its development. SDCom's last attempt was to provide comments into the IEEE ballot for the standard. These comments were detailed and specific to several areas of the standard, including strong criticism of the distance-extrapolation methods outlined in Annex A of the standard; the FCC is seeking to adopt the methodology in Annex A as regulation.

"SDCom represents broad-based expertise in the EMC field," Hare explained. "It provided detailed and specific input to the standard working group, but the group consistently voted to reject this expert input. The result is a standard that is technically flawed and unsupportable by the former cosponsor of the standard."

As one example, Hare noted that the standard contains a clause that stipulates that the BPL signal "shall be disabled" to make conducted emissions measurements of the device. To control EMC in the passband of the BPL signal, the standard requires that radiated emissions be measured; however, it allows the BPL signal to be turned off to measure the noise the BPL device conducts onto the ac mains. "This is not good engineering practice," Hare said. "Testing this way will miss intermodulation, harmonics and any spurious signals that may be generated by the device only when it is in use. What industry would not like to be able to turn off its signals to measure whether those signals comply with standards or regulations?"

Hare said that SDCom also had concerns about the provisions in the standard to measure the way that field strength decays with distance near BPL systems: "The comments provided by SDCom outline several concerns that SDCom had with this material. This methodology has not been demonstrated to be accurate in a complex EMC environment."

In an explanation of the discussion that took place during the SDCom vote, SDCom Chairman Andy Drozd noted that "[t]he vote on the motion reflects the SDCom's professional opinion that the IEEE EMC Society's long-standing reputation as experts in EMC would be placed at risk with the publication



This graph from the SDCom balloting comments was originally provided to the FCC by Current Technologies. It shows reported measurements of the decay of BPL signals from an overhead line vs distance. The "Entire Line Radiates" line is intended to show a 20 log decay of field strength vs distance and the "Point Source Radiates" is intended to show a 40 log decay rate. Note that any set of four measured points will give a dramatically different extrapolation calculation than any other set of four points. SDCom indicated that "[t]he premise that one can determine actual extrapolation from these data, based on BPL-industry measurements, is technically flawed and unsupportable."

of the draft of the standard as it is currently written. Additionally, it is the SDCom's opinion that by endorsing the publication of an 'EMC Standard' that does not adequately and sufficiently address important concerns expressed by experts of the EMC Society and in effect, contains certain technical flaws, will negatively serve the user community of this standard and could call into question the validity of the document as well as the integrity of the overall IEEE Standards process."

Hare noted that the working group wanted to develop this standard as quickly as possible, rather than take the additional time to try to find resolution of the technical issues and questions put on the table by SDCom. "The end result of this is that the 1775 working group and other sponsoring IEEE societies have developed an EMC standard that does not have the support of the IEEE EMC Society sponsorship," he said. "What is the value of that, and how can anyone rely on such a standard in confidence that it represents the best engineering practice that would normally be expected of an IEEE standard? There are some valuable and important aspects to this standard, but without the consensus that could have existed had the working group chosen not to set aside the technical input of the SDCom expertise, the process and end result have to be called into question."

ARRL TEACHERS INSTITUTE NOW ACCEPTING APPLICATIONS FOR 2011 SESSIONS

The ARRL Education Services Department has announced the 2011 schedule for the Teachers Institute on Wireless Technology workshop (TI). Offered through the ARRL's Education & Technology Program (ETP), the Teachers Institute is a four-day, expenses paid, in-residence learning opportunity designed for motivated teachers and other school staff who want to learn more about wireless technology and bring that knowledge to their students. A variety of topics are covered during the TI, including basic wireless technology literacy, electronics, the science of radio, radio astronomy, how to bring space into the classroom, ham radio operation, introduction to microcontrollers and basic robotics. While participants do not need to have an Amateur Radio license to attend the basic TI sessions, one is required for the advanced (TI-2) session.

"We'll be offering four sessions of the introductory Teachers Institute workshop this summer and one advanced, TI-2 session on Space in the Classroom that focuses on satellite communications," said ARRL Education Services Manager Debra Johnson, K1DMJ. "The workshops are offered to teachers in America's classrooms, with all expenses paid by donors who have contributed financial support to ARRL's Education & Technology Program Fund. The Dayton Amateur Radio Association (DARA) will once again host and sponsor the TI-2 session on Space in the Classroom. Generous support by Yaesu, Ham Radio Outlet and Parallax make our donors' contributions go even further."

There are four ARRL Teachers Institute sessions scheduled for 2011: June 13-16 in Albuquerque, New Mexico; June 20-23 at Parallax Inc in Rocklin, California; July 11-14 at the Mohawk Valley Community College in Utica, New York, and July 18-21 at ARRL Headquarters in Newington, Connecticut. The deadline to apply for the New Mexico and California sessions is April 15. The deadline for the New York and Connecticut sessions is May 15. The TI-2 is only available to those instructors who have participated in a previous Teachers Institute. This session will be in Dayton, Ohio July 11-14; the application deadline is May 15.

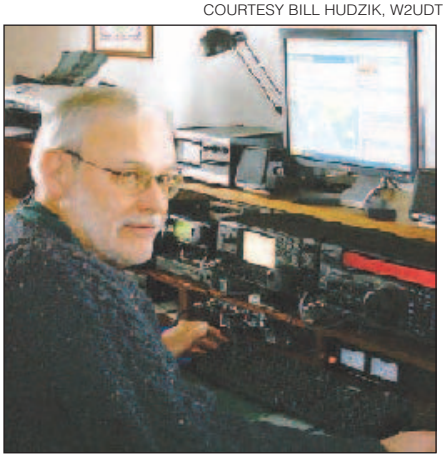
All information about the Teachers Institutes — including the application and a downloadable brochure — is available online at **www.arrl.org/teachers-institute-on-wireless-technology**. You will also find links on that page where hams and interested instructors can read more about what other ETP schools are doing with Amateur Radio and wireless technology topics.

FORMER NORTHERN NEW JERSEY SECTION MANAGER APPOINTED HUDSON DIVISION VICE DIRECTOR

After review of eligibility by the ARRL Ethics and Elections Committee, President Kay Craigie, N3KN, has appointed William W. Hudzik, W2UDT, of Gillette, New Jersey, to serve as Vice Director of the ARRL Hudson Division for the remainder of the current term that expires January 1, 2013. Hudzik fills the vacancy created when Frank Fallon, N2FF, retired from the ARRL Board of Directors after more than 14 years of service and his Vice Director, Joyce Birmingham, KA2ANF, assumed the Director position.

"I've know Bill for many years," Birmingham said. "He has been active in legislative matters in New Jersey. He did a fine job as the ARRL Northern New Jersey Section Manager and I know I can count on him to work well as Hudson Division Vice Director. I am pleased to have Bill as

COURTESY BILL HUDZIK, W2UDT



ARRL Hudson Division Vice Director Bill Hudzik, W2UDT

part of the Hudson Division Team."

An ARRL Life Member and an Amateur Extra class licensee, Hudzik — who admits to being a "contest junkie" — served as ARRL Northern New Jersey Section Manager from 2001-2008. He has been an ARRL Official Emergency Station since 1997.

"Being a member of the Board of Directors provides another insight into the operation of the League," said Hudzik. "Although I served several terms as the Northern New Jersey Section Manager, I'm aware that the Board operation sets policy, which is somewhat different that what my responsibilities were as a Section Manager. Therefore, I hope to draw on my experiences as a Board member in other organizations to act as a basis to become an active, participating member and contribute wherever I can. I've known Joyce for a number of years and have always seen her as a very dedicated individual. She will make an excellent Director and I'm looking forward to her guidance as I learn the nuances of the Vice Director position along with involvement at the policy making level."

First licensed in 1961 as WV2UDT, Hudzik has been continuously licensed for 50 years. Hudzik serves as Trustee of the Raritan Valley Radio Club and the North Jersey DX Association, and is also a member of the New Providence Radio Club. He cites his most outstanding ham radio memory as the holiday season of 1966-67. While stationed at Kadena Air Force Base on Okinawa, he ran phone patches for his fellow squadron members using the KR6SP call sign.

Hudzik is a Senior Engineering Aide/Project Manager for Morris County, New Jersey. He is married to Maryann, a Morris County Superior Court judge.

In Brief

DAVID JORDAN, AA4KN

ARISSat-1 team members prepare the nanosatellite for vibration testing at Johnson Space Center in September 2010.

• **ARISSat-1 Deployment Delayed**: At 0132 UTC on January 28, a Soyuz-U rocket lifted off from Kazakhstan carrying, among other things, the new AMSAT ARISSat-1 Amateur Radio satellite to the International Space Station (ISS). ARISSat-1 was initially scheduled to be manually jettisoned from the ISS during a spacewalk on February 16, but due to changes in the spacewalk work schedule, the date has been pushed back to July. The satellite features a new software-defined transponder that will provide simultaneous 2 meter FM, CW and BPSK transmissions, as well as a Mode U/V (70 cm uplink, 2 meter downlink) transponder. More information on ARISSat-1 is available at the AMSAT-NA website at **www.amsat.org** and in the February issue of *QST*.

• **2011 Field Day Packet Now Available**: It's that time of year again — time to start gearing up for ARRL Field Day, June 25-26, 2011! ARRL's flagship operating event — always held the fourth full weekend in June — brings together new and experienced hams for 24 hours of operating fun. Field Day packets are now available for download at **www.arrl.org/files/file/Field-Day/2011/2011_FD_Packet.pdf** and include the complete rules, as well as other reference items such as forms, ARRL Section abbreviation list, entry submission instructions, a Frequently Asked Questions section, guidelines for getting bonus points, instructions for GOTA stations and a kit to publicize your event with the local press. There is one rule change for 2011: Starting this year, all stations operating in Class A may use a free VHF station without increasing their operating category. This is designed to encourage more activity on the VHF bands, especially 6 and 2 meters, during the best sporadic-E season of the year.

• **FCC Adds New Country to CEPT Reciprocal Agreement for Amateurs**: On February 7, the FCC released *Public Notice* (DA 11-221). This adds a new country to the European Conference of Postal and Telecommunications Administrations, also known as CEPT, reciprocal operating arrangements for US citizens who hold a General, Advanced or Amateur Extra class Amateur Radio license. US hams may now operate in Montenegro, as well as the other countries covered by CEPT agreements, subject to the regulations in force in the country visited. Find the FCC's *Public Notice* online at **www.fcc.gov/Daily_Releases/Daily_Business/2011/db0207/DA-11-221A1.pdf**.

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*

Kansas ARES Helps Civil Air Patrol in Search

Jon Holder, NØOFG
n0ofg@embarqmail.com

Kansas Zone Alpha 1 ARES® was requested one night in mid December (2010) to monitor 121.5 MHz for an activated Emergency Locator Transmitter (ELT) beacon that had been reported to the Federal Aviation Administration (FAA) by numerous aircraft across the area. The Air Force Rescue Coordination Center (AFRCC) assigned Civil Air Patrol (CAP) a mission number to locate this ELT and silence it. The area in question, based on the reports provided by the FAA, was a very large football shaped area of northeast and east central Kansas that was centered just to the south and east of Forbes Field.

The Kansas Wing Civil Air Patrol (KSWG CAP) had dispatched at least one aircraft and several ground teams to prosecute this search. No CAP personnel were available in the Topeka area and they had a response time of up to an hour into Topeka. It was at this time I requested ARES assistance to monitor for possible hits in the Alpha 1 ARES area of responsibility.

ARES volunteers covered a lot of area to the south, east and west of Forbes into parts of Douglas, Osage and Wabaunsee Counties. Also, they made runs around several private strips in the area with no success. During the search the signal went silent. With no signal present and no reports of missing or overdue aircraft reported by the FAA, the AFRCC suspended the search and closed out the mission.

This isn't an uncommon practice by AFRCC. Very often an activated ELT will be discovered by an aircraft owner or operator and silenced without reporting its activation, leaving CAP and others searching for it chasing a ghost. If AFRCC hasn't had a positive report of an ELT signal for some time they will suspend and close a search pending more information (more ELT reports, overdue aircraft reported, etc).

Unfortunately, false activation of distress beacons is very common. A bumpy landing, mid air turbulence and wind across an improperly tied down plane will set them off. Some models will actually self activate as the battery voltage deteriorates over time. In any case, those charged with locating ELTs treat them as a SAR mission until we know it's a false activation and it is silenced. Fire and EMS are not activated during these searches unless a missing/overdue aircraft is reported or until an "actual" target is located. These folks usually have no direction finding equipment or training and are usually too busy with their other calls to standby for these types of searches.

I admit that when I heard the 589 page go out for a downed aircraft I knew it would generate a lot of interest. Unfortunately, distress beacon technology has eclipsed aviation regulation and the business of locating these older beacons is becoming increasingly difficult. During these times, all the help ARES can provide is always appreciated. On behalf of Kansas Wing CAP, I want to thank everyone who participated and I plan on providing everyone with more information on these searches soon.

THIRD ANNUAL EMCOMM EAST A SUCCESS

The third annual EmComm East Convention was held in mid September, 2010, at St John Fisher College, in Rochester, New York. Sponsored by the Monroe County ARES, it lived up to its advertisement as an "Amateur Radio emergency communications conference where Amateur Radio operators involved in EmComm can attend training sessions on technical topics, learn from served agencies, obtain VE testing for license upgrades and interact with other EmComm operators from all over the area."

Seventy five radio amateurs attended from New York, Pennsylvania, Virginia, Ohio, Maryland, Connecticut and Ontario.

The range of topics at EmComm East included "Civil Preparedness Initiative Communications Drill — An After Action Overview," "Soundcard Modes for EmComm," "ARES Qualification System," "Emotional Go Kit: Are You Prepared?," "EcomScs & GatewayScs Packet Radio Meets Real E-Mail" and "OpenVBX — Cloud Telephony for EmComm and Public Service Events."

EmComm East attendees also toured emergency communications vehicles that were on display and saw demonstrations of amateur television and digital communication modes that have emergency communications applications.

YELLOWSTONE ARES HONORED WITH NOAA PUBLIC SERVICE AWARD

The Yellowstone Amateur Radio Service (YARES) in Yellowstone County, Montana, was honored with the US Department of Commerce Public Service Award for their

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

outstanding critical communications support during numerous spring and summer severe weather events that impacted Yellowstone County in 2010. Specifically, this communication support provided critical updates for National Weather Service forecasters during a tornado that impacted Billings on June 20, 2010. This award is given to individuals or organizations for assisting branches of the US Department of Commerce, in this case NOAA's National Weather Service.

Meteorologist in Charge, Keith Meier, of NOAA's National Weather Service forecast office in Billings, Montana, presented the award to YARES on September 20, 2010, during the Yellowstone County Amateur Radio Club meeting in Billings.

When the skies darken or thunder begins to rumble, most people move indoors to safety. But a select group of people have a different reaction. When severe weather threatens, many times it is Amateur Radio operators who are often called into service. These people are storm spotters, volunteers trained in observing and reporting severe weather events. This training, combined with direct radio communications with the National Weather Service, serve to provide timely information when large hail falls or even a tornado touches down.

"Prior to the June 20th, Father's Day Tornado touching down in Billings, YARES operators were already in the Weather Forecast Office coordinating severe weather spotting efforts with Amateur Radio operators throughout the area," said Meier. "The visual observations from these weather spotters were relayed to the YARES operators within the National Weather Service office and passed directly onto the NWS forecasters monitoring the thunderstorms that afternoon. These reports were critical to NWS warning operations in this quickly evolving weather situation," he said.

Thanks to the National Weather Service in Billings (**www.weather.gov/billings**) and NOAA (**www.noaa.gov**). Special thanks go to Todd Gansel, AE7V, ARRL Montana Section Emergency Coordinator and to Doug Dunn, K7YD, Montana Section Manager, for bringing this news to our attention.

UPCOMING EMCOMM-RELATED CONFERENCES

April 16-17, 2011: Communications Academy, Seattle Washington

The 13th annual Communications Academy will be at South Seattle Community College. It is open to anyone with an interest in emergency communications, volunteer or professional. The presentations are designed to promote the development of knowledgeable, skilled emergency communicators who will support their local communities during a disaster or emergency response. The event is sponsored by Western Washington Medical Services Team and Seattle ACS. More information may be found at **www.commacademy.org**.

April 18-22, 2011: National Hurricane Conference, Atlanta, Georgia

The primary goal of the National Hurricane Conference is to improve hurricane preparedness, response, recovery and mitigation in order to save lives and property in the United States and the tropical islands of the Caribbean and Pacific. In addition, the conference serves as a national forum for federal, state and local officials to exchange ideas and recommend new policies to improve Emergency Management. More information on the conference can be found at **www.hurricanemeeting.com**.

May 6-8, 2011: EMCOMMWEST '11, Reno, Nevada

Since 1999, EMCOMMWEST has been specifically oriented toward emergency communications in the West. EMCOMMWEST '11 will feature new speakers and events. Log on to **www.emcommwest.org** for more information.

May 24-26, 2011: National VOAD Annual Conference, Kansas City, Missouri

The 19th Annual Voluntary Organizations Active in Disaster (VOAD) Conference will represent the largest gathering of emergency management individual assistance professionals in the country ranging from federal, state and local governments to nonprofits, voluntary agencies, corporations and academic institutions. More information can be found at **www.nvoad.org/avc**.

W7OTK RECOGNIZED AS LONGTIME NET CONTROL

Cris McBride, KB7QXQ
kb7qxq@arrl.net

Very few ham radio operators can match the net control status of Kent Carpenter, W7OTK, of Mesa, Arizona. Kent was born in a small Arizona town in 1925, has been licensed since 1950 and has an Advanced FCC Amateur Radio license.

His service as the only net control station (NCS) of the MARA Net began in 1990 and ended October 1, 2010. Since Kent's involvement with this net, the name has been changed to "The Arizona, Nevada, New Mexico Mercury Net." In two decades, he has missed only a small handful of nets and those were due to a brief time of being unusually ill. He also has all the rosters showing the names and call signs of all those who checked in each week, if you are interested in seeing them.

This continuous weekly net has met on early Saturday mornings between 0530 and 0730 Arizona time and has used frequencies between 3.980 and 3.990 MHz since starting over 30 years ago. The number of net participants has varied between 10 and 45 with an average of about 30 participants each week.

The service and dedication given by W7OTK is sincerely appreciated by the net managers, as well as the many participants of the nets over these many years. At his request, he has been allowed to retire effective October 1, 2010, as fulltime weekly NCS. There are now three to four net control stations who will be maintaining net communications hoping to keep up the excellent signal and voice quality that has become the standard for this weekly net.

CRIS MCBRIDE, KB7QXQ

Kent Carpenter, W7OTK, of Mesa, Arizona, ably served as Net Control Station of the MARA Net for 20 years.

This Month in Contesting

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

DIGGING OUT

I don't know about anybody else, but I'm really happy to see April arrive. Much of the US has experienced incredible winter weather this year, and I've had enough of the snow and ice. Winter has much more favorable conditions on HF and plenty of contests to occupy your time, but there comes a point when you need to get out of the house.

As the temperatures rise and the snow thaws, now is the time to take care of the maintenance that Old Man Winter might have prevented you from doing earlier. Did you lose an antenna in this past winter's fury? Examine the construction used and see if you can put that sky-hook back in the air with a better method so it doesn't come down next time. Maybe the antenna is still up but your SWR is mysteriously high; now is the time to examine why. Take a look at your tower and see if it's taken a beating over the winter. Check those runs of feed line to see if they got dinged or have water in them. It's best to take care of these things sooner than to have them create a big problem during one of the summer's contests.

After being cooped up in your shack all winter, April offers many events that you can enjoy in the great outdoors. There are some excellent state QSO parties in April, as I note in "Sean's Picks." State QSO parties have become great examples of how much fun you can have with events that aren't considered "major" HF contests. After the winter in the Northeast, activating a few counties in my car during the FQP doesn't sound too shabby! Check the Sean's Picks area this month and see if there's a state QSO party nearby; if so, grab your rig, hop in the car and activate some counties. Finding that rare county gives you a chance to get out of the house and be a rare multiplier for the weekend.

The QRPers are also active this time of year. In addition to the monthly QRP sprints offered by several QRP clubs, the annual QRP To the Field event is Saturday, April 23. The entire point is to…uh…take your QRP rig to the field. Pretty simple, huh? There is a lot of fun to be had in operating a simple station away from home. As if we needed any more of a reason to operate our wireless, the good folks at QRP-ARCI have their annual Spring QSO Party on the first weekend in April. Why not do it outside, too?

The VHF/UHFers are getting in on the action as well. The summer sporadic-E season isn't too far away and it's time to dust off your gear and make sure all is well. April is the month of the Spring VHF/UHF Sprints, with a 4 hour event beginning the second week in April, each focused on a single band. April 11 is 2 meters, April 19 is 222 MHz and April 27 is 432 MHz. All the April sprints run from 7 PM-11 PM *local* time. The VHF fun continues into May, with the Microwave and 6 meter sprints. VHF and outdoor operating go hand in hand, and these short events are a great way to get some operating in while atop your nearby hill or in a park. Maybe there's a rare grid within a short drive of you. If so, activate it!

April also features the ARRL Rookie Roundup. Now into its second year, the "RR" will once again return to SSB on April 17 and offer an event for the Amateur Radio newcomer. All operators licensed in 2009, 2010 or 2011 can enter as a Rookie. Visit **www.arrl.org/rookie-roundup** for complete details.

Along with the return of baseball, April will find me getting outdoors and finding a tall tree for a temporary antenna and operating from a park or hilltop in a rare grid or county. I hope you will join me. Here's hoping to work you in some of these excellent events this month.

Sean's Picks

- **State QSO Parties this month:** Florida, Georgia, Michigan, Missouri, Montana, Nebraska, New Mexico, Ontario.
- **QRP Contests:** QRP-ARCI Spring QSO Party (Apr 2-3), ARS Spartan Sprint (Apr 5), NAQCC Straight Key/Bug Sprint (Apr 13), EA QRP Contest (Apr 16-17), FPQRP Run For The Bacon (Apr 17), QRP To The Field (Apr 23).
- **Japan International DX Contest-CW (Apr 9-10):** How many Japanese prefectures can you work in 30 hours? Point your antennas towards JA and find out!
- **TARA Skirmish Digital Prefix Contest (Apr 16)**: Work as many different prefixes as you can in this all-digital contest. RTTY, PSK and several other digital modes are welcome!

APRIL 2011 W1AW QUALIFYING RUNS

W1AW Qualifying Runs are 9 AM EDT (1300Z) Thursday, April 7 and 4 PM EDT (2000Z) Thursday, April 21 (35-10 WPM). The West Coast Qualifying Run will be transmitted by station K6YR on 3590 kHz at 9 PM PDT Wednesday, April 13 (0400Z April 14) (10-40 WPM). Unless indicated otherwise, speeds are from 10-35 WPM.

In the March/April "Contesting 101"

"Back to basics." Kirk, K4RO, goes over the basics of antennas and propagation for contesting. Contesting 101 can be found in the *National Contest Journal*, published six times per year. For subscription information, visit **www.arrl.org/ncj**.

Field Day and VHF Stations

The 2011 Field Day packet is now available at **www.arrl.org/field-day**. In previous years, a free VHF+ station was available for class A stations with 2 or more transmitters; for 2011, that free VHF station can now be used by *all* class A entries. This opens the door to lots of free QSOs for your club's effort. The VHF bands function considerably differently from their HF counterparts, so be sure to review the Field Day VHF Operating Tips paper available in the Field Day packet. It includes a lot of good information about how to operate a VHF station effectively for those who have never done so. Don't leave free Field Day points on the table — get that VHF station on the air and make some QSOs.

CONTEST CORRAL

in association with the *National Contest Journal*

APRIL 2011

Start and Finish	HF	VHF+	Contest Title	Phone	CW	Digital	Exchange	Sponsor's Web Site or Contact
Apr 2, 0000Z - Apr 2 2359Z	3.5-28		Second Class Operators CW Bash		✘		SOC member number, name, and RST	www.qsl.net/soc
Apr 2, 0400Z - Apr 2 0800Z	7		LZ Open 40 Meter Contest		✘		6-digit serial and serial from previous QSO	www.lzopen.com
Apr 2, 1200Z - Apr 3 2400Z	1.8-28		QRP ARCI Spring QSO Party		✘		RST, S/P/C, power or QRP ARCI number	www.qrparci.org
Apr 2, 1500Z - Apr 3 1500Z	1.8-28		SP DX Contest	✘	✘		RS(T), serial or SP province	www.spdxcontest.info
Apr 2, 1600Z - Apr 3 1600Z	3.5-28		EA RTTY Contest			✘	RST, serial or EA province	www.ure.es/contest
Apr 2, 1800Z - See web site	1.8-28		MO QSO Party	✘	✘		RS(T), serial, MO county or S/P/C	www.w0ma.org
Apr 5, 0200Z - Apr 5 0400Z	3.5-28		ARS Spartan Sprint		✘		RST, S/P/C, and power	www.arsqrp.blogspot.com
Apr 8, 0200Z - Apr 8 0300Z	1.8-14		SNS and NS Weekly Sprints		✘		Serial, name, and S/P/C	www.ncccsprint.com/rules.html
Apr 9, 1600Z - Apr 9 1959Z	3.5-14		EU Spring Sprints		✘		Both call signs, serial, name	www.eusprint.com
Apr 9, 0000Z - Apr 10 2400Z		432, 3.4G	Worldwide EME Contest	✘	✘		TMO/RS(T) and "R"	www.dubus.org
Apr 9, 0000Z - Apr 10 0000Z	1.8-28	50-432	Montana QSO Party	✘	✘	✘	RS(T), S/P/C or MT county	www.fvarc.org
Apr 9, 0700Z - Apr 10 1300Z	1.8-28		Japan International DX Contest		✘		RST, JA prefecture or CQ Zone	jidx.org
Apr 9, 12 Noon - Apr 9 6 PM	14		PODXS 31 Flavors Contest			✘	S/P/C and name or 070 number	www.podxs070.com
Apr 9, 1400Z - Apr 10 0200Z	1.8-28	50	New Mexico QSO Party	✘	✘	✘	Call sign, name, and NM county or S/P/C	www.swcp.com/~n5zgt
Apr 9, 1800Z - Apr 10 1800Z	1.8-28	50+	QCWA Spring QSO Party	✘	✘	✘	Call,year lic'd,name,QCWA chap or S/P/C	www.qcwa.org/qso-party.htm
Apr 9, 1800Z - See web site	1.8-28	50	GA QSO Party	✘	✘		RS(T), S/P/C or GA county	gqp.contesting.com
Apr 9, 2100Z - Apr 10 2100Z	1.8-28		Yuri Gagarin DX Contest		✘		RST, ITU Zone	http://gc.qst.ru/en
Apr 11, 7 PM - Apr 11 11 PM		144	VHF Spring Sprints	✘	✘	✘	Grid Square (6-character preferred)	sites.google.com/site/springvhfupsprints
Apr 11, 0700Z - See web site	7,14		International Vintage Contest	✘	✘		RS(T), grid square	www.contestvintage.beepworld.it
Apr 13, 0030Z - Apr 13 0230Z	3.5-14		NAQCC Monthly QRP Sprint		✘		RST, S/P/C, and NAQCC mbr nr or power	naqcc.info
Apr 13, 1100Z - See web site	3.5-14		CW ops Monthly Mini-CWT Test		✘		Name, member number or S/P/C	cwops.org
Apr 15, 2100Z - Apr 16 2100Z	1.8-28		Holyland DX Contest	✘	✘	✘	RS(T), serial or Israel district	www.iarc.org
Apr 16, 1600Z - Apr 16 1959Z	3.5-14		EU Spring Sprints	✘			Both call signs, serial, name	www.eu-sprint.com
Apr 16, 0000Z - Apr 16 2359Z	1.8-28	50	TARA Skirmish Dig Pfx Contest			✘	Name, prefix	www.n2ty.org/seasons/tara_dpx_rules.html
Apr 16, 0001Z - Apr 24 2359Z	1.8-28		Lighthouse Spring Lites QSO Party	✘	✘	✘	ARLHS number or serial, name, S/P/C	arlhs.com
Apr 16, 0500Z - Apr 16 0859Z	3.5,7		ES Open HF Championship	✘	✘		RS(T), serial, dupes OK once/hour	www.erau.ee/index.php?newlang=eng
Apr 16, 1600Z - Apr 16 1800Z	1.8-28		Feld-Hell QRP Sprint			✘	RST, QTH, Feld-Hell number	www.feldhellclub.org
Apr 16, 1600Z - Apr 17 0400Z	3.5-28		Michigan QSO Party	✘	✘		Serial and MI county or S/P/C	www.miqp.org
Apr 16, 1700Z - Apr 17 1300Z	3.5-28		EA QRP Contest		✘		RST, category, M if EA QRP member	www.eaqrp.com
Apr 16, 1800Z - See web site	1.8-28	50,144	Ontario QSO Party	✘	✘		RS(T), S/P/C or Ontario QTH	www.va3cco.com
Apr 16, 2100Z - See web site	1.8-28		YU DX Contest		✘		RST and ITU zone	www.yu1srs.org.rs/dl/yudx/yudxmain.html
Apr 17, 1800Z - Apr 17 2359Z	**3.5-28**	**50**	**ARRL Rookie Roundup**	✘			**Both calls, name, check, S/P XE# or "DX"**	**www.arrl.org/contests**
Apr 19, 7 PM - Apr 19 11 PM		222	VHF Spring Sprints	✘	✘	✘	Grid Square (6-character preferred)	sites.google.com/site/springvhfupsprints
Apr 23, 0001Z - Apr 24 2359Z	28		Ten-Ten Spring Digital Contest			✘	Call, name, county & S/P/C, 10-10 number	www.ten-ten.org
Apr 23, 1200Z - Apr 24 1200Z	3.5-28		SP DX RTTY Contest			✘	RST, serial, SP province	www.pkrvg.org/zbior.html
Apr 23, 1300Z - Apr 24 1259Z	1.8-28		Helvetia Contest	✘	✘	✘	RS(T), serial or Swiss canton	www.uska.ch
Apr 23, 1500Z - Apr 24 0300Z	7-28		QRP To The Field		✘		RST, S/P/C	www.zianet.com/qrp
Apr 27, 7 PM - Apr 27 11 PM		432	VHF Spring Sprints	✘	✘	✘	Grid Square (6-character preferred)	sites.google.com/site/springvhfupsprints
Apr 30, 0000Z - May 1 2400Z		5.7G	Worldwide EME Contest	✘	✘		TMO/RS(T) and "R"	www.dubus.org
Apr 30, 1100Z - May 1 1700Z	1.8-28	50,144	Nebraska QSO Party	✘	✘	✘	RS(T), NE county or S/P/C	www.hdxa.net
Apr 30, 1600Z - See web site	7-28		Florida QSO Party	✘	✘		RS(T), FL county or S/P/C	www.floridaqsoparty.org
Apr 30, 1700Z - Apr 30 2100Z	3.5-28		BARTG 75 Sprint			✘	Serial	www.bartg.org.uk

All dates refer to UTC and may be different from calendar date in North America. Times given as AM or PM are local times and dates.
Refer to the contest Web sites 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

2010 IARU HF World Championship Results

Thousands keep finding HF fun in July.

Carl Luetzelschwab, K9LA
k9la@frontier.com

The write-up from last year's results started with the following statement: "In spite of being in the deepest solar minimum of our lifetimes, contesters came out in record numbers to participate in this increasingly popular summer event." Well, the sunspots weren't that much better in 2010 than 2009 (more on that later), but the number of logs received again set a new record. 3714 logs were received, which is up almost 10% from last year's 3404 submittals.

What is Making IARU HF Increasingly Popular?

You've probably participated in some of the "smaller" contests — like the friendly North American QSO Parties sponsored by the *National Contest Journal* (**www.ncjweb.com**) and your state's QSO party. You might have done fairly well in those events but want to ramp up your contesting endeavors to the bigger contests — that is, get your feet even wetter in contesting. If you're in this category, you might want to try the IARU HF World Championship this coming July.

Chris, AI4AW, summarized it nicely in his Soapbox comments on the July 10-11, 2010 event (**www.arrl.org/contests/soapbox**) by saying, "What makes the IARU contest fun is everyone works everyone, we get to operate both CW and phone, the exchange is simple, we get to work HQ stations and receive their nifty QSLs through the bureau, and it's a 24 hour contest. It's also during the summer break which allows busy college students to take it seriously."

Throw in the fact that almost two-thirds of the participants were entered in the Low Power category (less than or equal to 150 W) and that means your modest station will be on par with the majority of the competitors. Get your antennas ready (even better, make some improvements to your antenna farm) and join in the fun this July.

Logs, Zones, QSOs, Bands

As mentioned earlier, the 2010 event set a new record in log submittals. Figure 1 shows the number of logs submitted by year. No doubt the World Radiosport Team Championship 2010 (run within the IARU HF World Championship) contributed to more log submittals but it's pretty

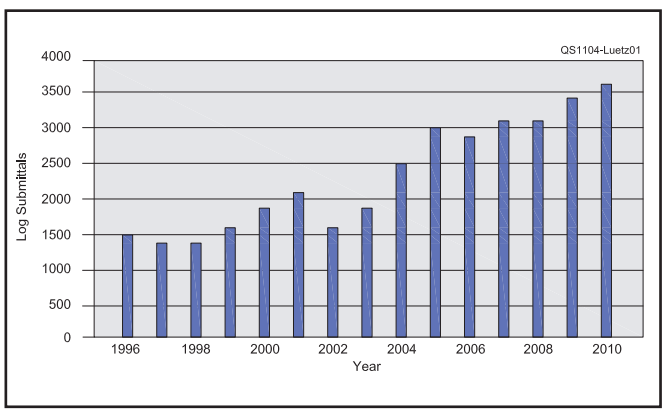


Figure 1 — Logs submitted by year

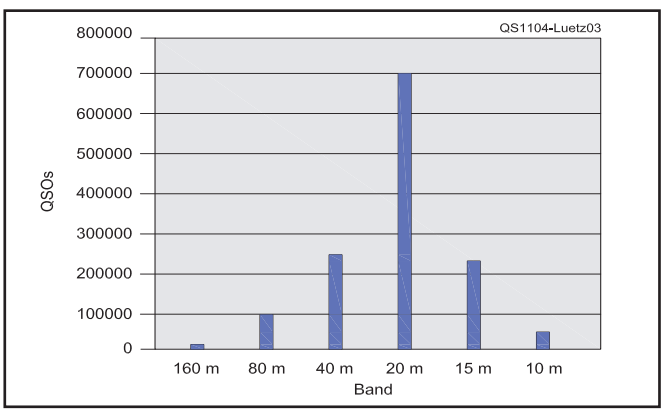


Figure 3 — Number of QSOs by band

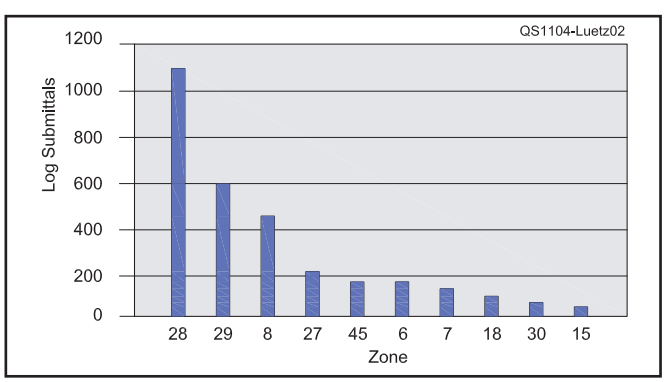


Figure 2 — Logs submitted by zone

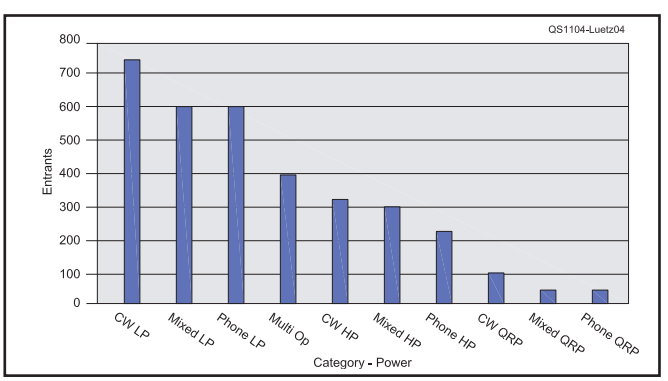


Figure 4 — Entrants by category and power

obvious that the popularity of this contest grows independently of the WRTC events.

Figure 2 shows the Zone participation in terms of the number of logs received. Zone 28 again takes top honors, with Zone 29, Zone 8, Zone 27 and Zone 45 rounding out the top five. Logs were received from 54 zones this year.

In the logs received there were almost 1,400,000 QSOs made over the 24 hour contest period. In the Phone-Only and CW-Only category, CW entrants made roughly twice as many QSOs as the Phone entrants. It is likely that this ratio applies to all the categories, which says CW is still just as popular as ever and offers more QSOs due to its inherent effectiveness in marginal conditions.

With solar Cycle 24 just beginning its ascent, one would expect little change from last year in the number of QSOs by band. Indeed, the percentages compared to last year look similar. Figure 3 shows the number of QSOs by band. It's possible that the slow rise of Cycle 24 will push the number of 15 meter QSOs past the number of 40 meter QSOs for this July's event.

One prediction from the data is certain — 20 meters will likely still be the go-to band regardless of where we are in a solar cycle. That's because this contest is run in the summer, when maximum useable frequencies are lower than winter. If you're restricted to one band for whatever reason, you might want to concentrate on 20 meters.

HQ Stations

After last year's disagreement over log checking for HQ stations the World Wide Radio Operators Foundation (**www.wwrof.org**) volunteered to set up a committee of EU log reviewers

W/VE

Single Operator, Mixed Mode, QRP

KT8K	110,016
NDØC	82,082
KA1LMR	57,486
W6AQ	38,346
K8ZT	29,176
VE3MGY	29,080
NT4TS	15,163
VE3WZ	14,364
WØMRZ	13,716
KU4A	13,146

Single Operator, Mixed Mode, Low Power

NR3X (N4YDU, op)	530,874
K9JF	502,720
VE3KF	457,905
KØAD	364,760
N2WN	268,200
N2ZN	203,371
KB9OWD	202,080
VE1AL	201,664
N9CM	198,120
N1YX	188,370

Single Operator, Mixed Mode, High Power

K3CR (LZ4AX, op)	2,472,660
VE3AT	2,187,184
KQ2M	1,938,457
K9RS (N3DXX, op)	1,624,129
K3ZO	1,516,816
W4AN (K4BAI, op)	1,446,898
K4AB	927,399
N4DA	733,838
K1JB	727,904
N4EEB	541,317

Single Operator, Phone Only, QRP

VE3RHD	32,175
AE5GT	31,800
W2TI	24,035
KD8DVY	12,606
WB7OCV	8,446
VE2EXB	6,688
WBØIWG	3,810
N4ZAK	2,136
KC7DVF	1,168
VA3WPV	340

Single Operator, Phone Only, Low Power

N1UR	592,920
KP2/AA1BU	533,621
W3LL	242,424
VE9ZX	230,016
NV8N	206,518
N2RJ	152,000
K4MDX	139,692
KA2KON	94,416
K1WO	89,960
W5GFI	75,030

Single Operator, Phone Only, High Power

VE3AP (LU7DW, op)	1,558,947
W7WA	1,370,520
WB9Z	1,280,570
NR5M	1,237,054
K5TR	1,064,688
WW1WW (KK1KW, op)	806,265
W4SVO	668,656
K4NV	564,582
K5ER	309,270

Single Operator, CW Only, QRP

W5GAI	195,548
VA3SB	174,276
K8CN	87,330
N5WLA	41,006
K4ORD	27,008
K7HBN	21,712
AI9K	21,120
K5ND	17,424
NU4B	17,169
K2QO	9,840

Single Operator, CW Only, Low Power

W1RM	1,135,630
VE3EK	477,462
W2/E78WW	456,304
NA4K	443,366
VA1CHP	407,484
K7WP	371,868
WB4TDH	363,058
VE1RGB	341,775
N2WQ/VE3	309,852
N9UC (WO9S, op)	304,448

Single Operator, CW Only, High Power

K1KI	2,085,460
KØDQ	1,890,966
K1TO	1,740,362
K8PO	1,665,816
AA3B	1,600,720
W9RE	1,561,680
N4AF	1,539,245
KØDXC	1,521,312
N4OGW	1,322,322
WØUA	1,100,790

Multioperator

NN3W	2,762,474
NØNI	1,649,572
K8AZ	1,562,724
W1UJ	1,425,690
K5MR	1,347,005
K2LE	1,309,280
W5WMU	1,269,496
K6NA	1,196,257
K5KG	1,143,628
N1LN	1,030,125

Worldwide

Single Operator, Mixed Mode, QRP

OK7CM	395,328
US2IZ	235,382
DR2Q (DL8MBS, op)	151,156
JR3RWB	108,460
RW6FO	107,502
LY4BF	87,000
IZ3NVR	72,653
RN4HAB	57,152
SP5DDJ	49,280
RK9DO	30,267

Single Operator, Mixed Mode, Low Power

HGØR (HAØNAR, op)	1,426,500
RL9AA	1,394,584
OL6P	1,053,949
HG1ØP (HA3MY, op)	1,036,028
UA3RC	1,030,621
LY4L	991,952
OK2BYW	710,160
RW9C	709,136
SK3A (SM3CVM, op)	661,153
VP5ØV (W5CW, op)	659,450

Single Operator, Mixed Mode, High Power

4O3A (UT5UDX, op)	3,573,079
RC9O	3,061,970
EA8CMX (OH2BYS, op)	2,944,200
RG3K (UA3QDX, op)	2,695,210
DL1IAO	2,361,174
YTØZ (YU1ZZ, op)	2,342,697
OH8L (OH8LQ, op)	2,289,030
UT7U (UT7UV, op)	2,189,970
PS2T (PY2NY, op)	2,081,359
RA9CKQ	1,894,405

Single Operator, Phone Only, QRP

HG1W	243,906
HA5KDQ (HA5NB, op)	94,560
RD3AJB	80,289
IV3AOL	55,335
SP2QOT	49,413
OK4AS	31,185
EA1GT/QRP	24,090
MØLPT	18,873
R2AD	17,493
PE2KP	17,493

Single Operator, Phone Only, Low Power

HA3DX (HA4XH, op)	1,011,974
EM7L (UT7XX, op)	835,582
RW1CW	719,590
IR5X	591,136
7Z1SJ	506,077
YP7P (YO7LFV, op)	459,856
YO3CZW	441,600
UA3BL	3 97,480
HK6P	393,000
IW1QN	392,274

Single Operator, Phone Only, High Power

HG8R	2,024,145
YL7A	1,837,000
ES5RW	1,634,816
UW5Q (UR3QCW, op)	1,632,255
RN7F	1,557,828
YT8A (YU1EA, op)	1,385,208
CR3L (DJ6QT, op)	1,252,968
ZX2B (PY2MNL, op)	1,252,416
GW9T (MWØZZK, op)	1,157,450
LY7A	1,107,195

Single Operator, CW Only, QRP

HA8BE	588,838
HA1ZH	463,541
HG5A (HA7AP, op)	433,552
OK3C (OK2ZC, op)	430,766
RA3AN	290,652
UA6LCJ	270,984
SP2DNI	254,842
SP9NSV	254,502
DD1IM	204,444
SP4GFG	189,108

Single Operator, CW Only, Low Power

ZC4LI	1,891,932
EF3A (EA3KU, op)	1,545,328
SM5IMO	1,356,277
OK2ZI	1,208,970
RA9AP	1,114,814
UW5U (UY2UA, op)	1,091,520
S52OP	1,072,190
UT1IA	991,650
RT9S	904,622
LZ9R (LZ3YY, op)	883,025

Single Operator, CW Only, High Power

5B/W2TAA (RV1AW, op)	4,219,995
CR3E (CT1BOH, op)	3,677,208
RD3A	3,073,600
OH0X (OH2PM, op)	2,713,710
RX9AM	2,458,783
UW1M (UR5MW, op)	2,443,716
YT2T	2,160,877
RS3A (RA3CW, op)	2,028,534
RA9FTM	1,876,600
HG7T (HA7TM, op)	1,724,256

Multioperator

RT4F	4,226,220
OH4A	3,707,304
CR3T	3,116,464
UA9UZZ	2,744,415
RN9S	2,708,500
RK9CWW	2,542,428
HG8DX	2,376,990
HG1S	2,201,804
LZ9W	2,171,884
RA9A	2,150,120

HQ and Administrative Council Report

HQ and AC scores are computed by World-Wide Radio Operators Foundation (**www.wwrof.org**). An "x" in a call sign indicates multiple calls with different numbers were used.

IARU Headquarters Stations

Call Sign	*Score*	*QSOs*	*Mults*
DAØHQ	22,443,225	20,547	465
TMØHQ	22,067,901	14,731	449
IUxHQ	19,884,220	14,830	466
GR2HQ	19,710,339	14,857	417
SNØHQ	19,615,155	15,587	445
E7HQ	18,492,208	13,568	458
9AØHQ	17,100,670	13,319	430
R3HQ	16,989,612	12,448	419
SK9HQ	16,595,943	11,647	403
S5ØHQ	16,256,250	12,494	425
YL4HQ	15,580,789	11,555	421
LYØHQ	12,998,415	10,445	401
YTØHQ	12,627,177	11,039	417
OE1A	12,187,856	10,632	388
4X3HQ	10,928,960	7,222	328
CR5HQ	10,696,320	7,817	384
LXØHQ	10,628,380	8,707	356
EM5HQ	10,564,073	8,841	389
NU1AW	10,467,530	9,670	355
YRØHQ	10,187,806	9,772	401
OZ1HQ	10,150,700	8,398	350
OH2HQ	9,191,322	7,480	357
LZ7HQ	8,598,000	8,552	375
SXØHQ	8,171,989	9,099	367
8NxHQ	7,723,625	10,419	325
UN1HQ	7,630,146	5,670	303
W1AW/8	6,889,311	8,749	303
A71A	6,663,276	4,712	309
BxHQ	4,615,942	3,877	254
OPØHQ	3,878,550	4,493	270
LN2HQ	3,136,250	3,831	250
HB9HQ	2,839,980	3,898	286
CX1AA	2,257,580	1,963	260
ZL6HQ	1,965,540	2,076	205
EIØHQ	1,884,056	2,852	214
HGØHQ	1,198,275	2,089	195
ZF1A	953,250	1,867	150
ER7HQ	615,465	1,665	141
YV5AJ	392,496	686	136
EKØHQ	389,784	918	109
TF3HQ	114,172	860	34
TGØAA (TG9ANF, op)	99,640	658	47
HLØHQ	92,304	412	72
P4ØHQ (P43JB, op)	64,746	182	109
JU1HQ (JT1CS, op)	58,630	338	55
HSØAC (HSØ/OZ1HET, op)	28,014	191	46
XE1LM	21,700	152	50
HBØHQ	18,815	225	53
VR2HK	800	18	16

Administrative Council and Regional Official Stations

Call Sign	*Score*	*QSOs*	*Mults*
9A5W	1,348,121	1,675	251
JA1TRC	654,858	948	201
XE1KK	418,040	900	140
VE6SH	71,020	330	67
NB2T	51,442	302	89
ZS4BS	20	2	2
JE1MUI	1	1	1

representing their national societies (9A5K, DL3DXX, E77DX, F2DX, G4IRN, HB9EPA, OK1DIG, LA6FJA, SM6JSM and SP7DQR). Their table of final results for the HQ and AC stations is included. We greatly appreciate the work done by the committee to make sure the HQ and AC logs are judged agreeably to all. A sidebar by Chris, 9A5K is available in the online version of this article.

Records

Three new records were set during the 2010 contest. Two of the three were individuals beating their old record! The World Single Op CW HP record set in 2005 was beaten by RV1AW operating as 5B/W2TAA. His 4.2-million score bested CT1BOH's 3.8-million record score at CT3EN. N1UR beat his Single-Op, Low Power, Phone 506k record set in 2009 with a score of 593k. And W1RM squeaked by his Single-Op, Low Power, CW 1,065,100 point record set in 2006 with a score of 1,135,630. Way to go, guys!

Class-Power Statistics

It was mentioned earlier that almost two-thirds of the participants entered in the Low Power category. Figure 4 breaks down the entries by Category and Power. Single-Op, Low Power, CW is the most popular entry, with Single-Op, Low Power, Mixed and Single-Op, Low Power, Phone pretty much running neck and neck.

On the other end of the power meter, forty participants braved Single-Op, QRP, Phone (less than or equal to 5 W). This was followed closely by 46 entrants in Single-Op, QRP, Mixed. The number of Single-Op, QRP, CW entrants was more than twice that of Phone or Mixed. CW had a whopping 103 brass pounders working at the 5 W or less level.

Zones To Be In to Win

There is nothing surprising in the tables of Top Ten winners for both the World and W/VE. If you want to win the World, Zone

Record Scores Through 2010

New records are in **bold**

World Records	*Call*	*Score*	*Year*
Single Operator Mixed HP	3V1A	4,414,517	2007
Single Operator Mixed LP	HG3M (HA3MY, Op)	2,095,522	2004
Single Operator Mixed QRP	HG5Y	1,067,647	2007
Single Operator Phone HP	CN2R (W7EJ, Op)	4,718,736	2005
Single Operator Phone LP	D4C (IZ4DPV, op)	2,975,632	2008
Single Operator Phone QRP	HG1W (HA1WD, Op)	348,517	2007
Single Operator CW HP	**5B/W2TAA (RV1AW, Op)**	**4,219,995**	**2010**
Single Operator CW LP	HA8DU	2,278,782	2006
Single Operator CW QRP	HA5KDQ (HA7ANT, Op)	1,412,260	2006
Multioperator	P3A	7,008,176	2003
W/VE Records			
Single Operator Mixed HP	KQ2M	2,810,088	2001
Single Operator Mixed LP	VE3DZ	1,179,150	2009
Single Operator Mixed QRP	NØKE	187,590	2008
Single Operator Phone HP	KH6ND	2,257,190	2002
Single Operator Phone LP	**N1UR**	**592,920**	**2010**
Single Operator Phone QRP	KC5R	172,080	2007
Single Operator CW HP	VY2ZM (K5ZD, Op)	2,631,694	2005
Single Operator CW LP	**W1RM**	**1,135,630**	**2010**
Single Operator CW QRP	W2GD	427,392	2009
Multioperator	K1LZ	2,554,760	2009

W/VE Regional Leaders by Category

For class: A=Mixed Mode, B=Phone Only, C=CW Only, D=Multioperator. *For power:* A=QRP, B=Low Power, C=High Power

Northeast Region
(New England, Hudson and Atlantic Divisions; Maritime and Quebec Sections)

Call	*Score*	*Class*	*Pwr*
KA1LMR	57,486	A	A
N3XRV	12,236	A	A
VE9QRP	12,100	A	A
VA3JFF/W1	3,657	A	A
N2ZN	203,371	A	B
VE1AL	201,664	A	B
N1YX	188,370	A	B
KB3LIX	123,098	A	B
N1IBM	107,460	A	B
K3CR (LZ4AX, op)	2,472,660	A	C
KQ2M	1,938,457	A	C
K9RS (N3DXX, op)	1,624,129	A	C
K3ZO	1,516,816	A	C
K1JB	727,904	A	C
W2TI	24,035	B	A
WB7OCV	8,446	B	A
VE2EXB	6,688	B	A
WBØIWG	3,810	B	A
N1UR	592,920	B	B
W3LL	242,424	B	B
VE9ZX	230,016	B	B
N2RJ	152,000	B	B
KA2KON	94,416	B	B
WW1WW (KK1KW, op)	806,265	B	C
AD1DX	56,274	B	C
K3OQ	27,936	B	C
VE2FXL	22,576	B	C
WA3AFS	21,868	B	C
K8CN	87,330	C	A
K2QO	9,840	C	A
VA2SG	8,646	C	A
N2EIK	7,626	C	A
NQ2W	896	C	A
W1RM	1,135,630	C	B
W2/E78WW	456,304	C	B
VA1CHP	407,484	C	B
VE1RGB	341,775	C	B
VY2SS	301,568	C	B
K1KI	2,085,460	C	C
K8PO	1,665,816	C	C
AA3B	1,600,720	C	C
KØDXC	1,521,312	C	C
K1FWE	944,091	C	C
NN3W	2,762,474	D	
W1UJ	1,425,690	D	
K2LE	1,309,280	D	
N2MM	927,830	D	
W1QK	545,598	D	

Southeast Region
(Delta, Roanoke and Southeastern Divisions)

Call	*Score*	*Class*	*Pwr*
NT4TS	15,163	A	A
W4QO	9,196	A	A
NR3X (N4YDU, op)	530,874	A	B
N2WN	268,200	A	B
N9CM	198,120	A	B
NV4B	141,565	A	B
K3TW/4	57,540	A	B
W4AN (K4BAI, op)	1,446,898	A	C
K4AB	927,399	A	C
N4DA	733,838	A	C
N4EEB	541,317	A	C
NF4A	287,250	A	C
KD8DVY	12,606	B	A
N4ZAK	2,136	B	A
N8OQ	145	B	A
KP2/AA1BU	533,621	B	B
K4MDX	139,692	B	B
K4WES	56,758	B	B
KS4X	56,238	B	B
KJ4KVC	10,846	B	B
W4SVO	668,656	B	C
K4NV	564,582	B	C
K5ER	309,270	B	C
NJ2F	165,998	B	C
WA5OYU	94,785	B	C
K4ORD	27,008	C	A
NU4B	17,169	C	A
NA4K	443,366	C	B
WB4TDH	363,058	C	B
WA1FCN	258,525	C	B
WK2G	248,512	C	B
N3ZL	214,920	C	B
KØDQ	1,890,966	C	C
K1TO	1,740,362	C	C
N4AF	1,539,245	C	C
N4OGW	1,322,322	C	C
N4PN	1,100,232	C	C
W5WMU	1,269,496	D	
K5KG	1,143,628	D	
N1LN	1,030,125	D	
KA1ARB	891,885	D	
AB4GG	749,853	D	

Central Region
(Central and Great Lakes Divisions; Ontario Section)

Call	*Score*	*Class*	*Pwr*
KT8K	110,016	A	A
K8ZT	29,176	A	A
VE3MGY	29,080	A	A
VE3WZ	14,364	A	A
KU4A	13,146	A	A
VE3KF	457,905	A	B
KB9OWD	202,080	A	B
W9ZRX	107,811	A	B
W8TM	89,454	A	B
N8DE	63,308	A	B
VE3AT	2,187,184	A	C
W9IU	476,136	A	C
VE3OI	246,078	A	C
VE3XN	212,472	A	C
VE3JM	177,918	A	C
VE3RHD	32,175	B	A
VA3WPV	340	B	A
NV8N	206,518	B	B
KB8UUZ	64,155	B	B
VA3SWG	47,400	B	B
W8KNO	43,848	B	B
VA3GD	20,829	B	B
VE3AP (LU7DW, op)	1,558,947	B	C
WB9Z	1,280,570	B	C
N9JZN	15,290	B	C
K9JIG	14,700	B	C
VA3XH	13,674	B	C
VA3SB	174,276	C	A
AI9K	21,120	C	A
VA3RKM	3,744	C	A
K8DD	3,720	C	A
N8XX	2,684	C	A
VE3EK	477,462	C	B
N2WQ/VE3	309,852	C	B
N9UC (WO9S, op)	304,448	C	B
K8AJS	256,610	C	B
VE3KAO	209,096	C	B
W9RE	1,561,680	C	C
K8GL	694,112	C	C
N8PW	439,245	C	C
KE9I	387,512	C	C
K9MMS	366,208	C	C
K8AZ	1,562,724	D	
W8MJ	930,628	D	
K9SD	860,453	D	
VE3YAA	573,000	D	
K9NR	443,443	D	

Midwest Region
(Dakota, Midwest, Rocky Mountain and West Gulf Divisions; Manitoba and Saskatchewan Sections)

Call	*Score*	*Class*	*Pwr*
NDØC	82,082	A	A
WØMRZ	13,716	A	A
WØYJT	4,536	A	A
AD7BN	80	A	A
KØAD	364,760	A	B
VE4YU	172,260	A	B
WØETT	169,626	A	B
AD1C	149,600	A	B
KØBJ	66,339	A	B
KØOU	431,860	A	C
NØKE	391,170	A	C
KO7X	225,055	A	C
WWØAL	60,996	A	C
AA5VU	1,771	A	C
AE5GT	31,800	B	A
W5GFI	75,030	B	B
WØFMS	62,046	B	B
K5DHY	59,220	B	B
WBØTSR	42,009	B	B
WDØBMR	38,478	B	B
NR5M	1,237,054	B	C
K5TR	1,064,688	B	C
KØRH	265,088	B	C
AD5XD	144,760	B	C
NØQO	87,616	B	C
W5GAI	195,548	C	A
N5WLA	41,006	C	A
K5ND	17,424	C	A
WB5BKL	220	C	A
NAØN	271,062	C	B
WØIMD	193,193	C	B
W5RYA	181,860	C	B
ACØDS	133,042	C	B
K5CM	129,986	C	B
WØUA	1,100,790	C	C
W5KFT (N1XS, op)	416,619	C	C
KØFX	324,810	C	C
K5BG	284,376	C	C
K7IA	132,848	C	C
NØNI	1,649,572	D	
K5MR	1,347,005	D	
N7VM	445,793	D	
KØDI	196,776	D	
N5ZK	151,368	D	

West Coast Region
(Pacific, Northwestern and Southwestern Divisions; Alberta, British Columbia and NWT Sections)

Call	*Score*	*Class*	*Pwr*
W6AQ	38,346	A	A
AC6YY	5,130	A	A
K9JF	502,720	A	B
WA6FGV	140,794	A	B
NR7Q	112,211	A	B
VE7WEB	105,552	A	B
K3FIV	91,205	A	B
KC6X	367,780	A	C
K6SRZ	291,712	A	C
K4XU	215,943	A	C
WA5VGI	179,529	A	C
W6SX	152,460	A	C
KC7DVF	1,168	B	A
VA7DXC	55,522	B	B
N7VPN	23,622	B	B
K7XE	14,196	B	B
K7ACZ	12,236	B	B
K7DNH	11,997	B	B
W7WA	1,370,520	B	C
W6AFA	218,932	B	C
KT6VV	95,284	B	C
N7VF	66,202	B	C
KB6FB	57,084	B	C
K7HBN	21,712	C	A
WT6P	5,250	C	A
KL7/WA4DOX	638	C	A
W6/VK2IMM	470	C	A
WB6BDD	224	C	A
K7WP	371,868	C	B
VE6BF	151,183	C	B
K2PO/7	115,620	C	B
KM6Z	104,377	C	B
WN6K	86,515	C	B
KH6YR (K1YR, op)	980,235	C	C
K6AW (@ N6RO)	942,011	C	C
N7TT	550,593	C	C
AD6E	412,167	C	C
VA7ST	374,472	C	C
K6NA	1,196,257	D	
KH6LC	1,023,624	D	
N7AT	840,917	D	
W7VJ	839,496	D	
K6LRG	663,120	D	

Continental Leaders by Category

For class: A=Mixed Mode, B=Phone Only, C=CW Only, D=Multioperator. *For power:* A=QRP, B=Low Power, C=High Power

Call	Score	Class	Power
Africa			
EA8BQM	62,040	A	B
EC8AFM	13,821	A	B
CN8VO	10,575	A	B
EA8CMX (OH2BYS, op)	2,944,200	A	C
VQ9ØJC (VQ9JC, op)	236,800	A	C
EA8CNR	132,600	B	B
D2QMN	20,832	B	B
CT3KU	10,122	B	B
CR3L (DJ6QT, op)	1,252,968	B	C
ZS5NK	17,836	B	C
CT3HF	9,664	B	C
EA8DA	286,740	C	B
CN8YR	7,326	C	B
V51YJ	3,640	C	B
CR3E (CT1BOH, op)	3,677,208	C	C
ED8T (EA8AY, op)	813,375	C	C
ZS1EL	35,259	C	C
CR3T	3,116,464	D	C
Asia			
JR3RWB	108,460	A	A
RK9DO	30,267	A	A
JK1TCV	6,562	A	A
RL9AA	1,394,584	A	B
RW9C	709,136	A	B
UA9CMQ	581,658	A	B
RC9O	3,061,970	A	C
RA9CKQ	1,894,405	A	C
ZC4VJ	1,005,123	A	C
JA2MWV	8,446	B	A
7Z1SJ	506,077	B	B
P39P (5B4AIP, op)	324,478	B	B
RX9FR	135,315	B	B
RN7F	1,557,828	B	C
A61BK	896,235	B	C
RA9AU	519,861	B	C
RW4AA/9	148,120	C	A
RD9CX	148,002	C	A
4L9QQ	63,525	C	A
ZC4LI	1,891,932	C	B
RA9AP	1,114,814	C	B
RT9S	904,622	C	B
5B/W2TAA (RV1AW, op)	4,219,995	C	C
RX9AM	2,458,783	C	C
RA9FTM	1,876,600	C	C
UA9UZZ	2,744,415	D	C
RN9S	2,708,500	D	C
RK9CWW	2,542,428	D	C
Europe			
OK7CM	395,328	A	A
US2IZ	235,382	A	A
DR2Q (DL8MBS, op)	151,156	A	A
HGØR (HAØNAR, op)	1,426,500	A	B
OL6P	1,053,949	A	B
HG1ØP (HA3MY, op)	1,036,028	A	B
4O3A (UT5UDX, op)	3,573,079	A	C
RG3K (UA3QDX, op)	2,695,210	A	C
DL1IAO	2,361,174	A	C
HG1W	243,906	B	A
HA5KDQ (HA5NB, op)	94,560	B	A
RD3AJB	80,289	B	A
HA3DX (HA4XH, op)	1,011,974	B	B
EM7L (UT7XX, op)	835,582	B	B
RW1CW	719,590	B	B
HG8R	2,024,145	B	C
YL7A	1,837,000	B	C
ES5RW	1,634,816	B	C
HA8BE	588,838	C	A
HA1ZH	463,541	C	A
HG5A (HA7AP, op)	433,552	C	A
EF3A (EA3KU, op)	1,545,328	C	B
SM5IMO	1,356,277	C	B
OK2ZI	1,208,970	C	B
RD3A	3,073,600	C	C
OHØX (OH2PM, op)	2,713,710	C	C
UW1M (UR5MW, op)	2,443,716	C	C
RT4F	4,226,220	D	C
OH4A	3,707,304	D	C
HG8DX	2,376,990	D	C
North America			
VP5ØV (W5CW, op)	659,450	A	B
H7A (YN4SU, op)	111,873	A	B
HI3FVA	17,700	A	B
XE1V	9,962	A	C
WP3GW	44,560	B	B
HI3K	8,500	B	B
XE2YWH	7,874	B	B
4B1EE (XE1EE, op)	5,440	B	C
WP4WW (KP4JRS, op)	5,408	B	C
J39BS	90,864	C	B
XE2AC	56,283	C	B
HP1AC	17,200	C	B
NP2X (K9VV, op)	237,360	C	C
XE1MM	82,350	C	C
XE2WWW	42,960	C	C
KP2B	238,810	D	C
HR2DMR	71,730	D	C
FP/K9OT	18,603	D	C
Oceania			
VK4AN	26,158	A	B
VK3DLI	25,075	A	B
VK2APU	24,920	A	B
VK3TDX	456,048	A	C
VK7ZE	105,984	A	C
VK3IO	101,380	A	C
DV1JM	79,380	B	B
YB8EL	25,865	B	B
YB1UUN	17,043	B	B
KH2JU	172,800	B	C
DU1AV	126,996	B	C
VK4GH	17,507	B	C
9M6YBG	140,630	C	B
YB3XM	49,842	C	B
VK2GR	35,165	C	B
NH2T (N2NL, op)	1,032,669	C	C
VK4EMM	357,555	C	C
ZM2B (ZL2BR, op)	197,736	C	C
ZM4G (ZL2iFB, op)	349,885	D	C
ZL2JU	216,360	D	C
KG6DX	109,956	D	C
South America			
PY7RP	210,160	A	B
AY8A (LU8ADX, op)	103,831	A	B
PY2SEX	71,424	A	B
PS2T (PY2NY, op)	2,081,359	A	C
PV8AA	821,873	A	C
PP5JY	86,320	A	C
HK6P	393,000	B	B
LU1UM (LU2UF, op)	261,198	B	B
YV5LI	112,817	B	B
ZX2B (PY2MNL, op)	1,252,416	B	C
PY2LSM	1,058,282	B	C
LU4DX	627,414	B	C
LU1DCB (LU6DO, op)	23,124	C	A
LU8EHR	1,045	C	A
LU7HZ	550	C	A
AY9F (LU5FZ, op)	112,728	C	B
CE3DNP	71,412	C	B
HK3Q	37,680	C	B
PY2YU	1,496,286	C	C
L33M	63,384	C	C
PY7ZY	46,410	C	C
ZW5B	1,668,816	D	C
LR2F	1,648,548	D	C
PT5T	1,526,890	D	C

28 gives you the best chance due to the population density and point structure of the scoring format. Likewise, Zone 8 gives a W/VE station the best chance of winning. Of course there are a few exceptions, but the data tells the story.

Propagation

The 10.7 cm solar flux was in the low 80s during the contest period. It certainly could have been better to give some spice to 15 and 10 meters. At least Cycle 24 is on the rise. And thank goodness the geomagnetic field was quiet over the contest weekend with the 3-hour K index at 2 or below, including high latitudes!

What's most important is the smoothed sunspot number, as it is correlated to the state of the ionosphere in our propagation prediction programs. As long as the smoothed sunspot number (or the smoothed 10.7 cm solar flux) is on the rise, propagation should get better. So this year's contest should offer improved high-band propagation. I think we're all anxious for that!

W1AW/8

For the 2010 contest, the South West Ohio DX Association (SWODXA) hosted the W1AW HQ stations — six stations scattered throughout southwest Ohio. See the online version of this article for a full description and photos.

COURTESY DAVID VEST, K8DV

The W1AW/8 75 meter team of operators at K8DV — (left to right) AA8HH, K8CR, K8DV, AA8MC.

Extended Writeup — More Online!

There is a lot more in the online version of this article at **www.arrl.org/contests**. Winning stations are listed individually along with more scoring and record tables. You'll also find a set of contributions by the operators of the W1AW/8 Headquarters-category stations describing the contest from their point of view. Soapbox photos and comments are also available at **www.arrl.org/contests/soapbox**.

Disqualifications

The YPØA team (YO8WW, YO8SS, YO8DDP, YO8TOH, YO8OW, YO8BIG, YO8DOH and YO8TRC) was disqualified from the 2010 IARU HF contest for claiming credit for false QSOs while also generating and submitting multiple fake logs. Please play by the rules, people — enough said? Is winning so important to you that you won't play by the rules?

Check Logs

There were 282 logs relegated to check logs. Thanks to all who ended up in this pile. These logs do help the log checkers, so please submit your log regardless of your score.

2011 Contest

As a reminder, the 2011 contest will be held on the second full weekend of July — which puts it on July 9 and 10. I hope to work you in the contest! QST

The 2011 April Rookie Roundup — SSB

Sunday, April 17 — 1800 through 2359 UTC

- The event where new operators are tops! All amateurs licensed from 2009-2011 are Rookies. See how many stations you can work in 6 hours. Old Timers work the Rookies and provide on-air guidance and Elmering.
- The top five Rookies in each call area, Canadian province and DX stations receive a top five certificate. All Rookie entries receive a participation certificate.
- All score summaries must be received no later than 2359 UTC Wednesday, April 20, 2011. No late entries will be accepted.
- Complete rules and the online score summary reporting form can be found at **www.arrl.org/rookie-roundup**.
- Hope to see you on the air!

COURTESY FRANDY JOHNSON, N1FJ

Matt Wilhelm, W1MSW, of Northampton, Massachusetts will be on the air again from W1, defending his August 2010 SSB victory.

In the March/April 2011 Issue:

- John Post, KA5GSQ, shows how to use circuit simulation software to determine the gain of positive or negative feedback loops in "On Determining Loop Gain through Circuit Simulation."
- Arch Doty, W7ACD, discusses "The Effects of Ground Conductivity on Antenna Radials."
- In "Network Control of the W8ZR StationPro II," Paul Christensen, W9AC, expands the capability of this powerful device and includes the ability to control it over a LAN or even the Internet.
- Build a SoftRock SDR rig that doesn't need a PC. Charles Hill, W5BAA, shows how he did it in "SDR2GO: A DSP Odyssey."
- John Roos, K6IQL, describes a way to keep an old frequency standard useful in "Converting a Vintage 5 MHz Frequency Standard to 10 MHz with a Low Spurious Frequency Doubler."
- Maynard Wright, W6PAP, provides another installment in his series of tutorials on the use of the free *Octave* mathematics program in "*Octave* for L Networks."

QEX is edited by Larry Wolfgang, WR1B, (**lwolfgang@arrl.org**) and is published bimonthly. The subscription rate (6 issues) for ARRL members in the US is $24. For First Class US delivery, it's $37; in Canada and internationally by airmail it's $31. Nonmembers add $12 to these rates. Subscribe to *QEX* today at **www.arrl.org/qex**.

Would you like to write for *QEX*? It pays $50/printed page. Get more information and an *Author's Guide* at **www.arrl.org/qex-author-guide**. If you prefer postal mail, send a business-size self-addressed, stamped envelope to *QEX* Author's Guide, c/o Maty Weinberg, ARRL, 225 Main St, Newington, CT 06111-1494.

Strays

MARCONI MUSEUM ON CAPE COD, MASSACHUSETTS

♢The Chatham Marconi Maritime Museum opened its doors last summer on Rte 28 and Old Comers Road in Chatham, Massachusetts. It contains various exhibits depicting the development of wireless technology and glimpses of Guglielmo Marconi's life. The Center is located at the former Chatham Radio WCC Operations Building built by Marconi.

For more information on the museum, go to **www.chathammarconi.org**.

GO NORTH, JOHN!

♢*QST* author John Reisenauer Jr, KL7JR, has published his first book, *Go North, John!* The book describes 20 years of adventure while operating Amateur Radio in Alaska and the Yukon. John lived the Alaska experience, fulfilling a lifelong dream of exploring the Last Frontier, working on the Trans-Alaska Pipeline and DXing from a spectacular locale.

Available in paperback at Lulu Publishing, **www.lulu.com/product/paperback/go-north-john/14449726**.

ARRL Straight Key Night 2011

Where amateurs go to find a *Peaceful, Easy Feeling*.

Dan Henderson, N1ND
ARRL Regulatory Information Manager

It is funny how moods change when operating your Amateur Radio transmitter. There are times when you will pour all of your energy into a pileup, trying to work the DXpedition that has travelled to that rare entity. At other times, you might be laser-focused into handling traffic on the state NTS or emergency net — simply trying to do your part during crunch time. At some other time you may spend hours running stations during a contest, or if that is not your operating style, you may do some "search-and-pounce" to find a few counties or states you need to work for some wallpaper you are chasing.

When we accomplish our goals during those activities, we are rewarded with a great feeling of accomplishment — something to brag about at the next club meeting or to share with your friends on the repeater. Many hams will contend there is nothing quite like the "*Peaceful, Easy Feeling*" that comes with the laid-back operating event known as ARRL Straight Key Night (SKN).

For a brief 24 hour period once a year — 0000 to 2400 UTC January 1 — the often hectic nature of everyday Amateur Radio takes a breather. Instead of structured nets or contact rates of 150 an hour, during SKN you find dozens of amateurs relaxing, letting their fists do the talking as they recapture, if but briefly, some of the enchantment of our father's (and grandfather's) Amateur Radio.

A Fistful of Fun

The 191 reports received for SKN 2011 show that the glamour of this operating event has not dulled. The eager participants reported 1467 contacts from almost every state — and several foreign countries. As Bill Gerth, W4RK, licensed for over 55 years, put it, the participants appreciate "the opportunity it affords us Old Timers to relive the past in such a wonderful way," but SKN is not just for long-time licensees. When you read the list of participants submitting entries you will find calls that are more recent as well — KB9, KI4 and more. SKN is not just a trip down memory lane for seasoned licensees — it is the opportunity for newer amateurs to experience a small part of the magic of our common heritage.

HELEN MAHONEY, KI6LQV

Doug, K6JEY, lit up the ether on 40 meters.

When you read the comments posted by participants in the ARRL Online Soapbox (**www.arrl.org/soapbox**) you quickly realize that part of the "peaceful, easy feeling" can be found as amateurs "reconnect" with not only straight keys and CW, but with some of the equipment of their early days in the hobby. Many operators use SKN as the opportunity (or excuse) to dust off some of the gear of their youth to see if they still remember how it works. Thanks go to the many operators who shared part of their story in the Soapbox thus allowing many others to share in the experience.

COURTESY BILL SHELTON, K7SIM

Bill, K7SIM, went from playing the bagpipes to playing with a J-38 key for SKN.

As always, numerous reports of good fists and interesting contacts were mentioned. One-hundred-three different operators were nominated at least once for having the Best Fist with Kent, K9ZTV; Ralph, WB8DQT; Larry, W8IX; Michael, W4IT, and Henry, W2QF, each receiving two votes. A total of 84 operators received a nomination from one of the peers for Most Interesting contact consideration, with Bill, N4TS; John, N2BE; Michael, W4IT, and Carl, WBØCFF, each receiving two votes. Congratulations for helping make SKN enjoyable for those participating.

For those who participated, recalling the peaceful time and easy feelings of SKN 2011 is only a brief nod into reverie away. For those looking for one of the better experiences in the hobby, start setting your mindset to SKN 2012. It will be here sooner than you think.

Stations Participating in SKN 2011

AA2YV, AA4RA, AA4TB, AA4ZS, AAØQZ, AB8FJ, ABØXE, AC7JW, AE3A, AE4MZ, AE7CG, AF8A, HP1AC, HP1IBF, JH1GNU, JR1NKN, K1LEE, K1LNL, K1SEZ, K2KEY, K2NPN, K2TV, K3BVQ, K3MD, K4EOR, K4HGX, K4TP, K5BZH, K5HK, K5ICW, K5LY, K5LYT, K5RIX, K5SOH, K6CSL, K6CTW, K6FFY, K6JEY, K6KQV, K6LG, K6LQ, K6PBQ, K6ZY, K7SIM, K7TFW, K7WA, K7XC, K7ZYV, K8JV, K8QMN, K8UC, K9LA, K9VKY, K9VP, K9WWT, K9YA, K9ZTV, KA4JQZ, KA6ROD, KA7T, KA8NNY, KA8OQF, KB5IRC, KB8PGW, KB8TL, KB8TXZ, KB9ZBN, KC2KWA, KC2LMX, KC7YE, KC8UR, KCØGXX, KD2JC, KD5QHV, KD6WKY, KF4IZE, KF8KS, KG4KGY, KH6OU, KI4EZC, KIØG, KIØKM, KØCDJ, KØCY, KØLWV, KT3A, KW6G, N2BE, N2GT, N2KZ, N3RIK, N5BNU, N5LH, N5LUL, N5SV, N6TCZ, N6ZFO, N7CQR, N8KC, N8KV, N9BOR, N9NM, NG2T, NJ3K, NJ3Z, NMØC, NMØL, NØBGT, NØJBF, NØTK, NQ4Q, NU7T, ON6ZJ, VA3RKM, VE3LC, VE3NGS, VE5BCS, VE7NI, VO1NA, W1HIS, W1OH, W1RO/7, W1RV, W1TPB, W2LG, W2LID, W2QJH, W3CEI, W3DF, W3GK, W4OTN, W4RK, W4RKC, W4STX, W4UR, W4YOK, W5DY, W5ESE, W5FBQ, W5JBV, W5PDW, W5QLF, W5ROS (WA5KRP, W5XW, operating), W5UX, W6IEE, W6JHQ, W6VNR, W7GVE, W7LNG, W7QH, W7UYJ, W7YS, W8IX, W9FCC, W9YO, WA1ABI, WA2KBZ, WA2QQF, WA2YSJ, WA4KFZ, WA4OAB, WA4ONV, WA5AU, WA5J, WA5OLT, WA5ZKO, WA6BXV, WA7GSN, WA7YUL, WA8TOX, WA9ZBW, WA9ZJI, WAØJLY, WAØVQY, WB5LRP, WB5NMZ, WB6AAJ, WB6SCA, WB8CFO, WB8LZG, WB9HFK, WB9MII, WBØB, WBØCFF, WBØCJB, WD8RIF, WD9EWK, WØKU, WØSZP, WØTT, WS9E, WX4MAP.

W3UR

HOW'S DX?

Sudan (ST)

The Republic of Sudan (ST) is made up of Arabs and Nubians in the north and Christians and Animist Nilotes in the south. Sudan gained its independence in 1956. It is the largest country within Africa and has suffered from two civil wars (1955-1972 and 1983-2003) and then the Darfur Conflict, which took place between February 2003 and February 2010.

During the second week of January (9-15) of 2011 the people of the autonomous region of southern Sudan voted on a referendum for independence. This vote was the result of the 2005 peace agreement between the north and south, which granted the southern region "limited autonomy" to be followed by the January 2011 referendum for independence.

As of press time early polling suggests an overwhelming percentage are in favor of independence. So now there is a 6 month transition period during which both countries need to agree on their international boundary and on the sharing of billions of dollars of annual oil revenue that comes from the south. They will also have to decide on the disputed Abyei area, a small province located in the central part of Sudan. Sudan's President Omar al-Bashir has promised to accept the referendum results and acknowledged the south is likely to secede. He said both sides are in "dire need of peace." As it stands, it looks as through Southern Sudan, which will more than likely be renamed, will gain its independence on July 9, 2011.

The Old DXCC Entity STØ — Southern Sudan

During the late '70s Southern Sudan (STØ) was on the DX Advisory Committee's (DXAC) radar as a potential new country under the old separate administration rule. At the January 19-20, 1978 ARRL Board of Directors meeting, Liaison Gay Milius, W4UG, presented a report covering several new countries including that of Southern Sudan. The October 1978 issue of *QST* (pg 64) announced "The following recommendation from the DX Advisory Committee was submitted to Headquarters by the DXAC: Southern Sudan (STØ) should be added to the ARRL DXCC list. The recommendation was accepted by the communications manager."[1] The "DXCC Notes" section of that same issue stated "STØ, Southern Sudan, QSOs made on or after May 7, 1972, count for this country."[2] It also was reported that credits could be obtained from the DXCC Desk starting November 1, 1978.

Past Operations from Southern Sudan

Prior to the October 1978 announcement there were two earlier operations (ST2SA/STØ and STØRK) from Southern Sudan. Shortly after the announcement Dr Sanford "San" Hutson, K5YY, fired up at the end of August 1978. In March 1998 the ARRL DXAC and Awards committee voted to delete Southern Sudan, STØ, as it no longer met the DXCC criteria of the time. This was prior to the DXCC 2000 Rules going into effect on April 1, 1998. Southern Sudan remained on the DXCC list until December 31, 1994. Some of the other Southern Sudan operations included 6UØKK, ST2FF/STØ, K5LBU/STØ, LA1RR/STØ, 9Y4RD/STØ, TL8GE/STØ, STØAS, PA3CXC/STØ, STØYD and STØDX.

[1]R. L. White, W1CW, "DXAC Notes," *QST*, Oct 1978, p 64.
[2]R. L. White, W1CW, "DXCC Notes," *QST*, Oct 1978, p 64.

A New DXCC Entity

Based on the January 2011 referendum results it looks as though the southern provinces will be claiming their independence on July 9, 2011. As of press time the government of the southern province and soon to be fledgling nation has yet to choose a name for their new country. The likelihood of them taking up the name Southern Sudan is doubtful. Regardless of the name this will most likely be a new DXCC country once the DXCC criteria has been met. Per the DXCC rules "Entities deleted from the List may be returned to the List in the future, should they qualify again in the future under these criteria. However, an entity that does qualify again in the future does so as a totally new Entity, not as a reinstated old one." This would mean everyone has to work it again for a new country. Until then watch your favorite DX newsletter for any updates on this potentially new counter.

T31 — CANTON ISLAND, CENTRAL KIRIBATI

A 12 man international team is heading to Canton Island, Central Kiribati in April of 2011. T31 ranks number 28 on *The DX Magazine's* 2010 "Most Wanted" list. The Telecommunication Authority of Kiribati (TAK) has issued the call T31A.

Bernie McClenny, W3UR ♦ 3025 Hobbs Rd, Glenwood, MD 21738-9728 ♦ w3ur@arrl.org

Team members include Carlos Garcia, EA1IR; Jim Price, K6ZH; Dave Franco, N1EMC; Arnie Shatz, N6HC; John Kennon, N7CQQ; Bud Semon, N7CW; Mike Goode, N9NS; Paul Budanov, UX2HO; Jay Kobelin, W2IJ; Charlie Spetnagel, W6KK; Phil Florig, W9IXX, and Hrane Milosevic, YT1AD. Pilot stations for this operation will be Eduardo, EA3NY, and San, K5YY.

Plans are to ship the equipment to Apia, Samoa via shipping container in March. An advanced team of two of the operators will go to Samoa between April 6 and 11 to inspect the equipment and will be QRV from 5W. The rest of the team will arrive in Apia on April 11. The entire team expects to set sail aboard the R/V *Bounty Bay* on April 13 with expected arrival on Canton Island on April 17. The team plans to be QRV on 1.8 through 50 MHz on SSB, CW and RTTY starting April 17 or 18 through April 28. They will set up two operating sites. Suggested operating frequencies are as follows:

CW — 1826; 3504; 7004; 10,104; 14,024; 18,074; 21,024; 24,894; 28,024, and 50,099 kHz
SSB — 1843; 3798; 7084; 14,195; 18,145; 21,295; 24,945; 28,495, and 50,120 kHz
RTTY — 3582; 7043; 10,140; 14,080; 18,100; 21,080; 24,920, and 28,080 kHz

Plans are to pack up and depart back to Apia on April 29, with an expected 1 day stop on Tokelau on May 1 and back to Samoa the following day. Roberto, EA2RY, will be the Webmaster of their **www.t31a.com** website. They are looking into the ability to connect to the Internet from T31 and if able to do so will upload logs to their website. The website also has complete bios, background information on Canton Island and propagation data. QSL either direct to Jay Kobelin, W2IJ, 10628 Grandview Dr, Rancho Cucamonga, CA 91701, USA or via the bureau.

Table 1
P2 Activity Schedule

Dates	*Call*	*Island (IOTA)*	*QSL via*
April 2-7	P29VCX	Feni Island (OC-101)	SM6CVX
April 8-14	P29NI	Nuguria Island (OC-257)	G3KHZ
April 15-18	P29VLR	Green Island (OC-231)	SM6CVX
April 22-25	P29VCX	Misima (OC-117)	SM6CVX
April 25-27	P29VCX	Loloata (OC-240)	SM6CVX

DX NEWS FROM AROUND THE GLOBE

9G — GHANA

9G5LK in Ghana will be Kees, PE1KL, and Lisa, PA2LS, April 28-May 6. They plan to operate on 80-10 meter SSB, PSK31 and RTTY. QSL to PA2LS. **www.pe1kl-pa2ls.com**

FH — MAYOTTE

A Brazilian team has announced their plans for a DXpedition to Mayotte Island (FH) for this coming April. The team includes Jose, PT9ZE; Ric, PY2PT; Anderson, PY2TNT; Alex, PY2WAS, and Fernando, PY4BZ. The group will depart Brazil on April 15 heading for Paris and then departing onward to Mayotte on the 17th. They will be using the special call sign TO2FH between April 18 and 25. Plans are to have three stations QRV simultaneously on 1.8 through 28 MHz on CW and SSB. QSL details will be posted on their **QRZ.com** page **www.qrz.com/db/to2fh**.

FR — REUNION ISLAND

TO2Z will be the special call operated by Olivier, F4FLF, from Reunion Island April 9-22 of 2012. This holiday operation will be on SSB, PSK and RTTY. QSL via F4FLF.

JW — SVALBARD

Francois, F8DVD, will be "HF active" from Longyearbyen, Spitsbergen, Svalbard, JW, April 1-8, 2011.

KHØ — MARIANA ISLANDS

WE8A/KHØ and K8RLY/KHØ in the Northern Mariana Islands, plan to operate next year, March 30-April 2, 2012. QSL direct only, to their Japanese addresses. See **QRZ.com** for that information. WE8A/KHØ will focus on 30, 17 and 12 meter SSB and CW, and CW on the other 80-10 meter HF bands, plus 6 meters. K8RLY/KHØ will be phone only, including AM by request.

P2 — PAPUA NEW GUINEA

Five European Amateur Radio operators are teaming up to do three P29 — Papua New Guinea IOTA counters followed by one of the team members going to two more islands! The five include SM6CVX, G3KHZ, CT1AGF, G3JKX and G3UKV. They plan to have four stations QRV simultaneously with activity on all bands, including 6 meters on CW, SSB and RTTY (see Table 1). Remember the first three are with the five man team and the last two are single operator trips by SM6CVX.

Any questions or requests can be sent to **sm6cvx@hjelmstrom.se**. They have a website at **www.p29ni.weebly.com**.

P4 — ARUBA

Look for Dee, W1HEO, to be on Aruba (SA-036) and QRV as P4/W1HEO from the P49V station April 3-16. He'll be on 1.8 through 28 MHz on CW and SSB with a focus on the higher HF bands as well as 30, 17 and 12 meters. Listen for him on or near the usual IOTA frequencies: 14.260, 14.040, 18.128, 18.098, 21.260, 21.040, 28.460 and 28.040 MHz. Color postcard/QSL will be available via W1HEO CBA or via the bureau.

SPRATLY ISLANDS

It has been rumored that the January DXØDX DXpedition to the Spratly Islands, which was postponed in January of this year has been rescheduled for April 2011. Keep an eye on your favorite DX news outlet or **www.dx0dx.net** for the latest on this one.

T6 — AFGHANISTAN

Updating the T6PSE DXpedition planning, Afghanistan in May "Due to security concerns, we are not going to announce the specific 10 days in May that we will be active, or our location in advance." A band and mode survey is on the web page **www.intrepid-dx.com/t6pse/survey.php**. The team is finalized, with 12 operators. Almost the entire YI9PSE team is on board. Added are K7HC and WO1S. John, WO1S, "has extensive experience in Afghanistan going back to 1962. He has operated there recently as T6EE." Pilot stations are AA6G, N1DG and MMØNDX. Fund raising continues, the most significant costs being security and shipping. All gear must be shipped air cargo, competing for space with government entities and NGOs.

WRAP UP

That's it for this month. Thanks to KE3Q and *The Daily DX* for making this month's column possible. Until next month, see you in the pileups! — *Bernie, W3UR* QST

W3ZZ

THE WORLD ABOVE 50 MHz

Extreme Distances on 6 Meter E-skip

In recent "World Above 50 MHz" columns Bob Cooper, ZL4AAA, has described a number of exotic long and skewed F2 propagation paths. Given the current state of sunspot Cycle 24, it is not clear whether such propagation will return this cycle. It should be noted that extremely long distance paths on E-skip (E_s) have been identified in recent years and in this column Jim Kennedy, KH6/K6MIO, the now retired Associate Director of the Gemini Observatory in Hilo, Hawaii, discusses just such E_s propagation that extends the equivalent of several E_s hops (>6800 km). As you will see, such propagation can and does occur during periods of low sunspot activity and can prove to be the means to support long distance communication even in years of low or minimal F2 ionization.

Jim Kennedy, KH6/K6MIO
k6mio@arrl.net

The very long short-path 6 meter propagation that has become almost commonplace for many locations in recent years, coincident with an unusually extended solar minimum, has rightly attracted a lot of attention. Many people have been wondering why it happens. This has led to a number of articles proposing answers to the questions.

Observationally, there appear to be two different, though perhaps related, phenomena. The most commonly observed version propagates largely east-west, between two points in the same "polar" hemisphere, either northern or southern. That is, the path never crosses the geomagnetic equator. Typical paths include EU-JA, JA-NA and NA-EU in the Northern Hemisphere. These are seen to extend out to about 10,000 km. The known paths in the Southern Hemisphere are from South America to Oceania, primarily VK/ZL-OA/CE. These paths reach out to about 13,000 km. Both the northern and southern paths open during their respective *local summer* E_s seasons.

The second version, a relative newcomer to the scene, has both a strong east-west component and a strong north-south component. Here the paths do cross the geomagnetic equator and also have long east-west extent. Those documented so far are paths between VK/ZL-NA. As observed so far, these events occur during the *overlap* of the Southern Hemisphere major E_s season and the Northern Hemisphere minor E_s season, typically from mid-December to mid-January. There is no apparent NA-ZS counterpart in the southern summer and no apparent corresponding north-south path, with long east-west propagation, to anywhere in the northern summer.

In 2006, Han Higasa, JE1BMJ, published an article in Japan's *CQ Ham Radio* calling the radio world's attention to the Northern Hemisphere east-west effect.[1] He proposed that E-layer chordal hops might be the cause allowing 10,000 km paths with adequate signal for communications. He labeled the phenomenon Short-path Summer Solstice Propagation (SSSP). This spawned a lively and healthy debate in ham radio publications about whether the process was ordinary multihop E_s (nE_s, where n = number of hops), chordal, E-layer "top-bottom" ducting or some combination of the three.

A Look at the Facts

With encouragement and help from Gene Zimmerman, W3ZZ, I presented a paper at the 2010 Central States VHF Society conference that showed an analysis of data from three specific Northern Hemisphere openings in 2000, 2006 and 2009.[2] The objective was to discern whatever real data could tell us about the actual events and explore the possibility of chordal (or ducting) hops. The 2000 and 2009 data were from my own logs from openings between KH6 and North America.

The first two questions were whether I had observed traditional multihop E_s and were there also instances of chordal/ducting. To be fair, the maximum distance from my KH6 location to eastern North America is about 8300 km, not 10,000 km (if it's nE_s, it's four hops). As it works out, past four hops on that azimuth it goes over the Atlantic to Morocco-at $7E_s$. Nevertheless, the 2000 and 2009 data showed convincingly that nE_s was the mechanism in the 2000 opening-1Es lands in the Pacific, but $2E_s$, $3E_s$ and $4E_s$ stations were all present at about the right distances in diminishing quantities as one moved farther east.

Also, the 2009 data showed a marked aberration in that the number of $2E_s$ stations was very small (and with weak signals), the number of $3E_s$ stations was somewhat larger and there was a very significant peak in activity right in the middle of the $4E_s$ range. The conclusion was that there was definitely something going on that allowed a path that passed substantially over the top of the $2E_s$ footprint and much of the $3E_s$ footprint, to land primarily in the $4E_s$ footprint.

Whatever it was, it was consistent with at least some of the path being provided by a chordal or ducting mechanism. This was not the first time that my fellow KH6ers and I have noticed this. Here there were enough contacts to get useful statistics. The ultimate conclusion was that, out to about 8300 km, both nE_s and chordal/ductal propagation is actually observed on occasion.

The 2006 data were from Yoshi Miyamoto, JM1DTF, representing a typical JA-W *SSSP* opening. The data were consistent with chordal/ducting, but the case was not conclusive either way, because most of the intermediate-hop footprints were either in the ocean or in sparsely populated land areas, where it was hard to tell if the path came to earth.

The very clear point to emerge was that

[1]See H. Higasa, JE1BMJ, "SSSP: Short-path Summer Solstice Propagation," *CQ VHF*, Fall 2008, p 12, for an English translation of this article.

[2]Available at Bob Cooper's, ZL4AAA, website **www.bobcooper.tv/kh6-k6mio.htm**. Select the "Extreme Multihop 50 MHz Es" link.

This Month

April 11	144 MHz Spring Sprint
*April 16	Very good EME conditions
April 19	222 MHz Spring Sprint
April 27	432 MHz Spring Sprint
April 29-30	Southeastern VHF Society Conference, Huntsville, Alabama

*Degradation per EA6VQ

Gene Zimmerman, W3ZZ ♦ 33 Brighton Dr, Gaithersburg, MD 20877 ♦ w3zz@arrl.org; (301-948-2594)

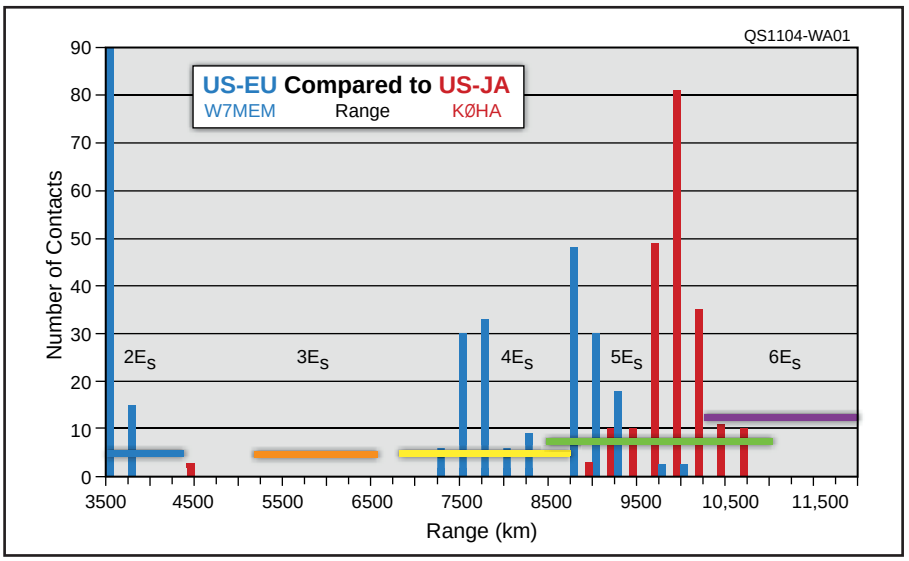


Figure 1 — Range comparisons between US-EU and US-JA contacts.

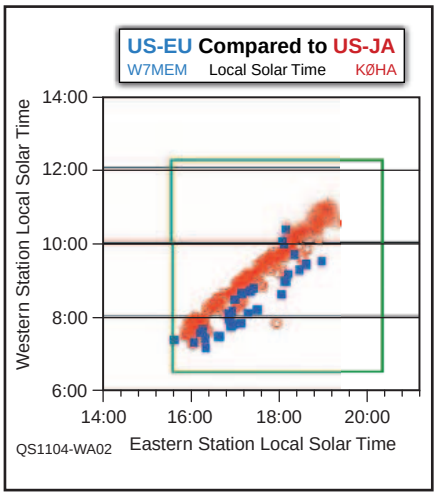


Figure 2 — Local Standard Time comparisons between US-EU and US-JA contacts.

SSSP propagation happened only during the times that the western station (JA) was in the local morning E_s peak window and the eastern station (W) was in its local afternoon-evening E_s peak window. Due to the innate same-hemisphere longitude difference, this *early-on-late* local solar time (LST) condition occurs for east-west paths from about 9500 km to more than 14,000 km. Basically, the first and last geographical skip points were ideally located for optimum ionization to ensure that the signal started and ended skipping toward the other station. The propagation rarely, if ever, occurred at other times of day. This early-on-late effect is strong evidence supporting it as being an E_s phenomenon (at least at the first and last hops).

Using the past north and south E seasons, Gene and I have teamed up to explore the east-west phenomenon for the 2010 season. This time we paid particular attention to the NA-EU paths that were not included in the 2009 study. We also took a look at the 2010-2011 ZL/VK-NA paths crossing the geomagnetic equator. While still a work in progress, what follows is a preview of what we found.

2010 — A Preliminary Analysis

The first priority was to compare the propagation characteristics between the NA-JA paths westward and the NA-EU paths eastward. We picked one US station actively working the JAs and another single US station actively working EUs, gleaning data from various sources. This was to determine who else a single station was working along the direction of the path in order to see if any intermediate hops were open at the same time (ie, is it nE_s or chordal/ductal?).

We chose data from the operations of KØHA for the JA paths and W7MEM for the EU paths, in part because both had multiple contacts and some distances were at 10,000 km or more. So far we have looked at two parameters, the range distances between the stations and the LST of each contact at each end of the circuit. The purpose of the distance distributions was to assess whether or not any intermediate hops were observed. The purpose of the LST comparisons was to see how it fit with the known diurnal E_s propagation pattern.

Figure 1 shows the EU (blue) and JA (red) distance comparisons. The colored horizontal bars represent the classical nE_s skip distances for reference. The total number of contacts has been normalized, some to make the graphic more visually useful (there were well over 100 contacts for each station).

The figure shows that there is very little evidence of intermediate hops for the NA-JA path. There is one lonely KL7 contact at 4500 km (2Es). All of the JAs fell into a nice statistical distribution in the 9000-10,750 km range.

By contrast, the NA-EU plot shows that there was a lot of two-hop activity (we ignored single hop), no three hop and then there is clear evidence of both 4Es and 5Es, with even a small gap in between them. Before jumping to conclusions there are important factors to consider. Starting in the US, both paths cross over vast amounts of largely uninhabited territory before getting to the destinations; there are few stations at 3Es.

At multiple hop range, KØHA looks northwest over western Canada and Alaska, and then the Bering Sea and the Pacific Ocean, until arriving at JA. W7MEM looks northeast across Hudson Bay (although W1, W2 and other east coast stations were in and being worked in between the EU stations). The path then crossed central Greenland and Iceland before reaching EU.

The point is that, while the JA data are consistent with chordal/ducting hops, they are *not definitive*. It could just as well be ordinary nE_s multihop. The EU data leads to a somewhat stronger conclusion. Whatever happened before the third hop, the evidence strongly supports nE_s for the fourth and fifth hops.

Figure 2 shows a comparison of the LST at each end of each contact for both the JA (red) and EU (blue) paths. The green box shows the classical boundaries of the early-on-late E_s time frames. In both cases, the timings of the contacts are excellent matches to the usual pattern. This strongly supports the notion that these were E_s-related events.

There were a very few Southern Hemisphere contacts made by OA4TT and OA4B into the ZL/VK environs again during the southern summer. We are still interested in knowing about more such contacts, so there will be enough data to draw some conclusions. At this point there is every reason to believe that these Southern Hemisphere events are simply the southern version of what is happening in the Northern Hemisphere summer.

The task was to look at the very recent flurry of very long contacts across the geomagnetic equator between NA and the ZL/VK environs. Figure 3 shows a plot of the distances observed and some labels identifying the endpoints. To an even higher degree than the strictly Northern Hemisphere events, this is still a work in progress and it

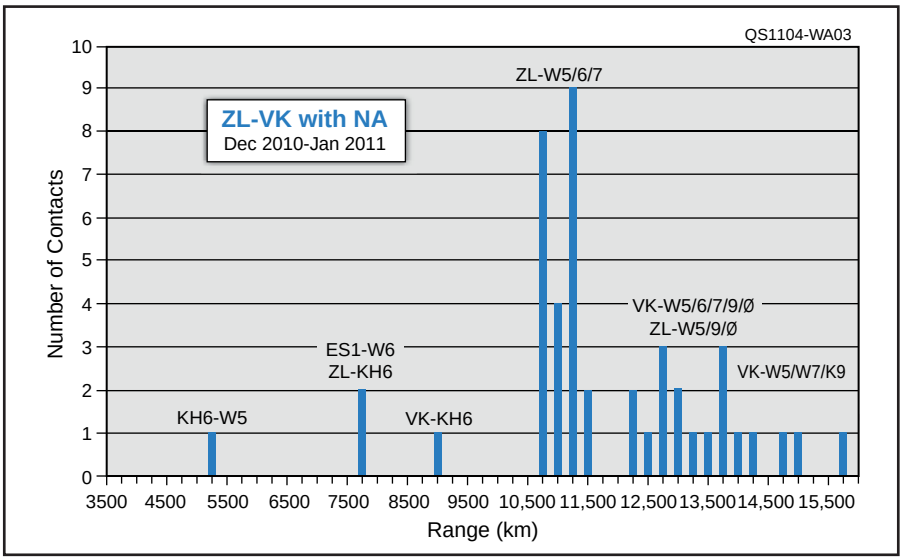


Figure 3 — Range distribution for ZL/VK-North America contacts.

will be the subject of another report but, the distances are phenomenal and the propagation processes are not at all clear.

At this point, all we can say is that they are occurring during the southern-northern E_s season overlap. Moreover, *virtually all* of the LSTs at the east end (NA) fell squarely in the E_s afternoon-evening peak. This strongly suggests that E_s was a factor on the east end. Going west, the path comes out of afternoon or twilight into full sunshine over the US west coast and stays in daytime until it reaches ZL/VK. There on the west end, about half arrive in the E_s morning peak and half fall where you would expect a *valley* in E_s ionization (1300-1500 LST).

It is tempting to suggest that some sort of F-layer TEP might be carrying the path across the geomagnetic equator. But in December/January only the southern branch of the Equatorial Anomaly has any substantial ionization (otherwise TEP would be common then). If there were enough ionization for a single chordal hop from the energized southern anomaly, the math says that an 11,000 km E_s path linked to a single 4000 km chordal F-hop would take you the required 15,000 km. On the other hand, one could postulate the (normally daytime) equatorial E_s might take a handoff from the temperate zone E_s somewhere over the Pacific and bring it on down. Resolving this will require further examination of ionospheric data. Stay tuned.

ON THE BANDS

6 meters. The Christmas bonus continues unabated. Bob, K6QXY (CM88) reports ZL video Jan 1 and 2. He worked ZL1RS on Jan 7 and again on Jan 10. He also worked ZL3NW early on Jan 11. The latter contacts were on JT65a. Peaking on Jan 11, major E_s links at both ends of the paths yielded widespread contacts of extremely long distances. Steve, VK3OT (QF12ag) first heard the K6FV/B beacon (CM87) and then worked WØOGH (DM43) in AZ. He then worked several others including K9HMB (EN52), his ODX, N7CW, W7KNT and AA7A. The same day Bob, ZL1RS (RF64vs) also worked K9HMB, KCØCF (EN32), NØLL (EM09), N5JEH, K7VAY, WØGNE, N7KA, W7RCS and N7CW. ZL2TPY (RF72) reports WØOGH and N7CW.

Bob, K6QXY, worked into KH7Y and KH6SX during this opening and had a partial contact with VK9NA on Norfolk Island. Other VKs reported to be working into the US included VK4MA (QG64kb), VK4WM (QG64jq), VK2KPP (QF55) and VK4DDC (QG62pb). Thus the opening appears to be the combination of widespread E_s links at both ends of the path with some kind of F2 linkage at mid-path. It is possible that the F2 linkage was TEP although a straight F2 link across the geomagnetic equator is equally or more likely, or perhaps an equatorial E link as described above. TEP at the solstices is reasonably uncommon especially during periods of low sunspot activity such as we are experiencing now.

Jack, OA4TT, worked ZL1RS on Jan 9 via JT65a. Jack says that JT65a digital is a very effective means of communication terrestrially on marginal paths. K6QXY worked ZL3NW on the 12th and ZL1RS on the 13th. On Jan 13 VK3DUT worked KH7Y. KH7Y is reported to have worked several other VK/ZLs including VK3OT, VK3AAU and ZL4AS. The ZLs report that their E_s season appeared to end abruptly on Jan 15. Lacking any E_s links these long distance contacts ceased at that point.

Microwaves. Adrian, VK4OX (QG63kf) writes that on Jan 27 at 0315Z he worked Steve, ZL1TPH/p (RF73hm) on 2304 SSB at a distance of ~2315 km. Adrian was running 20 W and Steve was running 100 W. Less than 24 hours later at 2130Z Adrian worked Brian, ZL1AVZ (RF73fd) at ~2318 km. Brian was running 15 W. Both these contacts easily broke the former Australian 13 cm record. Congratulations all!

EME. Lance, W7GJ, reports what is probably the first 6 meter EME contact from the new PJ2 country (Curaçao) with a contact with PJ2/W8WTS (FK52kg) at 1541Z Jan 27 on JT65a. This is Lance's DXCC #164 (113 via EME).

January VHF Contest. The January contest lived up to its midwinter reputation. Ice and snow, and temperatures much below normal caused poor tropospheric propagation and limited rover activities in many regions. I received almost no reports. The few scores I saw have not been stellar. The mid-Atlantic locals did worse than usual according to K1RZ and W8ZN. Ed, K6VNV (CM98) said he had a lot of fun using a newly acquired ICOM IC-271A transceiver and a small Yagi to make 4 contacts in his first VHF contest.

HERE AND THERE

Logbook of The World and VUCC. The ARRL Logbook of The World (LoTW) now works with VUCC Awards. Details can be found at the LoTW website at **p1k.arrl.org/lotwuser/default** *or* **www.arrl.org/vucc**. Thanks to the VHF community for continuing to ask for its implementation and to the ARRL IT people for making it happen.

Spring Sprints. Time to tune up your station for summer. The first three of these short duration Sprints are 144 MHz, Monday, April 11; 222 MHz, Tuesday, April 19, and 432 MHz, Wednesday, April 27. Each runs from 7-11 PM local time. Exchange six digit grid squares; distance scoring will be used for the 2011 Spring Sprints. Full details can be found at **sites.google.com/site/springvhfupsprints**.

Southeastern VHF Conference. The 2011 SVHFS Conference will be held at the Holiday Inn Downtown Huntsville in Huntsville, Alabama, April 29-30, 2011. This is always an excellent convention that brings together VHF enthusiasts from throughout the Southeast. More details can be found at the SVHFS website at **www.svhfs.org/conference.html**.

2011 Six Meters Marathon. The seventh annual Six Meters Marathon begins May 7, 2011 at 0000Z and runs through August 7 at 2400Z. The objective is to work as many DXCC entities as possible on 6 meters during this period. You can follow the progress of the contest at **6m.dy.fi**. Full details can be found at **www.tamrinki.fi/6m/mrules.php**. (Thanks Seppo, OH1VR)

SPECIAL EVENTS

Contact these stations and help commemorate history. Many provide a special QSL card or certificate!

Mar 12-Mar 13, 1500Z-2130Z, N4WIS, Virginia Beach, VA. USS *Wisconsin* Radio Club. USS *Wisconsin* in the Wisconsin QSO Party. 14.264. QSL. N4WIS-USS *Wisconsin* Radio Club, PO Box 6682, Virginia Beach, VA 23456. **www.n4wis.org**

Mar 28-Apr 2, 0001Z-2359Z, KØR, Boone, IA. Tall Corn Amateur Radio Club. Boone Speedway Annual Frost Buster Race. 21.310 14.260 7.250 3.980. Certificate. Jim Moreland, 109 S Underhill St, Boone, IA 50036. **w0bnw@yahoo.com**

Mar 31-Apr 2, 1400Z-0000Z, W4GGM, Columbia, TN. Maury Amateur Radio Club. 2011 Mule Days. 21.360 21.085 21.040 14.260 14.085 14.071 14.040 7.260 7.085 7.060 7.040 3.960 3.580 3.560. QSL. MARC, 205 Cowan St, Columbia, TN 38401. *PSK31, RTTY, CW, SSTV & phone. Mule Capital of the world, annual celebration of all things related to mules.* **W4GGM.org**

Apr 1, 1300Z-2030Z, W7U, Richfield, OH. Sam Hevener. 70th Anniversary of the USO (United Service Organizations). 18.145 7.245. Certificate. Sam Hevener, 3583 Everett Rd, Richfield, OH 44286. *Operating from the VA Hospital in Brecksville, OH.* **w8kbf@qsl.net**

Apr 2, 0900Z-1700Z, KB4CC, Folkston, GA. Camden County Amateur Radio Society. Annual Railwatch Days 14.280 14.050. Certificate. Railwatch SES, PO Box 1244, Kingsland, GA 31548. **www.ccars.org**

Apr 8-Apr 10, 1300Z-2359Z, K4S, Venice, FL. Tamiami Amateur Radio Club. Venice Sharks Tooth Festival. 28.483 21.313 18.153 14.236. QSL. Jack Sproat, W4JS, 1419 E Manasota Beach Rd, Englewood, FL 34223-63. **tamiamiarc.org**

Apr 8-Apr 9, 2200Z-2200Z, KK5K, Tupelo, MS. Tupelo Amateur Radio Club. 75th Anniversary of the Tupelo Tornado. 14.245 14.035 7.240 7.030. Certificate. Tupelo Amateur Radio Club, PO Box 3104, Tupelo, MS 38803. **www.tupeloarc.org**

Apr 9, 0000Z-2359Z, W5CCH, Oklahoma City, OK. Oklahoma City County Health Department. Celebrating *National Public Health Week*. 14.265 7.265 PSK 14.070 7.080. Certificate. Dave Cox, Oklahoma City-County Health Department, 921 NE 23rd St, Oklahoma City, OK 73105. *SSTV contacts will be attempted upon request*. **www.occhd.org/w5cch**

Apr 9, 1700Z-2359Z, NI6IW, San Diego, CA. USS *Midway* (CV-41) Museum Radio Operations Room. USS *Midway* (CV-41) Decommissioned 1992, Chief Petty Officer Grade Established 1893. SSB 14.320 7.250 PSK31 14.070 D-STAR 012C and 2 m/70 cm SOCAL rptrs. QSL. USS *Midway* Museum Radio Room, 910 N Harbor Dr, San Diego, CA 92101. **kk6fz@arrl.net**

Apr 9-Apr 10, 1500Z-2100Z, K4C, Camden, SC. Kershaw County Amateur Radio Club. Armies through Time. 10 15 20 40 80 m. QSL. Kershaw County ARC, 602 Kirkland St, Camden, SC 29020. *1500-2000Z on 4/9; 1500-2100 on 4/10*. **www.kershawcountyarc.org**

Apr 9-Apr 10, 1500Z-2300Z, W4C, Greenville, AL. Jim Bell Wireless Association. Calico Fort Arts & Crafts Fair 40th Anniversary. 7.240 7.070 PSK-31. QSL. Bob Glasscock, PO Box 340, Greenville, AL 36037. **www.calicofort.com**; **www.k4tns.org**

Apr 11-Apr 16, 1400Z-2030Z, W1MGY, Indian Orchard, MA. *Titanic* Historical Society, Inc. RMS *Titanic* Special 99th Anniversary Event Station. 14.260 14.033 7.260 7.033. QSL. *Titanic* Special Event Station W1MGY, PO Box 51053, 208 Main St, Indian Orchard, MA 01151. **webpages.charter.net/kb1mu/Titanic/titanic.htm**

Apr 16, 1600Z-2300Z, K6M, Martinez, CA. Martinez Amateur Radio Club. Celebrating the 173rd birthday of John Muir, Father of the US National Parks System. 21.350 14.255. QSL. Martinez ARC, 230 F St, Martinez, CA 94553. *Operating from the John Muir House National Historic site*.

Apr 16-Apr 17, 0001Z-2359Z, WØSHQ, Independence, MO. Association of Saints Church Radio Amateurs. ASCRA 38th Anniversary Ragchew Party. SSB 28.387 21.387 14.287 7.233 3.833 CW 28.187 21.087 14.087 7.087 3.587 WØSHQ/R 146.73(-) no PL Echo-Link WØSHQ-R #127303. Certificate & QSL. Doug Shaw WAØEMX, ASCRA Exec Dir, PO Box 73, Independence, MO 64051. *Call CQ ASCRA to contact other ASCRA stations. Anniversaries: 38th of ASCRA, 181st of Community of Christ*. **www.CofChrist.org**, **www.ascra.org**

Apr 16-Apr 17, 1600Z-0000Z, W7FLY&W7PIG, Bothell and Stanwood, WA. BEARONS/SCARC. 21.260 21.250 14.270 14.260 7.260 7.230. When Pigs Fly. QSL. Mark McLauchlin, 2625 176th St SE, Bothell, WA 98012. *Boeing Employees Amateur Radio Operators North Society and Stanwood-Camano Amateur Radio Club first ever* When Pigs Fly *special event. A commemorative QSL card has been commissioned for the event. Stations working both W7FLY and W7PIG will receive the special card. Single contacts with W7FLY or W7PIG only will receive the respective club's normal QSL*. **mysite.ncnetwork.net/res8ytw6/wpf.htm**

Apr 17, 1600Z-2300Z, K6P, Petaluma, CA. Sonoma Mountain Repeater Society and Sonoma County Auxiliary Communications Services. Butter & Egg Days Parade — Petaluma Takes Flight. 21.290 21.045 14.280 14.045 146.91R. QSL. Eric Swanson, WB6MVT, 224 King Rd, Petaluma, CA 94952. *The parade celebrates the centennial of the first US airmail delivery by Fred Wiseman on February 17, 1911.* **repairguy.net/ACS**

Apr 21, 1730Z-2030Z, K7DPS, Phoenix, AZ. Arizona Department of Public Safety Amateur Radio Group. Annual Fundraiser Event for Special Olympics. 14.290. QSL. Paul Swietek, 5427 E Broadway Ave, Apache Junction, AZ 85119. *Equipment demonstration and BBQ at HQ in support of the Special Olympics and the Law Enforcement Torch Run for Special Olympics. Open to the public. 20 m; local contacts on the White Tanks repeater 146.940. No E-QSL. No LoTW. No Bureau.* **www.qrz.com/db/k7dps**

Apr 22-Apr 24, 1800-0500Z daily, KI6GIL, Fresno, CA. Amateur Radio Association of Central California. Celebrating the recently opened Fossil Discovery Center of Madera County. 7.255 3.955. Certificate. ARACC Special Event, 4473 N Van Dyke Ave, Fresno, CA 93705. *Operating and demonstrating radio contacts to draw attention to the ongoing excavation and display of this unique cache of fossils from up to 700,000 years ago*. **www.aracc.org**

Apr 23, 1200Z-1930Z, N4C, Raleigh, NC. Raleigh Amateur Radio Society. 39th Annual Raleigh Hamfest and ARRL NC State Convention. 14.235 14.055 7.235 7.055. Certificate. RARS, PO Box 17124, Raleigh, NC 27619. **www.rars.org/hamfest**

Apr 23, 1500Z-1900Z, WA5PC, Gary, TX. Panola County Amateur Radio Club. Only International Boundary Marker "Within" the USA. 14.260. Certificate. WA5PC, 380 CR 1241, Gary, TX 75643. *Local weather permitting, we will be on location of the only international boundary marker "within" the United States; separating the Republic of Texas & USA, erected in 1841.* **www.wa5pc.org**

Apr 30-May 1, 1500Z-0500Z, K5JVL, Jacksonville, TX. Cherokee County Amateur Radio Club. 7th Annual CCARC Drakes On The Lake. 21.375 14.275 7.275 3.875. Certificate. CCARC, c/o William Foreman, K5WCF, PO Box 8285, Jacksonville, TX 75766. **k5jvl.net**

Certificates and QSL cards: To obtain a certificate from any of the special-event stations offering them, send your QSO information along with a 9 × 12 inch self-addressed, stamped envelope to the address listed in the announcement. To receive a special event QSL card (when offered), be sure to include a self-addressed, stamped business envelope along with your QSL card and QSO information. *Note: Some clubs may ask for a nominal fee to cover the cost of the certificate or QSL. Request will be made on air during the event or on the club's 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 **Jun** *QST* would have to be received by **Apr 1**. In addition to being listed in *QST*, your event will be listed on the ARRL Web Special 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 February 10. You can view all received Special Events at **www.arrl.org/special-event-stations**. QST

Maty Weinberg, KB1EIB ♦ Special Events ♦ events@arrl.org

The Amateur Radio Service and the ITU

Rod Stafford, W6ROD, IARU Secretary

If you were to ask most Amateur Radio operators which entity is responsible for granting privileges to use portions of the radio spectrum for Amateur Radio purposes, the answer would likely be their own national telecommunication authority, such as the FCC. But that's only partially true: The ultimate authority for the use of the radio spectrum is the International Telecommunication Union (ITU). Every Amateur Radio operator should understand what the ITU is and why its work and decisions are important.

Most countries are Member States of the ITU, and by way of treaty, generally agree to be bound by the decisions of the ITU when it comes to the usage of the radio spectrum. Each country can decide that a certain use determined by the ITU may not apply in their own jurisdiction. It is not common for countries to do this, but it is within their sovereign authority to do so.

The ITU is a United Nations agency that deals with information and communications technology issues. They have an extensive website — **www.itu.int** — that details much of their work. Based in Geneva, Switzerland, the ITU includes in its membership 192 Member States and more than 700 Sector Members and Associates.

The ITU has coordinated the shared global use of the radio spectrum, promoted international cooperation in assigning satellite orbits, worked to improve telecommunication infrastructure in the developing world, established the worldwide standards that foster seamless interconnection of a vast range of communications systems and addressed other global concerns, such as mitigating climate change and strengthening cybersecurity.

The top staff official of the ITU is Secretary-General Dr Hamadoun Touré, HB9EHT. There are three sectors in the ITU: Radiocommunication (ITU-R), Development (ITU-D) and Standardization (ITU-T). The IARU is a Sector Member in both the ITU-R and the ITU-D Sectors. The IARU fully participates in both of those sectors by attending meetings that involve issues that may impact the Amateur or the Amateur Satellite Services. The Secretary-General, the Deputy Secretary-General and the Directors of the three ITU Sectors are elected to four year terms by the Member States at Plenipotentiary Conferences, which are held every four years. The IARU is a recognized international telecommunication organization and is invited to participate as an observer at the Plenipotentiary Conferences. The most recent "Plenipot" was held in October 2010 in Guadalajara, Mexico.

ITU-R

The ITU-R Sector is very important for radiocommunication services, including the Amateur and Amateur Satellite Services. Every four or five years, the ITU holds a World Radiocommunication Conference (WRC) to revise the international Radio Regulations. It is the job of WRC to review and, if necessary, revise the Radio Regulations — the international treaty governing the use of the radio-frequency spectrum and the geostationary-satellite and non-geostationary-satellite orbits. Revisions are made on the basis of an agenda determined by the ITU Council, which takes into account recommendations made by previous WRCs. The general scope of the agenda of a WRC is established four to six years in advance, with the final agenda set by the ITU Council two years before the conference, with the concurrence of a majority of Member States. The next WRC is scheduled for January 23-February 17, 2012, less than one year away.

Under the terms of the ITU Constitution, a WRC can:

- Revise the Radio Regulations and any associated frequency assignment and allotment plans.
- Address any radiocommunication matter of worldwide character.
- Instruct the Radio Regulations Board and the Radiocommunication Bureau and review their activities.
- Determine questions for study by the Radiocommunication Assembly and its Study Groups in preparation for future WRCs.

There is a lengthy preparatory process for every WRC in which the IARU participates as a Sector Member. There are usually countless meetings dealing with each agenda item that has been determined to be on the agenda for a WRC. Many of those agenda items can — and do — have a substantial impact on the Amateur Radio usage of portions of the radio spectrum. It is important for the IARU to participate to protect our frequencies, and when the opportunity presents itself, to expand our spectrum.

ITU-R Study Groups and Working Parties address each agenda item on the WRC agenda and try to arrive at a consensus and recommendation(s) on how the agenda item may be addressed or dealt with at the WRC. Studies are conducted many times to determine how a proposed new usage may impact the other services, or not. Each of these agenda items are thoroughly discussed for at least a couple of years leading up to the WRC. It is very important to the worldwide amateur community that the IARU participate in the entire study group/working party process.

ITU-D

ITU-D is where much of the ITU's work on disaster response takes place. The development arm of the ITU considers emergency telecommunications an integral part of its projects that integrate telecommunications, information and communication technology in disaster predication, detection and alerting. Emergency communications play a critical role in the immediate aftermath of disasters by ensuring timely flow of vital information that is much needed by government agencies, as well as other humanitarian agencies that are involved in rescue operations and who provide medical assistance to the injured.

The IARU's task in the ITU-D Sector is to ensure that Amateur Radio's role in disaster communications is understood and appreciated by the ITU members. The ITU-D Sector also conducts a worldwide conference. The current schedule calls for a World Telecommunication Development Conference every four years. In 2010, the WTDC was held in Hyderabad, India in late May and early June. The IARU participated in the conference.

Other ITU Activities

The ITU also sponsors regional and global exhibitions called Telecoms. An ITU Telecom offers a global information and communications technology (ICT) community platform that gathers stakeholders from across the telecommunications and ICT sector to connect, collaborate and create the future ICT landscape. Forums or seminars related to ICT are conducted at the Telecoms and the IARU has participated in such forums, usually on topics related to emergency communications. QST

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

K2TQN

VINTAGE RADIO

Behind the Scenes in the LAFAYETTE FACTORY

When I wrote my March and June 2010 columns about Lafayette Radio, I received a lot of e-mail requesting more information. Details about the company have not been easy to find. But recently I bought a 1936 Lafayette Amateur Radio Equipment Catalog No 60, which I will share with you. This has turned out to be one of the best ham catalogs I own. It starts with a detailed story and photos about their 1930s factory. This will give you a good idea how the early radio factories worked.

They say:

> Fifteen years ago (in 1921) we realized the interest existing among radio amateurs for popular-priced, laboratory-rated merchandise, and we decided to further develop our activities in this field.
>
> This decision lead us to employ the best in radio engineering skill and ability and to plan and build an organization primarily to serve the needs of the amateur. Today the Lafayette factory, a unit of Wholesale Radio Service Co. Inc., is an important organization, producing many items of amateur equipment designed by Lafayette staff engineers. It is part of our main establishment at 100 Sixth Avenue, New York.
>
> It is here "Behind the Scenes in the Lafayette Factory" that the research and design laboratory engineers conceive and materialize ideas. The men engaged in this work are not only capable engineers, but active amateurs as well they are aware of your problems, because your problems are theirs as well. With this viewpoint and interest at heart they continue to design and develop quality apparatus of professional appearance that must, in every case, meet the requirements of our "Bureau of Standards."
>
> In the case of amateur transmitting and receiving units, power supplies, preamplifiers,

Working under clean, comfortable conditions, the wiremen in the Lafayette factory do consistently careful and accurate jobs on receivers, transmitters, transceivers and amplifiers.

Natural daylight in the factory at 100 Sixth Avenue, New York City, enables these craftsmen to turn out uniform products.

This is a corner of the transmitter laboratory. Shown, from the left, are Frank Lester, chief engineer of the amateur division, John de Leon and Roy Neusch.

Sound Engineer Frank Dostal performs scientific measurements of audio gain, frequency response, etc, in this special audio frequency laboratory containing the latest test equipment.

John Dilks, K2TQN ♦ 125 Wharf Rd, Egg Harbor Township, NJ 08234-8501 ♦ k2tqn@arrl.org

BRUCE HOWES, W1UJR

Before Lafayette products are released for sale, a thorough check of all operating features is made in this test room, which is equipped with every modern testing device.

The Lafayette PB46A phone and CW transmitter was designed in a modular format so a ham could purchase individual units as funds became available.

mixers, etc., even after laboratory tests are made to assure their quality, exacting field tests are held under the same conditions that would be encountered by the purchaser. This procedure applies also to Lafayette public address equipment, which is actually installed in theatres and auditoriums, and to auto radios, which are given grueling road tests.

Every item turned over to the production department by the research and design laboratory must pass many severe tests, which are long and involved. Condensers are tested for breakdown voltage; coils and chokes of various kinds for inductance value and current capacity; transformers for their frequency response or power ratings; receivers for sensitivity, selectivity and tone quality. In other words, you are always absolutely sure of the performance of merchandise produced by the Lafayette factory. It is in the plant, illustrated here, that the merchandise offered by Lafayette, whether it be sets, transmitters, amplifiers or public address equipment, is designed and turned out. Prices are kept as low as is consistent with quality, but quality is never sacrificed under any circumstances. Let's say hello to the chief engineer of Lafayette transmitter and receiver division Frank Lester. In the photo above you find him seated at a PB46 transmitter, with his assistants, Roy Neusch, W2CF, at the drawing board and John de Leon, W2AGO working on a l00-watt transmitter. Frank, as you know, is the inventor of the "Les-Tet" harmonic oscillator and the author of many technical articles for amateur radio magazines. His call is W2AMJ, and he is very active on the air.

We have found it advantageous to plan well and to layout a wiring and assembly department on a scientific basis. This department occupies considerable space and is arranged to permit trained and experienced workers, every modern facility with which to carry out their part in the production of Lafayette merchandise. It is in this department that Lafayette amateur radio equipment takes on the form of finished products.

The wiring and assembling work involves much minute detail. The men engaged in this work are all experts in their line, above the average found elsewhere in the industry. They not only have a highly technical background but are acquainted with the applications of the apparatus they build. Each man is trained to observe the Lafayette rules of wiring and assembly developed by our staff engineers for the sake of uniformity and stability.

In order to get maximum output, whether transmitter or receiver, and long life, wiring must strictly conform to Lafayette rules. The wires are usually cabled, while resistor and condenser placement is actually a matter of engineering design. The entire unit or units are Lafayette throughout and nothing but the finest goes into their production. The boys here are just as proud of the appearance of the insides of the chassis as they are of the outer looks.

And by the way, most of these men are licensed amateurs and have a whole-hearted interest in their work. A different atmosphere exists when the men building your equipment want it to work as you expect Lafayette merchandise to perform. The result is highly efficient workmanship in every detail of construction plus gratifying results for those who purchase and use Lafayette precision apparatus. Lafayette units are so popular and the demand for them so great that production is divided into the operations of assembling and wiring, to speed the process without impairing quality. One group is constantly assembling, while another is wiring the parts on the metal chassis. For instance, let us consider a Model PB46 phone transmitter, very popular and a favorite among amateurs. This is an outfit the Lafayette engineers developed for the amateur demanding a moderately powered transmitter at a reasonable price. It fills a decided demand for a transmitter of professional appearance and laboratory construction, built and priced for every amateur. A strong feature of this outfit is that it is so constructed that the financially limited amateur can purchase the units separately, yet enable him to put a 30 watt CW transmitter on the air immediately, since this unit includes its own power supply. Later on, when finances permit, the modulator unit can be purchased and in five minutes the outfit is converted into an excellent radiophone transmitter. For still further improvement the antenna coupling unit can then be purchased.

The units designed and built by Lafayette are all mounted on 16 gauge cadmium plated steel chassis the foundation, according to our standards, necessary for durability and long life. The components used in Lafayette construction, such as Hammarlund variable condensers, Sangamo fixed condensers, Triplett Bakelite cased meters, etc., are furnished to Lafayette specifications.

Transformers used are oversize and are constructed with very heavy cores and windings, not usually found in equipment turned out for the radio amateur at such popular prices. In other words, Lafayette assures you of the best in performance, appearance and price. We invite you at all times to compare our prices see for yourself how Lafayette has gained an enviable position in the radio field.

The final tests given Lafayette products are severe. In testing, the audio frequency unit is first subjected to the R.C.A. cathode ray oscillograph for hum. Oscillator tests determine amplification and fidelity, while output tests are made with special meters of Lafayette design. After the audio unit has met each and every test to our satisfaction, it is coupled with the radio frequency unit and again tested for modulation. Both dummy and actual antenna tests are given finished units.

The Lafayette 100-watt transmitter incorporates such modern features as suppressor-grid modulation, crystal frequency control, the new "Les-Tet" harmonic oscillator which uses a 56-53 circuit to provide a stable crystal oscillator and a very efficient doubler or neutralized buffer stage having more than sufficient output to excite the 100-watt pentode amplifier, and a universal antenna matching unit that permits successful operation of the transmitter with practically any type of antenna. It is so constructed that it can be purchased complete or in separate units. And like all other Lafayette merchandise it carries the Lafayette guarantee for your protection.

I will post several pages of the Lafayette ham radio line shown in this catalog on my web page, **www.k2tqn.com**.

Photos by K2TQN, except as noted.

WB8IMY

ECLECTIC TECHNOLOGY

Hot Ticket of the Month: The FunCube Dongle Pro

The FunCube Dongle Pro software-defined VHF+ receiver.

Good seats at Taylor Swift concerts are fantastically difficult to acquire. My daughter loves the pop/country idol and, doting father that I am, I do what I can to secure the treasured tickets. In the age of the Internet, that means perching at my keyboard, credit card at the ready, at the precise minute the tickets officially go on sale. If I hesitate, they're gone. Ms Swift can easily sell out an entire concert arena in less than 10 minutes.

But nothing like that happens in Amateur Radio, right?

You'd think so, unless you were trying to get your hands on a FunCube Dongle Pro early this year. The Dongle is a software defined receiver that, unlike most SDRs, covers the VHF and low microwave spectrum from about 64 to 1700 MHz. The tiny receiver sports a USB connector on one end and an SMA antenna jack on the other. You simply plug it into your computer, connect an antenna, fire up the SDR software and go. It will receive everything from FM to SSB and sells for about $173.

Profits from Dongle Pro sales help fund the AMSAT-UK FunCube project, which involves a small yet-to-be-launched satellite that will function as part of an educational outreach program. The FunCube project itself is quite clever (you can learn more on the Web here: **funcube.org.uk**/), but it is the FunCube Dongle Pro receiver that has ignited a storm of interest.

How much interest? The first batch of 100 FunCube Dongle Pro receivers sold out in *less than 5 minutes*. The little radios are assembled by volunteers; this isn't a commercial mass-production undertaking. So, they put together a quantity and then announce the dates and times when they'll be available for sale at the Dongle website at **www.funcubedongle.com**. The current buying frenzy will eventually subside, but if you want one of these nifty receivers I'd recommend that you check the Web site often. When you see a sale announcement, mark the date and time on your calendar and make sure you have Internet access when the moment arrives.

Contestia on VHF+

We often discuss the pantheon of HF digital modes — it seems like there is a new one every month – but there hasn't been as much chatter about digital operating above 50 MHz. Of course, there is D-STAR, APCO-25, the various WSJT modes for meteor scatter and moonbounce, packet radio (including APRS) and even Domino EX. APRS is the hands-down winner in terms of sheer popularity and D-STAR is gaining ground. Despite all this, it is interesting to see that hams are trying other digital pathways with intriguing results.

You may be aware of Contestia, a digital mode heard occasionally on the HF bands. If you use the Digital Master 780 module in *Ham Radio Deluxe* (**www.ham-radio-deluxe.com**), you'll find it in the mode list. Ditto for *Fldigi* (**www.w1hkj.com**) and *MultiPSK* (**f6cte.free.fr/index_anglais.htm**). Skip Teller, KH6TY, has been trying Contestia on VHF and UHF with excellent results. According to Skip, using Contestia 64/1000 often produces 95% to 100% print while SSB phone is unreadable. Download one of the free applications, build Skip's VOX interface described in last month's *QST* and give Contestia a try. See Skip's article on the Web at **contestia.blogspot.com/p/vhfuhf.html**.

Racetrack Memory

It seems as though many of us are becoming impatient with our station computers. I'm guilty as charged. In my last rebuild, I installed a sold-state drive and made it the home for *Windows 7* and any other software that needed to execute quickly. Yes, the PC certainly boots up rapidly, but there is still a slightly annoying lag.

There are people in the world who take this issue very seriously. Depending on who you talk to, some believe the global cost in terms of lost productivity and energy consumption runs into the hundreds of millions of dollars *a day*.

One possible solution for lightning response times involves technology that harkens back to magnetic tape. (I suspect many readers are old enough to remember loading programs into home computers from cassette tapes!) The proposed solution involves data recorded on magnetic tape, but the similarity ends there; in this system the tape would be a nickel-iron nanowire, a million times smaller than the classic tape. And unlike a magnetic videotape, in this system nothing moves mechanically. The bits of information stored in the wire are simply pushed around inside the tape using a spin-polarized current, attaining the breakneck speed of several hundred meters per second in the process. It's like reading an entire VHS cassette in less than a second.

In order for the idea to be feasible, each bit of information must be clearly separated from the next so that the data can be read reliably. This is achieved by using "domain walls" with magnetic vortices to delineate two adjacent bits. To estimate the maximum velocity at which the bits can be moved, scientists carried out measurements on vortices and found that the physical mechanism could allow for possible higher access speeds than expected. Their results were published online last October in the journal *Physical Review Letters*. Millions or even billions of nanowires would be embedded in a chip, providing enormous capacity on a shock-proof platform. This so-called "racetrack memory" could be available in as little as 5-7 years.

Racetrack memory promises to be a real breakthrough in data storage and retrieval. Racetrack-equipped computers would boot up instantly (ditto for radios that incorporate these chips) and their information could be accessed 100,000 times more rapidly than with a traditional hard disk. QST

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

W1GHZ

MICROWAVELENGTHS

Microwave Construction Techniques

One of the fun things about microwaves is being able to build your own equipment, with the satisfaction of making something that not only works, but works well. Few of us could build an HF transceiver competitive with commercial offerings, but most of us can homebrew some useful parts of a microwave system. We can start with simple modules or kits and progress to more complex things or higher frequencies as we develop new skills.

The October 2009 Microwavelengths column described some simple microwave transverters that I designed.[1] One of my intents was to make them reproducible — the magic is in the PC board pattern — so that there is a high confidence level that the circuit will work if assembled correctly. You don't have to be a microwave expert, just know which end of a soldering iron to hold.

Surface-mount Soldering

If you pass this first test, you may have built some simple kits or projects using components with wire leads, but may be intimidated by surface mount construction. Wire leads don't work very well at microwave frequencies; they are inductors, usually with more inductance than the circuit needs. By using surface mount components — chip capacitors and resistors, plus transistors and ICs — we can minimize inductance and connect the components directly to printed transmission lines.

For the lower microwave frequencies, we can use larger sizes of surface-mount components, big enough to see and to handle (much smaller ones are used in your cell phone). I'm going to describe how I assemble them, which may be quite different from the process used in volume manufacturing where automated machinery assembles thousands of components per hour.

The tools we need are a soldering iron, some fine solder, a pair of sharp tweezers and a good light. Many of us are old enough that some sort of magnifier helps to make the parts clearly visible. A temperature-controlled soldering iron is preferred, since excess heat can damage the metal terminals on chip components — I set mine fairly low, around 700°F. The solder should be tin-lead, eutectic (63-37 percent mix) preferred; I like low residue "no clean" solder like Kester 245 or Multicore X39B to minimize flux cleanup. Finally, I prefer curved tweezers with a sharp point, like Swiss style #7. This is a matter of personal preference — you may find straight tweezers easier to use.

For each component, I start by heating one PC board pad with the soldering iron and melting a small amount of solder on the pad. After the solder hardens, I pick up the component with the tweezers, hold it in place on the pads and melt the solder again while pushing the component down and holding it in place until the solder hardens. If I am satisfied with the placement, I solder the other end of the component, then go back and touch up the first joint if needed. On the other hand, if something shifted or I'm not happy with the placement, I go back and try again before proceeding. Occasionally a component will slip out of the tweezers and fly away — chip capacitors and resistors are only a few cents each, so having spares available is not a hardship. Figure 1 shows this manual assembly technique with the tweezers, using a mouse pad as a non-slip base.

Your first thought is that it takes a very steady hand to hold a small component in place with tweezers. The secret is to see it clearly — the light and magnifier. When you can see your work clearly, visual feedback steadies your hand. For very small components, a microscope may be needed.

But there are alternatives — fixtures or adhesives to hold the components in place while soldering. In automated manufacturing, the components are all glued in place

[1] P. Wade, W1GHZ, "Microwavelengths," *QST*, Oct 2009, pp 97-98.

Figure 1 — This is the manual assembly technique with the tweezers, using a mouse pad as a non-slip base.

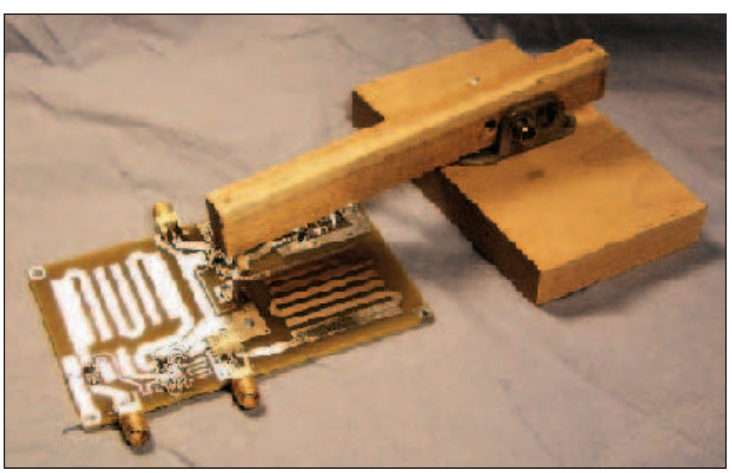


Figure 2 — A homemade fixture used to hold the surface-mount component during soldering.

Paul Wade, W1GHZ ♦ 161 Center Rd, Shirley, MA 01464 ♦ w1ghz@arrl.org

Figure 3 — Ordinary copper pipe caps can be used as filters to construct a microwave transverter.

Figure 5 — Once the pipe cap is positioned, hold it down with a screwdriver and use a heat gun to melt the solder ring.

with a tiny bit of adhesive, then all soldered at once in an oven or furnace. Some hams use a similar technique with tiny bits of a tacky material, like the removable adhesive putty used for posters. The trick is to get the stuff in the space between the solder pads, not on the pads.

Another choice is a fixture like the one in Figure 2 that I made to hold surface-mount components while soldering. A wooden stick from a cotton tipped swab pushes down on the component with the weight of the arm. For a hinge, I used a piece from a storm-door closer and a bit of hobby tubing. A coin or washer can be added to the arm to adjust the weight, just as we used to do with phonograph needles.

A different approach is to solder all the components at once in an oven. In the January 2011 *QST*, VE5FP described a simple way to use an ordinary toaster-oven for soldering surface-mount components.[2] If you are doing a batch of boards, perhaps as a club project, this would be great. I am usually experimenting, adding a few components at a time, testing and modifying, so hand-soldering works better.

Pipe-cap Filters

Some of my microwave transverters, like the one shown in Figure 3, use pipe-cap filters. These are made with ordinary copper plumbing fittings, which are too large to solder with an ordinary soldering iron. Plumbers use a torch to solder copper fittings, so I also used a torch until a microwaver suggested that a hot-air gun (like those used for stripping paint) was more controllable. I wish I remembered who he was so I could give him proper credit, but he was right — the hot air gun does a cleaner job with less discoloration and a smaller chance of damage if you slip.

Figure 4 — Here is a pipe cap ready to solder. You can see the solder ring and the scribe lines.

Before soldering, a hole in the center of the pipe cap is drilled and tapped for the tuning screw. Since the pipe cap will be soldered to the ground-plane side of a circuit board, I scribe lines on the board to locate it. Then I put a small amount of rosin paste flux (I use Kester SP-44) on the rim of the pipe cap and place it in position on the board. Next, I make a ring of solder and slip it over the pipe cap, pushing it down to the board. Figure 4 shows a pipe cap ready to solder — see the solder ring and the scribe lines.

Finally, I push the cap down with a screwdriver and heat it from the top with the hot air gun, as shown in Figure 5. The copper conducts heat well down to the board and when the copper temperature reaches the melting point of the solder, the solder ring will melt all at once and flow evenly around the base of the pipe cap — time to remove the heat and hold still until the solder solidifies. In Figure 3, there are nice solder fillets around the base of the pipe caps.

Learn by Doing

If you haven't done any surface-mount soldering before, a little practice might be good. Buy some extra chip capacitors and solder them to a scrap of PC board. Or build something simple — an MMIC, plus a few capacitors and resistors, can make a useful microwave amplifier. The transmission line can be cut out with an X-Acto knife or you can build it dead-bug style. Either way, it will work and you'll gain confidence. The transverters are just a handful of these amplifiers on a single board, plus the stuff that determines the operating frequency.

Photos by Paul Wade, W1GHZ QST

[2]J. Koehler, VE5FP, "Reflow Soldering for the Radio Amateur," *QST*, Jan 2011, pp 32-34.

Strays

BLOGGING A QSO A DAY

♢QSO365 is a project running throughout 2011 to have a QSO per day during 2011 and document the progress on a blog. This is quite a personal challenge because I only have limited time each day to operate the radio. QSOs can be on any band or mode although to date they've all been between 80 m and 2 m and all have been SSB. As part of the project, I am in the process of learning Morse code and intend to use CW on air during the year.

All stations mentioned on the blog throughout the year will receive a QSL card with a sticker on the back mentioning the project and the day the QSO took place.

The QSO365 website and blog can be found at **qso365.co.uk/**. — *Keith Maton, G6NHU*

CONVENTION AND HAMFEST CALENDAR

Abbreviations
Spr = Sponsor
TI = Talk-in frequency
Adm = Admission

Alabama (Greenville) — May 7
D F H R S T V
8 AM. *Spr:* Jim Bell Wireless Assn. Butler County Fairgrounds, AL Rte 10. *TI:* 146.67. *Adm:* $5. Tables: 1 table free, additional tables $5 each. Jerry McCullough, KE4ERO, 274 W Pettibone Rd, Georgiana, AL 36033; 334-382-7644; **ke4ero@gmail.com**; **www.k4tns.org**.

SOUTHEASTERN VHF SOCIETY CONFERENCE
April 29-30, Huntsville, AL
D F H R S
The Southeastern VHF Society Conference (15th Annual Conference), sponsored by the Southeastern VHF Society, will be held at the Holiday Inn Downtown, 401 Williams Ave. Doors are open 9 AM-5 PM. Features include dealers, flea market, technical presentations, antenna range operations, handicapped accessible. Conference fee is $38 in advance, $48 at the door. Tables are $10. Contact Robin Midgett, K4IDC, 3229 Pugh Rd, Hermitage, TN 37076; 615-336-7091; **k4idc@comcast.net**; **www.svhfs.org/conference.html**.

Alabama (Mobile) — Apr 9
D F H R S V
8 AM-2 PM. *Spr:* Mobile ARC. Gulf State Fairgrounds, 1035 Cody Rd N. *TI:* 146.82 (203.5 Hz). *Adm:* $6. Tables: $10. Larry Early, WB4YOR, 8495 Desert Oak Ct, Mobile, AL 36695; 251-635-2327; **mobilehamfest@hotmail.com**; **www.w4iax.net**.

Arizona (Sierra Vista) — May 7
D F H R T V
7 AM. *Spr:* Cochise ARA. Green Acres, 2756 S Moson Rd. "Larry Warren Memorial Hamfest," ARCA meeting (10 AM), foxhunt (noon). *TI:* 146.76 (162.2 Hz). *Adm:* Free. Tables: inside $10 ($5 per tailgate space). Dale Chidester, NJ7C, 5053 S Apache Ave, Sierra Vista, AZ 85650; 520-227-1823; **dalechid@cox.net**; **www.k7rdg.org**.

Arizona (Tucson) — Mar 26
D F H R V
6 AM-noon. *Spr:* Radio Society of Tucson. Kino Sports Park, 2805 E Ajo Way. *TI:* 146.8 (156.7 Hz). *Adm:* Free. Tables: $5. Matthew Grossman, AC7IL, 5225 N Sabino Canyon Rd, Tucson, AZ 85750; 520-529-8194; **president@rstclub.org**; **www.tucsonhamfest.org**.

Arkansas (Fort Smith) — Apr 2
D F H Q R S T V
8 AM-3 PM. *Spr:* Fort Smith Area ARC. Columbus Acres, 10203 Columbus Acres Rd. *TI:* 146.64 (88.5 Hz). *Adm:* advance $8, door $10. Tables: $10 (plus $5 for power, if available). Jimmie Lowrey, W5JNL, Box 3102, Fort Smith, AR 72913; 479-649-7249; fax 866-829-6269; **W5JNL@IRSTaxes.biz**; **www.HangingJudgeHamfest.com**.

California (Sonoma) — Apr 30
D F H R S T V
8 AM-noon. *Spr:* Valley of the Moon ARC. Sonoma Veteran's Memorial Building, 126 First St W. Operating demonstration station on phone and digital, transmitter hunt. *TI:* 145.35 (88.5 Hz). *Adm:* Free. Tables: $10. Darrel Jones, WD6BOR, 358 Patten St, Sonoma, CA 95476; 707-996-4494; **wd6bor@vom.com**; **vomarc.org/events.html**.

Coming ARRL Conventions

March 19
Nebraska State, Lincoln*
West Texas Section, Midland*

March 25-26
Maine State, Lewiston*

March 26-27
Maryland State, Timonium*

April 2-3
New Jersey State, Ewing*

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, Huntsville, AL

May 6-8
EMCOMMWEST, Reno, NV

May 7
South Carolina State, Spartanburg

June 3-5
Northwestern Division, Seaside, OR

June 4
Georgia State, Marietta
Atlantic Division, Rochester, NY

June 10-11
ARRL National, Plano, TX

*See March *QST* for details.

INTERNATIONAL DX CONVENTION
April 15-17, Visalia, CA
D F H Q R S
The International DX Convention (62nd Annual International DX Convention), co-sponsored by the Northern California DX Club, the Central Arizona DXA, and the Utah DXA will be held at the Visalia Holiday Inn, 9000 W Airport Dr. Doors are open Friday 1-5 PM, Saturday 8 AM-5 PM, and Sunday 7:30-11 AM. Features include old-fashioned swapmeet; DX-oriented forums and presentations; technical sessions; vendors; major equipment manufacturers; exhibitors; Contest Academy (Friday 1-5 PM, $10 per person); top DX operators from around the world; DXCC card checking; special guest from ARRL HQ, Sean Kutzko, KX9X, Contest Branch Manager; Saturday barbeque lunch; Saturday eve banquet; Sunday Breakfast Buffet; Saturday Tour; RV parking ($40 for the weekend; Brian Lancaster, 559-651-5000 ext 2608; **blancaster@altamonthotels.com**); handicapped accessible. Admission is $95 in advance (by Mar 20), $100 at the door or after Mar 20 (includes all meals). Contact Steve Jones, N6SJ, 2100 Bear Gulch Rd, Woodside, CA 94062; 650-851-8985; **n6sj@earthlink.net**; **dxconvention.org**.

Connecticut (Gales Ferry) — Apr 16
H R
Sellers 8 AM for equipment setup; 9 AM for bidders' inspection; public 10 AM-3 PM (or until last item is sold). *Spr:* Radio Amateur Society of Norwich. Gales Ferry Firehouse, 1772 Rte 12. RASON Auction. *TI:* 146.73, 449.725 (156.7 Hz). *Adm:* $2. Gary Divan, WT1SND, 102 Plain Hill Rd, Baltic, CT 06330; 860-884-4218; **WitsEnd@portone.com**; **www.RASON.org**.

Delaware (Georgetown) — Apr 16
D H Q R S T V
7:30 AM-3 PM (gates open at 6 AM). *Sprs:* Sussex ARA and Sussex Technical High School. Sussex Technical High School, 17099 County Seat Hwy (Rte 9). Delmarva AR and Electronics Expo. *TI:* 147.075 (156.7 Hz). *Adm:* $5. Tables: $15 for the first table; $10 for each additional table. Chuck Betyeman, W3DEL, 20 Shay Ln, Milton, DE 19968; 302-646-2225; **gunk302@comcast.net**; **www.radioelectronicsexpo.com**.

Florida (Cocoa) — Apr 16
D F T V
8 AM-2 PM. *Spr:* Brevard Emergency AR Services. Florida Solar Energy Center, 1679 Clearlake Rd. *TI:* 147.135. *Adm:* $3. Tables: $10. Mike Stallings, K4RVR, 121 Rosewood Dr, Cocoa, FL 32926; 321-636-3619; **mike@stallings.com**; **bears.homelinux.net/**.

Florida (Coral Gables) — Apr 16. Bill Moore, WA4TEJ, 305-264-4465; **wa4tej@juno.com**; **www.FlamingoNet.8m.net**.

Florida (Gainesville) — Apr 30-May 1
D H R S T V
Saturday 8 AM-4 PM, Sunday 8 AM-noon. *Spr:* Gainesville ARS. Alachua County Fairgrounds, 2900 NE 39th Ave. Poorman's Hamfest and Computer Show, on-site overnight camping ($10 per night, Friday and Saturday). *TI:* 146.82 (123 Hz), 146.985. *Adm:* advance $5, door $7. Tables: $8 (8-ft, plus admission; power available). Pete Winters, W4GHP, c/o GARS, Box 140383, Gainesville, FL 32614; 352-529-2033; fax 352-528-6698; **bugmeister@embarqmail.com**; **www.gars.net/hamfest**.

Florida (St Petersburg) — Apr 30
F T V
8 AM-noon. *Spr:* St Petersburg ARC. Lake Maggiore Park, 3804 Martin Luther King Jr St S. *TI:* 147.06. *Adm:* Free. Tables: Free. Tom Schaefer, NY4I, 323 Old Oak Cir, Palm Harbor, FL 34683; 727-437-2771; **ny4i@arrl.net**; **www.sparc-club.org**.

Florida (Tampa) — Apr 16
F H Q R T V
8 AM-1 PM. *Spr:* Tampa ARC. TARC Clubhouse, 7801 N 22nd St. TARCFest. *TI:* 147.105 (146.2 Hz). *Adm:* $2. Tables: $3. William Bode, N4WEB, 14302 Capitol Dr, Tampa, FL 33613; 813-382-9262; **n4web@hamclub.org**; **www.hamclub.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

Georgia (Byron) — May 7 D F H R T V
8 AM-3 PM. *Sprs:* Central Georgia ARC, Middle Georgia Radio Assn, Byron Middle School ARC, Macon ARC. Byron Middle School, 201 Linda Dr. "Heart of Georgia Hamfest." *TI:* 146.85. *Adm:* $5. Tables: $5. Tim Hardy, AF1G, 207 River Valley Trail, Kathleen, GA 31047; 478-396-0124; **af1g@arrl.net**; **www.wa4ort.com**.

Georgia (Sugar Valley) — Apr 23 D F H R T V
8 AM-2 PM. *Spr:* Cherokee Capital ARS. Sugar Valley Community Center, 3295 Sugar Valley Rd NW. *TI:* 443.675, 146.745, 146.805. *Adm:* $5. Tables: $5. Felton Floyd, AF4DN, 1054 Mountain Loop Rd NW, Sugar Valley, GA 30746; 770-324-9859; **af4dn@iwispr.net**; **www.k4woc.com**.

IDAHO STATE CONVENTION

April 22-24, Boise
D H Q R S T V

The Idaho State Convention, sponsored by the Voice of Idaho ARC, will be held at the Boise Hotel and Conference Center (formerly known as the Holiday Inn at Boise Airport), 3300 S Vista Ave. Doors are open Friday noon-9 PM, Saturday 8 AM-9 PM, Sunday 9 AM-noon. Features include indoor and outdoor swapmeet; vendors and exhibitors; consignment sales; tailgating ($10 per space); numerous training sessions, seminars and forums; VE sessions (two test sessions on Saturday, 10 AM-noon and 2-4 PM; no pre-registration required, $15; Nina Kurpjuweit, KE7SPP, **ngkurp@yahoo.com**); special Friday eve seminar and dinner ($20); Saturday Breakfast ($8); Saturday Lunch ($8); Saturday eve banquet featuring guest speaker Ward Silver, NØAX ($40). Talk-in on 146.84 (100 Hz). Admission is $10 in advance, $12 at the door (good all three days). Tables are $60 (display booth). Contact Lynn Rasmussen, W7RAZ, 1433 Ross Rd, Weiser, ID 83672; 208-550-7710; **w7raz24@gmail.com**; **www.idahostateconvention.com**.

Illinois (Arthur) — May 1 D F H R S T V
8 AM-noon. *Spr:* Moultrie ARK. Arthur Fire Station, 323 W Columbia (Rte 133). 50th Annual Hamfest. *TI:* 146.655 (162.2 Hz), 444.925 (103.5 Hz). *Adm:* $7 (under 14 free). Tables: $10 (paid in advance only). Ralph Zancha, WC9V, Box 55, Lovington, IL 61937; 217-873-5287 or 217-254-7574 (cell); **rzancha@one-eleven.net**; **www.qsl.net/mark**.

Illinois (Galva) — Apr 17 D F H R T
8 AM-noon. *Spr:* Area AR Operators. Galva High School, 1020 N Center Ave. *TI:* 145.49 (225.7 Hz). *Adm:* advance $5 (3 stubs), door $5 (1 stub). Tables: $8 (before Apr 7), $10 (after Apr 7). Bill Anderson, WA9BA, 30 Wallace St, Galva, IL 61434; 309-932-3023; **wa9ba@arrl.net**; **www.aa9ro.com**.

Illinois (Godfrey) — Apr 30 D F H R V
7 AM-noon. *Spr:* Lewis and Clark RC. Lewis and Clark Community College (Riverbend Arena), Godfrey Rd (Rte 67). *TI:* 145.23 (79.7 Hz). *Adm:* advance $2 (or 3 for $5), door $3 (or 2 for $5). Tables: $10. Larry Roberts, W9MXC, 5319 Dover Dr, Godfrey, IL 62035; 618-466-0041; **lhrob@charter.net**; **k9ham.org**.

Illinois (Jeffersonville) — Apr 2 D F H R T V
8 AM-1 PM. *Spr:* WHERE ARC. Geff Ruritan Bldg., N Washington St. April Fools Fest. *TI:* 442.625 (123 Hz), 146.52. *Adm:* $2. Tables: $5. Steven Hamilton, KC9GMX, 207 S Washington St, Geff, IL 62842; 618-919-0536; **stevelton17@hotmail.com**; **www.whereradio.com**.

Illinois (Sandwich) — May 1 D F H R T
8 AM-1 PM. *Spr:* Kishwaukee ARC. Sandwich Fairgrounds, 1401 Suydam Rd. DeKalb Hamfest. *TI:* 146.73 (100 Hz), 146.52. *Adm:* advance $5, door $7. Tables: $10. Bob Yurs, W9ICU, 1107 Commercial St, Sycamore, IL 60178; 815-895-3219; fax 815-895-7584; **w9icu@arrl.net**; **www.kish-club.org**.

Indiana (Peru) — Apr 16 D F H R T V
7 AM-2 PM. *Sprs:* Cass County, Grant County, Miami County, and Kokomo ARCs. Miami County 4-H Fairgrounds, 1079 W 200 N. *TI:* 147.345. *Adm:* $5. Tables: $4. Steve Shepler, WA9RVM, Box 824, Marion, IN 46952; 765-661-5260; **shepler1@gmail.com**; **www.nci-hamfest.net**.

Iowa (Des Moines) — Apr 23 D F H R V
8 AM-1 PM. *Spr:* Des Moines RA Assn. Iowa State Fairgrounds, E 30th St and E University Ave. *TI:* 146.94 (114.8 Hz). *Adm:* $6 (under 12 free). Tables: $20. Ron Hobbs, NØXWI, Box 88, Des Moines, IA 50301; 515-255-4020; **rwhobbs@aol.com**; **www.dmraa.com/hamfest**.

Iowa (Oskaloosa) — Mar 19. Vern Stanley, NØSJF, 641-622-2154; **vstanley@iowatelecom.net**.

Kentucky (Ashland) — Apr 30 H R T V
8 AM-1 PM. *Spr:* River Cities ARA. PNC Bank Parking Lot, 1100 Carter Ave. *TI:* 146.94 (107.2 Hz). *Adm:* Free. Tables: Free. Ken Bramblett, K4IT, 1118 Grandview Dr, Flatwoods, KY 41139; 606-836-9170; **k4it@arrl.net**; **www.rcara.site90.com/**.

Kentucky (Elizabethtown) — Apr 2
D F H R S T V
8 AM-2 PM. *Spr:* Lincoln Trail ARC. State Fire Rescue Training Area 5, 630 College Street Rd. *TI:* 146.98. *Adm:* advance $5, door $6. James Skala, AA4ZD, 45 Lincoln Dr, Elizabethtown, KY 42701; 270-737-5748; **james.skala@gmail.com**; **www.qsl.net/ltarc/**.

Louisiana (Benton) — May 7 F H R T
10 AM-3 PM. *Spr:* ARC of Shreveport. Cypress Black Bayou Recreation Park, 135 Cypress Park Dr. 10th Annual ARCOS Swapmeet and Cookout. *TI:* 146.67 (186.2 Hz). *Adm:* $1 (entry fee to park). Tables: Free (first-come, first-served basis). J. Mark Robertson, K5JMR, 237 Norcross St, Bossier City, LA 71111; 318-747-9877; **k5jmr@yahoo.com**; **www.qsl.net/nwlarn/arcos.htm**.

LOUISIANA STATE CONVENTION

April 23, Monroe
D F H Q R S V

The Louisiana State Convention (Northeast Louisiana Regional Ham RadioFest), sponsored by the Twin City Ham Club, will be held at the Barak Shrine Temple, 6620 Frontage Rd. Doors are open for setup on Friday 2-7 PM, Saturday 7 AM; public 8 AM-4 PM. Features include great flea market; dealers and vendors; forums; special guest from ARRL HQ Dan Henderson, N1ND, Regulatory Information Manager; QSL card checking; VE sessions (9 AM); handicapped accessible; refreshments. Talk-in on 146.85. Admission is $5. Tables are $10 (electricity $10 additional; **tables@tchams.org**). Contact Darell LeBlanc, KE5JVZ, 2701 Blue Water Ln, Monroe, LA 71201; 318-512-1626; **darellmleblanc@comcast.net**; **www.tchams.org**.

Maine (South Portland) — Apr 16
D F H R T V
8 AM-noon. *Spr:* Portland Amateur Wireless Assn. Stewart Morrill American Legion Post #35, 413 Broadway St. *TI:* 146.073 (100 Hz). *Adm:* $5. Tables: $10. John Bogner, W1JLB, 90 Wayside Rd, Portland, ME 04102; 207-773-7120; **jbogner1@maine.rr.com**; **pawa-maine.org**.

Maryland (Boonsboro) — Apr 30
D F H R S T V
6 AM-1 PM. *Spr:* Antietam Radio Assn. Ag Expo Center, 7313 Sharpsburg Pike (Rte 65). *TI:* 147.09. *Adm:* $5. Tables: $10. Karin Christensen, KB3GFV, 19106 Lappans Rd, Boonsboro, MD 21713; 301-432-2358; **dilbert@wildblue.net**; **w3cwc.org**.

Massachusetts (Cambridge) — Apr 17. Nick Altenbernd, KA1MQX, 617-253-3776 (9 AM-5 PM); **w1gsl@mit.edu**; **www.swapfest.us**.

Massachusetts (Framingham) — Apr 3
D F H R V
Set up 7:30 AM; public 9 AM-1 PM. *Spr:* Framingham ARA. Keefe Technical School, 750 Winter St. *TI:* 147.15. *Adm:* $5. Tables: advance $20, door $25. Bev Lees, N1LOO, c/o FARA, Box 3005, Framingham, MA 01705; 508-626-2012; **beverlylees@hotmail.com**; **fara.org/flea**.

Michigan (Cadillac) — May 7 D F H R V
8 AM-noon. *Spr:* Wexaukee ARC. Cadillac Jr High School, 500 Chestnut St. 49th Annual Swap and Shop. *TI:* 146.98. *Adm:* $5. Tables: $10 (8-ft). Alton McConnell, NU8L, c/o Wexaukee ARC, Box 163, Cadillac, MI 49601; 231-876-1485; **nu8l@yahoo.com**; **www.wexaukeearc.org/index.html**.

Michigan (Highland) — Apr 16 D H R
8 AM-1 PM. *Spr:* Milford ARC. Milford High School, 2380 Milford Rd. *TI:* 145.49 (67 Hz), 146.52. *Adm:* advance $5, door $6. Tables: $1.50 per foot. Rose Moore, KC8NQJ, 1383 Sylvan Dr, Hartland, MI 48353; 810-632-5174; **kc8ide@comcast.net**; **www.qsl.net/w8ydk**.

Missouri (Kansas City) — Apr 23
D F H R S V
8 AM-2 PM. *Spr:* Ararat Shrine ARC. Ararat Shrine Temple, 5100 Ararat Dr. *TI:* 145.13. *Adm:* advance 3 for $7, door $4 each. Tables: $17. Dave Michael, WAØNXD, 3361 Blue Ridge Blvd, Independence, MO 64052; 816-254-9011; **demichael38@hotmail.com**; **www.hambash.com**.

EMCOMMWEST CONVENTION

May 6-8, Reno, NV
D F H Q R S T V

The EMCOMMWEST Convention, sponsored by EMCOMMWEST, Inc, will be held at the Grand Sierra Resort and Casino, 2500 E 2nd St. Doors are open Friday 8 AM-5 PM, Saturday 8 AM-10 PM, Sunday 8 AM-1 PM. Features include swapmeet; ARRL forum; vendors; speakers and presentations; Static Displays; FEMA/ICS Training; Emergency Communications forums; VE sessions; breakfast buffet; banquet (Saturday eve, $39); special guest speaker from ARRL HQ, Mike Corey, W5MPC, Emergency Preparedness Manager); handicapped accessible. Talk-in on 146.52, 446.0, 147.3 (123 Hz). Admission is $15 in advance, $20 at the door. Tables are $150. Contact Rob Gilmore, KI6TRK, 408-888-5565; **ki6trk@gbis.com**; **www.emcommwest.org**.

New Jersey (Succasunna) — Apr 3
D F H Q R T V
Sellers 6 AM, buyers 8 AM-12:30 PM. *Spr:* Splitrock ARA. Roxbury Senior Center, 72 Eyland Ave. *TI:* 146.985 (131.8 Hz). *Adm:* $5 (nonham spouses and children free). Tables: $20 (includes one admission); tailgating $15 per space (includes one admission). Mike Greenfeld, K8BQ, c/o Splitrock ARA, Box 610, Rockaway, NJ 07866; 866-457-6687; **hamfest@splitrockara.org**; **www.splitrockara.org**.

New Jersey (Tinton Falls) — May 7
D H R T V
Sellers 7 AM; buyers 8 AM-noon. *Sprs:* Garden State ARA and Jersey Coast DX Assn. MAECOM Adult Education Facility, 100 Tornillo Way. *TI:* 448.125 (141.3 Hz). *Adm:* $5 (nonham spouses and children free). Tables: $15 (tailgaters; tables provided to pre-registered upon request). Frank Wroblewski, W2XYZ, 450B Cheshire Ct, Lakewood, NJ 08701; 732-942-7705; **w2xyz@arrl.net**; **www.gardenstateara.org** or **nadxa.org**.

New Jersey (Wall Township) — Apr 16
H R T V
Sellers 6 AM, buyers 7 AM. *Spr:* Ocean-Monmouth ARC. InfoAge Learning Center, Project Diana Site, 2300 Marconi Rd. *Tl:* 145.11 (127.3 Hz). *Adm:* $5 (tailgating $10 per space). Jeff Harshman, N2LXM, 5 The Arborway, Ocean, NJ 07712; 732-996-0637; **n2lxm@juno.com**; **www.omarc.org**.

New Mexico (Las Cruces) — May 1
D H R T V
8 AM-3 PM. *Spr:* Mesilla Valley RC. MVRC Clubhouse, 6609 Jefferson. "Bean Feed." *Tl:* 146.64 (100 Hz). *Adm:* Free. Tables: Free. Terry Angle, KF5DNS, 795 Suzanne Ave, Las Cruces, NM 88005; 575-640-9669; **kf5dns@gmail.com**; **www.n5bl.org/**.

New York (Newark) — Apr 16 D F H R T V
Set up 7 AM; public 8 AM. *Spr:* Drumlins ARC. Marbletown Fire Department, 6416 Silver Hill Rd. *Tl:* 146.745. *Adm:* $5. Tables: $5. David Taylor, KB2KBY, 228 W Jackson St, Palmyra, NY 14522; 315-597-4293; **kb2kby@rochester.rr.com**; **www.drumlinsarc.org**.

New York (Port Crane) — Apr 17 D H R T V
8 AM-1 PM. *Spr:* Binghamton ARA. Port Crane Fire Company, 844 Rte 369. *Tl:* 146.865 (146.2 Hz). *Adm:* $6. Tables: $10. Brian Adee, K2DLB, 1060 Bunn Hill Rd, Vestal, NY 13850; 607-752-3230; **k2dlb@arrl.net**; **w2ow.org**.

NORTH CAROLINA STATE CONVENTION

April 23, Raleigh
D F H Q R S V
The North Carolina State Convention (39th Annual RARSFest), sponsored by the Raleigh ARS, will be held at the North Carolina State Fairgrounds, Jim Graham Bldg, 1025 Blue Ridge Rd. Doors are open 8 AM-3:30 PM. Features include huge electronics flea market; computers; new equipment dealers; major Amateur Radio exhibitors; vendors; forums and meetings; special guest from ARRL HQ Harold Kramer, WJ1B, Chief Operating Officer; VE sessions (9 AM, walk-ins accepted, $14 fee; Joe White, WA4GIR, 919-387-9152, **wa4gir@arrl.net**); equipment test station; QSL card checking; contests; Special Event Station N4C that you can operate; hands-on construction projects; Youth Lounge; RV parking with full hookup for nominal fee; handicapped accessible. Talk in on 146.64. Admission is $7 in advance (by Apr 16), $8 at the door or after Apr 16; age 16 and under admitted free when accompanied by paying adult. Tables with 2 chairs are $18 each in advance (by Apr 16), $20 each after Apr 16 (power is $25 per outlet, bring your own extension cords). Contact Chuck Littlewood, K4HF, 2005 Quail Ridge Rd, Raleigh, NC 27609; 919-872-6555; **k4hf@arrl.net**; **www.rars.org/hamfest**.

North Dakota (West Fargo) — Apr 16
F H Q R S V
8 AM-2 PM. *Spr:* Red River Radio Amateurs. Red River Valley Fairgrounds, 1805 W Main Ave. *Tl:* 145.35, 146.76, 147.255, 444.875 (123 Hz). *Adm:* $7. Tables: $15. Tim Gooding, KDØYX, 421 12th Ave E, W Fargo, ND 58078; 701-282-6630; **kd0yx@cableone.net**; **www.rrra.org**.

Ohio (Athens) — May 1 D F H R T V
8 AM-1 PM. *Spr:* Athens County ARA. Athens Community Center, 701 E State St. 32nd Annual Hamfest. *Tl:* 145.15. *Adm:* $5. Tables $10. W. Eric McFadden, WD8RIF, 12600 Adeline Cir, Athens, OH 45701; 740-593-7176; **wd8rif@arrl.net**; **ac-ara.org**.

Ohio (Jackson) — Apr 23 D H R T V
9 AM-1 PM. *Spr:* Jackson County ARC. Jackson County YMCA, 594 E Main St. *Tl:* 146.79. *Adm:* $5. Tables: $10. Don Barnhart, KD8HHG, 31 Anna Marie Dr, Londonderry, OH 45647; 740-701-3356; **kd8hhg@yahoo.com**; **jacksoncountyarc.org/index.html**.

Pennsylvania (Boston) — Apr 3 D F H R V
8 AM-3 PM. *Spr:* Two Rivers ARC. The Boston Spectrum, 6100 Smithfield St. *Tl:* 146.73. *Adm:* $5. Tables: $10. Bill Hetrick, N3LQC, 696 King St, McKeesport, PA 15132; 412-751-1937; **n3lqc@comcast.net**; **www.trarc.net**.

South Carolina (Moncks Corner) — Apr 23 T
9 AM-3 PM. *Spr:* Trident ARC. Moncks Corner Fraternal Order of Police, Lodge 19, 1310 S Live Oak Dr. 5th Annual TARC Tailgate Party. *Tl:* 147.15. *Adm:* $2. Tables: $5. Dennis Zabawa, KG4RUL, 307 Pine Cone Ct, Ladson, SC 29456; 843-572-4053; **kg4rul@comcast.net**; **www.tridenthams.org/Tailgate_Party.htm**.

SOUTH CAROLINA STATE CONVENTION

May 7, Spartanburg
D F H S T V
The South Carolina State Convention (49th Annual "Upstate Hamfest"), sponsored by the Blue Ridge ARS, will be held at the Piedmont Interstate Fairgrounds, 575 Fairgrounds Rd. Doors are open for setup Friday 1-9 PM, Saturday 6-8 AM; public 8 AM-3 PM. Features include flea market, tailgating (10-ft space with admission), vendors ($31 for 1st table, $11 for each additional), MARS presentation (9 AM), VE sessions (off-site at Spartanburg American Red Cross building; register 10 AM, testing 10:30 AM), overnight camping available ($20), handicapped accessible, refreshments. Talk-in on 146.61, 146.82. Admission is $6 in advance, $7 at the door (under 12 free). Tables are $11 (electricity $10 per drop for inside tables only). Contact Wyatt Miler, KJ4CTD, Box 6751, Greenville, SC 29606; 864-373-4880; **president@brars.org**; **upstatehamfest.com**.

Tennessee (Clarksville) — May 7 F H T
8 AM-3 PM. *Spr:* Clarksville Amateur Transmitting Society. Hilldale Baptist Church Picnic Pavilion, 250 Old Farmers Rd. *Tl:* 147.39 (123 Hz). *Adm:* Free. Tables: Free. John Freed, KX6F, 216 Maplewood Dr, Clarksville, TN 37042; 931-216-2503; **jdfreed@bellsouth.net**; **www.kf4l.org**.

COMMUNICATIONS ACADEMY

April 16-17, Seattle, WA
D H S
The Communications Academy (13th Annual Event – Bringing Professionalism to Amateur Emergency Communications), co-sponsored by the WWA Medical Services Team and the Seattle ACS, will be held at the South Seattle Community College (Olympic Bldg and Jerry Brockey Student Center, south end of campus), 6000 16th Ave SW. Doors are open both days from 8:30 AM-5 PM. Features include two days of continuing education training in emergency management; basic radio communications; technical and hands-on communications; communications van display; vendors; networking; Portable Radio Kit Contest; Special Event Station W7A; special guest from ARRL Hq Allen Pitts, W1AGP, Media and Public Relations Manager. Registration for two days is $48 (by Mar 28), $60 (Mar 28-Apr 15), $65 at the door. Registration for one day is $32 (by Mar 28), $40 (Mar 28-Apr 15), $45 at the door. Group registration of 5 or more receive a 10% discount (all registration fees include lunch). Contact Marina Zuetell, N7LSL, Box 15624, Seattle, WA 98115; 206-954-4099; **n7lsl@arrl.net**; **www.commacademy.org**.

Washington (Selah) — Apr 9 D F H R S V
9 AM-4 PM. *Spr:* Yakima ARC. Selah Civic Center, 216 S 1st St. Indoor bunny hunt. *Tl:* 146.66 (123 Hz). *Adm:* $6. Tables: $20 (6-ft). Lindsay Kooser, N7RHW, 141 Stark Rd, #7, Yakima, WA 98908; 509-965-6612; **n7rhw@arrl.net**; **www.w7aq.org**.

West Virginia (Ripley) — May 1 D F H R V
8 AM-2 PM. *Spr:* Jackson County ARC. Ripley Middle School, School St and Klondike Rd. *Tl:* 146.67. *Adm:* $5. Tables: $5. Roy Moore, KB8ZSG, 25 Daniels Run Rd, Spencer, WV 25276; 304-927-4412; **morning_glory114@hotmail.com**.

Wisconsin (Cedarburg) — May 7 D F H R S
Set up 6 AM; public 8 AM. *Spr:* Ozaukee RC. Circle B Recreation Center, 6261 State Hwy 60. 33rd Annual Swapfest. *Tl:* 146.97 (127.3 Hz). *Adm:* advance $4, door $5. Tables: $10 (buy 4, get 1 free). Tom Nawrot, AA9XK, 10335 N Grasslyn Rd, Mequon, WI 53092; 262-242-1029; **tnawrot@wi.rr.com**; **www.ozaukeeradioclub.org**.

Wisconsin (Stoughton) — Apr 16
D F H R V
8 AM-1 PM. *Spr:* Madison Area Repeater Assn. Mandt Community Center, 400 Mandt Parkway. Madison Swapfest and Computer Fair. *Tl:* 147.15 (123 Hz), D-Star 145.305. *Adm:* $5. Tables: $15 (before Apr 1), $18 (after Apr 1). Paul Toussaint, N9VWH, 3835 County Rd A, Stoughton, WI 53589; 608-205-1994; fax 608-205-1996; **w9hsy@execpc.com**; **www.qsl.net/mara/**.

Wisconsin (Superior) — May 7 D H R V
9 AM-2 PM. *Spr:* Arrowhead RAC. Head of the Lakes Fairgrounds, 4700 S Tower Ave (Hwy 35). *Tl:* 146.94 (103.5 Hz). *Adm:* $7. Tables: $10. Robert Schulz, KCØNFB, 115 Eden Ln, Duluth, MN 55805; 218-724-6957; **arac_hamfest@charter.net**; **www.thearac.org**.

To All Event Sponsors

Before making a final decision on a date for your event, you are encouraged to check the Hamfest and Convention Database (**www.arrl.org/hamfests-and-conventions-calendar**) for events that may already be scheduled in your area on that date. You are also encouraged to register your event with HQ as far in advance as your planning permits. See **www.arrl.org/hamfest-convention-application** for an online registration form. Dates may be recorded up to two years in advance.

Events that are sanctioned by the ARRL receive special benefits, including an announcement in these listings and online. Sanctioned conventions are also listed in the *ARRL Letter*. In addition, events receive donated ARRL prize certificates and handouts.

For hamfests: Once the form has been submitted, your ARRL director will decide whether to approve the date and provide ARRL sanction. *For conventions:* Approval must come from your director and the ARRL executive committee.

The deadline for receipt of items for this column is the **1st of the second month preceding publication date**. For example, your information must arrive at HQ by **April 1** to be listed in the **June** issue. Information in this column is accurate as of our deadline; contact the sponsor or check the sponsor's Web site for possible late changes, for driving directions and for other event details. Please note that postal regulations prohibit mention in *QST* of games of chance such as raffles or bingo.

Promoting your event is guaranteed to increase attendance. As an approved event sponsor, you are entitled to special discounted rates on *QST* display advertising and ARRL Web banner advertising. Call the ARRL Advertising Desk at 860-594-0207, or e-mail **ads@arrl.org**.

75, 50 AND 25 YEARS AGO

April 1936

■ The cover photo shows the chassis layout of a simplified high-performance superhet.

■ The editorial announces the recent passing of League founders Hiram Percy Maxim and Charles H. Stewart, and presents a look at their lives and achievements.

■ James Lamb, W1AL, reports on "More Developments in the Noise-Silencing I.F. Circuit."

■ George Grammer, W1DF, tells us about "Building a Simplified High-Performance Superhet"(the cover story).

■ H. J. Breuer, W6JN, gives us details on his antenna, "A 28-Mc. Rotary Beam."

■ Herbert Hollister tells us how to use variable-gap mounting of crystals to vary their frequency, in "Tuning the Crystal."

■ "Cathode-Ray Monitoring of Received Signals," by Edwin Ewing, W9HYO, describes how to connect an oscilloscope to a superhet receiver to take a look at incoming 'phone signals.

■ Byron Goodman, W1JPE, describes "Open-Type Transmitter Construction for Small Floor Space."

■ Clinton B. DeSoto, W1CBD, provides construction details on "A Laboratory-Type Beat-Frequency Oscillator and R.F. Signal Generator."

■ J. C. Flippin, W4VT, writes a romantic ode "To a Lady with Red Hair." He begins by noting that not *all* hams are men, and goes on to spin a wonderful tale of Miss Ann Yardley and "Jug."

April 1961

■ The cover photo montage shows W6NLZ and KH6UK, and announces that the two were chosen for the 1960 Edison Award.

■ The editorial discusses the bad rap that ham radio receives when CB operators cause TVI.

■ Francis LeBaron, W1TQZ, tells us how to make "A Home-Built Parabolic-Type Reflector for 1296 Mc."

■ Lew McCoy, W1ICP, gives us "Surplus Tubes + An Old TV Set = 150-Watt Amplifier."

■ "A 75-Meter S.S.B. Transceiver," built by Houston Taylor, K5BUQ, is a compact and nice-looking filter rig for mobile, portable, or home use.

■ Looking ahead to June, Ernest Adolph, K1DRX, tells us how to build an easily transportable "Three-Band Quad for Field Day."

■ Ed Tilton, W1HDQ, performs "An Evaluation of the Nuvistor," comparing the 6CW4 with conventional tubes at frequencies from 50 to 450 Mc.

■ Robert Thomas, W3QZO, describes his "All-Transistor Walkie-Talkie for 28 Mc."

■ William Lattin, W4JRW, describes his "Multiband Antennas Using Loading Coils" for 3.5 and 7.0 Mc.

■ "1960 Edison Award to W6NLZ and KH6UK" honors those pioneering hams for their work in making contact between California and Hawaii on 144, 220, and 432 Mc. The principal speaker at the award ceremony was FCC Chairman Frederick W. Ford. Ford's remarks were such a fine tribute to both the two honorees and Amateur Radio in general that the article reproduces them in full.

April 1986

■ The cover photo montage shows hams who are involved in The Great Armadillo Run of 1986, putting rare Oklahoma counties on the air for the hams trying for contact with all 3076 US counties.

■ The editorial reports on the rapid progress made in the field of packet radio.

■ "SuperSCAF and Son — A Pair of Switched-Capacitor Audio Filters," by Rich Arndt, WB4TLM, and Joe Fikes, KB4KVE, tells about two audio high-performance filters that you can easily build.

■ Doug DeMaw, W1FB, presents "A Tester for Coil Inductance," Part 6 of the series "Under Construction."

■ Brian Wermager. KØEOU, describes "A Truly Broadband Antenna for 80/75 Meters."

■ "The KI6O 160-Meter Linear-Loaded Sloper," by Deane Yungling, KI6O, is a Top Band antenna for the ham who has limited space.

■ In "Tune Up Your Tribander," Paul Pagel, N1FB, tells us how to do some spring cleaning to improve your beam's performance.

■ David Morris, NS5D, gives us food for deep thought with his fine, forward-looking article, "Gravity Gradient Modulation: The Newest Frontier in Amateur Radio." As Jack Benny so famously said, "I'm thinking! I'm thinking!"

Al Brogdon, W1AB ♦ Contributing Editor

Field Organization Reports

JANUARY 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**.

490
W7TVA
440
W5KAV
373
KØIBS
360
KT2S
358
K8OLY
355
KA2ZNZ
346
KI4KWR
320
WB9YBI
298
W4CAC
287
K2DYB
284
KB2ETO
283
AD4BL
280
N1UMJ
270
K2HJ
K8RDN
WB8RCR
245
WB9FHP
243
W2MTA
235
N4HUB
230
WD9FLJ
210
AK2Z
208
K2HAT
200
K2ABX
197
KK5NU
KT4SR
195
KØLQB
WB9JSR
190
WA2BSS
185
N9VC
WD8USA

180
KB2RTZ
176
KC2SFU
160
KGØGG
172
NC4VA
170
N1QLN
159
KA8ZGY
155
K7OAH
150
KB5SDU
145
NX9K
KE5HYW
N7CM
140
K7BFL
KK3F
WM2C
KB2BAA
135
K9LGU
W3YVQ
WE2G
130
WB2FTX
N2GJ
K4GK
K6JT
K4IWW
N2JBA
126
KB5KKT
WS6P
W3CB
KK7DEB
125
NN7H
N3RB
W4DNA
KF7GC
K7EAJ
KB8RCR
K2TV
121
WD8BCS
120
AG9G
N2GS
W1GMF
KW1U
N1LKJ
N8IO
WB8HHZ
KA4FZI

W5DY
WB8WKQ
NX8A
KØVTT
119
K4BEH
117
N2VC
115
N1IQI
KD1LE
114
K1EIC
110
W7QM
KCØM
K1HEJ
KB1NMO
W7GB
KA3OCS
K4BG
K1YCQ
WI2G
K3RC
W8UL
WD8DJG
KE4CB
KC5OZT
W2EAG
W7JSW
WB6OTS
K6HTN
N7XG
N7YSS
K7BDU
W7QM
WA5LOU
N9MN
K1REV
N5NVP
103
KB2CCD
104
N2DW
102
W4LHQ
100
W6WW
K4SCL
NM1K
N1JX
N3SW
W3TWV
WØCLS
NIØI
NØMEA
N8OD
WD8Q
WG8Z
WA3EZN
WB6UZX
K2GW

WA2NDA
AA3SB
W4TTO
N5OUJ
W7FQQ
W9LW
NR2F
K8VFZ
K8AE
99
WØSJS
W8CPG
97
W4AVD
K5MC
95
W5CU
N9DN
W9WXN
K4JGA
N2YJZ
94
W7ELI
93
W5GKH
KB5PGY
92
W2CC
91
AL7N
KS3Z
90
K4MSG
N9VT
W4WNE
WB4BIK
N8CJS
KC8WH
WB8SIQ
N8DD
KB3LNM
K3IN
N3ZOC
KA5AZK
KE5YTA
N7KB
KI4YV
WK4P
N9WLW
W9MBT
KI4AAN
N4ELI
W3GQJ
KA1G
K1JPG
NU8K
KZ8Q
KT4YA
KD8CYK
WA2CUW

88
KF5CRX
87
AD8BC
86
KB9KEG
KC4PZA
W8ERV
83
K6RAU
82
NA9L
80
KB1RGQ
W4NA
KA3NZR
WA4UJC
WB8VNV
KF5IOU
KJ4HGH
K8KV
KD8NWE
N5ASU
KD8LZB
W8QZ
KJ7NO
AC5CW
79
N2VQA
78
W8IM
NA7G
KC2UMX
77
W5XX
75
KA8NSG
KK7TN
73
KD8AAD
71
K7MQF
KK1X
KI4DHS
70
KØDEU
NØDLK
NØDUW
NØDUX
NUØF
WØFUI
KBØJKO
NØMHJ
N3NTV
KØPTK
KØOR
KØRXC
NØUKO
WAØVKC
KCØZDA
KD7ZUP

The following stations qualified for PSHR in previous months, but were not properly recognized in this column: (Dec) N4HUB 371, W4AVD 125, W4LHQ 176, W5KAV, W7QM, KO4OL 110, W7FQQ 100, W4GLE 81. (Nov) N4HUB 321, W4AVD 125, W4LHQ 176, KO4OL 100, W4GLE 81, WD8JAW 79, KC4PZA 75. (Oct) N4HUB 411, W4LHQ 286, W4AVD 267, KO4OL 100, KC4BQK 71. (Sep) KJ4HPG 111, KO4OL 100, WD8JAW 87, (Aug) KO4OL 100, WD8JAW 78.

Section Traffic Manager Reports

The following Section Traffic Managers reported: AK, AL, AR, AZ, EB, EMA, ENY, EPA, EWA, GA, CT, IA, IL, IN, LA, LAX, ME, MDC, MI, MS, NC, NFL, NLI, NNJ, NNY, NTX, OH, OK, OR, ORG, SD, SFL, SJV, SNJ, STX, TN, UT, VA, WI, WCF, WNY, WPA, WV, WY.

Section Emergency Coordinator Reports

The following ARRL Section Emergency Coordinators reported: AR, AZ, EWA, GA, IA, ID, IN, KS, LA, MDC, MI, MN, MO, MT, NC, NLI, OH, SD, SFL, STX, SV, TN, WTX, WV.

Brass Pounders League

The BPL is open to all amateurs in the US, Canada and US possessions who report to their SMs a total of 500 or more points or a sum of 100 or more origination and delivery points for any calendar month.

KK3F 3714, W5KAV 2672, W1GMF 1821, KA9EKG 1487, N1IQI 1336, W8UL 1328, WB5NKD 1319, WB5NKC 1188, KW1U 929, WB9JSR 971, WB9FHP 880, WB2FTX 844, W4WNE 872, N8IXF 710, WB6OTS 700, NX9K 696, KZ8Q 691, K1JPG 686, W6WW 677, N9VC 666, WB8WKQ 593, N1LKJ 571, K4JGA 567, WD8Q 543, N1UMJ 504.

Stations earning BPL by Originations plus Deliveries: K8LJG 275, NM1K 108.

The following station qualified for BPL in previous months, but were not properly recognized in this column: (Dec) K7BDU 880, W7FQQ 523.

SILENT KEYS

It is with deep regret that we record the passing of these amateurs:

♦W1EOR **Henley**, John L., Edgartown, MA
W1EYP **Demergy**, Paul C., Lynn, MA
KA1JNP **Torrisi**, William C. Jr, West Kingston, RI
N1KXP **Theroux**, William C., Chicopee, MA
N2ACX **Jackson**, Gary L., Delran, NJ
N2BGE **Reichert**, Edwin H. Jr, Mount Laurel, NJ
W2PFD **Mallette**, James, East Syracuse, NY
KB2SLE **Bull**, Earl A., Latham, NY
W2TQK **Pfiester**, Walter E. Jr, Tully, NY
N2UJJ **Maier**, William E., Red Bank, NJ
KB3CVQ **Keal**, John K., Southampton, PA
K3HMB **Shaiebly**, P Eugene, Columbia, PA
WB3IBU **Lindberg**, William A., Irwin, PA
W3IUI **Graettinger**, Willard F., Berlin, MD
K3IWE **Dewhirst**, Kenneth R., Silver Spring, MD
K3KSB **Berringer**, Milton G., Erie, PA
N3WGQ **Fronk**, Glenn W., Williamsport, PA
KG4CBA **Miller**, Cindy L., Orlando, FL
K4DHH **Hockersmith**, Donald H., Valley, AL
KB4GL **Threlkeld**, Frank, Anderson, SC
WB4HUH **Frank**, Kathryn C., Lynden, WA
WA4JR **Roberts**, John R., Summit Point, WV
♦K4KE **Stocky**, David G., Yankeetown, FL
KA4LBE **Smith**, Benson B., Seymour, TN
N4NAS **Taylor**, Joe A., Glasgow, KY
W4PAS **Whynall**, Richard G., Newport, NH
KB4PMJ **Casale**, Anne H., Lakeland, FL
KG4PSR **Hutchins**, Monte T., Bradyville, TN
AJ4R **Wiggins**, William C., Palm Harbor, FL
K4RAY **Fernandez**, Ramon E., Coral Springs, FL
K4TBZ **Douglas**, Constance "Connie," Pinellas Park, FL
WA4TPN **Humpherys**, Ronald D., Memphis, TN
N4WIK **Halloway**, Frank A., Charlotte, NC
♦W4YA **Roux**, Jim, Longwood, FL
W5CRH **Crow**, Floyd M., Tecumseh, OK
N5CRZ **Quarterman**, Palmer L., Ridgeland, MS
K5FSB **Diamond**, Gary Lyle., Albuquerque, NM
♦WB5GGD **Whitten**, Ronald W., Harker Heights, TX
W5JRP **Paule**, Jack R., Espanola, NM
WA5LQZ **Levine**, Alan, Westlake, LA
N5OFT **Runnells**, Warren A., Rio Rancho, NM
W5RNF **Hacker**, Francis "Frank," Plano, TX
W5TJ **Shields**, Frank B., Amory, MS
W5TSE **Munsch**, Ella N., San Antonio, TX
WB5UVS **Smith**, Fred, El Dorado, AR
K5VV **Hopper**, Walter V., Hernando, MS
KT5W **Thomas**, Charles H., Charenton, LA
W6BFQ **Enyeart**, Basil D., Lemon Grove, CA
♦WD6BOX **Babigian**, Berge H. Jr, Elk Grove, CA
W6CVQ **Craven**, Edgar S., Sunnyvale, CA
♦K6CWM **Smith**, Carter B., Tiburon, CA
WA6FZQ **Sink**, Robert E., San Diego, CA
WA6HWQ **Briggs**, Harvey G., Bosque, NM
KB6JKP **Challberg**, Roger W., Campo, CA
♦W6NT **Davis**, Alva R. Jr, Corona Del Mar, CA
AC6TB **Johnston**, Terry W., Pahrump, NV
K6VP **Moore**, Garland V., Newbury Park, CA
W6VU **West**, Ernest C., Redondo Beach, CA
W6ZHK **Ruk**, Joseph J., Millbrae, CA
KD7ATR **Grills**, Charles H., Apache Junction, AZ
♦W7FCH **Strickland**, M. H. Jr, Bellingham, WA
♦KD7G **Sprague**, Gene E., Everett, WA
WA7LHZ **Bird**, Stephen R. II, Wickenburg, AZ
W7MAA **Parson**, George R., Las Vegas, NV
W7QHV **Helms**, George W., Scottsdale, AZ
KE7XY **Maloney**, F. C., Glendale, AZ
W7YO **Leininger**, Gary M., Waite Park, MN
W7YQ **Lindgren**, Timothy "Tim," Reno, NV
W8EVD **Brown**, George L., Columbus, OH
W8FFH **Robertson**, Otto E., Sullivan, OH
KD8FRN **Bruce**, Garry E., The Plains, OH
WA8JGQ **Hitchcock**, Keith G., Midland, MI
W8KNG **Samples**, William J. Jr, Saint Albans, WV
W8NFQ **Sonnanstine**, Edgar H. Jr, Miamisburg, OH
W8PHG **Frost**, John "Jack," Sun City West, AZ
W8PPG **Schmalzel**, George, Lincoln Park, MI
KC8TMZ **Drake**, Sylvia J., Elyria, OH
WA8VNI **Feistamel**, John S., Grand Rapids, MI
K9WDW **Vander Wall,** Clifford C., Wausau, WI
KC9DJL **Zurawik**, Patrick J., Hebron, IN
W9BOD **Ruther**, Westly E., Bertram, TX
WA9DVN **Taylor**, Kent A., Brooksville, FL
WB9HZC **Jakubovie**, Daniel M., Whiting, IN
WD9BDW **Geoffrion,** Phillibert D., Michigan City, IN
AA9IO **Rutyna**, Jacek F., Lake Zurich, IL
K9KGM **Lust**, Leslie V., McFarland, WI
W9KJZ **Howard**, Clayton "Clay," Orange City, FL
W9PSU **Reese**, Staber W. Jr, Minocqua, WI
WB9RPE **Molstad**, Danny R., Farmersville, TX
KB9SSP **Percival**, Mark A., Watson, IL
♦N9TN **Borgstrom**, William A., Deer Park, IL
W9TQD **Parsons**, Leland R., La Crosse, WI
WA9TSQ **Gawronski**, Bernard S., Chesterton, IN
W9UB **Haut**, Charles H., New Berlin, WI
KZ9V **Taylor**, Charles "Chuck" Jr, Phillips, WI
W9YRL **Burns**, Paul M., Fort Wayne, IN
♦NØEG **Magnuson**, John M., Boonville, MO
WDØFL **Williams**, Harold "Pete," Kansas City, MO
WØGLH **Ritzman**, Dean D., Perry, IA
WØJHC **Kohler**, Armin P., Mason City, IA
WØJWH **Harris**, Jess W., Ely, IA
KØKIZ **Needham**, George F., Blue Springs, MO
NØKZZ **Lindgren**, Reed D., Grand Rapids, MN
NØLXS **Levad**, Charles, Mason City, IA
NØNDA **Marx**, Robert "Bob," Hill City, SD
WØPWA **Airy**, Philip W., Shellsburg, IA
WØULV **Kelling**, Kenneth M., Ankeny, IA

♦ Life Member, ARRL

Note: Silent Key reports must confirm the death by one of the following means: a letter or note from a family member, a copy of a newspaper obituary notice, a copy of the death certificate, or a letter from the family lawyer or the executor. Please be sure to include the amateur's name, address and call sign. Allow several months for the listing to appear in this column.

Many hams remember a Silent Key with a memorial contribution to the ARRL Foundation or to ARRL. If you wish to make a contribution in a friend or relative's memory, you can designate it for an existing youth scholarship, the Jesse A. Bieberman Meritorious Membership Fund, the Victor C. Clark Youth Incentive Program Fund, or the General Fund. Contributions to the Foundation are tax-deductible to the extent permitted under current tax law. Our address is: The ARRL Foundation Inc, 225 Main St, Newington, CT 06111. QST

Gail Iannone ♦ Silent Keys Administrator ♦ sk@arrl.org

W1AW Schedule

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

♦ **Morse code transmissions:** Frequencies are 1.8025, 3.5815, 7.0475, 14.0475, 18.0975, 21.0675, 28.0675 and 147.555 MHz.

Slow Code = practice sent at 5, 7½, 10, 13 and 15 WPM.

Fast Code = practice sent at 35, 30, 25, 20, 15, 13 and 10 WPM.

Code bulletins are sent at 18 WPM.

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

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

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

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

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

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

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

During 2011, Headquarters and W1AW are closed on New Year's Day (observed December 31, 2010), Presidents' Day (February 21), Good Friday (April 22), Memorial Day (May 30), Independence Day (July 4), Labor Day (September 5), Thanksgiving and the following day (November 24 and 25) and Christmas (observed December 26). For more information, visit us at **www.arrl.org/w1aw**.

PACIFIC	MTN	CENT	EAST	MON	TUE	WED	THU	FRI
6 AM	7 AM	8 AM	9 AM		FAST CODE	SLOW CODE	FAST CODE	SLOW CODE
7 AM-1 PM	8 AM-2 PM	9 AM-3 PM	10 AM-4 PM	VISITING OPERATOR TIME (12 PM-1 PM CLOSED FOR LUNCH)				
1 PM	2 PM	3 PM	4 PM	FAST CODE	SLOW CODE	FAST CODE	SLOW CODE	FAST CODE
2 PM	3 PM	4 PM	5 PM	CODE BULLETIN				
3 PM	4 PM	5 PM	6 PM	DIGITAL BULLETIN				
4 PM	5 PM	6 PM	7 PM	SLOW CODE	FAST CODE	SLOW CODE	FAST CODE	SLOW CODE
5 PM	6 PM	7 PM	8 PM	CODE BULLETIN				
6 PM	7 PM	8 PM	9 PM	DIGITAL BULLETIN				
6:45 PM	7:45 PM	8:45 PM	9:45 PM	VOICE BULLETIN				
7 PM	8 PM	9 PM	10 PM	FAST CODE	SLOW CODE	FAST CODE	SLOW CODE	FAST CODE
8 PM	9 PM	10 PM	11 PM	CODE BULLETIN				

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

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

OAKLAND, CA
2210 Livingston St., 94606
(510) 534-5757
(877) 892-1745
Mark, WI7YN, Mgr.
I-880 at 23rd Ave. ramp
oakland@hamradio.com

SAN DIEGO, CA
5375 Kearny Villa Rd., 92123
(858) 560-4900
(877) 520-9623
Jose, XE2SJB, Mgr.
Hwy. 163 & Claremont Mesa
sandiego@hamradio.com

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

NEW CASTLE, DE
(Near Philadelphia)
1509 N. Dupont Hwy., 19720
(302) 322-7092
(800) 644-4476
Chuck, N1UC, Mgr.
RT.13 1/4 mi., So. I-295
newcastle@hamradio.com

PORTLAND, OR
11705 S.W. Pacific Hwy.
97223
(503) 598-0555
(800) 765-4267
Bill, K7WCE, Mgr.
Tigard-99W exit
from Hwy. 5 & 217
portland@hamradio.com

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

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

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

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

SALEM, NH
(Near Boston)
224 N. Broadway, 03079
(603) 898-3750
(800) 444-0047
Peter, KI1M, Mgr.
sales@hamradio.com
Exit 1, I-93;
28 mi. No. of Boston
salem@hamradio.com

April is Yaesu Month at HRO

HAM RADIO OUTLET®

Refreshments and live in-store demos at all 12 stores! Watch for schedule at www.hamradio.com

WORLDWIDE DISTRIBUTION

YAESU Mfr coupons scheduled to expire 3/31 Call for latest updates!

YAESU

#1 Yaesu Dealer Worldwide

Competitive pricing!

FREE FPR-1 w/purch.

FTM-350AR 2m/440 Dualband

- 50W 2m/440† - 1 watt 220Mhz
- TNC built-in, Bluetooth capable
- Band scope built-in
- 500 Memories

FREE YSK-857

FT-857D

Ultra compact HF, VHF, UHF

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

Call for Low Price!

FT-897D VHF/UHF/HF Transceiver

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

Call Now For Our Low Pricing!

FTDX5000MP 200w HF + 6M Transceiver

- Station Monitor SM-5000 Included
- 0.05ppm OCXO included
- 300 Hz Roofing filter included
- 600 Hz Roofing filter included
- 3 kHz Roofing filter included

$20. mfr coupon

FT-7900R 2M/440 Mobile

- 50w 2m, 45w on 440mHz
- Weather Alert
- 1000+ Mems
- WIRES Capability
- Wideband Receiver (Cell Blocked)

FREE YSK-7800

Call Now For Your Low Price!

$50. mfr coupon

FT-950 HF + 6M TCVR

- 100W HF/6M
- Auto Tuner built-in
- 3 roofing filters built-in
- DMU-2000 Compatible

NEW!

Call Now For Low Pricing!

$20. mfr coupon

VX-7R/VX-7R Black

50/2M/220/440 HT

- Wideband RX - 900 Memories
- 5W TX (300mw 220Mhz)
- Li-Ion Battery
- Fully Submersible to 3 ft.
- Built-in CTCSS/DCS
- Internet WIRES compatible

Now available in Black!

$100. mfr coupon

FT-2000/FT2000D HF + 6M tcvr

- 100 W w/ auto tuner • built-in Power supply
- DSP filters / Voice memory recorder
- 200W (FT-2000D)
- 3 Band Parametric Mic EQ • 3 IF roofing filters

Call For Low Pricing!

FREE YSK-8900

$10. mfr coupon

FT-8800R 2M/440 Mobile

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

Call Now For Low Pricing!

VX-6R

2M/220/440HT

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

$10. mfr coupon

NEW Low Price!

VX-8DR/VX-8GR

50/144/220/440 (VX-8DR)
2m/440 w/ Built-in GPS (VX-8GR)

- 5w (1w 222 Mhz VX-8DR only)
- Bluetooth optional (VX-8DR only)
- waterproof/submersible 3 ft 30 mins
- GPS/APRS operation optional
- Li-ion Hi-capacity battery
- wide band Rx

$30. mfr coupon VX-8GR only

NEW!

FT-450D HF + 6M TCVR

- 100W HF/6M • Auto Tuner built-in • DSP Built-in
- 500 Memories • DNR, IF Notch, IF Shift

Call Now For Special Pricing

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

Look for the HRO Home Page on the World Wide Web
http://www.hamradio.com

#1 in Customer Service

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

April is Yaesu Month at HRO

HAM RADIO OUTLET®

#1 Yaesu Dealer Worldwide

WORLDWIDE DISTRIBUTION

Refreshments and live in-store demos at all 12 stores! Watch for schedule at www.hamradio.com

Competitive pricing!

YAESU Mfr coupons scheduled to expire 3/31 Call for latest updates!

YAESU

FT-1900R 2m Mobile

- 55W no cooling fan required
- Loud receiver audio
- CTCSS/DCS Enc/Dec Built-in
- WIRES ready - alpha numeric mems

Call Now for our Low Price!

FT-2900R 2m Mobile

- 75W no cooling fan Reqíd
- Loud receiver audio
- CTCSS/DCS Enc/Dec Built-in
- WIRES ready - alpha numeric mems

Call Now for our Low Price!

FT-817ND HF/VHF/UHF Multimode

- 5W 160m-10m/6m/2m/70cm
- wideband receiver
- IF Shift/IF noise blanker
- Built-in CW keyer
- includes 1400mAh NiMH Battery

Call Now for your Low Price!

Quadra System HF + 6m Amplifier

- 1 KW Mosfet Power complete w PS
- Built-in automatic Antenna Tuner
- 110 VAC (at reduced output) or 220V
- automatic band changes w/ most Yaesu rigs

Call for Low Price!

FTDX-9000D Ultimate Elite HF/6m Tcvr

- 200W Output built-in PS
- Advanced 32-bit IF DSP
- 40 dBm 3rd order Intercept point
- Full Duplex for single radio SO2R
- Built-in roofing filters

400 Watt FTDX9000MP also available!

FT-60R 2M / 440 Handheld

- 5W 2m/440 Mhz
- 1000 alpha-numeric memories
- CTCSS/DCS Enc/Dec built-in
- Wide-Band Receiver

Call now for your Low Pricing!

FT-250R

Compact 2M Handheld

- 5W Output
- 700 mW loud audio
- 209 Memories
- 1400 mAh battery
- Enc/Dec Built-in

Call now for special Pricing!

FT-270R

2M Hi-performance Handheld

- 5W TX with Loud 800mW rcvr audio
- IPX7 water tested
- WiRES-II ready
- 200 Alpha-Numeric Mems
- Enc/Dec Built-in

Call for low Pricing!

VX-3R

Ultra compact Dual Band Handheld

- 2M /440 1.5W
- AM/FM broadcast band receiver
- 1000 Memories
- WiRES-II ready
- Wide band receiver
- CW learning/training feature

Call Now for your special price!

CALL TOLL FREE

Phone Hours: 9:30 AM – 5:30 PM
Store Hours: 10:00 AM – 5:30 PM Closed Sun.

Toll free, incl. Hawaii, Alaska, Canada; call routed to nearest store; all HRO 800-lines can assist you, if the first line you call is busy, you may call another.

West.....800-854-6046
Mountain.....800-444-9476
Southeast.....800-444-7927
Mid-Atlantic...800-444-4799
Northeast.....800-644-4476
New England..800-444-0047

HRO Owned and operated by ACTIVE HAMS

Look for the HRO Home Page on the World Wide Web
http://www.hamradio.com

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

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

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

OAKLAND, CA
2210 Livingston St., 94606
(510) 534-5757
(877) 892-1745
Mark, WI7YN, Mgr.
I-880 at 23rd Ave. ramp
oakland@hamradio.com

SAN DIEGO, CA
5375 Kearny Villa Rd., 92123
(858) 560-4900
(877) 520-9623
Jose, XE2SJB, Mgr.
Hwy. 163 & Claremont Mesa
sandiego@hamradio.com

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

NEW CASTLE, DE
(Near Philadelphia)
1509 N. Dupont Hwy., 19720
(302) 322-7092
(800) 644-4476
Chuck, N1UC, Mgr.
RT.13 1/4 mi., So. I-295
newcastle@hamradio.com

PORTLAND, OR
11705 S.W. Pacific Hwy. 97223
(503) 598-0555
(800) 765-4267
Bill, K7WCE, Mgr.
Tigard-99W exit from Hwy. 5 & 217
portland@hamradio.com

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

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

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

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

SALEM, NH
(Near Boston)
224 N. Broadway, 03079
(603) 898-3750
(800) 444-0047
Peter, KI1M, Mgr.
sales@hamradio.com
Exit 1, I-93;
28 mi. No. of Boston
salem@hamradio.com

12 STORE BUYING POWER

HAM RADIO OUTLET®

WORLDWIDE DISTRIBUTION

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

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

OAKLAND, CA
2210 Livingston St., 94606
(510) 534-5757
(877) 892-1745
Mark, WI7YN, Mgr.
I-880 at 23rd Ave. ramp
oakland@hamradio.com

SAN DIEGO, CA
5375 Kearny Villa Rd., 92123
(858) 560-4900
(877) 520-9623
Jose, XE2SJB, Mgr.
Hwy. 163 & Claremont Mesa
sandiego@hamradio.com

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

NEW CASTLE, DE
(Near Philadelphia)
1509 N. Dupont Hwy., 19720
(302) 322-7092
(800) 644-4476
Chuck, N1UC, Mgr.
RT.13 1/4 mi., So. I-295
newcastle@hamradio.com

PORTLAND, OR
11705 S.W. Pacific Hwy.
97223
(503) 598-0555
(800) 765-4267
Bill, K7WCE, Mgr.
Tigard-99W exit
from Hwy. 5 & 217
portland@hamradio.com

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

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

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

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

SALEM, NH
(Near Boston)
224 N. Broadway, 03079
(603) 898-3750
(800) 444-0047
Peter, KI1M, Mgr.
sales@hamradio.com
Exit 1, I-93;
28 mi. No. of Boston
salem@hamradio.com

Spring Specials From Kenwood

Kenwood instant coupons good thru 5/31/11

KENWOOD

World's LARGEST HAM RADIO INVENTORY in stock for quick delivery

TM-D710A 2M/440 Dualband

- 50w 2M & UHF
- Optional Voice synthesizer
- 1000 memories • Dual receive
- Advanced APRS Features
- Echolink ® Ready w/ 10 memories
- Built-in TNC • Sky Command II+
- GPS I/O Port
- Choice of Green/Amber LCD backlight

Call Now For Special Introductory Price!

TM-271A 2 Mtr Mobile

- 60 Watt, 200 Mems, CTCSS/DCS
- Mil-Std specs, Hi-Quality Audio

Call Now For Special Low Price!

TH-D72A NEW!

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

Call For Special Low Price!

TS-2000 HF/VHF/UHF TCVR

TS-2000 $225. Kenwood Coupon
TS-2000X $275. Kenwood Coupon

- 100W HF, 6M, 2M • 50W 70CM
- 10W 1.2 GHz w/opt UT-20 module
- Built-in TNC, DX packet cluster
- IF Stage DSP • Backlit Front Key Panel

Call Now For Special Price!

TS-480SAT/HX HF+6M Transceiver

- 480SAT 100w HF & 6M w/AT
- 480HX 200w HF & 100w 6M (no Tuner)
- DSP built in
- Remotable w/front panel/speaker

Call Now For Your Low Price!

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

Call Now For Your Low Price!

TS-590S HF+6M Transceiver

- 100W HF + 6M
- 500Hz & 2.7Khz roofing filter
- built-in Auto Tuner
- best Dynamic Range in class
- 32 bit DSP

NEW!

Call Now For Your Low Price!

TH-K2AT

2M Handheld

2m 5w • VOX • CTCSS/DCS/1750 Burst Built In • Weather Alert •

Call For Special Low Price!

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

Look for the HRO Home Page on the World Wide Web
http://www.hamradio.com

#1 in Customer Service

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

12 STORE BUYING POWER

HAM RADIO OUTLET

ALL sales staff are ACTIVE HAMS

WORLDWIDE DISTRIBUTION

TOKYO HY-POWER

FLASH!

Now with 12m and 10m built-in! Complies with new FCC rules!

HL-1.5KFX

- 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

CALL FOR ADDITIONAL THP PRODUCTS!

ICOM

IC-7000 All Mode Transceiver

- 160-10M/6m/2m/70CM
- 2x DSP
- Digital IF Filters
- Digital Voice recorder
- 2.5 inch TFT Display

RMK-7000 Separation Kit included with your purchase

IC-7410 HF + 6M Transceiver

- 100W 13.8DVC
- Faster DSP
- +30 dBm 3rd order Intercept point
- Optional roofing filters
- USB for control & Audio
- Larger Multi-Function LCD

NEW!

CALL Now for delivery !!

REMOTE RIG

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:
TS-480HX/SAT; TS-2000 (RC-2000 req'd); IC-703/Plus IC-706 series; DX-SR8T; IC-2820H; IC-R2500

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.
• Mounts easily on wall. Size: 34 1/2" x 22 1/2"

USI 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

Call For Latest Pricing!

TX-455

55' Freestanding Crank-Up
Handles 18 sq. ft. @ 50 mph
No guying required
Extra-strength const.
Can add raising and motor drive acces.

Towers Rated to EIA Specifications
Other Models at Great Prices!

Call For Latest Pricing!

Buy From HRO, World's Largest U.S. Tower Dealer

All US Towers shipped by truck; freight charges additional

CALL TOLL FREE

Phone Hours: 9:30 AM – 5:30 PM
Store Hours: 10:00 AM – 5:30 PM Closed Sun.

Toll free, incl. Hawaii, Alaska, Canada; call routed to nearest store; all HRO 800-lines can assist you, if the first line you call is busy, you may call another.

West.....800-854-6046
Mountain.....800-444-9476
Southeast.....800-444-7927
Mid-Atlantic...800-444-4799
Northeast.....800-644-4476
New England..800-444-0047

HRO Owned and operated by ACTIVE HAMS

Look for the HRO Home Page on the World Wide Web
http://www.hamradio.com

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

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

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

OAKLAND, CA
2210 Livingston St., 94606
(510) 534-5757
(877) 892-1745
Mark, WI7YN, Mgr.
I-880 at 23rd Ave. ramp
oakland@hamradio.com

SAN DIEGO, CA
5375 Kearny Villa Rd., 92123
(858) 560-4900
(877) 520-9623
Jose, XE2SJB, Mgr.
Hwy. 163 & Claremont Mesa
sandiego@hamradio.com

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

NEW CASTLE, DE
(Near Philadelphia)
1509 N. Dupont Hwy., 19720
(302) 322-7092
(800) 644-4476
Chuck, N1UC, Mgr.
RT.13 1/4 mi., So. I-295
newcastle@hamradio.com

PORTLAND, OR
11705 S.W. Pacific Hwy. 97223
(503) 598-0555
(800) 765-4267
Bill, K7WCE, Mgr.
Tigard-99W exit from Hwy. 5 & 217
portland@hamradio.com

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

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

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

NEW EXPANDED STORE!

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

SALEM, NH
(Near Boston)
224 N. Broadway, 03079
(603) 898-3750
(800) 444-0047
Peter, KI1M, Mgr.
sales@hamradio.com
Exit 1, I-93;
28 mi. No. of Boston
salem@hamradio.com

DX ENGINEERING

FREE SHIPPING on

- 95% Bare Copper Braid Shield
- 78% Velocity Factor
- Foam Polyethylene Dielectric .157" O.D.
- Black Vinyl Jacket .240" O.D.
- Center Conductor 16 AWG
  19 Strands of 29 AWG Bare Copper

- 95% Bare Copper Braid Shield
- 78% Velocity Factor
- Foam Polyethylene Dielectric .285" O.D.
- Black Vinyl Jacket .405" O.D.
- Center Conductor 13 AWG
  7 Strands of 21 AWG Bare Copper

SPECIAL BUY! Vertical Antennas Affordable Pricing


AV-640


80VA-3

DXE-80VA-3
Full Size Performance 80M, Only 43 ft. Tall
Now Only **$349.95**

HYG-AV-640
8 Bands 40-6M, 25 ft.
No Radials
Now Only **$379.95**

#1 Rated 43 ft. Multi-Band Verticals

Why Pay More For Less?
Priced Right!
Highest Quality!

New!

From **$194.95**

Stainless steel tilt and mount, strongest Extren® base insulator—standard equipment

DX Engineering Original

Multi-Band

DXE-8040VA-1	THUNDERBOLT™ Design 80/40 Meter Dual Band 55 ft.	$694.95
DXE-MBVA-1UP	43 ft. THUNDERBOLT™ Design 160-10 Meter w/UNUN	$299.95
DXE-MBVE-1	43 ft. 160 to 10 Meter Multi-Band	$194.95
DXE-MBVE-1-4P	43 ft. Multi-Band Vertical/Radial Plate Package	*SPECIAL* $269.95
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

Monoband

DXE-7580VA-1	THUNDERBOLT™ Design 75/80 Meter Monoband 55 ft.	$549.95
DXE-80VA-3	THUNDERBOLT™ Design 75/80 Meter Vertical	$349.95
DXE-60VA-1P	THUNDERBOLT™ Design 60 Meter 43 ft. Vertical	$259.50
DXE-30VE-1	Fast Taper High Performance 30 Meter	$229.50
DXE-40VA-1	40 or 30 Meter High Performance 1/4 Wave	$249.50
DXE-40VA-1TB	Foldover 24 ft. High Performance Freestanding, Low Profile	$179.95
DXE-40VE-1	Fast Taper, High Performance 40 Meter	$179.95
DXE-40VE-1TB	Foldover 40 Meter 1/4 Wave Freestanding, Heavy Duty	*SPECIAL* $179.95
DXE-60VE-1P	Fast Taper High Performance 60 Meter	$229.95

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

We Have First Rate Products, Reliable Performance, & Great Prices—

Better than the Other Guys! New Un-Slit Lengths, Smoothly Telescoping. Pre-Slit Just Add Clamps & Slide It Together for a Complete Antenna Element!

6063-T832 Aluminum Tubing

The Best Aluminum Tubing Available
- Better than the other guys, Same Price!
- Order from us and the other guys—
  We guarantee that you'll send theirs back!
- Smoothly telescoping pre-slit or un-slit lengths
- Custom made just for DX Engineering

3 ft. lengths .058 wall - 3/8" to 2 1/8" OD
6 ft. lengths .058 wall - 3/8" to 2 1/8" OD
Perfect for Most Elements
6061-T8 .120 wall - 1.5" to 3" OD Unslit
For Booms and HD Element Designs

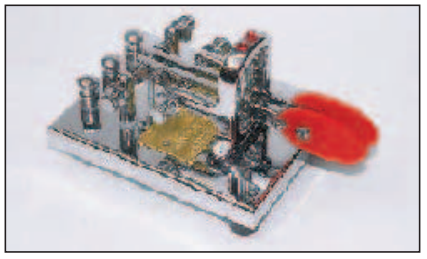
See DXEngineering.com for specs and additional tubing. DX Engineering Has All-Stainless Steel Element Clamps That Fit Exact Tubing Sizes!

Add Bands to Your BTV!

DX Engineering stocks replacement parts for all BTV antennas

Easiest assembly and tuning of any multi-band vertical!

HUS-4BTV	(10, 15, 20, 40m)	$124.95
HUS-5BTV	(10, 15, 20, 40, & 75-80m)	$159.95
HUS-6BTV	(10, 15, 20, 30, 40, & 75-80m)	$189.95
DXE-8X19-RT	Coax Jumper Cable to BTV Base	$16.95
DXE-AOK-DCF	SO-239 Add-On Kit for BTV Base	$22.95
DXE-AOK-12M	12m Add-On Kit for BTV	$59.95
DXE-AOK-17M	17m Add-On Kit for BTV	$69.95
DXE-AOK-60M	60m Add-On Kit for BTV	$74.95



Vibroplex© IAMBIC Deluxe

The Vibroplex IAMBIC is the modern descendant of the original CW bug. It has the traditional Vibroplex look but is designed for use with modern electronic keyers. Code speed depends on your electronic keyer—you get the same crisp operation at 5 words per minute as you do at 50+ wpm. The IAMBIC Deluxe has a highly polished chrome base and jeweled movements.

VIB-IAMBIC-D $189.95

Check DXEngineering.com for more Vibroplex products.

Amplifiers

AMERITRON®

AMR-AL-811
800 Watt Amplifier
Only $679.00

Export-only models also in stock!

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

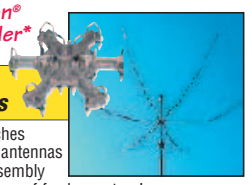
RG-8X JSC-3060 Cable Assemblies with PL-259 Connectors

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

Custom Lengths Available—Contact Us
See DXEngineering.com for complete information!

FREE SHIPPING on $50.00 or more Coax order!

*Complete 5-Band Kit with NEW Stainless/Teflon® Balanced RIGID Feeder**



MARK II Hexx 5-Band HF Beam Antenna Kits

- Low noise results—approaches performance of closed loop antennas
- 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
- Can be turned with a light duty rotor—save money
- Has full length elements—no lossy coils or traps
- Requires no matching network—direct single 50 Ω coax feed
- Good results at 20 to 30 feet above ground

New!

DXE-HEXX-1HBP	Hub and Hardware Package	$99.95
DXE-HEXX-1SCP-2	Spreader and Center Post Package	$199.95
DXE-HEXX-1WRP-2	1-Band Element & Wire Guide Package	$75.95
DXE-HEXX-5WRP-2	5-Band Element & Wire Guide Package	$149.95
DXE-HEXX-5FFP	5-Band Rigid Feeder* Package	$194.95
DXE-HEXX-1TAP-2	1-Band Total Antenna Package	$359.95
DXE-HEXX-5TAP-2	5-Band Total Antenna Package	$599.95

maxi-core™ High Performance

Current Baluns and Feedline Current Chokes

- 5, 10 and 10 kW+ Baluns and Current Chokes
- High efficiency, low loss—W8JI design
- All standard ratios available

Starting at just $84.95 for FCC050-H05-A
See April 2009 QST Short Takes!

We Will Beat Any Competitor's Prices—Call Us For Details!

$50.00 or more COAX ORDER!

- 97% Bare Copper Braid Shield
- 66% Velocity Factor
- Polyethylene Dielectric .285" O.D.
- .405" O.D. Non-Contaminating Black Vinyl Jacket
- 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.

DXEngineering.com
1.800.777.0703

Plus Great Customer Service and Fast and Inexpensive Shipping!

Microphones

HEI-GM-4	GOLDLINE 2-element Mic, HC4	$129.00
HEI-GM-5.1	GOLDLINE 2-element Mic, HC5.1	$129.00
HEI-HM-10-DUAL	Dual Mic, HC4 & HC5 Elements	$119.00
HEI-ICM	Mic for ICOM, 8 ft. attached	$99.00
HEI-PR781	Dynamic Cardioid Studio Quality Mic	$179.00

Headsets

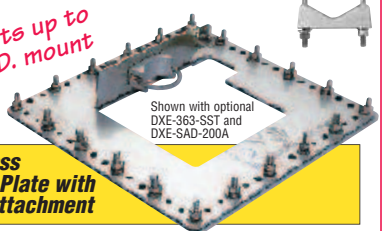
HEI-PROSET-4	Boom Mic/Headset, HC4	$125.00
HEI-PROSET-5	Boom Mic/Headset, HC5	$125.00
HEI-PROSETIC	Boom Mic/Headset/Adapter, ICOM Electret	$139.00
HEI-PSE-6	**PROSET Elite** with HC-6 element	$165.00

We are "Clamp Central"!

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.
See the many sizes at DXEngineering.com
The best clamps on the planet!

Now fits up to 3" O.D. mount



Stainless Radial Plate with Coax Attachment

NOT CHEAP ALUMINUM!
GUARANTEES BEST RADIAL SYSTEM CONDUCTIVITY OVER TIME

New!

Makes radial attachment a snap!
- Fits 3" pipe, 4x4 and 6x6 posts
- 0.125" thick 304 stainless steel
- Accommodates up to 120 radials
- Patented high current coax connection to radials

DXE-RADP-3	Complete with 20 stainless bolt sets	$54.50
DXE-RADP-1HWK	20 sets of 1/4" stainless hardware	$7.50
DXE-SSVC-2P	Stainless Saddle Clamp for attachment to steel tube 1" to 2" O.D.	$11.95
DXE-SSVC-3P	Stainless Saddle Clamp for attachment to steel tube 2" to 3" O.D.	$14.95
DXE-363-SST	Silver/Teflon® bulkhead connector	$6.95
DXE-VFCC-H05-A	Vertical Feedline Current Choke	$134.95
DXE-RADW-500K	Radial Wire Kit, 500 feet of wire, 20 lugs, 100 steel anchor pins	$61.90
DXE-RADW-1000K	Radial Wire Kit, 1,000 feet of wire, 40 lugs, 200 steel anchor pins	$123.95
DXE-STPL-100P	Steel Radial Wire Anchor Pins, 100 pack	$16.00

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 DXE'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
DXE-RCA8-SYS-3P	Full Electronics Package	$1,375.00
ARR-8560	ARRL ON4UN's Low Band DXing, 5th Ed.	$44.95

Four Square Receiving Array!

100 kHZ - 30 MHz 4 Switchable Directions

New!

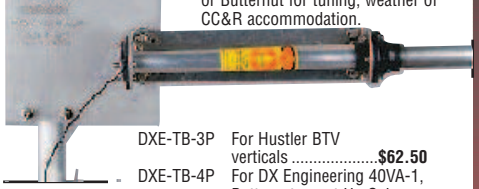
A sophisticated receiving system with time delay phasing for broadband performance. Optimized to produce wider and deeper rear nulls and a narrower main lobe. Noise and undesirable signals are greatly reduced by a superior front-to-rear ratio (F/R). Better control of phase and currents provides a cleaner 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

ONE MAN TILT OVER

Thick, Laser Cut Stainless Steel Tilt Base

- Patented cam action allows you to easily raise or lower DX Engineering, Hustler, Hy-Gain, or Butternut for tuning, weather or CC&R accommodation.



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

Enjoy the Fun of Digital Communications!

A Complete Digital Solution for Less

PSK-31
SSTV
WSJT
RTTY
& More

SignaLink™ From Tigertronics

TIG-SL-USB.....$86.95

Then choose a cable for each radio!

Any Radio Interface Cable*, only **$12.95** when purchased with SignaLink™ unit
.....YOUR TOTAL $99.90

For your complete digital solution!
**except the special Elecraft K3 cable*

- Easiest installation and setup—Macintosh or PC
- Software CD ROM included
- Built-in low noise sound card
- USB port powered
- Works with ALL radios
- 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
- 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

Thousands More Ham Products at
DXEngineering.com
1.800.777.0703
Order by 4:00 pm ET for Same-Day Shipping

8:30 am to 4:30 pm ET
1230 to 2030 UTC (March-October)
1330 to 2130 UTC (November-February)

Tech/International: **330.572.3200**

SOURCE CODE: 1104QS

Prices effective through 5/15/11

We Will Beat Any Competitor's Prices—Call Us For Details!

LDG ELECTRONICS

We're #1

Our customers have always known we're #1. But did you know that LDG was the first company with a "no questions asked" two-year transferable warranty on ALL our products? LDG autotuners also have the highest resale value of any autotuner on the market. Our customers feel good about owning LDG products and so will you!

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***

Visit our website for a complete dealer list.

Call or visit your favorite dealer today! ***www.ldgelectronics.com***

LDG

hy-gain® ROTATORS

. . . the first choice of hams around the world!

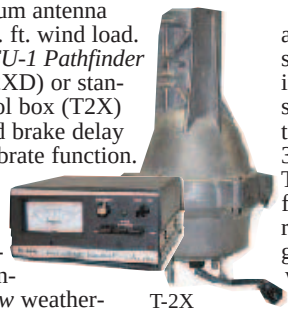
HAM-IV

HAM-IV $649.95

The most popular rotator in the world! For medium communications arrays up to 15 square feet wind load area. *New* 5-second brake delay! *New* Test/Calibrate function. *New* low temperature grease permits normal operation down to -30 degrees F. *New* alloy ring gear gives extra strength up to 100,000 PSI for maximum reliability. *New* indicator potentiometer. *New* ferrite beads reduce RF susceptibility. *New* Cinch plug plus 8-pin plug at control box. Dual 98 ball bearing race for load bearing strength and electric locking steel wedge brake prevents wind induced antenna movement. North or South center of rotation scale on meter, low voltage control, max mast size of $2^{1}/_{16}$ inches.

HAM IV and HAM V Rotator Specifications	
Wind Load capacity (inside tower)	15 square feet
Wind Load (w/mast adapter)	**7.5 square feet**
Turning Power	800 in.-lbs.
Brake Power	**5000 in.-lbs.**
Brake Construction	Electric Wedge
Bearing Assembly	**dual race/96 ball bearings**
Mounting Hardware	Clamp plate/steel U-bolts
Control Cable Conductors	**8**
Shipping Weight	26 lbs.
Effective Moment (in tower)	**2800 ft.-lbs.**

TAILTWISTER SERIES II



For large medium antenna arrays up to 20 sq. ft. wind load. Available with *DCU-1 Pathfinder* digital control (T2XD) or standard analog control box (T2X) with *new* 5-second brake delay and *new* Test/Calibrate function. Low temperature grease, alloy ring gear, indicator potentiometer, ferrite beads on potentiometer wires, *new* weatherproof AMP connectors plus 8-pin plug at control box, triple bearing race with 138 ball bearings for large load bearing strength, electric locking steel wedge brake, North or South center of rotation scale on meter, low voltage control, $2^{1}/_{16}$ inch max. mast.

T-2X $799.95

T-2XD $1229.95 with DCU-1

TAILTWISTER Rotator Specifications	
Wind load capacity (inside tower)	20 square feet
Wind Load (w/ mast adapter)	**10 square feet**
Turning Power	1000 in.-lbs.
Brake Power	**9000** in.-lbs.
Brake Construction	Electric Wedge
Bearing Assembly	**Triple race/138 ball brngs**
Mounting Hardware	Clamp plate/steel U-bolts
Control Cable Conductors	**8**
Shipping Weight	31 lbs.
Effective Moment (in tower)	**3400 ft.-lbs.**

CD-45II

CD-45II $449.95

For antenna arrays up to 8.5 sq. feet mounted inside tower or 5 sq. ft. with mast adapter. Low temperature grease good to -30 F degrees. *New* Test/Calibrate function. Bell rotator design gives total weather protection, dual 58 ball bearing race gives proven support. Die-cast ring gear, stamped steel gear drive, heavy duty, trouble free gear train, North center scale, lighted directional indicator, 8-pin plug/socket on control unit, snap-action control switches, low voltage control, safe operation, takes maximum mast size to $2^{1}/_{16}$ inches. MSLD light duty lower mast support included.

CD-45II Rotator Specifications	
Wind load capacity (inside tower)	8.5 square feet
Wind Load (w/ mast adapter)	**5.0 square feet**
Turning Power	600 in.-lbs.
Brake Power	**800 in.-lbs.**
Brake Construction	Disc Brake
Bearing Assembly	**Dual race/48 ball brings**
Mounting Hardware	Clamp plate/steel U-bolts
Control Cable Conductors	**8**
Shipping Weight	22 lbs.
Effective Moment (in tower)	**1200 ft.-lbs.**

HAM-V

HAM-V $1099.95 with DCU-1

For medium antenna arrays up to 15 square feet wind load area. Similar to the HAM IV, but includes *DCU-1 Pathfinder* digital control unit with gas plasma display. Provides automatic operation of brake and rotor, compatible with many logging/contest programs, 6 presets for beam headings, 1 degree accuracy, auto 8-second brake delay, 360 degree choice for center location, *more!*

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.

RBD-5 $29.95

NEW! Automatic Rotator Brake Delay

Provides automatic 5-second brake delay -- insures your rotator is fully stopped before brake is engaged. Prevents accidentally engaging brake while rotator is moving. Use with HAM II, III, IV, V, T2Xs. Easy-to-install. Includes pre-assembled PCB, hardware.

http://www.hy-gain.com
Nearest Dealer, Free catalog, To Order . . .
800-973-6572
Voice: 662-323-9538 **Fax:** 662-323-6551

hy-gain®

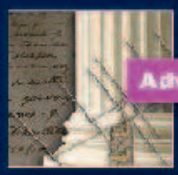
Antennas, Rotators & Towers

308 Industrial Park Road,Starkville, MS 39759, USA

Purchase Alpha Amplifier products direct from the factory or at any of our fine resellers:

Ham Radio Outlet | AES Amateur Electronic Supply | Radioworld

www.rfconcepts.com **303-473-9232**



Join or Renew!

Devoted Entirely to Amateur Radio

Includes QST

www.arrl.org/join

Membership Application

☑ Membership options (circle your choice/s)

	1 Year	2 Years	3 Years	
Regular	$39	$76	$111	Monthly *QST* via standard mail for US members
Canada	$49	$93	$132	Monthly *QST* via standard mail for Canadian members
Intl *QST*	$62	$118	$167	Monthly *QST* via air mail for international members
Intl CD	$39	$76	$111	Annual CD-ROM (*QST*, *NCJ* and *QEX*) for international members
Blind	$8	$16	$24	No *QST* delivery, all other member benefits apply
Family	$8	$16	$24	Reside at the same address as the primary member, no additional *QST*. Membership dates must correspond with primary member.

Membership includes $15 per year for subscription to *QST*. Memberships and *QST* cannot be separated. Dues subject to change without notice and are nonrefundable.

If you are 21 or younger a special rate may apply. Contact ARRL for more details.

Additional membership options available online at www.arrl.org/join.

Name _____ Call Sign _____

Street _____ City _____ State _____ ZIP _____

E-mail _____ Birth Date _____

Family Member Name _____ Call Sign (if any) _____

☑ Payment Options

☐ Visa ☐ MasterCard ☐ Amex ☐ Discover ☐ Check Enclosed

☐ Total enclosed payable to ARRL $ _____

☐ If you do not want your name and address made available for non-ARRL related mailings, please check here.

Card Number _____ Expiration Date _____

*Cardholder's Signature _____

Join Now

ONLINE: **www.arrl.org/join** PHONE: **1-888-277-5289 (US)**
ARRL • 225 Main Street • Newington, CT 06111-1494
Phone: 860-594-0338 • FAX: 860-594-0303

Source Code: QST 4/2011

FT-270R

VX-7RB

FT-270R 2M FM HT

- TX: 144-148 • RX: 136-174 • Power: 5/2/0.5W
- Memories: 200 • Extra large LCD display & speaker

VX-7RB Tri-band Submersible FM HT

- TX: 50-54, 144-148, 222-225, 430-450 MHz
- 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

VX-8GR

VX-8DR Quad-band FM HT

- TX: 50-54, 144-148, 222-225, 430-450 MHz
- 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

FT-8800R 2M/440 FM Mobile

- TX: 144-148, 430-450 MHz • RX: 108-520, 700-999 MHz (cell blkd) • Power: 50/20/10/5W (2M), 35/20/10/5W (440 MHz) • Memories: 1000
- Crossband repeat • YSK-8900 included!

FT-8900R Quad-Band FM Mobile

- Same as FT-8800R but TX: 28-29.7, 50-54, 144-148, 430-450 MHz and RX: 28-29.7, 50-54, 108-180, 320-480, 700-985 MHz (cell blkd) • Power: 50/20/10/5W (10/6/2M), 35/20/10/5W (440 MHz) • YSK-8900 included!

FT-450AT

100W HF/6M Compact Transceiver

- TX: HF/6M • RX: 0.03-56 MHz • Power: 10-100W
- Memories: 500 • IF DSP Technology
- Selectable AGC, IF width & shift, contour, digital noise reduction, manual notch filter and clarifier
- Includes Auto Antenna Tuner

FT-950 100W 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
- 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-2000 100W 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 200W HF/6M Transceiver

- FT-2000 except RF output is 200W and supplied power supply 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

AES
AMATEUR ELECTRONIC SUPPLY

5710 W. Good Hope Rd.
Milwaukee, WI 53223
414-358-0333
800-558-0411
Service 414-358-4087
milwaukee@aesham.com

28940 Euclid Ave.
Cleveland, OH 44092
440-585-7388
800-321-3594
cleveland@aesham.com

621 Commonwealth Ave.
Orlando, FL 32803
407-894-3238
800-327-1917
orlando@aesham.com

4640 South Polaris Ave.
Las Vegas, NV 89103
702-647-3114
800-634-6227
lasvegas@aesham.com

1-800-558-0411
aesham.com

Included items are available for limited time.

FOLLOW US ON TWITTER!
twitter.com/K9AES

TRADE UP TO YAESU
CALL AES NOW FOR A QUOTE!

Radios by YAESU

Dayton 2011 HAMVENTION® Global Friendship

May 20-22, 2011 Hara Arena, Dayton, Ohio

www.hamvention.org

Buy your Tickets, Flea Market, and Inside Exhibit spaces online.
OR Send SASE with a check made out to Dayton Hamvention
To: Hamvention Tickets, P.O. Box 1446, Dayton, OH 45401

The Biggest Show on Earth

Ticket Prices: $20 in advance, $25 at the door.

General Inquiry: Dayton Hamvention®
937.276.6930 P.O. Box 964 Dayton, OH 45401

And Featuring...

ARRL EXPO 2011

Your Hamvention admission includes entry to ARRL EXPO

Program Highlights

- Special Exhibits and Guests ▪ ARRL Bookstore
- Presentations ▪ DXCC Card Checking
- ARRL Youth Activities – friends, fun and food!
- Join or renew with ARRL – and receive a FREE GIFT

ARRL Project Building Booth

Instructors ▪ Teachers ▪ Club Leaders:

SAVE $5 on a KIT

with a copy of this ad

ARRL The national association for AMATEUR RADIO™
www.arrl.org/expo

NEW FROM KENWOOD!

TH-D72A
2M/440 FM HT w/Built-in GPS

- TX: 144-148, 430-450 MHz
- RX: TBD • Power: 5/0.5/0.05W
- Memories: 1000 • USB Port
- 1200/9600 bps packet TNC
- SkyCommand and APRS Firmware
- Stand-alone Digipeater
- Built-in High Performance GPS
- GPS logging - memory for up to 5,000 points of track data
- Echolink® ready
- KISS mode protocol
- Can function as an iGate (Internet Gateway) when properly connected

TS-590S 100W HF/6M Transceiver

- TX: HF/6M • RX: 0.03-60 MHz
- Power: 5-100W (5-25W on AM)
- Memories: 110 + 10 Quick Channels
- HF/6M Auto Antenna Tuner
- Down conversion receiver, narrow first roofing filter and dedicated first mixer, which gives it the best dynamic range in its class when handling unwanted adjacent off-frequency signals
- Full/semi break-in CW • 10 Hz Dual VFO Display
- USB connectivity for PC and remote control

TM-271A 2M FM Mobile

- TX: 144-148 MHz • RX: 136-174 MHz
- Power: 60/25W • Memories: 200

TM-V71A Dualband FM Mobile

- TX: 144-148, 430-450 MHz
- RX: 118-524, 800-1300 MHz (cell blkd)
- Power: 50/10/5W • Dual receive (V+V) (U+U)
- Cross-band repeat • EchoLink® ready

TM-D710A
Dualband FM Mobile w/TNC

- TX: 144-148, 430-450 MHz
- RX: 118-524, 800-1300 MHz (cell blkd)
- Power: 50/10/5W • Dual receive (V+V) (U+U)
- Built-in TNC for APRS (needs GPS)
- Cross-band repeat • AvMap G5 & EchoLink® ready

TH-K2AT 2M FM HT

- TX: 144-148 • RX: 136-174
- Power: 5/1.5/0.5W • Memories: 100

TH-F6A Triband FM HT

- TX: 144-148, 222-225, 430-450 MHz
- RX: 0.1-1300 MHz (cell blkd) • Dual band RX
- FM Wide/Narrow, AM, SSB and CW receive modes
- Power: 5/0.5/0.05W • Memories: 435

TS-2000 100W HF/VHF/UHF Transceiver

- TX: HF/6M/2M/440 MHz • RX: 0.03-60, 142-152, 420-450 MHz • Power: 10-100W (10-50W on 440 MHz)
- Memories: 99 • HF/6M Auto Antenna Tuner
- IF/stage DSP on main band, AF/stage DSP on sub-band

TS-B2000 Same as the TS-2000 with no front panel controls. Includes PC control software.

TS-2000X The TS-2000 with 1.2 GHz @ 10W.

AES
AMATEUR ELECTRONIC SUPPLY

5710 W. Good Hope Rd.
Milwaukee, WI 53223
414-358-0333
800-558-0411
Service 414-358-4087
milwaukee@aesham.com

28940 Euclid Ave.
Cleveland, OH 44092
440-585-7388
800-321-3594
cleveland@aesham.com

621 Commonwealth Ave.
Orlando, FL 32803
407-894-3238
800-327-1917
orlando@aesham.com

4640 South Polaris Ave.
Las Vegas, NV 89103
702-647-3114
800-634-6227
lasvegas@aesham.com

1-800-558-0411
aesham.com

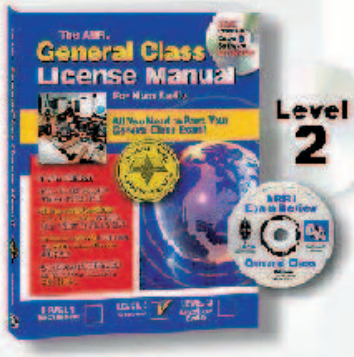
FOLLOW US ON TWITTER!
twitter.com/K9AES

TRADE UP TO KENWOOD
CALL NOW FOR A QUOTE!

Radios by KENWOOD

ARRL License Manuals

Now Including Practice Exam Software!



ARRL's popular license manuals just got even better! Each book now includes the ARRL Exam Review CD-ROM. Use the software with your book to review the study material. Take randomly-generated practice exams using questions from the actual examination question pool. Additional features allow you to print sample exams…as many as you like. ARRL Exam Review tracks your progress, giving you the feedback you need to fine-tune your studies. **You won't have any surprises on exam day!**

Get your FIRST ham radio license!

The ARRL Ham Radio License Manual—**Second Edition**
Let ARRL guide you as you get started in Amateur Radio—as you select your equipment, set-up your first station and make your first radio contact.

- **Easy-to-understand "bite-sized" sections**. Pass the 35-question Technician Class exam.
- **Includes the latest question pool with answer key**, for use through June 30, 2014.
- **Software** included featuring the **ARRL Exam Review** CD-ROM.
- **Designed for self-study and classroom use**. Intended for all newcomers, instructors and schoolteachers.

ARRL Order No. 0977

Also Available
The ARRL Instructor's Manual
ARRL Order No. 8737
$19.95*

Upgrade and enjoy more frequency privileges!

The ARRL General Class License Manual—**Sixth Edition**
Upgrade to General and experience the thrill of worldwide communications!

- Pass the 35-question General Class exam.
- **All the Exam Questions with Answer Key**, for use through June 30, 2011.
- **Software** included featuring the **ARRL Exam Review** CD-ROM.
- Detailed explanations for all questions, including **FCC rules**.

ARRL Order No. 8690

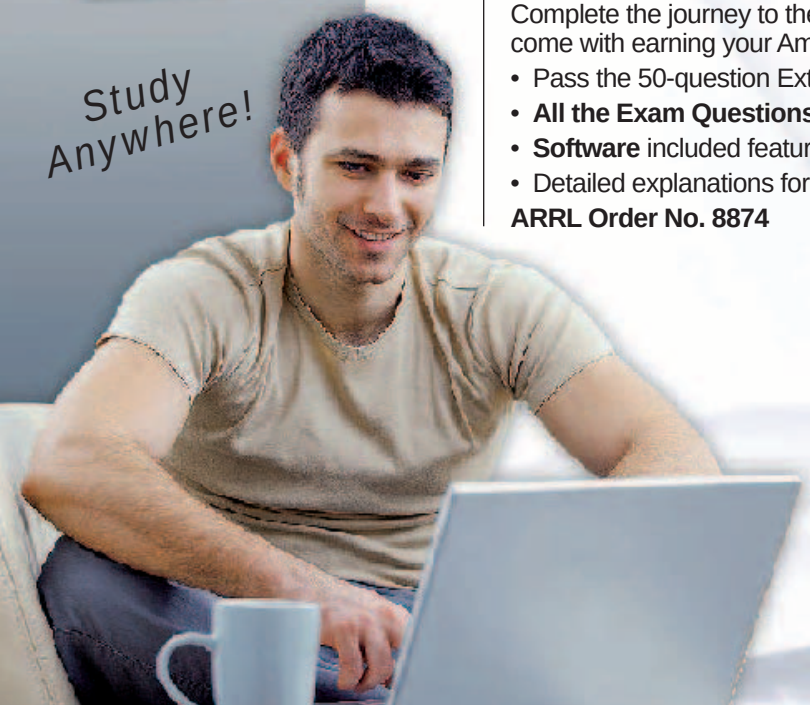
Achieve the highest level of Amateur Radio licensing!

The ARRL Extra Class License Manual—**Ninth Edition**
Complete the journey to the top and enjoy all the operating privileges that come with earning your Amateur Extra Class license.

- Pass the 50-question Extra Class exam.
- **All the Exam Questions with Answer Key**, for use through June 30, 2012.
- **Software** included featuring the **ARRL Exam Review** CD-ROM.
- Detailed explanations for all questions, including **FCC rules**.

ARRL Order No. 8874

Study Anywhere!



Book and CD-ROM
Only $29.95*/ea.
Order Today!

*Shipping and Handling charges apply. Sales Tax is required for orders shipped to CT, VA, and Canada. Prices and product availability are subject to change without notice.

ARRL *The national association for AMATEUR RADIO™*

225 Main Street, Newington, CT 06111-1494 USA

SHOP DIRECT *or call for a dealer near you.*
ONLINE WWW.ARRL.ORG/SHOP
ORDER TOLL-FREE 888/277-5289 (US)

IT'S BACK FOR A LIMITED TIME!

Get $50 OFF a PS-125 Power Supply when purchased with a IC-746PRO!

Here is your last chance to get the Legendary IC-746PRO brand new in the box! AES is the ONLY place that has them so hurry while supplies last!

IC-V80/SPORT

RX-7-05

IC-V80 2M FM Handheld

- TX: 144-148 MHz • RX: 136-174 MHz
- 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-7000 Multimode HF/VHF/UHF Mobile

- TX: HF/6M/2M/440 MHz • RX: 0.03-199, 400-470 MHz
- Power: 2-100W (HF/6M), 2-50W (2M), 2-35W (440)
- Memories: 503 • 41 band-widths with sharp or soft filter shape • RMK-7000 included!

IC-718 Multimode 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-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-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-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-7600 Multimode 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

AES

AMATEUR ELECTRONIC SUPPLY

5710 W. Good Hope Rd.
Milwaukee, WI 53223
414-358-0333
800-558-0411
Service 414-358-4087
milwaukee@aesham.com

28940 Euclid Ave.
Cleveland, OH 44092
440-585-7388
800-321-3594
cleveland@aesham.com

621 Commonwealth Ave.
Orlando, FL 32803
407-894-3238
800-327-1917
orlando@aesham.com

4640 South Polaris Ave.
Las Vegas, NV 89103
702-647-3114
800-634-6227
lasvegas@aesham.com

1-800-558-0411

aesham.com

Included items are available for limited time.

FOLLOW US ON TWITTER!
twitter.com/K9AES

TRADE UP TO ICOM
CALL AES NOW FOR A QUOTE!

Radios by ICOM

Quicksilver Radio Products

See us at Hamfests from Maine to Florida. New retail store *now open* in Meriden, CT.

New! Andy-Crimp *Pro*

No other tool does all this:

15-30-45-50-75 Amp Powerpoles
***And* Molex-type Connectors**
***And* Insulated Terminals**
***And* Uninsulated Terminals**
***And* has available dies for coax connectors**

***And* is on sale for just**

$49.73

We have more Powerpole Stuff Than Anybody!

Professional Grade wire stripper. On sale now for just $15.00

40W variable temperature soldering station Blowout

Sale price *$25.00*

Coax Adapter Kit

New and in stock Adapts N, UHF, mini-UHF, TNC, BNC, and SMA. 144 different combinations

Sale Price $99.73

Deluxe Coax Crimp Kit

Includes crimper with extra die set, two strippers, and coax cutter; all in a sturdy ABS carrying case. Crimps LMR-400, 9913, RG-8, RG-213, RG-8X, RG-58, RG-316, RG-174, and more. High Quality N, PL-259, BNC, and SMA Connectors are in stock. On Sale Now. *Save $$$*

Gadgets and Gizmos Galore

Everyone knows this is the place to find all the parts you need for that next project. Low-loss coax and jumpers, LMR -400, Bury-Flex, ladder line, antenna rope, pulleys, wire, baluns, and more are ready for immediate shipment.

Quicksilver Radio Products

Sign up on our Web Site for your free newsletter.
Ham Radio news, articles, and special subscriber discounts

www.qsradio.com

QST QuickStats

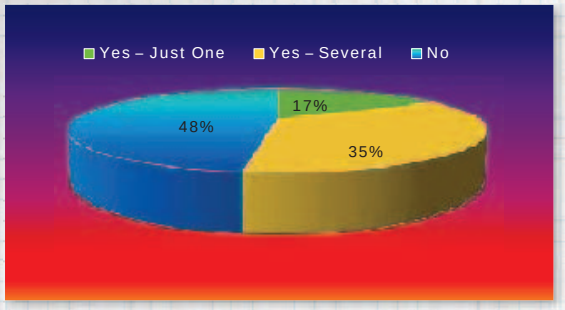
sta·tis·tics (st-tstks) n.
1. (used with a sing. verb) The mathematics of the collection, organization, and interpretation of numerical data, especially the analysis of population characteristics by inference from sampling.
2. (used with a pl. verb) Numerical data.

www.arrl.org/QuickStats

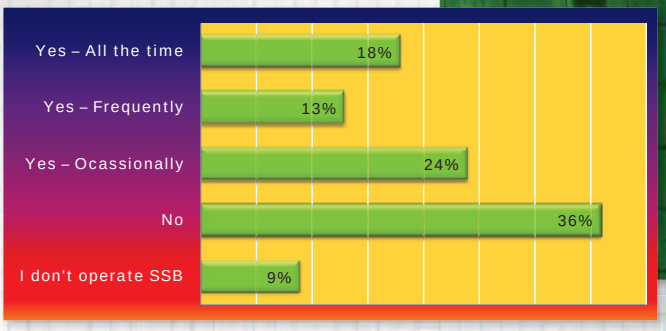
Online QuickStats Poll Results for January 10 through February 10.

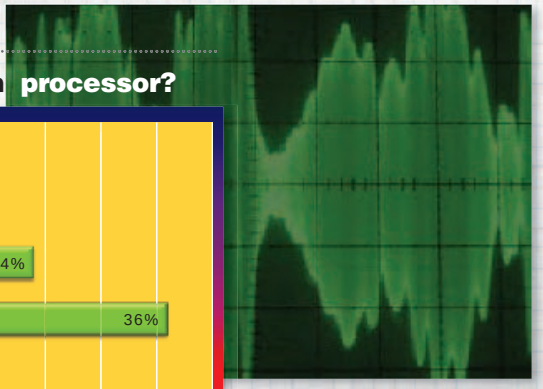
Get on the web and vote today at **www.arrl.org/quickstats**!

Do you subscribe to any publications that you read online?

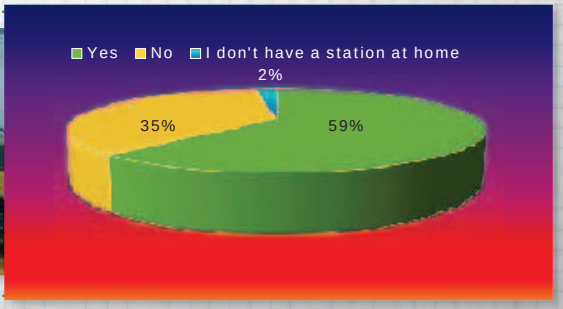


When operating SSB, do you use a speech processor?

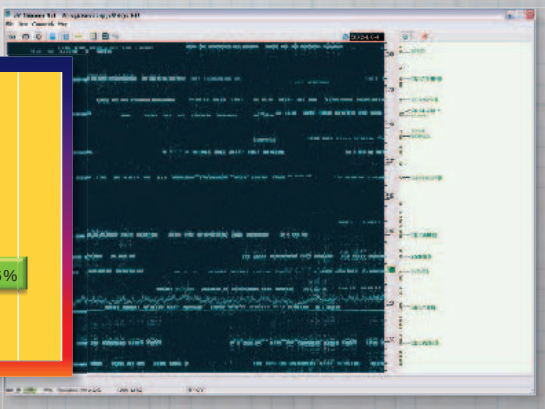




Do you have a separate room in your home that's dedicated strictly to your ham station?



Do you use a computer to send or receive CW?



MFJ-259B *1.8-170 MHz* SWR Analyzer

World's most popular SWR analyzer is super easy-to-use

Reads SWR . . . Complex RF Impedance: Resistance(R) and Reactance(X) or Magnitude(Z) and Phase(degrees) . . . Coax cable loss(dB) . . . Coax cable length and Distance to fault . . . Return Loss . . . Reflection Coefficient . . . Inductance . . . Capacitance . . . Battery Voltage. LCD digital readout . . . frequency counter . . . side-by-side meters . . . Battery charger . . . battery saver . . . low battery warning . . . smooth reduction drive tuning . . .

World's most popular SWR analyzer! ***The famous MFJ-259B gives you a complete picture of your antenna's performance. You can read your antenna's SWR and Complex Impedance from 1.8 to 170 MHz.***

You can read Complex Impedance as series resistance and reactance (R+jX) or as magnitude (Z) and phase (degrees).

You can determine velocity factor, coax cable loss in dB, length of coax and distance to a short or open.

You can read SWR, return loss and reflection coefficient at any frequency simultaneously.

You can read inductance in uH and capacitance in pF at RF frequencies.

Large easy-to-read two line LCD screen and side-by-side meters clearly display your information.

It has built-in frequency counter, Ni-MH/Ni-CD charger circuit, battery saver, low battery warning and smooth reduction drive tuning.

Super easy to use! Just set the bandswitch and tune the dial -- just like your transceiver. SWR and Complex Impedance are displayed instantly!

Here's what you can do

Find your antenna's true resonant frequency. Trim dipoles and verticals.

Adjust your Yagi, quad, loop and other antennas, change antenna spacing and height and watch SWR, resistance and reactance change instantly. You'll know exactly what to do by simply watching the display.

Perfectly tune critical HF mobile antennas in seconds for super DX -- without subjecting your transceiver to high SWR.

Measure your antenna's 2:1 SWR bandwidth on one band, or analyze multiband performance from HF to VHF -- 1.8-170 MHz!

Check SWR outside the ham bands without violating FCC rules.

Take the guesswork out of building and adjusting matching networks and baluns.

Accurately measure distance to a short or open in a failed coax. Measure length of a roll of coax, coax loss, velocity factor and impedance.

Measure inductance and capacitance. Troubleshoot and measure resonant frequency and Q of traps, stubs, transmission lines, RF chokes, tuned circuits and baluns.

Call your favorite dealer for your best price!

MFJ-259B **$289.95**

Adjust your antenna tuner for a perfect 1:1 match without creating QRM.

And this is only the beginning! The MFJ-259B is a complete ham radio test station including -- frequency counter, RF signal generator, *SWR Analyzer*™, RF Resistance and Reactance Analyzer, Coax Analyzer, Capacitance and Inductance Meter and more!

Free Manual: call, write or download

MFJ's comprehensive instruction manual is packed with useful applications -- all explained in simple language you can understand.

Take it anywhere

Fully portable, take it anywhere -- remote sites, up towers, on DX-peditions. It uses 10 AA or Ni-Cad batteries (not included) or 110 VAC with MFJ-1312D, $15.95. Its rugged all metal cabinet is a compact 4x2x6¾ in.

How good is the MFJ-259B?

MFJ *SWR Analyzers*™ work so good, many antenna manufacturers use them in their lab and on the production line -- saving thousands of dollars in instrumentation costs! Used worldwide by professionals everywhere.

More MFJ SWR Analyzers™

MFJ-249B, $269.95. Like MFJ-259B, but reads SWR, true impedance magnitude and frequency only on LCD. No meters.

MFJ-209, $159.95. Like MFJ-249B but SWR meter only. No LCD/frequency counter.

MFJ-219B, $119.95. UHF *SWR Analyzer* covers 420-450 MHz. External frequency counter jack. 7½x2½ x2¼ in. *Free* "N" to SO-239 adapter.

SWR Analyzer Accessories

Dip Meter Adapter

MFJ-66, $24.95. Plug a dip meter coupling coil into your MFJ *SWR Analyzer*™ and turn it into a sensitive and accurate bandswitched dip meter. Takes guesswork out of winding coils and determining resonant frequency of tuned circuits and Q of coils. Set of two coils cover 1.8-170 MHz depending on your *SWR Analyzer*.

Genuine MFJ Carrying Case

MFJ-29C, $24.95. Tote your MFJ-259B anywhere with this MFJ custom carrying case. Has back pocket with security cover for carrying dip coils, adaptors and accessories. Made of special foam-filled fabric -- cushions blows, deflects scrapes, and protects knobs, meters and displays from harm. Wear it around your waist, over your shoulder, or clip it onto the tower while you work -- the fully-adjustable webbed-fabric carrying strap has snap hooks on both ends. Has clear protective window for frequency display and cutouts for knobs and connectors so you can use your MFJ *SWR Analyzer*™ without taking it out of your case.

MFJ-99, $60.85. Accessory Package for MFJ-259/B/249/B/209. Includes MFJ-29C carrying case, MFJ-66 dip meter adapter, MFJ-1312D 110VAC adapter. ***Save $5!***

Tunable Measurement Filter

MFJ-731, $99.95. *Exclusive* MFJ tunable RF filter allows accurate SWR and impedance measurements 1.8-30 MHz in presence of strong RF fields. Virtually no effect on measurements. Works with *all* SWR Analyzers.

MFJ *No Matter What*™ warranty

MFJ will repair or replace (at our option) your MFJ *SWR Analyzer*™ for one full year.

Dealer/Catalog/Manuals

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

1.8-170 MHz *plus* 415-470 MHz SWR Analyzer

All-in-one handheld antenna test lab lets you quickly check/tune HF, VHF, ***UHF*** antennas anywhere. Measures: SWR, Return Loss, Reflection Coefficient, R, X, Z, Phase Angle, Coax cable loss, Coax cable length, Distance to short/open in coax, Inductance, Capacitance, Resonant Frequency, Bandwidth, Q, Velocity Factor, Attenuation, more!

MFJ-269 **$389.95**

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

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

More hams use MFJ SWR Analyzers™ than any others in the world!

MFJ TUNERS

New, Improved MFJ-989D 1500 Watt *legal limit* Antenna Tuner

World's most popular 1500 Watt Legal Limit Tuner just got better -- much better -- gives you more for your money!

New, improved MFJ-989D *legal limit* antenna tuner gives you better efficiency, lower losses and a new *true* peak reading meter. It easily handles *full* 1500 Watts SSB/CW, 1.8 to 30 MHz, including MARS/WARC bands.

New dual 500 pF *air variable capacitors* give you twice the capacitance for more efficient operation on 160 and 80 Meters.

New, improved *AirCore*™ *Roller Inductor* gives you lower losses, higher Q and handles more power more efficiently.

New *TrueActive*™ peak reading Cross-Needle *SWR/Wattmeter* lets you read *true* peak power on all modes.

MFJ-989D $389.95

New high voltage *current balun* lets you tune balanced lines at high power with no worries.

New *crank knob* lets you reset your roller inductor quickly, smoothly and accurately.

New larger 2-inch diameter *capacitor knobs* with easy-to-see dials make tuning much easier.

New cabinet maintains components' high-Q. Generous air vents keep components cool. $12\frac{7}{8}$Wx6Hx$11\frac{5}{8}$D inches.

Includes six position ceramic antenna switch, 50 Ohm dummy load, indestructible multi-color Lexan front panel with detailed logging scales and legends.

The MFJ-989D uses the superb time-tested T-Network. It has the widest matching range and is the easiest to use of all matching networks. Now with MFJ's new 500 pF air variable capacitors and new low loss roller inductor, it easily handles higher power much more efficiently.

***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-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. $10\frac{3}{4}$Wx$4\frac{1}{2}$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. $10\frac{3}{4}$x$4\frac{1}{2}$x$10\frac{7}{8}$ 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. $3\frac{1}{2}$Hx$10\frac{1}{2}$Wx$9\frac{1}{2}$D inches.

MFJ-949E ***deluxe*** 300 Watt Tuner

MFJ-949E $179.95

More *hams use MFJ-949s than any other antenna tuner in the world!* Handles 300 Watts. Full 1.8 to 30 MHz coverage, custom inductor switch, 1000 Volt tuning capacitors, *full size* peak/average lighted Cross-Needle SWR/Wattmeter, 8 position antenna switch, dummy load, *QRM-Free PreTune*™, scratch proof Lexan front panel. $3\frac{1}{2}$Hx$10\frac{5}{8}$Wx7D inches. **MFJ-948, $139.95.** Economy version of MFJ-949E, less dummy load, Lexan front panel.

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 $10\frac{1}{2}$Wx$2\frac{1}{2}$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$6\frac{1}{2}$x$2\frac{1}{2}$ 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 $4\frac{1}{2}$x$2\frac{1}{4}$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. $7\frac{1}{4}$x$2\frac{1}{4}$x$2\frac{3}{4}$ 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$2\frac{1}{2}$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.

Dealer/Catalog/Manuals

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

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

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

MFJ *Balanced Line* Antenna Tuner

Superb balance . . . Very wide matching range . . . Covers 1.8-54 MHz . . . Cross-Needle SWR Wattmeter . . . Handles 300 Watts . . . Compact size . . .

The MFJ-974HB is a* fully balanced true *balanced line antenna tuner. It gives you superb current balance.

Johnson Matchbox

For decades, the Johnson Matchbox has been the standard of comparison for balanced line antenna tuners. But, it had a severely limited matching range and covered only 80, 40, 20, 15 and 10 Meters.

***The** MFJ-974HB is its successor*. It meets today's needs and even surpasses the Johnson Matchbox outstanding performance.

Everything You Need

The MFJ-974HB gives you excellent current balance, very wide matching range(12-2000 Ohms) and covers 1.8 through 54 MHz *continuously* including all WARC bands, 160 Meters, 6 Meters and the new 60 Meter band. Handles 300 Watts SSB PEP and 150 Watts CW.

Tuning is fast and easy - - just three tuning controls. You can adjust for highly efficient broadband low-Q operation or use higher Q when you encounter extreme loads.

A large three-inch lighted Cross-Needle SWR/Wattmeter lets you read SWR, peak or average forward and reflected power *all at a glance* on 300/60 or 30/6 Watt ranges.

A ground post is provided to ground one output terminal so you can also tune random wires and coax fed antennas.

Compact 7½Wx6Hx8D in. fits anywhere.

Tunes any Balanced Line

The MFJ-974HB tunes any balanced lines including 600 Ohm open wire line, 450/300 Ohm ladder lines, 300/72 Ohm twin lead - - shielded or unshielded.

Superb current balance minimizes feedline radiation that can cause troublesome TVI /RFI, painful RF bites, mysterious RF feedback problems and radiation pattern distortion.

Excellent Balance, Excellent Design

The MFJ-974HB is a *fully balanced* wide range T-Network. *Four* 1000 Volt air variable capacitors are gear driven. A high-Q air wound tapped inductor is used for 80-10 Meters with separate inductors for 6 and 160 Meters. The tuning components are mounted symmetrically to insure electrical balance.

MFJ-974HB
$209.95

A 1:1 *current* balun is placed on the low impedance 50 Ohm input side to convert the balanced T-Net-work to un-balanced operation. An efficient balun is made of 50 ferrite beads on RG-303 *Teflon*™ coax to give very high isolation. It stays cool even at max power.

Balanced Line = Extremely Low Loss

Balanced lines give extremely low loss.

Doublet, horizontal loop, vertical loop, quad, double extended Zepp, Lazy H, W8JK antennas all give efficient multi-band operation when fed with balanced lines.

6-80 Meter Balanced Line Tuner

MFJ-974B
$189.95

MFJ-974B, $189.95. Same as MFJ-974H but for 6-80 Meter operation (no 160 Meters).

160-6 Meters All Band Doublet Antenna

MFJ-1777, $59.95. 102 feet doublet antenna covers 160-6 Meters with balanced line tuner. Super strong custom fiberglass center insulator provides stress relief for 450 Ohm ladder line (100 feet included). Authentic *glazed ceramic* end insulators. Handles 1500 Watts.

MFJ 1500 Watt *Fully Balanced* Antenna Tuner

Fully balanced MFJ-976 handles 1500 Watts legal limit . . . Extra-wide 12-2000 Ohms matching range . . . continuous 1.8 to 30 MHz coverage including all WARC bands . . . Four separate 500 pF in two gangs gives you a total of 2000 pF capacitance . . . Heavy duty 1:1 current balun . . . more!

MFJ-976
$499.95

The MFJ-976 is a 1500 Watt Legal Limit *fully balanced* antenna tuner.

You get *superb* current balance, very wide matching range (12-2000 Ohms) and *continuous* 1.8-30 MHz coverage including all WARC bands. Handles *full* 1500 Watts SSB *and* CW.

You can tune *any* balanced lines including 600 Ohm open wire line, 450/ 300 Ohm ladder lines, 300/72 Ohm twin lead -- shielded or unshielded. Also tunes random wires and coax fed antennas.

MFJ's *fully balanced* extremely wide-range T-network gives you simple, fast three knob tuning. No complicated switching between high and low impedance and switching in additional capacitance of L-networks.

Four separate 500 pF in two gangs gives you a total of 2000 pF for highly efficient low loss operation on 160 Meters.

You get superb 10 Meter performance due to MFJ's low minimum capacitance and exclusive *Self-Resonance Killer*™ high-Q *AirCore*™ roller inductor with silver plated contacts.

Heavy duty 1:1 current balun gives you *superb balance* and stays cool even at 1.5kW.

True *active* peak reading lighted Cross-Needle SWR/Wattmeter lets you read SWR, *true peak* or average forward and reflected power all at a glance on 300/ 3000 Watt ranges. 12Wx6Hx15¾D inches.

Ladder line, Twin lead, Insulators, Copper wire . . .

Super-strong fiberglass 450 Ohm ladder line insulators

MFJ-16D01, $8.95. *Center* insulator. Double weave ladder line stress-relief. Strong wire tie points. Hang hole.

MFJ-16E01, $9.95. Feedpoint *End* Insulator. Double weave ladder line stress relief. Built-in SO-239 connector.

MFJ-16F01, $8.95. *Middle* insulator. High-strength coax connection at mid-point with SO-239, quadruple weave-through ladder line stress relief.

MFJ-16C06, $4.56. Authentic *glazed ceramic* Insulator, 6-pack.

450 Ohm Ladder Line

Extremely low loss, open-frame construction. Heavy duty black polyethylene. Solid 18 gauge wire. MFJ-18H050, **50 Ft.**, $19.95. MFJ-18H100, **100 Ft.**, $34.95. MFJ-18H250, **250 Ft.**, $89.95.

300 Ohm Twin-Lead

20 gauge stranded copper wire. Black polyethylene. MFJ-18T050, **50 Ft.**, $24.95. MFJ-18T100, **100 Ft.**, $44.95. MFJ-18T250, **250 Ft.**, $99.95.

Copper Antenna Wire

Flexible, 7-strand, 14 gauge, hard solid-copper wire. Strong/long-lasting. MFJ-18G100, **100 Ft.**, $24.95. MFJ-18G250, **250 Ft.**, $59.95.

Free MFJ Catalog

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

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

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

MFJ . . . The World Leader in Ham Radio Accessories

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-998 1500 Watt *Legal Limit IntelliTuner*™

Only the MFJ-998 gives you fully automatic antenna tuning for your legal limit full 1500 Watts SSB/CW linear amplifier!

MFJ-998 $699.95

Ultra-fast Automatic Tuning

Instantly match impedances from 12-1600 ohms using MFJ's exclusive *IntelliTune*™, *Adaptive Search*™ and *InstantRecall*™ algorithms with over 20,000 *VirtualAntenna*™ Memories.

Safe auto tuning protects amp

MFJ's exclusive *Amplifier Bypass Control*™ makes tuning safe and "stupid-proof"!

Digital/Analog Meters

A *backlit* LCD meter displays SWR, forward/reflected power, frequency, antenna selected, an auto-ranging bargraph power indication, and much more.

Has quick-glance auto-ranging Cross-Needle SWR/Wattmeter.

MFJ VirtualAntenna™ Memory

MFJ new *VirtualAntenna*™ Memory system gives you 4 antenna memory banks for *each* of 2 switchable antenna coax connectors. Select up to 4 antennas on each antenna connector. Each antenna has 2500 memories, 20,000 total. Has binding post for end-fed long wire antennas.

Download & Upgrade Remotely

Download from internet and upgrade your MFJ-998 firmware as new features are introduced.

Plus Much More!

Built-in radio interface controls most transceivers.

Automatically bypasses with excessive tuning power.

Use balanced line antennas with external **MFJ-912, $59.95**, 1.5 kW 4:1 balun.

Small 13Wx4Hx15D inches easily fits into your ham station. 8 pounds. Requires 12-15VDC at 1.4 amps maximum or 110 VAC with **MFJ-1316, $21.95**.

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.

300 Watt...Best Seller

Digital Meter, Ant Switch, Balun

The *world's best selling* automatic antenna tuner is *highly acclaimed the world over* for its ultra high-speed, wide matching range, reliability, ease-of-use! Matches virtually *any* antenna.

MFJ-993B $259.95

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

MFJ-928 $199.95

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.

200 Watt *MightyMite*™

Matches IC-706, FT-857D, TS-50S

MFJ-925 $179.95

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!

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

MFJ-926B $399.95

Fully *weather-sealed for remote Outdoor/Marine use*! Tough, durable, built-to-last the elements for years.

200 Watt...Remote

Coax/Wire Ant, No pwr cable needed

MFJ-927 $259.95

Weather protected fully automatic *remote* auto tuner for wire ***and*** *coax* antennas -- an MFJ exclusive. Powers through coax -- No separate power cable needed.

Free MFJ Catalog

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

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

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

http://www.mfjenterprises.com for instruction manuals, catalog, info

MFJ *Switching* Power Supplies

Power your HF transceiver, 2 meter/440 MHz mobile/base and accessories with these highly reliable 15, 22, 30, 40 or 75 Amp MFJ Switching Power Supplies!

No RF hash . . . Super lightweight . . . Super small . . . Volt/Amp Meters . . .

MFJ's adjustable voltage switching power supplies do it all! Power your HF or 2M/440 MHz radio and accessories.

MFJ's *MightyLites*™ are so light and small you can carry them with one hand! Take them with you anywhere.

No more picking up and hauling around heavy, bulky supplies that can give you a painful backache, pulled muscle or hernia.

These babies are clean . . . Your buddies won't hear *any* RF hash on your signal! *None* in your receiver either! These super clean *MightyLites*™ meet all FCC Class B regulations.

Less than 35 mV peak-to-peak ripple under 25 or 45 amp full load. Load regulation is better than 1.5% under full load.

You won't burn up our power supplies!

MFJ Power supplies are *fully protected* with Over Voltage, Over-temperature and Over Current protection circuits.

MFJ *MightyLites*™ can be used anywhere in the world! They have switchable AC input voltage and work from 85 to 135 VAC or 170 to 260 VAC. Replaceable fuse.

A whisper quiet internal fan efficiently cools your power supply for long life.

22 Amp Continuous

Mighty Lite™

MFJ-4125

$84.95

Ham Radio's smallest and lightest 22 Amp continuous power supply is also its best selling!

22 Amps continuous/25 Amps max at 13.8VDC. 5-way binding posts on front, 5A quick connects on back. 85-135/170-260 VAC input. 2.9 lbs. 5¾Wx3Hx5¾D".

MFJ-4125P, $94.95. Adds 2-pairs *Anderson PowerPoles*™.

22 Amp Continuous

Mighty Lite™

MFJ-4225MV

$99.95

22 Amps continuous, 25 Amps maximum. Like MFJ-4125 but adds Volt/Amp meters, cigarette lighter plug. Adjustable 9-15 VDC Output. 5¼Wx 4½Hx6D in. Weighs 3.7 lbs. Use 85-135 VAC or 170-260 VAC input. Replaceable fuse.

40 Amp Continuous

MightyLite™

MFJ-4245MV

$149.95

40 Amps continuous, 45 Amps max. Adjustable 9-15 VDC output. Volt/Amp meters, cigarette lighter plug, front 5-way binding posts, two rear quick connects. 5.5 lbs. 7½Wx 4¾Hx9D inches. Use 85-135 VAC or 170-260 VAC input. Replaceable fuse.

75 Amp Continuous

MFJ-4175

$359.95

75 Amps continuous. Adjustable 13.8-14.2 VDC output. Reverse polarity, over-current/temperature, brown-out input protection, 7.8 lbs. 6½Wx3½Hx10D in. 108-132 VAC. Great for Ameritron's ALS-500M mobile amplifier!

High Current Multiple DC Power Outlets

Power multiple Transceivers/accessories from a single DC power supply . . . Keeps you neat, organized and safe . . .Prevents fire hazard . . . Keeps wires from tangling up and shorting . . . Fused and RF bypassed . . . 6 foot, 8 gauge color coded cable . . .

Versatile 5-Way Binding Posts

MFJ-1118

$84.95

MFJ-1118, $84.95. Power two HF and/or VHF rigs and six accessories from your main 12 VDC supply. *Built-in 0-25 VDC voltmeter*. Two pairs 35 amp 5-way binding posts, fused and RF bypassed for transceivers. Six pairs RF bypassed binding posts provide 15 Amps for accessories. Master fuse, ON/OFF switch,"ON" LED. 12½x2¾x2½ in.

MFJ-1116

$59.95

MFJ-1116, $59.95. 8 pairs binding posts, 15A total.Voltmeter, on/off switch.

MFJ-1112

$44.95

MFJ-1112, $44.95. 6 pairs binding posts, 15 Amps total.

MFJ-1117

$64.95

MFJ-1117, $64.95. Powers *four* transceivers simultaneously (two at 35 Amps each and two at 35 Amps combined). 8x2x3 inches.

All PowerPoles™

MFJ-1128

$104.95

MFJ-1128, $104.95. 3 high-current outlets for transceivers. 9 *switched* outlets for accessories. Mix & match included fuses as needed (one-40A, one-25A, four-10A, four-5A, three-1A fuses installed). 0-25 VDC *Voltmeter*. *Extra* contacts, fuses. 12Wx1¼Hx2¾D".

MFJ-1126

$84.95

MFJ-1126, $84.95. 8 outlets, each fused, 40 Amps total. Factory installed fuses: two 1A, three 5A, two 10A, one 25A, one 40A. *0-25 VDC Voltmeter*. Includes *extra PowerPoles®*, *extra* fuses -- *no extra cost*. 9Wx1¼Hx2¾ inches.

MFJ-1129

$114.95

PowerPoles™ AND 5-Way Binding Posts

MFJ-1129, $114.95. 10 outlets each fused, 40 Amp total. 3 high-current outlets for rigs -- 2 *PowerPoles®* and one 5-way binding post. 7 *switched* outlets for accessories (20A max) -- 5 *PowerPoles®* and 2 binding posts. Fuses include (1- 40A, 2-25A, 3-10A, 3-5A, 2-1A installed). *0-25 VDC Voltmeter*. Includes extra *PowerPoles®* and fuses, 12½Wx1¼Hx2¾D inches.

MFJ-1124

$64.95

MFJ-1124, $64.95. 6 outlets each fused, 40 Amps total. 4 *PowerPoles®*, 2 high-current binding posts, Installed fuses: 1-40A, 2-25A, 2-10A, 1-5A, 1-1A. Includes extra *PowerPoles®* & fuses -- *no extra cost.*

15 Amp Continuous

15 Amps continuous, 17 Amps max at 13.8 VDC. Over-voltage, over-current protection. 5-way binding posts. Load fault indicator and automatic shutdown. 90-130 VAC input. 1½ lbs. Tiny 3¾Wx2¼Hx3¾D inches fits easily in an overnight bag.

MFJ-4115

$59.95

30 Amps Continuous

Linear with 19.2 lb.Transformer

This heavy-duty linearly regulated MFJ-4035MV has *abolutely no RF Hash*. It delivers 30 Amps continuous, 35 Amps maximum from its massive 19.2 lb. transformer. Front panel adjustable 1-14 VDC output with convenient detent at 13.8 VDC. Volt/Amp Meters. 1% load regulation, 30 mV ripple. Over-voltage/current/temperature protection, 5-way binding posts, 2 pairs of quick-connects and a covered cigarette lighter socket for mobile accessories. Front panel replaceable fuse. 110 VAC input. 9½Wx6Hx9¾D in.

No RF Hash!

MFJ-4035MV

$149.95

Free MFJ Catalog

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

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

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

Add shipping.

MFJ high-accuracy *Digital* SWR/Wattmeter

MFJ's high-accuracy digital SWR/Wattmeter gives you three 10-bit frequency compensated power ranges!

MFJ-826B
$179.95

New!

An optimum power range is automatically selected. Each range has full 10-bit resolution. A low range (25 Watt full scale), a mid-range (250 Watt full scale) and a high-range (1500 Watts full scale) covers the entire amateur power spectrum with high accuracy.

A built-in frequency counter selects the appropriate frequency compensated data set to insure highest accuracy for each band. It also displays your transmitted frequency and provides digital frequency readout for older rigs and QRP rigs such as MFJ-9420/9040/9340.

True peak or average forward and reflected power, SWR and frequency are *simultaneously* displayed.

Bargraphs makes tuning antenna tuners, amplifiers and transmitters easy. You can select bargraphs to display forward and reflected power *or* forward power and SWR *or* SWR only.

MFJ's PeakHold™ freezes high-est forward power displayed (bar segment also) for 1, 2 or 3 seconds.

MFJ's *TrueActive*™ peak reading circuit gives you *true* peak or average power.

When SWR is greater than 1.5 to 3 (selectable) an alarm LED lights and buzzer sounds.

Has large high-contrast *backlit* LCD display.

Use 12 VDC or 110 VAC with optional MFJ-1312D, $15.95. 6½Wx2⅝Hx6D inches.

MFJ *giant* SWR/Wattmeter

World's *largest HF SWR/Wattmeter has giant 6½ inch meter!*

This one you can SEE! Extra-long scales gives you highly accurate SWR and power measurements. Huge numbers makes reading easy across your shack.

Like your analog watch, one glance at the meter needle gives you fast and accurate readings without actually reading the scale.

MFJ's exclusive *TrueActive*™ peak reading circuit captures *true* peak or average forward and reflected power readings.

Has 20/200/2000 Watt ranges for accurate QRP or QRO operation.

MFJ-868
$149.95

Exclusive MFJ Wattmeter *Power Saver*™ circuit turns on meter only when RF power is being measured.

Covers 1.8-30 MHz. Use 9 volt battery or 12 VDC or 110 VAC with MFJ-1312D, $15.95. 7Wx5½Hx5D in. SO-239 connectors.

New!
Giant 144/220/440 MHz SWR/Wattmeter
MFJ-867, $159.95. Like MFJ-868 giant SWR/Wattmeter, but covers 144/220/440 MHz.

www.mfjenterprises.com . . . World's largest selection of HF/VHF/UHF SWR Wattmeters!

MFJ-822
$59.95

Lighted 3" Cross-Needle Meter, SWR/Watts, 1.8-200 MHz, Fwd/Ref pwr, 30/300W. Compact.

MFJ-862
$59.95

Lighted Cross-Needle Meter, SWR/Watts, 144/220/440 MHz, 30/300 Watts Fwd, 60/6 W Ref.

MFJ-864
$99.95

Lighted Cross-Needle,SWR/Watts, 1.8-60/144/440 MHz, 30/300W Fwd, 6/60W Ref. Hook up HF&VHF/UHF rigs.

MFJ-815C
$89.95

Lighted 3" C/N Meter, SWR/Watts, 1.8-30 MHz, 300/3000W Fwd, 60/600W Ref. True Peak.

MFJ-812B
$39.95

VHF SWR Wattmeter, 2M/220 MHz, built-in field strength meter, Fwd/Ref, Pwr in 2 30/300W ranges.

MFJ-4416B *Super* Battery Booster

Boost battery voltage as low as 9 Volts back up to 13.8 VDC! Keeps your transceiver at full power output, compensates for run down battery, wiring voltage drop, car off . . .

MFJ-4416B
$149.95

Boost battery voltage as low as 9 Volts back up to 13.8 VDC! Keeps your transceiver at full power output, provides full performance/efficiency, prevents output signal distortion and transceiver shutdown. Compensates for run-down battery, wiring voltage drop or when car is off. Provides up to 25 Amps peak with 90% efficiency. Selectable 9/10/11 Volts minimum input voltage prevents battery damage from over-discharging. RF sense turns MFJ-4416B off during receive to save power and increase efficiency. Adjustable 12 to 13.8 VDC output pass-through voltage improves efficiency and lets transceiver run cooler. Has output over-voltage crowbar protection. *Anderson PowerPoles*® and high-current 5-way binding posts for DC input, regulated output. 7¾Wx4Hx2⅛D inches.

100 Watts SSB from *cigarette lighter socket!*

MFJ-4403
$119.95

4-Farad capacitors supply 25 Amps needed for 100 Watts SSB peaks and replenished by 10 Amps average from cigarette lighter socket. Protects against reverse/over voltage, voltage transients, short circuits. Provides super noise/ripple filtering.

MFJ AC Line RFI Filter

Eliminate obnoxious power line and computer hash and noise by 6 S-units!

MFJ-1164B
$79.95

Filters and reduces AC power line RFI, hash, noise, transients, surges generated by computers, motors, RF transmitters, static/lightning by 30 db and up to 60-80 dB with a good earth ground. Super fast, *nano-second* overvoltage protection. Four 3-wire 15A, 120VAC outlets.

Transceiver Surge Protector

MFJ-1163, $69.95. Protects your expensive transceiver from damaging power surges. Capacitive decoupling and *ultra-fast* MOVs protection. 4 AC outlets.

MFJ all-in-one *Transmit Audio Console*

MFJ-655B
$219.95

MFJ all-in-one *Transmit Audio Console* gives you an *8-Band Equalizer* for full quality ragchewing audio *or* powerful, pileup penetrating speech . . . Adjustable *Noise Gate* gives you transparent, back-ground noise reduction . . . Clean low-distortion *Compressor* gives you more powerful, richer, fuller sounding speech and higher average power SSB . . . Smooth *Limiter* keeps audio peaks from over-driving your transmitter, prevents SSB distortion and splatter. *Universal Mic-Interface* lets you use any microphone with any transceiver. Has low-noise preamp, mic voltages, PTT jack, impedance matching, level controls, RF/audio isolation, VU meter, headphone monitor, auxiliary input.

Free MFJ Catalog

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

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

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

http://www.mfjenterprises.com for instruction manuals, catalog, info

MFJ *Speech Intelligibility* Enhancer

. . . makes barely understandable speech highly understandable!

MFJ-616
$189.95

"What did you say?" Can you hear but . . . just can't always understand everything people are saying?

As we get older, high frequency hearing loss reduces our ability to understand speech. Here's why . . .

Research shows that nearly *half* the speech intelligibility is contained in 1000 to 4000 Hz range, but contains a miniscule 4% of total speech energy.

On the other hand, the low frequencies, 125 to 500 Hz have most of the speech energy (55%) but contribute very little to intelligibility -- only 4%.

To dramatically improve your ability to understand speech, you must:

First, drastically increase the speech energy above 500 Hz, where 83% of the speech intelligibility is concentrated.

Second, drastically reduce speech energy below 500 Hz where only 4% of speech intelligibility lies.

The MFJ-616 splits the audio speech band into four overlapping octave ranges centered at 300, 600, 1200 and 2400 Hz. You can boost or cut each range by nearly 20 dB.

A balance control and separate 2½ Watt amplifiers let you equalize perceived loudness to each ear so both ears help.

By boosting high and cutting low frequencies and adjusting the balanced control, speech that you can barely understand become highly understandable!

Even if you *don't* have high frequency hearing loss, you'll dramatically improve your ability to understand speech. You'll get an edge in contesting and DXing and enjoy ragchewing more.

Here's what *QST* for April, 2001 said . . . *"I expected a subtle effect at best, but I was astonished . . . The result was remarkably clean, understandable speech without hissing, ringing or other strange effects . . . made a dramatic improvement . . ."*

Immuned to RFI. Has phone jack, on/off speaker switch, 2 inputs, bypass switch. 10Wx2½Hx6D". Needs 12 VDC.

MFJ-1316, $21.95. For 110 VAC operation. Provides 12 VDC/1.5 Amps.

MFJ-72, $69.80. *All-in-one MFJ-616 Accessory Pack.* Includes MFJ-392 headphones, two MFJ-281 speakers and MFJ-1316 power supply. ***Save $7!***

Try it for 30 Days

Order from MFJ and try it -- No obligation. If not delighted, return it within 30 days for refund less shipping.

MFJ Contest Voice Keyer

Transformer-coupled -- No RFI, hum or feedback . . . 75 seconds total, 5-messages . . . Records received audio . . .

MFJ-434B
$199.95

Let this *new* microprocessor controlled MFJ *Contest Voice Keyer*™ call CQ, send your call and do contest exchanges for you in your own natural voice!

Store frequently used phrases like "CQ Contest this is AA5MT", "You're 59" . . . "Qth is Mississippi" . . . Contest by pressing a few buttons and save your voice.

Record and playback 5 natural sounding messages in a total of 75 seconds. Uses *eeprom* -- no battery backup needed. Use your mic or its built-in mic for recording.

You can repeat messages continuously and vary the repeat delay from 3 to 500 seconds. Makes a great voice beacon and calling CQ is *so* easy.

You can also record and play back off-the-air signals -- great help if you didn't get it right the first time! No more "*Please repeat*".

A playing message can be halted by the *Stop Button*, your microphone's PTT/VOX, remote control or computer.

Has jack for remote or computer control (using CT, NA or other program). Lets you select, play and cancel messages.

Your mic's audio characteristics do not change when your MFJ-434B is installed.

All audio lines are RF filtered to eliminate RFI, audio feedback and distortion. An audio isolation transformer totally eliminates hum and distortion caused by ground loops.

New! **It's** easy to use -- just plug in your 8 pin round or modular mic plug, set the internal jumpers for your transceiver and plug in the appropriate (included) cable for your rig.

Built-in speaker-amplifier. Speaker/phone jack. Use 9 Volt battery, 9-15 VDC or 110 VAC with optional MFJ-1312D, $15.95. 6½Wx2½Hx6½D in.

MFJ-73, $34.95. MFJ-434B Remote Control with cable.

60 dB Null *wipes out* noise and interference

MFJ-1026
$199.95

Wipe out noise and interference *before* it gets into your receiver with a 60 dB null!

Eliminate all types of noise -- severe power line noise from arcing transformers and insulators, fluorescent lamps, light dimmers, touch controlled lamps, computers, TV birdies, lightning crashes from distant thunderstorms, electric drills, motors, industrial processes . . .

It's *more effective* than a noise blanker! Interference much stronger than your desired signal can be completely removed without affecting your signal.

It works on *all modes* -- SSB, AM, CW, FM -- and frequences from BCB to lower VHF.

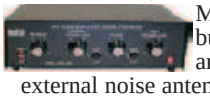
You can null out strong QRM on top of weak rare DX and then work him! You can null out a strong local ham or AM broadcast station to prevent your receiver from overloading.

Use the MFJ-1026 as an *adjustable phasing network.* You can combine two antennas to give you various directional patterns. Null out a strong interfering signal or peak a weak signal at a push of a button.

Easy-to-use! Plugs between transmitting antenna and transceiver. To null, adjust amplitude and phase controls for minimum S-meter reading or lowest noise. To peak, push reverse button. Use built-in active antenna or an external one. MFJ's exclusive *Constant Amplitude Phase Control*™ makes nulling easy.

RF sense T/R switch automatically bypasses your transceiver when you transmit. Adjustable delay time. Uses 12 VDC or 110 VAC with MFJ-1312D, $15.95. 6½x1½x6¼ in.

MFJ-1025, $179.95. Like



MFJ-1026 less built-in active antenna, use external noise antenna.

MFJ *tunable* Super DSP filter

MFJ-784B
$279.95

Only MFJ gives you *tunable* and *programmable* "brick wall" DSP filters.

You can continuously *tune* low pass, high pass, notch and bandpass filters and continuously *vary* bandwidth to pinpoint and eliminate interference.

Only MFJ gives you 5 factory pre-set and 10 programmable pre-set filters you can customize. **Automatic** notch filter searches for and eliminates multiple heterodynes. Advanced adaptive noise reduction silences background noise and QRM.

Free MFJ Catalog

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

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

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

http://www.mfjenterprises.com *for instruction manuals, catalog, info*

License Study Materials

Technician Class

Exam: 35-question Technician test (Element 2)
NEW! The ARRL Ham Radio License Manual—Revised 2nd Edition. Ham radio's most popular license manual! Organized in easy-to-understand "bite-sized" sections, this is all you need to become an Amateur Radio operator. **Now including practice exam software on CD-ROM.**
Order No. 0977 ..... **$29.95**
ARRL's Tech Q & A—5th Edition. Order No. 0847 ..... $17.95
Ham Radio for Dummies. Order No. 9392 ..... **$21.99**
Technician Class Flash Card Set. Order No. 1345 ..... **$24.95**

General Class (upgrade from Technician)

Exam: 35-question General test (Element 3)
NEW! The ARRL General Class License Manual—Revised 6th Edition. Now including practice exam software.
Order No. 8690 ..... **$29.95**
ARRL's General Q & A—3rd Edition.
Order No. 9957 ..... **$17.95**
General Class Flash Card Set. Order No. 1357 ..... **$39.95**

Extra Class (upgrade from General)

Exam: 50-question Extra test (Element 4)
NEW! The ARRL Extra Class License Manual—Revised 9th Edition.
Achieve the highest level of Amateur Radio licensing! **Now including practice exam software**.
Order No. 8874 ..... **$29.95**
ARRL's Extra Q & A— 2nd Edition. Order No. 1379 ..... **$17.95**
Extra Class Flash Card Set. Order No. 1366 ..... **$39.95**

Operating and Reference

The ARRL Operating Manual—9th Edition. The MOST COMPLETE book about Amateur Radio Operating. It contains everything you need to explore new activities, lean new skills, find new references, and more.
Order No. 1093 ..... **$29.95**
NEW! ARRL Repeater Directory®—2011/2012 Edition.
Pocket-sized (3.75" x 5.25"), Order No. 1769 ..... **$10.95**
Desktop Edition (6" x 9"), Order No. 1936 ..... **$15.95**
NEW! TravelPlus for Repeaters™—2011-2012 Edition. CD-ROM, version 15.0. Order No. 7921 ..... **$39.95**
The ARRL DXCC List. May 2009 Edition. Order No. 8256 ..... **$5.95**
The ARRL DXCC Handbook. Order No. 9884 ..... **$19.95**
DXing on the Edge. Order No. 6354 ..... **$19.95** ~~$29.95~~
RF Exposure and You. Order No. 6621 ..... **$22.95**
50 Years of Amateur Radio Innovation. Order No. 0228 ..... **$39.95**
50 Years of Amateur Radio CD-ROM. Order No. 3558 ..... **$19.95**
Hints & Kinks. 17th Edition. Order No. 9361 ..... **$17.95**
Low Profile Amateur Radio. 2nd Edition. Order No. 9744 ..... **$19.95**
The ARRL Field Day Handbook. Order No. 0885 ..... **$19.95**
FCC Rules and Regulations. 2nd Edition. Order No. 1173 ..... **$5.95**
Getting Started with Ham Radio. Order No. 9728 ..... **$19.95**
The ARRL Software Library for Hams. CD-ROM, version 3.0
Order No. 1424 ..... **$19.95**
Amateur Radio on the Move. Order No. 9450 ..... **$19.95**
Storm Spotting and Amateur Radio. Order No. 0908 ..... **$22.95**
ARRL's Vintage Radio. Order No. 9183 ..... **$19.95**
Your Introduction to Morse Code. Order No. 8314 ..... **$12.95**
Two-Way Radios & Scanners for Dummies. Order No. 9696 ..... **$21.99**
Passport to World Band Radio. 2009 Edition. Order No. 0339 ..... **$22.95**
NEW! 2011 Super Frequency List on CD-ROM. Order No. 0137 ..... **$44.95**
NEW! 2011 Shortwave Frequency Guide. Order No. 0113 ..... **$59.95**
Remote Operating for Amateur Radio. Order No. 0992 ..... **$22.95**
Pocket Ref (by Glover). Order No. 1148 ..... **$12.95**
Marine Amateur Radio. Order No. 9723 ..... **$12.95**
Shortwave DX Handbook. Order No. 9953 ..... **$34.95**
A Year of DX. Order No. 0040 ..... **$20**
The Complete DX'er. Order No. 9073 ..... **$19.95**

MAPS

ARRL Map of North America. 27 x 39 inches. Includes grids!
Order No. 8977 ..... **$15**
ARRL Map of the World (Azimuthal). 27 x 39 inches.
Order No. 7717 ..... **$15**
ARRL Map of the World (Robinson). 26 x 34.5 inches.
Order No. 8804 ..... **$15**
ARRL Worked All States (WAS) Map. 11 x 17 inches. ARRL Frequency Chart on reverse side. Order No. 1126 ..... **$3**
The Radio Amateur's World Atlas. Order No. 5226 ..... **$12.95**

NEW! RSGB Amateur Radio Operating Manual. Order No. 2300 ..... **$29.95**
RSGB IOTA Directory. Order No. 0112 ..... **$19.95**
RSGB 6 Metre Handbook. Order No. 0340 ..... **$24.95**
RSGB LF Today. 2nd Edition. Order No. 0220 ..... **$24.95**
RSGB Radio Orienteering. Order No. 0131 ..... **$19.95**
NEW! RSGB Prefix Guide. 9th Edition.
Order No. 0180 ..... **$19.95**
RSGB Morse Code for Radio Amateurs. Order No. 0221 ..... **$15.95**

Antennas and Transmission Lines

The ARRL Antenna Book—21st Edition. The ultimate reference for Amateur Radio antennas, transmission lines and propagation. **CD-ROM included.**
Softcover. Order No. 9876 ..... **$44.95**
Basic Antennas. Order No. 9994 ..... **$29.95**
International Antenna Collection.
Volume 1. Order No. 9156 ..... **$19.95**
Volume 2. Order No. 9465 ..... **$21.95**
The ARRL Antenna Designer's Notebook.
Order No. 1479 ..... **$34.95**
NEW! ON4UN's Low-Band DXing. 5th Edition. Order No. 8560 ..... **$44.95**
Antenna Towers for Radio Amateurs. Order No. 0946 ..... **$34.95**
The ARRL Guide to Antenna Tuners. Order No. 0984 ..... **$22.95**
ARRL's Yagi Antenna classics. Order No. 8187 ..... **$17.95**
Simple and Fun Antennas for Hams. Order No. 8624 ..... **$22.95**
ARRL's Wire Antenna Classics. Order No. 7075 ..... **$14**
More Wire Antenna Classics—Volume 2. Order No. 7709 ..... **$17.95**
More Vertical Antenna Classics. Order No. 9795 ..... **$17.95**
Vertical Antenna Classics. Order No. 5218 ..... **$12**
ARRL's VHF/UHF Antenna Classics. Order No. 9078 ..... **$14.95**
ARRL Antenna Compendium. Vol. 1. Order No. 0194 ..... **$20**
ARRL Antenna Compendium. Vol. 2. Order No. 2545 ..... **$14**
ARRL Antenna Compendium. Vol. 3. Order No. 4017 ..... **$14**
ARRL Antenna Compendium. Vol. 4. Order No. 4912 ..... **$20**
ARRL Antenna Compendium. Vol. 5. Order No. 5625 ..... **$20**
ARRL Antenna Compendium. Vol. 6. Order No. 7431 ..... **$22.95**
ARRL Antenna Compendium. Vol. 7. Order No. 8608 ..... **$24.95**
ARRL Antenna Compendium. Vol. 8. Order No. 0991 ..... **$24.95**
RSGB Practical Wire Antennas. Order No. R878 ..... **$17**
RSGB Practical Wire Antennas 2. Order No. 9563 ..... **$24.95**
RSGB HF Antennas for Everyone. Order No. 0145 ..... **$24.95**
RSGB HF Antennas for All Locations. Order No. 4300 ..... **$34.95**
RSGB Antennas for VHF and Above. Order No. 0501 ..... **$29.95**
RSGB Building Successful HF Antennas.
Order No. 0800 ..... **$34.95**
RSGB The Antenna Experimenter's Guide.
Order No. 6087 ..... **$34.95**
RSGB HF Antenna Collection. Order No. 3770 ..... **$34.95**
NEW! RSGB Stealth Antennas. Order No. 3208 ..... **$24.95**
RSGB Backyard Antennas. Order No. RBYA **$34.95**
RSGB Radio Propagation - Principles and Practice.
Order No. 9328 ..... **$29.95**
Antennas: Fundamentals, Design, Measurement. Standard Edition.
Order No. 0320 ..... **$99**
Antennas: Fundamentals, Design Measurement. Deluxe Edition.
Order No. 0175 ..... **$149**
Tower Climbing Safety & Rescue. Order No. 1108 ..... **$29.95**
Electronic Applications of the Smith Chart. Order No. 7261 ..... **$75**
Radio-Electronic Transmission Fundamentals.
Order No. RETF **$89**
Transmission Line Transformers. Order No. TLT4 ..... **$59**
Transmission Line Transformers. CD-ROM. Order No. 9088 ..... **$129**

CD-ROM Collections

QST on CD-ROM!

2010 Periodicals on CD-ROM. Order No. 2001 ..... **$24.95**
2009 Periodicals on CD-ROM. Order No. 1486 ..... **$24.95**
2008 Periodicals on CD-ROM. Order No. 9406 ..... **$24.95**
2007 Periodicals on CD-ROM. Order No. 1204 ..... **$19.95**
2006 Periodicals on CD-ROM. Order No. 9841 ..... **$19.95**
2005 Periodicals on CD-ROM. Order No. 9574 ..... **$19.95**
2004 Periodicals on CD-ROM. Order No. 9396 ..... **$19.95**
2003 Periodicals on CD-ROM. Order No. 9124 ..... **$19.95**
2002 Periodicals on CD-ROM. Order No. 8802 ..... **$19.95**
2001 Periodicals on CD-ROM. Order No. 8632 ..... **$19.95**
2000 Periodicals on CD-ROM. Order No. 8209 ..... **$19.95**
1999 Periodicals on CD-ROM. Order No. 7881 ..... **$19.95**
1997 Periodicals on CD-ROM. Order No. 6729 ..... **$19.95**
1996 Periodicals on CD-ROM. Order No. 6109 ..... **$19.95**
1995 Periodicals on CD-ROM. Order No. 5579 ..... **$19.95**
Callbook CD-ROM. Winter 2011 Edition. Order No. 0210 ..... **$49.95**
HamCall™ CD-ROM. Order No. 8991 ..... **$49.95**

Continued on page 134

VECTRONICS RF Accessories

300 Watt Antenna Tuner

VC-300DLP
$179.95

VECTRONICS uses the finest components available to build the highest quality 300 Watt antenna tuner ever made.

You can tune any *real* antenna 1.8-30 MHz. Custom 48 position switched inductor and 1000 Volt variable capacitors provide arc-free operation. Handles 300 Watts PEP SSB, (150 Watts on 1.8 MHz).

8 position antenna switch, 50 Ohm dummy load, peak reading backlit Cross-Needle SWR Power meter, 4:1 balun for balanced lines. Scratch-proof Lexan front panel. 10.2x9.4x3.5 inches. 3.4 pounds.

300 Watt Mobile Tuner

VC-300M
$129.95

The VC-300M *Mobile* Antenna Tuner is compact, lightweight, easy-to-operate and is our most economical tuner.

It's compatible with *any* mobile antenna, any HF transceiver and fits in the smallest car. It can also be used at home with any coax fed antennas -- dipoles, vees, verticals, beams or quads.

Backlit Cross-Needle meter simultaneously monitors Forward/Reflected power and SWR. Covers 1.8 to 30 MHz.

Handles 300 Watts SSB PEP, 200 Watts continuous, (150 Watts on 1.8 MHz). 7.25x8.75x3.6 inches. 3.4 pounds.

SWR/Power Meters

PM-30
$89.95
PM-30UV
$99.95

PM-30, $89.95, for 1.8 to 60 MHz.
Displays forward/reflected power, SWR simultaneously on Cross-Needle meter. True shielded directional coupler assures accuracy. Backlit meter displays peak or average power in 300/3000 Watt ranges. First-rate construction, scratch-proof case, durable paint, Lexan front panel. Lamp switch. SO-239 connectors. 5.3x5.75x3.5 in.

144/220/440 MHz, 30/300 SWR/Wattmeters
PM-30UV, $99.95, SO-239 connectors.
PM-30UVN, $99.95, N connectors.
PM-30UVB, $99.95, BNC connectors.

1.5 kW *dry* Dummy Load

DL-650M, $79.95
100 Watts continuous 1500 W/10 seconds to 650 MHz. *Ceramic* resistor. SWR less than 1.3. SO-239s. **DL-650MN, $84.95** has N connectors.

Low Pass TVI Filter

LP-30, $89.95
Eliminates TVI by attenuating harmonics at the source. Plugs between transmitter and antenna or tuner. Handles 1.5 kW.

High Pass TVI Filter

HPF-2, $34.95
Installs between VCR/TV and cable TV/antenna cable. Eliminates or reduces interference caused by nearby HF transmitters.

http://www.vectronics.com
Nearest Dealer, Free catalog, To Order . . .
800-363-2922
Voice: 662-323-5800 **Fax:** 662-323-6551

VECTRONICS®
300 Industrial Park Road,Starkville, MS 39759, USA

VECTRONICS . . . the finest amateur radio products made!

MIRAGE. . .160 Watts on 2 Meters!

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 in.

B-5018-G
$329

B-1018-G, $409. MIRAGE's most popular *dual purpose* HT/mobile/base amp. 160 Watts out/10W in. For 0.25-10W rigs.

B-2518-G, $329. Like B-5018-G but for 10-25 Watt mobile/base. 160W out/25W in.

RC-2, $49. Remote Control. On/Off, preamp On/Off, selects SSB/FM. 25 ft. 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

FCC Type Accepted

6 Meter Amplifier

A-1015-G, $389, *world's most popular* all mode FM/SSB/CW 6 Meter amplifier. 150 Watts out/10W in. For 1-15 W transceivers. 20 dB GaAsFET preamp.

300 Watts on 2-Meters, $739

3 models: 300 Watts out for 10, 25, or 50 Watts in. FM/SSB/CW. 15/20 dB gain, *GaAsFET* preamp.

Repeater Amps

11 models: *continuous* duty FM/SSB/CW *Repeater* Amps for 6, 2, 1¼ Meters, 70 cm, 450 MHz, ATV.

70 cm Amplifiers (420-450 MHz)

D-3010-N, $389 -- 100 W out/30W in. For 5-45 Watt *mobile/base*. **D-1010-N, $419**, 100W out/10W in. *Dual purpose* -- for handhelds or mobile/ base. **D-26-N, $299**, 60W out/2W in, for *handhelds*.

Low Noise GaAsFET preamps

High gain ultra low noise *GaAsFET* preamps for receiving weak signals. Selectable 15-22 dB gain prevents intermod. < 0.8 dB noise figure, auto RF switching to 160W.

In-shack or Mast-Mount models.

Frequency, MHz	*In Shack, $149.95*	*MastMount,$199.95*
28-30	KP-1/10M	KP-2/10M
50-54	KP-1/6M	KP-2/6M
144-148	KP-1/2M	KP-2/2M
220-225	KP-1/220	KP-2/220
430-450	KP-1/440	KP-2/440

Commercial Amps, $159 to $429

Commercial Amps for 150-174, 450-470 MHz, VHF marine bands, 70-130 Watts out.

Amateur TV Amps

Industry standard ATV amps: **D-1010-ATVN, $439**, 82 W PEP out/10W in. **D-100-ATVN, $449**, 82W PEP out/2W in. (without sync compression).

Accurate SWR/Wattmeters

Read SWR directly and Forward/ Reflected, Peak/Average power. Remote coupler. 1.8-30, 50-200, 420-450, 1260-1300 MHz band models.

1¼ Meter Amps (223-225 MHz)

10 models -- 20-220 Watts out for 2-50W in, $169-$739.

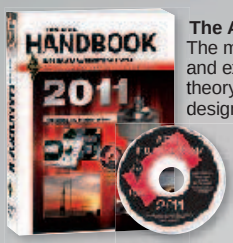
http://www.mirageamp.com
Nearest Dealer, Free catalog, To Order . . .
800-647-1800
Tech: 662-323-8287 **Fax:** 662-323-6551

300 Industrial Park Rd
Starkville, MS 39759

MIRAGE

ARRL Publications—continued from page 132

Practical Circuits and Design



The ARRL Handbook—2011 Edition.
The most comprehensive guide to radio electronics and experimentation. Part reference and part applied theory, it is filled with electronic fundamentals, RF design, digital and software radio technology, and antenna construction. **Always Revised!** This 88th edition includes new topics, project material, and expanded content.
CD-ROM Included! (version 15.0)
Softcover. Book and CD-ROM.
Order No. 0953 ..... $49.95

Understanding Basic Electronics. 2nd Edition.
Order No. 0823 ..... **ARRL Member Price $29.95** ..... ~~$32.95~~
Basic Radio—Understanding the Key Building Blocks.
Order No. 9558 ..... **$29.95**
Digital Signal Processing Technology.
Order No. 8195 ..... **$34.95** ..... ~~$44.95~~
ARRL's Hands-On Radio Experiments. Order No. 1255 ..... **$19.95**
Hands-On Radio Parts Kit. Order No. 1255K **$79.95**
The ARRL RFI Book. 3rd Edition. Order No. 0915 ..... **$29.95**
Experimental Methods in RF Design. Revised 1st Edition.
Order No. 9239 ..... **$49.95**
ARRL's Pic Programming for Beginners. Revised 1st Edition.
Order No. 0892 ..... **ARRL Member Price $39.95** ..... ~~$44.95~~
NEW! ARRL PIC Programming Kit. Order No. 0030 ..... **$149.95**
NEW! ARRL Morse Code Oscillator Kit. Order No. 0022 ..... **$22.95**
NEW! Morse Code Key. Order No. 0242 ..... **$15.95**
Keyer Touch Paddle Kit. Order No. 0670 ..... **$49.95**
MFJ 20-meter CW Cub Transceiver Kit. Order No. 0018 ..... **$89.95**
L/C/F and Single-Layer Coil Winding Calculator. Order No. 9123 ..... **$12.95**
Introduction to Radio Frequency Design. Order No. 4920 ..... **$39.95**
ARRL's RF Amplifier Classics. Order No. 9310 ..... **$19.95**
More QRP Power. Order No. 9655 ..... **$19.95**
QRP Romps. Order No. 0160 ..... **$18**
ARRL's Low Power Communication. 3rd Edition. Order No.1042 ..... **$19.95**
ARRL's Low Power Communication with Cub CW Transceiver Kit.
Order No.1042K **$99.95**
Do-It-Yourself Circuitbuilding for Dummies. Order No. 0015 ..... **$24.99**
Electronics for Dummies. 2nd Edition. Order No. 0196 ..... **$24.99**
Electronics Projects for Dummies. Order No. 9944 ..... **$24.99**
Practical Digital Signal Processing. Order No. 9331 ..... **$46.95**
Power Supply Handbook. Order No. 9977 ..... **$29.95**
Electromagnetic Compatibility Engineering. Order No. 0192 ..... **$120**
Discrete-Signal Analysis and Design. Order No. 0140 ..... **$125**
RF Components and Circuits. Order No. 8759 ..... **$50.95**
Practical Radio Frequency Test & Measurement. Order No. 7954 ..... **$66.95**
Communications Receivers. Order No. CR3E **$94.95**
Radio Receiver Design. Order No. RRCD **$95**
HF Radio Systems & Circuits. Order No. 7253 ..... **$89**
Build Your Own Low-Power Transmitters. Order No. 9458 ..... **$54.95**
AC Power Interference Handbook. Order No. 1103 ..... **$34.95**
Power Supply Cookbook. Order No. 8599 ..... **$54.95**
Instruments of Amplification. Order No. 9163 ..... **$19.95**
RSGB Homebrew Cookbook. Order No. 0232 ..... **$24.95**
NEW! RSGB Elimination of Electrical Noise. Order No. 1082 ..... **$12.95**
RSGB International QRP Collection. Order No. 0020 ..... **$24.95**
RSGB Weekend Projects for the Radio Amateur. Order No. 0123 ..... **$24.95**

Digital and Image Communications

VHF Digital Handbook— 1st Edition.
Everything you need to get started in digital radio applications. Includes Packet Radio, APRS, D-Star, digital applications in public service and emergency communications, and more!
Order No. 1220 ..... **$19.95**
ARRL's HF Digital Handbook. 4th Edition.
Order No. 1034 ..... **$19.95**
VoIP: Internet Linking for Radio Amateurs. 2nd Edition.
Order No. 1431 ..... **$24.95**
GPS and Amateur Radio. Order No. 9922 ..... **$18.95**
The ARRL Image Communications Handbook.
Order No. 8616 ..... **$19.95** ..... ~~$25.95~~
Your Guide to HF Fun. Order No. 0153 ..... **$16**
RSGB RTTY/PSK31 for Radio Amateurs. Order No. 0329 ..... **$15.95**
Nifty E-Z Guide to PSK31 Operation. Order No. 0370 ..... **$12.95**
Nifty E-Z Guide to D-STAR Operation. Order No. 0125 ..... **$13.95**
Digital Communication Systems *Using SystemVue*.
Order No. 1084 ..... **$49.99**

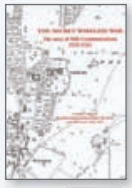
Public Service and Emergency Communications

The ARRL Digital Technology for Emergency Communications Course.
CD-ROM, version 1.0 Order No. 1247 ..... **$49.95**
The ARRL Emergency Communications Handbook. Order No. 9388 ..... **$19.95**
The ARRL Emergency Communication Library. CD-ROM, version 1.0
Order No. 9868 ..... **$19.95**
ARES Field Resource Manual. Order No. 5439 ..... **$12.95**
Emergency Power for Radio Communications. Order No. 9531 ..... **$19.95**
Amateur Radio Emergency Communications Course Book Level 1.
Order No. 8462 ..... **$19.95**
PR-101 Course on CD-ROM. Order No. 0133 ..... **$19.95**
ARES Hat. Order No. 0099 ..... **$14.95**
ARES Mesh Vest. (M-3XL) Order No. 0128 ..... **$15.95**
ARES Solid Vest with Pockets. (M-3XL) Order No. 0136 ..... **$24.95**

Space and VHF/UHF/Microwave Communications

The ARRL Satellite Handbook. Order No.9857 ..... **$24.95**
NOVA for Windows. CD-ROM. Order No. 8754 ..... **$59.95**
RSGB Radio Nature. Order No. 0240 ..... **$24.95**
The ARRL UHF/Microwave Projects CD. Order No. 8853 ..... **$24.95**
International Microwave Handbook. 2nd Edition. Order No. 0330 ..... **$29.95**
RSGB VHF/UHF Handbook. 2nd Edition. Order No. 1229 ..... **$29.95**
RSGB Microwave Projects. Order No. 9022 ..... **$29.95**
RSGB Mocrowave Know How. Order No. 0303 ..... **$21.95**

History and Adventure



The Secret Wireless War— Softcover Edition.
The Story of MI6 Communications--1939-1945 (World War II). This is an extraordinary story that includes hams among those patriots that undoubtedly helped the allied war effort.
Order No. 0262 ..... **$39.95**
Edgar Harrison. Order No. 0270 ..... **$29.95**
YASME--The Danny Weil and Colvin Radio Expeditions.
Order No. 8934 ..... **$24.95**
Hiram Percy Maxim. Order No. 7016 ..... **$19.95**
200 Meters and Down. Order No. 0011 ..... **$12**
The Gil Cartoon Book. Order No. 0364 ..... **$15.95**
The Story of W6RO and the Queen Mary. DVD Order No. 1344 ..... **$15.95**
Crystal Clear. Order No. 0353 ..... **$58.50**
Don C. Wallace: W6AM, Amateur Radio's Pioneer. Order No. 0016 ..... **$29.95**
World War II Radio Heroes: Letters of Compassion.
Order No. 1268 ..... **$15.95**
Perera's Telegraph Collector's Guide. Order No. 1277 ..... **$19.95**
Perera's Telegraph Collectors Reference CD-ROM. Order No. 1282 ..... **$15**
The Story of the Enigma CD-ROM. Order No. 1296 ..... **$15**
NEW! Inside Enigma. Order No. 0611 ..... **$19.95**
Keys II: The Emporium. Order No. 1372 ..... **$16**
Keys III: The World of Keys. Order No. 1381 ..... **$18**
Full Circle: A Dream Denied, A Vision Fulfilled. Order No. 0152 ..... **$13.95**
Frozen in Time. Order No. 0098 ..... **$16.99**

Ordering Information

For a complete publications listing or to place an order, please contact us:

1. To order or obtain the address of an ARRL Dealer near you, call toll-free (US): **1-888-277-5289** (non-US call **860-594-0355**) 8 AM-5 PM Eastern time, Monday-Friday.
2. Fax **1-860-594-0303** 24 hours a day, 7 days a week.
3. By mail to: ARRL, 225 Main St, Newington CT 06111-1494
4. Visit our World Wide Web site: **http://www.arrl.org/shop**

Shipping and Handling Rates:
Add the following amounts to your order to cover shipping and handling (S/H). US orders will be shipped via a ground delivery method. Orders outside of the US will be shipped via an international delivery service. Express delivery options and other specialty forwarding services are available. Please call, write or email for more information.

Order Value	US	International Economy 2-4 weeks delivery
Up to $20.00	$7.50	$15.00
$20.01 to $50.00	$10.50	$25.00
$50.01 to $250.00	$12.50	$35.00
Single CD-ROM	First Class Mail $2.75	n/a
Over $250	Contact ARRL for shipping options and rates: **orders@arrl.org**	

Sales Tax:
CT add 6% state sales tax (including S/H). VA add 5% sales tax (excluding S/H). Canadian Provinces NS, NB and NL add 13% HST (excluding S/H), all other Provinces add 5% GST (excluding S/H).

We accept the following major credit cards: American Express, MasterCard, Visa and Discover. Prices and product availability are subject to change without notice.

ARRL The national association for AMATEUR RADIO™

SHOP DIRECT *or call for a dealer near you.*
ONLINE WWW.ARRL.ORG/SHOP
ORDER TOLL-FREE 888/277-5289 (US)

The ARRL National Convention hosted by Ham-Com

June 10-11, 2011 at the
Plano Centre in Plano, Texas
www.arrl.org/expo www.hamcom.org

PROGRAM HIGHLIGHTS

Ham-Com – "The BIGGEST Hamfest in Texas," will feature equipment dealers, manufacturers, forums, license examinations, transmitter hunts and more. Tailgate Market opens at 7 AM each day!

ARRL EXPO 2011 – A special exhibit area including ARRL program representatives, activities and a huge ARRL bookstore.

DXCC Card Checking – and other ARRL operating awards.

W5DXCC Dinner – Friday evening, sponsored by the Lone Star DX Association.

ARRL Youth Activities and Youth Lounge

Boy Scout One-day Radio Merit Badge Program – sponsored by Ham-Com.

W1AW/5 Special Event Station

ARRL Wouff Hong Ceremony

...and much more!

See **www.arrl.org/expo** for lodging options and links to travel information.

ARRL
The national association for
AMATEUR RADIO™

Photo by Loudoun Amateur Radio Group - K4LRG.ORG

TICKETS

www.hamcom.org
Purchase advance tickets online by May 31.

General admission
in advance $8
at the door $10

Additional family members
in advance $6
at the door $8

Children 12 and under and uniformed Scouts are FREE.

Visit hamcom.org for exhibit booth reservations.

Tailgaters $8 per space per day, first-come, first-served.

ARRL SPECIAL GUEST

Riley Hollingsworth, K4ZDH

Before his retirement from the Federal Communications Commission in 2008, Riley Hollingsworth was recognized as the man who embodied Amateur Radio Enforcement. Today, he continues to champion good amateur practice, responsibility for our radio spectrum privileges, and respect for the Amateur Radio Service as part of the American heritage.

Riley, K4ZDH, will give the ARRL National Convention keynote address.

NEARBY

Historic downtown Plano

Interurban Railway Museum

The Shops at Legacy

Bring your family & friends!

Southfork Ranch

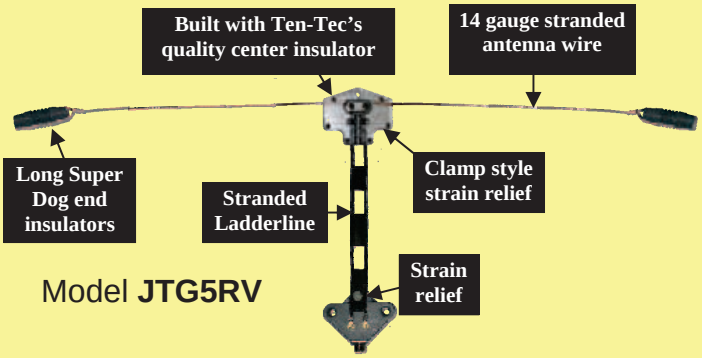
R&L Electronics®

1315 Maple Ave HAMilton, Oh 45011
http://randl.com sales@randl.com
Local/Tech 513-868-6399
Fax 513-868-6574
(800)221-7735

JETSTREAM

Premium G5RV

10-80 meters
102' overall length

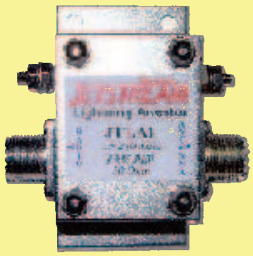


Model **JTG5RV**

$69.95

JETSTREAM

Lightning Arrestors



$43.95

JTLA1	JTLA2
1.5-200 mHz	30-500 mHz
8kW PEP, 4kW DC	3kW PEP, 1.5kW DC

The JTLA1/2 essentially converts your antenna to a DC grounded antenna. So it is constantly working. It does not wait for a surge of voltage. It is constantly draining any voltage transients to ground. It has a backup gas discharge device for exceptionally large or fast rise impulses. Since the JTLA2 is constantly draining any surges to ground, it will reduce some unwanted hash noise.

ICOM

IC718

The HF bands allow you to communicate over long distances covering many km even to the other side of the world. With the superior performance found in the IC-718 such as wide dvnamic range, high C/N ratio, and full duty operation you will find making these contacts easy. Experience the combination of the latest RF and digital technology, along with the size and simplified operation. You will see the IC-718 will be the most practical rig you will ever own.

AH4 Auto Tuner 319.95
CT17 Level Converter 142.95
FL52A 500Hz CW filter 204.95
MB23 Carrying Handle 16.95
UT102 Voice Synthesizer 67.95

IC2820H

Wideband receiver with simultaneous receive capability, Diversity receive capability, 50W on VHF and UHF, Separate controller from main unit, 522 memory channels, Band scope function, Optional D-Star operation.

CS2820 Programming Software 38.95
MB65 Mounting Base 35.95
OPC478UC USB Cloning Cable 52.95
OPC589 8 pin modular adapter 36.95
OPC1663 Separation Cable 11.2ft 15.95
UT123 Digital/GPS Unit 289.95

IC7000

IF DSP, AGC Loop Management, Digital IF filter, 2 point manual notch filter, Digital noise reduction, Digital noise blanker, 35W output on 70cm band, High stability crystal unit, Direct digital synthesizer circuit, Compact, all in one package, User friendly key allocation, Digital voice recorder, Built-in RTTY demodulator, 2.5 inch color TFT display.

AT180 Auto Tuner 444.95
CT17 Level Converter 142.95
OPC589 Modular 8 pin mic adapter 36.95
RMK7000 Remote Kit 74.95
SM20 Desk Mic 209.95

IC92AD

Rugged submersible protection, Optional GPS speaker microphone, Wideband receiver with dualwatch capability, 5 watt output, Simple bandscope, Built in voice recorder, Large dot matix display, One touch reply button, Keypad navigation, Optional PC remote control capability.

BC177 Rapid Charger 68.95
BP256 7.4V @ 1620mAh Li-Ion 86.95
BP257 AA Battery Case 36.95
HM175GPS Wtrprf spkr mc w/GPS 229.95
HM75A Speaker Mic w/Remote 63.95
HS85 Headset w/VOX, PTT 93.95
LC168 Carrying Case 29.95
RS92 Remote control software 82.95

ICT70A

Rugged 2m/70cm HT, 700mW loud audio, Long Lasting Battery Life, External DC Power Jack, 302 Memory Channels, CTCSS Built-in, Internal VOX function, PC Programmable with Optional CST70.

BC193 Rapid Charger 50.95
BP263 AA Battery Case 26.95
BP265 7.4V @ 1900mAh Li-Ion 46.95
CP19R Cigarette Lighter Adapter 42.95
CST70 Programming Software 37.95
HM131 Speaker Mic 37.95
OPC478UC USB Programming Cable 52.95

MFJ *Pocket size* Morse Code Reader™

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

Is your CW rusty?

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

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

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

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

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

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

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

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

MFJ-461 $89.95

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

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

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

Uses 9 Volt battery. Fits in your shirt pocket with room to spare - smaller than a pack of cigarettes. Tiny $2^{1}/_{4}$x$3^{1}/_{4}$x1 inches. $5^{1}/_{2}$ ounces.

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

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

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

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

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

MFJ Morse Code *Reader and Keyer* Combination

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

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

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

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

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

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

MFJ Iambic Paddles

MFJ-564 Chrome
MFJ-564B Black
$69.95

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

***Miniature* Travel Iambic Paddle**

MFJ-561, $24.95. $1^{3}/_{4}$W x $1^{3}/_{4}$D x $^{3}/_{4}$H inches. *Formed* phosphorous bronze spring paddle, stainless steel base. 4 ft. cord, 3.5 mm plug.

MFJ Code Oscillator

MFJ-557 $39.95

MFJ-557 Deluxe Code Practice Oscillator has a Morse key and oscillator unit mounted together on a heavy steel base -- stays put on your table! Portable. 9-Volt battery or 110 VAC with MFJ-1312D, $15.95. Earphone jack, tone and volume controls, speaker. Adjustable key. Sturdy. $8^{1}/_{2}$x$2^{1}/_{4}$x$3^{3}/_{4}$ inches.

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

MFJ *Pocket* Morse Tutor

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

MFJ-418 $89.95

MFJ Deluxe CW Keyer

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

MFJ-407D $79.95

MFJ-401D, $69.95. Econo Keyer II has front-panel volume/speed controls (8-50 wpm), tune switch. Internal adjust weight, tone. Solid state keying. Tiny 4x2x$3^{1}/_{2}$ inches.

Keyer/Paddle Combo

MFJ-422D $189.95

Best of all CW worlds -- a *deluxe MFJ Curtis*™ *keyer* that fits right on *Bencher paddle*! Adjustable weight and tone, front panel volume and speed controls (8-50 WPM), built-in dot-dash memories, speaker, sidetone, semi-automatic/tune or automatic modes. Use 9V battery or 110 VAC with MFJ-1312D, $15.95. $4^{1}/8$x$2^{5}/8$x$5^{1}/4$ in.

MFJ-422DX, $99.95.

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

MFJ *ClearTone*™ Speaker

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

MFJ 24/12 Hour Station Clock

MFJ-108B, $21.95. Dual 24/12 hour clock. Read UTC *and* local time *at-a-glance*. High-contrast 5/8" LCD, brushed aluminum frame. Batteries included. $4^{1}/_{2}$Wx1Dx2H in.

Free MFJ Catalog

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

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

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

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

RigExpert AA-54 Antenna Analyzer

- 0.1 to 54 MHz
- Graphical display
- Hand-held design
- Connection to a personal computer

Worldwide Distributors

Array Solutions
www.arraysolutions.com

Rig Expert Canada
www.rigexpert.net

KMK UK Limited
www.mixw.co.uk

リグエキスパート ジャパン
www.ja1scw.jp/shop

Antenna Analyzers

USB Transceiver Interfaces

www.rigexpert.com

Send your voice to the world with a mobile radio.

Work a D-STAR repeater and you're tied in to worldwide communications, whether you're using a D-STAR mobile or handheld radio. Enjoy advanced digital communication with D-STAR transceivers.

Feature-rich mobile with optional GPS receiver

VHF/UHF DUAL BAND TRANSCEIVER

IC-2820H D-STAR optional

- 50/15/5 Watt Output
- RX: 118–549.995, 118–173.995, 375–549.999, 810–999.990MHz*
- 522 Alphanumeric Memory Channels
- One Touch Reply Function
- Digital Voice/GPS (Optional UT-123 Required)
- Low Speed Data (Optional OPC-1529R Required)

Entry class digital mobile

VHF/UHF DUAL BAND TRANSCEIVER

IC-880H D-STAR ready

- 50/15/5 Watt VHF/UHF
- FM, AM (Receive only), DV
- RX: 118–999.990MHz*
- 1052 Alphanumeric Memory Channels
- Free Programming Software**

***www.icomamerica.com/amateur/DSTAR for details about free software*

*Frequency specs may vary. Refer to owner's manual for exact frequency specs.

ID-RP2C
REPEATER CONTROLLER

The cornerstone of the D-STAR system. Handles up to four RF modules. Basic in-band or crossband operation. Linking capabilities through the internet.

ID-RP2D
23CM DATA MODULE

Access point with a data rate of up to 128kbps. Perfect for email, web applications and support via internet connection.

ID-RP2V
23CM DIGITAL VOICE MODULE

ID-RP2000V
2M DIGITAL VOICE MODULE

ID-RP4000V
70CM DIGITAL VOICE MODULE

IC-80AD
NEXT GENERATION 2M/70CM DUAL BANDER

D-STAR ready

- 5/2.5/0.5/0.1 Watt VHF/UHF
- FM, FM-N, AM (Receive only), WFM (Receive only), DV
- RX: 0.495–999.990MHz*
- 1052 Alphanumeric Memory Channels
- Li-ion Battery
- Free Programming Software**

***www.icomamerica.com/amateur/DSTAR for details about free software*

IC-V82/IC-U82
D-STAR UPGRADEABLE FOR 2M OR 70CM

D-STAR optional

- 7/4/0.5W (V82), 5/2/0.5W (U82)
- RX: 136–174MHz* (V82), 400–479MHz* (U82)
- 207 Alphanumeric Memory Channels
- CTCSS & DTCS Encode/Decode with Tone Scan
- Digital Voice & Data (Opt. UT-118 Required)

IC-2200H
D-STAR UPGRADEABLE FOR 2M

D-STAR optional

- 65 Watt Output
- RX: 118–174MHz*
- 207 Alphanumeric Memory Channels
- CTCSS & DTCS Encode/Decode with Tone Scan
- Built-in 10dB Squelch Attenuator
- Digital Voice & Data (Optional UT-118 Required)

ID-1
GO DIGITAL ON 23CM

D-STAR ready

- 10 Watt on 23cm (FM, DV, DD)
- RX: 1240–1300MHz*
- 100 Alphanumeric Memory Channels
- USB Rig Control, Ethernet Plug for DD
- Black Box Operation
- Remote Control Head, Remote Speaker and Cables Included
- PC Software Included

IC-92AD
MILITARY RUGGED & SUBMERSIBLE 2M/70CM DUAL BANDER

D-STAR ready

- 5/2.5/0.5/0.1 Watt Output
- RX: 0.495–999.990, 118–174, 350–470MHz*
- 1304 Alphanumeric Memory Channels
- Optional GPS Speaker Mic (HM-175GPS)
- IPX7 Submersible

IC-91A
ANALOG & OPTIONAL DIGITAL 2M/70CM DUAL BANDER

D-STAR optional

- 5/0.5 Watt Output
- RX: 0.495–999.990, 118–174, 350–470MHz*
- 1304 Alphanumeric Memory Channels
- Li-ion Battery
- Digital Voice and Data (Opt. UT-121 Required)

D-PRS™

ICOM®

TIMEWAVE TECHNOLOGY INC.

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

25th Aniversary Edition of the Legendary PK-232/USB!

PK-232/USB Multimode Data Controller*
Sound card interface, USB, Pactor, RTTY, Packet & more!
Certified 64-bit Windows 7 Drivers now available!
100,000 sold - All-time top selling data controller!

Kill the Noise with the ANC-4 and DSP-599zx!

■ **DSP-599zx Audio Signal Processor***
Noise Reduction & filtering for Audio, CW & data

■ **ANC-4 Antenna Noise Canceller**
Kill noise before it gets to your receiver!

Optimize Your Antenna with the Field-Proven AntennaSmith™

Patented - portable - battery powered

Check Antennas and Transmission Lines

Once you use the TZ-900 - you'll never want to use any other!

TZ-900 AntennaSmith™

Antenna Impedance Analyzer -

FREE!
ARRL Antenna Book with every TZ-900

- ■ Graphic display - full color in bright sunlight!
- ■ Stand-alone operation - no computer required
- ■ Before & After color graphic overlays - instant comparison
- ■ Handheld - take it to the antenna - measure where it counts!
- ■ Store complete sweeps in permanent memory - download to your PC via USB when it's convenient
- ■ Hours of portable operation, fast recharging
- ■ Complete with software, charger, coax adapters and more!

■ **DSP-232+ Multimode Data Controller***
Sound card interface, USB, Pactor, 1200/9600 Packet

■ **PK-96/100 TNC - 1200/9600 Packet***
Available with USB or RS-232

HamLink™ Wireless and USB Remote Control & Audio

■ **HamLinkUSB™ Rig Control Plus**
Logic Level plus PTT

■ **U232™ RS-232-to-USB Adapter**
Universal Conversion Module
Replaces PCB-mount DB-9 & DB-25

■ **PK-232 RS-232-to-USB Adapter***
Use the PK-232 with new computers!

■ **HamLinkBT-BTH+™ Headset**
Use a standard cellphone Bluetooth® headset to keep your hands free for driving and operating.
Includes USB rig control for your station.
Audio, VOX & PTT - Fixed & Mobile.

■ **HamLinkUSB™ Audio Adapter**
USB Sound Card Interface
No software drivers! Just plug it in.

***From the Timewave Fountain of Youth** - **Upgrades for many of our DSP & PK products. Call Us Now!**

Timewave Technology Inc.
27 Empire Drive, Suite 110
St. Paul, MN 55103 USA

www.timewave.com
sales@timewave.com

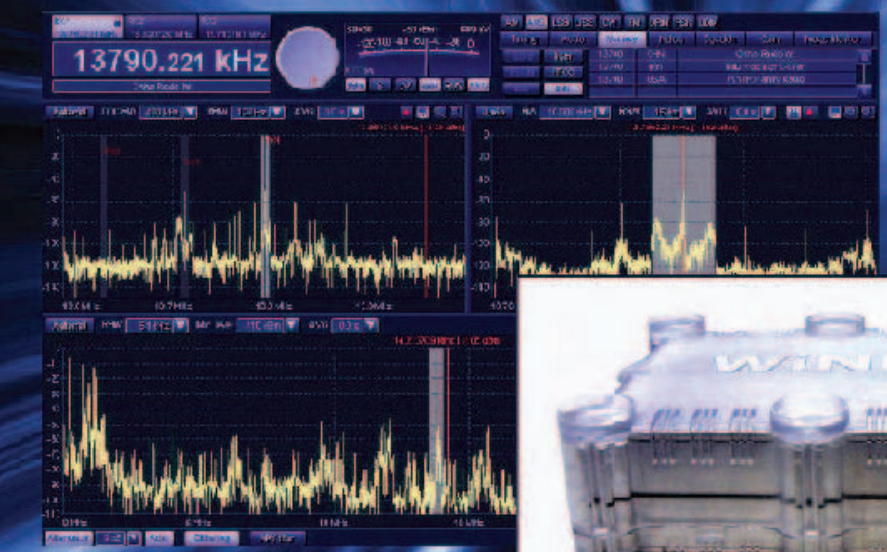
651-489-5080
Fax 651-489-5066

It's a Winner!

"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

Always Updated!

The ARRL Repeater Directory®
NEW 2011/2012 Edition

The best directory of frequencies for the thousands of repeaters around the country! Includes D-Star and APCO-25 repeaters, references for operating practices, emergency message handling and much more.
Locate repeaters on the road or on-the-go!

- Improved **Desktop Edition!** New lay-flat *spiral binding* allows for easy reference on the road. And, now including the ARRL Radiogram and ICS-213 Message Forms.
- Handy indexing tabs on the cover.
- Easy-to-read listings.
- Repeater notes located right up front.

The ARRL Repeater Directory®

Desktop Edition (6 x 9 inches, spiral bound).
ARRL Order No. 1936 ..... **$15.95***

Pocket-sized (3.75 x 5.25 inches).
ARRL Order No. 1769 ..... **$10.95***

TravelPlus for Repeaters™
CD-ROM—version 15.0

Make TravelPlus your traveling companion and you'll never be alone on the road. Locate ham radio repeaters along US and Canadian travel routes using this map-based software. It's like having the power of ***The ARRL Repeater Directory®*** on your **COMPUTER!**

- Map your travel route and tune in. Supports GPS.
- View and print maps and repeater lists.
- Includes **The ARRL Repeater Database**, global Internet linked nodes, AM/FM radio, broadcast television, NOAA weather stations, USA and Canadian licenses, and ham radio points of interest.
- Export data for radio programming, handheld devices, and more.

TravelPlus for Repeaters™ CD-ROM

ARRL Order No. 7921 ..... **$39.95***

*Shipping and Handling charges apply. Sales Tax is required for orders shipped to CT, VA, and Canada. Prices and product availability are subject to change without notice.

LIMITED TIME BONUS OFFER! Pre-order ***TravelPlus*** and get a **FREE *ARRL Repeater Directory*** (pocket-sized). You get both for only $39.95*. Pre-orders will ship mid-April.

Pre-order Today! **www.arrl.org/shop**. Toll-Free **1-888-277-5289** (US)

Upgrade at Dayton Hamvention®.
Visit TravelPlus in the ARRL EXPO area. Bring your previous version of TravelPlus proof-of-purchase for a special upgrade price!

Bonus "ARRL Repeater Directory" premium cannot be redeemed for cash. No returns. Exchanges must be accompanied by premium. Valid on pre-orders direct from ARRL, only. This offer may be cancelled or modified at any time due to system error, fraud or other unforeseen problem. Void where prohibited.

ARRL *The national association for AMATEUR RADIO™*

225 Main Street, Newington, CT 06111-1494 USA

SHOP DIRECT *or call for a dealer near you.*
ONLINE WWW.ARRL.ORG/SHOP
ORDER TOLL-FREE 888/277-5289 (US)

QS4/2011

IMAGINE your Amateur Radio experience...

- ***Without your memorable first contact…***
- ***Without the ability to help during a hurricane or blizzard…***
- ***Without the enjoyment of new bands and modes, or…***
- ***Without the variety of contests on every band.***

IMAGINE the world of Amateur Radio without the work of ARRL to protect the Amateur Radio bands and the operating privileges you enjoy.

Your annual donation to the Spectrum Defense Fund is vital to the continued efforts of ARRL to protect ensure your ability to enjoy Amateur Radio.

ARRL 2011 SPECTRUM DEFENSE FUND

For more information, contact:

Mary M. Hobart, K1MMH
Chief Development Officer
ARRL
225 Main Street
Newington CT 06111-1494
Telephone: **860-594-0397**
Email: **mhobart@arrl.org**

Ham Ads

Please contact the **Advertising Department** at **860-594-0231** or **hamads@arrl.org** for further information or to submit your ad.

1. Advertising must pertain to products and services which are related to Amateur Radio.

2. The Ham-Ad rate for commercial firms offering products or services for sale is $2.25 per word. Individuals selling or buying personal equipment: ARRL member 1.00 per word. Non-ARRL member $1.50 per word. **Bolding** is available for $2.50 a word. Prices subject to change without notice. You may pay by check payable to the ARRL and sent to: Ham-Ads, ARRL, 225 Main St., Newington, CT 06111. Or, you may pay by credit card sending the information by fax to 860-594-4285 or via e-mail to hamads@arrl.org. The credit card information we need is: the type of credit card, the exact name that appears on the credit card, the credit card number, the expiration date and the credit card billing address.

3. Remittance in full must accompany copy since Ham-Ads are not carried on our books. Each word, abbreviation, model number and group of numbers counts as one word. Entire telephone numbers count as one word. No charge for postal Zip code. No cash or contract discounts or agency commission will be allowed. Tear sheets or proofs of Ham-Ads cannot be supplied. Ads submitted in writing should be typed or printed clearly on an 8 1/2" X 11" sheet of paper.

4. Closing date for Ham-Ads is the 15th of the second month preceding publication date. No cancellations or changes will be accepted after this closing date. Example: Ads received February 16th through March 15th will appear in May *QST*. If the 15th falls on a weekend or holiday, the Ham-Ad deadline is the previous working day. Please contact the Advertising Department at 860-594-0255 or hamads@arrl.org for further information or to submit your ad.

5. No Ham-Ad may use more than 200 words. No advertiser may use more than two ads in one issue. A last name or call must appear in each ad. Mention of lotteries, prize drawings, games of chance etc is not permitted in *QST* advertising.

6. New firms or individuals offering products or services for sale must check with us to determine if a production sample (which will be returned) should be submitted for examination. Dealers are exempted, unless the product is unknown to us. Check with us if you are in doubt. You must stand by and support all claims and specifications mentioned in your advertising.

The publisher of *QST* will vouch for the integrity of advertisers who are obviously commercial in character and for the grade or character of their products and services. Individual advertisers are not subject to scrutiny.

The American Radio Relay League does not discriminate in its advertising on the basis of race, color, religion, age, sex, sexual orientation, marital status or national origin. The League reserves the right to decline or discontinue advertising for any other reason.

7. AN IMPORTANT NOTICE TO ALL HAM AD POSTERS AND RESPONDERS, FROM THE ARRL ADVERTISING DEPARTMENT Greetings from ARRL HQ! Please note that we have received reports from many ARRL members who have placed classified ads in these listings, and have received responses from individuals proposing "creative" payment schemes. These particular instances involved offers of overpayments for goods by bank check, followed by instructions to deduct the cost of your item from the overpayment, and to transfer the overage back or to another individual. This is a well-known scam. Unfortunately, we have no control over this and other scams of this type. Once your email address is posted, you are vulnerable to those individuals seeking to provide you with questionable information. See **http://www.arrl.org/news/features/2005/07/15/1/?nc=1** for further details. REMEMBER: TRANSACT CAREFULLY AND PROTECT YOURSELF.

QST Ham Ads on the Web – Updated Monthly!
www.arrl.org/ads/ham-ads.html

Club/Hamfests/Nets

ARMS-Amateur Radio Missionary Service Net Christian Fellowship Net - Everyone Welcome 14.307.5 Daily xcpt Sunay 1500-1700Z Website: www.qsl.net/arms

FRIEND OF BILL W – Join HAAM net daily on 14.316 at 12:30 East (09:30 Pac) time w/290 or 340 as alt freq's http:www.qst.net/haam

MARCO The Medical Amateur Radio Council Ltd is a charitable non-profit group of health care professionals who meet weekly at 10:00am Eastern time Sundays for the "Grand Rounds of the Air" net on 14.307 MHz. All interested are welcome. Request info & free newsletter to Danny@w4dan.com or write MARCO, 2712 Bryant Dr, Cleveland, TN 37311. Ph 423-479-6160. Web site www.marco-ltd.org

N4USA Building International Goodwill www.fairs.org www.twitter.com/N4USA

RAINBOW AMATEUR RADIO ASSOCIATION Serving the gay/lesbian/GLBT community since 1995. ARRL affiliated. Privacy respected. Active weekly HF/VoIP nets, newsletters, chat room, message forum, cruises, Dxpeditions. Web Site: WWW.RARA.ORG. Information: 954-502-6969 or PO Box 18541, Rochester NY 14618-0541.

Property/Vacation/Rentals

4 BR 3 1/2 Bath. Secluded custom home on Bull Run Mountain in Northern VA. Many extras including 65 ft tower with antennas. Email: tomasgarasic@gmail.com for list of extras. Tenant in place for 1 year.

Almost seven wooded acres with two running streams. Includes a well-maintained 14'X70' mobile home, well and septic system. Edge of town, close to many conveniences yet private and secluded. $113,900- Call K3JN before 5:00PM ET 814-886-5298

BARBADOS HAM holiday weekly spacious rental house on ocean cliff with antennae, 2+ bdrms www.bajan.info, amybeam@yahoo.com

BELIZE VACATION QTH www.wishwilly.net

COLORADO CHALET with ham gear for weekly rental, www.lostcreekcabin.com. WØLSD, Buena Vista, CO.

Dominica DX Rental www.hettyscottage.com kk4ww@fairs.org

For Sale Blue Ridge Mountain Top DX location KK4WW www.Littlefamilyfarm.com

HAWAII DX VACATION RENTAL STEPP-IR Antennas KH6RC. 808-929-7101 www.leilanibedandbreakfast.com

J73Z Dominica Clubstation operate stay overnight J73CAJ N4USA@swva.net

VIRGIN ISLANDS www.radioreef.com

VY2TT www.peidxlodge.com

"WANNA HAM in the Cayman Islands?" go to www.martykaiser.com/24.htm

Antique/Vintage/Classic

ANTIQUE WIRELESS ASSOCIATION. The organization for all enthusiasts of antique and historical radio! Publishes THE AWA JOURNAL, covering vintage ham gear, keys, telegraphy, contests, broadcast receivers, vacuum tubes, historical, technical articles, restoration, and much more. AWA produces the famous annual Rochester, NY meet. Maintains world-famous historical radio-electronics communications museum. Membership only $25/year USA, $30 elsewhere. Antique Wireless Association, PO Box 421, Dept. 1, Bloomfield, NY 14469. Check our Website: http://www.antiquewireless.org

CLASSIC REPAIR - Specializing in Collins, Drake and other fine tube radios. Steve, 661-822-6850. n6hk@hotmail.com

CODE PRACTICE OSCILLATOR MUSEUM: http://www.n4mw.com

HALLICRAFTERS MANUALS $10.00 ARDCO ELECTRONICS, P O Box 24, Palos Park, IL 60464. www.ardcoelectronics.com. wa9gob@aol.com

Visit THE SOUTHERN APPALACHIAN RADIO MUSEUM! - www.saradiomuseum.org 828-299-1276. Asheville, NC.

W4QCF MANUALS - 828-298-1847 http://www.w4qcfmanuals.com

Wanted Pre1980 Historical MicroComputers for Museum Collection, Alto, Star, Notetaker, Dorado, Apple 1 and others. kk4ww microcomputercollector.com

QSLCards/Call Sign Novelties

At **RUSPRINT** you get the Highest Quality QSL Cards at the Lowest Prices. In business since 1956! Free Samples. Full Color Card. Custome Cards. Photo Cards. 1-888-962-5783. Visit our new website at www.rusprintsupreme.com

CALL SIGN DECAL 1-1/4 white vinyl characters. Interior or exterior window mount. $6.00. Gary Hengstenberger 6880 Rolling Ridge Rd NE Canton, OH 44721 330-354-1755

CALL SIGN NAME BADGES. Club logos our specialty. Certified ARRL engraver. Capital Engraving, 3109 Marigold St, Longview, Washington 98632-3415. Al, WA7UQE. capengrave@kalama.com. http://www.kalama.com/~capengrave/

www.airmailpostage.com

Call sign T-shirts, coffee mugs, ID badges for your club or Field Day group. Your design or ours. No minimum order. www.rileystrickshop.com/hamradio 800-474-5397

ENGRAVING: Callsign/name badges by WØLQV. Send for price list. 8319 Marty St., Overland Park, Kansas 66212-1963. E-mail: w0lqv@arrl.net

FREE SAMPLES. The QSLMAN®, Box 73, Monetta, SC 29105. Phone/FAX (803) 685-7117 anytime. Email: w4mpy@qslman.com. Always 100% satisfaction guarantee on anything we do. Check the web site at: http://www.qslman.com

www.oldqslcards.com

Get **Top Quality Full Color UV-Coated QSL Cards** direct from the printer. Chester QSL Cards is now Star Cards, Inc. Call (800) 748-7089 for info or visit www.star-cards.net

HANDCRAFTED OAK CALL SIGNS www.oakcallsigns.com 636-394-6570, KCØSDV

NEED A RELIABLE QSL MANAGER details contact James E. Mackey k3fn@aol.com

OVERSEAS AIRMAIL POSTAGE plus complete line of airmail envelopes. Order directly from our web site - James E. Mackey, proprietor. www.airmailpostage.com

QSLKIT – CardBoxes – Dividers – MORE www.HamStuff.com by W7NN

RUSPRINT QSL'S 1 816 282 8924 www.rusprintsupreme.com

www.quikcards.biz

General

ABR Industries is looking for Hamfest dealers. This is a limited distribution opportunity, w/a reasonable start-up investment. Serious inquiries only: 713-492-2722 or info@abrind.com

Affordable radio repair $35/hr. buy, sell, trade, new for used, Jess Miley 719-784-3040 e k0taajess@q.com

ALUMINUM CHASSIS AND CABINET KITS. UHF-VHF Antenna Parts, Catalog E-mail: k3iwk@flash.net or http://www.flash.net/~k3iwk

ANTENNA COMPARISON REPORT: TRIBANDERS K7LXC & NØAX test Hy-Gain, KLM, CC, Bencher, Force 12, Mosley and others. $17 + $4 s/h. More info at www.championradio.com 206-890-4188

ANTENNA COMPARISON REPORT: VERTICALS. K7LXC & NØAX test CC, Butternut, MFJ, Force 12, Diamond, Hustler, GAP and other. $17 + $4 s/h. More info at www.championradio.com 206-890-4188

APRS Link Cables - for Garmin/Kenwood products - http://stores.ebay.com/Jabber-Electronics WE6G 480-905-8484

www.SecondHandRadio.com Electronic or Electrical - find it here, sell it here.

BEAM HEADINGS laser printout $25.00 Engineering Systems Inc., P.O. Box 1934, Middleburg, Virginia 20118-1934, w4het@aol.com

BIGGEST on-line ham classifieds: http://swap.QTH.com

C-Band Remembered ("A joy to read", K9EID) at www.bobcooper.tv

CALL SIGN DECAL 1-1/4 white vinyl characters. Interior or exterior window mount. $6.00. Gary Hengstenberger 6880 Rolling Ridge Rd NE Canton, OH 44721 330-354-1755

CALL SIGNS IN NEON Duncan DeSigns, 401-846-0294

Collins & Drake: AC/DC SMPS available for either. In stock or build to order. New & less than E-Bay. GPW350 for Drake $Call. GPW500 for Collins, $Call. CHECK or M.O. NKiseloff@aol.com / 720-341-0709

Custom Ham Maps by N1XFS!!! Customized azimuthal equidistant projection maps with beam headings and distances based on your QTH. Adds that special "wow" factor to your shack. Makes a great gift! Go to: CustomHamMaps.com

CW Ring Tones for Your Cell Phone: Customized text, be creative! Visit www.SuperBertha.com then click Amateur Radio, then click CW Ring Tones.

DIGITAL FIELD strength meters: IC Engineering, http://www.digifield.com

"DXPEDITION DVD VIDEOS for full description and how to order...www.k4uee.com/dvd/

ELECTRIC RADIO MAGAZINE: America's popular monthly publication devoted entirely to vintage amateur radio, military equipment, restorations, and radio history. Samples $1. Electric Radio, P O Box 242, Bailey CO 80421, www.ERmag.com

Electronic Components, Kits, Test Equipment, Hard To Find Items, Magnet Wire, Toroids, Vernier Dials, Visit J-Tron, www.j-tron.com

ENIGMA CIPHER MACHINE: Museum, Information, Repairs: www.w1tp.com/enigma

ESTATE SALE: Cushman CE4 Service Monitor with 301 Scope and 317 high sensitivity monitor. Will monitor off the air. Frequency range up to 1000 MC with pad, cable and front protective cover. Very very clean. No dents. He had it out of his home shop only 5 times. $900.00. Amateur Radios: GE Mastr II two meter repeater, continuous duty. Very clean, $1200.00. GE Mastr II six meter repeater, continuous duty. Very clean, $1200.00. GE 110 watt continuous duty amplifiers, 2 and 6 meter, $400.00 each. GE and Motorola mobile mikes, $45.00 each. Many GE parts. All pricing plus shipping. Call anytime, 603-669-5771.

"EVERYTHING FOR THE MORSE ENTHUSIAST." Morse Express. Keys, keyers, kits, books. 303-752-3382. http://www.MorseX.com

FRAME UR LICENSE - Laser engraved wood license frame specially sized for the US FCC Ham License...visit www.Gifts4Hams.com.

FREE!!! Ham Radio and other CD-Roms & Software disk catalog. **MOM 'N' POP'S SOFTWARE,** P. O. Box 15003-HA, Springhill, FL 34604-0111. 1-352-688-9108. momnpop@momnpopsware.com

HAM "novel" features by Coop (K6EDX/ZL4AAA) at www.bobcooper.tv

HEATHKIT AMATEUR RADIO REPAIR by RTO Electronics, 601 E. 1st Street Calexico, CA 92231 269-468-7780. E-mail: hamtech@rtoham.com. www.rtoham.com

HY POWER ANTENNA COMPANY http://www.freewebs.com/hypower. Halfsquares, deltaloops, multiband, QRP, OCF and Baluns

KENWOOD AMATEUR RADIO REPAIR by K3TEN Electronics 609-846-5190 Email k3ten@verizon.net Web http://www.k3ten.com

Kenwood TS520S hf transceiver, DG5 frequency display, MC50 mic. $495.00 plus shipping. Call: 718-241-1414.

LEARN CODE by Hypnosis, www.success-is-easy.com 561-302-7731

MicroLog by WAØH .. Free download .. www.waØh.com

New Mexico Amateur Radio License Plates Wanted. JohnstonRanch@totacc.com, 575-382-7804, K5ZI@arrl.net

OWA Yagis by WA3FET/K3LR: Bust pileups using proven DX and Contest winning "Ultimate OWA Yagis"! Visit www.SuperBertha.com for info and free PDF catalog.

PRINTED CIRCUIT BOARDS for projects shown in QST, QEX, HR, ARRL HB, 73 and more. Custom boards available. FAR Circuits, 18N640 Field Ct, Dundee, IL 60118; fax/phone 847-836-9148; www.farcircuits.net; mail@farcircuits.net

Put the FUN back into ham radio! http://HamRadioFun.com

RFI Filters www.RFchoke.com

Collins & Drake: AC/DC SMPS available for either. In stock or build to order. New & less than E-Bay. GPW350 for Drake $Call. GPW500 for Collins, $Call. CHECK or M.O. NKiseloff@aol.com / 720-341-0709

SuperBertha...BudgetBertha...EcoBertha Rotating Monopole Towers: No guy wires, Entire pole rotates, Ground level rotor. Stack and rotate all your antennas at optimum heights on one monopole. Visit www.SuperBertha.com for info and free PDF catalog.

TOWER ACCESSORIES Gin Pole Kits - stand off brackets - antenna mounts - vehicle radio mounts for 30 years. IIX Equipment Ltd. 708-337-8172 www.w9iix.com

Trinity Rotor Repair Rotors bought, sold and repaired. For more info call: 856-447-3391.

Two novels involving ham radio: Full Circle, and Frozen in Time, by N4XX. Visit www.theodorecohennovels.com

Kenwood TS520S hf transceiver, DG5 frequency display, MC50 mic. $495.00 plus shipping. Call: 718-241-1414.

WANTED: Revell (yes the model company) Regen, 2-transistor, 4-band, Shortwave Radio circa 1962. All or part or manual. WB6UHQ@ARRL.NET.

WANTED: Working Mars **ELDICO T210** AMP w/PWR Supply. WA0VYW Top Dollar. NORM-AN-LIN@SKYBEAM.COM

WE BUY/SELL RADIOS. **#1 IN ESTATES** – www.recycledradio.com (603) 942-7173

www.HamPlaques.com -CNC router carved and laser engraved plaques-logos for 17 clubs

"YOU CAN check spots, log contacts: www.dxtreme.com"

AMSAT – Join now! Call 301-589-6062 or visit the AMSAT Web site at www.amsat.org. AMSAT®, 850 Sligo Avenue, Suite 600, Silver Spring, MD 20910.

QST Index of

Contact Information:

Toll Free: 800-243-7768
Direct Line: 860-594-0207
Fax: 860-594-4285
E-mail: ads@arrl.org
Web: www.arrl.org/ads

Additional advertising information is available on the web at:
www.arrl.org/ads

Advertisers

QST Advertising Deadlines:

Issue	Reservation Date	Materials Due Date
May 2011	Friday, March 18, 2011	Monday, March 21, 2011
June 2011	Friday, April 15, 2011	Monday, April 18, 2011

For links to the Web sites of all ARRL advertisers, visit www.arrl.org/ads/adlinks.html

Array Solutions Your Source for Outstanding Radio Products

Top ranked equipment from Array Solutions

Tokyo Hy-Power HL-550FX
550W HF/50MHz Linear Amplifier

The lightest and most compact 550W HF / 50MHz linear amplifier in the industry. This world-class HF amplifier has the built-in switching mode power supply to save the weight to only 9.1kg (21 lbs) Best suited for DX-peditioners.

TOKYO HY-POWER

Specifications

Frequency Band:
1.8~50 MHz all amateur bands including WARC bands

Mode:
SSB, CW (RTTY)

RF Drive:
65~90W typ. (100W max.)

Output Power:
HF: 550W typ., 50MHz: 500W (RTTY, SSTV, FM 250W max.)
(When set to AC100V-120V, 500W on both HF and 50MHz)

Drain Voltage:
44V

Drain Current:
30A max.

Input Impedance:
50Ω (unbalanced)

Output Impedance:
50Ω (unbalanced)

Final Transistor:
VRF150 x 4

Circuit:
Class AB parallel push-pull

Cooling Method:
Forced Air Cooling

Multi-meter (F.S.):

Output Power	Pf 1kW
Reflected Power	Pr 100W
Drain Voltage	Vd 60V
Drain Current	Id 50A

Input/Output Connectors:
UHF SO-239 (Type M-J)

AC Power:
AC 200~260V, 50/60Hz 7.5A max.
AC 100~130V, 50/60Hz 15A max.

AC Consumption:
1.3kVA max. when TX

Dimension:
232 x 145 x 392 mm,
9.1 x 5.7 x 15.4 inches (WxHxD)

Weight:
Approx. 9.2kgs. or 20.3lbs.

Accessories:
AC Power Cord
Coax Jumper Cable (PL259)
RCA Plug (For PTT and ALC)
Complete Set of Spare Fuses
Users Manual

Optional:
Custom-made soft carrying case with shoulder strap. (Will fit in the overhead bin of most aircraft).

ACOM 2000A Automatic HF Linear Amplifier

The ACOM 2000A Automatic HF Linear Amplifier is the world's most advanced HF amplifier designed for amateur use.

ACOM 1011 160-10m Amplifier

The latest ACOM 1011, budget 160-10m small and lightweight linear amplifier, for fixed or DXpedition and Field Day operations.

Announcing the NEW Array Solutions...

AIM *uhf* Analyzer

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

NEW!

NEW!

Rig Expert Antenna Analyzers

New low-cost RigExpert AA-30 and AA-54 are powerful antenna analyzers designed for testing, checking, tuning or repairing antennas and antenna feedlines.

Other Quality Products from Array Solutions...

ACOM
Sales and Service for Amplifiers and Accessories

Phillystran, Inc.
Official Worldwide Phillystran Distributor

Tokyo Hy-Power
Sales and Factory Authorized Service

RigExpert
Analyzers and Interfaces

Prosistel Rotators
Strongest Rotators on the Market

OptiBeam Antennas
German Engineering means High Performance

Hofi®
Surge Arrestors & Antenna Switches

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

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

powerwerx.com

The most Powerpole related products anywhere!

Wouxun Radios

NEW!

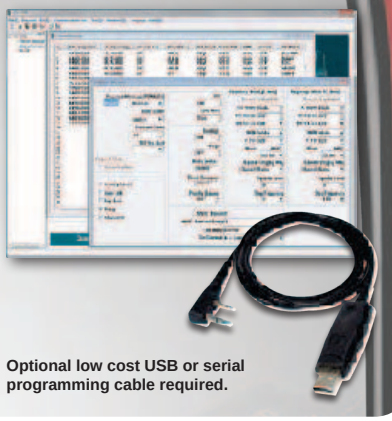
WOUXUN KG-UV3D

Full featured 2M/UHF Dual-Band Handheld for under *$120*

- Full 5 Watt Output on 2-Meters/4 Watts UHF
- High capacity (1700 mAh) Li-ion battery pack included
- Dual-band monitor (VHF/UHF, VHF/VHF, UHF/UHF)
- 3-4 hour desktop rapid charger included
- Dual Alpha-Numeric Backlit Display w/ Channel Name
- Built-in Ultra Bright LED Flashlight function

FCC Certified

Windows PC programmable
Free software available



Optional low cost USB or serial programming cable required.

2M/220Mhz model also available.

Visit www.powerwerx.com/wouxun

Anderson Powerpoles & Accessories

All Amps, Gauges & Colors in Stock!

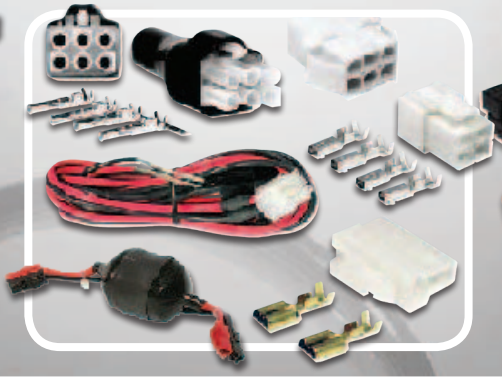
Wouxun Radio Optional Accessories

USB Prog. Cable | Speaker Microphone | BNC RF Adapter | Car Charger

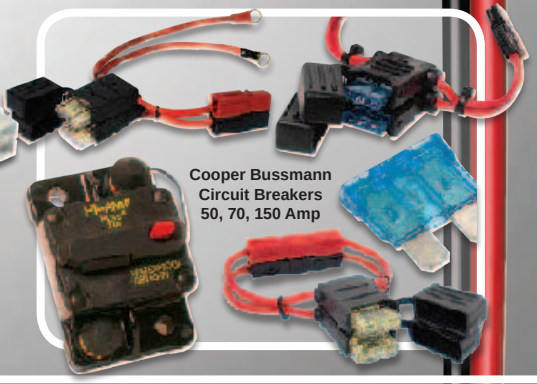
AA Battery Pack | UHF RF Adapter | Dual Slot Rapid Charger | Battery Eliminator

Adapter & Extension Cables

OEM Connectors & Filters



Fuse Holders & Fuses



Cooper Bussmann Circuit Breakers 50, 70, 150 Amp

powerwerx.com

Order online at www.powerwerx.com
Order toll free 888-321-0073

Follow us on Facebook
facebook.com/powerwerx

Follow us on Twitter
twitter.com/powerwerx

YOUR NUMBER FOR SAVINGS (800) 272-3467

US TOWER CORPORATION

- Great Gear
- Great Deals
- Great Service
- Free UPS S/H!*

*On all radio orders shipped within the contiguous USA.

TEXAS TOWERS

Savings As Big As Texas!

Call for Our New Ham Radio Catalog!

TX SERIES

Heavy Duty Crankup towers, self-supporting heights range 38 to 106 feet. Supports up to 37 square feet of antenna wind load.

HDX SERIES

Extra heavy duty crankup towers. Self supporting heights from 38 to 106 feet. Support up to 70 square feet of antenna wind load.

We Ain't Braggin'

But we've helped so many Hams order US Towers over the years that we've become the US Tower experts. Please call for help selecting the perfect US Tower for your QTH!

Universal

B-18 SERIES

Light duty aluminum self supporting towers. Five models ranging from 30 to 50 feet in height, and support up to 12 square feet of antenna wind load.

CALL FOR MORE INFO!

B-26 SERIES

Medium duty aluminum self supporting towers. Thirteen models ranging from 30 to 90 feet and support up to 34.5 square feet of antenna wind load.

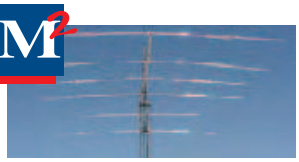
CALL FOR MORE INFO!

B-30 SERIES

Heavy duty aluminum self supporting towers. Nineteen models ranging from 40 to 100 feet, and support up to 34.5 square feet of wind load.

CALL FOR MORE INFO!

M2



M2 KT-36XA

Six element triband beam. Computer optimized for maximum performance, with dual driven elements for flat match and broad gain. Five elements are active on 15 and 20m, all six are active on 10m. Supplied with 3000W balun.

CALL FOR M2 ANTENNAS!

TIMES LMR COAX

High performance coax cable. Lower loss than RG-213/U without the water displacement problems common to 9913 and 9086 types.

HUGE LMR STOCK, CALL!

ALUMINUM TUBING

O.D.	WALL	COST/FT.
6063-T832 DRAWN ALUMINUM TUBING		
.375"	.058"	$1.00
.500"	.058"	$1.10
.625"	.058"	$1.20
.750"	.058"	$1.30
.875"	.058"	$1.40
1.000"	.058"	$1.50
1.125"	.058"	$1.65
1.250"	.058"	$1.85
1.375"	.058"	$2.05
1.500"	.058"	$2.25
1.625"	.058"	$2.55
1.750"	.058"	$2.80
1.875"	.058"	$3.05
2.000"	.058"	$3.30
2.125"	.058"	$3.80

ICOM

ICOM IC-7410

All Mode HF/6m XCVR, Large Multi-Function LCD Display with Bandscope Function, 32-Bit Digital Signal Processing, Automatic Tuner, Built-In .5 PPM TCXO, Built-In Voice Synthesizer, and Much More!

CALL FOR YOUR LOW PRICE!

KENWOOD

KENWOOD TS-590S

Mobile Performance, All Mode HF/6m, 32-Bit IF-Level Digital Signal Processing, Automatic Tuner, CW Memory Keyer, TCXO, and Much More!

NOW IN STOCK, PLEASE CALL!

KENWOOD TS-480SAT

Mobile Performance, All Mode HF/6m, Automatic Tuner, Separate Front Control Panel, 16-Bit DSP, CTCSS Encode/Decode, Much More!

$275 KENWOOD COUPON!

YAESU

YAESU FT-DX5000
YAESU FT-DX5000D
YAESU FT-DX5000MP

New, All Mode HF/6m XCVR, 32-Bit DSP, Auto Tuner, Station Monitor (D & MP models), 200 W RF Output, More!

CALL FOR YOUR LOW PRICE!

YAESU FT-950

HF/6m XCVR, 32-Bit DSP, High Speed Auto Tuner, Built-in CW Keyer, and Much More!

IN STOCK—FAST DELIVERY!

ANTENNA ROTATORS

Hygain, CD-45II	$399
Hygain, Ham-IV	$589
Hygain, Ham-V	$989
Hygain, T2X	$699
Hygain, T2X Digital	$1099
M2, OR-2800PX	$1329
Yaesu, G-450A	$289
Yaesu G-550	$399
Yaesu, G-800SA	$409
Yaesu, G-800DXA	$489
Yaesu, G-1000DXA	$609
Yaesu, G-2800DXA	$1319
Yaesu G-5500	$719

ROTOR CABLE IN STOCK!

TEXAS TOWERS

1108 Summit Avenue, #4 • Plano, TX 75074
Hours: M-F 9 AM–5 PM Central Time
Email: sales@texastowers.com

TOLL FREE **(800) 272-3467**

MASTERCARD
VISA • DISCOVER

Proudly Serving Ham Operators Since 1978!
Visit Our Website for More Great Deals:
http://www.texastowers.com

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**

■ **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.

■ **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

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

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

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℠

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

EXPLORE NEW HORIZONS

with this feature rich GPS-equipped portable.

Kenwood's dual-band transceiver with full APRS® and EchoLink® support. Featuring the SiRFstar III™ high-performance GPS receiver.

The TH-D72A is perhaps the most technology advanced, feature rich portable offered to the Amateur market. Easy to use, yet affordable. You be the judge!

The All New TH-D72A

144/440 MHz FM Dual Bander

- 1200/9600 bps packet TNC
- Sky Command II
- Stand-alone Digipeater
- USB port (mini B)
- MIL-STD810 and IP54 weatherproofing
- 1000 memory channels
- Cross-tone

The TH-D72A comes with the PB-45L a 1,800 mAH lithium-ion rechargeable battery. A single charge will power the transceiver for approximately 6 hours of normal use at the 5W Transmit level.To save battery power the Output can be set at 5, 0.5, or 0.05 Watts.

The GPS and its logging functions can be used for up to 35 hours by turning off the transceiver functions and running in the GPS only mode. Store up to 5000 points of track data, there are three ways to save track data: Interval, Travel Distance or APRS® Beacon.

Free MCP-4A software will convert log data to the KML file format.

SiRFstar III™ is a trademark of CSR plc.
APRS® is a registered trademark of Bob Bruninga. see www.aprs.org
EchoLink® is a registered trademark of Synergenics, LLC in the USA. see www.echolink.org

Contact your local dealer today for more information.

KENWOOD
Listen to the Future

KENWOOD U.S.A. CORPORATION
Communications Sector Headquarters
3970 Johns Creek Court, Suite 100, Suwanee, GA 30024
Customer Support/Distribution
P.O. Box 22745, 2201 East Dominguez St., Long Beach, CA 90801-5745
Customer Support: (310) 639-4200 Fax: (310) 537-8235 ADS#42810

www.kenwoodusa.com

JQA-1205 091-A
ISO9001 Registered
Communications Equipment Division
Kenwood Corporation
ISO9001 certification