Official Journal of
ARRL
The national association
for AMATEUR RADIO

QST

devoted entirely to
AMATEUR RADIO

October 2004

QST reviews

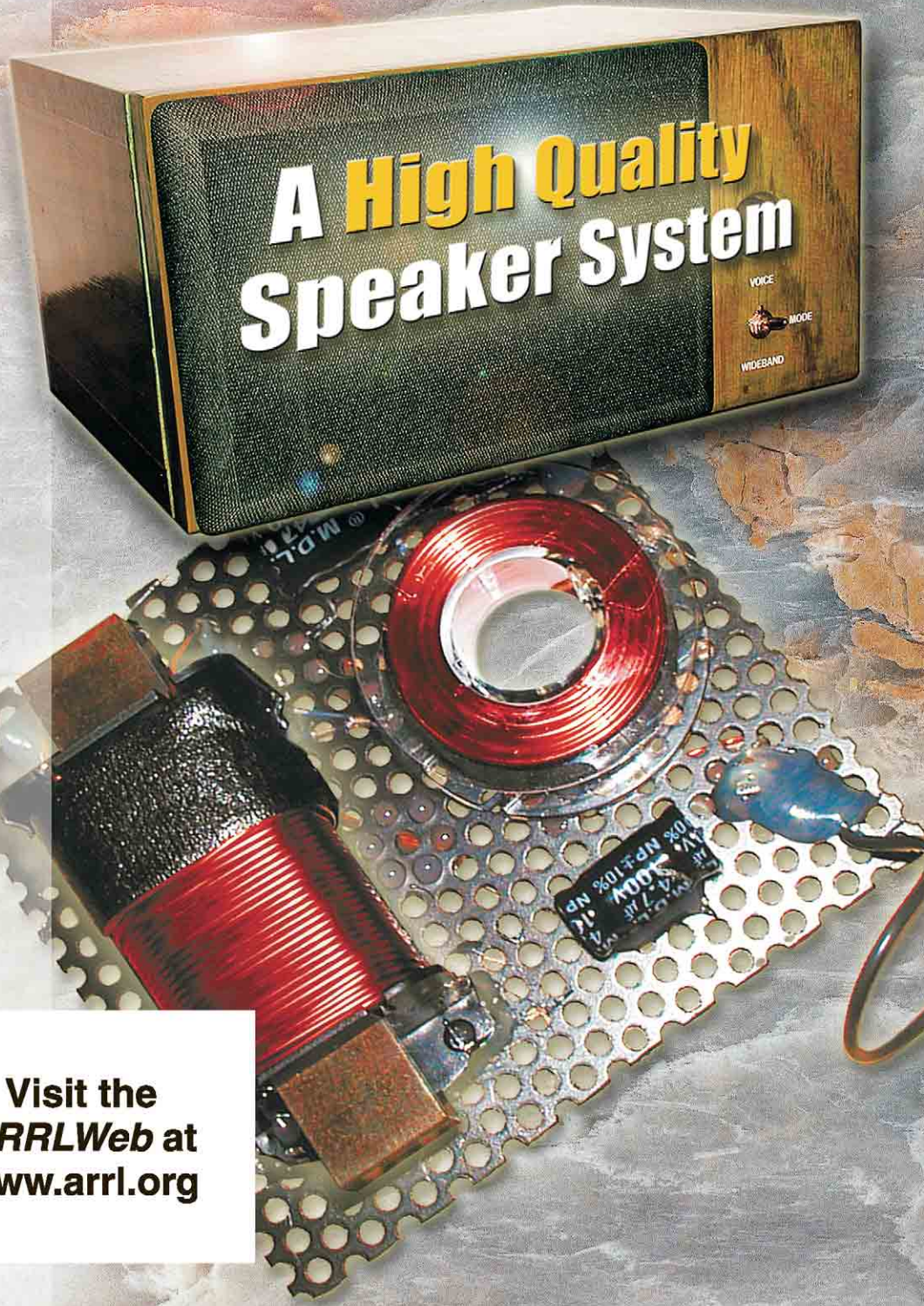
Elecraft XV144 transverter kit

WaveNode WN-1 station monitoring system

A tiny APRS transmitter

A 10/17 meter hanging loop antenna

Is there an ideal antenna tuner?



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IC-7800
The Ultimate HF!

Multiple Meter Readouts See the latest in meter technology with the '7800's virtual meter system. These digital meters are visually superior to and of a higher performance than analog. Don't believe it? Log on to www.icomamerica.com/7800 and see for yourself!

Multiple Spectrum Displays You can select a standard spectrum display either centered on your operating frequency or a fixed range to view the band! Choose how you want to SEE the band, and then tune to what signals you see. (Photo shows the fixed range spectrum display.)

CF Card Slot The ultimate way to "take your rig with you". Just pull your CF card from your '7800, slide it into another '7800, and you now have your rig!

Triple Band Stack Registers Memorizes the last 3 used frequencies – quick recall for band hopping, provides the ultimate in multi-mode flexibility.

DUAL RECEIVER CONTROLS

Digital Voice Recorder Controls Simple record and play controls for the internal DVR. Great for quick recording and playback of a call, great for reducing the number of broken calls in your log.

Dual VFO Tuning Knobs Independent tuning knobs for each receiver. There's no mistake about which receiver you are adjusting, as the size difference allows for "no-look" operation!

DUAL RECEIVER CONTROLS

Gentlemen, start your engines. All four of them!

Power your way to front of the pack with Icom's new IC-7800. Cutting edge digital meets the best of world class analog, resulting in an amazing 110dB of receiver dynamic range and a *+40dBm IP3 in the HF bands!* But that's not all. The '7800 has two identical, independent receiver circuits. Receive two different bands simultaneously on different antennas, with no adverse effects from one receiver to the other – take your band hopping and contesting to the next level! There are four 32-bit floating point DSP units with 24-bit AD/DA converters, one each for the main RX, second RX, TX, and spectrum scope, to accelerate data processing to whiplash speeds! Newly designed power amplifiers provide a powerful 200W of output power at full duty cycle and low transmit IMD. So what are you waiting for? Make your move. See your authorized Icom dealer!

Dual Receive Controls Separate key receiver controls are available for each receiver. Controls for volume, RF gain, and DSP controls, the '7800 also has independent controls for the Digital Twin PassBand tuning as well as the 70 dB Manual Notch filters. Whether in a contest, or just hopping around the bands, easy access to receiver controls such as volume, RF gain, and AGC adjustments are at your fingertips.

Dual Digital Twin PassBand Tuning Only Icom brings you Digital Twin PassBand tuning. Adjustments can be made for each receiver without affecting the other receiver.

Independent Digi-Sel Controls Incorporated into the IC-7800 is a newly designed digital pre-selector, with separate controls for each receiver.

Independent Auto Tune Automatically zero beat your CW or AM carrier signals. The '7800 makes sure you're right on the proper frequency for these modes. Each receiver has a separate control.

Independent AGC Settings Multiple AGC settings for each receiver. On-the-fly adjustment for either preset AGC settings, or a completely variable AGC control.

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ICOM

IC-R20

Dual watch & audio record!

150 kHz – 3.3 GHz* • AM, FM, WFM, USB, LSB, CW • 1250 Alphanumeric Memories • CTCSS/DTCS Decode • Dual Watch • Audio Recorder • Weather Alert • Dynamic Memory Scan • Icoms Hot 100 Preprogrammed TV & Shortwave Channels • Lithium Ion Power

IC-R10

Advanced performance!

500 kHz – 1.3 GHz* • AM, FM, WFM, USB, LSB, CW • 1000 Alphanumeric Memories • Attenuator • Backlit Display & Key Pad • Voice Scan Control • 7 Different Scan Modes • Beginner Mode • Band Scope • AA Ni-Cds & Charger

IC-R3

See & hear all the action!

• 500 kHz – 2.45 GHz* • AM, FM, WFM, AM-TV, FM-TV • 450 Alphanumeric Memories • CTCSS with Tone Scan • 4 Level Attenuator • Antenna with BNC Connector • 2" Color TFT Display with Video and Audio Output Jacks • Lithium Ion Power

IC-R5

Compact performance!

150 kHz – 1.3 GHz* • AM, FM, WFM • 1250 Alphanumeric Memories • CTCSS/DTCS Decode • Weather Alert • Dynamic Memory Scan • Icoms Hot 100 Preprogrammed TV & Shortwave Channels • Weather Resistant • 2 AA Ni-Cd Batteries

Tune in the world with Icom!

IC-R75

Pull out the weak signals! ***DSP included, US models only!***

• 30 kHz - 60.0 MHz* • AM, FM, S-AM, USB, LSB, CW, RTTY • 101 Alphanumeric Memory Channels • Twin Passband Tuning (PBT) • Synchronous AM Detection (S-AM) • Optional DSP with Noise Reduction Auto Notch Filter • Triple Conversion • Up to Two Optional Filters • Front Mounted Speaker • Large Display • Well Spaced Keys and Dials • PC Remote Control with Optional Icom RSR75 Software for Windows® • And Many Other Features

programmable PC programmable

All Icom receivers are PC programmable. See your dealer for details.

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hy-gain® ROTATORS

. . . the first choice of hams around the world!

HAM-IV

HAM-IV
$559.95

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
$649.95

T-2XD
$1029.95
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
$389.95

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
$949.95
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!*

ROTATOR OPTIONS

MSHD, $99.95. Heavy duty mast support for T2X, HAM-IV and HAM-V.
MSLD, $39.95. Light duty mast support for CD-45II and AR-40.
TSP-1, $34.95. Lower spacer plate for HAM-IV and HAM-V.

AR-40

AR-40
$289.95

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
$1379.95

For ***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.**

Digital Automatic Controller

DCU-1
$649.95

Automatically controls T2X, HAM-IV, V rotators. 6 presets for favorite headings, 1 degree 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
$69.95

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.

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You've seen the rest... now own the BEST!

Base Station

HF • Mono-Band • Dual-Band • Tri-Band • Yagi • Wireless / 2400 MHz

Coax Connection at Base End

Heavy Duty Base/ Radial Assembly

Strong Joint Couplings

Mobile Antennas

•HF • Mono-Band • Dual-Band • Tri-Band • 2400 MHz

Fold-Over
Patented One-Touch Fold-Over feature on most Diamond Mobile Antennas.

Mobile Mounts

Trunk • Hatchback • Luggage Rack • Mirror • Hide-Away • Magnet • Motorized

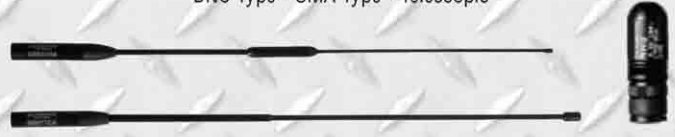
Magnetic

Trunk/Hatchback

Luggage Rack

HT Antennas

BNC Type • SMA Type • Telescopic



Accessories

Duplexers & Triplexers • Wattmeters • Dummy Loads • Lightning Protection • Adapters • Power Supplies • Coax Switches • Cable Assemblies

Duplexers & Triplexers

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Dummy Loads

Lightning Protection

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Cable Assemblies

Coax Switches

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Wireless-LAN

Base Station Vertical • Base Station Yagi-Beam
Mobile • Desktop • Terminal Equipment

To obtain a list of Diamond® Antenna dealers, visit our website at www.diamondantenna.net or call 760-744-0900 • Fax: 760-744-1943
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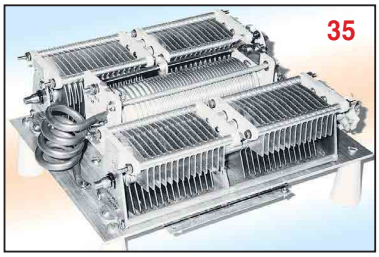

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News and Features

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Our Cover
Speaking of speakers... If you've ever had the urge to upgrade your ham shack audio, here's your chance. The article begins on page 28. Photos by John Russell, KG4AIH.

US & Possessions: Membership in the ARRL, including a one year subscription to *QST*, is available to individuals at $39. Age 65 and over, with proof of age, $36. 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.* Age 65 and over, $900.* Membership and *QST* cannot be separated. Libraries and institutions, $39 per year. Single copies $5.

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60 m Band

HF/50 MHz 100 W/144 MHz 50 W/430 MHz 20 W
20 W (Optional FNB-78 Battery Required)

TCXO DSP

DSP
DIGITAL SIGNAL PROCESSING
Included

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FT-857D

60 m Band

HF/50 MHz 100 W/144 MHz 50 W/430 MHz 20 W

DSP

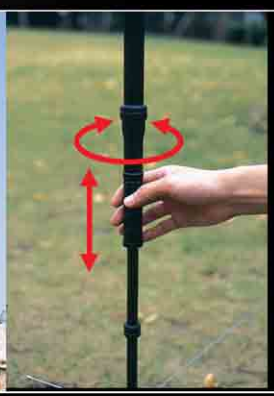
FNB-85 1400 mAh Long-Life Ni-MH Battery and NC-72B Charger Included

ULTRA COMPACT
ALL MODE PORTABLE TRANSCEIVER

FT-817ND

60 m Band

HF/50/144/430 MHz 5 W



ATAS-25 Manually-Tuned Portable Antenna

The ATAS-25 is a manually-adjusted portable antenna ideal for field use with the FT-817. Designed for mounting on a standard camera tripod (1/4" stud), the ATAS-25 is tuned by sliding the shorting ring of the loading coil up or down and selecting the appropriate number of top sections. Counterpoise wires are supplied.

The ATAS-25 is constructed of high-grade materials for maximum efficiency, and it's the perfect traveling companion for your FT-817!

Freq. Range:	Amateur Bands 7-450 MHz.
Max. Power:	HF/50 MHz: 100 W SSB/CW (50% Duty, 1 min. TX/RX)
	AM/FM: 50 W
	144/430 MHz: 50 W
Size:	Max. Length 7'3" (2.2 m)
	Min. Length for Carrying: 2' (0.6 m)
Weight:	2.1 lb. (930 g)

ATAS MICRO

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

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

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

Seeking to Achieve the Ultimate...

Ultra-Quiet 400 MHz High-Resolution DDS
1st IF 40 MHz / 3 kHz Roofing Filter Implementation
Quiet Triple Conversion Receiver Architecture
Variable RF filter (VRF) and " μ " Tuning Narrow RF Filter
IF WIDTH / SHIFT, IF NOTCH,Filter Shaping Contour Control,
Super Multi-function 30 kHz/32-bit Floating Point IF DSP
Completely Independent Dual Receive system

*1 Installed in "D" version
*2 Option on "Contest" version

The radio: FT DX 9000

Delivery: December, 2004

FT DX 9000D **200 W Version HF/50 MHz**
Large TFT Display, Built-in Memory Board, Main and Sub Receiver VRF, Full Dual RX,
"μ" Tuning (3 modules) Installed, Internal Switching Power Supply

Future Production Model: **FT DX 9000MP** **400 W Version HF/50 MHz**
Dual Analog Meter Sets, LCD Display, Memory Card Installed, Main and Sub Receiver VRF, Full Dual RX,
Switching External Power Supply/Twin Speaker Enclosure.

FT DX 9000 Contest **200 W Version HF/50 MHz**
Dual Meters + LCD, VRF Installed in Main Receiver, Extra Key and Headphone Jacks,
Internal Switching Power Supply

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

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Now available: FT DX 9000 Technical Supplement. Please call (714) 827-7600, Ext 2272.
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Antenna Tuners for Your Applications

LDG Autotuners will match your antenna with an SWR up to 10:1 down to 1.5:1 or less!

- Gone are the days of endlessly spinning knobs on a manual tuner
- Switched L network gives you the most efficient power transfer to your antenna
- All tuners are microprocessor controlled and operate on +12VDC
- Interfaces available for many popular radios but are not required for operation

AT-100Pro Memory Automatic Antenna Tuner

The **AT-100Pro** is a full featured, frequency sensing, memory autotuner designed for today's HF radios. It features dual antenna connectors with over 2000 memories for each. Latching relays reduce power consumption and hold the match even with DC power removed. Tunes with SSB. Just pick up the mic, speak, and it tunes!

The **AT-100Pro** uses LDG's standard high efficiency, microprocessor controlled, switched "L" network and works with dipoles, verticals, inverted Vees and other coax fed antennas. Use with the optional 4:1 or 1:1 external baluns for long wires or ladder line fed antennas. Optional interface cables provide DC power and control from most Icom, Alinco, Kenwood and Yaesu radios.

- 0.1 to 125 watts
- 160 to 6 meters
- LED bargraphs for Power/SWR/Status
- Two antenna jacks; >4000 memories

$219

AT-1000 Hi Power Autotuner

- Up to 1000 watts SSB, 750 watts CW, 500 watts Digital
- 160 to 6 meters
- Analog Power/SWR meter

$599

Z-100 Low Cost Autotuner

- 0.1 to 125 watts (50 watts on 6M)
- 160 to 6 meters
- Latching relays
- LED status and SWR indicators
- 200 fast memories

$149

AT-897 Autotuner

- Bolts on Yaesu FT-897
- 160 to 6 meters
- Powered from CAT Port
- Latching relays, no fan

$199

Optional Accessories and Interface Cables

RT-11 Remote Autotuner

- 0.1 to 125 watts peak
- 160 to 6 meters
- Water resistant case
- Optional Remote Head **RT-11 RH**
- Perfect for remote installation

$209

RBA-1:1 External 1:1 Balun

- Power range to 200 watts
- 1.8 to 30 MHz
- Binding post connectors
- Weather resistant
- Just 5 x 2.5 x 1.25 inches

$30

RBA-4:1 External 4:1 Balun

- Power range to 200 watts
- 1.8 to 30 MHz
- Binding post connectors
- Weather resistant
- Just 5 x 2.5 x 1.25 inches

$30

ICOM interface. Provides tuner control and DC power to LDG Autotuners

- AC-1 – **$8**
- Icom IC-1 – **$20**
- Icom IC-2 – **$8**
- AL-IC-1 – **$20**
- Y-ACC – **$10**

- Intelligent radio to LDG tuner interface
- Simply press the tune button on an LDG autotuner, and the OTT handles the rest!
- K-OTT – One Touch Tune interface for Kenwood radios compatable with AT-300
- Y-OTT – One Touch Tune interface for Yaesu FT-100 (D) and FT-817

$59

LDG ELECTRONICS

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St. Leonard, MD 20685
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Fax: 410-586-8475

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"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; see pages 14 and 15 for detailed contact information.

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"IT SEEMS TO US..."

Spectrum Defense—More Than BPL

An ARRL member recently asked me a question that may also be on your mind. Paraphrasing a bit, it was:

> I've been an ARRL member ever since I got my first license. I don't agree with everything the League does, but I know that Amateur Radio wouldn't exist if it weren't for the ARRL. I also know there's no one else consistently representing my interests in Washington. But I pay my dues. Why do I keep hearing that you need more money for spectrum defense, education programs, W1AW, and who knows what else? Don't the dues cover all that?

It's a fair question. For decades the ARRL was able to fund its operations from membership dues and the sale of publications and advertising space in *QST*. We kept costs low because we wanted the dues to be affordable for as many amateurs as possible. This approach worked pretty well. Affordable dues meant a large membership with lots of active volunteers. The League didn't accumulate a large nest egg, but we were able to pay the bills and confined our appeals for voluntary contributions to fund extraordinary programs such as W1AW renovation or infrequent international conferences.

About ten years ago we could see that the challenges facing Amateur Radio were changing. Telecommunications innovations—many of them requiring access to the radio spectrum—were popping up like mushrooms. Instead of having to worry about a major World Administrative Radio Conference every 12 to 20 years, World Radiocommunication Conferences (WRCs) began to be scheduled every two years. Domestic regulatory developments also accelerated. To keep pace in this environment we needed to strengthen our ability to represent the Amateur Radio Service. Advocacy on behalf of Amateur Radio, always an important function of the ARRL, assumed even greater importance.

To confront these challenges we opened a Technical Relations Office in the Washington, DC, area. There, three engineers and an administrative assistant work full time, making sure that Amateur Radio is competently and effectively represented inside the Beltway—this on top of our ongoing legal and legislative efforts. Here in Newington the ARRL Lab—once known chiefly for producing *QST* and *Handbook* construction projects—now devotes much of its resources to supporting our advocacy program.

The first major challenge to our new approach was also a major success. Proponents of a commercial scheme to reallocate VHF and UHF radio spectrum for low-Earth-orbit satellites, so-called "Little LEOs," had their eyes on the amateur 2-meter and 70-cm bands. We mounted a spirited defense of these popular bands, and we won.

Not everything we undertake is defensive. Thanks to our persistent effort over more than a decade, last year's WRC agreed to double the size of the worldwide 40-meter amateur band by relocating broadcasting stations elsewhere in the spectrum. When this reallocation takes effect in 2009, our 40-meter band will be far more useful at night than it is today. Last year we also were able to win access for US amateurs to five channels in the 5-MHz band, a nice enhancement of our emergency communications capabilities.

Neither of these great victories—nor a number of smaller ones—would have been possible without the financial support, above and beyond their membership dues, of thousands of ARRL members like you. We launched the Technical Relations Office—an expense that existing revenues wouldn't cover—based on our belief that those ARRL members who could afford to, would see the need and would support the endeavor with voluntary contributions. And so they have each year, from 1996 until today.

Today we face an even greater challenge, one that jeopardizes the unique capacity of the high-frequency radio spectrum to support long-distance communication: interference from Broadband over Power Line (BPL). Over the past two years we've devoted this page to BPL more than to any other subject. If you want to know more, go to **www.arrl.org/bpl** for the full scoop.

The ARRL has mounted a strong campaign against BPL interference. We have buried the FCC in well-documented technical studies. We have explained our concerns to anyone in Washington who would listen, and to some who wouldn't. But we know we must do more, and with your help we *will* do more in the coming months.

BPL is the biggest, but is far from the only, challenge to our utilization of the radio spectrum. The whole philosophy of spectrum management is being rethought, with the objective of easing access for new products for consumers and industry. Many of these products will improve the quality of life or reduce costs. Probably you will want to use some of them yourself. But as the rules for their introduction and use are developed, we in the Amateur Radio Service need an advocate to ensure that our interests are safeguarded. With your help the ARRL will continue to be that advocate, for ourselves and for future generations of radio amateurs.

Year after year, you tell us that advocating for Amateur Radio's interests is the most valuable service we can perform for you as an ARRL member. Please make sure we can continue to do that by making your first contribution to the Spectrum Defense Fund this year, or by renewing your past support.

Is it working? Yes, it is. In Washington the ARRL is seen as a strong advocate for Amateur Radio's interests. It brightened the day a few weeks ago when one of our BPL opponents resorted in frustration to name-calling, referring to us as "a misinformed set of armchair amateurs that still use vacuum tube transmitters."

My response was simple: Amateurs built the Ark. Professionals built the *Titanic*.
—*David Sumner, K1ZZ*

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

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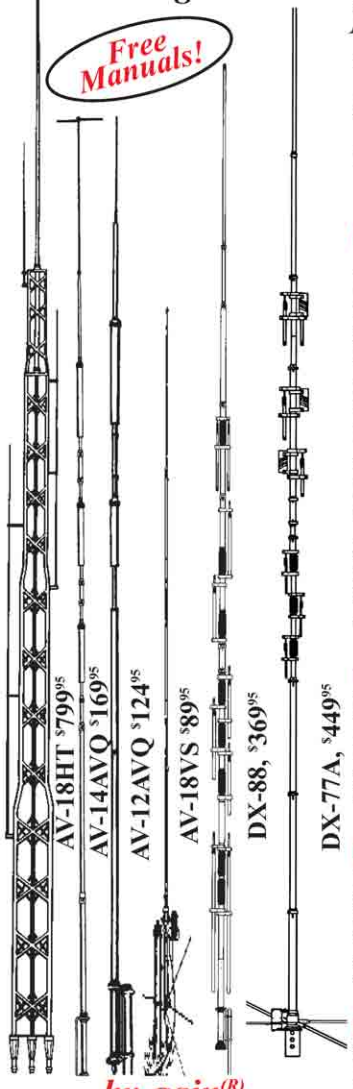

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They offer remarkable DX performance with their extremely low angle of radiation and omnidirectional pattern.

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AV-18HT, $799.95. (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, $169.95. (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, $124.95. (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, $89.95. (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, $189.95. Ground Radial System, GRK-88, $99.95. Roof Radial System, RRK-88, $99.95.

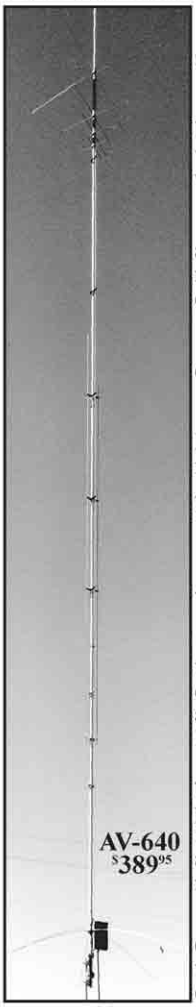
DX-77A, $449.95. (10, 12, 15, 17, 20, 30, 40 Meters). 29 ft., 25 lbs.

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	$799.95	10,15,20,40,80	1500 W PEP	53 feet	114 pounds	75 MPH	------
AV-14AVQ	**$169.95**	**10,15,20,40**	**1500 W PEP**	**18 feet**	**9 pounds**	**80 MPH**	**1.5-1.625"**
AV-12AVQ	$134.95	10/15/20 M	1500 W PEP	13 feet	9 pounds	80 MPH	1.5-1.625"
AV-18VS	**$89.95**	**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(R) PATRIOT

Hy-Gain's new PATRIOT HF verticals are the best built, best performing and best priced multiband verticals available today. For exciting DX make full use of your sunspot cycle with the PATRIOT's *low 17 degree angle* signal.



No ground or radials needed

Effective counterpoise replaces radials and ground.

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AV-640, $359.95. (6,10,12, 15,17,20,30,40 Meters). 25.5 ft., 17.5 lbs. The AV-640 uses quarter wave stubs on 6, 10, 12 and 17 meters and efficient end loading coil and capacity hats on 15, 20, 30 and 40 meters -- no traps. Resonators are placed in parallel not in series. End loading of the lower HF bands allows efficient operation with a manageable antenna height.

AV-620, $289.95. (6,10,12,15,17,20 Meters). 22.5 ft., 10.5 lbs. The AV-620 covers all bands 6 through 20 Meters with no traps, no coils, no radials yielding an uncompromised signal across all bands.

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This "breakthrough" switching power supply packs a lot of features into a compact, lightweight design that features 5 ~ 15 VDC variable output and delivers up to 30 amps continuous, 32 amps peak. Unlike some other "switchers" it's electrically quiet. But if you should find noise, the patented Noise Offset Circuit™ lets you move any noise you might find to another frequency. Other features include a large illuminated Volt/Amp meter, rear panel binding posts (32 A), front panel cigar outlet (10 A), two sets of snap-in terminals (5 A each), front panel voltage adjust, customer-defined output "memory", ripple less than 15mV p-p and triple circuit protection for short circuit, over temperature, and current limiting.

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ARRL in ACTION

***YOUR* membership at work**

By Steve Ford, WB8IMY, sford@arrl.org

ARRL Pacific Division Director Speaks at San Francisco Section Convention

The San Francisco Section Convention/Redwood Coast Amateur Radio Convention was held July 9-11 at the fairgrounds in Ferndale, California. The ARRL Forum drew a good crowd with Bob Vallio, W6RGG, Pacific Division Director, giving an excellent BPL presentation. Bob took the stage again Saturday night as the featured banquet speaker.

ARRL Pacific Division Director Bob Vallio, W6RGG (left) and ARRL Field and Regulatory Correspondent Chuck Skolaut, KØBOG, present the latest edition of the *Hints & Kinks* collection to Aaron Roberts, a prospective ham, at the San Francisco Section Convention.

ARRL Volunteers Earn Praise

We received the following e-mail in mid-July . . .

I am a new member of the ARRL and I'm proud to be part of the wonderful group of radio amateurs who dedicate themselves to great causes in helping their human and animal neighbors. Such is the case of two incredible men who invited me into the Salvation Army as a volunteer and into their Emergency Disaster Services unit.

These men, Carlos Varon, K2LCV and Jeff Schneller, N2HPO, by their actions and example, convinced me that the world is not populated by selfish, inconsiderate people. In their role as hams working with the Salvation Army, these two men traveled to the World Trade Center to lend their support doing anything needed to serve the police, firemen and women, EMS and survivors who needed compassion and human understanding in the wake of 9/11.

Recently Jeff and Carlos, along with other Salvation Army volunteers, traveled 14 hours to help storm-ravaged people in the Carolinas. They did everything from serving coffee to handling vital radio communication.

MICHAEL GOMEZ, N2WGC

Carlos Varon, K2LCV (right) and Jeff Schneller, N2HPO, at Salvation Army Headquarters in New York City in the days following September 11.

Thanks to their example, I've decided to study for my Amateur Radio license. I want to be part of this exciting avocation, too.

I'm grateful to the ARRL and its members for their dedication and support. I never understood how important you all are until I decided to join you on the battlegrounds and support humanity worldwide.—*Rick Lenchus, EDS Salvation Army (and future ham licensee)*

Western Washington Section Manager Represents ARRL at SAR Conference

The Lewis County (Washington) Sheriff's Office and Search & Rescue Council sponsored a SAR (Search and Rescue) conference May 21-23. The conference attracted more than 1300 attendees, including ARRL Western Washington Section Manager Ed Bruette, N7NVP, who spoke on the benefits of Amateur Radio in SAR operations. Other topics specific to Amateur Radio included "APRS and GIS—Linking Both Together" by Rick Kincaid, WB6QHS and Paul Newman of the Clark County GIS, and "NWAPRS" by Herb Gerhardt, KB7UVC. Also in attendance was Curt Mills, WE7U, who is a contributor to the *Xastir* APRS software effort.

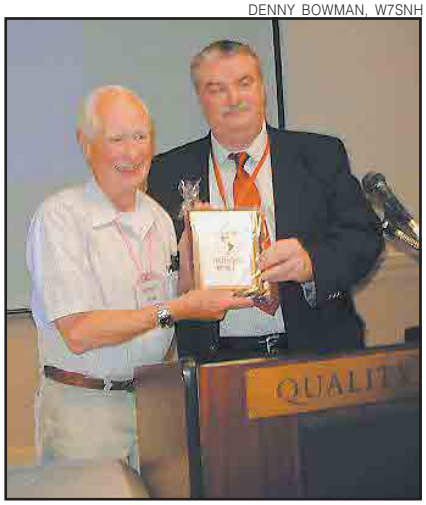
Next year's conference will be at the National Fish Hatchery in Leavenworth, Washington from May 16-22. More information is available at **www.chelansar.org/**, or by contacting Sgt Bruce Long at 509-667-6999, ext 1709.

The League Makes a Special Delivery

Bill Moore, NC1L, the ARRL's DXCC Manager, was scheduled to speak at the Pacific Northwest DX Convention in Seattle in July. As he prepared to depart, he packed a few extra items.

"Dick Pooley, W7HUY, asked if I could put his Honor-Roll and 5-Band DXCC pins in my pocket and bring them to the convention, which I was happy to do. During my presentation, I called Bill up to the podium and handed him the pins. As Bill turned to say something to the audience, however, I interrupted with, 'Excuse me, Dick, but there is something else.' From out of its hiding place I produced his Honor Roll plaque. You should have seen the look on his face!"

DENNY BOWMAN, W7SNH



Bill Moore, NC1L (right), surprises Dick Pooley, W7HUY, with an unexpected DXCC Honor Roll plaque.

Central States VHF Society Donates $1000 to ARRL

Dennis Motschenbacher, K7BV, the ARRL Sales and Marketing Manager, gave a technical presentation and was the banquet speaker at the Central States VHF Society Conference July 23-24. The conference was hosted by the Ontario VHF Association and the Toronto VHF Society at the Delta Meadowvale Resort and Conference Centre in Mississauga, Ontario, Canada. At the banquet, the Central States VHF Society presented Dennis with two $500 checks for the ARRL Spectrum Defense Fund and the Spectrum Defense Special Campaign (BPL).

Dennis Motschenbacher, K7BV (left), accepts the donation checks from Central States VHF Society treasurer Bruce Richardson, W9FZ.

ARRL On-Line Courses Gaining Momentum

With autumn upon us and winter approaching, thoughts turn to indoor activities. In addition to spending more time with their radios, hams are using the opportunity to expand their educational horizons through ARRL Certification and Continuing Education on-line courses.

According to Howard Robins, W1HSR, ARRL On-line Course Development Coordinator, the most popular technical courses are Antenna Modeling, Technician Licensing, Satellite Communications, Antenna Design & Construction and HF Digital Communications. The Amateur Radio Emergency Communications Courses (ARECC) are by far the most popular nontechnical courses.

Robins adds that an RF Propagation course will become available soon. It is authored by Ian Poole, G3YWX, a noted expert on the topic. Ward Silver, NØAX, is currently writing two courses—Analog Electronics and Digital Electronics—that should be available later in the year.

You'll find more information on the Web at **www.arrl.org/cce/**.

ARRL Team Attends National VEC Meeting

Eleven of the nation's 14 Volunteer Examiner Coordinators (VECs) and several FCC staffers met in Gettysburg, Pennsylvania on July 23 to review issues surrounding the volunteer examiner system. Among other topics, the VECs discussed the size, scope and comprehension level of exam questions.

The ARRL team consisted of VEC Manager Bart Jahnke, W9JJ, Amateur Radio Education and Technology Manager Mark Spencer, WA8SME and Perry Green, WY1O, Assistant to the VEC Manager.

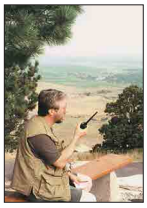
The FCC's Bill Cross, W3TN, advised the group on the state of FCC activity related to license restructuring. Riley Hollingsworth, K4ZDH, FCC Special Counsel for Enforcement, briefed the conferees on matters involving testing irregularities, retests and maintaining testing integrity. Riley cautioned all VECs to "be awake at the wheel" and to avoid any potential "failure to imagine what might happen" (a phrase coined by the 9/11 Commission) in regard to techniques less-than-honest examinees might use to defraud the system.

See "Happenings" in this issue for more information.

The day before the VEC Meeting, the FCC's Donna Scott gave ARRL's Bart Jahnke, Perry Green and Mark Spencer an impromptu tour of their Gettysburg licensing operations. Here Donna Scott is checking the license-printing log while Bart Jahnke looks on. All FCC licenses are printed on the same specially embossed security-paper stock on a commercial-grade laser printer. Some 350-550 amateur licenses are printed daily.

Guide to ARRL Member Services

ARRL, 225 Main Street, Newington, CT 06111-1494



www.arrl.org/services.html/ **860-594-0200**

Technical and Regulatory Information Services

A wealth of problem-solving information is available to you on the ARRLWeb at **www.arrl.org/tis/**. Can't find the answer there? Call the Technical Information Service at 860-594-0214 from 9 AM to 4 PM Eastern Time, or e-mail **tis@arrl.org**.

Do you have a question about FCC Rules or local antenna restrictions? See the Regulatory Information Branch on the Web, call 860-594-0236 or e-mail **reginfo@arrl.org**.

ARRLWeb www.arrl.org

Log on for news, information and ARRL services. Members have access to special ARRL Web site features. Place free classified ads. Download and view *QST* product reviews and search the on-line periodicals index.

ARRL E-mail Forwarding

Life in cyberspace is easier when you have your own **arrl.net** e-mail address. When you switch Internet Service Providers, all you have to do is let us know and we'll change your e-mail forwarding automatically. You're spared the hassle of having to tell everyone that you've changed addresses! Sign up on the Web at **www.arrl.org/members-only/emailfwd.html**.

ARRL News

The ARRL News service is the most credible source of news for the amateur community. Breaking stories are available on the ARRLWeb. You can also listen to ARRL Audio News on the Web, or by telephone at 860-594-0384. Have a news tip? E-mail **n1rl@arrl.org**.

QSL Service

The most economical way to send and receive QSL cards throughout the world is through the ARRL QSL Service.

Insurance

The ARRL "All Risk" Ham Radio Equipment Insurance Plan provides protection from loss or damage to your amateur station and mobile equipment by theft, accident, fire, flood, tornado and other natural disasters. Antennas, rotators and towers can be insured too. Call 860-594-0211.

Books, Software and Operating Resources

You can rely on ARRL for the very best publications and products: license manuals, circuit design and project resources, antenna construction ideas, and more. Shop online or locate a dealer near you at **www.arrl.org/shop**. What's the secret for making great publications even better?**—We listen to you!** E-mail your publications feedback, suggestions and product ideas to **pubsfdbk@arrl.org**.

DXCC/VUCC

The DX Century Club and VHF/UHF Century Club award programs are among the most popular Amateur Radio awards in the world.

Volunteer Examiner Coordinator (VEC)

Are you looking for a place to take your license exam? Do you have questions about the examination process? The ARRL VEC network is the largest in the nation.

FCC License Renewal/Modifications Service

At just over 90 days before license expiration, ARRL sends FCC-license renewal notices to ARRL members reminding them to renew. ARRL will also handle duplicate license requests, as well as address or other license changes (upon receipt of a completed and signed Form 605) as a free members-only service.

Educational Materials

A complete line of educational materials are available to schools, clubs and individuals.

Trust in Advertising

ARRL's advertising acceptance process is a unique and respected service provided to both members and advertisers. The ARRL Lab regularly evaluates products for acceptable construction quality, safety, compliance with FCC requirements and performance claims. Members rely on *QST* and other ARRL publications to locate reputable suppliers of Amateur Radio equipment and services.

ARRL Foundation

This is your source for scholarships and other financial grant programs to support Amateur Radio. See **www.arrl.org/arrlf/** on the Web or call 860-594-0397.

Write for *QST*

We're always looking for articles of interest to amateurs. See our Author's Guide at **www.arrl.org/qst/aguide/**. If you have questions, or wish to submit an article for consideration, send an e-mail to **qst@arrl.org** or simply mail your article to *QST* c/o ARRL Hq.

Interested in Becoming a Ham?

Phone toll free 1-800-326-3942, or e-mail **newham@arrl.org**. We'll provide helpful advice on obtaining an Amateur Radio license. See **www.arrl.org/hamradio.html**.

We're at *your* Service

ARRL Headquarters is open from 8 AM to 5 PM Eastern Time, Monday through Friday, except holidays. Call **toll free** to join the ARRL or order ARRL products: **1-888-277-5289** (US), Monday-Friday only, 8 AM to 8 PM Eastern Time. From outside the US, call 860-594-0355. The fax number is 860-594-0303 (24 hours a day, 7 days a week).

If you're in Connecticut, stop by ARRL Headquarters for a visit and tour. Located at 225 Main St, Newington, CT 06111, HQ offers tours at 9, 10 and 11 AM, and 1, 2 and 3 PM Monday through Friday, except holidays. Bring your license and operate W1AW anytime between 10 AM and noon, and 1 to 3:45 PM.

If you have a question, try one of these ARRL Headquarters departments . . .

	Contact	*Telephone*	*Electronic Mail*
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***QST* Delivery**	Circulation Desk	860-594-0338	**circulation@arrl.org**
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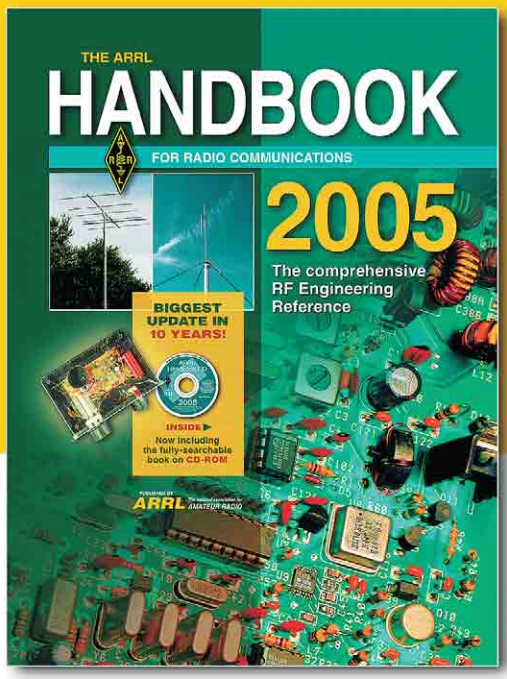

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YI9CR—Ham Radio in Iraq

By Steve Ostaff, AB8CR

I'm in the 1092nd Combat Engineer Battalion of the West Virginia National Guard. We arrived in Kuwait in April 9, 2003. A month later, Bravo Company was sent to An Nasiriyah, Iraq. I asked the communications officer for permission to operate a ham rig. After a month, he gave me a verbal approval. May, June and July were spent fixing up old buildings to live in, while sleeping outside, and enduring the heat and dust storms. When life began to seem routine and we learned we would be in theater for another six months, it was time to order the radio.

I decided on the new ICOM IC-703 with built-in tuner. The 10 W works out well with a rechargeable battery, and we had generators. I also ordered a G5RV antenna and paddles. Besides, I could use the radio at home, because I run off of solar charged batteries on my remote home in West Virginia. The house there is 100 years old and never had electricity installed.

I operated the radio from late September to early November. I made 41 QSOs to 18 countries in about six weeks. All but the first few were CW. I used AB8CR/Iraq as a call sign. Then, when we found out that we were to be sent into the Sunni Triangle on combat operations, it was time to pack up the rig and send it home.

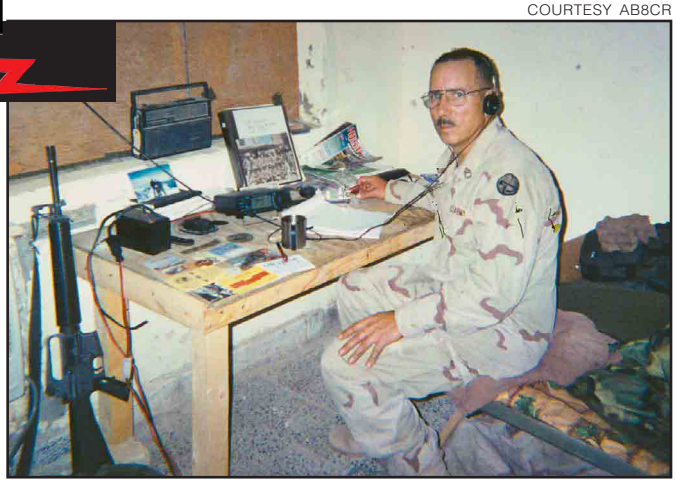
By the time I got my Iraq license, the rig was sent home. It didn't cost anything, and is good for five years. Hopefully, I won't get sent back to Iraq. The license is a good memento for me.

The QSOs were generally short. For operational security, I didn't say where I was in Iraq. I only ran into one other ham, and he was using *Echolink* on a computer. He let me talk to someone who was on 2 meters in Michigan. Another ham, someone I've never met, sent me a wonderful care package, just to be supportive of troops in Iraq.

One of my QSOs was with DL6AB, Günter, in Giessen, Germany. Since Günter offered to help, I told him I planned to take leave in Germany to see my son who is stationed there, and that I needed a map of Germany. Günter also sent a list of country prefixes, and even offered to make a phone call for me. Never underestimate the help one gets through the bond of ham radio.

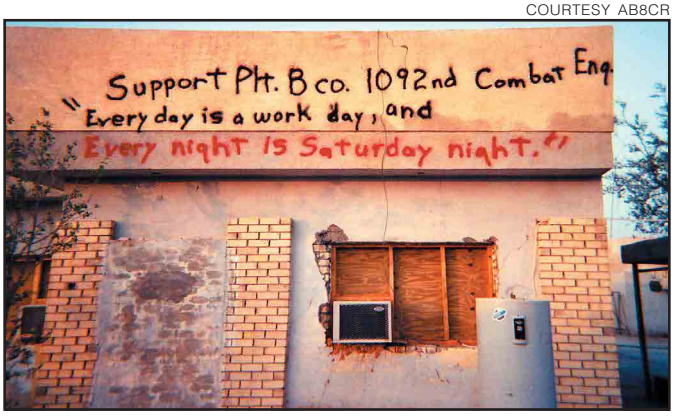
For me, ham radio was one of the most fun things I did in Iraq. My activities got some of the other guys there interested in ham radio. Now, the same IC-703 is set up at home. It seems to get amazing signal reports for 10 W.

COURTESY AB8CR



Steve, AB8CR, made most of his contacts on CW while he was deployed in Iraq.

COURTESY AB8CR



This building served as living quarters for AB8CR and other US soldiers.

One Man's Hamily

Few of us can boast the number of hams in our family that the K6YXH Hamily can. What's unusual about this group is that the two dozen or so members—all licensed—are all related to Norm Goodkin, K6YXH, of Calabasas, California. It's almost impossible to get all of them together in one place, although most Goodkin family gatherings have more hams attending than most radio clubs.

The criterion for including members? If they're close enough in the family to not be able to administer a VE Exam, then they're family.

Amazingly, Norm reports, "I've got a whole new generation of nieces coming up, and a grandson, Jonah, who just loves to push buttons and take things apart, and there are still a few stragglers holding out. I expect to continue to add to the Hamily every year."

COURTESY NORM GOODKIN, K6YXH

This picture, taken on July 4th, shows 17 members of the K6YXH Hamily. Top row: KC6DFX, KE6DEQ, KE6DQT, KI4DKP, KE6MVG, KE6CUJ, KA6VSS, KD6AXA; Middle row: KA6PTV, KG6GMQ, KE6DHL, KE6CUK, K6YXH, KC6ZQO, WB6OHW; Front row: KD6AXB, N6NUB. Not pictured: KE6VZH, KG6RUQ, KG6RVN, KD6LVS, KE6UUK, KE6LZT, N6FKG, WA6SLG, KB6QWY, WB6WFO and N6NEF (SK).

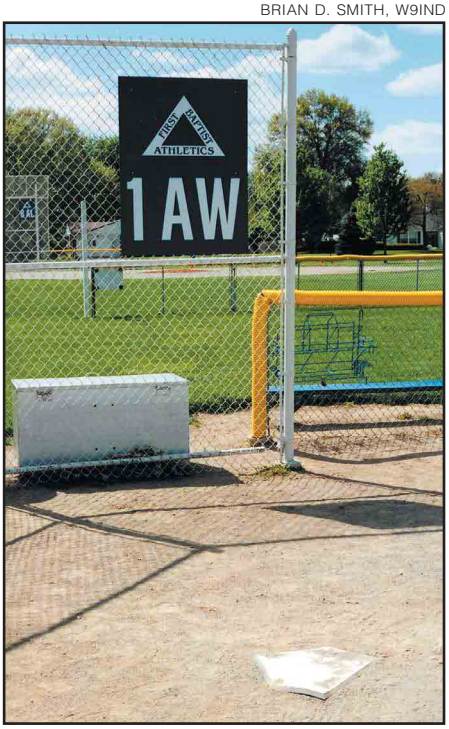
CARL ENNA

Congratulations! **Mare Dykes, KC5ETZ, of Beebe, Arkansas, recently named Ms Wheelchair of Arkansas, will go on to compete for the national title next year. As Mare explains: "Ms. Wheelchair Arkansas/America is not a 'beauty' pageant based on one's outer appearance, but is rather based on one's abilities and accomplish-ments since the onset of their disability." During the pageant interviews we were judged on our advocacy roles, and our accomplishments and abilities since onset of disability. My husband Darin, KK5WA, and I have spent numerous hours storm spotting, taking part in disaster preparedness exercises, parade and other community service communica-tions, and aiding disaster services. It helped demonstrate that people with disabilities have *much* to give to their communities...and this just happens to be one of the ways I personally do so."—*tnx Bob Ideker, WB5VUH***

TOM TAORMINA, K5RC

Perfect fit: **Tom Taormina, K5RC, of Virginia City, Nevada, writes: "I dropped in the office supply store to purchase some round mailing tubes to pack an antenna for shipment. To my wonder and amazement, I discovered a product specifically designed exactly for my needs and catering to our market!"**

BRIAN D. SMITH, W9IND



Another HPM commemoration? **Brian D. Smith, W9IND, suggests this ballfield on the north side of Indianapolis would be the perfect place to operate—of course—Field Day!**

New Command for Long-Time Ham

Richard J. Wallace, NØRW, of St Petersburg, Florida, has a new rank—Rear Admiral—to go with his new command of the Naval Reserve Air Systems Program. An active ham since 1968, Admiral Wallace writes: "Most of my activity the last 10 years has been mobile during my 2 hour per day commute in the Washing-ton, DC area on 222, 2 meters and HF voice. At home I am 95% CW. Tried most every-thing ham radio has to offer over the past 36 or so years from 1.8 MHz literally through light (laser communications). I still tinker and have built a lot of simple QRP HF gear. I'm an avid antenna experimenter now with a salt-water ground plane in the St Petersburg area. My son, KA4MYZ, and I keep an open 222 MHz re-peater here in St Pete."

CAPTAIN RICHARD OTIS, WB3LCS

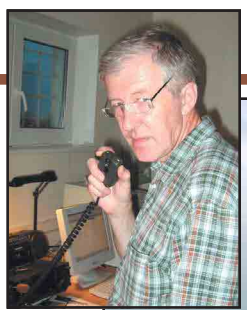
Congratulations, Sir! **Vicci Wallace, WA4KLG, pins the insignia of Rear Admiral on her husband, Richard J. Wallace, NØRW, at a ceremony attended by Admiral Wallace's father John, KB3JI, and son Matt, KA4MYZ. An ARRL Life Member, NØRW now commands the Naval Reserve Air Systems Program. The ceremony took place in June at Naval Air Station Patuxent River, Maryland.**

47 GHz EME Success!

By Al Ward, W5LUA

The first 24 GHz EME contact took place August 18, 2001 between W5LUA and VE4MA. The question was, how long would it take to make the first EME contact on 47 GHz, the next higher amateur band? Achieving low noise figures and generating enough power to overcome the additional path loss to the moon were only two of the many technological hurdles that would have to be overcome. Well, three years later, on July 24, 2004 at 1540 UTC, Sergey Zhutyaev, RW3BP, a Russian amateur, heard the first-ever echoes from the moon on 47 GHz. Several other amateurs have been working toward the same goal. During the several days after Sergey received the first echoes, additional transmissions from RW3BP to the moon were received by AD6FP, W5LUA, VE4MA and VE7CLD.

The system at RW3BP consists of a 2.4 meter offset-fed dish, a 4 dB noise figure receiver and a traveling wave tube capable of up to 200 W output. It is anticipated that with further receiver improvements and by running additional tests at lunar perigee and when the oxygen and water vapor absorption is decreased, that the first two way 47 GHz EME contact will become a reality.



RW3BP at his operating position in Moscow.

ALEXI ZHUTYAEV

The 2.4 meter offset-fed dish at RW3BP used to hear the first lunar echoes on 47 GHz.

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W8JK—A REMEMBRANCE

♦ "Radio—the word fascinated me. From a transmitting antenna to a receiving antenna radio waves traveled without wires. How could this be?"—*John Kraus, W8JK, from* Big Ear II

The recent passing of John Kraus is an especially significant loss of a person who was driven not only to wonder about the cosmos but to try to unlock its mysteries in ingenious and grand ways. Many of us know of John Kraus by his contributions to Amateur Radio, especially his 8JK flat-top beam and the highly versatile helical antenna. (Did you know that the "bowtie" feed corner reflector was also a Kraus creation?) His long and productive life was certainly greatly influenced by his introduction to Amateur Radio as a youth. *QST* was one of John's first sources of information about radio technology.

What Amateur Radio operators might be less familiar with is John Kraus's career as a radio astronomer. Radio astronomy began serendipitously in 1933 with an experiment by Karl Jansky, who was searching for sources of short-wave interference for Bell Labs. A few years after earning his PhD in Physics from the University of Michigan, Kraus heard a talk by Jansky at an IRE meeting. Few were taking seriously the significance of Jansky's discovery, but Kraus did.

Immediately after the World War II, Kraus met Grote Reber, W9GFZ, at yet another IRE meeting. Reber had built the first "dish" antenna radiotelescope and had mapped the sky in low resolution at VHF. Reber and Kraus were to become lifelong friends.

Bypassing several lucrative job offers from industry, Kraus accepted a professorship at Ohio State University in Columbus. There he spent spare hours producing such classic books as *Electromagnetics* and the definitive *Antennas*. But the urge to get his hands dirty building antennas could not be stifled for long. A $2000 initial grant allowed him to purchase the steel to begin building his first real radiotelescope, a tiltable array of helical antennas on a mesh covered frame. By 1953 he had assembled, with the help of his students, an array of 96 helices that operated at 250 MHz.

An even more magnificent antenna was yet to come—a reflector type that came to be known as the Big Ear. His design maximized his antenna aperture at minimum cost. A fixed parabolic rectangle, measuring 110 by 21 meters, received reflected rays from a tiltable flat reflector panel. The parabolic antenna in turn focused the signal to a central point at ground level. The flat surface reflector could be more easily built to maintain its shape as it was tilted than could a traditional dish and feed arrangement. In addition, the Kraus antenna had little aperture blocking and a low profile that helped make it immune to interference.

Eventually, this radiotelescope was to make some stunning observations, including detailed surveys and the famous "WOW" signal that is often quoted as a possible SETI hit. Sadly, the telescope was demolished in 1998 to add nine holes to an adjoining golf course. A Web site still exists for the Big Ear at **www.bigear.org**.

Although my relationship with John was mostly via telephone, I did visit him once in his Powell, Ohio, home with the purpose of interviewing him for an article I was going to write about him. He graciously welcomed me into his house. I was more than a bit nervous, afraid that I might ask something stupid. I fumbled through my notes and began with some question about what frequencies he would recommend for Amateur Radio astronomers. He answered, and then asked, "Sky, what kind of name is that?" The next hour was consumed with John Kraus interviewing *me*! I never got the "interview" on paper. I left dazzled by this man in his eighties who had such a huge and happy curiosity about the world. I snapped a picture of him outside his home before I left. In it, he is standing there, tall and smiling, in his overalls.—*Jim Sky, KH6SKY, Ocean View, Hawaii*

UNIQUE?

♦ I read with interest your article regarding the history of the Heath Company and Heathkits [Aug 2004, pages 86-87]. I have in my possession what may be the world's only unassembled Heathkit in its original box, with original manuals, still sealed. This is a power supply kit that I purchased in the 1970s and never took the time to assemble. I believe this is a unique item—maybe the only one in the world.—*A. Robert Spitzer, MD, KB1AP, W Bloomfield, Michigan*

[*Editor's note:* Your unopened Heath power supply may well be very rare, although there's no way to tell for certain. Those who visit ARRL HQ can feast their eyes on a similar item—an HW-9 QRP transceiver that's been removed from the original carton for display purposes. The carton's contents are all there, however—still wrapped in their original plastic covering.]

HOPING FOR OPENINGS

♦ I wish to thank Bill, K5MAT, for a very fine, informative article on 6 meters in the August 2004 issue ["What to Expect on 6," pages 49-51]. As a ham who owns an HF rig that covers HF + 6 meters and also owning a 6 meter vertical—and one who knew nothing about 6—I greatly enjoyed the article. I'm hoping for some good propagation yet to come.—*Geary Schied, KF7SN, Billings, Montana*

OF *ECHOLINK* AND CHARLEY

♦ Soon after becoming licensed in November 2003, I discovered *Echolink*. It enables you to use your PC as though it were a radio, linking up repeaters to the Internet. My very first contact on the K7NWS repeater via *Echolink* was KD7WGN. For a couple of weeks, I used it to talk to various people on the repeater, meeting other hams, making new friends. Then I got my very first radio, a DJ-V5TH handheld. First person I called? You guessed it: Lee, KD7WGN.

Then disaster struck. I dropped my handheld, cracking the front faceplate and destroying the tabs that held the battery on. What was I to do while my radio was in the shop? I went back on *Echolink*. It was there that I discovered ARES. I can thank Ralph, N7KGA for that. Soon after contacting Bob, W7ZMO, the ARES coordinator for Kirkland, I was participating in my first statewide simulated exercise. I decided I liked the experience, but knew that I would need more training in order to learn the skills needed to help out in a crisis. So I signed up for the ARRL Emergency Communications Course Level I.

While I was eagerly waiting to start the course, disaster struck a second time.

Hurricane Charley had battered Florida, leaving millions without communications. Landlines were knocked out; cell phones were paralyzed. I'd heard of ham radio being used in the past during a natural disaster, but up here in Washington, with only a Technician license, what could I do?

Echolink was the answer. Using *Echolink*, I found a conference called "WX_TALK." I decided to log in and ask about the hurricane. A very stern voice came back saying that it was a directed Emergency Net. I identified myself as an ARES member here in Kirkland, Washington. The next question was, "What can I do to help?" I was told "Stand by and listen." For the next day, I listened to how the net was run, and learned about its structure and how it functioned. I listened well into the night until I couldn't keep my eyes open anymore.

The next morning, I logged into the WX_TALK net. VE3JED was net control operator. The top of the hour was coming up. He surprised me by having me read the hourly bulletin, since he'd put in a long night and I had just gotten up. Emulating what I'd heard over the last day, I read the bulletin from the National Hurricane Center.

After the net officially closed down once Charley became a tropical depression and was no longer a threat, I decided to start my own net—after asking if anyone would mind. At 5 in the morning, I doubt anyone did. At the top of the hour, I read the NHC bulletin over the link, and an abbreviated version at the bottom of the hour. The rest of the time was spent listening for any stations that wanted to use the net.

Stations logged in, and gave what information they knew from Florida. Using the free Web page I got with my Yahoo mail account, I set up an information page that provided telephone numbers of who to call for health and welfare checks. I've been at it now for four days and have the blessing of the net manager, Kevin, KD5WX.

In November, I will have been a ham for a year. I'm saving for my second radio, and look forward to upgrading my license to General. In the meantime, it's time for the noon report....—*George White, KD7YVV, Kirkland, Washington*

HELP WITH TOWERS

♦ I am in writing in response to the note sent in by Marty Feeney, K1OYB, who wrote about "older folks" having problems erecting towers due to the exorbitant expense of professional installation and the difficulty in finding hams with the energy and strength to assist [Sep 2004, page 25]. On the latter point, I see this as yet another symptom of an aging ham community with little new blood entering the hobby, and the little that does enter being less than fully active. As a 26 year old, I see few contemporaries at ham club meetings. While I enjoy being exposed to the years of experience and wisdom of the "gray beards," I really do worry that by the time I am their age there won't be many people to talk to on the bands and I will have had to find some other hobby to take ham radio's place.

If Marty lived near Houston, I'd be more than happy to climb his tower for him. If there were more active young people in the hobby, he'd probably have a much easier time finding someone close by to help out.—*Jason Dugas, KB5URQ, Bacliff, Texas*

♦ The growing off-grid renewable energy folks have a lot of towers for small wind generators. The people who do this work of installing wind generators may not know a lot about RF stuff and would have to be told what to do with beams and rotators, etc, but they certainly know how to erect tall towers...

Dealers of wind generator type equipment can be found through *Home Power Magazine*, which has been promoting this for many years—as well as photovoltaics, micro hydro power, battery care, building codes, etc. I would expect the manufacturers of "small" towers also might have lists of installers. —*S. Premena, AJØJ, Boulder, Colorado*

JOIN MOCAD

♦ I have formed a new club. There are no dues and no meetings; you can become a member now. The outcome will make ham radio better, and you will have fun doing it. Now you are wondering what the heck is MOCAD. The letters stand for Make One Contact A Day. The rules are easy:

1) Make one contact each day, on any band.

2) Keep a log for yourself; this is a self-policing system.

3) Tell at least one other ham about it each week.

4) Be proud to be a MOCAD.

You will be surprised how fast time passes and look back in your log and want to show others your contacts. There are no awards or paper for the wall—just knowing you had a part in improving activity on the bands.—*Steve Sheers, W8AFX, Proctorville, Ohio*

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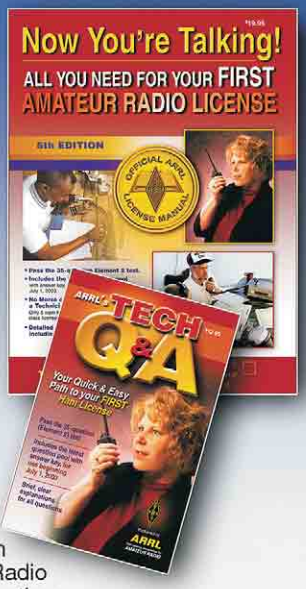

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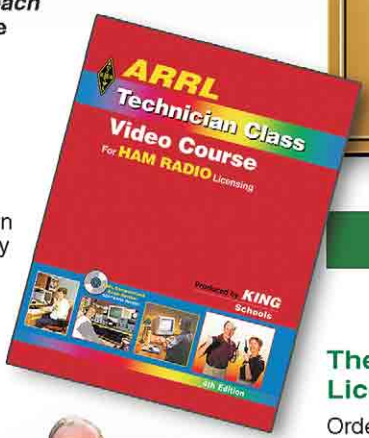

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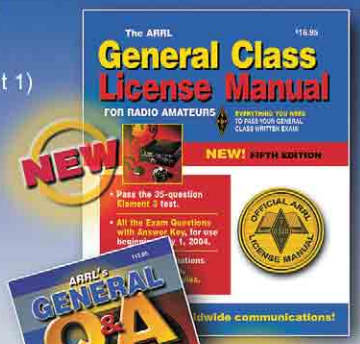

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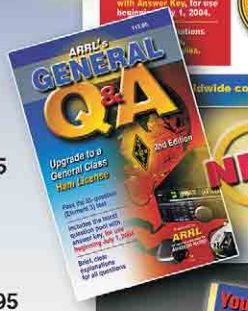

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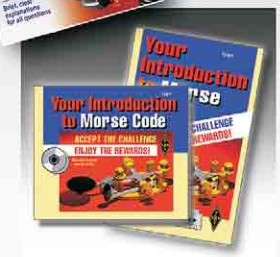

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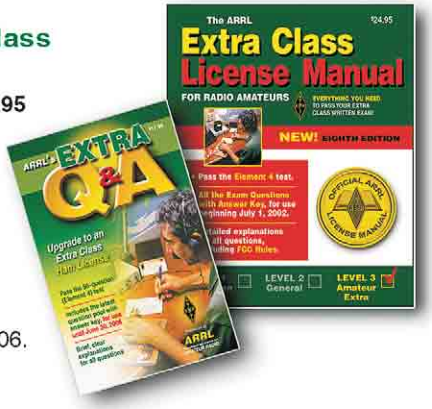

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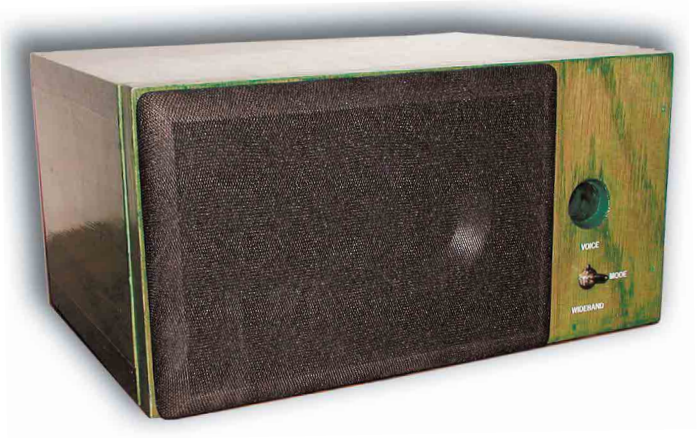
By John M. Russell, KG4AIH

A High Quality Speaker System for the Ham Shack

KG4AIH speaks up and tells how to build an excellent communications speaker system for the radio room. Plus—its switchable response can also handle music.



How would you like to have a speaker system for your shack that serves the dual purpose of a bandwidth limited speaker for communications and a high fidelity speaker for short wave (SW) or broadcast listening? This venture started as a way of using some oak plywood left over from another project to build an external speaker for use with my Ten-Tec Argonaut. I use this from time to time for SW listening and I wanted better sound quality than that provided by the built-in bottom-firing speaker.

Building speaker systems is another hobby of mine and I decided to construct a compact two-way ported system to give good sound from a small box. To use the audiophile jargon, I built a two-way system with a Butterworth fourth-order vented enclosure, first-order crossovers and a flared port with Zobel-network impedance compensation for the woofer.

To keep the costs down I used simple 6 dB first-order Butterworth crossovers for the tweeter and woofer. I chose a switched Butterworth second-order 12 dB band-pass filter to limit the audio response to about 300-3000 Hz when used for communications monitoring in VOICE mode. In the WIDEBAND mode the frequency response is from approximately 50 Hz to over 19 kHz. I also selected magnetically shielded drivers that could be placed close to a computer monitor without affecting that display.

The total cost of parts is less than $40, plus the cost of whatever woods you choose to use. The sound quality in the WIDEBAND mode will rival that of many commercial speaker systems costing several times as much. If you listen to music on any of the SW broadcast or local FM bands the difference in sound quality compared to that of built-in speakers will be amazing. If you want a pair for stereo, build two speakers and omit the band-pass filter and switch on one.

I have to admit I like the looks of wood. My father was a master cabinetmaker and I had the good fortune to work with him for several years. Speaker enclosures are ideal wood-building projects. Wood allows multiple options in appearance and finishes—it is easy to work with, and it is relatively inexpensive. The tools required are a circular saw (commonly called a skill saw), a drill, a sander and a jigsaw for cutting the circular speaker opening. Large paddle (flat) wood drill bits are used for the port and switch cutouts and a hole-saw is used for the tweeter opening. A table saw will make the job easier, but careful cutting with a circular saw will give good results if you don't have one.

Speaker Building Basics

Years ago, building a speaker system that provided good bass response required the use of large woofers of 8 to 15 inches in size. They were needed to move the quantity of air required for the low frequency sounds because of their limited X_{max} or speaker cone excursion. These systems were usually enclosed in very large cabinets of 5-10 cubic foot volume. Modern speakers use a rubber or foam surround around the speaker cone with much larger magnets that allow a small diameter cone to move lots of air and produce excellent bass response. By using these speakers with a tuned port, a small diameter speaker in a small enclosure will produce bass response that was not possible years ago. Porting the enclosure also increases the efficiency of the speaker system. That means less power from an audio amplifier to provide a given sound pressure level (SPL) compared to that of a similar-sized sealed enclosure.

Designing a ported enclosure has now been greatly simplified, because the data (Thiele-Small parameters) required for calculation of the enclosure size, port diameter and length are generally provided by the speaker driver manufacturer. The use of computers or scientific calculators to do the math for enclosure and crossover design has also made things much easier and faster.

There are numerous freeware and shareware programs available that require only the input of supplied data to calculate the enclosure volume, port diameter and length, enclosure panel dimensions and even the values of the capacitors and

inductors required for the crossovers.

I used *Loudspeaker 101*, a freeware program, to help with this design (no longer available). I also checked those results with an inexpensive scientific calculator. I am currently using *Boxplot*, a shareware program.[1] I also used *PEboX 1.1* for the Zobel network calculation.[2]

Drivers

The woofer selected for this project should meet several requirements. It needs to have a high X_{max}, a stiff cone, low Q_{ts} (total Q) and low F_s (resonant frequency) to utilize a small enclosure and provide extended bass response. After many hours of inputting data, I decided to use a 4 inch, magnetically shielded, aluminum cone woofer from MCM Electronics.[3]

The important specifications are Q_{ts} = 0.38, V_{as} = 0.176, F_s = 60 Hz, X_{max} = 2.55 mm, Z = 8 Ω, R_e = 6.8 Ω, L_e = 0.78 mH and an SPL sensitivity of 86 dB W/m. The sensitivity refers to a sound pressure level of 86 dB with 1 W input measured at 1 meter from the cone. This is a fairly high level for a small driver and it will provide more than ample volume from most radios while still able to handle an input power of up to 20 W for high fidelity use. The less than $12 cost is very reasonable for the driver quality.

The tweeter I used was one I had on-hand from a previous project and it is also an excellent driver for the cost ($2.30).[4] The important specifications here are Z = 8 Ω, F_s = 2600 Hz, SPL sensitivity = 90 dB W/m, a response of 4 kHz to 19 kHz and magnetic shielding. This tweeter uses a Mylar dome and an acoustic lens for wide dispersion, and it is ferrofluid cooled. I used a crossover point of 5 kHz for the tweeter.

[1]Notes appear on page 34.

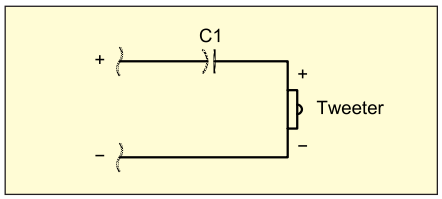


Figure 1—A simple high-pass filter, consisting of a suitable non-polarized capacitor, will pass only high frequencies to the treble speaker or tweeter.

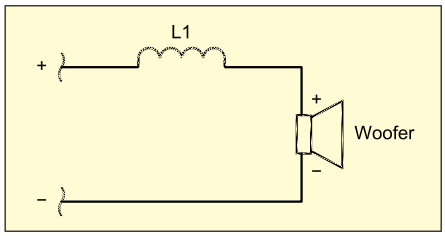


Figure 2—A simple low-pass filter (one inductor) will channel mostly low frequencies to the bass driver or woofer.

Crossovers

The crossover is a filter used to direct low frequencies to the woofer and high frequencies to the tweeter. If you don't use a crossover, both drivers will try to reproduce the full range of audio frequencies with disastrous effects on the tweeter. A tweeter, because of the small size of the radiating element (usually a cone or dome), has restricted cone motion and cannot reproduce the low frequencies. Its voice coil would quickly burn out if a crossover were not used. The woofer, on the other hand, because of its large mass, cannot accurately reproduce the higher frequencies because it can't physically move fast enough.

Crossovers can be as simple as a single nonpolarized capacitor (Figure 1) or an inductor (Figure 2) for a 6 dB (1st order) crossover to multiple capacitors and inductors for more complex systems providing 12 dB, 18 dB or more roll off (slope). All polarized in speaker crossover networks, bandpass and Zobel filters because we are usually dealing with relatively large values of capacitance in bipolar (ac) circuits.

Crossovers are specified in dB loss per frequency octave; for example, a 6 dB crossover will reduce the input by 6 dB per octave. This means that the audio signal is reduced to 25% at the first octave and 6.25% at the second for a 6 dB crossover and 6.25% at the first and 1.56% at the second for a 12 dB crossover. Every 3 dB of loss produces a reduction in power of 50%.

Crossovers are designed as low-pass filters to pass the lower frequencies and attenuate the high frequencies and as high-pass filters to pass the high frequencies and attenuate the low (as shown in Figures 1 and 2).

A band-pass crossover, usually used for the midrange driver in a three-way system, utilizes both high and low-pass filters to pass a wide band of frequencies (see Figure 3). This project uses a 2nd order Butterworth, 12 dB band-pass filter. This allows only the frequencies in the range of 300-3000 Hz to be passed to the drivers when in the VOICE (narrow) mode (for communications monitoring). To accomplish this we use a 300 Hz high-pass filter to pass frequencies above 300 Hz connected to a 3000 Hz low pass to block those frequencies above 3000 Hz. This will filter high and low frequency noises and interference by 12 dB per octave to provide for cleaner audio in the voice frequency ranges.

Calculations

The calculations can be performed by software or with the use of an inexpensive scientific calculator. I use a Texas Instruments model TI-30Xa calculator for teaching basic electricity and electronics classes and I used it to check the calculations in this project. It is generally available for about $12. I highly recommend it for electronics calculations. I find the engineering mode very helpful for working with the powers of 10 used in most electronic calculations.

1st Order Butterworth Crossover (6 dB)

Crossover frequency (f) = 5000 Hz
R_L= woofer impedance = 8 Ω
R_h= tweeter impedance = 8 Ω
Capacitor C1 = 1 / 2π (R_h× f) =
3.975 µF (use 4 µF)
Inductor L1 = R_L / 2πf = 0.255 mH
(use 0.27 mH)

Zobel Filter

The voice coil in a speaker is, in fact, an inductor. Since inductive reactance increases with an increase in frequency, a method of compensation must be used to maintain a flat frequency response in a woofer. Some tweeters employ mechanical compensation to obviate the need for a Zobel filter. To compensate for this rising impedance, a Zobel filter is used on the woofer to help flatten the response. The Thiele-Small parameters of R_e = 6.8 Ω (voice coil dc resistance) and L_e = 0.78 mH (voice coil inductance) are used to calculate these values. The design equations for this type of filter are:

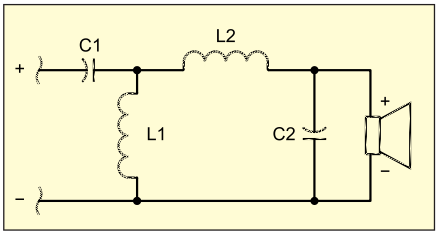


Figure 3—A more complex bandpass filter will channel a range of frequencies (upper and lower) to a midrange driver.

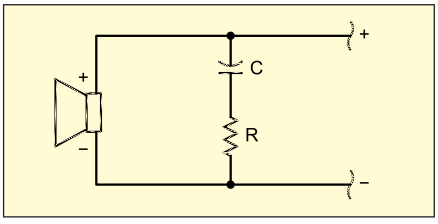


Figure 4—A Zobel filter, consisting of a series RC network, is placed across the driver to compensate and help flatten the driver voice coil impedance variation with frequency.

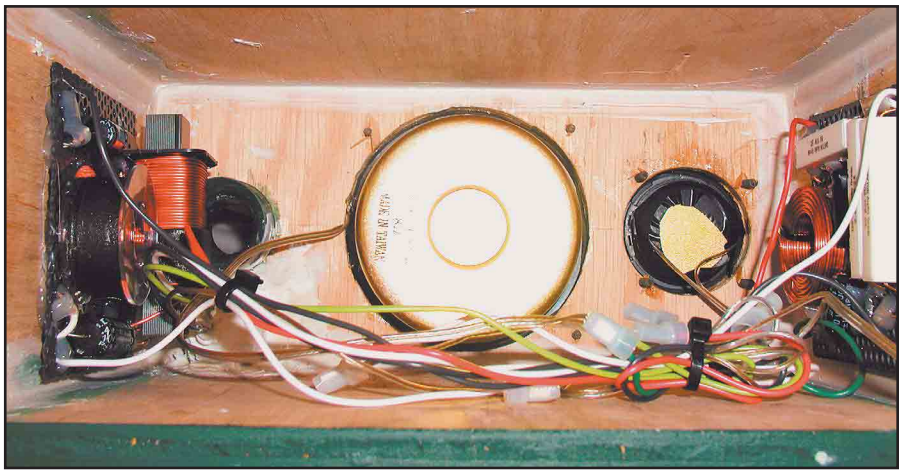


Figure 5—The interior of the speaker system. The band-pass network is on the left-hand side panel. The crossover network is on the right-hand side panel. The low frequency driver (woofer) is in the center and the high frequency driver (tweeter) is to the right.

Resistor $R_c = 1.25 \times R_e$
Capacitor = L_e/R_c^2
Our speaker specifications are R_e = 6.8 Ω and L_e = 0.78 mH, so:
Resistor = 1.25 × R_e (6.8) = 8.5 Ω (use 8 Ω)
Capacitor = 0.78 mH / 46.24 = 16.8 µF (use 17 µF)

For this woofer, the values calculated call for a 16.8 µF capacitor and an 8.5 Ω resistor. Standard values of 17 µF and 8 Ω will work fine, as the values are not critical. The capacitor and resistor are connected in series and wired in parallel with the woofer voice coil (see Figure 4).

The tweeter used in this project is ferrofluid cooled for increased power handling capability. The tweeter also provides mechanically controlled compensation for the voice coil, so a Zobel network is not required. The tweeter can be seen to the right in Figure 5.

The Band-pass Filter

For the band-pass filter I used a 2nd order Butterworth filter, which provides a 12 dB slope. This will require two capacitors and two inductors, as shown in Figure 3.

The calculations are:

C1 = 0.1125 / (R_h × f) = 0.1125 / 8 Ω × 300 Hz = 46.875 µF (use 47 µF)
L1 = (0.2251 × R_h) / f = (0.2251 × 8 Ω) / 300 Hz = 6 mH
C2 = 0.1125 / (R_L × f) = 0.1125 / (8 Ω × 3000 Hz) = 4.687 µF (use 4.7 µF)
L2 = (0.2251 × R_L) / f = (0.2251 × 8 Ω) / 3000 Hz = 0.6 mH

The Enclosure Calculations

The parameters of the woofer are: Q_{ts} = 0.38, V_{as} = 0.176, F_s = 60 Hz and these are generally furnished with the driver or obtainable from the manufacturer.

The formula for the internal volume of the box is:

$$V_b \text{ (in cubic inches)} = Q_{ts}^{2.87} \times 15 \times V_{as}$$

By using the Q_{ts} and V_{as} provided, the V_b or internal volume of the box can be calculated and gives an enclosure size of 0.164 cubic feet of internal volume.

V_b = 0.062 × 15 × 0.176 = 0.164 cubic inches

You need to add some to the V_b of 0.164 for the area displaced by the speaker magnets and frame and crossover parts. I used 0.1875 cubic feet for this box and partially filled it with polyester pillow stuffing for damping of any internal standing waves.

The low frequency response (the point at which the low frequency response is down 3 dB) can be found with the following formula:

$F3 = Q_{ts}^{-1.4} \times 0.26 \times F_s$
= 3.875 × 0.26 × 60 Hz = 60.45 Hz

With this woofer, the enclosure will provide a low frequency response corner that is down 3 dB (F3) at 60 Hz.

Box Tuning Calculations

The frequency for the tuning of the box is found by the formula:

$F_b = Q_{ts}^{-0.9} \times 0.42 \times F_s$
F_b = 2.388 × 0.42 × 60 Hz = 60.19 Hz

The enclosure needs to be tuned to 60 Hz, which is accomplished by the addition of a port or vent.

The minimum vent diameter for a straight non-flared tube is found by this formula:

$$D_v \text{ (vent diameter)} \geq 39.37 \times (F_b \times V_d)^{0.5}$$

V_d is found by X_{max} (in meters) × S_d (a constant; for a 4 inch driver about 0.0055)

So V_d = 2.2 mm × 0.0055 = 0.000012 and F_b = 60.19 Hz

D_v = 39.37 × 0.027 = 1.06 inches

The suggested minimum vent diameter is 1 inch to prevent any possible vent noise caused by the movement of air through the vent. Our vent diameter is smaller, however; any vent noise is prevented by the use of a flared design.

The length of the vent is calculated by the following formula:

$$L_v = [(1.463 \times 10^7 \times R^2) / (F_b^2 \times V_b)] = 1.463R]$$

Because we are using a flared port, we can use a smaller diameter; in this case about 0.75 inch.

Our radius would then be about 0.375 inches or half the diameter. V_b is in cubic inches. To convert our 0.164 cubic feet to cubic inches, multiply it by 1728, which equals 283.

Using the above formula and calculating through, we arrive at L_v = 1.46 inches. So, our vent should be about 1.5 inches long.

The port normally should be located on the rear of the enclosure as far from the woofer as possible for the best performance. Locating it on the front, however, does not greatly impact performance. And, it is a preferable location if the speaker is to be placed against a wall or if it does not have a large open area to the rear. It will provide more bass energy to the front even though bass frequencies are, in general, omni-directional.

I'm frugal (my wife would say *cheap*!) and I'm always saving stuff like PVC pipe and cardboard tubes for future projects. I save the top part of plastic soft drink bottles (2 liter) and cut them to size for small projects like this one. I cut this one to 1 3/8 inch because the vent tube will not extend completely through the 3/4 inch plywood (Figure 6). The hole in the panel is sized to 1 1/8 inch in order to glue the tube in. The tube can be painted whatever color you choose (mine is black). It will not be flush with the front of the panel so you need to fill the gap at an angle to add a

Figure 6—The flared port tube is made from the top of a plastic 2 liter soft drink bottle.

Figure 7—The front of the tuned port is flared (tapered) slightly with putty as it doesn't fully extend to the surface of the front panel.

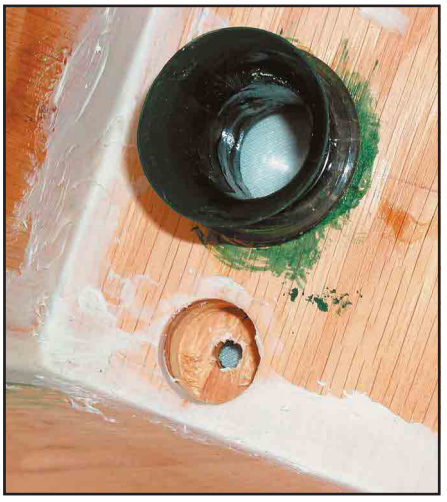


Figure 8—The hole for the switch is recessed. Note the caulked interior. The enclosure must be airtight, including the back. This means that the front panel switch and rear panel input jack must also be sealed.

taper to the front. Figure 7 shows the tapered front port. The internal portion of the front of the port (internal to the speaker) must be caulked to seal it to the front panel, as shown in Figure 8.

Use a bottle cap or a small box to seal the inside of the 1/4 inch phone jack and switch, as shown in Figure 9. Remember that the enclosure must be air tight, except for the port tube, to function correctly.

Circuit Description

Refer to the schematic, shown in Figure 10. The band pass filter consists of C1, L1, C2 and L2. C1, a 47 µF nonpolarized capacitor and L1, a 6 mH coil, form the 300 Hz filter high-pass section, blocking frequencies below 300 Hz. C2, a 4.7 µF nonpolarized capacitor and L2, a 0.6 mH coil, form a 3 kHz low-pass filter blocking frequencies above 3000 Hz. This passes the audio band of 300 to 3000 Hz when switched by S1, the VOICE/WIDEBAND switch, when in the VOICE position.

When in the WIDEBAND position the band-pass filter is bypassed to provide full range operation. C3 and L3 are the components used for the 6 dB first order crossover for the woofer and tweeter.

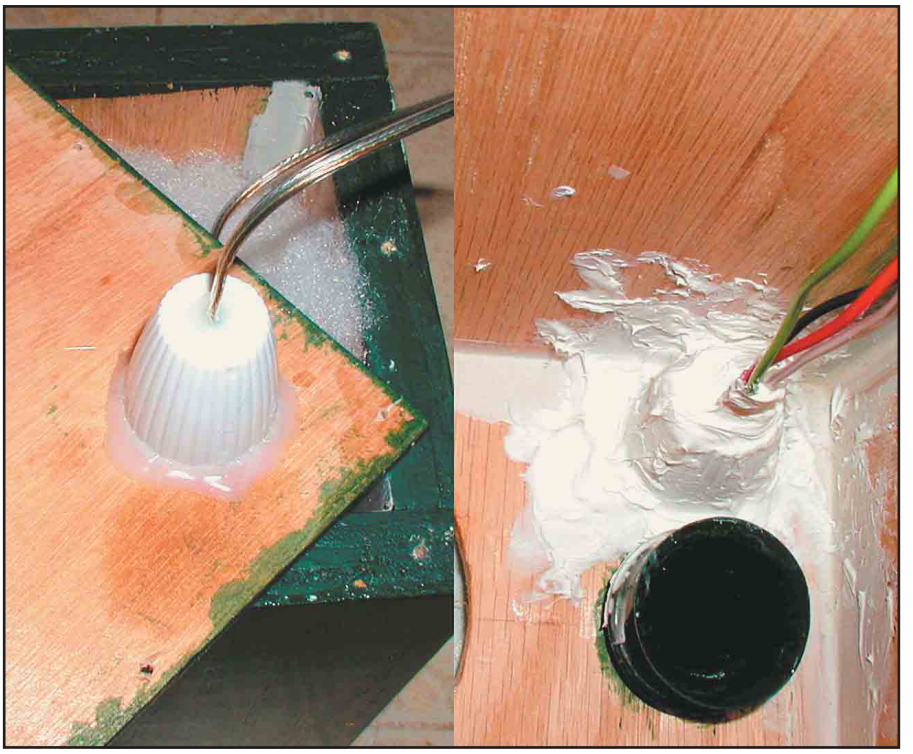


Figure 9—Can or bottle caps are used to seal the response switch and the input jack.

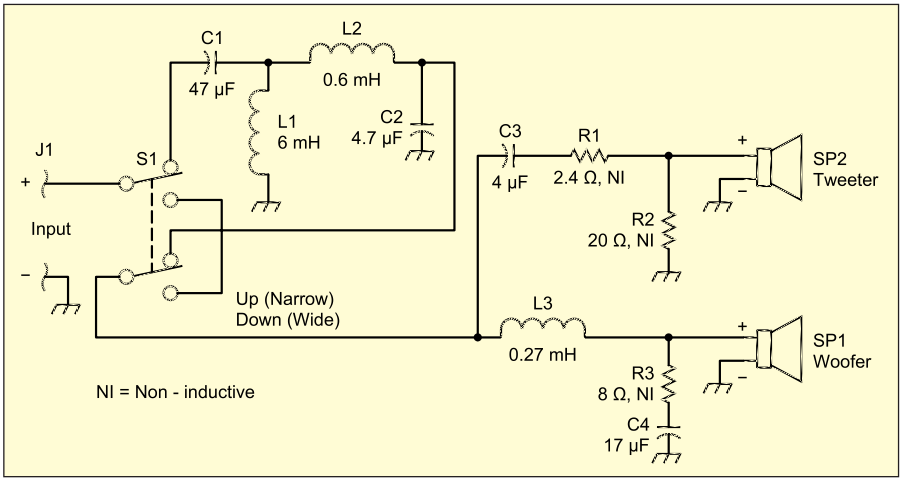


Figure 10—Schematic of the communications and wideband speaker system. The speaker uses a two-way crossover system with Zobel filter woofer compensation in a compact ported enclosure. PE denotes Parts Express, 725 Pleasant Valley Dr, Springboro, OH 45066; 800-338-0531; www.partsexpress.com. MCM denotes MCM Electronics, 650 Congress Park Dr, Centerville, OH 45459; 800-543-4330; www.mcminone.com. Note: The author will be able to provide a complete set of parts with assembled crossover, filter and shipping for $60. Completed systems can also be provided. Prices for completed systems will be quoted on request due to the option of multiple finishes. The author can be contacted at the address given at the end of the article.

C1—47 µF, NP capacitor (PE 027-352).
C2—4.7 µF, NP capacitor (PE 027-332).
C3—4 µF, NP capacitor (PE 027-330).
C4—17 µF, NP capacitor (PE 027-346).
J1—1/4 inch headphone jack (PE 090-310).
L1—6 mH inductor (PE 266-572).
L2—0.6 mH inductor (PE 260-725).
L3—0.27 mH inductor (PE 266-810).
R1—2.4 Ω, 10 W resistor (PE 004-2.4).
R2—20 Ω, 10 W resistor (PE 004-20).
R3—8 Ω, 10 W resistor (PE 004-8).
S1—Toggle switch, mini, DPDT (PE 060-338).
SP1—Woofer, 4 inch (MCM 55-1853).
SP2—Tweeter, Mylar (PE 270-175).

Miscellaneous
2×2 foot plywood or 1×4 foot MDF.
3/4 inch wood tape to match plywood.
3 feet of 1/2 inch quarter round molding.
1 × 1 foot 3/8 inch plywood.
Latex or RTV caulk.
Wood finishing materials.
Above available at Lowe's / The Home Depot.
Polyester fill and scrap cloth (available at a fabric store).
Empty 2L soda plastic bottle.

Figure 11—An example of stains and stain colors that can be used for the enclosure exterior.

Figure 12—Using a saw guide to ensure accurate cutting.

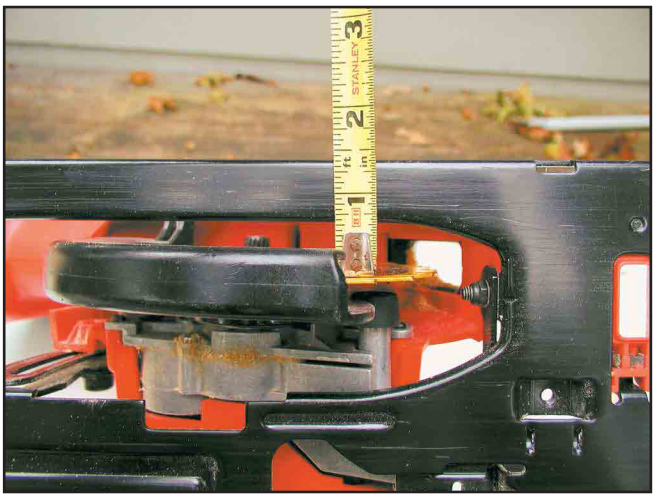


Figure 13—Measuring the cutting saw offset.

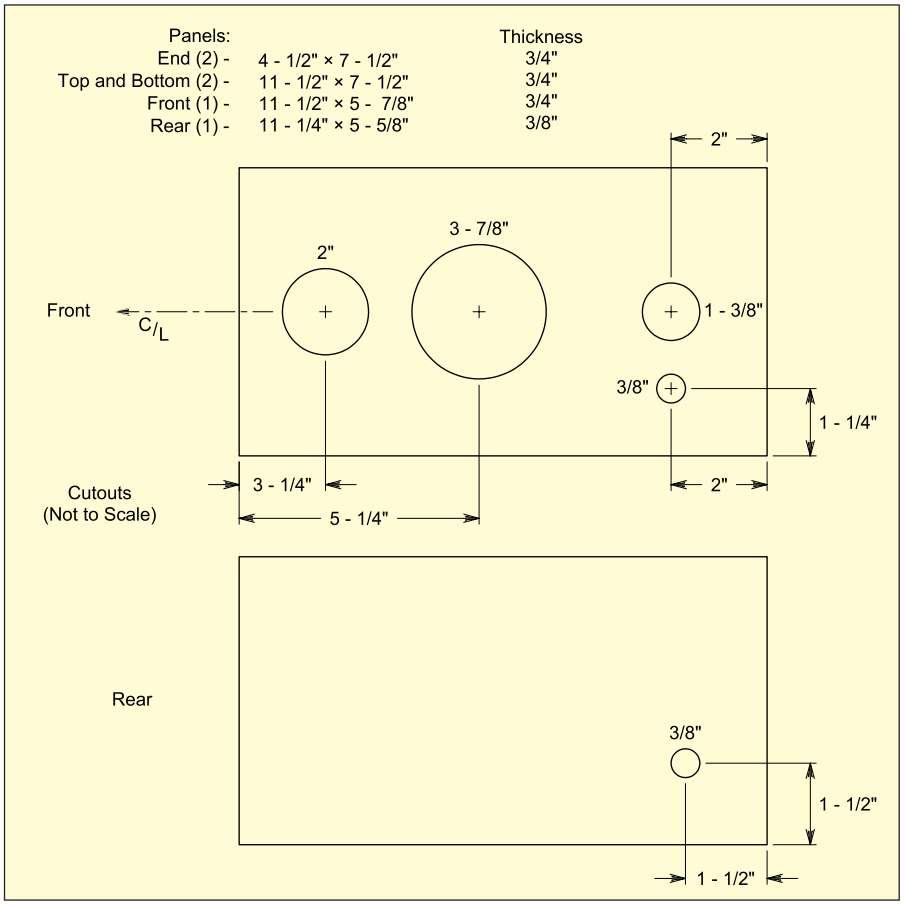


Figure 14—Enclosure dimensions and cutting details.

C3, a 4 µF nonpolarized capacitor is the 5000 Hz high-pass filter for the tweeter and L3, a 0.27 mH coil, is the low-pass filter for the woofer, passing the frequencies below 5 kHz to the woofer. R1 and R2, 2.4 Ω and 20 Ω noninductive resistors, form a 3 dB L-pad to attenuate the tweeter level by 3 dB. This is required to match the SPL levels of the tweeter at 90 dB to the woofer at 86 dB. A 1 dB difference is negligible. C4 and R3, a 17 µF nonpolarized capacitor and an 8 Ω noninductive resistor, form the Zobel network for woofer voice coil impedance compensation.

Construction and Finishing

I used $^3/_4$ inch oak plywood for my speaker although any plywood, particleboard or MDF (medium density fiberboard) can be used depending on the final finish. If the enclosure will be painted I suggest the MDF, but for a stained finish use a good grade of plywood. I like the appearance of a finish that has both color and the natural grain of the wood. I used a "wash" of latex paint diluted with an equal part of water to color the wood without hiding the grain. Figure 11 shows the black, green and golden oak colors on oak plywood. This technique can be used to color the wood to match any equipment color.

The enclosure shown in this article was stained a medium green using a Hunter green latex paint diluted with an equal part of water. Simply wipe the color on and wipe it off with a dry rag immediately. I've used children's finger paints for other projects to mix a whole palette of colors and still show the wood grain. If you want to match a Collins or Heathkit, mix your own colors. Simply brush it on, wipe dry with a cloth, allow it to completely dry, then apply several clear coats before fine sanding with a 320 or 400 grit sandpaper.

The final finish can be a polyurethane, clear lacquer, or like on the black cabinet, a hand-rubbed oil finish using Behr brand Scandinavian Tung Oil Finish. This provides an "old world" semi-gloss finish at a cost of many hand-rubbed coats. Caution: Don't use this unless you are willing to apply at least 10 coats to oak; fewer for less porous woods like birch.

I've also had good experiences with several brands of latex polyurethane—they are fast drying and clean up with water. I like to stain first and then apply a few coats

Figure 15—A closeup of the front panel switch labels and tuned port.

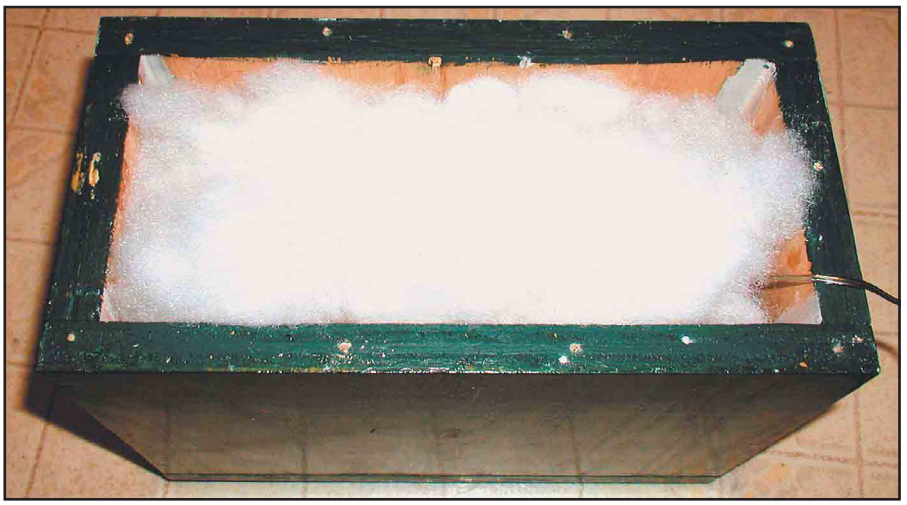


Figure 16—The box interior after stuffing with polyester material.

of finish before assembling the enclosure.

Cutting and Assembling the Enclosure

Always use a guide firmly clamped to the material to be cut to ensure a straight cut. I use a piece of 1 inch angle aluminum, as shown in Figure 12, but any straight edged piece of wood can be used. Measure the offset of your saw and clamp the guide back from your cutting line by that amount. My saw has an offset of $1\frac{3}{8}$ inch (see Figure 13). If you are using plywood, a 2 × 2 foot piece of $\frac{3}{4}$ inch material will be all you need for one speaker. Lowe's or The Home Depot sell oak and birch plywood in 2 × 2 foot sheets. If you're painting the enclosure, buy a 1 × 4 foot, $\frac{3}{4}$ inch piece of MDF.

Figure 14 shows the dimensions I used for the enclosure. After cutting all the pieces, apply a wood tape to all four edges of the front and both ends of the sides of the plywood. This tape can be found in both iron-on and glue-on types; I used the iron-on tape for this project. Cut the tape about 1 inch longer than the side to be covered and use a high temperature iron to apply. If someone is watching, cover the tape with heavy paper from a brown paper bag before using the iron; if not, be sure to check the iron for residual glue and clean it after use! You'll need to apply the tape to the two short sides of the front, then trim and sand flush before doing the long sides. If you need to reposition the tape, just reheat and move it. Allow it to cool completely before sanding flush.

The panels should be glued with wood glue and fastened with nails for those enclosures that will be stained. Use screws if you are painting the enclosure. Be sure to set the nails below the surface or countersink the screws and fill before painting. If you do use a color to stain the wood, I suggest using Durham brand water putty. Color it with the same paint and use it for filling the nail holes and any small gaps in the joints. Most wood fillers will not take a stain very well. If you use a wood stain like Minwax Golden Oak, get the matching Minwax Golden Oak filler. Seal the interior with a latex

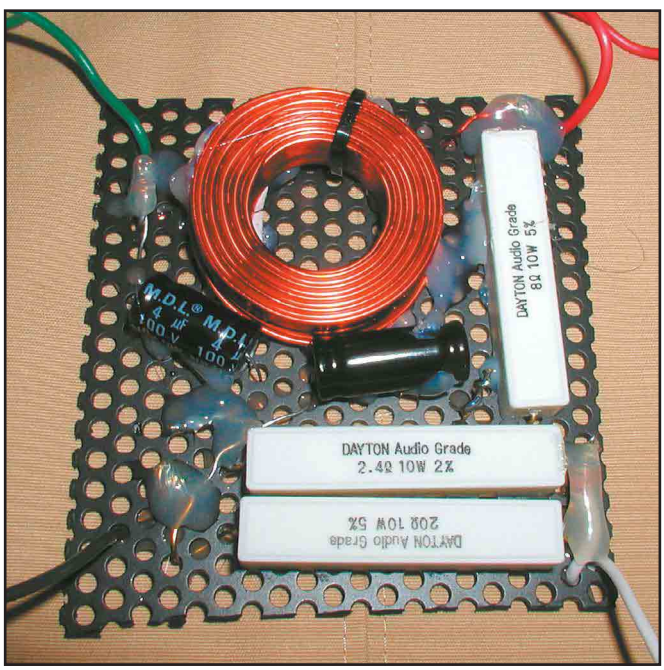


Figure 17—A close-up of the crossover network.

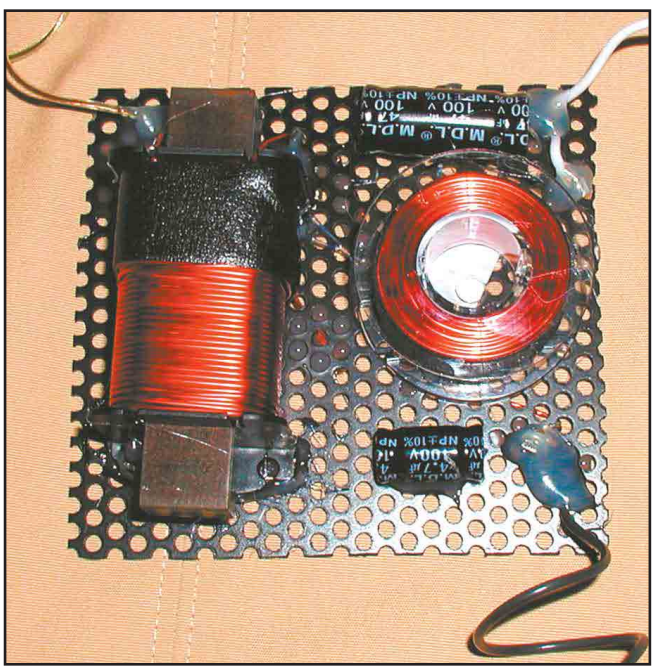


Figure 18—A close-up of the band-pass filter network.

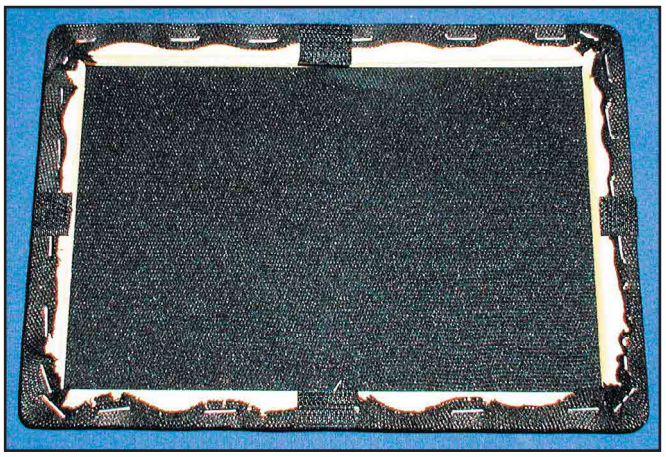


Figure 19—The grill after mounting to the frame and just before gluing.

or RTV caulk to provide an airtight enclosure, as shown in Figure 8. Do not install the rear panel until the speaker is tested and then apply a bead of caulk to the rear edge before final assembly.

You'll need to use a paddle (flat) bit to drill all but about 1/4 inch out of the front for mounting the switch (see Figure 8) or drill a 1 inch hole and use a thin plastic or metal plate for mounting the switch. The inside of the enclosure must be sealed to ensure that it is airtight. I use small bottle or aerosol can caps drilled for the wires to seal these.

The speakers must be caulked on the rear of the front mounting flange of the drivers to seal them to the front panel before attaching (they mount from the front). The drivers should present an airtight seal save for the front openings and the port.

Assembling the Electronics

The crossover and band-pass filters were assembled on plastic mesh sheets. Perf board or a small piece of 1/4 inch plywood can also be used. Secure all the components with hot glue to prevent vibration. Solder all connections and attach 12 inch wires for inputs, outputs and commons. The top two terminals of the switch are connected together with a short wire. The switch is installed with both of these shorted terminals positioned toward the top of the enclosure. The enclosure can be used either horizontally or vertically. Install and label the switch for the position in which you will be using the enclosure. I used rub-on labels followed by several coats of clear polyurethane for protection, as shown in Figure 15.

When the switch is in the up position the speaker system will be in the VOICE mode (passband limited). The DOWN switch position will be the WIDEBAND mode for full audio range. After connecting all of the wiring by using crimp splices or soldering, tape or tie wrap the wires (as shown in the interior view of Figure 5) and loosely fill the enclosure with polyester pillow stuffing (Figure 16). Do not block the port with the polyester fill material. A suggested layout for the crossover components is shown in Figure 17 and a layout for the band-pass filter assembly can be seen in Figure 18.

Grill Cover

I used 1/2 inch quarter-round molding to make the frame for the grill cloth. I used leftover grill cloth scrap to cover the frame. This can be seen in Figure 19. Visit your local sewing or fabric supply store and find a small piece of lightweight cloth in the color of your choice and stretch and staple it to the back of the frame. Attach it to the speaker enclosure with Velcro fasteners.

Testing

Attach a two-conductor cable (about 20 gauge) to a 1/4 inch phone plug with the positive-marked conductor going to the tip. Plug it into the 1/4 inch jack on the rear of the speaker and then connect it to the external speaker jack on your radio with the appropriate connector. Tune your radio to a broadcast station and adjust the volume to a reasonable listening level. The WIDEBAND position of the switch will give a wide frequency response and the VOICE a communications (narrow) response. If everything is okay, caulk the rear edge and attach the back with screws. If the back needs to be opened you'll have to use a knife to cut through the caulking before opening.

If you listen to stereo music in your shack while building or housekeeping and want excellent quality audio in a small package, then build two of these. Or assemble one without the band-pass filter and switch and enjoy the wideband sound of a high quality speaker that you built from scratch. Either way, it's hard to top the gratification you'll get from building one or two of these great speakers.

Notes

[1]*Boxplot* is available from Richard Carlson, 62 Fox Trail Rd, Sparta, NJ 07871. A free trial version can be downloaded at **www.diamondcut.com/boxplot.htm**. The complete version carries a $25 registration fee.

[2]The Zobel calculation software (*PEboX 1.1*) is available from Parts Express as freeware (**www.partsexpress.com/resources/pebox.html**).

[3]The aluminum cone woofer is available from MCM Electronics, part no. 55-1853 (**www.mcminone.com**).

[4]The tweeter is available from Parts Express, part no. 270-175 (**www.partsexpress.com**).

Photos by the author.

John M. Russell, KG4AIH, has been licensed since 1998 and holds an Amateur Extra class ticket. He provides electronics training services for maintenance technicians in the telecommunications industry. John operates low power (QRP) exclusively and enjoys homebrewing equipment. He can be reached at 4123 E Freedom Circle, Ooltewah, TN 37363; **jmrts@bellsouth.net**.

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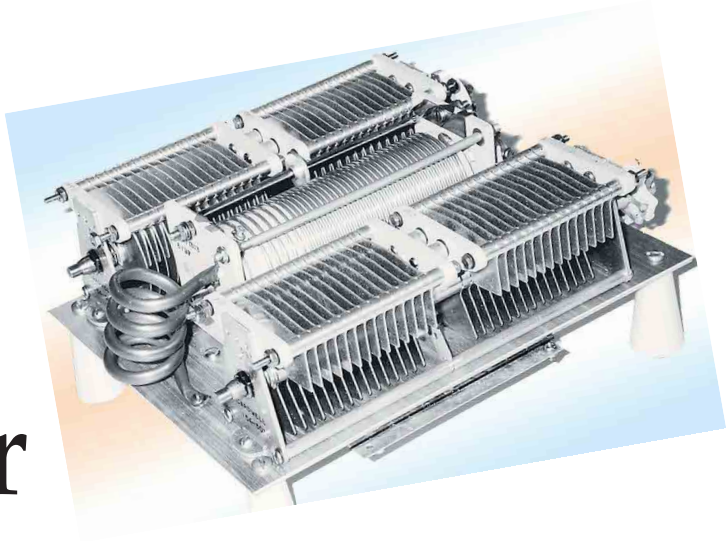
The PSQP is delivered in a soft leatherette carrying bag and contains a foam windscreen for the microphone as well as two washable cotton ear pad covers that help make the vinyl ear pads much smoother and cooler to wear. Suggested list price is $225 for the PSQP-4 and PSQP 5. The PSQP "iC" is delivered with the special ICOM AD-1 iC adapter and is $242.

For more information, see your Heil Sound dealer or **www.heilsound.com**.

By John S. (Jack) Belrose, VE2CV

On the Quest for an Ideal Antenna Tuner



This discussion of optimum antenna tuners for feeding antennas through balanced lines will clear up some common misconceptions.

Introduction

The function of an antenna system tuning unit (ASTU) is to transform the impedance at the input end of the transmission line to the 50 Ω impedance required by the transmitter, and so establish a conjugate match for maximum power transfer to the antenna system. Over the years, radio amateurs have devised many circuits for doing this. At one time, when open wire transmission line was in common use, transmitters had link coupled tuned circuits to provide the balanced output needed to feed a balanced antenna system such as a ladder line-fed multiband dipole.

Coaxial cable feed lines are now more commonly used, and most commercial and homebrew antenna tuners use unbalanced networks. Thus, to feed an antenna system, such as a multiband dipole, a balun is required at the point where the coaxial cable connects to the balanced antenna system. If open wire transmission line is used, the balun is usually placed between the ASTU and the balanced line, where the VSWR can be high. This stresses the balun, and could lead to balun failure. In addition, power loss can be considerable.

Most commercial ASTUs used by amateurs employ a high-pass T network. Dean Straw, N6BV (and others) have developed computer simulation programs that make it possible to estimate matching range, internal losses and peak RF voltages for T, π and L section networks. This program is provided with recent editions of *The ARRL Antenna Book,*[1] and example calculations are given, in aid of selecting the most practical tuner. The high power tuner designed and built by N6BV is a T section matching network.[2] James Garland, W8ZR, using the ARRL program, describes a very professional looking automatic T network-based tuner in his *QST* article series.[3]

The principal differences between N6BV's tuner and W8ZR's tuner are as follows:

- N6BV has constructed his tuner so that the "ground" terminal of the unbalanced T network can be isolated from chassis ground. That is, the chassis is not hot but the unbalanced RF network can be floated with respect to the chassis and transceiver ground. Hence, a balun can be inserted at the input to the ASTU (between the transmitter and the tuner), and the output terminals are in effect balanced with respect to ground. W8ZR's tuner is the more usual unbalanced network arrangement, and so to feed a balanced transmission line a balun is inserted between the tuner and the transmission line (where the VSWR can be high); and,
- W8ZR has automated his tuner, which is certainly an accomplishment that I could not do. The inductor in his circuit will certainly have a Q factor that is high compared with the compact commercial automatic tuners, which are less efficient when used to tune antenna systems that have a large capacitive input impedance.[4]

Simplifying the Network

W8ZR's three part article begins with a brief review of antenna system tuning units and follows with a description of versions of the T network. He decides in his quest for the "ideal tuner" to base his design on the popular T network. A consideration of the L network is provided in the following comment in a footnote:

"For tuners dedicated to specific antennas, many amateurs swear by the simple L network. However, the L network cannot match both low and high impedance loads without changing the configuration, and this shortcoming makes it unsuitable for a general purpose antenna tuner."

I have used L networks for 50 years[5] to match antenna systems, for ease of matching and to allow visualizing what I am doing. The procedure that I use is to resonate the antenna by a series reactance, and then use an L network to match the resistive component of the antenna's impedance to the required 50 Ω impedance. If the antenna's resistance is less than 50 Ω, a two element L-C network will do the trick. If the antenna's impedance is greater than 50 Ω, a reversed L network must be used, and so the two element L network then becomes a three element network, or a T network. A rearrangement of the circuit elements can usually provide a match using a two element L network for almost any antenna system impedance (see below).

With the L network or the reversed L network referred to by W8ZR, the so-called "shortcoming" is not really a problem. A single pole double throw switch can be used to change the configuration, as shown in Figure 1. When impedance matching, the user of the T has to tune three knobs to match while an L matching network requires only two (and one less variable RF component). In the words of my Newfoundlander colleague Joe Craig, VO1NA, "the user of a T wastes

[1]Notes appear on page 39.

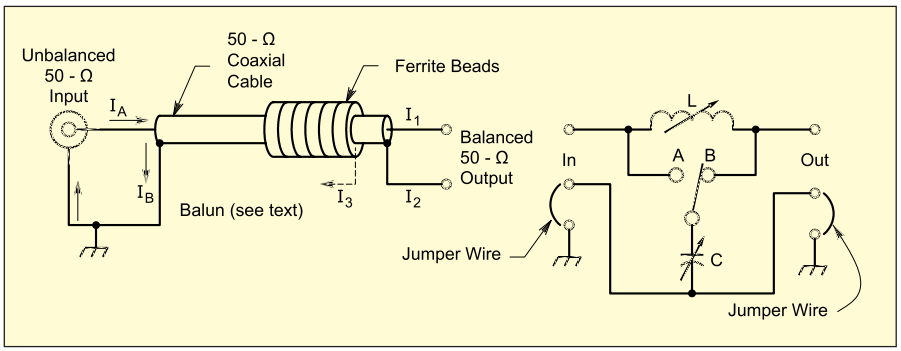


Figure 1—A simple reversible L matching network. Typical values for the inductor and capacitor: L = 30 mH, C is a dual-section 19-202 pF/section (Cardwell-Johnson 153-503-1), arranged so that it can be operated as a single section or with the two sections in parallel to keep the minimum capacity as low as possible (see Figure 2 and text).

time mucking about with a 'useless knob,' since an L network is just as useful for getting a low VSWR."[6]

To tune balanced loads, the "ground" connection for the network (normally connected to chassis ground) needs to be isolated from chassis ground. See Figure 1. The tuner input terminals could be a standard female chassis mount coaxial connector, mounted on a small square piece of Plexiglas so it can be isolated from chassis ground. The jumper connections provide the necessary connections at the input and output terminals to chassis ground, as required for tuning unbalanced antenna systems. A 1:1 W2DU type current balun, ferrite beads over the coaxial cable, is shown in the figure. This balun is in fact an integral part of the coaxial line connecting the tuner to the transmitter.

A Case Study

I have for many years[7] been making the case that the best method to feed a multiband dipole is to use a balanced transmission line having the necessary length to reach from antenna terminals to transceiver, not as Louis Varney, G5RV, did (see the Appendix). To illustrate the usefulness of the simple L network, using component values given in Figure 1, I have used the *EZNEC pro* antenna modeling program *NEC 4D* provided by Roy Lewallen, W7EL, combined with the ARRL *TLA* Transmission Line Matching program. I have shown that indeed this network (with the switch in Position B) can be used to match a 102 foot (30.1 meter) dipole, popularly called a G5RV dipole, fed with 450 Ω windowed twin lead, on all amateur bands 3.5 MHz to 29.7 MHz. The dipole height is 40 feet (12.2 meters) and for my numerical model this is the length of the transmission line [Editor's note: The 19th and later editions of *The ARRL Antenna Book* bundled a *Windows* version called *TLW* (Transmission Line for *Windows*). *TLW* gives a more sophisticated set of values for nominal 450 Ω line compared with *TLA*.]

The results of this case study are tabulated in Table 1. Note that for 3.75 MHz the maximum capacitance of the 153-503-1 capacitor is perhaps just enough (including distributed capacitance), and clearly a low minimum capacitance is also required for the higher frequencies.

The computed tuner losses (including the loss in the transmission line) using the default values of the ARRL program are a dB or less.

A More Versatile Tuner

One can certainly find impedances that this simple circuit will not match. This difficulty can usually be overcome by interchanging L and C. For optimum performance the circuit shown in Figure 2 could be used, since this arrangement permits by switch selection the full range of versatility available with the L network. Switch S1 is used (as in Figure 1) to switch the shunt element from the input to the output terminals. Switch S2 is a four pole, three position switch that interchanges C and L or bypasses the tuner. Switch S3 selects either a single section of a dual section capacitor, or parallels the two sections. This arrangement is used to minimize the minimum capacity setting for the capacitor C. If C were a vacuum variable this switch would not be needed. This switch should be a multiposition switch to connect fixed capacitors across C (or external fixed capacitors could be added by means of connection to banana plugs mounted on a Plexiglas strip), which may be needed for the lower bands (40 meters and up).

The ground circuit arrangement should be as indicated in Figure 1. To make the tuner even more versatile, a 4:1 balun could be used[8] as an aid in matching some impedances. This is because, in effect, the balun is an integral part of the coaxial cable connecting the transceiver to the ASTU. Thus, the tuner will then match to 200 Ω, instead of 50 Ω (see below).

Some Aspects of the Balun Problem

I have, see above, and in published articles,[7,9] said that the place to put a balun is on the tuned side of an ASTU where the VSWR is 1:1. I have experimented with two versions of tuners feeding a system of off center fed dipoles—an antenna system that presents an unbalanced load to the balanced transmission line—because the arms of the dipole are different lengths. Each conductor of the transmission line sees a different impedance with respect to virtual ground. This antenna system makes an interesting load for an ASTU. I used (1) a balanced network with a voltage balun on the input "tuned side," and (2) an unbalanced network with a current balun on the output side (high VSWR).

Feeder currents I_1 and I_2 were monitored (by means of current transformers) at the input terminals of the balanced transmission line. The balanced transmission line was, in fact, two coaxial lines; we in effect had a center tap to measure

Table 1
Case Study by Simulation
98 foot 9 inch (30.1 meter) dipole height 40 feet, feeder 40 feet of 450 Ω windowed twin lead, average ground.

Frequency (MHz)	*Dipole Impedance (Ω)*	*Input Impedance of Antenna System (Ω)*	*Network Values*	*Transmission Line Loss (Tuner Loss)*
3.75	29 – *j*334.6	25.75 + *j*172.96	9.9 µH, 413.6 pF	0.8 dB (0.15 dB)
7.15	533.3 + *j*1244	56.23 + *j*22.47	0.6 µH, 325.6 pF	0.18 dB (0.02 dB)
14.15	114.8 – *j*54.5	154.13 + *j*243.56	1.7 µH, 98.9 pF	0.15 dB (0.09 dB)
18.1	2066 + *j*1573	65 + *j*21.6	0.3 µH, 122 pF	0.25 dB (0.02 dB)
21.15	289.3 – *j*1048	863.1 + *j*1681.2	3.3 µH, 20.5 pF	0.41 dB (0.24 dB)
24.925	201.1 + *j*313.9	477.9 + *j*600	1.5 µH, 31.9 pF	0.14 dB (0.13 dB)
29.0	2108 – *j*1502	67.4 + *j*21.35	0.2 µH, 75.1 pF	0.29 dB (0.02 dB)

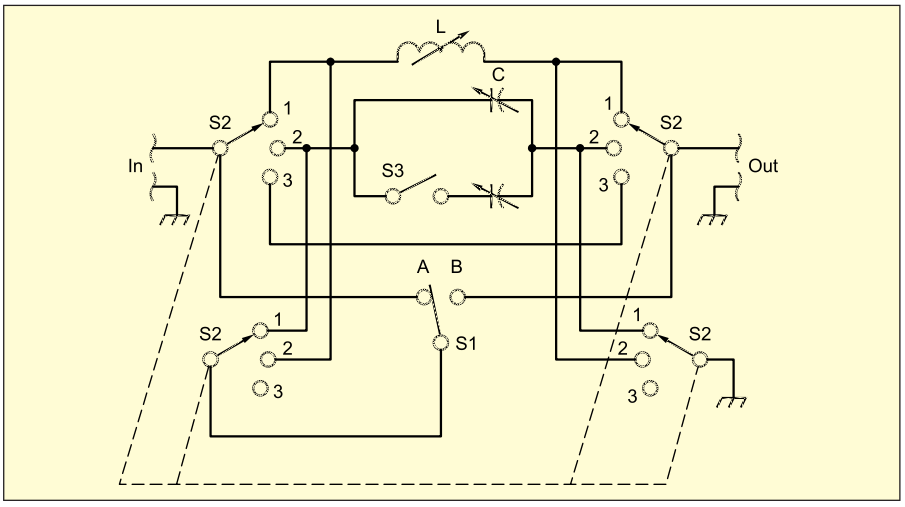


Figure 2—A versatile L matching network. This circuit is basically the same as shown in Figure 1 (see text for details), but the component arrangement can be changed.

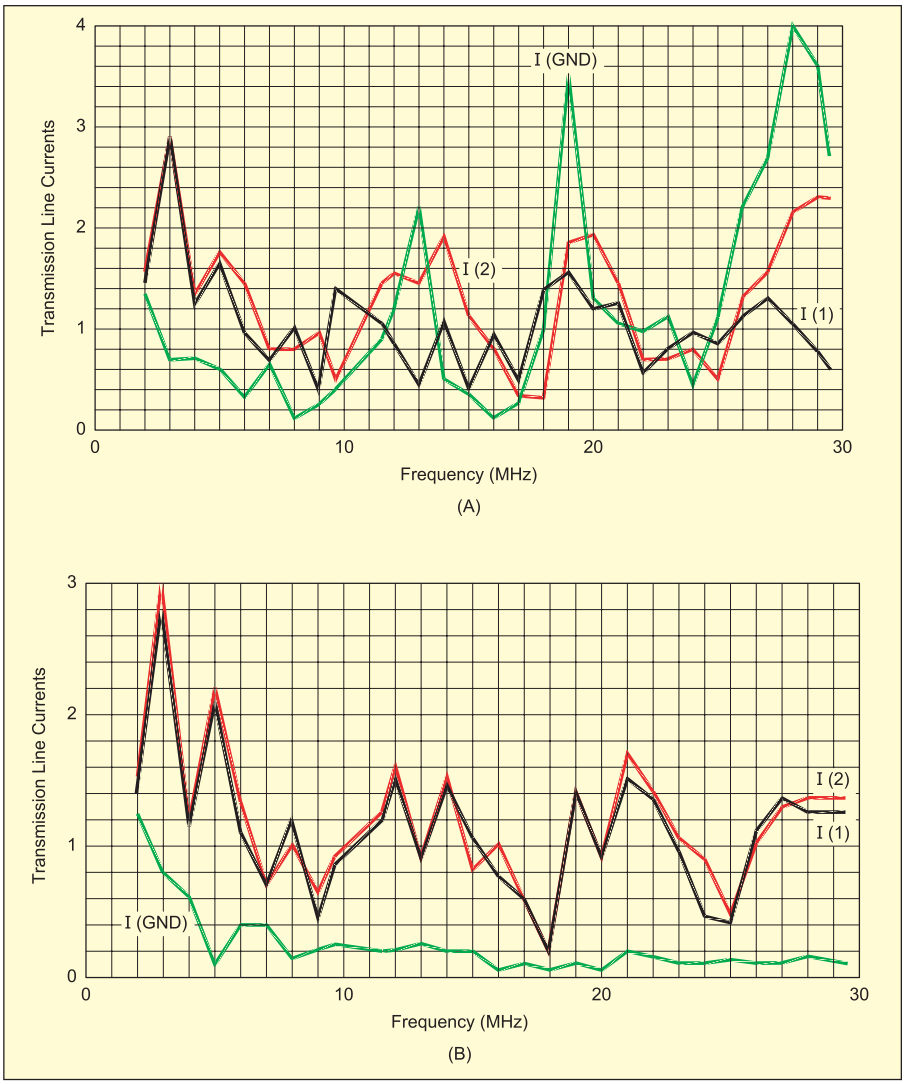


Figure 3—At A, transmission line currents (peak values shown for 100 W transmitter output power) for an off center fed dipole, tuned by a balanced tuner and a voltage balun on the input side of the tuner. At B, transmission line currents (peak values for 100 W transmitter output power) for the same antenna, tuned by an unbalanced T network and a ferrite bead choke (W2DU) current balun (balun on the output end of the tuner). This illustrates that a current balun will indeed "force" the currents to be equal better than will a voltage balun. [This test did not directly address the issue of where the balun should be placed—at the input or at the output of a tuner.—*Ed.*]

current in the center tap lead to ground, $I_{gnd.}$ That is, the shields of the coaxial cables are connected at the transmitter end and at the antenna end and, at the transmitter end, the shields connect to chassis ground. The results of this experiment are shown in Figure 3. This experiment tells us that even though a balanced tuner was used, it is necessary to use a current balun to force almost equal currents into the two conductors of the balanced line. For our transmission line, if the currents are not exactly equal, there will be a difference current flowing in the ground lead that connects the braids of the two coaxial cables to the tuner ground. Peak I_{gnd} currents are less (except for one value) for the case where the balun is on the output side of the tuner (high VSWR) and, although the balun is certainly doing its job (equal currents into an unbalanced two conductor load), the balun losses are increased.

In other experiments with baluns placed at the output terminals of an unbalanced tuner, in cases where the VSWR can be high, we can have problems with baluns. The W2DU type balun (ferrite beads over coax) gets very hot at kW power levels. Increasing the number of beads from 100 to 300 helped the heat problem, but we still had excessive balun power loss. Various versions of the bifilar wound choke type balun[10] on a ferrite toroid failed (blue flame and smoke) during testing (carbon burns damaged the insulation because of arcing between turns), and I even cracked the ferrite core of a so-called commercial 10 kW balun.

Providing the VSWR is not too high, it does not matter where the balun is located (input or output end), but power loss will be smaller if the balun is on the input side.

Finally, I will comment on using a tuner with an unbalanced network, but with a "floating ground," compared with using a balanced tuner. In my view there is no circuit performance difference, excepting that the balanced network component values are different, and at least three components are needed rather than two. The current balun insures equal transmission line conductor currents in both cases. Stray capacitance will also be slightly different.[11]

Finally, looking again at Web discussions, it should be noted that an unbalanced network with a "floating ground" means the so-called "ground end" of the network is not connected to chassis ground. The chassis is not "hot," the chassis is grounded, but the network is floating.

Concluding Remarks

The L matching network that I describe, using a switch arrangement to provide different circuit arrangements, is indeed a very versatile tuner. It is not, however, *an*

innovative design that can provide performance better than any homebrew ASTU ever created. It can be designed to handle antenna systems having a high reactance. It has so far proven to be just as useful for getting a 1:1 VSWR as other tuners I have used, for example T matching networks made by Vectronics and by MFJ; and a π matching network made by R. L. Drake (I still have and use the performance proven Drake MN-1000).

A final comment on power loss in the ASTUs. From the point of view of resistance match, the L network can be used to provide a low loss (typically less than a dB) resistance match to almost any load resistance (from a few ohms to thousands of ohms). Tuner loss when using the T network increases with decrease in load resistance, and tuner loss becomes significant for load resistances less than the desired match load resistance (50 Ω). See, for example, Figure 3 in Part 1 of the article by W8ZR. Both types of tuners (T or L) suffer increasing loss when the decrease in the resistive component of the load impedance is associated with an increase in the capacitive reactance of the load (for example, tuning electrically small antennas). But this loss is unavoidable, since the capacitive reactance of the load has to be canceled by a conjugate inductive reactance provided by the tuner.

Let me consider, for point of illustration, a case study—the matching an impedance of $Z_a = 5 - j400$ Ω at a frequency 3.75 MHz. Tuner loss (using default values for the ARRL program) for the L section network is 2 dB (according to *TLA*). Tuning the same load with a T matching network yields a loss of 4.1 dB to 2.1 dB, depending on the setting of the output series capacitor (100 pF to 800 pF, respectively). This example illustrates that for the T there can be a range of settings that lead to a 1:1 VSWR and that some settings are better than others.

In other words, a low resistance high capacitive reactance is not good for anybody's tuner. That is why electrically short antennas should be tuned by a high Q (low loss) base loading coil.

Dean Straw, N6BV, noted, on reading an earlier version of this article, that if I had used a longer transmission line (62 feet instead of 40 feet) for my G5RV dipole, I would have to match a different impedance at 3.75 MHz, $59 + j600$ Ω (instead of $26 + j173$ Ω). He noted that a high-pass T network with the maximum output series capacity of 400 pF will match this impedance, and the loss will be 0.09 dB. My L network will match this impedance (series L on the input side, shunt C) but the loss is 0.33 dB. The T network is better?

The question mark—is it? If instead of asking the ASTU to match to 50 Ω, suppose we match to 200 Ω. An L network (shunt L, series C on the output side) will tune and match this antenna impedance, and the loss will be 0.04 dB.

Finally, I noted above that most commercial tuners use a T network, with the balun on the output side of the tuner. At least two tuners (but I have seen and used only one) employ an L network. One is a tuner made a number of years ago by UPC (Unique Wire Products), their "Unique Wire Tuner" (I have one). The other is the Ten-Tec Model 238B, a high power tuner in current production that utilizes an L network.[12] This L network has a series inductance with a switching arrangement to move the combination fixed and variable capacitors between input and output to match high and low impedances.

Professional (Laboratory type) L matching networks that I have used for high-power work-related projects all used quality components: Jennings vacuum variable capacitors and silver plated edge wound inductors made by Gates (Q factor 500 compared with 200, the default value for the ARRL program). In my experience, antenna engineers usually employ the L matching network to tune antenna systems. The T and π matching networks are used (on the tuned side) for phased array antenna systems, since a resistance match (to control current) can be realized for the required phase lag needed for the directional pattern. The phase lag for the L matching network is what it turns out to be, depending on the impedances to be matched.

I will be interested to hear from anyone who might construct my versatile L matching network shown in Figure 2. A comment for those who do: matching some impedances on some bands may appear (at first) to be a bit tricky, since tuning the knobs may initially have no observable effect on VSWR. This may be because you are using the wrong network configuration. There are four configurations. Sometimes more than one configuration will tune the antenna, sometimes only one. With the correct network configuration tuning will be very precise, and a VSWR of 1:1 will be achievable. Each time you tune to a new band, log the switch positions, and the capacitor and inductor dial settings, for convenience when returning to the same frequency or band.

Notes

[1] *The ARRL Antenna Book*, 20th edition, available from your local dealer or the ARRL Bookstore for $39.95 plus shipping. Order number 9043. Telephone toll-free in the US 888-277-5289, or 860-594-0355; **www.arrl.org/shop/**; **pubsales@arrl.org**.

[2] *The ARRL Antenna Book*, 20th edition, Chapter 25, pp 15-18.

[3] J. Garland, "The EZ Tuner—Parts 1, 2 and 3," *QST*, Apr 2002, pp 40-43, May 2002, pp 28-34 and Jun 2002, pp 33-36.

[4] J. Belrose, "Automatic Antenna Tuners for Wire Antennas," *QST* (Technical Correspondence), Apr 1994, p 84.

[5] J. Belrose, "Short Antennas for Mobile Operation," *QST*, Sep 1953, pp 30-35, 108.

[6] J. Craig, "Notes on the 'RL' (Reversible L) Impedance Matching Network," *VO News*, Feb 1987. (Out of print.) Copies are maintained by the Marconi Radio Club of Newfoundland.

[7] J. Belrose, and P. Bouliane, "On Center-Fed Multiband HF Dipoles," *ARRL Antenna Compendium Volume 4*, 1995, pp 103-111.

[8] J. Belrose, "Transforming the Balun," *QST* Jun 1991, pp 30-33.

[9] J. Belrose, and P. Bouliane, "The Off-Center-Fed Dipole Revisited: A Broadband, Multiband Antenna," *QST*, pp 28-33, Aug 1990.

[10] J. Sevick, *Understanding, Building and Using Baluns and Ununs*. Available from the ARRL Bookstore for $19.95 plus shipping. Order number 8982. Telephone toll-free in the US 888-277-5289, or 860-594-0355; **www.arrl.org/shop**; **pubsales@arrl.org**.

[11] To use *TLA* to analyze a balanced network, change the default value for the input impedance to 25 Ω (instead of 50 Ω). We want to match half the antenna's impedance to half the desired input impedance. TLA tells us that the loss for this network is the same (in dB) as that for the unbalanced network, but do not get confused. This loss in dB is a power loss for half the transmitter power, so the total loss is identical.

[12] J. Parise, "Product Review—*QST* Reviews Five High-Power Antenna Tuners," *QST*, Feb 2003, pp 69-75.

John S. (Jack) Belrose received his BASc and MASc degrees in Electrical Engineering from the University of British Columbia, Vancouver. He joined the Radio Propagation Laboratory, of the Defence Research Board, Ottawa, Ontario in September 1951. He received his PhD degree from the University of Cambridge in Radio Physics in 1958. From 1957 to present he has been with the Communications Research Centre, where he was Director of the Radio Sciences Branch. Following a 50 year career in radioscience and his retirement, he is now an Emeritus Researcher at the Communications Research Centre Canada.

He is Technical Advisor to the ARRL in the areas of radio communications technology, antennas and propagation; a Fellow member of the Radio Club of America; a Life member of the Antique Wireless Association and the Quarter Century Wireless Association, and a Life Senior Member of the IEEE (Antennas and Propagation Society). A licensed radio amateur since 1947, he is the author or coauthor of over 140 papers, articles and technical correspondence letters in his field.

Jack is married to Denise (née Fenal of Paris), and they have three children and two grandchildren. Jack and Denise holiday in Europe, Canada and the United States, traveling in a Holiday Rambler Neptune Motor Home. He enjoys camping, swimming, cross country skiing and Amateur Radio. You can reach the author at 17 rue de Tadoussac, Aylmer, QC J9J 1G1, Canada; **john.belrose@crc.ca**.

Appendix

The initial design[13] of the antenna designed by Louis Varney, G5RV (SK), still popularly used, employed a two part transmission line between the dipole and the transceiver. The first part is a 34 foot (10.34 meter) length of open wire transmission or window transmission line, referred to as a "matching section." The second part is a coaxial cable "feeder transmission line" with a recommended length of 50 to 60 feet. Varney recognized that "under certain conditions" a current may flow on the outside surface of the coaxial cable, and that a balun should be used at the place where the coaxial cable connects to the matching section. His recommendation was not to use a balun, because "later experiments and a better understanding of the theory of operation of the balun indicate that such a device was unsuitable because of the highly reactive load it would see at the base of the matching section or make up section on most HF bands." Let me look at the effect feeding the antenna with this transmission line arrangement and no balun.

I have numerically modeled a sloping G5RV, sloping since a single tower is used for support. The dipole arm lengths are 51 feet (15.5 meters) with an angle between arms of the dipole of 120°. It is fed by a 34 feet (10.36 meters) length of open wire line, and 28 feet 5 inches (8.66 meters) of coaxial cable. My dipole is supported by a 62 foot tower and thus is at a height of 62 feet (19 meters).

To feed the G5RV with open wire transmission line, I place a jumper across the input end of the transmission line (Varney's "matching section") and placed my source in the center of that jumper wire.

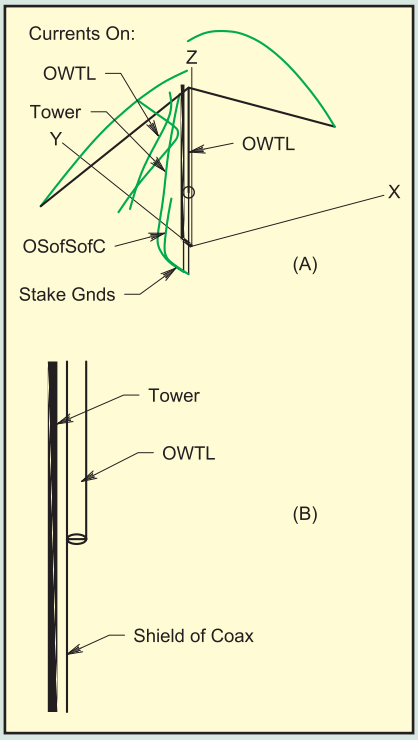


Figure 4—At A, a G5RV center fed dipole dimensioned and fed as Louis Varney did from an early design. His original version used 72 Ω twin lead for the feeder, but coaxial cable was later used. This shows currents (amplitudes only) on the arms of the dipole for a frequency of 7.2 MHz; on the open wire transmission line (OWTL). These currents are approximately 180° out of phase. Induced currents on the support tower; on the outer surface of shield of the coaxial cable (OSofSofC); on the stakes grounding the tower and the shield of the coaxial cable are shown. For clarity the open wire transmission line itself is also indicated. At B, for clarity, I show the detail of my model in the vicinity of the source.

Now add the coax feeder, no balun. The coax is grounded at the transmitter end (transceiver ground). The shield of the coax at the antenna end connects to one conductor of the open wire line, the center conductor of the coax to other conductor. In effect, this places the source at the junction between coax and open wire line (see Figure 4A). Certainly currents flowing on the inside surface of the coax and on the center conductor of the coaxial cable do not radiate. My model for the shield of the coax is a ½ inch (12.7 mm) thick conductor, with the source moved to the antenna end.

The tower and the shield of the coaxial cable are grounded to 10 foot (3 meter) stake grounds. Figure 4A shows my wire model and the currents on all wires of the model (green traces) for a frequency of 7.2 MHz. Notice:

- the currents on the two arms of the dipole are certainly not equal;
- this is because the currents on the two conductors of the open wire line are not equal (these currents are approximately 180° out of phase); and
- current is induced to flow on the outer surface of the coaxial cable, and on the support tower.
- the impedance at the effective feed point, at the junction between the coaxial cable and the open wire line is 111 – *j* 231 Ω, which indicates the problem of installing a balun there.

Clearly current everywhere is undesirable.

If the dipole is fed by open wire line all the way, the currents on the two arms of the dipole will be equal (not shown), and there will be no induced current on the support tower.

[13]L. Varney, "The G5RV Multiband Antenna—Up-to-Date," *The ARRL Antenna Compendium Volume 1*, 1985, pp 86-90.

NEW PRODUCTS

ALPHA 4510 COMPUTING WATTMETER

◊ The Alpha/Power 4510 is a computing wattmeter for the 1.8-30 MHz 60 mW to 3000 W range. It features both an analog and a digital display. The LED digital display can be used for a quick on-the-air glance to ensure the transmitter is working, as well as for power readout. Either forward power or delivered power can be displayed on the digital meter. The analog meter is said to be useful for peaking or nulling and has nine full-scale power ranges from 300 mW to 3000 W. Either forward power, reflected power or SWR can be displayed on the analog meter. The 4510 features a fast-sampling mode for tune-up, and a PEP mode for normal operation. The computer-based PEP estimation algorithm is said to be more accurate than traditional diode/capacitor approaches. The unit measures its internal temperature and estimates the frequency of the power applied to it, and uses these to improve the measurement accuracy. All measurements are available at full accuracy through a serial interface, using a simple ASCII protocol. Power accuracy is specified at 5% of reading max, 3% typical.

The unit is supplied with an 80-260 V power cube that supplies the 12 V at 0.5 A required for operation. All illumination is by LED. A CD-ROM is included with a Windows application to display the serial data on a PC. For more information, see **www.alpha-amps.com** or call 303-473-9232.

FEEDBACK

◊ A couple of errors crept into the K2AOP oscillator schematic in Technical Correspondence [Figure 1, "A Simple, Well-Behaved Crystal Oscillator," Sep 2004, p 67]. R1, shown as 22 MΩ, should be 2.2 MΩ. R5, shown as 100 Ω, should be 1000 Ω. The variable trimmer capacitor (shown as C4) should be C3 (18 pF). C4 should be a fixed capacitor.

◊ The ferrite core referred to in the caption of Figure 2 in "The Doctor is IN" [Aug 2004, p 54], should be a type FT-50-75 rather than the FT-37-75 shown. The schematic reference is correct.

◊ In "About FM" [Jul 2004, p 39], the definition of m is incorrect in stating that there are 180/π radians in a circle. That is the conversion factor from radians to degrees. There are actually 2π radians in a circle. One radian does equal 57.3°.

◊ The article entitled "A High Quality Speaker System" appears in this issue; it was inadvertently included in the list of articles on the cover of last month's issue.

By Jim Hall, W4TVI, and Tony Barrett, N7MTZ

A Pocket APRS Transmitter

This practical application of APRS technology could save many lives. The full article appears in the September/October 2004 issue of *QEX*.

One day Tony, N7MTZ, walked into the shack and said, "Wouldn't it be neat if we could build an inexpensive APRS transmitter that weighed only a few ounces, would operate off a 9 V battery for several days and had an integrated GPS interface?" A transmitter like that would open APRS operation to a whole range of personal activities such as biking, hang gliding, backpacking, skiing or snowmobiling. It would also be a great asset for emergency or Search-and-Rescue situations.[1]

Just put the transmitter and a GPS receiver on anything (person, vehicle, even a search dog) to track it automatically (see Figure 1 and the sidebar, "An APRS 'Killer App?'"). And it would be a natural for Near-Space ballooning.[2] The concept was so compelling that we immediately agreed we should attempt to build such a unit. The Pocket APRS Transmitter presented here is the result of our effort. The complete article appears in the September/October 2004 issue of *QEX*.

[1]Notes appear on page 41.

Features

- Output frequencies: 144.39 and 144.34 MHz (with crystal stability).
- An integrated APRS encoder for automatic position transmission.
- Low cost.
- Small size (fit in a standard mint tin with a 9 V battery).
- 200-250 mW output.
- Battery life: At least 4 days with a standard 9 V alkaline battery.
- Simple to build.
- Uses modern, readily available parts.

The RF output power minimizes dc input power and is sufficient for most urban areas with well developed APRS repeater infrastructure. For emergency or other special situations out of repeater range, it is easy to configure a standard mobile APRS station as a digipeater.[3] For Near-Space Ballooning, a few hundred milliwatts covers distances up to 200 miles.[4]

Most modern electronic designs use surface-mount technology (SMT). SMT was a natural choice for this project, given our goal of a small pocket transmitter using modern, commercially available parts.

Figure 1—At A, Tony's wife, Delora, prepares to go mountain biking with the APRS transmitter at her waist. B shows a search dog, Xena, with the first attempt to secure a pocket tracker to her vest. C shows a weatherproof plastic case available at many sporting goods stores for about $7. D shows a pocket tracker stuck to the inside of a vehicle window with suction cups. It has ridden there for thousands of miles. A similar arrangement with a $^5/_8$ λ antenna routinely reaches directly to a digipeater 45 air miles away.

We did, however, use through-hole parts where they were less expensive than SMT and readily available.

The TinyTrak3 (TT3) GPS position encoder (**www.byonics.com**) provides an off-the-shelf, single-chip interface between an external GPS receiver and the FM transmitter. Its power requirements are low and by using SMT parts, we made it fit our package.

Figure 2B shows an internal view of the Pocket APRS Transmitter, and Figure 3 shows a block diagram. The TT3 receives position data from an external GPS receiver and produces an audio signal representing the GPS position report in one of several user-selectable APRS packet data formats. After processing, this audio signal modulates the frequency of the VCO.

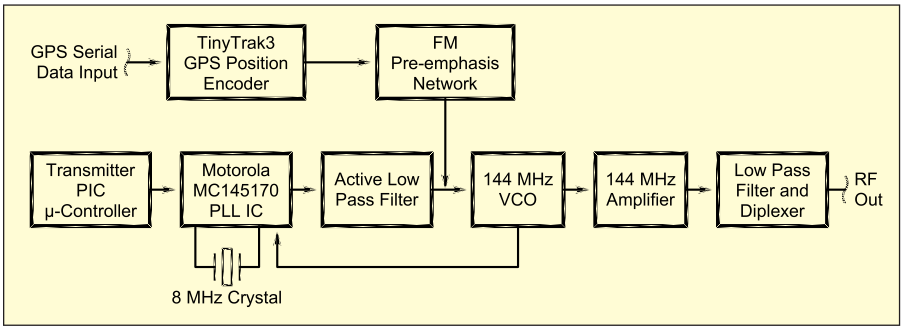


Figure 3—A simplified block diagram of the Packet APRS Transmitter.

Construction

There are several options for constructing the Pocket APRS Transmitter. A complete set of parts including the PC board with all surface-mount parts soldered in place is available at **www.byonics.com/pockettracker**. The bare PC board or the PC assembly with all surface-mount components soldered in place is available by contacting author N7MTZ at **n7mtz@sunvalley.net**. Complete, step-by-step instructions for constructing the transmitter can be downloaded from **www.byonics.com/pockettracker**.

The Pocket APRS Transmitter can send weather-station data via the APRS weather protocol[5] if you substitute the Byonics WXTrak chip for the TT3 GPS position-encoder chip.

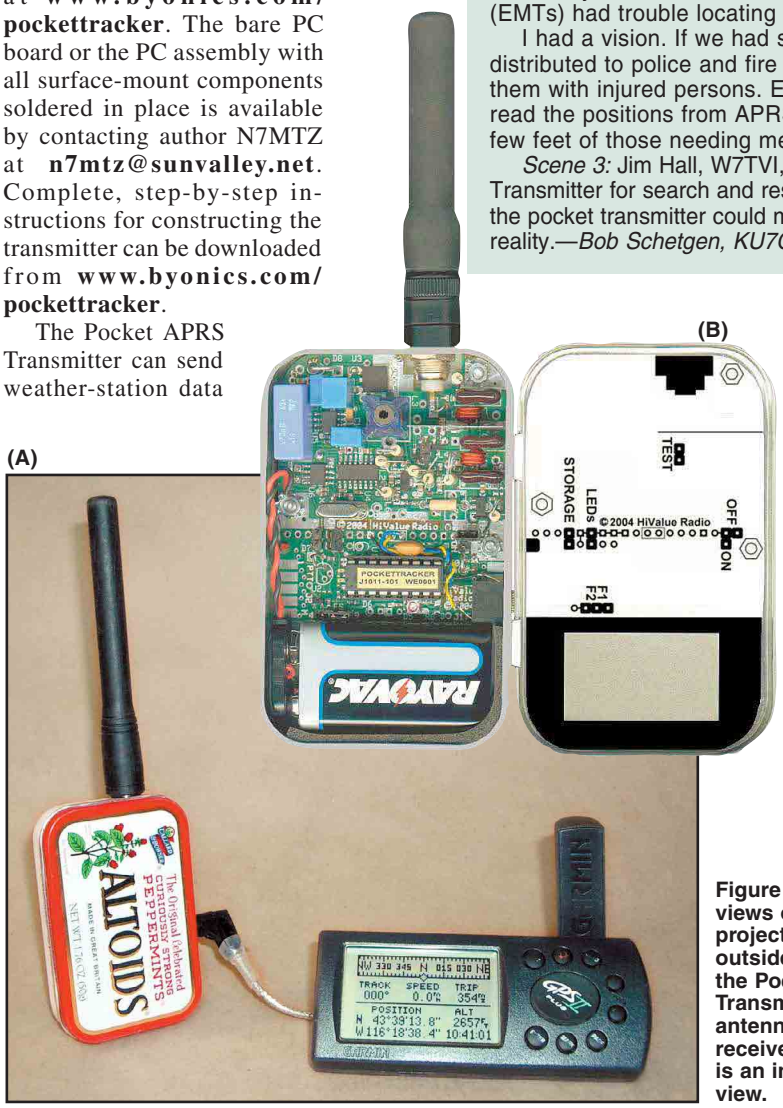


Figure 2—Two views of the project. A is an outside view of the Pocket APRS Transmitter with antenna and GPS receiver. B (right) is an internal view.

An APRS "Killer App"?

Have you heard the term "Killer App"? It's an application that brings hitherto underused technology into common usage. For example, one could argue that Microsoft *Office* was a "killer app" for the *Windows* operating system.

Scene 1: APRS began when hams wanted to track the progress of the runner who makes the trek from Annapolis to West Point for the annual Army versus Navy football game. Since then, it has developed into a fascinating Amateur Radio activity used by hams to report their positions or those of their vehicles to other hams or Web sites. While this is fun, it is not a *compelling* use for the technology.

Scene 2: Some years ago, as I was driving to ARRL HQ for work, I heard a news story about a fire at a group home in Hartford, Connecticut. Medical attention was delayed for some of the injured because the Emergency Medical Technicians (EMTs) had trouble locating the patients at the site.

I had a vision. If we had small, inexpensive APRS transmitters, they could be distributed to police and fire departments. Then, police or firefighters could place them with injured persons. EMTs with cell-phones and notebook computers could read the positions from APRS Web sites and use GPS location to navigate within a few feet of those needing medical attention.

Scene 3: Jim Hall, W7TVI, and Tony Barrett, N7MTZ, develop the Pocket APRS Transmitter for search and rescue work in the Pacific Northwest. Mass production of the pocket transmitter could make it inexpensive enough for the vision to become reality.—*Bob Schetgen, KU7G, Senior Assistant Technical Editor,* QST

Summary

Developing the Pocket APRS Transmitter was a fun project. It makes APRS tracking practical for many exciting applications where conventional approaches don't work well because of size, weight, cost or battery constraints. For complete details, see our article beginning on page 3 of the September/October 2004 issue of *QEX*.

Notes

[1]J. Lehman, "APRS and Search and Rescue," *QST*, Sep 2003, pp 75-77.

[2]L. Verhage, "Ham Radio Ballooning to Near Space," *QST*, Jan 1999, pp 28-32.

[3]See Note 1.

[4]See Note 2.

[5]R. Parry, "Amateur Radio, Paragliding and an APRS Weather Station," *QST*, Aug 2003, pp 28-33.

You can contact Jim Hall, W4TVI, at 960 W Bayhill Ct, Boise, ID 83704; **jahall@perseidsystems.com**, *and you can reach Tony Barrett, N7MTZ, at 5389 Kyle Ave, Boise, ID 83704;* **tonybarrett@sunvalley.net**.

By Sam Kennedy, KT4QW

A 10/17 Meter Hanging Loop Antenna

Loops work! Build a hanging loop for 10 and 17 meters that will give almost 3 dBd of gain. It's compact, horizontally polarized, has a broad azimuth pattern, requires no matching network and can be easily rotated.

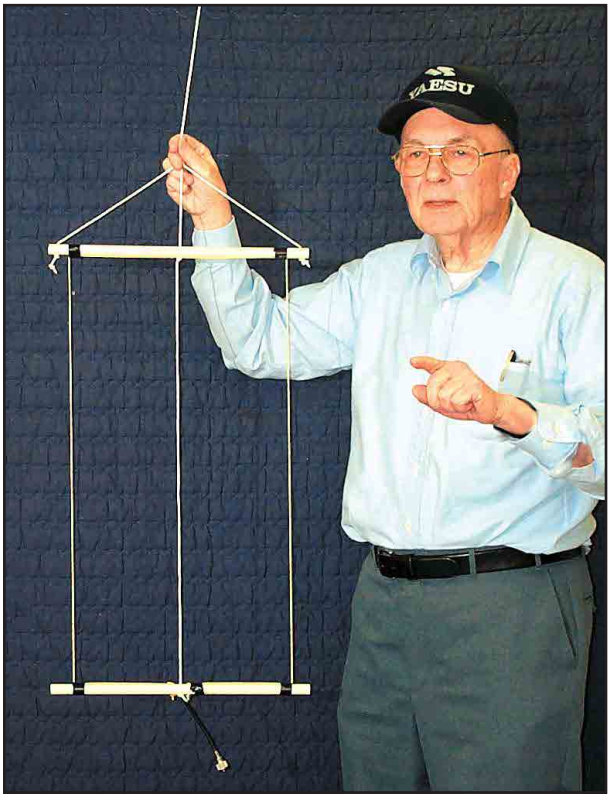


Figure 1—At a radio club meeting, the author explains the hanging rectangular loop using a scale model of the antenna. The antenna shown is a workable 2 meter loop. Although the antenna has relatively low gain at VHF, the smaller model serves well to illustrate the design.

I have experimented with several "hanging" antenna designs because the numerous tall trees in my yard furnish good support for hanging antennas. As most of my hanging antennas up to this point have been vertically polarized, I decided to try my luck with a horizontally polarized loop. A square loop proved to be too unwieldy for a hanging design and could not be easily matched on a multi-band basis using a single coax. As a result, I researched the available material and noticed the single rectangular 10 meter loop design in *The ARRL Handbook*.[1] Basic loop antenna design dates from the 1930s, but loops work just as well today as they did then!

Design

One big advantage of this antenna is that it has a feed-point impedance of 50 Ω. This same design can, of course, be scaled to any frequency, and more than one loop can be hung within the same frame. In this case I combined the 10 and 17 meter bands. I also tried to include a 15 meter element. It resonated okay, but it interacted with the 17 meter element, so I could not achieve a flat SWR on either band. Using *The ARRL Handbook* design as a launch point, I used *NEC4WIN95* modeling software and rescaled it to 17 meters.[2]

After careful examination, and a series of optimizing sequences, my new design, which theorized results that were very pleasing, emerged. I used 18.140 MHz as the 17 meter center frequency to ensure a low SWR across the entire phone band. Covering all of 17 meters was no problem, as it is a narrow band. Later, I included the 10 meter element and embedded it in the hang-up harness. I centered the 10 meter loop at 28.500 MHz and, of course, it could not cover the entire band without supplemental tuning. It does, however, cover the popular low-phone portion with a favorable SWR.

Figure 1 shows a scaled 2 meter model of the antenna, sized for demonstration purposes only, as the relative gain at VHF is low. The radiation pattern is essentially that of a dipole. The gain of this antenna is realized by compression of its vertical lobes into the main lobe and the take-off angle is low. The antenna has very good performance characteristics and it suits the needs of 10 and 17 meter communications for both distant and local coverage. Figure 2 shows the antenna's basic layout.

A "rotator" string has been included, attached to one bottom corner of the loop. This allows you to stabilize the direction of the loop or to rotate it, if desired. You'll need only to rotate it about 45° to get stations out of its deep side nulls or to null an undesired signal. A rotation angle of 90° is the maximum that would ever be necessary. I did try the loop both with and without a balun and found no measurable difference in SWR or in radiation characteristics. I chose to use the simplest approach and eliminated the balun. While not a critical consideration, if the antenna wires make contact with foliage, the loop may become detuned.

The ARRL Handbook has a good description of the slingshot method of launching lines into trees.[3] I've found that I can usually launch a line over the desired limb with a few tries. That tree in the backyard isn't a tower, but it's the next best thing to it.

Figures 3 and 4 show the elevation and azimuth radiation patterns. Note that the blue outside trace is the loop and the red trace represents a half wave horizontal reference dipole at the same frequency and height. Referring to the current distribution plot, Figure 5, you'll note that the bottom half of the loop forms a virtual half-wave dipole joined to and feeding the top half, which is also a virtual half-wave dipole. The two dipoles thus

[1]Notes appear on page 45.

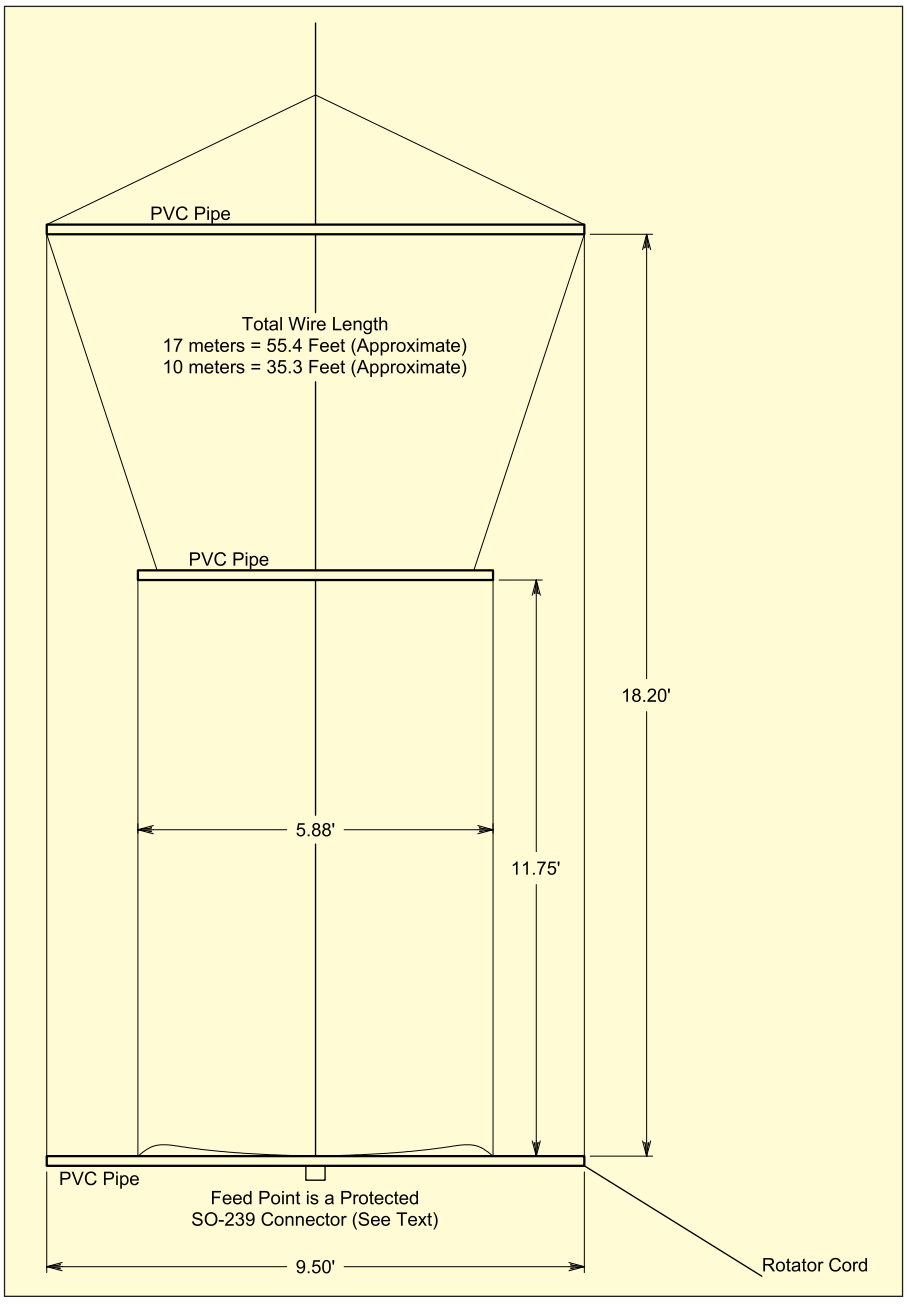


Figure 2—The rectangular loop for 17 and 10 meters.

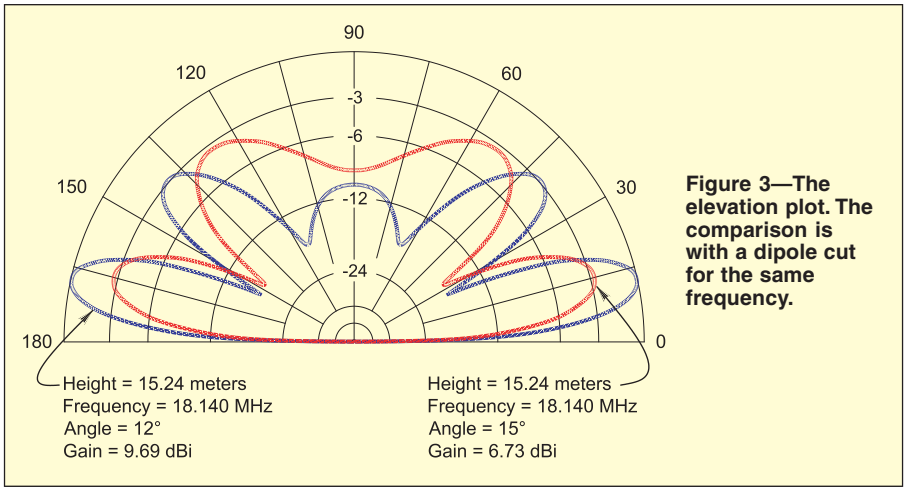


Figure 3—The elevation plot. The comparison is with a dipole cut for the same frequency.

form a one-over-one horizontal array. This compresses the higher vertical lobes into the main lobe. As a result, small (but worthwhile) gain is realized compared to a single dipole, close to 3 dB. As with any antenna, the higher you hang it, the lower the radiation angle. This usually improves the performance of the antenna, depending on distances and propagation conditions. This antenna gives a better impedance match to 50 Ω cable at the feed point than a simple dipole at the same height (72 Ω).[4] You can actually "tune" the feed point impedance by slightly changing the aspect ratio of the rectangle. The wider the horizontal dimension is, the higher the impedance.

Construction

Table 1 gives the materials needed for building the antenna and a step-by-step guide for constructing the antenna follows below.

1) Prepare the two 10 foot schedule 40 PVC spreaders and place them at the proper points in the ground. Drive four small stakes in the ground corresponding to the dimensions of the loop. See Figure 6.

2) Unspool the 14 gauge stranded copper wire and apply it around the ground stakes. This forms the rectangular loop and allows the PVC spreader pipes to be correctly positioned at the top and bottom. Start and end the wire at the center of the bottom of the loop, leaving enough extra to connection to the feed point. *Be sure to allow enough extra length for pruning, as necessary.* The total length of the wire used is calculated by the following formula: Length in feet = 1005/MHz. Always cut a little longer than calculated; then adjust.

3) Connect the antenna wires to the feedpoint connector temporarily. Do not solder until you have completed the tune-up procedure.

4) Carefully measure the wire and temporarily tape it in place on the spreader PVC pipes. Tape it in enough places to ensure that it holds its shape. Note that the antenna wire is fastened to the surface of the PVC pipe. The wire does not go through the PVC; only the feedpoint assembly is positioned through the PVC pipe.

5) Build the hanging harness by paying attention to Figure 7. It is advisable to melt the rope instead of cutting it, to avoid end fraying. *Caution*—be very careful when melting synthetic rope!

6) Hoist the antenna up to your prepared test location so that the bottom of the antenna is at least a half wave above the ground, if possible. Using an antenna analyzer, minimize the SWR at the center operating frequency. To avoid being

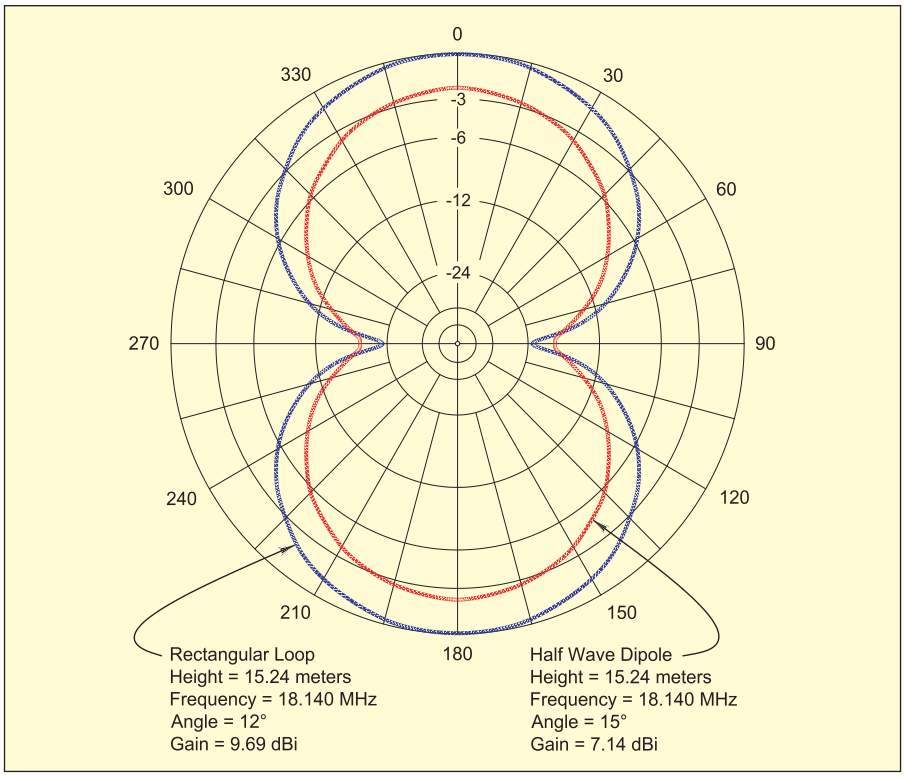


Figure 4—The azimuth plot. Again, a dipole cut for the same frequency is compared.

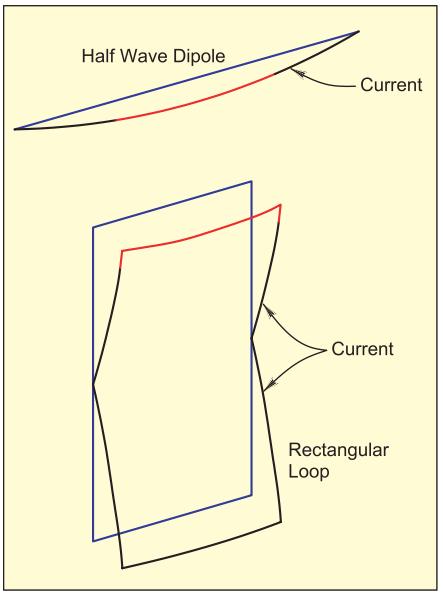


Figure 5—A current distribution plot. The antenna is compared with a dipole cut for the same frequency.

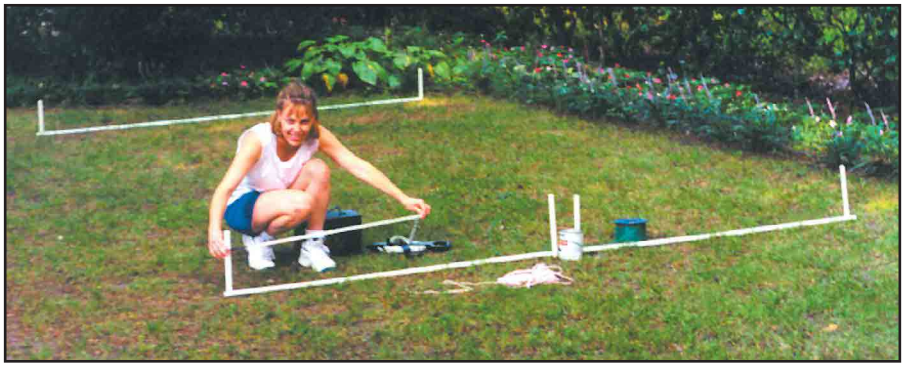


Figure 6—The layout technique used for quick wire measurement and assembly of the loop and its associated hang-up harness. Note the use of PVC pipe stakes, carefully positioned and squared, for forming the structure. Both the 17 and 10 meter elements can be put into place during this operation.

Table 1
Materials for the 10/17 Meter Loop

2 each	PVC pipe, 10 feet, 1/2" schedule 40 (use uncut—full length).
4 each	End cap, 1/2" PVC.
65'	Wire, #14 stranded copper, green vinyl insulated.
25	Tie wraps or equal, black UV resistant.
50'	Rope, nylon or dacron, 1/4" or smaller (for harness fabrication).
50'	Cord, construction-type, nylon (for rotator cord).
1	Silicone sealer, medium size tube.
1	Tape, electrical, vinyl black roll.
1	Container, durable plastic pillbox type design for quick disconnect.
1	Connector, SO-239 for coaxial cable disconnect.
1	Brazing rod, 1/8" brass.
1	Solder, 60/40, rosin core.
1	Paint, camouflage green, Plasti-Kote #17035.

misled by the analyzer's indications, use 50 Ω coaxial cable, cut to a multiple of a half-wave length at the center design frequency. Make sure to use the correct value of velocity factor (VF) in your calculations. The formula for a half-wave length of coax in feet is: Length= (491.8/MHz)×VF, where VF is the velocity factor of the coaxial cable used. The VF for RG-8X is 0.75 and for RG-8/U it is 0.66. For other types of cable see *The ARRL Handbook*. If you use, for example, RG-8X, one half wave would be 20.3 feet in length. Since you would need it a bit longer than that for testing, you would probably want to use two half wavelengths or 40.6 feet.

7) If you choose to minimize visual attention of the completed antenna, spray paint the entire unit, including the rope, with flat olive green paint. Protect the SO-239 connector from overspray by masking. A light "hazing" of spray paint is adequate and the painting will not affect the antenna's performance.

Note that PVC spreader pipes are specified in Table 1. To prevent bowing, use Schedule 40 PVC pipe for this application. Construction of this antenna is simple; however, a large flat space is needed for the layout. The harness arrangement shown in Figure 7 includes details about the knots used. It is difficult to achieve a good hanging shape with two or more elements, so it is important to have an easy means for shape adjustment. Using this construction technique the antenna may appear flimsy. It does, however, make for a very tough and survivable structure. My original unit has survived a hurricane and severe weather at my location for over three years.

Feed-point Connector

Figure 8 shows an effective way to feed the rectangular loop. I found this to be a practical way to build a strong, durable and weather resistant feed-point connec-

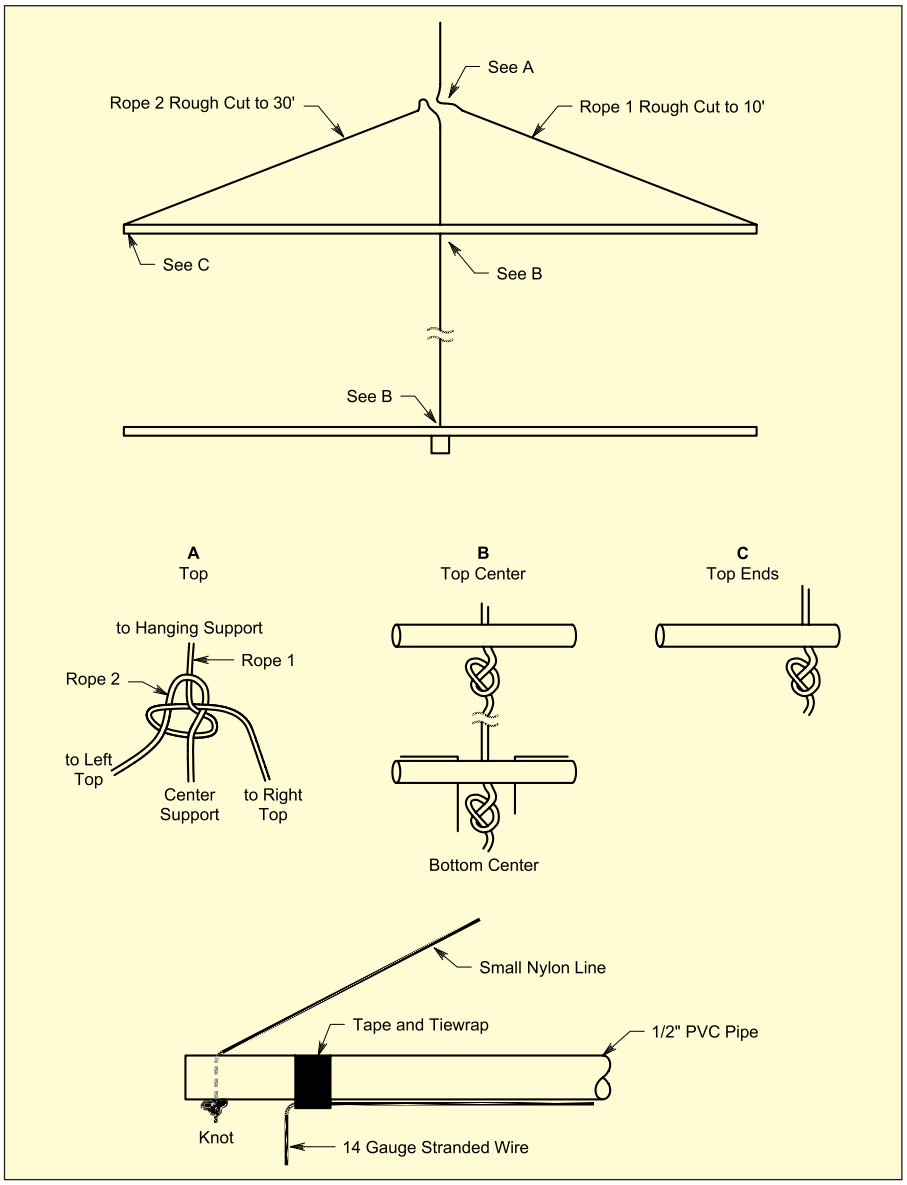


Figure 7—The rope harness is necessary for a stable hanging loop. For clarity, the knots are shown before tightening. The overhand knot is used because it holds firmly and is easy to adjust when necessary. Note that the antenna wires are fastened to the exterior of the PVC pipe.

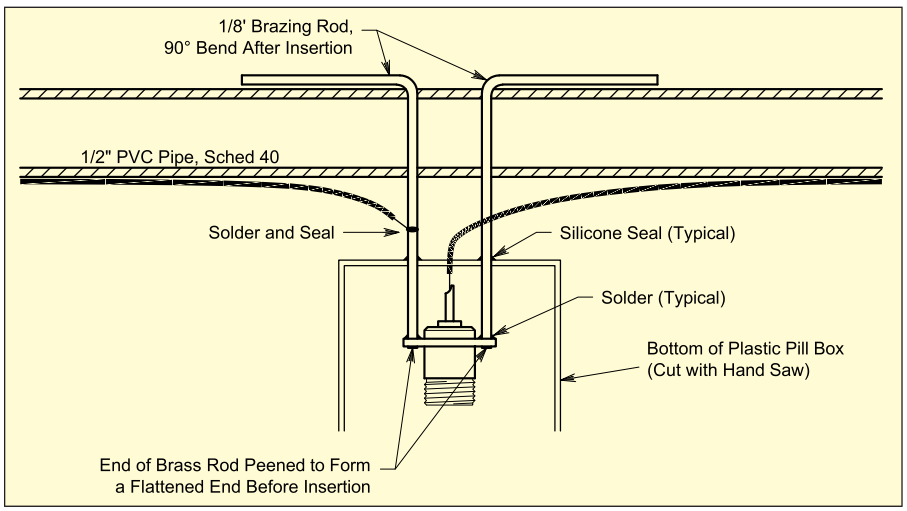


Figure 8—The feed-point connector assembly—it is a weather resistant connection that does not require taping and sealing.

tion that provides plenty of support for coaxial cable. By incorporating a standard SO-239 connector, a "drip skirt" and a strong vertical support member, this method for making a quick disconnect feed-point connector for the hanging rectangular loop has worked well. While other techniques can be used, this one has proven to be satisfactory. No sealing compounds or tape are necessary to protect the connector from the weather, although protection can be applied, if you so chose. Note that it is helpful to heat the general area of the 90° bend on each section of brazing rod with a propane torch until it becomes somewhat discolored. This will anneal the brass and make it much easier to make the bend. To avoid "melt-down," the annealing process is accomplished before installing the rods into the connector, the cover and the PVC pipe.

Conclusion

Although I have no facilities for scientific measurement of the actual antenna gain, this antenna consistently gives more than 1 S unit higher received signal level than my inverted V or my 17 meter vertical. If you do decide to build one, you will be pleased with its performance. When I started using this antenna I was pleasantly surprised with results that truly lived up to, and frequently exceeded, its theorized prediction. It's the best simple wire antenna in my inventory.

Notes

[1]The rectangular loop design used here is based on a design in the 2004 as well as earlier editions of *The ARRL Handbook*, Newington: ARRL, 2004, "A Simple Gain Antenna for 28 MHz," p 20.43.

[2]My computer modeling used the *NEC4WIN95* modeling program by Orion Microsystems (**www.orionmicro.com**).

[3]A good description of this method of launching lines into trees is covered in the 2004 as well as earlier editions of *The ARRL Handbook*, "The Trusty Slingshot," p 20.7.

[4][*Editor's note*: The feed impedance will depend upon the antenna's height above ground and its frequency of operation. Many hams use full wave low frequency loops as multiband antennas on the loop's harmonic frequencies. The feed impedance will vary with frequency when a loop is used this way. In that situation, it is best to feed the loop with open wire or ladder line into an antenna tuner, one preferably designed for link coupling.]

Photos by the author.

Sam Kennedy, KT4QW, was first licensed in the 1950s as K4DEP, but has been interested in radio since the age of 7. Relicensed in 1996, Sam was assigned his current call, and earned the Amateur Extra ticket shortly thereafter. He attended both commercial and US Navy electronics schools and has worked with military radio, radar and navigation equipment. Sam enjoys the technical aspects of ham radio. You can contact him at 57 Huxley Pl, Newport News, VA 23606 or at **kt4qw@arrl.net**.

By H. Ward Silver, NØAX

Contest Adventures—Operating From the Other End

Azure-blue skies, swaying palms and pileups—what could be better?

At some point in just about every contester's life, we tune across a pileup chasing an exotic call sign and wistfully think, "Boy, I wish I was there right now…" Well, let me tell you—it *is* fun and it's not as difficult as you might think. In fact, it's never been easier!

Contest Adventuring

Everybody knows about the well publicized mega-expeditions that occur during contest season, putting big signals on all bands and running up millions of points. These elite teams compete for the very top scores in all of contesting, putting untold hours into planning and preparation, shipping hundreds of pounds of equipment and assembling teams from all over the world. This article will show that these aren't the only travelers out there and not all expeditions are quite so massive.

In every contest where location counts, there are stations manned by contesters just like you seeking adventure—a big score, pileup excitement, or maybe a family vacation that just happens to include a weekend of radio fun. In terms of fun per ounce of effort, this is one of the biggest payoffs in ham radio. The key to success is to match your expectations with your capabilities. Let's start by whetting your appetite with a few successful stories.

FS/K7ZUM—Ken Knopp & Sons

Ken has been traveling to the Caribbean with his sons Dustin, KD7BSW, and Jordan, KC7TWZ, for CQ World Wide SSB contests since 1999. "In 1998 I happened to meet Craig, now AH8DX, and we discovered a mutual interest in contesting. He invited me to go to French St Martin for CQ WW that year. I think it was somewhere around 35,000 feet coming back that I got the great idea of bringing my two sons for the 1999 contest."

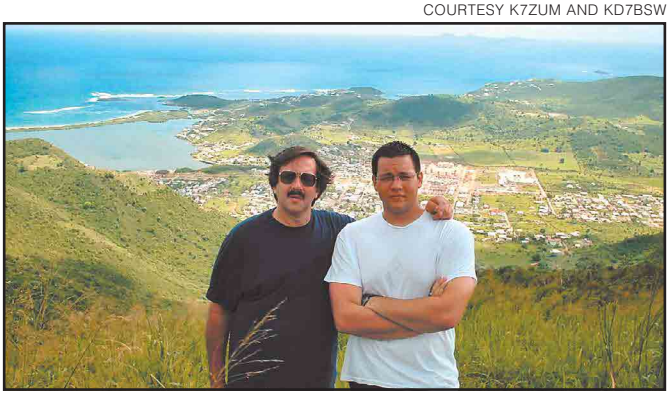
Were the boys enthusiastic? "That would be putting it mildly! We had almost a year to prepare for it so we entered various contests from my home station including participating in a couple of big multiop efforts at W7RM and W7GG." Volunteering with a local contest group is a great way to get an idea of what you'll get to enjoy from your target location. Put on a pair of headphones and listen, listen, listen while the more experienced ops work the pileups. Soon it will be your turn to try!

What about all that gear? "We take all of our own equipment, as this is pretty much a "Field Day" operation. Most airlines will allow you two checked bags of 70 pounds apiece plus a carry-on. I have gotten the baggage down to one full-sized radio, one small amp, 100 feet of RG-8, a laptop, voice keyer, Butternut multiband vertical, a spool of wire for a dozen radials, and the various odds and ends that are needed. It takes a while to get it all packed, but we have pretty much gotten it down pat!" Given the size of the new 100 W all-band rigs like the IC-706, TS-50, FT-897, and others, station weight is moving in the right direction.

Ken located a contest QTH by using the Internet and says that installing the antennas and radio gear has never been a problem. "All of the islanders we have run into are more than willing to give you a hand, and they are very curious as to what you are doing. They usually find it very hard to believe that someone would actually take the time to go to their island and talk on a radio for 48 hours. There's great swimming off the very fine white sand beaches, and the kids and I have done lots of that, too." Ken reminds contest travelers to reward the local helpers so they'll be glad to see you (and the rest of us) again.

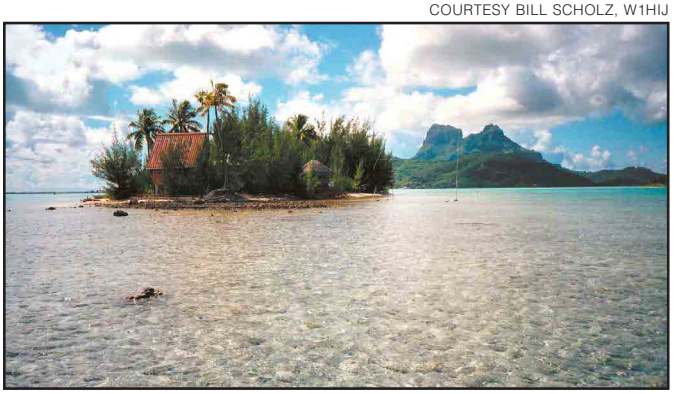
What's the best part? "Our main goal was just to have fun, make lots of good memories, and make about 5000 contacts. The best part for this year's trip was that since my oldest son will be leaving for the military in September, we took the time to take one last good trip

COURTESY K7ZUM AND KD7BSW



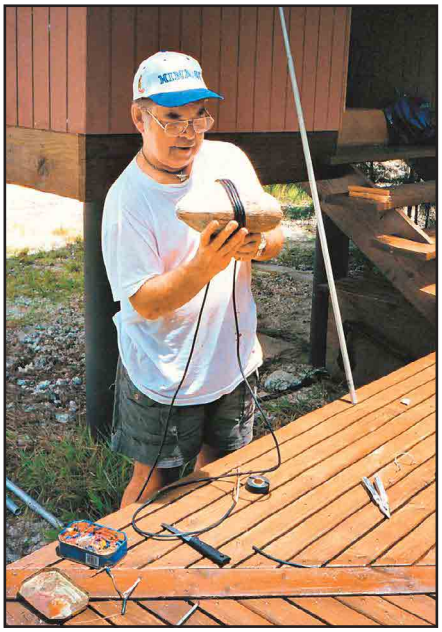
Ken, K7ZUM, and Dustin, KD7BSW, enjoying the view from Paradise Peak, French St Martin.

COURTESY BILL SCHOLZ, W1HIJ



The FO5IW motu with the HF2V installed in salt water, and Bora Bora in the background.

COURTESY BILL SCHOLZ, W1HIJ



Bill, W1HIJ, has discovered that coconuts make excellent balun-winding forms!

COURTESY JACQUES SAGET, CN2JS/F6BEE

The CN2JS antenna farm perched high atop the resort overlooking the Atlantic just a few hundred meters away.

together, had a chance to spend good quality time together, and make some wonderful memories." The worst part? "That's easy—having to come back and go to work. If you are even remotely considering a contest trip and taking family, by all means quit thinking about it—just plan it and do it! I guarantee that you will come back with great friends and wonderful memories."

FO/W1HIJ—Bill and Emily Go to Bora Bora

On the all-time list of fantasy tropical islands, French Polynesia's Bora Bora has to place near the top. Wouldn't this be a nice spot to spend a late fall or winter weekend with the whole world calling in? Bill Scholz, W1HIJ, arranged to visit Stan Wisniewski, FO5IW, during the CW WPX contest in May 2001 and again with friend Emily Redmon, KF6SGV, during ARRL DX CW in 2002. He reports:

> Stan owns the Mai Moana, a small resort on a motu in the lagoon. This great discovery was very good luck. A friend of mine, Ron, W6OM/FO5VO, suggested that I look at Stan's place and I will be forever grateful to Ron for the suggestion!
>
> Man, this is the greatest discovery for a vacation/R&R/radio place I can imagine. Not only is the location one of the most beautiful places on earth, not only is the hospitality the best and most complete that can be imagined, not only is the food absolutely exquisite, not only is the friendship and support of Stan and his family and friends wonderful, not only is the "radio" tremendous, but this is a place that the world envisions when they think of "tropical paradise"! The best moments of the whole trip though may have been the sheer relaxation of snorkeling in the lagoon with hundreds of brilliantly colored fish or paddling a kayak through "gin-clear" water.

Do you think they enjoyed it?

Transporting equipment is always a concern, but Bill says not to worry:

> There were no problems in carrying the equipment in and out of French Polynesia. I had been granted FOØSCH and part of the application was a temporary import permit for the radio and associated gear, so I was covered as far as customs was concerned. In three trips between November of 2000 and February of 2002, I've never been asked for the paperwork. Nevertheless, I continue to carry it with me, just in case.
>
> I took my FT-990, computer interface, laptop, power supply in a Pelican case. which makes transport so much safer and easier. Stan actually has a station there, including a beam on a short tower for 10, 15 and 20, but I elected to use my own radio because of familiarity. I took a Butternut HF2V for 80 and 40. We mounted it in the lagoon and it played extremely well with its base in 1 to 2 feet of salt water.

Bill encourages all potential contest adventurers this way:

> If you want to operate from the DX side, or even think you do, then go. My biggest stumbling block was fear—fear that I wouldn't measure up, fear that I would let the station owner down, fear that I'd make a fool of myself. The butterflies were there in the half hour before the contest started, but once it began it was just plain old fun.
>
> Find a place and facilities that meet your (and your companion's) desires and expectations. If at all possible, select a location where the people understand what you're doing. The fact that Stan was a contester really helped because he knew what I was doing and how I was doing it. Treat the contest as just one more delightful part of a wonderful holiday. I guarantee you that the memories you bring back will fuel your desires for more.

CN2JS/F6BEE—Jacques Saget in the Casbah

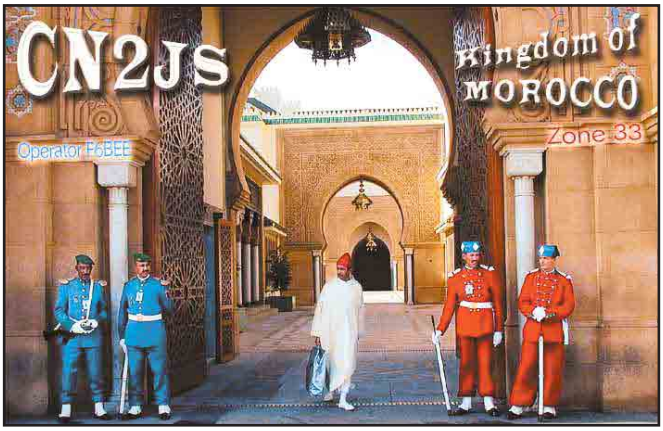
A well-known French contest operator, Jacques combined a family vacation with the ARRL DX CW contest in 2002. As many US and VE calls migrate to the sunny shores of the Caribbean, so do European operators suddenly show up from African locations. In Jacques' case, the QTH was Morocco, just across the Straits of Gibraltar and a sought-after contest multiplier.

"I planned a one-week stay with family in an all-inclusive resort at a very cost effective rate. We selected Morocco as the sun and heat were almost guaranteed at this time of the year. As I also had a temporary license there, renewing it one more time was not a problem.

"About six weeks prior to my departure, I exchanged some e-mails and faxes with the resort management, asking permission to operate. I attached a copy of my local license as well as my CN association membership card. I also mentioned a number of countries where I previously operated from resorts. At the same time, I also applied for a room facing northwest and at the top floor of the building, with the best clearance in other directions. Don't ask only for operating permission but also for a good radio location, if possible."

Jacques has experience in portable contest operating. This time his wife and 18

COURTESY JACQUES SAGET, CN2JS/F6BEE



A lasting memento of his contest adventure in Morocco, this is the FB QSL card of Jacques Saget, CN2JS/F6BEE.

COURTESY JACQUES SAGET, CN2JS/F6BEE

The complete CN2JS station, ready for action in Africa.

year old daughter came along. "For sure, they enjoyed traveling, the resort, the sweet climate and golf courses. They didn't complain about my radio operation. At the hotel we had a two bedroom "apartment" for the three of us, with two small balconies having a nice view of the Atlantic some 300 meters downhill. We were at the top floor of one of the uphill resort buildings." This worked out well and Jacques says they will be taking another family radio adventure.

Jacques' traveling kit includes the radio (an IC-706MKII) and laptop as carry-on luggage. The antenna system was a pair of verticals (HF2V and R-7000) packed in a section of PVC pipe, plus 65 meters of coax, headset, tools and antenna tuner in a suitcase. The only problem was the excess weight charges. In a tip repeated by many, Jacques suggests that you "reduce weight by taking less clothing!" The photo shows how compact the actual station is when set up.

It was a very successful trip. "The location was certainly great. I made 1464 QSOs and 200 mults in the 16 hours I operated during the contest. Another 1720 QSOs were logged in the following week, on all 9 HF bands, including 11 NA stations on 160. Not bad for 100 W into verticals." Wouldn't you like to be sending out QSLs like Jacques?

Pre-Adventure Planning

Now that your appetite is whetted for an adventure, how to go about it? Start by thinking about the whole trip *from start to finish*. Family trips work best if you leave time after the contest for relaxing and taking in the local sites and activities. Before the contest, you'll need a day or so to set up. The station will come apart pretty quickly afterward. If you set aside post-contest days for family time, you won't be preoccupied with the usual before-the-bell-rings jitters and worries. Trust me, your family won't have any trouble occupying themselves while you're on the radio over the weekend.

Timing is also important. The popular contest destinations are often booked for major contests years in advance, but you might be able to operate during a smaller contest or join a group looking for operators. Thanksgiving, the usual weekend for CQ WW CW, is often a light weekend at vacation resorts because US families are usually together at home. My family spent a memorable and relaxing Thanksgiving on Maui in 1993. Summer months can be low season in the tropics, as well. A travel agent may have information on off-season travel specials.

If this is your first trip, *start small*. If you can, make a practice run in a domestic contest or state QSO party. That will give you an idea of what you'll need to take for a portable station. If you've already done some portable work and are ready for a bigger adventure, it's time to look for a QTH.

If you like to travel light, there are a number of ham radio destinations, such as Sea-Q Maui, that are set up with a complete station ready to walk in and operate. These locations can be found in the Classified Ads of *QST* and *CQ*, on some of the popular Web portals, as well as in directories of contest stations. An excellent resource is the Web site of Ken, K2KW, **www.dxholiday.com**, which lists dozens of contest-friendly destinations worldwide. Ken also has numerous links and short discussions on topics that are of interest to every ham radio traveler.

If you plan on taking your own equipment Field Day-style, W6PH offers some advice. Kurt is a regular traveler, most recently to Bermuda, VP9, operating with low-power and considerable success. "The main thing is the antenna—it should be effective and efficient, not only in operation, but also in weight and mechanical considerations. This is why I have chosen the Cushcraft AV-5 trap vertical for 80-10 meters, which fits into a wooden box 50 inches long by 5 inches square, including radials and feed line. One should always test the antenna before the trip. I mark the tubing at the joints and label every piece of aluminum. It is an especially good idea to mark the traps because paper labels deteriorate quickly.

"I added 130 feet of insulated wire that I run up the vertical and out horizontally for 160 meters. The beauty of the vertical is that it works well on island locations and all the aluminum is used for radiating a signal. I use RG-58U, which is light and works fine for low power. For the radio I prefer the IC-706 and SS-25 power supply. I use an old NEC 486-50 laptop with *CT9* that is pretty rugged."

For those of you considering a trip to somewhere off the beaten path, medical preparation is also required. Joe Pontek, K8JP/V31JP, has written a very informative and useful article, "The Contest Traveler" available on the *NCJ* Web site (**www.ncjweb.com**) under the "DX-Ventures" tab. The article also lists a number of publications and Web sites that you will want to notify of your impending activity. Joe's article, "The DX-pedition Checklist" is also available on the site and lists just about everything an expeditioner might need.

Go for It!

My personal experiences in traveling to KH6, HC8 and rambling around the Northwest US to rare counties have convinced me that the hardest part of the journey is the first step—deciding to do it. If you need some encouragement, why not ask someone sporting a "/" in their call sign during a contest? The resources are all there—so go already! QST

By Rick Lindquist, N1RL

ARRL Board Names Award Winners

As it does each year at its July meeting, the ARRL Board of Directors recognized excellence, achievement or innovation in several areas.

2003 Hiram Percy Maxim Memorial Award

The ARRL Board of Directors faced a tough choice in deciding who deserved the prestigious Hiram Percy Maxim Memorial Award. Two exceptional young hams stood head and shoulders above the other nominees, however, and the Board selected both as winners in equal standing. They are Andrea Hartlage, KG4IUM, of Grayson, Georgia, and Jay Thompson, W6JAY, of Santa Ana, California. The Hiram Percy Maxim Memorial Award goes annually to an amateur under age 21 who has contributed in an exemplary manner to both the Amateur Radio community and the local community. This marked the first year the award had two winners.

Andrea Hartlage, KG4IUM

Nominated by Georgia Section Manager Susan Swiderski, AF4FO—who has designated Hartlage as Assistant Section Manager/Youth—and Bill Carter, KG4FXG, Hartlage, 15, is well known to visitors of the ARRL Web site as the editor of the monthly "Youth@HamRadio.Fun" column, **www.arrl.org/news/youth**. "Andrea is one of ham radio's best ambassadors and a strong leader," the Board said. She is very active in her community through her participation in Amateur Radio Emergency Service (ARES) activities, and she has completed the ARRL Amateur Radio Emergency Communications Level I and Level II courses.

Jay Thompson, W6JAY

Hartlage said she was honored to be selected, and she expressed special gratitude to her dad, Scott, KF4PWI, for introducing her to Amateur Radio.

Hartlage is a member of The International Morse Preservation Society FISTS, the Young Ladies' Radio League (YLRL), is active in Gwinnett County ARES and writes a bimonthly youth column for the YLRL newsletter, *YL-Harmonics*. Andrea still finds time to mentor young people in her community by instructing ham radio at Richards Middle School—an ARRL Education and Technology Program ("The Big Project") participating school.

It was an honor-filled summer for Hartlage, a high school sophomore. In addition to the ARRL award, *Amateur Radio Newsline* named her as its 2004 Young Ham of the Year (YHOTY).

Thompson, an ARRL Life Member nominated for the HPM Award by his father, Richard WA6NOL, shares another distinction with Hartlage: The 19-year-old was the 2003 YHOTY. Jay Thompson is active in Amateur Radio Direction Finding (ARDF) and has won numerous ARDF medals, including three in the IARU Region 2 competition. He was scheduled to compete in September in the ARDF 12th World Championship in the Czech Republic. Thompson also has taught DFing to Scouts. In addition, he serves as a net control station for his local ARES net and for the Hospital Disaster Support Communications System.

During numerous local and regional science fair competitions, Thompson has demonstrated his grasp of the technical side of ham radio. He designed and built a new type of quad antenna—the fractal quad—for a regional science fair. He also mentors other youth through his active participation in the Boy Scouts' radio merit badge program.

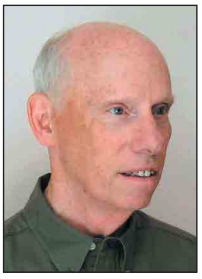
Thompson said he was surprised to be named the 2003 HPM Award winner. "I was thrilled that there were two winners, because it lets me know that there are other young hams with major accomplishments," he said.

Each will receive a $1500 stipend and engraved plaques. Thompson received his award at the ARRL Southwestern Division Convention in August. Hartlage will receive her award during the Georgia State Convention in November.

2003 Doug DeMaw, W1FB, Technical Excellence Award

There were multiple winners as well of the 2003 Doug DeMaw, W1FB, Technical Excellence Award. Created to honor the late Doug DeMaw, W1FB—one of the most widely published technical authors in Amateur Radio history—the award is bestowed upon the author or authors of the best *QST* or *QEX* technical article during the prior year, as judged by the ARRL Technical Advisor group. DeMaw was the ARRL Technical Department Manager and Senior Technical Editor from 1970 to 1983.

For 2003, two articles rose above all the rest—an unusual circumstance. As a result, the Technical Excellence Award went to both sets of authors. The Board recognized Bob Larkin, W7PUA, of Corvallis, Oregon; Larry Liljequist, W7SZ, of Washougal, Washington, and Ernest Manly, W7LHL, of Graham, Washington, for their article, "Microwave Propagation in the Upper Troposphere." It appeared in the July/August 2003 issue of *QEX*. The Board also recognized ARRL Life Member Robert Sommer, N4UU, for his article, "Optimum Radial Ground Systems," which appeared in the August 2003 *QST*.



Bob Larkin, W7PUA

Larkin is a consulting engineer for communications companies. His current Amateur Radio interests include VHF through microwave propagation and DSP weak signal techniques.

Liljequist, a retired engineer, developed an early interest in weak-signal experimentation on VHF and UHF. He was among those in-volved in early 2-meter meteor scatter work and later made pioneering digital

moonbounce contacts with W7LHL on 1296 MHz and 10 GHz.

Manly, also a retired engineer, has done considerable research and development work in the microwave field, and in the 1960s he helped to develop a commercial meteor scatter communication system. He currently enjoys operating on HF through 10 GHz and especially likes to study microwave propagation.

An ARRL Life Member, Sommer specialized in digital communications theory and applications during his engineering career. He holds two patents and has authored 18 technical papers plus three *QST* articles. His ham radio interests center on DX and antennas—especially verticals, with which he's made DXCC Honor Roll (352 entities).

Larry Liljequist, W7SZ

Ernest Manly, W7LHL

Robert Sommer, N4UU

The DeMaw Award consists of an engraved 9-inch pewter cup.

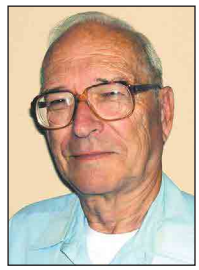
2003 ARRL Herb S. Brier (W9AD) Instructor of the Year Award

Donald P. Wright Jr, AA2F, of Pennington, New Jersey, is the winner of the 2003 ARRL Herb S. Brier (W9AD) Instructor of the Year Award. Named for the late, long-time *CQ* "Novice" column editor, the award honors an individual who represents the spirit of Brier's effective and caring Amateur Radio instruction. The Lake County Amateur Radio Club of Crown Point, Indiana, cosponsors the award.

Wright has been education director for the Delaware Valley Radio Association for more than 20 years and has taught hundreds of individuals to prepare for their license examinations. He uses hands-on lessons to teach Technician and General courses and tutor one on one. Wright also is a radio merit badge counselor for the Boy Scouts and helps interested scouts to get licensed.

Wright attributes his students' high success rate to small classes, which, he says "enable me to know and tell them when I feel they are ready to take and pass the tests."

As the 2003 winner of the Herb S. Brier Instructor of the Year Award, Wright will receive an engraved plaque.

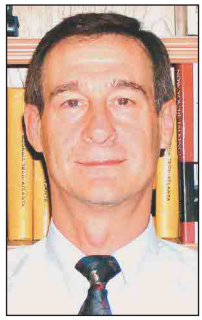


Don Wright, AA2F

2003 ARRL Professional Educator of the Year Award

The Board selected Nick Lance Jr, KC5KBO, of Houston, Texas, as the recipient of the 2003 ARRL Professional Educator of the Year Award. This award goes to a teacher who integrates Amateur Radio into his or her classroom curriculum. The Lambda Amateur Radio Club of Philadelphia is the award cosponsor.

Lance is solely responsible for assisting numerous members of NASA's Astronaut Corps and 29 of the space agency's aerospace education specialists (who work with teachers nationwide) to get their ham tickets. He also teaches a "Hamster" course to middle schoolers, at the same time inspiring them through Amateur Radio and Amateur Radio on the International Space Station activities to pursue careers in technology.



Nick Lance Jr, KC5KBO

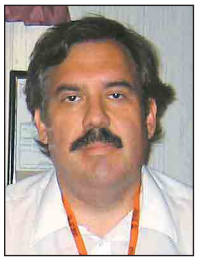
As the 2003 ARRL Professional Educator of the Year Award winner, Lance will receive an engraved plaque.

2004 Philip J. McGan Memorial Silver Antenna Award

Michael J. Duff, KG4SLH, of Florence, South Carolina, is the recipient of the 2004 Philip J. McGan Memorial Silver Antenna Award. The annual award honors an amateur who demonstrates outstanding public relations success on behalf of Amateur Radio at the local, state or national level. The recipient best exemplifies the volunteer spirit of the award's namesake—the late journalist Philip J. McGan, WA2MBQ, the first chairman of the ARRL's Public Relations Committee and an enthusiastic Amateur Radio booster.

An ARRL Life Member, Duff has helped build public awareness for Amateur Radio via radio, television and print and has reached out to the public through informational displays and speaking engagements, continually demonstrating his success as a public relations volunteer.

He's actively involved in ARES and RACES and is a volunteer examiner team leader. He serves as an assistant public information coordinator for the ARRL South Carolina Section as well as PIO for the ARRL-affiliated Florence Amateur Radio Club, W4ULH.



Mike Duff, KG4SLH

"Mike has the uncanny ability of successfully obtaining media and community exposure," said Jack Jackson, N4JJ, who nominated Duff for the award.

Jackson says Duff's efforts have enhanced both Amateur Radio and the ARRL in the Florence area, boosting club membership and demand for licensing classes and information.

The winner of the McGan Award receives an engraved plaque.

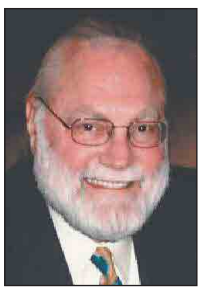
The 2003 Microwave Development Award

The Board also honored two recipients with the 2003 ARRL Microwave Development Award, which recognizes contributions to microwave equipment design and development. Named were Brian D. Justin Jr, WA1ZMS, of Lynchburg, Virginia, and John Champa, K8OCL, of Howell, Michigan. Both are ARRL Life Members.

The Board recognized Justin for his pioneering work in developing the Amateur Radio microwave bands above 30 GHz. Last February, Justin claimed a new world and North American DX record for the 241 GHz band—49.35 miles.

Brian Justin, WA1ZMS

Champa was honored for his leadership as chairman of the ARRL High Speed Multimedia Committee and for the development of practical IEEE 802.11 "WiFi" technology for Amateur Radio.



John Champa, K8OCL

Microwave Development Award recipients receive a $100 ARRL gift certificate and an engraved plaque.

Rick Lindquist, N1RL, is ARRL senior news editor. He can be reached at **rlindquist@arrl.org**.

By Marijane Sipple, NP2AZ

Hospital Benefits From Eagle Scout Project

A young ham's Eagle Scout project will bring long-lasting benefits to his local hospital.

Robbie Rikard, KG4MBQ, joined the New Bern Amateur Radio Club in North Carolina in 2001 after his uncle, Ray Hemphill, W7OPH, encouraged him to get his ham license. Since then, Robbie has been an enthusiastic participant in club activities supporting emergency communications and public events.

Last year, 14 year old Robbie mentioned at a club meeting that he was trying to decide on a project for his Eagle Scout Award. Jamie King, W4JHK, a club member who worked at the local hospital, suggested that an Amateur Radio station would be a good addition to the hospital's emergency communications system.

After researching the benefits and requirements for such a proposal, Robbie contacted hospital personnel to present the idea to them. They promised to give it their consideration and said they would get back to him.

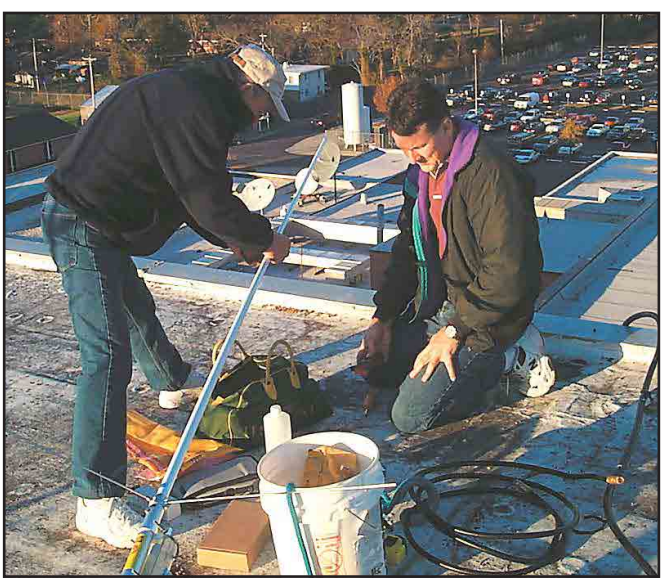
Ray Freeman, who is in charge of Security and Communications at Craven Regional Medical Center, recalls that he was skeptical when he first suggested the idea to their staff. "I was able to see the real merit of Robbie's idea after I attended a meeting of emergency management personnel and learned that several other hospitals in the region have Amateur Radio stations. In the event of a natural disaster, such as a hurricane, or a terrorist attack, this would provide us with a backup when normal lines of communication might be down."

At the March 2003 meeting of the New Bern Amateur Radio Club (NBARC), Robbie reported on the progress he was making. Club members were pleased to offer Robbie their assistance for such a worthwhile project. In the coming months they would gain a real appreciation for the time and effort involved in earning the rank of Eagle Scout, the highest award and last major step in the Boy Scouts of America advancement program.

After receiving approval from the hospital, Robbie was soon busy making a "shopping list" of the necessary equipment for a hospital ham station. The total cost for the radio, antenna, tower mount, lightning protector, Heliax coax and connectors came to $2118.36. He selected a 75-W ICOM 2-meter mobile transceiver and the MFJ-4125 power supply. A 10.5 foot Diamond F-22A antenna would be attached to the hospital's communications tower on top of the hospital roof with an SMK-150 tower side mount kit. He needed approximately 400 feet of coax to run from the station to the tower, making that item the biggest single expense ($1550). He pointed out that in the future it would be possible to upgrade the station to send packet data through a computer hooked to the radio.

According to the agreement Robbie drew up between the hospital and the ham club, CRMC would pay for the equipment, plus any maintenance costs, while the club would assist Robbie with the installation and maintenance jobs. As pri-

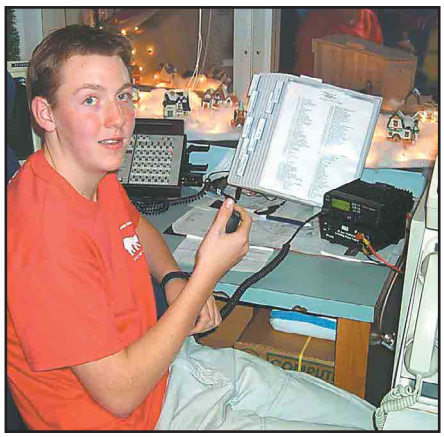
Robbie Rikard, KG4MBQ, acts as Net Control for the New Bern (North Carolina) Amateur Radio Club at the 2003 Neuse River Day event.



NBARC President Mac Eutsler, WAØZGL, and Robbie's dad Michael Rickard, KG4MSU, assemble the antenna on the hospital roof.

COURTESY KG4MBQ

From the top: Dave Warwick, K4DJW; KG4MSU, and John Jaskolka, KR4ZJ, install the 2 meter antenna at Craven Regional Medical Center.



Robbie makes the initial radio check at the new Amateur Radio station.

Just after Robbie was inducted into the Eagle Scouts: From the left—his dad Michael Rikard, KG4MSU; his mother Kim Rikard; Robbie, and scoutmaster Tim Mitchell.

mary operators of the CRMC station, the hospital Communications staff needed to earn their Amateur Radio licenses. NBARC offered to conduct Technician classes and give the necessary testing.

Ralph Bitely, N4RAB, who organized the classes, said: "We used the ARRL *Now You're Talking!* material and video course, allowing time for students to ask questions at the end of each segment. Others in addition to the hospital staff wanted to take the course, but we were limited to how many could view the TV screen. We managed to cram in 19 students. After the last class, VE exams were held, and we were pleased to have 16 receive their Technician ratings. Plans are being made to hold a second session, and 6 Boy Scouts have already signed up for the class."

Robbie, who belongs to Scout Troop 13 at the Centenary United Methodist Church in New Bern, was given the privilege of making the initial radio check from the hospital's new ham station once he completed installation of the equipment. Should the need arise, designated ARES (Amateur Radio Emergency Service) operators may be called in to assist the Communications staff.

The CRMC staff with Technician licenses will be registered with the Craven County Emergency Manager as Radio Amateur Civil Emergency Service (RACES) operators so that they can operate if the federal government should invoke the communications provisions of the War Powers Act. To maintain their skills, they are encouraged to participate in ARES drills and other Amateur Radio nets, such as Skywarn, and in the annual test conducted in conjunction with the nationwide ARRL Simulated Emergency Test.

In the event of an emergency, the ARES Coordinator for Craven County, Bruce Arnold, N8UTY, would be contacted to ascertain if other medical centers have activated their Amateur Radio stations. Craven County ARES also operates in close coordination with Craven County Emergency Management, the Red Cross and other emergency responders. Bruce commented that "Our planning centered primarily around the possibility of terrorist activity, such as a biological attack, which would tax normal communication channels and require the use of a secondary means of passing information. Nonetheless, should we be hit by a hurricane like Hugo or Andrew, telephones could be out for days or weeks."

On my way to the monthly meeting of the New Bern ARC, I stopped by the hospital so I could see the new Amateur Radio station in the Communications room. Rosie Willis was on duty, and she proudly pulled out her FCC Amateur Radio license to show me her new call sign, KI4EQI. She had the highest praise for the NBARC members who taught the Technician classes. "I just knew I would never pass the exam," she said, "but everyone was so supportive and encouraging that I was determined to get my license!"

Special recognition is also due the intrepid NBARC crew who braved the winter cold and wind, not once, but three times, to install the 2 meter antenna on the hospital tower. Michael Rikard, KG4MSU, Robbie's father, was one of the tower climbers. He was doubtless wishing he didn't have such an enterprising son at the time. Michael has his PhD in Biology and works at Cape Lookout National Seashore. Since getting his ham license last year, he has been able to keep in contact with Robbie via 2 meters while at work on a remote barrier island off the North Carolina coast.

Kim Rikard, Robbie's mother, works as a physician's assistant in New Bern. The pride that Robbie's parents and his Uncle Ray, W7OPH, have in him is shared by the entire New Bern ARC. We are all impressed by the work he did in planning and organizing the ham station at the hospital, a project that took him 10 months from start to finish. We hope his project and his enthusiasm for Amateur Radio will be an inspiration to many other young people.

All photos except those noted otherwise by Bob Chamberlain, W2HVX

Marijane Sipple, NP2AZ, was (along with her husband Vince, N6JIB) a pilot for American Inter-Island Airlines on St Thomas, USVI, when they decided to sell their island home and go cruising in their sailboat. They earned their ham radio licenses in 1983 as part of their preparations for this change in lifestyle. Although now retired and living ashore in North Carolina, they are still enthusiastic about the people they meet through ham radio. You can reach the author at 657 Country Club West Dr, Arapahoe, NC 28510; **turtlecove@pamlico.net**.

By Kay Craigie, N3KN

HPM Award Winners Demonstrate its Positive Effects

"It gave me the courage to think, 'Yes, I *can* do this.'"—*Zach Manganello, K1ZK, 1996 winner of the Hiram Percy Maxim Memorial Award*

When the ARRL Board of Directors selected the winners of the 2003 Hiram Percy Maxim Memorial Award in July 2004, it was the 20th anniversary of the award, in the League's 90th anniversary year. Though Amateur Radio always looks forward to the future, we can take just a moment to look back in time at this award, its pre-war antecedent, and the achievements of its past winners.

"In memory of their father, Hiram Percy Maxim, the two children of the founder of the American Radio Relay League have established an annual award which will perpetuate in an effective manner the warm and vital interest which he had in the welfare and the activities of the young radio amateur."—*QST*, Feb 1937, p 10

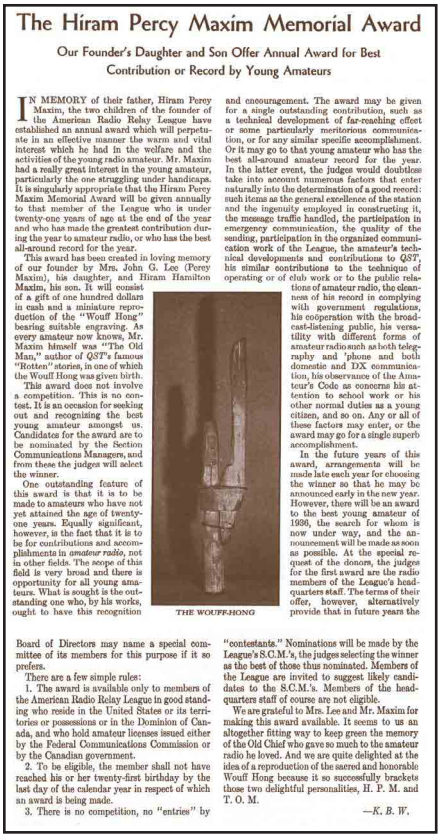
Six months later, *QST* announced that "the 1936 Hiram Percy Maxim Memorial Award winner is Victor H. Clark, W6KFC, of Phoenix, Ariz." The article by Clinton B. DeSoto went on to say that Clark's "career demonstrates an intensive, aggressive application to Amateur Radio, with a high degree of useful accomplishment..." (Aug 1937, p 11). Today, of course, we know just how prescient was DeSoto's glowing description of Vic Clark at age 20. More than 40 years later as W4KFC, Clark became President of the ARRL.

The award was conferred three more times before World War II shut down Amateur Radio. The 1937 winner was Oscar L. Short, W9RSO, from Missouri (Jun 1938, p 29), followed by Owen J. Dowd, W2JHB, from New York in 1938 (Jun 1939, p 29). The final pre-war winner was Dawkins Espy, W5CXH/6, a young Louisiana ham living in California (Aug 1940, p 27).

The award was not resumed when the war ended and young Americans were once again able to devote their energies to Amateur Radio.

In 1983, however, the League created two recognitions for outstanding young hams. One was the prestigious Goldwater Scholarship awarded by the ARRL Foundation. The other recognition was a revived Hiram Percy Maxim Memorial Award. The timing was right, for Vic Clark, W4KFC, was President of the ARRL in 1983 and knew from personal experience how much it means for a young person to be honored for hard work and achievement. Clark appointed a committee to raise funds for an award endowment to cover the annual expenses of the award. Among the donors were The Old Man's children, who had assisted in the creation of the original Award in the 1930s (Aug 1983, p 54).

Regrettably, Vic Clark became a Silent Key in November 1983, so the first pre-war award was not able to be at the ARRL National Convention in July 1984 to present the first post-war award to 18 year old Jon J. Willis, WDØAIT, from Littleton, Colorado (Oct 1984, p 47). First licensed at age 10, Willis had earned his Extra and was very active in the ARRL Field Organization.



The Hiram Percy Maxim Memorial Award

Our Founder's Daughter and Son Offer Annual Award for Best Contribution or Record by Young Amateurs

IN MEMORY of their father, Hiram Percy Maxim, the two children of the founder of the American Radio Relay League have established an annual award which will perpetuate in an effective manner the warm and vital interest which he had in the welfare and the activities of the young radio amateur. Mr. Maxim had a really great interest in the young amateur, particularly the one struggling under handicaps. It is singularly appropriate that the Hiram Percy Maxim Memorial Award will be given annually to that member of the League who is under twenty-one years of age at the end of the year and who has made the greatest contribution during the year to amateur radio, or who has the best all-around record for the year.

This award has been created in loving memory of our founder by Mrs. John G. Lee (Percy Maxim), his daughter, and Hiram Hamilton Maxim, his son. It will consist of a gift of one hundred dollars in cash and a miniature reproduction of the "Wouff Hong" bearing suitable engraving. As every amateur now knows, Mr. Maxim himself was "The Old Man," author of *QST*'s famous "Rotten" stories, in one of which the Wouff Hong was given birth.

This award does not involve a competition. This is no contest. It is an occasion for seeking out and recognizing the best young amateur amongst us. Candidates for the award are to be nominated by the section Communications Managers, and from these the judges will select the winner.

One outstanding feature of this award is that it is to be made to amateurs who have not yet attained the age of twenty-one years. Equally significant, however, is the fact that it is to be for contributions and accomplishments in *amateur radio*, not in other fields. The scope of this field is very broad and there is opportunity for all young amateurs. What is sought is the outstanding one who, by his works, ought to have this recognition and encouragement. The award may be given for a single outstanding contribution, such as a technical development of far-reaching effect or some particularly meritorious communication, or for any similar specific accomplishment. Or it may go to that young amateur who has the best all-around amateur record for the year. In the latter event, the judges would doubtless take into account numerous factors that enter naturally into the determination of a good record: such items as the general excellence of the station and the ingenuity employed in constructing it, the message traffic handled, the participation in emergency communication, the quality of the sending, participation in the organized communication work of the League, the amateur's technical developments and contributions to *QST*, his similar contributions to the technique of operating or of club work or to the public relations of amateur radio, the cleanness of his record in complying with government regulations, his cooperation with the broadcast-listening public, his versatility with different forms of amateur radio such as both telegraphy and 'phone and both domestic and DX communication, his observance of the Amateur's Code as concerns his attention to school work or his other normal duties as a young citizen, and so on. Any or all of these factors may enter, or the award may go for a single superb accomplishment.

In the future years of this award, arrangements will be made late each year for choosing the winner so that he may be announced early in the new year. However, there will be an award to the best young amateur of 1936, the search for whom is now under way, and the announcement will be made as soon as possible. At the special request of the donors, the judges for the first award are the radio members of the League's headquarters staff. The terms of their offer, however, alternatively provide that in future years the Board of Directors may name a special committee of its members for this purpose if it so prefers.

There are a few simple rules:

1. The award is available only to members of the American Radio Relay League in good standing who reside in the United States or its territories or possessions or in the Dominion of Canada, and who hold amateur licenses issued either by the Federal Communications Commission or by the Canadian government.

2. To be eligible, the member shall not have reached his or her twenty-first birthday by the last day of the calendar year in respect of which an award is being made.

3. There is no competition, no "entries" by "contestants." Nominations will be made by the League's S.C.M.'s, the judges selecting the winner as the best of those thus nominated. Members of the League are invited to suggest likely candidates to the S.C.M.'s. Members of the headquarters staff of course are not eligible.

We are grateful to Mrs. Lee and Mr. Maxim for making this award available. It seems to us an altogether fitting way to keep green the memory of the Old Chief who gave so much to the amateur radio he loved. And we are quite delighted at the idea of a reproduction of the sacred and honorable Wouff Hong because it so successfully brackets those two delightful personalities, H. P. M. and T. O. M.

—*K. B. W.*

THE WOUFF-HONG

An article in the February 1937 issue of *QST* announced The Hiram Percy Maxim Memorial Award.

Quick Facts

Twenty of the 21 post-war HPM award winners are still licensed radio amateurs. Eleven of them hold Amateur Extra class tickets, and three more are Advanced class licensees. The youngest person and first female to win the award was Stacey Garner Stump, ex-KA9WDE, from Wisconsin, who received the honor at age 13 in 1987. Other very young winners were Shauna Richards, N7NGT (1975), and Beth Harris, KJ7FC (1980), two Wyoming hams who won at age 14. The average age of the 21 winners is 16 years. No award was given in 1991.

Where are they Now?

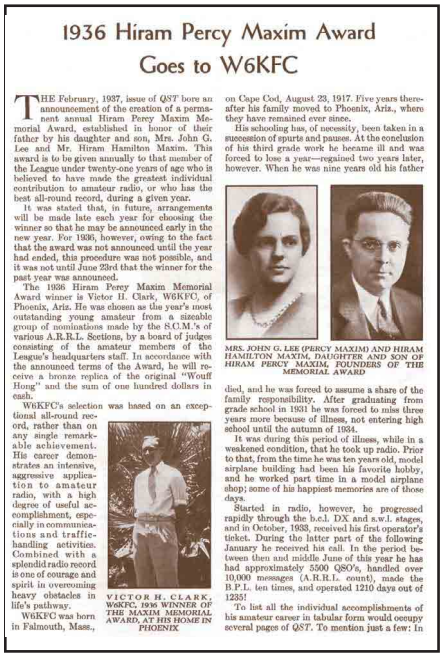
What has Amateur Radio meant in the lives of these outstanding people in the years since they received the HPM Award? I wrote to the past award winners and asked them about their lives and careers.

Mark Schreiner, NK8Q (1985), says:

I am currently a microwave/optical communications test engineer. I had previously been a microwave test engineer for a company that built commercial communications satellites where I worked on solid state power amplifiers at 3.7 to 4.2 GHz. Many of those amplifiers were used on the AT&T Telstar 4 series of satellites as well as some of the GE Americom satellites. Amateur Radio was the seed that provided the interest in such fields. While studying for my undergraduate and graduate degrees at Michigan Technological University and Villanova University, I was able to more easily grasp the seemingly abstract concepts that the textbooks and instructors

Table 1
Past Winners of the Hiram Percy Maxim Award

Year	Award Winner	Age
1983	Jon J. Willis, WD0AIT	18
1984	Donald R. Santangelo, KA2RLW	15
1985	Mark Schreiner, NK8Q	19
1986	Scott L. Young, N9FZS	17
1987	Stacey Garner Stump, KA9WDE	13
1988	Kevin Biekert, KB5AQV	16
1989	Shauna Richards, N7NGT	14
1990	Keri Miller Morgret, N6TME	15
1992	Chris Anziano, KD1OX	16
1993	Jonathan M. LeBretton, N1MJM	16
1994	Beth Harris, KJ7FC	14
1995	Michelle Ritterbusch Thompson, N1PNT	17
1996	Zachary Manganello, K1ZK	16
1997	Antone Duarte, N1XRS	16
1998	Elisabeth Price, KC8ALW	17
1999	Brian Mileshosky, N5ZGT	20
2000	Thaddeus W. Huff, KC0AQG	18
2001	Tamara M. Stuart, KF6RIV	17
2002	Ben Schupack, NW7DX	18
2003	Andrea Hartlage, KG4IUM	15
	Jay Thompson, W6JAY	19



1936 Hiram Percy Maxim Award Goes to W6KFC

THE February, 1937, issue of QST bore an announcement of the creation of a permanent annual Hiram Percy Maxim Memorial Award, established in honor of their father by his daughter and son, Mrs. John G. Lee and Mr. Hiram Hamilton Maxim. This award is to be given annually to that member of the League under twenty-one years of age who is believed to have made the greatest individual contribution to amateur radio, or who has the best all-round record, during a given year.

It was stated that, in future, arrangements will be made late each year for choosing the winner so that he may be announced early in the new year. For 1936, however, owing to the fact that the award was not announced until the year had ended, this procedure was not possible, and it was not until June 23rd that the winner for the past year was announced.

The 1936 Hiram Percy Maxim Memorial Award winner is Victor H. Clark, W6KFC, of Phoenix, Ariz. He was chosen as this year's most outstanding young amateur from a sizeable group of nominations made by the S.C.M.'s of various A.R.R.L. Sections, by a board of judges consisting of the amateur members of the League's headquarters staff. In accordance with the announced terms of the Award, he will receive a bronze replica of the original "Wouff Hong" and the sum of one hundred dollars in cash.

W6KFC's selection was based on an exceptional all-round record, rather than on any single remarkable achievement. His career demonstrates an intensive, aggressive application to amateur radio, with a high degree of useful accomplishment, especially in communications and traffic-handling activities. Combined with a splendid radio record is one of courage and spirit in overcoming heavy obstacles in life's pathway.

W6KFC was born in Falmouth, Mass., on Cape Cod, August 23, 1917. Five years thereafter his family moved to Phoenix, Ariz., where they have remained ever since.

His schooling has, of necessity, been taken in a succession of spurts and pauses. At the conclusion of his third grade work he became ill and was forced to lose a year—regained two years later, however. When he was nine years old his father died, and he was forced to assume a share of the family responsibility. After graduating from grade school in 1931 he was forced to miss three years more because of illness, not entering high school until the autumn of 1934.

It was during this period of illness, while in a weakened condition, that he took up radio. Prior to that, from the time he was ten years old, model airplane building had been his favorite hobby, and he worked part time in a model airplane shop; some of his happiest memories are of those days.

Started in radio, however, he progressed rapidly through the b.c.l. DX and s.w.l. stages, and in October, 1933, received his first operator's ticket. During the latter part of the following January he received his call. In the period between then and middle June of this year he has had approximately 5500 QSO's, handled over 10,000 messages (A.R.R.L. count), made the B.P.L. ten times, and operated 1210 days out of 1235!

To list all the individual accomplishments of his amateur career in tabular form would occupy several pages of QST. To mention just a few: In 1934 he placed second in his club's low-power DX contest, using 2 watts to a c.c. type 30, working all U. S. districts except W3 and W4, and VE5. In the 1935 Sweepstakes he placed high for Arizona with a score of 24,786. From May 15 to June 15, 1936, he kept nine daily skeds with the temperature over 100°, averaging 15 QSO's a day and handling 1110 messages. The same year he was W.A.S., was high in the 8th C.A. in an A.A.R.S. ZAG contest, and placed second nationally in the 1936 Sweepstakes. From Dec. 16, 1936, to Jan. 15, 1937, he piled up his highest traffic total: 1678 messages. In 1937 he won the W1M speed contest for the 8th C.A. with a speed of 50 w.p.m., was second national high in the year's first O.R.S. Party, served as "vigilante" station during the Ohio flood emergency, and then won the April O.R.S. Party with a total of 41,724 points, covering 118 QSO's with 49 Sections—the first time any West Coast operator ever topped the list.

The remarkable thing about this last feat—and, indeed, almost all his radio accomplishments—is that he was not only going to school but holding down a job copying press for KOY at the same time. He works there in the mornings from 5:00 until 11:15 A.M., attends high school in the afternoons, and hams the rest of the time. To win the April Party he had to sleep Sunday and then go to work and school the next day without having slept that night.

In addition to traffic-handling, W6KFC's radio activities include some 56-Mc. work (he and W6GZU took first place in the hidden five-meter transmitter hunt at the Third Arizona Hamfest) and a certain amount of DXing. The latter includes an 80-meter QSO with 2ZLO, who gave him an S6 report.

Going over to the personal side, W6KFC, not yet twenty, is six feet, four inches tall, and weighs 205 pounds. He guesses that it was just a case of too much radio that wore him down to what he is now!

He lives alone with his mother—"whose generosity and patience made my 5000 QSO's possible"—and the two cats. One of them—Niggie, the favorite station mascot—is black as sin. Vic's other interests include playing at tennis and the uke. He enjoys swimming, softball and other sports. He likes the movies, but would sooner handle traffic. Then, of course, he is interested in his pa job, and likes that a lot. He plans to begin study on Radiotelephone 1st and Radiotelegraph 2nd tickets as soon as he hears from Washington on the outcome of his Class A exam, recently taken.

Well, there he is—a fine, upstanding kind of young amateur, just the type that T.O.M. most approved. His is a fitting first name to engrave on the scroll of those who typify the everlasting heritage of honor and achievement left by our founder-president.

—C. B. D.

VICTOR H. CLARK, W6KFC, 1936 WINNER OF THE MAXIM MEMORIAL AWARD, AT HIS HOME IN PHOENIX

MRS. JOHN G. LEE (PERCY MAXIM) AND HIRAM HAMILTON MAXIM, DAUGHTER AND SON OF HIRAM PERCY MAXIM, FOUNDERS OF THE MEMORIAL AWARD

THE TROPHY, A MINIATURE OF T.O.M.'S WOUFF-HONG

THE LAYOUT AT W6KFC

And the winner is... **The article from the August 1937 issue announcing that future ARRL President Victor C. Clark, W6KFC, of Phoenix, Arizona, was the recipient of the first HPM Award. When the Award was reinstated in 1983, Vic commented: "As a young amateur, I was inspired to greater effort as a recipient of the award. The $100 cash presentation was a godsend, coming as it did in the midst of the Great Depression; in my case, it enabled me to finance the purchase of my first car, and this, in turn, led to a valuable employment opportunity."**

How to Qualify for the HPM Award

The Hiram Percy Maxim Memorial Award is given annually to a licensed radio amateur under the age of 21. The nominee's accomplishments and contributions to both the community of Amateur Radio and the local community should be of the most exemplary nature. These activities may include:

1) Participation or leadership in organizational affairs at the local or national level (for example: local radio club, ARES, net control, participation in civic groups);

2) Technical achievement (for example: built a radio, put up an antenna, etc);

3) Operating record (for example: nets, disaster drills, contests, Sweepstakes, etc);

4) Recruitment and training of new amateurs (for example: helped teach a license class, JOTA, etc);

5) Public relations activities (for example: create a ham radio Web page).

The award is intended to provide a tangible reward to those deserving young amateurs who contribute their time, skills and energies daily through their commitment to Amateur Radio. As models for their peers, and inspirations to us all, these fine young people are highly visible boosters of Amateur Radio awareness. We must continue to recognize and encourage their hard work and contributions at every opportunity.

Nomination forms and support information must be sent to the Section Manager. Section Managers will make the formal nomination by sending the form and information to ARRL before March 31. All additional support information must be received at ARRL on or before April 15.

There is no limit to the number of nominations an individual or club may submit to the ARRL Section Manager.

For more information, see **www.arrl.org/FandES/field/awards/hpm.html**.

were trying to teach. Many of those concepts were correlated with ideas from my experiences beginning at the age of about 11 years old as an SWL and later at age 14 as a Novice who eagerly worked to upgrade to General and later Extra class. I think that as long as my career involves some form of communications that can possibly be related in some way to Amateur Radio, I'll enjoy what I do.

I think I gained an extra level of maturity earlier in life due to my association with the local hams. The HPM award was a great boost to my self-worth. The money was applied toward my education, which eventually led to my gainful employment and interesting and evolving career.

Zach Manganello, K1ZK (1996), writes that he's a 2003 graduate of Middlebury College with a BA in physics and minors in mathematics and philosophy. He had internships with the National Radio Astronomy Observatory and wrote a thesis that involved construction of a working radio telescope at L-band. He describes the effect of ham radio on his life as "profound."

Zach adds:

Winning the award helped me to believe in myself. It gave me the courage to think, "Yes, I *can* do this." In applying to colleges I mentioned my interest in Amateur Radio and I am sure that helped me with some admissions offices.

The skills one gains as an Amateur Radio operator are useful wherever one goes. My interest in Amateur Radio led me to study physics in college. Amateur Radio has also shown me the great value of public service through ARES and RACES. Thanks to ham radio, I will always try to find ways to help my community. Amateur Radio has also allowed me to broaden my horizons. I have practiced foreign language skills with native speakers and learned about cultures all around the world. And I have honed my technical skills by studying everything from the macroscopic U-bolt down to the subatomic electron. I cannot imagine my life without Amateur Radio.

Brian Mileshosky, N5ZGT (1999), is a member of the technical staff at Sandia National Laboratories, working as an electrical engineer creating and designing test equipment for weapon evaluation. "Ham radio is responsible for my interest in electronics," he says. "It's given me a desire to learn more about RF and electronics. It's


Maxim Memorial Award Will Recognize Young Achievers

By David Sumner,* K1ZZ

Hiram Percy Maxim, W1AW, the founding President of the American Radio Relay League and the International Amateur Radio Union, passed away almost a half-century ago, on February 17, 1936. One year later, February 1937 *QST* made note of three ways in which the man whose genius had created the League was to be honored and remembered. One, the Maxim Memorial Relay, involved the sending, on the first anniversary of Mr. Maxim's death, of a commemorative message to all amateurs by ARRL President Eugene C. Woodruff, W8CMP, and acknowledging radiograms from those who received the memorial text. The second, the licensing of the ARRL Headquarters station with the *in memoriam* call sign W1AW, was at the time an unprecedented FCC action. (The construction and dedication of the building that to this day houses W1AW was to occur the following year, in 1938).

The third tribute to Mr. Maxim came from his own children, Mrs. John G. (Percy Maxim) Lee and Mr. Hiram Hamilton Maxim. They created a Hiram Percy Maxim Memorial Award, to be given annually to the member of the League under 21 years of age who had made the greatest contribution to Amateur Radio during that year. Nominations were to be made by ARRL Section Communications Managers, and the award itself was $100 in cash and a miniature reproduction of the dreaded Wouff Hong, the instrument of imaginary torture made famous by Mr. Maxim in his *QST* articles written under the pseudonym, "The Old Man."

The first Hiram Percy Maxim Memorial Award, for the year 1936, was given to a 19-year-old Arizona amateur with the call sign W6KFC (Arizona then being in the same district as California). August 1937 *QST* had this to say about the winner: "His career demonstrates an intensive, aggressive application to Amateur Radio, with a high degree of useful accomplishment, especially in communications and traffic-handling activities. Combined with a splendid radio record is one of courage and spirit in overcoming heavy obstacles in life's pathway."

The W6KFC of 1936 is Victor C. Clark, now W4KFC, the incumbent President of the American Radio Relay League. Can there be any finer testimony to the concept of the Maxim Memorial Award than for its initial recipient to assume the Presidency of the League some 46 years later, after a distinguished record of service to the League in other volunteer roles? Vic notes, "As a young amateur, I was inspired to greater effort as a recipient of the award. The $100 cash presentation was a godsend, coming as it did in the midst of the Great Depression; in my case, it enabled me to finance the purchase of my first car, and this, in turn, led to a valuable employment opportunity."

The award was given three more times before the interruption in amateur activity caused by World War II. For 1937 the winner was Oscar L. Short, W9RSO (now W4YJ); for 1938, Owen J. Dowd, W2JHB; and for 1939, Dawkins Espy, W5CXH/6. It was not revived at the conclusion of the war.

Late last year, following the recommendations of the ARRL Long-Range Planning Committee as endorsed by the Board of Directors, a campaign was initiated to resurrect the Hiram Percy Maxim Memorial Award. President Clark asked Hazard E. (Buz) Reeves, K2GL, to spearhead the effort to raise an endowment for the award, to ensure that it would be given in perpetuity. A number of leading amateurs and organizations were invited to contribute $1000 to the establishment of this endowment. As of this writing, the original goal has been passed, with almost $20,000 having been raised. The objective in creating the endowment is to cover the annual expenses of the award from interest earned, without reducing the principal. The new award is envisioned as a suitably engraved plaque or trophy, the sum of $1000 in cash, and travel and accommodations expenses to enable the winner to attend an ARRL convention at which an appropriate formal presentation can be made.

Nominations based upon achievement during 1983 will be solicited later this year, with a deadline for submission of March 1, 1984. A committee of five distinguished amateurs will review the nominations and select the winner.

The Hiram Percy Maxim Memorial Award should provide encouragement, and a tangible reward, for outstanding young amateurs. It will also provide an opportunity for Amateur Radio, and its many benefits for young people, to be brought to the attention of the public in a favorable light.

When the first of the new awards is presented, some time in 1984, we think The Old Man will be proud.

Nearly 50 years after his death, Hiram Percy Maxim serves as a role model for the award, about to be reinstituted, that bears his name.

Who Will Win the Maxim Memorial Award?

The Hiram Percy Maxim Memorial Award will be given annually to the licensed radio amateur under the age of 21 whose accomplishments and contributions are of the most exemplary nature within the framework of Amateur Radio activities, including, but not limited to, the following:

1) participation or leadership in organizational affairs at the local or national level;
2) technical achievement;
3) operating record;
4) recruitment and training of new amateurs;
5) public relations activities.

Later this year, *QST* will announce the opening of nominations for calendar year 1983.

Contributors to the Endowment for the Hiram Percy Maxim Memorial Award

Mrs. John G. (Percy Maxim) Lee and Hiram Hamilton Maxim
John Adel, W5RR
P. L. Anderson, Jr., N4AE
Victor C. and Hester Clark, W4KFC/WA4PAE
Richard C. Fenwick, K5RR
Harold Fox, W3AA
Gordon S. Marshall, W6RR
Hazard E. Reeves, K2GL
Robert Hamilton Robinson, W4ZR
John H. Sanders, WB4ANX
Alberto Shaio, HK3DEU
Ethel Smith, K4LMB
Leland W. Smith, W5KL
L. Phil Wicker, W4ACY
Mabel C. Young (in memory of Leo C. Young, Sr., W3WV)
Richard (W3PZW) and Mary Young
Eugene M. Zimmerman, W3ZZ
Foundation for Amateur Radio
ARRL Foundation

*General Manager, ARRL

54 QST

***It's back!* The first post-war HPM Memorial Award winner was announced 20 years ago, in the October 1984 issue of *QST*— 18-year-old Jon J. Willis, WDØAIT, of Littleton, Colorado.**

Oscar L. Short, W4YJ, ex-W9RSO

Of the pre-war HPM award winners, only one appears to be still living. Off the air for several years, Oscar Short, W4YJ (ex-W9RSO) now lives in Harrisonburg, Virginia. After receiving the award, Oscar continued his education and went to work first for the Department of Commerce and then for the War Department. His 40 WPM Morse code skill and knowledge of communications stood him in good stead with the War Department. From 1941 to 1980, Oscar worked for Westinghouse, beginning as an equipment tester and eventually rising into a management position in the company's electronics division. He credits Amateur Radio for getting him started on the path to career success.

Oscar enjoyed building his own ham radio equipment and was an avid contester and DXer. At one time he was close to the top of the post-war DXCC standings with 322 confirmed. In his long ham radio experience, he signed W9RSO, W3JNN, W3YJ, W8AC and finally W4YJ—*tnx Oscar Short via his daughter, Gwen Short-Munzer*

also given me a desire to contribute within the hobby by becoming active in club leadership, organizing activities, and helping other people make the most of their ham tickets." Brian is president of the Upper Rio FM Society, which has over 700 members and maintains a system of linked repeaters across the state of New Mexico.

Ben Schupack, NW7DX (2002), is a full-time student at Whitman College. "Amateur Radio has provided me insight into other cultures and other ways of thinking that not too many students my age have been exposed to." Although he's devoting most of his energy to his studies, when he has some free time Ben operates CW using his QRP transceiver and a portable HF antenna, working off a gel cell battery. He says, "Communicating with other stations on the air continues to bring me joy and satisfaction in my life."

Although she is no longer licensed, Stacey Garner Stump, ex-KA9WDE, has continued her education. She writes, "I am currently attending Graduate School at Minnesota State University-Mankato. After finishing high school, I became an EMT and then a paramedic. I decided to return to school in 2001 to earn my Bachelor's in Corrections and Psychology. I am now studying rehabilitation counseling."

Reaching Out to Other Young People

Winners of the HPM award have not kept the fun of Amateur Radio all to themselves. Zach, K1ZK, helped his younger brother and his girlfriend earn their licenses, and he started Amateur Radio clubs at both his high school and his college. His advice to young people? "Let Amateur Radio be your window into a fascinating, complex, and diverse world. After a hard day of work or studying, nothings beats coming home and trolling the bands for some rare DX!"

Brian, N5ZGT, helped the Valencia County ARA teach the Radio Merit Badge to 25 area Scouts and hosted a class to teach the badge to 15 Scouts in his own Troop 409. He also served as K2BSA staff at the 2001 National Scout Jamboree and has organized JOTA events in the Albuquerque area.

"Getting involved somehow is what creates most of the fun in ham radio," Brian says to young people. "Need ideas? Check out the *Youth@HamRadio.Fun* column on the ARRL Web site, now conducted by Andrea Hartlage, KG4IUM, winner of the 2003 Maxim Award."

Ben, NW7DX, advises young people getting started in ham radio to get on the air and make contacts. "This, however, is only one facet of Amateur Radio," he points out. "I know many people who are more into building and tinkering thanactually operating." Everyone has to find his or her own niche in Amateur Radio. Ben advises fellow young hams to join a local Amateur Radio club. "My first radio equipment was loaned to me by a member of my radio club," he says. "Club members make excellent resources for young radio amateurs."

The Message to the Rest of Us

Amateur Radio is a fellowship based on achievement, not on age. Young hams who challenge themselves, work hard and serve the public interest and the Amateur Radio family are accorded the same respect by other hams as equally hard-working amateurs who are many years older. For many children and teenagers, ham radio activity is the first time they have ever interacted with adults as peers. The respect young Amateurs earn from adult hams has a tremendous lasting effect on their self-confidence and sense of self-worth.

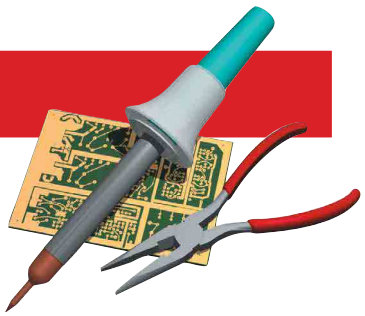
Young people have much to gain from Amateur Radio, but the reverse is certainly also true. "Youth involvement is essential to ham radio's survival," says Brian, N5ZGT. "This award has shown me that promoting to youth is fun and satisfying—and crucial for ham radio."

When he learned he would receive the HPM Award, Ben, NW7DX, says he "was pleased to know that young radio amateurs were getting recognized for their efforts, but I think that there are numerous other young radio amateurs still left unrecognized."

Ben is right when he says that there are many more young radio amateurs out there who deserve recognition and appreciation. Why not start now to identify some of these outstanding young hams in your community and gather supporting information for next year's round of Hiram Percy Maxim Memorial Award nominations? There are awards for young hams sponsored by organizations other than the ARRL, too. Or maybe your club or club council could start its own awards program for top-notch young hams.

What a great way to thank the next generation for doing their part to ensure that Amateur Radio will always be alive and thriving!

Kay Craigie, N3KN, is ARRL Second Vice President. Kay graduated from Georgia State College (now Georgia State University) in 1968 and then moved to Pennsylvania to earn a PhD from the University of Pennsylvania in Philadelphia. She taught at the University of Maryland for three years in the 1970s. Later, she taught part-time at Cabrini College in Pennsylvania and worked on the non-instructional staff at a local high school. First licensed in 1983, Kay soon became the editor of her home radio club's newsletter, a position she continues to hold. She's also a Volunteer Examiner with the club's VE team. In 1986, she became ARRL Section Manager for Eastern Pennsylvania, moving up to Atlantic Division Vice Director in 1990. Six years later, she became Atlantic Division Director, and in 2000, she was elected as a Vice President of the ARRL. You can reach the author at **n3kn@arrl.org**.



The Doctor is IN

QPaul, KI4CBT, asks: I use an ICOM IC-W32A handheld transceiver, mounted on a dashboard bracket with RG-58/U, going to an NMO antenna mount through a hole in the metal roof of my old friend, a beat-up station wagon. Since the coax shield is bonded to the roof metal of the car through the antenna mount, it results in a ground plane. On my newer car, I would like to use a magnet mount, to avoid the drilling. The magnet mount would make no direct electrical contact with the roof metal. Will I lose the ground plane benefits? Should I ground the antenna coax to the car so the coax shield is grounded? I believe I can do that at the dashboard.

AEven though the antenna isn't dc coupled to the roof of the car, there is still an RF connection and an effective counterpoise via capacitive coupling to the roof. The magnet mount and the car body provide enough capacitance, especially at VHF/UHF, to ensure a good RF ground. I don't see any benefit to grounding the coax to the dashboard. Such an antenna, however, could result in increased danger with respect to lightning, as it will provide a path inside the car (grounding to the dash won't help, as the lightning would already be inside the vehicle).

The lightning vulnerability depends a lot upon the design of the magnet mount used. Some mounts provide a relatively porous (electrically) membrane between the mount and the car body. This could offer a relatively easy path to ground for a high enough charge. Coax grounded to the metal chassis via a negative car battery terminal is generally ineffective for lightning—the path is too long and tortuous. On the other hand, with a properly installed NMO socket, lightning can arc from the center conductor to the ground rim—a relatively short distance. The object with lightning control is to bleed off an electrostatic charge *before* it results in the catastrophic discharge of a direct strike. The membrane between the mount and the car body would need to be able to pass that energy. A good idea would be to punch several holes (with a paper hole punch) in the plastic or vinyl membrane under the magnet mount. The idea is to make it easier for an arc to occur to the car body when that voltage reaches a flashover point and bypass the more dangerous path through the transmission line.

I suggest you look at some material on lightning protection at the ARRL TIS Web site: **www.arrl.org/tis/info/lightning.html**.

QMike, G3IZJ, writes: Some time in the last couple of years I saw a tip in *QST* on reducing the visual impact of 400 Ω ladder line, I have searched my *QST*s and cannot find it. But, as I gave away several copies, it's probably in one of those. This is a small island and our neighbors are rather nearer here than in the rather larger USA, so it's best not to get them excited!

AHints & Kinks of Jan 2002, p 68, "Stealthy Ladder Line," has what you're looking for. The author, K9SQG, cut rough holes in the line with "nail-slot-hole pliers" to reduce the uniformity of the line. He also used some spray paint (he cautions to avoid paints like ultra flat black, which use carbon black for pigmentation; a conductor) to aid the line camouflage. This results in a line that's hard to see from a reasonable distance. The modified line can be seen in Figure 1.

Figure 1—The "stealthy" ladder line on the right can be made by cutting the line with "nail-slot-hole pliers" used for punching oblong holes in aluminum and vinyl siding. The line is then sprayed with non-carbon pigment foliage colored paint.

QHere's a question from Ford, NØFP: I have what appears to be ignition noise on the lower HF bands in my pickup truck. It's a 2001 Toyota Tundra V8. The same engine is also used in various models of the Lexus. The noise has been isolated to the 8 "coil on plug" pods located on the top of each spark plug. The plugs were replaced with no change in noise. There's no distributor, no common coil and no high voltage plug wires. The identical noise heard on the radio can be heard using a small loop at the end of a piece of coax and "sniffing" around under the hood. All the common-mode grounding locations have been tested using jumpers and none were located. The noise sounds identical to that found when sniffing around the pods, so I'm convinced that that's where it's coming from. Traditional logic indicates that a shield needs to be constructed to contain the noise. But the wiring harness is huge—it's the size of my wrist with dozens of wires going in and out. Any advice for me?

AInternal combustion engine ignition systems are certainly changing! First, a little background information. The coil-on-plug (COP) systems came about for a variety of reasons. Manufacturers wanted to eliminate plug wires and the distributor, both a source of trouble on vehicle ignition systems. The COP system consists of a separate ignition coil for each spark plug, mounted directly above the plug. This keeps the high voltage (HV) coil leads as short as possible, avoiding wire deterioration and loss of spark energy. It also keeps the spark rise time extremely short. It's analogous to using a short transmission line from a transmitter to an antenna. Each coil is individually switched from a power train control module (PCM). The PCM takes its input from a variety of sensors but, in this case, the most significant is the crankshaft position or angle sensor (CAS). The CAS is driven from the crankshaft and determines the timing for the spark sequence. The PCM then outputs a low voltage primary pulse for each coil. Typical coil HV rise times are 12 µS, with a dwell time of about 0.85 mS at a coil voltage of about 35-40 kV.

The really neat thing about these systems is the short dwell time and the very short rise time. This ensures that the spark fires quickly and accurately for each cylinder. It also makes possible *multiple* coil firings in each firing sequence, especially

at low rpm and idle. Consider that, in a 6-cylinder engine turning at 3600 rpm, the dwell time per cylinder is about 2.8 mS. That means that, with this system, there's enough time for the spark *phase* to be varied over that interval and also for programmed multiple strikes, thus ensuring clean fuel burning and maximum power from the fuel mixture. The firing characteristics are also dependent on other inputs that the PCM receives. It's easy to see why they're popular on newer vehicles.

You need to determine conclusively whether your noise is solely *radiated* or partially *conducted*. Conducted noise will be present with the antenna disconnected, but with dc power coming from the vehicle's electrical system, not a secondary battery (like a handheld transceiver). If you hear the noise with the engine running and the antenna disconnected, a major portion of that noise is conducted. Because the coil wires are very short (or practically non-existent) and there is no distributor with these systems, the opportunity for radiated HV noise is considerably less and these systems should have lower radiated noise than conventional ignition systems.

On the surface, that seems not to be the case with your experience. The location of the COP modules in relation to other engine wiring could be a factor here, as well as possible suppression capacitor failure used at the coil primaries. Also, don't rule out the possibility of a defective COP module. Some of the COP module radiation could be coupling to other wiring and radiating or conducting it to the vehicle's electrical system. Some systems use one primary suppression capacitor for each bank of COP modules or, in the case of an 8-cylinder engine, 2 capacitors. It may be possible for you to put a capacitor at the input to each coil, rather than have one capacitor per coil bank. And, shielding may be easier than you think. Use some heavy-duty aluminum foil over the COP modules and try to ground these to the engine block. You can then determine whether shielding will be effective.

Check with your dealer—the service department may be aware of a service note addressing the EMI issue, if it turns out to be generic and not unique to your vehicle. This may take considerable research on your part and/or the dealer's part. Next, contact Toyota directly. Many manufacturers take ignition noise suppression seriously, as they must, in many cases, satisfy the demands of public safety radio agencies. I would not make hardware modifications (suppression capacitors) to the ignition system until I had exhausted all the other options. Finally, make sure you visit the ARRL Web sites pertaining to automotive interference: **www.arrl.org/tis/info/rficar.html** and **www.arrl.org/tis/info/rfiignit.html**.

Q From Don, KG4NLP, comes the following: I found the article in the Aug 2004 "The Doctor is IN" (p 54), which talked about oscilloscope monitoring of a transmitted signal, interesting. I would like to know where to get the FT-50-75 ferrite core for this project.

A The FT-50-75 core number refers to both the OD of the core and the ferrite mix used. The first number, "50," specifies a core with an OD of 0.5 inches and an ID of about 0.30 inches, large enough to pass the RG-8X coaxial cable, which is used as the line section. The second number, "75," specifies a ferrite mix of 75, which signifies a permeability (μ) of 5000. Note that the number specified in the Figure 2 caption refers to a core size only large enough to pass thinner coax (thanks to Phil, KE3FL, for pointing this out). To use the RG-8X cable specified, the FT-50-75 specified in the schematic and the text should be used.

You can get these from a number of different sources, including the following: Palomar Engineers, as a size F-50, type 75 (**www.palomar-engineers.com/Ferrite_Cores/ferrite_cores.html**); CWS ByteMark, as a type F-50-J (**www.cwsbytemark.com/prices/toroidal.php**); Ocean State Electronics, as a type FT50-75 (**www.oselectronics.com/ose_ p88.htm**) and Amidon Corporation, as an FT-50-75 (**www.amidoncorp.com**).

Q Sherman, KA6EOW, asks: What is a current balun and where would it be necessary to use one? Can you point me to any references about baluns?

A A current balun is designed to produce currents that are equal in magnitude and opposite in phase and transform a balanced load or source impedance to an unbalanced one. It would be necessary to use one when you have undesirable shield currents on the outside of a coaxial transmission line—when trying, for example, to couple a so-called "balanced" antenna to an unbalanced transmission line. Also, when coupling to an antenna that is unbalanced because of its surrounding environment, like a nearby structure, or when you need to transform a balanced impedance to an unbalanced one (like a 300 Ω balanced line or antenna to 75 Ω unbalanced coaxial cable).

Current baluns are generally preferable to voltage baluns (in antenna use) because the current balun acts like a constant current source, forcing equal *current* into both antenna halves, regardless of their impedance. A voltage balun will provide equal *voltage* to both antenna halves, but the current will be unequal if the impedances are different. If the SWR is very low and the antenna halves are truly balanced, the voltage balun will generally perform as well as the current balun. A balanced antenna, however, is never perfectly balanced unless it is in free space—its real environment will cause the opposite halves to be of slightly different impedance. And, it is desirable to have equal current flow in both halves of the antenna, regardless of that impedance unbalance. Most manufacturers of antenna baluns now offer current baluns. They are available in various impedance transformation ratios—usually from 1:1 to 4:1, but they can be obtained in ratios as high as 6:1 or 9:1.

There is an excellent article on antenna baluns in the Jan/Feb 2004 *QEX*, pp 55-58, "Why Do Baluns Burn Up?" W1VT points out that practical multiband baluns usually fall short of expectations, especially in situations of high SWR. The choking impedance is usually lower than that expected, so the current flow is excessive. If the SWR is low, however, the balun will behave properly (like in a well-designed triband beam). The last line of that article is worth noting: "Ferrite-core baluns should not be used haphazardly at high power levels." In other words, do not run high power with any balun under very high SWR conditions.

A couple of Web sites good for balun theory, design and practice are the following: **fermi.la.asu.edu/w9cf/articles/balun/** and **www.eznec.com/miscpage.htm**.

Q Ken, KE6ZWN, writes: Can you please give me a definition of *ground potential* and how it differs from real ground?

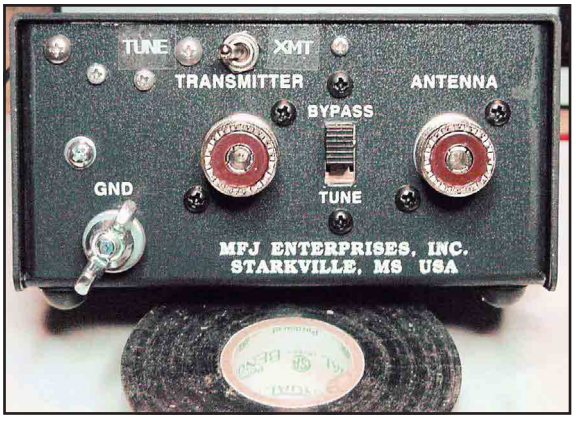
A *Ground potential*: *The zero reference level used to apply and measure voltages in a system. Note: A potential difference may exist between this reference level and the ground potential of the Earth, which varies with locality, soil conditions, and meteorological phenomena.* In other words, ground potential is the voltage at the negative terminal of your voltmeter, which is often different from the voltage present at "real ground." The zero reference level referred to above might be a considerable distance from the real ground reference level. The impedance of the path multiplied by the current in that path will equal the voltage difference between "real" ground and the system ground potential level.

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; www.arrl.org/tis/.

By Phil Salas, AD5X

An SWR Indicator for the MFJ-902 Antenna Tuner

The Wheatstone bridge gets pressed into service to make a compact tuner even more versatile.



The MFJ-902 is a compact travel antenna tuner that handles transmitter power up to 150 W from 80 through 10 meters. It includes a bypass switch on the back panel so you can take it off-line when your antenna system doesn't require tuning.

Although the MFJ-902 does not include an SWR indicator, most rigs include this capability as a display option. I prefer the SWR indicator to be part of the antenna tuner, however, as I normally monitor output power and don't like to make menu changes during tune-up. MFJ has recently released the MFJ-904, which includes an SWR meter, but this tuner is larger due to the meter and metering circuit. (The MFJ-904 is 7.25 inches wide, while the MFJ-902 is only 4.5 inches.) I wanted the small size of the MFJ-902 with an SWR indicator included.

The SWR Indicator

There are many circuits for SWR metering, but the absorptive SWR circuit is a simple resistive 50 Ω bridge (Figure 1). This deceptively simple circuit protects the transmitter from high SWR conditions while tuning, since the worst SWR it can see is 2:1. A disadvantage is the space required for resistors capable of dissipating up to 75% of the tune-up power.

I use three different portable rigs—an IC-706MKIIG, FT-817 and SG-2020—so adjusting output power during tuning is inconvenient. I normally run the FT-817 at 5 W on battery power and the SG-2020 at 20 W output power. I key the IC-706MKIIG with a switch connected to the TUNER connector so the output is 10 W when this external tune switch is engaged. My upper power limit is 20 W and my lower power limit is 5 W. The resistors must absorb up to 15 W in the resistor network. These power levels set the limits for SWR indication using an LED indicator. Red ultra-bright LEDs are readily available and make great SWR indicators (tuning until the LED goes out).

Resistor R4 is 10 kΩ, but you may want to reduce this value if the LED is not bright enough for you. The highest voltage illuminating the LED occurs when the load is an open circuit and it's also a function of your transmit power. The LED circuit sees half of the peak voltage from the transmitter into 100 Ω (the worst case). There is also about a 3 V drop due to the 1N4148 rectifier (0.7 V) and the LED (2 V). The current through this LED can be calculated as follows:

$$I = [\ 1.414\ (Pt \times 100/2)^{1/2} - 3)\ ] / R4$$

where

I = LED current

Pt = transmitter power when tuning

R4 = value of R4 (Ω)

I originally used a 4.7 kΩ resistor, which gave 8 mA of LED current, but I found this to be too bright—even at 5 W. By doubling the resistor value to 10 kΩ, the LED brightness works well for different power levels (20 W maximum). Depending on the LED and transmit power used for tuning, you may wish to lower the value of this resistor.

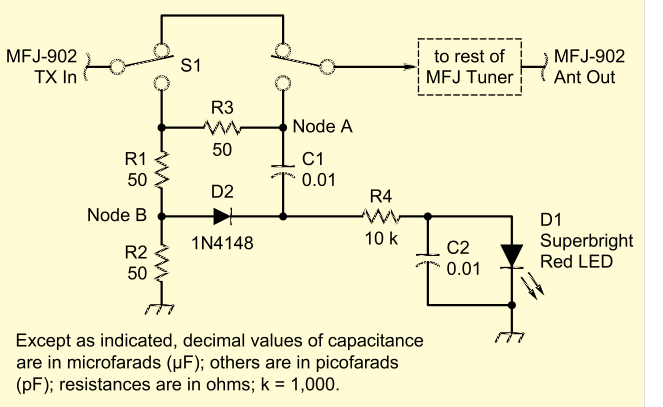


Figure 1—The absorptive SWR indicator schematic.

C1, C2—0.01 µF capacitor (Mouser 75-5HKSS10).
D1—Superbright LED (AllElectronics LED-94).
D2—1N4148 diode (RadioShack 276-1122).
R1, R2, R3—50 Ω, 15 W resistor (Mouser 684-MP915-50).
R4—10 kΩ, ¼ W resistor (AllElectronics 10K).
S1—DPDT toggle switch (Mouser 108-1MD1T2B3M1QE).

Misc

Terminal strip (RadioShack 274-688).
Heat sink grease (RadioShack 276-1372).
#2 screws (RadioShack 64-3010).
#2 nuts (RadioShack 64-3017).

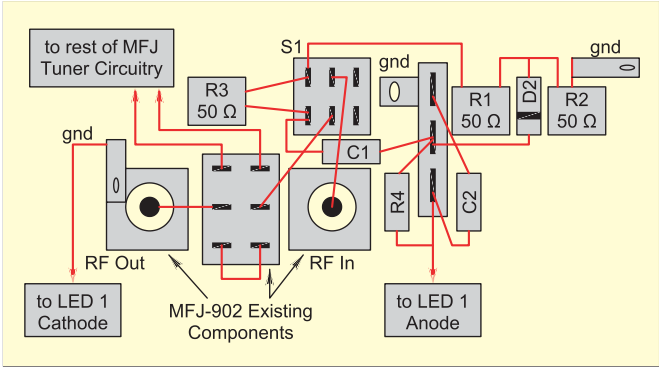


Figure 2—Component placement and layout diagram for the SWR circuit.

Handling the Heat

Finding resistors capable of dissipating 15 W that fit inside the MFJ-902 case was a challenge. Mouser Electronics (**www.mouser.com**) supplies power film resistors made by Caddock rated 15 to 100 W, depending on the resistor type. These noninductive power resistors provide an excellent resistive load across the HF band. I used the 50 Ω, 15 W resistors in a TO-126 package. These are small, so proper heat-sinking is required to dissipate heat at rated power.

If you want more power dissipation, there are 30 and 60 W versions in a TO-220 package and a 100 W version in a TO-247 package. There is limited room inside the MFJ-902 and the smaller 15 W, TO-126 package is more appropriate for this application. If you want to drive 100 W into this circuit, expect some serious heat—something not practical in the MFJ-902 without more separation of the resistors as well as external heat-sinking.

Figure 3—Component placement and wiring for the SWR circuit in the MFJ-902.

Figure 4—The modified front panel of the MFJ-902.

Adding the Bridge to the MFJ-902

Refer to Figures 2 through 5 to help place the new parts. The RadioShack terminal strips have five lugs. Clip off the lugs on one side of the ground/support lug, leaving three lugs (including the ground lug). The new toggle switch should mount just above the TX coaxial connector as shown. The 50 Ω, 15 W resistors must be mounted using #2 hardware. Apply a dab of the heat sink grease to the bottom of each resistor to ensure a good thermal path to the cabinet. Add a ground connection to the right of the right-most 50 Ω resistor as shown. Be sure to keep all components clear of the variable capacitor so there is no interference when it is rotated. A slide switch, with lower profile, may be substituted instead of the toggle switch, but I find it easier to drill a round hole than a rectangular hole. With a little care, the parts can be mounted comfortably clear of the rotating variable capacitor.

The SWR indication LED is mounted on the upper left corner of the front panel, as can be seen in Figures 5 and 6. Run the LED wires under the left variable capacitor and hold them to the bottom of the cabinet with a blob of hot-melt glue. Hot-melt glue can also hold the LED in place. I used a Casio labeler with "white on clear" tape to mark the switch positions on the back panel. For that real homebrew look, use Dymo labels.

Operation

To operate the modified MFJ-902, flip the new toggle switch to TUNE and adjust the tuner until the front LED SWR indicator goes out. This is surprisingly easy to do—as easy as using an analog meter. When the SWR is good, flip the toggle switch to XMT and you're in business! The case will get noticeably warm after about 30 seconds of tuning with a transmitter output of 20 W, so limit your tune time as necessary.

Momentary high SWR incidents that occur with switched inductor tuners have always been a worry. I've tended to unkey

Figure 5—The LED attachment with hot-melt glue on the front panel (viewed from inside).

The Wheatstone Bridge

Sir Charles Fothergill Wheatstone (1802-1875) is credited with inventing the concertina, needle telegraph and stereoscope just to mention a few. But the greatest invention associated with his name, the Wheatstone bridge, wasn't his creation. Samuel Hunter Christie (whose father, James, started the famous auction house) conceived and published the circuit in 1833. Wheatstone discovered and promoted many uses for the bridge and always gave credit to Christie. Notwithstanding, the bridge and Wheatstone have been inseparable.

The Wheatstone bridge is simply two voltage dividers in parallel. R1 and R2 make up one divider while R3 and R5 comprise the other. In the absorptive SWR application, R1, R2 and R3 are 50 Ω. R5 represents the antenna load. If the antenna load is exactly 50 Ω, a perfectly matched load and 1:1 SWR, no current will flow through the dividers—node A to node B—since they are at the same voltage.

If the antenna (load) is a dead short, the source input will see R3 in parallel with R1+R2 or 33.3 Ω (1.5:1 SWR). If the load is open circuit, the source sees two 50 Ω resistors in series (R1 and R2) or 100 Ω (2:1 SWR). Since these are the worst case conditions, the source (transmitter) will never see SWR worse than 2:1.

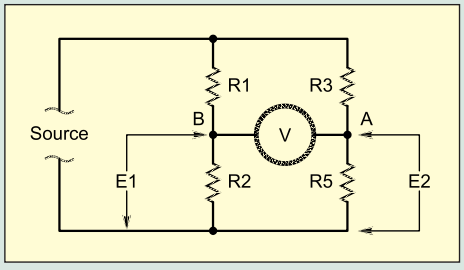


Figure A—The versatile Wheatstone bridge, a circuit that was invented in 1833.

Since current flows between the two dividers when the load (R5) is 50 Ω, the bridge is said to be "balanced." If the load (R5) is anything other than 50 Ω, the bridge is "unbalanced," node A and node B will be at different voltages and current will flow. The SWR indication is accomplished by placing a half-wave peak detector (the 1N4148 in Phil's circuit) across nodes A and B. The output of the peak detector drives the LED. If the LED is lit, a large unbalanced condition is present—that is, the load is not 50 Ω and the SWR is high. If the LED is not lit, the load must be close to 50 Ω, the bridge is close to balanced and SWR must be near 1:1

At low power levels (less than 2.5 W), the voltage difference between nodes A and B will not be sufficient to overcome the forward voltage of the diodes in the detector circuit. This causes a false indication of acceptable SWR (that is, the LED stays extinguished even for SWR near 2:1). Some QRP applications of this circuit have used an active comparator to overcome this deficiency.

The Wheatstone bridge works equally well with ac or dc stimulus. Its versatility, simplicity and sensitivity contribute to its widespread use today—more than 150 years since its inception.—*John Ceccherelli, N2XE*

the transmitter before making inductance changes. With the absorptive bridge in the modified MFJ-902, this is not a concern.

SWR measurements (tuner bypassed and into a true 50 Ω load) with and without the new circuitry show no difference across the HF spectrum. The added lead length and circuitry have no noticeable effect on the bypassed tuner performance.

Conclusion

For those, like me, who prefer to have SWR metering built into their antenna tuner, the absorptive SWR indicator is easy to add to the MFJ-902 and also protects the transmitter during tuning. These changes to the MFJ-902 make a small, flexible antenna tuner more versatile.

Photos by the author.

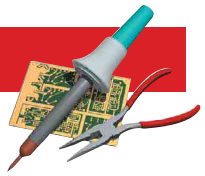
Phil Salas, AD5X, enjoys operating portable HF. He is an ARRL Life Member and has been a ham for 40 years. Phil holds BSEE and MSEE degrees in Electrical Engineering from Virginia Tech and Southern Methodist University, respectively, and is currently Vice President of Engineering at Celion Networks in Richardson, Texas. Phil may be contacted at **ad5x@arrl.net**.

NEW PRODUCTS

DIGITAL SOUND CARD INTERFACE FROM ILINKBOARDS.COM

◊ ILINKBOARDS.COM has announced the release of the AMI-2 all-mode interface. The AMI-2 is designed to work on most digital sound card modes. It was specifically designed for VoIP operation such as via *Echolink* and *EQSO* and has an on-board DTMF decoder to provide control of the link. In addition, it supports SSTV, PSK31 and RTTY. The AMI-2 has LED indicators on the front panel that visually confirm the status of your link and interface state. Audio sound levels from the sound card and radio can be adjusted from the front panel of the AMI-2. There is an AUX audio input that accepts a signal from a second receiver. This input is used for security purposes in VoIP applications and is active when the link is transmitting.

Included are user programmable functions that can be changed via a HyperTerminal. The user will be able to modify the timeout timer, carrier operated squelch levels and switch between RTS and DTR control. The AMI-2 price is $89 plus shipping. Order online at **www.ilinkboards.com** or call 609-771-8070.



CW DecoderXP

The problem with software CW decoders is that they fall short when compared to the amazing capacity of the human brain. That's because computers do not cope well with uncertainty. In the digital world, something either is or is not—nothing in between. If CW is perfectly sent, and signal conditions are adequate, almost any software decoder will work. The computer simply detects the on/off signal states, measures the time intervals of the signals and the silence between, then translates the results to text that you can read on your monitor.

Problems arise when too many variables creep into the mix. Maybe the operator lingers just a fraction of a second too long on a *dah* or *dit*, or doesn't wait long enough between words. Perhaps a character becomes muddled in a burst of noise, or a deep fade substantially weakens the signal. Our analog minds cope with all of this easily, but the computer draws a blank (sometimes literally).

To help improve the computer's ability to decode CW, several attempts have been made to make the software adaptable. With clever coding, the software can track changes in the signal with the goal of making better sense of what is being sent. The most recent step in this evolutionary process is *CW DecoderXP* by Grant Connell, WD6CNF.

Installation

CW DecoderXP is a free application for *Windows XP* that will run on any sound-card-equipped Pentium-class PC. You simply download the software from the WD6CNF Web site (**www.hotamateurprograms.com**). The 2-Mbyte file is in compressed ZIP format, so you must first unzip it to a folder, then run **Setup** to install the software.

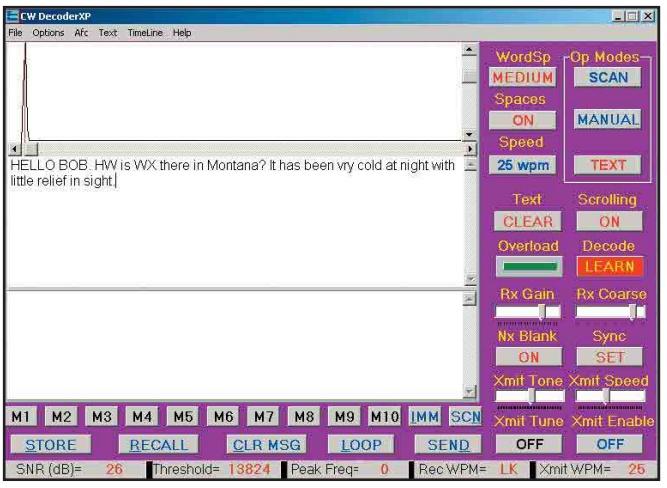
CW DecoderXP not only receives CW, it transmits as well. If you are only interested in receiving, all you need is an audio cable between your radio and the input of your computer sound card. To transmit, the PC needs to be able to key your transceiver, which it can do from either the serial (COM) or printer (LPT) ports. You'll need to purchase a sound card interface (such as those offered by MFJ, Tigertronics or West Mountain Radio), or you can build your own from a 2N2222 transistor and a couple of diodes.

Software that Learns

CW DecoderXP is simple to use, despite all of the button selections on the display. You tune the signal until the audio peaks are visible in the upper window. Then, just mouse click on the signal and away you go. The decoded text appears in the middle window.

CW DecoderXP gives you several variables to play with, which is a good thing considering all the variable fists you are likely to encounter. For instance, you can select between short, medium and long spacing between characters. My experience showed that this was one of the biggest obstacles to coherent text. It is a manifestation of that frustrating human tendency to change the way we do things—a pause might last a half second at one moment, then a quarter second later. *CW DecoderXP* tries to make sense of this, but words and letters still end up being jammed together. Unless the person you are copying is a near-perfect sender, you have to do a fair amount of text interpretation.

What makes the *CW DecoderXP* particularly interesting is its ability to "learn" the sending pattern of the other operator.



When *CW DecoderXP* begins, it analyzes the signal and attempts to decipher the unique "fist" of the operator. It listens to variations in the timing of *dits* and *dahs* and compares this to CW as it *should* be sent. Based on the results, the *CW DecoderXP* makes its best guess of the other operator's intent.

CW DecoderXP is on target to a remarkable degree—more so than I've seen with any similar software. If the sender suddenly changes his pattern, *CW DecoderXP* will jump back into the learning mode (a button on the display flashes "LEARN").

CW DecoderXP attempts to track the received CW speed and displays the result along the lower edge of its window (along with the audio frequency of the received signal and the signal-to-noise ratio). *CW DecoderXP* can receive to a maximum of 50 WPM.

I'd be remiss if I didn't discuss *CW DecoderXP's* transmit capability. There are two transmit modes. In the instant mode, anything you type in the lower window is instantly transmitted. Alternatively, you can type in your voluminous response, then click SEND to send it all when you are ready. *CW DecoderXP* provides 10 macros for stored messages (such as CQs), and the ability to "loop" transmissions, sending the same text over and over. Another nice feature is the ability to synchronize your transmit speed to the received speed with a click of the mouse.

Finally, *CW DecoderXP* includes an audio spectrum analyzer capability. This is particularly useful when you are examining signals, or hunting noise and interference sources. Clicking on SCAN activates it instantly.

Performance

CW DecoderXP is not a panacea for copying human-sent CW. It won't render a sloppy fist into perfect text. Having said that, it is still one of the best CW decoders I've seen in a while. I'd put it on about the same level as the popular *CWGet* software, and definitely a cut above many others. Even in poor conditions, *CW DecoderXP* was able to make at least partial sense out of what was being sent. It would occasionally jump into the LEARN mode when an operator decided to shift his style a bit, but that is the strength of this software. *CW DecoderXP* attempts to adapt to our analog world, and in doing so, it does a reasonable job of interpreting the Morse music. QST

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

Experiment #21: The L-Network

This month's experiment moves away from the world of transistors and ICs to visit one of radio's most fundamental designs, the L-network. This building block is the foundation of numerous common impedance matching circuits; the Pi-network—found in amplifiers and the T-network—popular in transmatches. Are its inner workings the black magic of mystical RF designers? Hardly. Read on and find out for yourself!

Terms to Learn

Equivalent series (parallel) circuits—a circuit whose series (parallel) components provide the same impedance at its terminals as the original circuit.

Transformation ratio—the ratio between the input and output impedances of a matching network.

Background

Although radio designers have long used 50 Ω as the standard "system impedance" for antennas and equipment, it seems that hardly any circuits offer 50 Ω impedances without coaxing. Many antennas have a natural impedance far from 50 Ω. What's a ham to do? If you look at the impedance matching equipment and circuits, nearly all have the L-network as part of their pedigree.

The L-network is based on a technique known as *series-parallel transformations*. For any series combination of resistance, R_S, and reactance, X_S, there is a parallel combination of R_P and X_P that looks exactly the same to the voltage applied across the series combination. The same can be said in reverse.

Converting from the series form to the parallel form is governed by the following set of simple equations:

$$Q = X_S/R_S = R_P/X_P = \sqrt{(R_P/R_S) - 1} \quad [1]$$

$$R_P = R_S\,(Q^2 + 1) \text{ and } R_S = R_P / (Q^2 + 1) \quad [2]$$

$$X_S = QR_S \text{ and } X_P = R_P / Q \quad [3]$$

Depending on which of the variables Q, X_S, R_S, X_S, and R_P that you know, you can solve for the rest. R_P must be greater than R_S. Note that the larger the *transformation ratio* between R_P and R_S, the larger Q becomes. As Q becomes larger, the values of X_S and X_P become more extreme.

The general process of designing an L-network takes four steps:

1) Assign the larger impedance to be transformed to R_P.

2) Determine Q and calculate X_P. X_P is a physical component in parallel with R_P.

3) R_S is already known, so calculate X_S to determine the series equivalent circuit.

4) Add a physical component with $-X_S$ in series with the parallel combination of R_P and X_P.

The orientation of the network—whether the parallel component is at the input or output—depends on whether the input or output impedance is greater. Remember that since reactance is frequency dependent, the L-network will match the two impedances only at one frequency.

The "big trick" is to realize that you can treat a circuit as its electrical equivalent with no change in the electrical outcome. After X_P has been added in parallel with R_P, the impedance of the combination has the correct resistive component, but also has reactance that must be cancelled. It is much easier to figure out what the necessary canceling reactance is if the parallel combination is treated as its series equivalent. The canceling reactance is just equal and opposite the equivalent series reactance.

This is much easier to understand as an example. Let's transform the 50 Ω resistive impedance of matched coaxial cable so that it looks like 10 Ω of resistance to match the collector impedance of a transistor amplifier as shown in Figure 1. Assign the coax impedance to R_P and the collector impedance to R_S. From equation 1, $Q = \sqrt{(50/10) - 1} = 2$ and from equation 3, $X_P = 50/2 = 25$ Ω. Now use Eq [3] to find $X_S = 2 \times 10 = 20$ Ω.

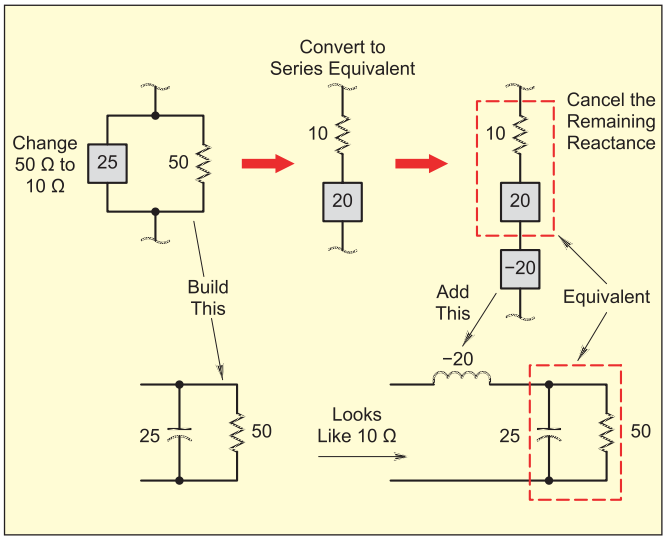


Figure 1—The step-by-step process of designing an L-network by using parallel-series transformations and equivalent circuits.

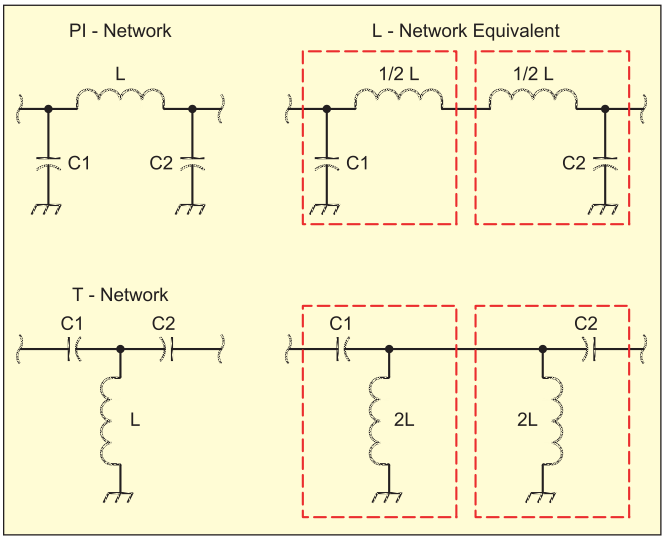


Figure 2—The T-network and Pi-network are easier to understand as a pair of back-to-back L-networks.

H. Ward Silver, NØAX ♦ 22916 107th Ave SW, Vashon, WA 98070 ♦ n0ax@arrl.org

Since we want just the 10 Ω of resistance, we must cancel the remaining reactance by adding 20 Ω of the opposite type of reactance in series. This leaves us with only the effective resistance of 10 Ω.

We never did say whether the parallel reactance was inductive or capacitive. The problem is solved either way. However, depending on frequency, the reactance values may be more practical as inductance or capacitance. If the frequency is 28 MHz, for example, the parallel reactance could be either a 0.14 µH inductor or a 227 pF capacitor. Clearly, the capacitor would be a more practical choice to connect between an amplifier output and ground. Thus, the canceling inductance would be 0.32 µH.

What if we were matching the "other" way, from 50 Ω to a higher impedance? In that case, R_p is assigned to the higher impedance and the problem is worked out by the same procedure. The component added in parallel is always next to the higher impedance.

Now that you recognize what the L-network can do, look closely at the Pi and T-networks in Figure 2. Each is just a pair of L-networks back to back. Why are those circuits used rather than just L-networks? The T-network can match a wider range of impedances than an L-network, including impedances that are both higher and lower than the input impedance. The Pi-network uses the two-step transformation of back-to-back networks to provide low-pass filtering for harmonics and to manage the overall Q of the network. Yet both are based on the simple L-network.

Design and Build an L-Network

This experiment assumes that you have an SWR analyzer, such as the MFJ-259, or a similar instrument. You can also use a low power (QRP) transmitter and an SWR bridge. Don't try this with more than a few watts unless you use heavy-duty components that can handle the power level. Use silver-mica, ceramic or air variable capacitors to avoid the parasitic effects of the inductance in other types of capacitors.

Experiment #1

A quarter-wave vertical over a good ground plane has an impedance of about 30 Ω at its resonant frequency. Construct an L-network to match the vertical's impedance (simulated by a 27 Ω resistor) to 50 Ω.

Experiment #2

A loop antenna has an impedance of around 150 Ω. Construct an L-network to match the loop's impedance to 50 Ω.

- Construct a load that simulates the impedance you're trying to match to 50 Ω. If you are using an SWR analyzer, a single resistor will suffice. If you are using a small transmitter, be sure the load is rated to take full transmitter power continuously. For example, 5-150 Ω, 1 W resistors will make a 30 Ω, 5 W load. Use non-inductive carbon composition or metal oxide resistors.
- Using a frequency of 28 MHz, determine the physical component values that have the calculated reactances. Remember that you can start with either a capacitor or an inductor. Use the one easiest to fabricate or obtain.
- Use the closest fixed-value capacitors to your calculated values, add capacitors in parallel (or series), use an air-variable or place an air-variable in parallel with a fixed value capacitor. The air variables allow you to tune for best match.
- Use fixed-value inductors only if you are using the low-power analyzer. Wind the inductors from hookup wire according to the following formula or Figure 6.40 in *The ARRL Handbook* for $^1/_2$ inch or $^3/_4$ inch diameter coils. The on-line calculator at **hawkins.pair.com/radiocalcs.shtml** is also useful.

Figure 3—An SO-239 acts as a good prototyping platform for working with L-networks. An RF analyzer is shown and is convenient, although a low power transmitter and an SWR bridge will work.

$$N = \sqrt{L(18\ d + 40\ l)} / d \qquad [4]$$

An SO-239 connector makes a good prototyping board for this experiment. Your regular prototype plug-in board won't work well at this frequency.

Follow the four-step procedure presented earlier to calculate your component values. Start by connecting your load resistor directly across the SO-239 to confirm that it is really presenting the expected load to the analyzer: an SWR of 1.7:1 for the 27 Ω load and 3:1 for the 150 Ω load. As shown in Figure 3, connect the SO-239 directly at the analyzer or bridge to avoid the effects of a transmission line on the impedance. Add the L-network between the load and the analyzer.

If you used an adjustable capacitor, tweak the network for optimum SWR. For a perfect match, the resistance will be 50 Ω and the reactance will be 0 Ω. You can stretch (raise) or compress (lower) the coil inductance for the same effect. I had to stretch my coil by about 10 percent. If you don't get a match and you are sure of your connections, double-check your calculations or try an on-line calculator such as **home.sandiego.edu/~ekim/e194rfs01/jwmatcher/matcher2.html**.

Suggested Reading

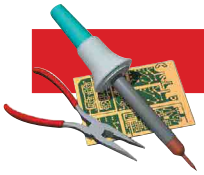
The ARRL Antenna Book, 20th Edition, covers the use of L-networks in chapter 25, along with Pi and T-networks. Another good reference that covers impedance matching networks in detail is Walt Maxwell's *Reflections II*, published by Worldradio, although this edition is currently out of print. This is an excellent text that explains transmission line concepts in an easy-to-read style.

Shopping List

- 27 Ω and 150 Ω non-inductive resistors.
- 20 or 22 gauge hookup wire.
- An SO-239 connector and a UHF double-male PL-259/PL-259 adapter.
- Fixed-value or air-variable capacitors in the 50 to 200 pF range.

Next Month

Let's stay in impedance land next month and learn how to make a harmonic filter out of one of those mysterious transmission line stubs. Hang onto that SWR analyzer! QST



By Steve Ford, WB8IMY

Strange Noises in Your Radio

Between the voices and the Morse, mysteries abound!

Spin your transceiver through the amateur bands and you're bound to hear some unusual things. Outside of the typical CW or phone conversation, you may stumble across signals that can best be described as "odd." Chances are, what you are hearing are various flavors of digital communication—or signals from alien civilizations offering you outrageous mortgage rates, in which case you've been up too late and it is time to go to bed.

The evolution of computer sound systems has made it astonishingly easy to dip your toe into the water of amateur digital communication. The computer sound card (or chip) does all the work of translating audio tones to data, and vice versa. You just need to get the audio to and from your radio. There are sound card interfaces from the likes of MFJ, TigerTronics, West Mountain Radio and others that do this job nicely. These little boxes can be very affordable—skip a couple of family meals at the local fast-food joint and you're all set. The software to try these various modes is often free on the Web.

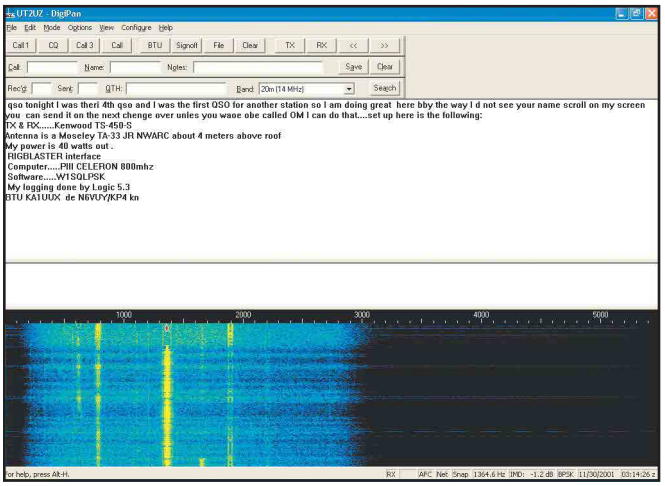
There are probably more Amateur Radio digital modes (and software) than Baskin-Robbins has ice cream, but there are a few you can explore easily…

PSK31: This is current king of HF digital. Tune around 14.070 MHz and you'll hear the warblings of PSK31 chats in progress. The attraction of PSK31 is excellent performance at low power levels and very narrow bandwidths. Grab the free *DigiPan* software for *Windows* at **www.digipan.net** and check it out.

RTTY: The grand old man—almost 60 years in the amateur service and still going strong. Listen for the pulsating *dee-dee-dee-dee* of RTTY between 14.080 and 14.100 MHz. This mode is still the most popular for HF digital DXing and contesting. In fact, one of the big RTTY contests, CQ World Wide, starts September 25 at 0000 UTC. Download *MMTTY* for *Windows* at **www.qsl.net/mmhamsoft/mmtty/** and watch the action—or better yet, participate!

MFSK16: You can't mistake this one—just listen for something that sounds like a carnival calliope, particularly in the vicinity of 14.080 MHz. MFSK16 does a remarkable job of punching through poor band conditions. You'll find free MFSK16 *Windows* software by Nino Porcino, IZ8BLY, at **iz8bly.sysonline.it/Stream/index.htm**. If Nino's Web site is off-line, as it is occasionally, wait a few days and try again. Alternatively, download *MultiPSK* at **members.aol.com/f6cte/index.htm**.

PACTOR: No, you're not hearing electronic crickets. That *chirp-buzz-chirp-chirp* is the sound of PACTOR in one of its three forms: I, II or III. What you are hearing are two stations sending signals back and forth. It is a digital waltz that assures error-free communication. At present, there is no sound card software that allows you to send and receive PACTOR. Instead, you need an external box known as a *multimode controller*. MFJ Enterprises, Timewave and Kantronics make controllers that include PACTOR I, but for PACTOR II and III you will have to buy controllers manufactured by SCS Corporation (**www.scs-ptc.com/**).



DigiPan **sound card software receiving PSK31. Each yellow line is a PSK31 conversation in progress.**

Packet: Contrary to rumor, packet radio is not dead. It is very much alive on VHF, especially in the Automatic Position Reporting System (APRS). Listen to 144.39 MHz (FM) for the sporadic buzzing of packet. If you hear signals, download the *AGW Packet Engine* for *Windows* (**www.elcom.gr/sv2agw/inst.htm**) and APRS shareware such as *UI-View* (**www.ui-view.com/**) and see what you've been missing. There is packet on HF, too. The Network 105 group has been enjoying live packet chats on 14.105 MHz for years (**ka1fsb.home.att.net/net105.html**) and you'll find HF APRS at 10.151 MHz (LSB).

Is That All?

Not hardly. Tune around some more and you may discover signals from modes such as MT-63, Q15X25, Domino, Throb and others. Look for these between 14.100 and 14.110 MHz, especially on weekends.

There is a limit to how much I can say in a single-page article, so the League has graciously allowed me to babble *ad nauseum* about HF digital in my book, *ARRL's HF Digital Handbook* (no, I don't earn royalties from the sales!). Stan Horzepa, WA1LOU, is our point man for APRS and I highly recommend his new book *APRS: Moving Hams on Radio and the Internet*.

Although I didn't mention Amateur Radio digital software for *Linux*, it is available. For example, try *LinPSK* for PSK31 and RTTY at **linpsk.sourceforge.net**. Mac users will find the *Multimode* software from Black Cat Systems at **www.blackcatsystems.com/software/multimode.html**.

There is much more that you can do with your computer beyond sending e-mail and keeping a station log. Grab some digital communication software and try a new way of hamming!

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

Wi-Sys 7110 Location Broadcast Beacon

Even if you are a newcomer to Amateur Radio, you've probably seen the acronym *APRS* in various ham publications. APRS stands for the Automatic Position Reporting System, a digital packet-radio network devoted to several activities, the most popular being the tracking of moving objects.

To track an object in motion, such as an automobile, you need a Global Positioning System (GPS) receiver onboard to provide a constant stream of data pinpointing the position of the car. You need a 2-meter FM transmitter (usually set to 144.39 MHz) to send the position information to all the monitoring stations. Their APRS software displays icons on computer-generated maps to indicate the location of the car.

A final piece of hardware ties it all together. This is a device that takes the data from the GPS receiver, encodes it into APRS data packets, then translates the packets into audio tones that can be sent over the air. There are several devices available on the ham market to perform this nifty trick, the most recent entry being the Wi-Sys 7110 Location Broadcast Beacon.

Versatility Plus

What makes the 7110 unique is the fact that it incorporates its own GPS receiver with a remote antenna, combining two separate elements of an APRS tracking setup into one. The 7110 is compact (about the size of a small paperback book) and light. The little unit is quite versatile with a number of functions for just about any application.

The 7110 package includes a CD-ROM for *Windows*. This disk contains the programming software that you'll need to set it up. After you've installed the configuration software, you connect your computer to the 7110 via a serial cable (there is a 9-pin serial port on the front of the 7110). You can configure the 7110 to function as a beacon, sending messages on a set schedule, or a tracker that sends data after the passage of a certain time interval, distance or change in direction. You can even configure the 7110 to send messages when a specific event takes place. For instance, you can set the 7110 to send a message when the voltage on an input pin reaches a certain level, which could be caused by a rise in temperature.

Using the configuration software, you can create up to six "presets" that can be chosen by pressing a button on the front of the unit. You might set Preset A to enable the 7110 to act as a tracking unit, Preset B to have the 7110 function as a event monitor and so on. Within each preset you can also set up the path for relaying your transmissions. If you program your presets carefully, chances are you'll rarely have to resort to using a computer to change the behavior of the 7110 in the future.

Installing the 7110

For this review I used the Wi-Sys 7110 with my ICOM IC-2000 FM mobile transceiver. Before you can hook up the 7110 to your radio, you need to open the unit and configure the internal switch and jumpers to match the microphone audio, push-to-talk and other signal lines going into the transceiver's microphone jack. The 7110 manual attempts to explain the process, but I still found it somewhat vague. I needed about 30 minutes of trial-and-error experimenting to get everything working properly.

The 7110 uses RJ45 network connectors for both the microphone input and output. Alternatively, you can interface to your radio using the 6 pin DIN connector. The interface cable is available as an option. Since the IC-2000 also uses the RJ45, it was a simple matter to connect a short cable between the 7110 and the microphone jack on the IC-2000. My IC-2000 microphone plugged right into the 7110 front panel.

The GPS antenna has a magnetic base and about 8 feet of cable. I simply attached the antenna to my car roof and attached the other end of the cable to the 7110.

The 7110 is powered by 12 Vdc, which in my case was supplied by a cigarette lighter plug and cable that comes with the 7110.

The final connection was an audio cable between my IC-2000 external speaker jack and the audio input jack on the rear of the 7110. The 7110 is more than a "dumb beacon." In fact, in the latest version of the unit, the 7110 is capable of functioning as a full-fledged packet radio terminal node controller (TNC). For APRS, this means that the 7110 "listens" to make sure that the frequency is clear before it sends a message. That's a valuable feature since mindless "deaf beaconing" can potentially clog an active frequency.

On the Road

I powered up my 7110 and waited a few seconds for the GPS receiver to obtain a lock. It indicates this by lighting an LED on the front panel. I toggled my tracking preset and headed down the highway. Every couple of miles the 7110 keyed my transceiver and sent a packet with my position information. At home, my family watched in amazement as they followed my car icon on the computer-generated APRS map while I cruised around town.

When it was time to do some old-fashioned voice work, I pressed the front-panel button and entered the voice mode. Now my microphone was patched directly to my radio and the receive audio was passed to the speaker inside the 7110. Pretty clever!

The 7110 also supports the MIC-E APRS mode. This allows the 7110 to tag your voice transmissions with bursts of data.

The Wi-Sys 7110 is a bit pricey, but keep in mind that you won't have to pay for a GPS receiver since it is included in the 7110. You are also getting a remarkably versatile device, more sophisticated than just about anything else available to hams.

Manufacturer: Wi-Sys, 308 Legget Dr, Ottawa, ON K2K 1Y6, Canada; tel 613-254-7386; **www.wi-sys.com**. $355.

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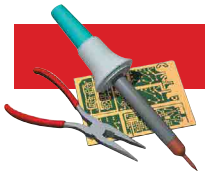

HINTS & KINKS

KENWOOD TS-850(S) BATTERY REPLACEMENT

◊ After purchasing a used Kenwood TS-850SAT and reading on-line comments about the rig, I decided to replace the rig's memory back-up battery.[1] The battery hadn't leaked (as it had for some '850 owners), but I wasn't going to wait until something went awry and I wound up with more than a battery replacement on my hands—such as damaged PC-board traces.

At first I thought I was lucky: It appeared that the battery in my TS-850 was in a coin-cell holder and I'd be able to simply slip it out of the holder. To my dismay, I discovered that the holder is spot-welded to the battery, so the battery/holder combination must be unsoldered from the Digital PC board (X46-3080). This requires removal of the top and bottom covers, the front panel and at least partial removal of the Digital PC board to gain access to the board bottom.

Although you can purchase direct-replacement batteries with welded-on holders, when it comes time to replace the battery again, you must resort to the same procedure described earlier.[2] Considering the difficulty, doing that once in a lifetime is enough for me! I wanted to simply be able to snap out the old battery and insert a new one without the unsoldering/soldering hassle. Standard CR-2430 coin cells (without the welded-on tabs) are available from several distributors (see Note 2) and RadioShack.[3]

At **www.jzap.com/n6tr/850repair.html**, I found some information provided by Bill Smith, KO4NR, on his approach to the problem: Remove the existing battery/holder and substitute a separate battery/holder combination located off the Digital PC board. Unfortunately, RadioShack no longer stocks coin-cell holders and I couldn't locate them anywhere locally. Although Newark and Allied Electronics stock CR-2430 holders and batteries, I didn't want to pay $5 for not meeting the minimum order requirement ($25). Besides, from what little I could see from the pictures of the Keystone holders, I wasn't sure the CR-2430 holder would exactly match the holes in the Digital PC board.

A call to Fred Reimers at FAR Circuits provided a quick solution.[4] Fred offers a small PC board with a CR-2430 holder and adhesive-backed mounting tape (you can get the battery from RadioShack). During disassembly of the front panel and digital PC board, I was able to access the bottom of the board after removing only three cables: one above the battery and two near the upper-left of the board. Positioning the rig on its left side gives easy access to the solder pads. Use a wrist strap and a low-wattage soldering iron with a fine tip. After removing the original battery/holder from the Digital PC board, I attached a pair of color-coded wires (cut from a length of ribbon cable) to the vacated holes. Use color-coded wires to ensure you wind up with the correct polarity: The battery's negative pin is at the top of the board; the two positive pins are near the middle of the board. Both positive-pin holes are connected by a PC-board trace so you need to connect the wire to one hole only.

I attached the other ends of the wire to the FAR Circuits board, again ensuring proper polarity. Using the supplied double-stick tape, I secured the board to the left-hand face of the left wall separating the fan/final assembly and RF unit (X44-3120), placing the board within the RF-unit compartment. In this position there's easy access to the battery-holder clip and it's simple to pop out the old battery and insert a new one. In this location should the battery ever leak, there are no PC-board traces to damage.

After I reattached the board and front panel, some of the front-panel key functions didn't work. I discovered the problem to be a disconnected cable near the bottom of the front panel. This short, flat multiconductor cable interconnects the front panel and the digital PC board and is located (as viewed from the top of the transceiver) below and to the left of the VFO knob. So be careful when moving/positioning the front panel. Having another inch or two of cable there would've been nice—as would an easily removable memory back-up battery.—*Paul Pagel, N1FB, 4 Roberts Rd, Enfield, CT 06082-6127*; **ppagel@erols.com**.

[1] **mailman.qth.net/mailman/listinfo/kenwood**. Another good site to search for information on Kenwood and many other rigs: **www.w9wze.org/ReflectorSearch/SearchReflectorForm.php**.

[2] Direct-replacement batteries with welded-on tabs can be found at Allied Electronics, 7410 Pebble Dr, Fort Worth, TX 76118, tel 800-433-5700; **www.alliedelec.com/**, Allied stock number 774-0087, Dantona CR2430-FT1; Pacific Coast Parts Distributors, 153 E. Compton Blvd, Gardena, CA 90248; tel 310-515-0207, 800-421-5080; fax 800-782-5747; **www.pacparts.com/**, part number W09-0514-05; East Coast Transistor, 2 Marlborough Rd, West Hempstead, NY 11552; tel 800-645-3516; **www.kenwoodparts.com/**, Sanyo CR2430 FT.

[3] RadioShack, tel 800-843-7422; **www.radioshack.com/**.

[4] FAR Circuits, 18N640 Field Court, Dundee, IL 60118; 847-836-9148 voice/fax; **www.farcircuits.net/**. Price: $4 plus $1.50 shipping and handling.

IMPROVEMENTS TO THE 2 METER CU LOOP

◊ The assembly and alignment of the 2 meter Cu loop antenna ["Try Copper for 2 Meters—The Cu Loop," *QST*, Dec 2002, pp 46-48] can be simplified by making the following changes to the gamma matching system. These changes eliminate forming the gamma match tube shape and delete the shorting strap and its adjustment completely. The center frequency can then be set by a simple adjustment of the end caps. If the SWR is not very low after completion, the center wire insulation is probably different than on those antennas tested. If that's the case, change the wire size in $^1/_8$ inch steps until the SWR is minimum. All other parameters of the design remain the same. Figure 1 shows a drawing of the modified match.

1. Drill a $^1/_4$ inch hole on the centerline of the elbow and tubing and $^3/_{16}$ inch below the edge of the elbow. The gamma rod should then be spaced $^9/_{16}$ inch from the OD of the lower antenna element, as shown. Place the $^1/_4$ inch gamma tube through the hole so that $4^{15}/_{16}$ inch is exposed outside the elbow. The tube should not touch the back wall when inserted.

2. Solder it in place, with the gamma tube parallel with the element. Do not heat to the point that you loosen the elbow. Insert 6 inches of sleeving against the element back wall. It should be exposed about $^3/_{16}$ of an inch at the connector end of the tube.

3. Insert a $4^7/_8$ inch length of #16 (AWG) vinyl covered

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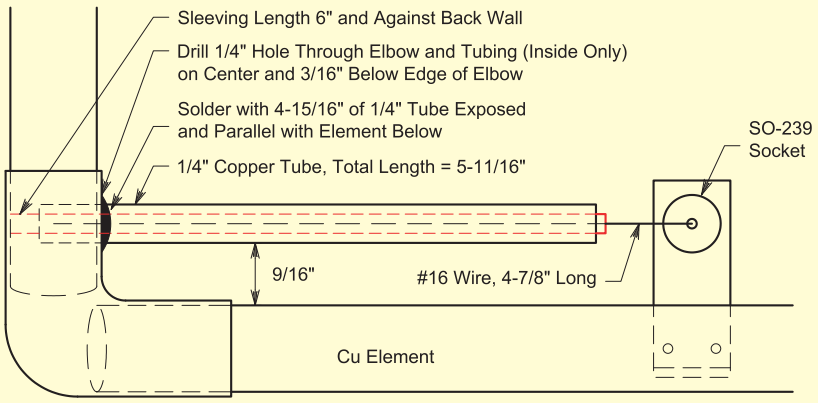


Figure 1—The modified gamma match assembly for the 2 meter copper loop antenna [*QST*, Dec 2002, pp 46-48] considerably simplifies the antenna assembly and adjustment by eliminating the gamma strap.

wire and solder it to the coax connector center pin. The length of this wire is critical and includes 1/8 inch excess, which is stripped for soldering to the connector. Both the back of the connector and the exposed end of the gamma rod should be sealed against moisture entry.—*Dick Stroud, W9SR, 3139 S Main, Box 73, Liberty Center, IN 46766*; **w9sr@arrl.net**

A PARTS HOLDER FOR TOWER WORK

◊ A common aggravation in tower work is finding a place to put small parts or tools while working on something else. During a recent session 100 feet up on a friend's tower, my mental light bulb went on with a solution to the problem.

I took a spring clamp large enough to clamp to a tower leg and attached a small plastic storage container to it. To facilitate mounting the container to the clamp, I used a 1 inch × 1 inch aluminum angle bar stock. This adapted the curved clamp to the straight-sided container and gave support to the bottom of the container. You'll find assembly easier if you tap the holes in the clamp to accept the mounting screws. Figures 2 and 3 show the assembly configuration and the holder mounted to a tower leg.

Figure 2—The parts holder in use, mounted to a tower leg.

Figure 3—The assembly configuration for the tower-mounted parts holder. Note the aluminum angle stock screwed to the clamp and the container.

With the matching container lid, parts can also be stored in the container for the trip up the tower. Using the holder doesn't guarantee that parts or tools won't fall, so remember to exercise caution while on the ground below a tower and wear a suitable hard hat.—*Jim Stahl, K8MR, 30499 Jackson Rd, Chagrin Falls, OH 44022;* **jimk8mr@aol.com**

CURING ELUSIVE TVI

◊ For a very long time I was plagued with daily TVI that ranged from annoying to very severe. In the attempt to find the source, I checked with neighbors and noted the periods when the interference occurred. (Unfortunately, most nonprofessionals aren't very critical of television picture quality and, therefore, aren't reliable when answering questions about whether or not they are experiencing interference.)

After long suffering the cursed interference, I was finally led to the culprit, which was the RadioShack TV signal amplifier I was using to boost the signals for my several TV sets. I therefore purchased a new one and the problem seemed to be solved. The cure, however, was short-lived, and the interference soon returned. I then decided to try an RCA signal amplifier and the cure was permanent!

Although RadioShack still sells TV signal amplifiers, they no longer carry the model that caused me so much grief. For readers who might own this devil, it is a four-way distribution amplifier, catalog No. 15-1119.—*Dick Shongut, W2QFR, 25 Cameron Pl, New Rochelle, NY 10804*; **W2QFR2@aol.com**

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.

The Elecraft XV144 2 Meter Transverter Kit

Gene Zimmerman, W3ZZ
Contributing Editor, QST

Many of you are familiar with the Elecraft K2 transceiver.[1] Originally designed as a high quality 5 W, upgradable to 100 W,[2] HF transceiver, it has taken on a life far beyond that as it became known that the receiver was competitive with some of the best HF transceivers on the market. QRPers are also quite interested in portable operation and are always looking for another small widget to build. Thus the folks at Elecraft now offer transverters that allow operation on the VHF bands. The result is a group of three transverters: the XV50 for 50 MHz, the XV144 for 144 MHz (Figure 1) and the XV222 for 222 MHz. A transverter for 432 MHz is expected early next year.

For those not familiar with transverters, a *transverter* is an extra conversion stage between your HF transceiver and a VHF antenna. The transmitted signal is translated to the new frequency with all of the characteristics of the transmitter portion of your HF transceiver. In a similar manner, received signals from the VHF antenna are translated to HF frequencies to be received on the receiver portion of your HF transceiver. All frequency setting, modulation choices, filtering and processing happen in your HF transceiver just as if you were operating on (usually) 10 meters.

It has been many years since I used transverters on the lower four V/UHF bands and at that time transverters were not of the quality that is now available. There are really three ways to get on the lower V/UHF bands: an HF/VHF/UHF transceiver, a V/UHF transceiver and V/UHF transverters ahead of an HF transceiver. The first two methods are the simplest, but in many cases they involve significant compromises. While there is little to choose in terms of transmit capability, the transceiver route allows the receive system to be optimized entirely for sensitivity and strong-signal handling capabilities, leaving the rest of the receiver to deal with all the other issues—readout, filters, DSP, audio, multiple VFOs, memories, modes and so on.

There are three critical issues involved with using transverters. Most obviously the HF transceiver you intend to use needs to be able to be configured so that it can function as an IF strip with transverters. Many modern and some older HF transceivers do have such provisions. Some of these even have the ability to read out VHF frequencies directly, while others require you to mentally translate 28.000 MHz to 144.000 MHz, for example.

For HF transceivers not designed for transverter operation, you must have the technical capability to modify them so that the transmitter output power is reduced to the level required by the transverter. You do not want to use the output directly from the normal antenna jack attenuated in some manner from a 100 W transceiver—it is entirely too easy to make a mistake and put the full output into the transverter. The results are not pretty! Secondly, you need to have access to the transceiver control facilities (TR changeover, for example) for most transverters. Finally, you want to find an HF transceiver that has reasonably good strong-signal-handling capabilities and low phase noise. Local signals on VHF can be enormously strong and you don't want phase noise introduced by the IF strip spreading across the band. Of course you cannot do much about people who use transmitters that have high phase noise.

It has been a number of years since a new high-end transverter came onto the US market to compete with the standards of the industry in this country, Down East Microwave and SSB Electronic. Thus when I was asked if I were interested in reviewing the XV144, the 2 meter version of the Elecraft transverter line, I jumped at the chance. Here was an opportunity to see how much difference there was between my normal station, a Yaesu FT-847 HF/VHF/UHF transceiver with International Radio Filters, and this state-of-the-art transverter in front of my unmodified

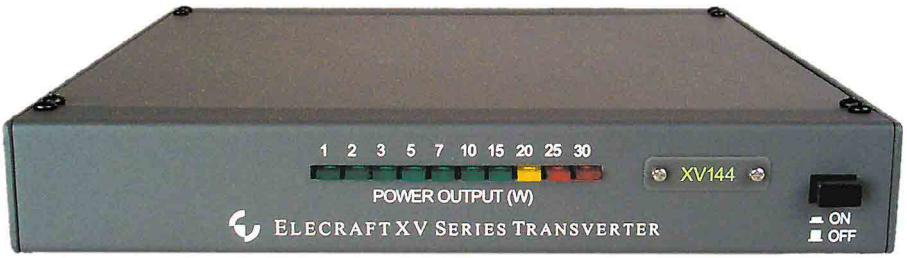


Figure 1—Front view of the Elecraft XV144 transverter.

Building the XV144

The manual is so well written I had no problems building this kit. I would guess the average builder would require about 15 to 20 hours to build one of the XV series transverters. As usual with Elecraft, the design, quality of the parts and the manual are excellent. Although the alignment can be performed with only a dummy load, VHF wattmeter and digital multimeter, I would recommend the Elecraft N-Gen noise generator kit and the DL1 20 W dummy load kit. The Elecraft DL1 20 W dummy load kit has a built in RF detector so if you build one of these a separate VHF wattmeter would not be required. These mini kits are also a good prelude to hone your skills before you start the XV144 or any major Elecraft kit.

Of course you will also need the 10 meter HF radio you are planning to use as the IF to complete the alignment. The XV series is designed to work with the Elecraft K2 or almost any another radio capable of 10 meter operation.

The tools required to build the kits are the normal hand tools including needle nose pliers, flush cutters, #1 Phillips screwdriver and a soldering iron. Although a simple soldering iron will work, I would recommend a temperature controlled soldering station if you are planning to build multiple kits.—*Don Brown, KD5NDB*

Bottom Line

For the serious VHF operator, the transverter route is the way to go. This transverter's performance defines it as a top rank alternative to its well known competitors.

[1]L. Wolfgang,"Elecraft K2 HF Transceiver Kit," *QST*, Mar 2000, pp 69-74.
[2]L. Wolfgang, "Elecraft KPA100: A 100 W Upgrade for Your Elecraft K2 HF Transceiver," *QST*, Feb 2004, pp 76-80.

Joel R. Hallas, W1ZR ♦ Assistant Technical Editor ♦ w1zr@arrl.org

Yaesu FT-1000MP. I have had the chance to use the Elecraft K2 under the most difficult of conditions, an all-CW ARRL Field Day contest operation in 2003 with good wire beams but essentially no E skip at all to help propagate the tiny signal. I must say I was highly impressed with the performance of the K2's receiver. Signals sounded crisp and sharp and the filters cut through the dense interference like a knife. Now I was going to get a chance to see how the transverter's performance compared to the transceiver.

Building the Kit

I did not have time to build the XV144 kit myself for this review, so that job was done by Don Brown, KD5NDB. Don was identified on the BUILDERS FOR HIRE tab of the Elecraft Web page (**www.elecraft.com**) as an experienced kit builder. Don's comments on the construction of the XV144 can be found in the sidebar.

I did, however, take a long look at the assembly manual. Elecraft kits get high marks from the building community and this one is no different. I can clearly say that if you liked working with Heathkits you will like the Elecraft manual. The parts list contains pictures and there are figures where needed to help during the assembly. There are many useful tips on building kits in the manual and at their Web site. Included are warnings about how to avoid electrostatic discharge damage to solid state devices, what tools would be valuable, how to prepare and mount parts, how to remove parts incorrectly installed, how to solder to PC boards, how to wire Anderson Power Poles and so on. All of the surface mount components are already premounted and presoldered, eliminating what perhaps would have been the most difficult part of the assembly. Figure 2 shows the assembled PC board.

The resulting transverter is a handsome, low profile, dark charcoal colored unit only 1.5 inches high including its feet, about 8 inches wide and 10 inches deep. The face displays only an LED bargraph readout for the power meter, a power switch and an XV144 logo that is illuminated when power is turned on. The rear panel on my unit has RCA phono jacks for KEYING LINE input and output, BNC connectors for TX and RX IF input and for the AUX (for a receive only antenna—not used on mine), an N connector for ANTENNA OUTPUT and a DB9 socket for control connections to a K2.

The Circuit

The XV144 design is a modern one that shares many common components between transmit and receive paths. On the receive side, the signal enters the antenna port and is amplified by an Agilent ATF34143 high-dynamic-range preamp that feeds a MiniCircuits ADEX-10H mixer through a band-pass filter. The local oscillator chain provides low side injection at 116 MHz through a low-pass filter. The IF output passes through another band-pass filter to the IF strip receiver.

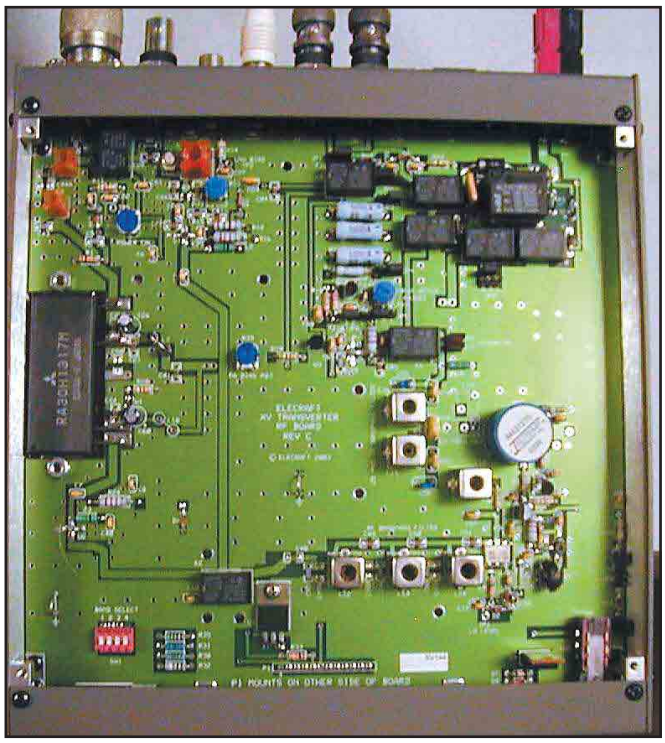


Figure 2—Inside view of the XV144.

In the other direction, the IF transmit signal passes through an IF level control through the mixer/local oscillator and then to a MIMIC driver stage (ERA-5) and a Mitsubishi RA30H1317M MOSFET amplifier module running at 20 W output, and finally through a low-pass filter to the antenna or external amplifier.

The XV144 operates as an integrated unit with the Elecraft K2. If your K2 has a KIO2 interface and Revision 2 firmware, you connect the command and control interface cable as described, set the internal Band Select DIP switches to assign the transverter to the correct band and everything is essentially plug and play. Several clever things will happen:

- the K2 will turn on your transverter,
- you can daisy chain up to six transverters,
- the K2 bandswitch will automatically select the correct transverter,
- the frequency readout on the K2 will display the operating frequency of the transverter, or even an upstream transverter.
- the K2 controls the output meter display and intensity,
- if the K2 is equipped with the internal K60XV option, automatic HF to VHF switching is provided.

Elecraft has carefully designed this transverter to have almost universal utility whether you are using their K2 as an IF radio or not, regardless of how your amplifiers, preamplifier and antennas are configured. Most importantly, the 20 W output will drive most intermediate level amplifiers, if you want more than 20 W output. You have a choice of single or separate lines on both your input and your output. Separate transmit and receive lines can be very handy when you have mast-mounted preamps or amplifiers with external relays. Acceptable input drive requirements for full output range from 8 W (+39 dBm) down to 0.01 mW (–20 dBm).

The XV144 normally comes with an extra stage of amplification prior to the mixer. The manual says that stage is unnecessary if an external preamplifier is used. Eric Swartz, WA6HHQ, of Elecraft indicates that this stage is also unnecessary with IF radios that have good noise figures and, in that case, the dynamic range will be improved. Improved local oscillator stability is available by choosing the crystal oven option. Given the high frequency stability requirements for ultrasensitive digital modes like JT65A, this is one option you ought to get and we had one with ours. You can also specify almost any type of standard connectors for the XV144 rear panel RF connections.

Several protective circuits are included to keep you out of trouble. If a transmit IF signal is accidentally applied to the XV144 when it is in receive mode, a protective circuit disables the transverter. The

changeover from transmit to receive is set at 50 ms; if this is a problem during TR switching, you can increase the delay to 200 ms by changing an internal jumper. This can be very important in sequencing an amplifier as well. Power is shown by a 10 segment LED bargraph on the front of the transverter. The first 7 lights are green; the 8th light is yellow showing that 20 W has been reached; the 9th and 10th lights are red indicating more than 20 W output. My Bird wattmeter says that the yellow light begins to flicker on at about 19 W so even this relatively coarse readout appears quite accurate.

Connections

My installation uses the XV144 with a Yaesu FT-1000MP HF transceiver. The transverter is configured to have separate TX and RX IF lines and a common transceive output line. Once the cables were made, there was very little problem getting the system to work. The '1000MP provides –6 dBm of RF drive to the transverter (TRV) port that is connected into the XV144 TXIN/IF1 jack on the rear panel. The external (Beverage) antenna port RX in on the 'MP is connected to the RXOUT/IF2 port on the XV144 and the RX ANT button is engaged on the 'MP front panel. A quick trip to the 'MP menus changed the frequency readout to 144 MHz. The transverter control line (ground to transmit) is connected to TX GND on the MP. The auxiliary (AUX) BNC connector that allows a separate receive line from the transverter output was not used in my installation. The output (Type N connector) of the XV144 is connected to the external relay system for my homebrew W6PO-designed 8877 power amplifier. With 20 W of drive, the amplifier will deliver close to 700 W output. My antenna is a 31 foot boom Cushcraft 17B2 at 95 feet fed with 7/8 inch Andrew LDF-5 Heliax.

The only problem was getting enough drive from the '1000MP to the transverter to reach more than 7 W output on 2 meters. After reading the manual (yes, it's well written—you should read it) and removing the top cover, I quickly located the input power jumpers JP3 through JP6 and noticed that they had been set for a power input of +1 to +24 dBm. Since the 'MP nominally produces –6 dBm from its TRV jack, I needed only to reset the jumpers on JP5 and JP6 as directed by the manual and voilà, the output easily reached 20 W. In fact I had to back off on the FT-1000MP drive control to hold the power down to that level.

My unit did have the crystal oven option. Please note that when it is installed, the unit draws 400 mA on receive instead of the 250 mA (without oven) in the specifications. My unit also had the additional pre-mixer amplifier installed. This is the way the unit was tested in the ARRL Lab and the way most people will configure the transverter. Likely it is not necessary with a radio of the quality of the FT-1000MP, but removing it requires that some parts literally be ablated, which I did not want to do unless the receive portion did not measure up to my expectations. As you will see, that really was no problem.

Table 1
Elecraft XV144 2 Meter Transverter

Manufacturer's Specifications	Measured in the ARRL Lab
Power requirements: Transmit, 4.0 A; receive, 0.25 A, 13.8 V dc.	Transmit, 3.3 A (at 20 W output); receive, 0.4 A,* tested at 13.8 V.
Size (HWD): 1.5×7.8×9.5 inches; weight, 2.5 pounds.	
Frequency coverage: Receive and transmit, 144-146 MHz.	As specified.
Modes of operation: CW, SSB, AM, FM, PSK.	As specified.
Receiver	**Receiver Testing**
Conversion gain: 25 dB.	24 dB.
Noise figure: 1 dB.	1.0 dB.
Image rejection: 60 dB.	70 dB.
Third-order intercept: +18 dBm.	+17 dBm.
Transmitter	**Transmitter Testing**
Frequency accuracy: Not specified.	28.00000 MHz in = 144.00022 MHz (220 Hz error).
Transmit RF input: 0.01 mW to 8.0 W.	As specified.
Transmit RF output: 20 W.	As specified.
Spurious and harmonic suppression: 60 dB.	64 dB. Meets FCC requirements.
Intermodulation distortion (IMD): Not specified.	See Figure 3.

*Unit tested includes crystal oven oscillator option.

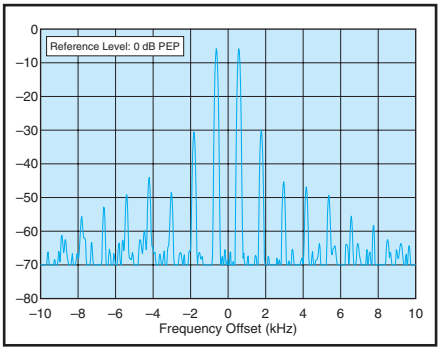


Figure 3— Worst-case spectral display of the Elecraft XV144 transverter during two-tone intermodulation distortion (IMD) testing. The worst-case third-order product is approximately 30 dB below PEP output, and the worst-case fifth-order product is down approximately 44 dB. The transmitter was being operated at 20 W PEP output at 144.2 MHz.

Operations

With the cables and control lines installed, it was time to take the transverter for a spin. Initially when the ARRL suggested that I do 2 meters in June and July I was a little hesitant because 6 meters is often open much of that time and when that happens, 2 meter activity is really scarce, even if you have a kW and a reasonably good antenna. The first day I had the transceiver I checked it on the beacons. The best check, the WA2UMX beacon in FN23xc, 320 miles from me, was unfortunately down for repairs. However, the local beacons W3VD, FM19ne and W3CCX, FM29jw, were the same strength as I normally hear them and the WD4GSM beacon in EM86qv some 334 miles away, which I seldom hear, was 579 for 3 days. The first day I had the radio I worked stations up and down the coast as far as K1WHS in FN43, 438 miles away with Dave running only 100 W. Then it was time to put the transverter to the ultimate test.

I called two friends who are line of sight to me, run high power with big antennas and have high quality transverters ahead of good IF strips—K8ISK, FM18dv on Bull Run Mountain, Virginia, 32 miles away, and K1RZ, FM19jg, 9 miles away. With our antennas turned toward the other, each of them did something I have never seen before—they turned on every single S meter bargraph light on the FT-1000MP. I made exten-

sive checks with both of them on receive and transmit. With my amplifier off and the XV144 running 20 W, my quality reports were excellent and they both reported that I was almost nonexistent 10 kHz away. With the amplifier on, they still said they could make contacts less than 20 kHz from my frequency. If either of us turned our antenna, they both said they could get within 5 kHz of me.

On receive I found much the same thing. Clearly the transceiver was getting unhappy with the beams head-on and having 1 kW poured at it. Still 20 kHz away I would have been able to copy signals that were quite weak although I could hear "junk" from both the stations—about the same report they were giving me. This was probably a function of the transverter because neither disengaging the FT-1000MP front end (IPO button) nor adding up to 24 dB of attenuation in the MP changed anything. Once the signals were reduced even 6 dB, all the "junk" disappeared. Now I do not know whether configuring the XV144 to remove the premixer amplifier would have made it capable of going the last 6 dB. On the other hand, it is very unlikely that most people would ever encounter signals that loud. In practical terms through Field Day and the CQ VHF contest, I never knew any station more than 5 kHz from my frequency was even there.

The best was yet to come. On July 5, I was away from the house midday when 2 meters opened from here to VE1 and VO1, but the next day I hit the jackpot. On July 6, as detailed in this month's "World Above 50 MHz" column, the Eastern and Midwestern United States encountered perhaps the best sporadic E (E_s) opening ever on 2 meters. For 2½ hours the band was wide open from Maryland, first to Minnesota and Wisconsin and then quickly to Kansas, New England, Missouri, Arkansas, Illinois, Indiana, Tennessee and Kentucky. I made a total of 42 contacts.

For the most part the band sounded like 20 meters on a busy afternoon. What a wonderful opportunity to test the transverter and it stood the test very, very well. I never had the impression that there were any strong signals desensing the receiver and I seemed to hear all the stations others nearby were hearing. On July 9 another 2½ hour E_s session occurred, this one much more spotty, but with stations in Oklahoma and South and West Texas at much greater distances than the July 6 opening including W3XO, EM00kd at 1399 miles, and W5GAL, EL09to at 1375 miles. Again some of these signals were very loud and the XV144 receiver handled them all with ease.

A (Very) Little Carping

A thorough review should turn up some glitches but I must say they were few and far between on this unit. I suppose one could carp with the transverter's inability to handle the last 6 dB of what must have been enormously strong signals from K8ISK and K1RZ. But I don't find that much of a complaint, and without the premixer amplifier it might have been able to go the last 6 dB. I did notice a small amount of thermal drift in the XV144 transmitter; power dropped 1 or 2 W below the nominal 20 W after a long session of talking, such as during the E_s openings, but this could be reset by increasing the drive from the FT-1000MP. Had there been an intermediate amplifier running at reduced output of 60 W or so driving the 8877, this might not have been noticeable. Again this is more of an observation than a complaint; many other VHF transmitters do exactly the same thing as they warm up.

Final Thoughts

Did I like it? You bet! The XV144 was easy to set up, even with a transceiver it wasn't designed to operate with. I particularly liked the wide range of input IF power it could handle. Several people whose opinions I trust and who know what my voice normally sounds like on the air gave this transverter high marks for audio quality. In particular, its receive performance appears comparable with the best transverters currently available.

Would I buy one? If I owned a K2, it's an obvious choice. The integration features make the Elecraft transverters the right move for a K2 owner. If I owned something else, the XV144 would still be high on my list. Its ability to integrate with non-Elecraft radios is very impressive and its performance surely stands up to the competition. As an owner of an HF/VHF/UHF transceiver with upgraded filters and a requirement for 50 W of drive on 50, 144 and 432 for my amplifiers, I would have to think about what I would do. A transverter like the XV144 and a good quiet IF strip like the FT-1000MP are clearly better than what I have now, but I am not sure they would be enough better to make me want to make the investment in a set of transverters to replace what I have.

Finally, while there appears to be no connection with this review and the outstanding E_s conditions on 2 meters this year, I will eagerly accept the request to review another transverter next summer!

Manufacturer: Elecraft, PO Box 69, Aptos, CA 95001-0069; tel 831-662-8345; fax 831-662-0830; **www.elecraft.com**. Price: XV50, XV144 or XV222 kit, $349; XVOVN oscillator oven option: $45.

WaveNode WN-1 Station Monitoring System

Joel R. Hallas, W1ZR
Assistant Technical Editor

It's tempting to try to buttonhole the WaveNode WN-1 as a computer displaying RF power meter, but it really does enough with RF and other data to deserve the name "station monitoring system." It can also serve as a control system in a number of ways.

The WN-1 consists of a small interface box with many available inputs, up to four RF probes and a computer program designed to run on a PC running *Windows 95, 98, ME, 2000, NT* or *XP* as operating system. RF probes "HF-1" (1.6 to 60 MHz to 2 kW, 8 kW and 60 W probes are also available) or "UHF-1" (140 to 460 MHz, 500 W max) are available. Probes can be equipped with either SO-239 or Type N connectors. One probe of your choice comes with the unit, others may be purchased as accessories. The computer interface is via a cable designed to plug into a bi-directional parallel LPT (line printer) port on the PC (more about this later). Software is provided on an included CD

Bottom Line

The WaveNode WN-1 brings a bunch of station monitoring and control functions together in a convenient and intuitive hardware and software package.

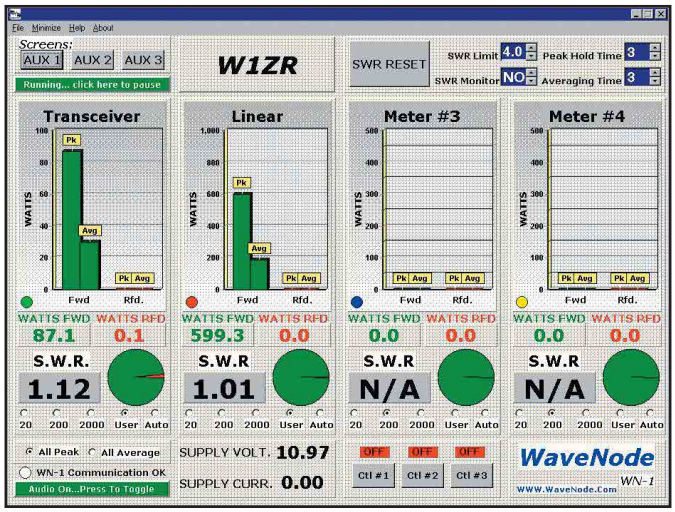


Figure 4—The WaveNode main display indicating power and SWR measured on sensors 1 and 2.

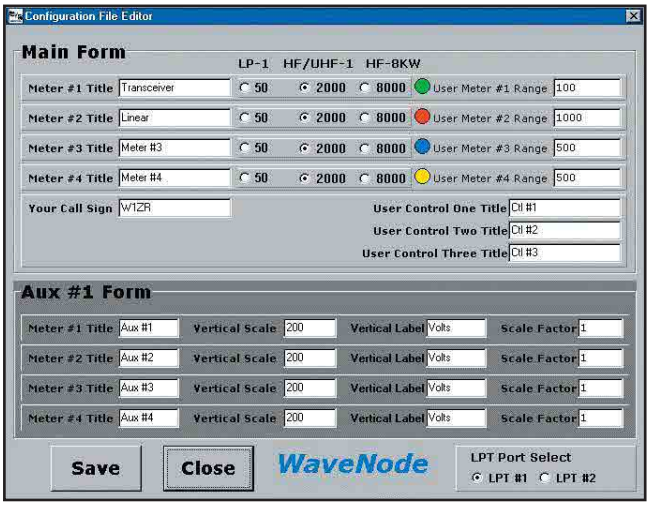


Figure 5— The WaveNode configuration screen allows setting scales ranges and limits.

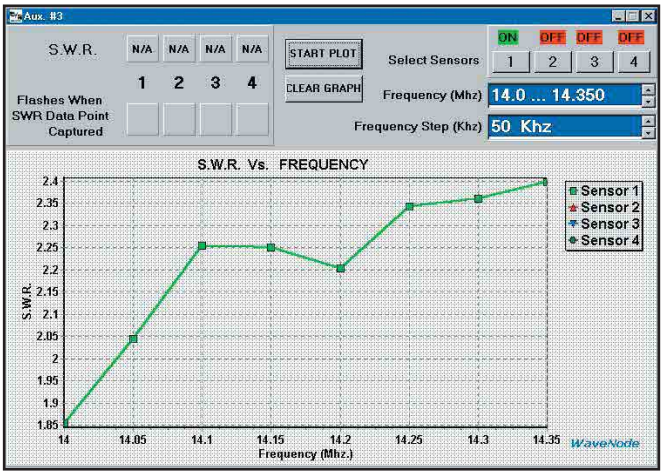


Figure 6—A plot of SWR versus frequency made using the AUX III display.

ROM. If you have Internet access, you may want to check their Web site for the latest release. Ours came with version 1.5, but 1.6 was listed on the site. In addition, the manufacturer mentioned that a beta version of 1.8 was available, the version expected to be packed with units shipped after this issue hits the street. We tried both 1.5 and 1.8.

Well, What Does it Do?

Let's start with the power meter, its bread and butter. We received our unit with two HF probes and it took me a minute to think about why I might want two identical probes. The light came on and I realized that they were perfect for input and output of a linear amplifier or even a tuner feeding a coax-fed antenna. Gee, now I could use three of these! A look at Figure 4 shows the main display indicating peak and average power out of the transceiver and out of the linear, with both forward and reflected power shown and SWR at both points calculated. Very nice! I checked the displayed power against my Bird 43 wattmeter and found the readings within the Bird tolerance. The ARRL Lab made a more comprehensive assessment, as shown in Table 2.

If there were a third sensor in line at the output of the tuner, I could also keep tabs on antenna changes on the same screen. This is particularly handy if you use an auto tuner (I'm still cranking here at W1ZR) since a broken or fallen antenna will generally have a different SWR. Chances are the auto tuner will still happily match to it and you won't know you have a problem until it gets tangled in your lawnmower, or your weekly sked says you're down 20 dB! With the WN-1 you have the possibility of near instantaneous indication, and may even spot an intermittent connection in the antenna system. A "UHF" sensor would fill out the screen and I could watch the 2 meter packet station operation—all four on the same screen at the same time!

WN-1 software version 1.5 provided fixed full-scale indications of 20, 200 or 2000 W. A nice feature of version 1.8 is the ability to set the full-scale reading to anything you want through the use of the CONFIGURATION screen (Figure 5), accessible via a tab under the FILE button on the main screen. I set my transceiver and linear scales at 100 and 1000 W, for example. This screen is also where you can set up multiple other functions including inserting your call letters onto the display.

Another handy feature is the ability to plot SWR versus frequency. This is done through the AUX III screen. You tell the program what frequency range and spacing you want, and the program prompts you for a test transmission at each data point and generates a professional looking plot as shown in Figure 6. Of course, you can pick any sensor for this and plot the input SWR of your linear amplifier as well as that of your antenna. Multiple plots are possible, but the data must all be taken at the same time using the different probes.

What is it Besides a Power Meter?

First, this unit can analyze and plot power readings in a number of interesting ways. Any two power readings can be selected for plotting versus either time or by histogram, and relationship between them is also shown. This is shown in Figures 7 (time domain) and 8 (histogram). In both cases, I have used SSB transmission with a switch from speech compressor on to off to determine the impact of compression on peak to average power ratio. On the histogram, the two clusters of power level are shown distinctly, and on the time domain plot it is easy to see the compressor-on

Table 2
WaveNode WM-1 Station Monitor System

Manufacturer's Specifications	Measured in the ARRL Lab			
Frequency range: HF-1 sensor tested; 1.8-60 MHz.				
Power range(s): HF-1 sensor tested; 0-2000 W.				
Actual forward power:	Measured, Sensor 1/Sensor 2.			
Frequency;	*2 MHz*	*14 MHz*	*28 MHz*	*50 MHz*
5 W CW (avg)	3/3	3/4	3/4	5/6
5 W CW (peak)	4/4	4/5	5/5	7/7
5 W 50% (peak)	4/4	4/4	5/5	6/7
100 W CW (avg)	100/95	100/100	100/100	100/100
100 W CW (peak)	100/100	95/100	100/100	100/100
100 W 50% (peak)	120/120	120/120	120/120	110/110
100 W two-tone (peak)	90/90	90/90	90/90	100/110
100 W voice (peak)	100/100	100/100	100/100	100/110
1 kW CW (avg)	1000/1000	1000/1000	1000/1000	*
1 kW CW (peak)	1000/1000	1000/1000	1000/1000	*
1 kW 50% (peak)	1000/1000	1100/1100	1200/1200	*
1 kW two-tone (peak)	1000/1000	900/950	950/1000	*
1 kW voice (peak)	1000/1000	1100/1100	1000/1100	*
SWR accuracy (worst case):				
1:1 SWR	1.1:1/1.1:1			
2:1 SWR	2.2:1/1.7:1			
4:1 SWR	3.7:1/3.3:1			
Insertion loss:	<0.1 dB	<0.1 dB	<0.1 dB	<0.1 dB

*An amplifier for 6 meters was not available at the time of testing.

period on the right half of the screen.

If your computer has a sound card and speakers, you can get an audio output of any of the forward peak power readings in real sounding speech by pressing keys 1 through 4 on the keyboard "meter one, power eight nine," handy for the visually impaired. A press of the S key provides the SWR observed by the last probe selected.

There are also four "auxiliary" metering inputs as well. These actually read to 4.0 V dc full scale with current limited by a 10 kΩ external resistor, but can be scaled to measure other values through external resistors or amplifiers. Using the configuration screen, you can identify the measurement and set the indicated scale and units. The results show up on the Auxiliary (AUX) II screen (Figure 9) along with the power consumed by your transceiver (if you choose to run the power through the terminals provided) in Wh, perhaps so you can figure your share of the electric bill, and the transmitted power in the same units.

On the control side, there is provision to switch off a linear amplifier or other radio if the SWR exceeds a programmed level. This has the possibility of protecting amplifier tubes or output transistors from a high SWR condition, if your radio doesn't already do so. The value and state of the SWR alarm are shown on the upper right of the main screen, along with a reset button to apply after you get the antenna out of the lawnmower. Note that the internal relay can switch a maximum of 1 A at 24 V dc so an external relay is required to switch off primary power, for example.

In addition, there are three other remote control buttons on the bottom of the main screen that can be used to provide binary control of external equipment. These can be used to drive antenna selector relays, turn on and off tower lights, etc. In general, you will need to provide any external circuitry required to make the interface work. Examples are shown on their Web site, **www.wavenode.com**.

That LPT Interface

Computer driven hardware vendors are being faced with a challenge to find a

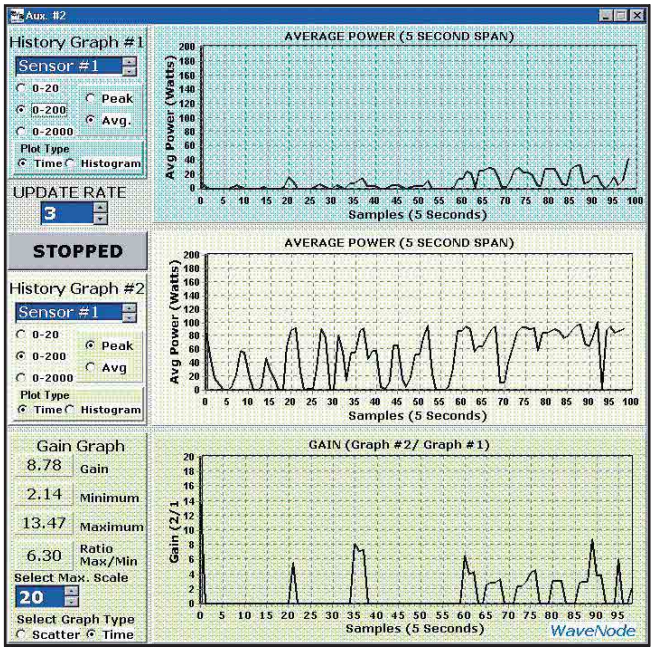


Figure 7—Power history plots—time domain version.

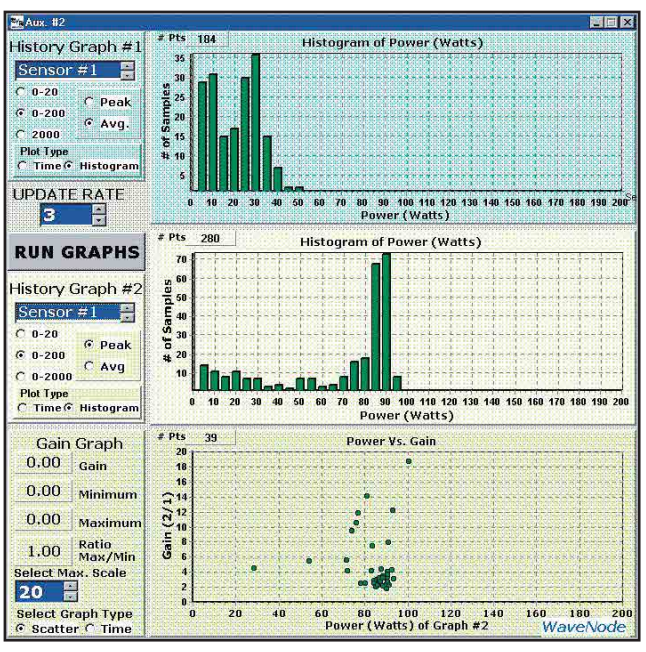


Figure 8—Power history plots—histogram comparison.

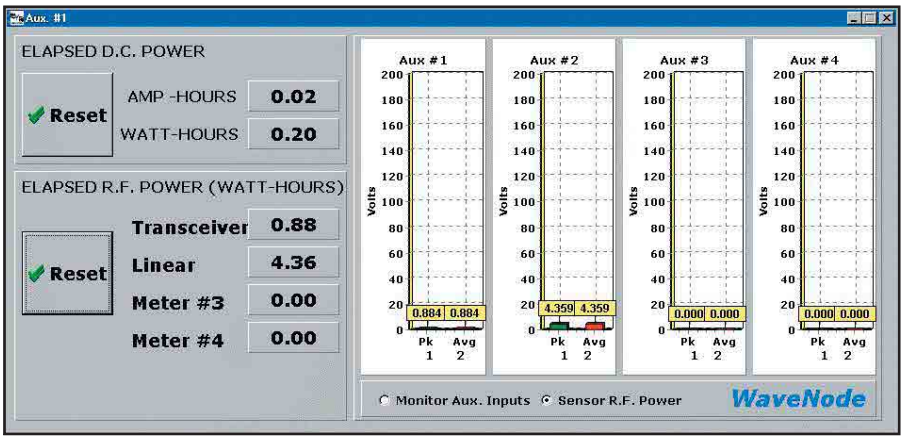


Figure 9—DC and RF power summary with charts for auxiliary functions.

good way to interface with computers. The old standard was to use a serial (COM) port, but many laptop computers no longer have them. Some have gone with a Universal Serial Bus (USB) port, which newer laptops often have, but those may not be available on older desktops. WaveNode has thought outside the box, or at least to a different corner, and has opted to use a parallel printer (LPT) port.

LPT ports are generally quite useful beyond just serving as a printer connection point. Because they send 8 bits with each clock cycle, they can be faster than some serial ports and they support data in both directions. This leaves us with only two concerns:

Where do you Plug the Printer?

One easy way is to use a two position switch that switches the 25 pins from the computer to either the printer or the WN-1. Another way is to purchase a plug-in LPT port card (use that one for the printer and use your original LPT connection for the WN-1). If you're really lucky your PC will have two printer ports, LPT-1 and LPT-2 and one can be made to drive the WN-1, the other your printer. The WN-1 can be configured to use either LPT-1 or LPT-2 *if* they have the proper I/O address range, which leads to the next concern.

What's This I/O Address Range Business?

Each PC has an address range assigned to each of its resources. The way serial and USB ports operate, this isn't an issue with them. Something about the way the WN-1 software interfaces with the LPT ports requires that the assigned PC I/O address range start with 378 for LPT-1 or 278 for LPT-2. These apparently are the *Windows* default ranges, however, not all computers adhere to them. Fortunately (for this review), my shack PC did not use 378 on LPT-1 and I am thus sensitized to this issue!

I would suggest potential purchasers check and adjust as necessary to confirm their PC will support WN-1 operation. It's easy to check via *Windows Device Manager*. Each version is slightly different in how to get there, but the sequence on mine is START/SETTINGS/CONTROL PANEL/SYSTEM/HARDWARE/DEVICE MANAGER/PORTS/LPT1/RESOURCES. A window should show you I/O Range 0378-037F (8 hexadecimal bits), for example. If so, LPT-1 should operate with the WN-1. It may show a second range as well.

If it doesn't, as was the case with two of mine, you may be able to change it right in *Windows Device Manager*, if you uncheck REMOVE AUTOMATIC SETTINGS. First write down the original setting in case you get in trouble. Of the four PCs I checked at our house, two (a Dell and a Gateway) were already on 378. One IBM that wasn't would let me change the setting to 378 in device manager, but then wouldn't operate until I changed it back using the start-up *configuration manager* program.

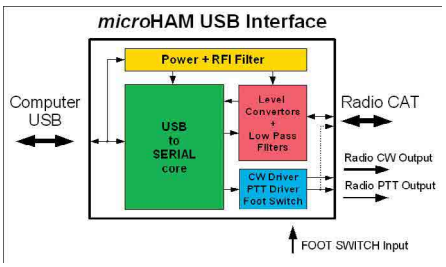
If I had been planning on owning the WN-1, I'm sure I could have resolved the apparent address conflict by reassigning another device's address range. The other basement IBM would not let me change it using *device manager*, but would in power-on *configuration manager* and it worked fine. I used this machine for the review. As an additional data point, my ARRL office machine, a Compaq, was configured as 378. Hopefully, you won't have any problems with this, but I recommend checking first to find out.

Manufacturer: WaveNode, PO Box 111404, Campbell, CA 95011; tel 408-933-8059; **www.wavenode.com**. Price: WN-1 System (includes one sensor, cable and software), $159.99; System including two sensors, $199.99; additional HF or UHF sensors, $44.95 each.

NEW PRODUCTS

VIRTUAL SERIAL PORT VIA USB WITH MICROHAM CAT INTERFACE

◊ German antenna and radio provider WiMo has announced a line of microHAM CAT interfaces to allow control of radios from computers that do not have available RS-232 serial ports. Many recent notebook computers support USB interfaces, but have no serial ports and other systems may have all serial ports in use. After installing the driver software each USB interface shows up as a "virtual" COM port. The interface is said to work with any software that adheres to the *Windows* procedure of accessing serial ports.



The USB interface contains the required level converters for most radios, so the original level converters (eg CT-62, IF-232m and CT-17, for example) are not required. Interface ports allow the control of PTT and CW keying by control of virtual serial port handshake lines. Power is provided from a USB 2.0 compliant interface so an external power supply is not required. The microHAM USB CAT interface is supported under *Windows* 98, *MAC OS* 8.0, *Linux kernel* 2.4.0 and newer operating systems. *DOS* is not supported.

The microHAM USB Cat interface has a metal case to reduce RF interference, and all inputs are filtered with LC circuits. Models are available for most computer controlled radios. See **www.wimo.com** or contact WiMo Antennen und Elektronik GmbH, Am Gaexwald 14, 76863, Herxheim, Germany; tel 49-7276-96680 or **junge@wimo.com**.

NEWS PRODUCTS

SEARCHABLE ONLINE *CQ* MAGAZINE ARCHIVE

◊ CQ Communications, publisher of *CQ Amateur Radio* magazine, and Buckmaster Publishing of Mineral, Virginia have created a searchable on-line archive of *CQ* magazine back issues, eventually dating back to the magazine's first issue of January 1945. A beta test version covering 1990-2002 is currently on-line.

Buckmaster has filmed back issues of *CQ* onto microfiche for use by researchers and hobbyists alike, reportedly using advanced scanning and searching technology for on-line posting of documents. This technology will be applied to back issues of *CQ*. As currently envisioned, searches will be free, while reading and printing specific pages will require a subscription at a nominal fee.

In addition to scans of each page of each issue they will use optical character recognition (OCR) to automatically index each word in each article. Their search engine will identify each article containing the search term(s). The indexing of every word eliminates the restriction of most indexes and search engines that are limited to looking for key words that have been manually assigned or indexed. For details of the offering, or to subscribe to the service, see **hamcall.net/cgi-bin/cqcgi**.

RC210 DELUXE REPEATER COMPUTER

◊ Arcom Communications has announced the RC210 Deluxe Repeater Computer. This unit can control up to three separate repeaters with a single controller. The RC-210 provides three independently operating radio ports, each with its own timeout and hang timers, courtesy tone, IDs and dedicated DTMF decoder. With DTMF commands, you can link ports together or just control three independent repeaters. The RC-210 runs at 16 MHz using a RISC CPU, and is controlled via flash memory, so upgrades can be accommodated.

Each port has its own individual voice and CW IDs. With a repeater specific vocabulary and human sounding speech. A digital voice recorder is also provided to allow the recording of custom voice ID's and other messages off the air.

A built-in clock and calendar is provided for use with the scheduler and may also be used in ID's and other custom messages.

The RC-210 is priced at $249 for the kit version or $349 assembled and tested, and comes with a two year parts and one year labor warranty. For more information, see **www.ah6le.net/arcom**.

TRANSCEIVER/ACCESSORIES TRAVEL CASE

◊ MFJ has announced the MFJ-6404 travel case designed for those who like to travel with their ham gear or other equipment. This hard-side case is designed around a foam insert system. The foam is pre-separated into small tear-away cubes in the bottom portion designed to allow arranging the foam padding to custom fit your electronic equipment. The underside of the case cover is foam padded like an eggshell crate to provide protection from both sides.

The case comes with a black handle, carrying strap and two sets of keys. Both left and right snaps lock to keep out curious bystanders. Corners are riveted with extra metal pieces to help guard against wear and tear.

Price: MFJ-6404, $39.95. MFJ-6404F, extra foam insert to allow use with multiple equipment configurations, $9.95. For more information, contact MFJ Enterprises, Inc, 300 Industrial Park Rd, Starkville, MS 39759; tel 800-647-1800; fax 662-323-6551; **www.mfjenterprises.com**.

BAND DECODER FOR HF TRANSCEIVERS

◊ Elecraft has announced the KRC2 Band Decoder kit, a programmable station control unit that can switch a combination of antennas, filters, amplifiers or other equipment. It supports analog, digital, and RS232 control inputs and is designed to be compatible with transceivers from ICOM (voltage level), Yaesu (BCD and voltage level) and Kenwood (serial or BCD via logging program), as well as Elecraft's own K2 and K2/100. Decoded outputs are provided for all HF bands as well as transverter bands.

New KRC2 firmware can be downloaded from a PC, allowing for future enhancements or customization for special applications. The 1.2×3.5×5.5 inch unit is said to be suitable for first-time kit builders. An accessibility option, the KRC2ACC provides both the regular band decoding functions of the KRC2 and full CW feedback of K2 frequency, button presses, displays and menu items. This allows complete operation of the K2, including accessing menu items, without the need to actually see the rig. For further details on the KRC2 and other Elecraft products, contact Elecraft at PO Box 69, Aptos, CA, 95003; tel 831-662-8345; **www.elecraft.com**. Price KRC2 kit: $159, KRC2ACC kit: $178, KRC2ACCMDKT to convert a KRC2 to a KRC2ACC: $19.

ARRL Goes to Bat for Arizona Amateurs, Seeks BPL Field Trial Shutdown

The ARRL in August asked the FCC to immediately shut down a broadband over power line (BPL) field trial in the Cottonwood, Arizona, area because it's causing "severe interference" to Amateur Radio communication. Electric Broadband LLC and utility APS have been operating the BPL experiment at two Yavapai County sites since June under a Special Temporary Authorization (STA) the FCC granted to Electric Broadband in March. Michael Kinney, KU7W, filed the first Amateur Radio complaint in June. It cited testing by the Verde Valley Amateur Radio Association (VVARA) in the 1.8-30 MHz range showing that BPL interference makes attempts at ham radio communication useless.

"The interference on typical Amateur Radio equipment shows received undesired signal levels in excess of 60 dB over S9 on the receiver's signal strength meter," ARRL General Counsel Chris Imlay, W3KD, told FCC officials on the League's behalf. "The utility and Electric Broadband were contacted, and no response was received." The ARRL asserted that both companies are aware that the BPL field trial has been causing harmful interference and "neither has taken any steps to either resolve it or terminate the test."

ERNIE CUMMINGS, K6XF

The Cottonwood BPL field trial uses Mitsubishi Electric PLCLINK equipment.

The League said VVARA and ARRL testing indicates levels of radiated RF energy on amateur HF allocations is "extremely high," well in excess of the FCC Part 15 levels with which Electric Broadband told the FCC it would comply. VVARA testing revealed "actual harmful interference" from the BPL system to mobile stations in the vicinity and to the fixed station of David Kiggins, KB7KMR. Distances ranged from between 30 and 70 feet from BPL equipment to 0.56 mile and 0.71 mile from Kiggins's station antenna, the League said.

The League's shutdown request went out August 16 via e-mail and courier to FCC Enforcement Bureau Chief David Solomon and Deputy Office of Engineering and Technology Chief Bruce Franca. No response had been received as of press time.

ARRL called on the FCC to instruct Electric Broadband and APS to shut down the BPL trial immediately and not resume operation until it can demonstrate that all interference issues have been resolved. It also insisted that the FCC immediately revoke any STAs granted for the Cottonwood or nearby operations, and that it institute forfeiture proceedings against the two companies for knowingly causing harmful interference.

VVARA submitted a lengthy and comprehensive report to the two companies and to the Commission in late July detailing the interference issues arising from the Cottonwood BPL field trial. There's been no response, the ARRL said.

The VVARA took baseline measurements in January, before the BPL trial began, and it's continued taking measurements since the system's startup to determine the extent of interference. ARRL Lab Manager Ed Hare, W1RFI, conducted independent tests of the Cottonwood BPL system in July, and the League attached a summary of his findings to its letter.

"Mr Hare found strong BPL noise levels across a wide geographical area surrounding the BPL site and made measurements that show that the system is operating at levels several orders of magnitude higher than the FCC Part 15 limits," the League said. One measurement cited was more than 32 dB higher than Part 15 allows.

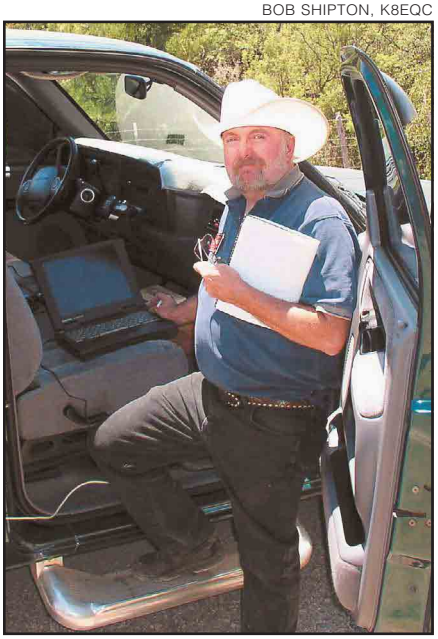
"The measurements taken were consistent with the levels seen on the Amateur Radio station receiver signal-strength meter by the Verde Valley group," the League added.

The VVARA and ARRL measurements, ARRL said, indicate widespread interference to Amateur Radio communication in an area within a mile of the BPL field trial and radiated emissions from BPL modems at more than twice what FCC regulations permit. The League further accused Electric Broadband of misrepresenting facts to the Commission by saying it would comply with §15.109 of the FCC's rules.

The ARRL said continued operation of the system while violating the conditions under which the STA was granted constitutes "willful and repeated interference," and both the utility and the BPL provider should be subject to fines as a result.

"ARRL requests that this test station be shut down immediately and that the appropriate monetary forfeitures be imposed against both Electric Broadband and APS," the League concluded.

BOB SHIPTON, K8EQC



ARRL Lab Manager Ed Hare, W1RFI, in Arizona to take measurements on the Cottonwood BPL field trial system

Rick Lindquist, N1RL ♦ Senior News Editor ♦ n1rl@arrl.org

North Carolina Utility Ends BPL Field Trial

Progress Energy Corporation (PEC) announced in August that it had completed Phase II of its broadband over power line (BPL) field trial in the Raleigh, North Carolina, area. According to an internal company memorandum made available to ARRL, PEC was wrapping up its program to "test the viability of providing broadband service" to its service communities.

"Currently, the company does not have plans for a large-scale commercial rollout of BPL in the company's service territories," the memorandum states. But PEC has since appeared to back away from that stance. In subsequent statements directed at the BPL industry, PEC has suggested that it has not altogether ruled out BPL.

Progress Energy's decision came on the heels of announced shutdowns of BPL field trials in Cedar Rapids, Iowa, and Penn Yan, New York (see sidebar, "Broadband Provider to Drop BPL in New York Trial Community").

PEC Vice President of Energy Delivery Solutions Lisa Myers said the utility obtained significant information about the design, construction and operation of a BPL system. "Overall, this has been a successful test for us," the memorandum quotes her as saying. "We have gathered valuable information about broadband over power lines and its potential."

During its six-month Phase I and Phase II tests, the utility says it offered broadband service to more than 400 homes in southern Wake County. Early this year, FCC Chairman Michael Powell visited the BPL field trial to promote the technology, and local radio amateurs spoke briefly with him about their interference concerns.

The PEC memorandum acknowledged Amateur Radio interference complaints. "BPL has met with vocal opposition from amateur or 'ham' radio operators who are concerned that the service will interfere with the radio frequencies they use," it said. "Some complaints were filed with the Federal Communications Commission (FCC) during Phase II by ham radio operators using mobile equipment in search of BPL signals."

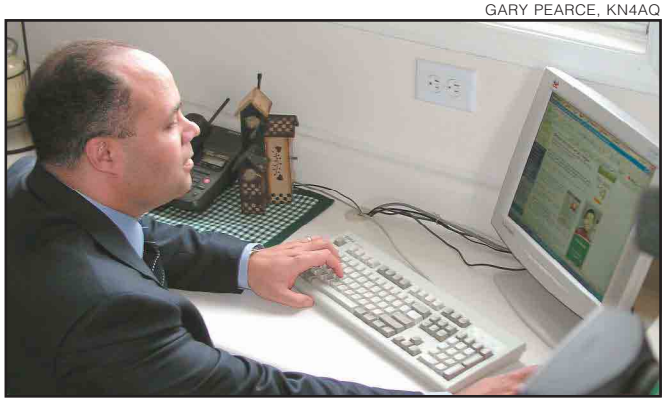
Responding to one amateur's complaint, the FCC earlier this summer took measurements in the field trial area. FCC Office of Engineering and Technology (OET) Deputy Chief Bruce A. Franca said the FCC concluded that PEC's BPL trial "is in compliance" with FCC rules and that the company's ham band notching efforts "are effective" to avoid the potential for harmful interference. The ARRL has requested clarification of certain claims made in Franca's July 22 letter, however. The memorandum cites PEC Director of Emerging Technologies Matt Oja as saying the technology PEC selected—by Amperion—"allowed us to address all complaints by changing the settings to mitigate interference."

One of the amateurs who's been closely monitoring PEC's foray into BPL—Gary Pearce, KN4AQ—says he's pleased with the utility's decision. "It's a positive thing for ham radio that Progress Energy is not going to be pursuing BPL for whatever reason they decided not to do it," Pearce told ARRL. "It's going to make a lot of hams in Eastern North Carolina happy."

Pearce acknowledged that Progress Energy and Amperion personnel worked closely with local amateurs to notch out interference on HF amateur frequencies. Effective notching turned out to be more difficult than anticipated, however. Even following the FCC's visit to take measurements, amateurs continued to report strong BPL interference on the high end of 20 meters as well as in the HF international broadcast bands.

For more information on BPL, visit the "Broadband Over Power Line (BPL) and Amateur Radio" page on the ARRL Web site, **www.arrl.org/bpl/**.

GARY PEARCE, KN4AQ



Early this year, FCC Chairman Michael K. Powell visited the Progress Energy field trial and checked out the system (but not its interference potential) for himself.

Broadband Provider to Drop BPL in New York Trial Community

A broadband provider that's been testing BPL in the Village of Penn Yan, New York, will move away from that technology. The Western New York community of some 5000 residents considered various proposals with Data Ventures (DVI) to offer broadband service. A BPL trial has been underway in Penn Yan for several months. According to an article in the July 28 edition of the *Finger Lakes Times Online*, DVI now is proposing to employ wireless mesh "WiFi" technology instead of BPL. ARRL CEO David Sumner, K1ZZ, congratulated Penn Yan Mayor Douglas G. Marchionda Jr and DVI for going with wireless broadband instead of BPL.

"Not only will your citizens receive better service, but a serious radio spectrum pollution problem has been averted as well," Sumner said in a fax to Marchionda and to DVI CEO Marc Burling. "We hope that other communities will be able to profit from your experience." Sumner raised the issue of interference complaints from the Penn Yan BPL trial with Marchionda last April.

The *Finger Lakes Times* report quotes Burling as saying that his company didn't feel BPL was "commercially deployable." He also cited issues with the BPL trial including security concerns and interference—which will not be an issue with the wireless system.

Burling told ARRL that the Penn Yan BPL system would be shut down once DVI starts deploying its wireless system. As for BPL, "We are going to sit back and wait for an official ruling from the FCC and go from there," Burling added.

Penn Yan amateur Dave Simmons, KB2ITN, has been been working in what he called "an advisory capacity" to both the village and DVI. "We're going to go totally mesh," he confirmed in late August. Simmons said the BPL system would be phased out once the wireless equipment arrives.

In a March 23 article "In This Power Play, High-Wire Act Riles Ham-Radio Fans," *Wall Street Journal* reporter Ken Brown described a "firestorm" of protest from amateurs when Penn Yan approved the BPL test plan.

ARRL also learned this summer that Energy East—a cooperative of New York State Electric & Gas and Rochester Gas & Electric—decided against deploying BPL in the utilities' Western New York service area. Energy East based its decision in large part on the high levels of radio frequency interference an engineer and company officials observed during a visit to the Penn Yan field trial.

On July 29, Grand Haven, Michigan, announced that it had become the first community in the US to deploy a WiFi network that blankets the city and up to 15 miles offshore in Lake Michigan with broadband Internet access.

UPLC COMMENT SHOWS BPL CAMPAIGN STARTING TO PAY OFF, HAYNIE SAYS

ARRL President Jim Haynie, W5JBP, says a remark the United Power Line Council (UPLC) made about Amateur Radio shows that the League's BPL message is getting through. In its reply comments on the FCC's BPL *Notice of Proposed Rule Making* in ET Docket 04-37, the UPLC's Brett Kilbourne claimed that members of the BPL industry are the real experts on the technology, "not a misinformed set of armchair amateurs that still use vacuum tube transmitters." A subsequent UPLC press release repeated the swipe, drawing a storm of protest from the amateur community. Haynie says he took comfort rather than offense at the intended affront.

"I thought that the comment was a good indicator that the work that the League has been doing on multiple fronts is beginning to pay off," he said. The League's FCC filings, technical studies and information on BPL, he said, have made it "very embarrassing" for the BPL industry to keep insisting "that the emperor is wearing clothes," so it's resorted to name calling instead.

Haynie said he remains puzzled that the BPL industry appears unwilling to support its claims that "the risk of interference

FCC News

ARRL MEMBER NAMED TO KEY FCC WIRELESS BUREAU POST

The FCC has named Michael J. Wilhelm, WS6BR, of Washington, DC, as chief of the Wireless Telecommunications Bureau's Public Safety and Critical Infrastructure Division. The division deals with Amateur Radio Service issues, and the appointment makes Wilhelm—a League member—the first amateur licensee in several years to hold such a position within the FCC.

Wilhelm replaces D'wana Terry, whom WTB Chief John Muleta named to be his chief of staff and associate bureau chief. Terry headed the Public Safety and Critical Infrastructure Division and its predecessor, the Public Safety and Private Wireless Division, for six years.

Wilhelm most recently served as the division's deputy chief (legal). In his new post, he will oversee all policy, regulatory and licensing matters related to public safety entities, critical infrastructure industries and private wireless radio services. Among Wilhelm's staffers is Bill Cross, W3TN, an ARRL member and FCC figure well-known within the amateur community.

Wilhelm holds a bachelor's degree from the University of Detroit, a master's from the University of Michigan and a *juris doctor* degree with high honors from the University of Florida Law School.—*FCC*

FCC NO LONGER ISSUING CERTAIN 2×3-FORMAT VANITY CALL SIGNS

The FCC has ceased issuing 2×3-format Amateur Radio vanity call signs that begin with the prefixes WC, WR, WK and WT (eg, WR1AAA, WC4ZZZ). The Commission erroneously granted more than 150 WR and WC-prefix 2×3 vanity call signs from 1997 through September 2003, after which it began rejecting such call sign requests.

Some background: In the late 1970s, the FCC announced a new Amateur Service call sign assignment system. It provided four standard call sign groups, designated Group A, B, C and D, delineated by license class and issued sequentially with no backfilling. The FCC's Bill Cross, W3TN, told the nation's volunteer examiner coordinators (VECs) in July that the FCC also had an unofficial "Group X." These included WC (RACES), WR (repeater), WK and WT-prefix 2×3-format call signs reportedly reserved for special-use licenses.

The FCC stopped issuing repeater call signs in 1983 and ceased renewing RACES licenses in 2000. After the current vanity program began in 1996, several ham clubs sought new and formerly held repeater and RACES-type call signs. When the Universal Licensing System came along in August 1999, however, the FCC encountered some licensing system programming shortcomings, including the anomalous assignments of WC and WR-prefix 2×3 call signs as acceptable formats.

When the FCC implemented programming corrections that halted the issuance of Group X call signs in September 2003, it did not advise the amateur community. As a result, several amateurs who filed for 2×3 WC or WR-prefix call signs had their applications dismissed with the explanation that the applicant's call sign choice was unavailable. That remains the case.

The FCC has not indicated whether it plans to address the WC and WR-prefix 2×3 call signs it's already issued.

FCC EXPANDS UNIVERSAL LICENSING SYSTEM HOTLINE SUPPORT

The FCC has announced expanded hours for its Universal Licensing System (ULS), **wireless.fcc.gov/uls/**, Hotline Support. ULS users now may reach the FCC ULS Hotline by phone—toll-free, 877-480-3201 or local, 717-338-2888 (Amateur Service callers select Option 2)—from 8 AM until 7 PM Eastern Time except on federal holidays. ULS Hotline Support also is available via e-mail, **ulshelp@fcc.gov**.

Contact ULS Hotline Support if you have questions about which applications to use, what information is being requested on a ULS form or schedule or any other ULS-related licensing matter.

The FCC continues to provide ULS technical support weekdays from 8 AM until 6 PM Eastern time. Call toll-free, 877-480-3201 or local, 202-414-1250 (TTY 202-414-1255). Technical Support handles questions concerning computer access to ULS, uploading files, submitting attachments to ULS filings and FRN passwords.

The FCC notes that all calls to the ULS hotlines are recorded.—*FCC*

Amateur Enforcement

♦ **FCC reduces amateur licensee's fine from $12,000 to $400:** The FCC has reduced the fine it had proposed to levy on an Ohio amateur from $12,000 to $400. In May 2003, the FCC released a *Notice of Apparent Liability* to Ronald E. Sauer, N8QN (ex-WE8E), of Bedford Heights. The FCC's decision to reduce Sauer's fine, spelled out in an August 6 *Forfeiture Order*, was based on his inability to pay. The fine stemmed from the FCC's finding that Sauer had deliberately interfered with Canadian Amateur Radio operations, transmitted music, failed to identify and violated other FCC Part 97 rules. The FCC said Sauer did not contest the FCC's findings, but sought to have the fine canceled because he couldn't pay it.

"After reviewing Sauer's supporting financial documentation, we agree that he is unable to pay the proposed $12,000 forfeiture," the FCC said in its *Order*, which concluded that a $400 fine was appropriate and "consistent with precedent."

Although it drastically reduced the fine, the FCC admonished Sauer for his "deliberate, willful and repeated violations" of Part 97 rules and cautioned him that further violations could result in additional enforcement measures including license revocation.

Sauer claimed that he is unemployed, owns no real property and lives on Social Security. He submitted recent Social Security benefit statements to back up his assertions, the FCC *Order* said.

from BPL is extraordinarily low, because it produces only minimal radio frequency energy at a few points in the system," as the UPLC's press release asserts. Any harmful interference that does occur, the UPLC claims, can be "mitigated" using a variety of techniques, "including frequency notching or frequency shifting."

"Just saying 'We said it's not going to interfere' is not going to cut it," he said. Haynie challenged the BPL industry to sponsor independent, professional engineering evaluations of the technology's interference risk. "Let's see what they've got."

Haynie said that while he found the UPLC's "armchair amateurs" remark amusing, he considered its severe criticism of the National Telecommunications and Information Administration (NTIA) Phase 1 BPL report and comments in the proceeding ill advised. In its press release, the UPLC said "NTIA's recommendations and ARRL's nay saying are misguided" and that the UPLC has "forcefully replied" to interference concerns.


Jim Haynie, W5JBP

"For Mr Kilbourne to come out and say they [NTIA] don't know what they're talking about, he might as well shoot himself in the foot," Haynie said, pointing out that the White House, which is promoting BPL, is putting a lot of weight on the NTIA's recommendations.

In its comments, the UPLC said the NTIA's approach was "fundamentally at odds with the Part 15 rules" and "unjustified" by BPL's interference potential. Responding to criticism from the amateur community, the UPLC declared its "support for Amateur Radio remains unabated," but expressed concern for "uninformed armchair quarterbacking by a small number of amateurs."

The UPLC also said it has "sought to work with ARRL," citing its offer to help resolve "a complaint in Cedar Rapids, Iowa." Alliant Energy prematurely shut down its BPL pilot system in Cedar Rapids June 25. Interference complaints from amateurs were cited as one factor in the utility's decision.

MINNESOTA ELECTS NEW SECTION MANAGER

The ARRL Minnesota Section will be getting a new Section Manager. Richard H. "Skip" Jackson, KSØJ, of Inver Grove Heights, received 646 votes to outpoll Chuck Gysi, N2DUP, of Rochester, who got 332 votes. Jackson will succeed SM Randy "Max" Wendel, KMØD, who has served as Minnesota's SM since 1993 and did not seek another term. Votes were counted August 24 at ARRL Headquarters.

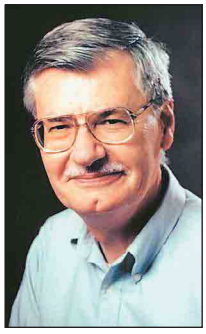
First licensed in 1955, Jackson cites 40 years' experience in technical management and electronics among his primary assets. In recent years, he says, his primary Amateur Radio focus has been on emergency communications and public service. Jackson pledged during his campaign to appoint a management team to help him to guide the section during his tenure.

The Minnesota SM slot was the only contested race in the current SM election cycle. Incumbent SMs in eight other ARRL sections ran without opposition for new terms. They are Betsey Doane, K1EIC, Connecticut; Doug Rich, W7DVR, Idaho; Kent Olson, KAØLDG, North Dakota; Joe Phillips, K8QOE, Ohio; John Thomason, WB5SYT, Oklahoma; Sherri Brower, W4STB, Southern Florida; John Ellis, NP2B, Virgin Islands, and Scott Bauer, W2LC, Western New York.

Two-year terms for all successful candidates begin October 1. Since there were no candidates for Puerto Rico SM, the League will resolicit nominations for that position. Current ARRL Puerto Rico SM Victor Madera, KP4PQ, has decided not to run for another term.

TWO DIRECTORS STEPPING ASIDE; BALLOTING SET IN THREE DIVISIONS

Two members of the ARRL Board of Directors are not seeking new terms this fall, and there will be an election to fill one of the vacancies. Southwestern Division Director Art Goddard, W6XD, who's held the seat since 2002, announced earlier this year that he would not run for the 2005-2007 term. Rocky Mountain Division Director Walt Stinson, WØCP, also has decided not to seek another term after serving since 1998.


An election will decide who will replace outgoing Southwestern Division Director Art Goddard, W6XD.

"We will miss Art and Walt, who have contributed enormously to the League's success during their tenures," said ARRL CEO David Sumner, K1ZZ, who is secretary of the Board of Directors.

Seeking to succeed Goddard is

Media Hits

■ When radio amateurs in Maryland's Prince George's County assisted a local hospital during an August 16 telephone service outage, it made the news on WRC-TV, the NBC affiliate in Washington, DC. The NBC4 account said Prince George's Office of Emergency Management issued the call to "its network of volunteer Amateur Radio operators" to assist—in part because of the limited capacity of the hospital's backup telephone system. Ham operators were stationed at the county's emergency operations center as well as at two other area hospitals which were unable to communicate with Prince George's Hospital Center although they didn't lose telephone service themselves. The hospital's telephone service was out for about 10 hours.

■ An article in the *Union Leader*, Manchester, New Hampshire, quoted ARRL New Hampshire Section Manager Alan Schuman, N1FIK, of New Boston, and other SKYWARN volunteers following a sudden and severe weather event August 3.

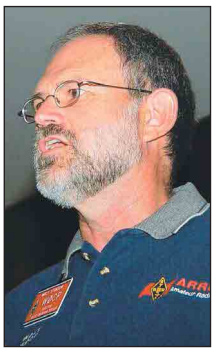
■ Connecticut's *The Hartford Courant* in August ran an article about the ARRL's archives project that quoted New England Division Director Tom Frenaye, K1KI, who chairs the Historical Committee.

■ A two-page spread in the Science and Technology section of the *Washington Times* profiled Murray Green, K3BEQ, of suburban Cheverly, Maryland. The July feature article stressed both the public service that hams provide and the enjoyment to be had from making new friends around the world. It included a photograph of Green in his ham shack.

■ The Ada *Evening News* in Oklahoma ran a story July 14 entitled "Amateur Radio Saves the Day." The report described how five local hams who were assisting as a Fourth of July celebration suddenly shifted gears when a 3-year-old child became lost. The hams, along with Kiwanis Club members, fanned out to cover the entire park and found the youngster within 5 minutes.

■ Web magazine *eWeek*'s Technology Editor, Peter Coffee, AC6EN, wrote an August 2 column entitled "Beware the BPL Buzz." It warned of the harmful interference that BPL deployment would bring to existing users of the radio spectrum.

current Vice Director Tuck Miller, NZ6T, of National City, California, who faces a challenge from Richard J. "Dick" Norton, N6AA, of Topanga, California. A DXer and contester, Norton competed at the 2002 World Radiosport Team Championship and is a pioneer in computerized contest log checking.



Rocky Mountain Director Walt Stinson, WØCP, won't be seeking a third term.

Rocky Mountain Division Vice Director Warren G. "Rev" Morton, WS7W, of Casper, Wyoming, is unopposed to replace Stinson in the top job. Brian Mileshosky, N5ZGT, of Albuquerque, New Mexico, is unchallenged in his bid to succeed Morton. Mileshosky, who turns 25 in October, will be the youngest person in recent memory to serve as an ARRL Vice Director. He was the 1999 winner of the ARRL Hiram Percy Maxim Memorial Award.

Current Rocky Mountain Vice Director Rev Morton, WS7W, will succeed Stinson January 1.

Edward J. Stearns, AA7A, of Scottsdale, Arizona—a DXCC Honor Roll member and past chair of the ARRL Contest Advisory Committee—is unopposed for the Southwestern Division Vice Director's seat that Miller is vacating to run for Director. Stearns and Miller faced off for the seat in 2001.

In the Southeastern Division, while 25-year veteran Director Frank Butler, W4RH, faces no opposition for a new term and has been declared re-elected, there is a contest for the division's second slot. Incumbent Vice Director Nelson E. "Sandy" Donahue, W4RU, faces a challenge from Sharon T. "Sherri" Brower, W4STB, of Vero Beach, Florida. Donahue, a former Georgia Section Manager who lives in Atlanta, was elected in 2001. Brower has served as Southern Florida SM since October 2002 and won a new term in August.

In the Pacific Division incumbent Director Bob Vallio, W6RGG, is unopposed in his bid for a new term in his own right. The Castro Valley, California, retiree took over the director's chair in February 2003

In Brief

● **W9SR wins *QST* Cover Plaque Award:** The winner of the *QST* Cover Plaque Award for July was Richard W. Stroud, W9SR, for his article "Copper Loops for 222 and 440 MHz." Congratulations, Dick! The winner of the *QST* Cover Plaque award—given to the author or authors of the best article in each *QST* issue—is determined by a vote of ARRL members. Voting takes place each month on the *QST* Cover Plaque Poll Web page, **www.arrl.org/members-only/qstvote.html**. Cast a ballot for your favorite article!

● **California Historical Radio Society obtains late ARRL director's call sign:** The call sign of the late ARRL Pacific Division Director Jim Maxwell, W6CF, will live on in memoriam, thanks to Maxwell's widow, Trudy, KC6NAX, and the California Historical Radio Society (CHRS). The club, which is restoring the former KRE (AM 1400 kHz) radio studio in Berkeley as its headquarters and as a vintage radio museum, will use W6CF for its amateur club station. Trudy Maxwell, who assented to the call sign acquisition, also donated her husband's extensive technical library to CHRS, and it has been moved to the KRE location as the James Maxwell Memorial Radio Library and Archive. Maxwell had an abiding interest in radio and electronics history, and Jim and Trudy Maxwell spearheaded initial efforts at ARRL Headquarters to catalogue documents from the League's early years (that work continues under Archivist Perry Williams, W1UED). Maxwell died February 6, 2003, at the age of 69. The KRE parking lot, front entrance and studio appeared in the 1973 movie *American Graffiti* as the backdrop for the DJ Wolfman Jack sequences. An article, "Northern California Radio Group Gets Classic Radio Station," by Mike Adams, in the August issue of *Antique Radio Classified* details the CHRS restoration effort.—*some information provided by Bart Lee, KV6LEE, and Antique Radio Classified*

● **IEEE honors Tony England, WØORE:** The Institute of Electrical and Electronics Engineers has honored former NASA astronaut Tony England, WØORE, with its 2004 Judith A. Resnik Award. The IEEE recognized England for "significant contributions to the development and application of spaceborne microwave radiometry to remote sensing." The award was named in memory of IEEE member Judith Resnik, an engineer and a NASA mission specialist who died in the 1986 shuttle *Challenger* disaster. England was the second astronaut to operate ham radio from space (the first was Owen Garriott, W5LFL), and he was a mission specialist aboard the *Challenger* in 1985. England promoted using the acronym SAREX for the Shuttle (later Space) Amateur Radio EXperiment program and using SAREX to interest youngsters in science and Amateur Radio. (SAREX now is the Amateur Radio on the International Space Station—or ARISS—program.) An Amateur Extra licensee, England is an electrical engineer and computer scientist, and a professor of atmospheric, oceanic and space sciences at the University of Michigan. England and Garriott were co-winners of the 2002 Dayton Hamvention Special Achievement Award.—*ARISS*

● **William Fanckboner, W9INN, SK:** William E. "Bill" Fanckboner, W9INN, of Mt Prospect, Illinois—the proprietor of W9INN Antennas—died July 30. He was 80. W9INN Antennas will die with him. "He did all of the work by himself, so it is effectively out of business," said his daughter, Robin Randall. "He *was* the business." An ARRL member and supporter, Fanckboner turned his talents for radio and electronics into W9INN Antennas some three decades ago after working for Motorola, and he was a regular *QST* advertiser. Fanckboner designed and hand-built his antennas and, his daughter says, he was working full time until a week prior to his death. Fanckboner enjoyed a reputation within the amateur community for skilled workmanship and a friendly, helpful manner. A memorial service was held August 9. The family has invited memorial donations to the American Cancer Society.

● **Alexanderson SAQ station placed on UNESCO World Heritage List:** Varberg Radio SAQ at Grimeton, Sweden, has been added to the United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage List. The only remaining pre-electronic transmitter for transatlantic work, SAQ is maintained in perfect working order. On 2004 Alexanderson Day July 4, the 80-year-old 200 kW Alexanderson alternator—with its multiple-tuned antenna—transmitted a celebration message on 17.2 kHz. The message was copied in Europe and on the East Coast of the US. Return channels included Amateur Radio station SA6Q at the Grimeton site and the Internet. UNESCO said the 1920s-vintage Varberg radio station in southern Sweden is an exceptionally well-preserved monument to early transatlantic wireless communication. The site includes the transmitter equipment and its associated antenna system, comprised of six 127-meter (approximately 417 foot) steel towers and staff housing. There's more information on the SAQ Web site, **www.alexander.n.se/**.—*Carl Henrik Walde, SM5BF*

following the unexpected and untimely death of Jim Maxwell, W6CF. Vice Director Andy Oppel, N6AJO, of Alameda, California, also is running unopposed. He was appointed in 2003 to replace Vallio.

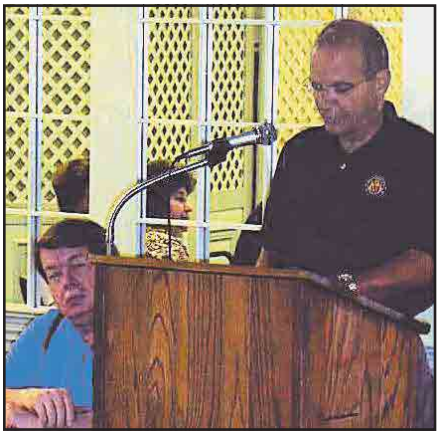
In the West Gulf Division, Director Coy C. Day, N5OK, of Union City, Oklahoma, has no opposition for a new term. Vice Director Dr David Woolweaver, K5RAV, of Harlingen, Texas, faces a challenge from Doug Loughmiller, W5BL (ex-KO5I and W5DAL), of McKinney, Texas. A past AMSAT-NA Board chairman and the author of more than a dozen *QST* and *QEX* articles on amateur satellites, Loughmiller's interests include VHF-UHF work, moonbounce and low-power operating.

Ballots in contested seats will be mailed by October 1 to all full ARRL members in good standing in a division as of September 10 and will be counted November 19 at ARRL Headquarters. Three-year terms for successful candidates begin January 1, 2005.

VECs DISCUSS QUESTION POOLS, RESTRUCTURING

The size, scope and comprehension level of Amateur Radio examination questions occupied much of the discussion as 11 of the nation's 14 Volunteer Examiner coordinators gathered July 23 in Gettysburg, Pennsylvania. But those attending the National Conference of Volunteer Examiner Coordinators (NCVEC) annual meeting reached no firm conclusions as they await FCC action on Amateur Radio restructuring. The FCC's Bill Cross, W3TN, told the VECs that the Commission—with help from some law school interns—is reviewing the approximately 6000 comments filed on 18 petitions addressing the Morse code as an exam element and Amateur Radio restructuring. Cross informed the VECs that a decision on restructuring or the Morse code issue is not imminent.

BART JAHNKE, W9JJ



FCC Special Counsel for Enforcement Riley Hollingsworth addresses the NCVEC conference. NCVEC Vice Chairman Jim Wiley, KL7CC, is at the left.

"He indicated that some time will be necessary to review all the comments to glean some consensus on the number of license classes, whether or not to retain Morse code as a licensing requirement for HF operation, the proposed auto-upgrading of certain license classes and what to call any new beginner's license," said ARRL VEC Manager Bart Jahnke, W9JJ.

FCC Special Counsel for Enforcement Riley Hollingsworth told the VECs he was "really aggravated" to still be dealing with enforcement issues resulting from several 1999 examination sessions in Yucaipa, California "where VEs apparently sold licenses." The situation occurred, Hollingsworth said, because "VEC management was asleep at the wheel."

"It was a failure of imagination—a failure to think on the part of the manager about what he was there for in the first place," said Hollingsworth—borrowing a phrase from this summer's 9/11 Commission report. In the Yucaipa case, he said, several volunteer examiners signed off on 250 examinations in a 26-month period. Following a 2000 FCC audit into exam sessions in Puerto Rico, Hollingsworth said, the FCC recalled 100 applicants for retesting, and only one showed up. Although Hollingsworth did not identify the VEC, both the Yucaipa and Puerto Rico cases involved the W5YI VEC, which referred the California exam session irregularities to the FCC after investigating on its own. After irregularities came to light in Puerto Rico, the W5YI VEC discontinued the services of all its Puerto Rico VEs, except those associated with the Arecibo Observatory Amateur Radio Club.

"I can tell you that so far I have been a fan of the VEC program," Hollingsworth said. "But if we have one more case of the magnitude of the Puerto Rico or Yucaipa cases, that's going to change fast." He pointed out that the FCC does not have to accept the services of any given VEC, and he said if any VECs are uncomfortable with taking responsibility for oversight, following up and random reviews of their test sessions, they can stop being VECs.

"You have an obligation to remain awake at the wheel, and the point is not how fast or easily you can do your job, but how well you can do it." He said today's applicants will determine the character of the Amateur Radio Service in the future. "If your own VEs are running a license factory right in front of you, we are going to hold you responsible."

Hollingsworth concluded by saying that he expects the VECs to "add integrity to the process" and be vigilant to avoid future embarrassments and problems.

SECTION MANAGER ELECTION NOTICE

To all members in the ARRL Arizona, Arkansas, Iowa, Kentucky, Mississippi, Montana, North Texas, Orange and Wyoming 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. We suggest the following format:

(Place and Date)

Field & Educational Services Manager
ARRL
225 Main St
Newington, CT 06111

We, the undersigned full members of the _____ ARRL Section in the _____ Division, hereby nominate _____ as candidate for Section Manager for 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, a licensed amateur 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 petition for nomination. Petitions must be received at Headquarters by 4 PM Eastern Time on December 10, 2004. Whenever more than one member is nominated in a single section, ballots will be mailed from Headquarters on or before January 3, 2005, to full members of record as of December 10, 2004, which is the closing date for nominations. Returns will be counted February 22, 2005. Section Managers elected as a result of the above procedure will take office April 1, 2005. If only one valid petition is received from a section, that nominee shall be declared elected without opposition for a two-year term beginning April 1, 2005. If *no* petitions are received from a section by the specified closing date, such section will be resolicited in the April 2005 *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 Field & Educational Services Manager. You are urged to take the initiative and file a nomination petition immediately.—*Rosalie White, K1STO, Field & Educational Services Manager*

REPEAT NOMINATING SOLICITATION

Since no petitions were received for the Puerto Rico Section Manager election by the repeat nomination deadline of June 4, 2004, nominations are hereby resolicited. See above for details on how to nominate.

Central Florida Hams Support Triathlon

By Norm Lauterette, WA4HYJ

It was only fitting that on May 23, the newest North America segment of the most grueling and inspiring sporting event in the world be held at the premier tourist attraction in Orlando, Florida's Walt Disney World Resort. It was also fitting and an honor that the Florida Half Triathlon staff, looking for that extra margin of safety, requested the communication services of local Amateur Radio operators. DEARS (Disney Emergency Amateur Radio Service) along with Orange and Seminole County ARES and the Lake Monroe Amateur Radio Society (LMARS) responded with united support. Mike Welch, KF4HFC, who is LMARS president and ARRL Public Information Coordinator for Northern Florida, and Norm Lauterette, WA4HYJ, Public Information Officer, Seminole County, doubled as media representatives for ARRL. Jay Underwood, WB4WYJ, DEARS president at Disney, provided their repeater for Net Control operations.

The Florida Ironman Half Triathlon at Disney features a 1.2 mile swim course, a 56 mile bike course and a 13.1 mile run course. This is half the distance of the US Championship Triathlon held in Lake Placid, New York, and the World Championship held in Kona, Hawaii.

Ironman Background

Ironman celebrated its 25th year of competition in 2003, and currently holds 16 sanctioned races worldwide. More than 20,000 athletes competed last year. Of those, over 12,000 competed in North American-held events. All US athletes who qualify at the Florida Half Triathlon and other North American races qualify for the US National Championship scheduled for November. The 2004 Florida Half Triathlon at Disney had close to 2400 registered. It all started in Hawaii 26 years ago when Navy Commander John Collins settled a Navy Seal discussion about who were the fittest athletes in the world, swimmers, cyclists or runners? He decided the only way to know was to do all events at once and find out. "Whoever finishes first will be called the Ironman," Collins said.

Pre-Event Preparations

Our Amateur Radio planning team, Steve Harvard, N4VSP; Jay Underwood, WB4WYJ; Mike Welch, KF4HFC; Mike Devine, KF4LTF; Bob Mahon, KG4HBO, and Norm Lauterette, WA4HYJ, attended the May 12 Volunteer Captain Planning Meeting in Clermont, Florida. We reviewed the courses, checkpoint positions and race schedules, and developed our action plan. Net Control was changed from a Disney Fort Wilderness cabin to a tent near the start and finish lines next to the medical tent.

Field operators were positioned at aid and medical stations along the routes and in sag wagons patrolling the course. We were impressed with the staff's supportive attitude and appreciation for our services. We were part of their team and an important organized segment of their communication and safety operation.

The top three women in the triathlon celebrate at the finish line. Left to right: Lisa Bentley, Heather Gollneck and Heather Fuhr.

Bob Mahon, KG4HBO (standing), Jay Underwood, WB4WYJ (seated on left) and Mike Devine, KF4LTF, handle the net control duties.

Race Day Set-up

The Seminole County group met at a planned rendezvous point at 4 AM and caravanned to Disney. We stayed together due to justifiable concerns about finding the correct open Disney gate at that early hour and our assigned parking areas. Our vehicles were packed with radio equipment for the 6 AM Net Control set-up deadline. The other ARES groups had their own travel plans and obstacles to overcome to get to their assigned locations.

Amateur support was only required for coverage of the bike and run segments. Staff members and lifeguards in an assortment of watercraft were stationed along the entire course and monitored for safety of over 2000 swimmers. This first leg of the Triathlon started at 6:40 AM with professionals starting first then followed by amateur swimmers arranged by age in time-separated wave groups.

Race Day Support

We set up the NCS with time to spare. Once we got past the normal start-up confusion, Mike, KC4LTF, and Bob, KG4HBO, fired up the NCS and supported field team members trying to find their race locations. Alphanumeric tactical calls consisting of Alpha, Bravo and Charlie were assigned. A total of 42 hams were assigned positions and four APRS stations were field active with one at the NCS. Medical concerns were high with a forecasted temperature of 91° with a heat index of 101°.

The lead professional swimmers reached the swim/bike transition area around 7:15 AM and our Alpha team lead vehicle operator Art, NE4QGV, took the lead with APRS on board. Staff members monitoring at net control were amazed as they watched the lead biker's exact location progress along the course on our laptop computer APRS screen with the average speed of the lead biker shown. All aid stations and sag wagons reported biker progress and situations along the course. Large gaps developed as professionals separated from the amateur groups and their original spacing.

After the lead professional bikers went through the bike/runner transition area, our Bravo team took over and followed a similar communication plan as Alpha. Medical situations started to pop up

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

around 11:30 AM. Amateur Radio again proved its value as real-time medical support needs flowed into net control from aid stations and relayed to medical for unit dispatching.

The first three professionals in the men's category crossed the finish line in under 4 hours. The winner was Simon Lessing from Boulder, Colorado, who clocked in at 3:52:08. Following Simon was Chris Lieto from Denville, California, and Michael Lovato, also from Boulder. In the professional women's category, the first three were Lisa Bentley from Canada, Heather Gollneck from Hartsford, Wisconsin, and Heather Fuhr from Canada. The remaining men and women professionals all finished around 11 AM. The amateur contestants were spread way out, and the afternoon heat took its toll. More than 2000 athletes completed the course before the 4 PM deadline. Those still on the course were driven in with Bravo team units following and doing a final sweep.

Support Recap

I was very proud of our communication performance as a multi-county ARES and club team. We worked together very well and the radio skills of the entire group were exceptional, a tribute to their excellent training. We performed like professionals and received praise from various staff members throughout the day.

MULTIPLE INCIDENT COMMAND DRILL

By Karen Weinstock, KC8WSZ, Shelby County ARES AEC/SKYWARN Coordinator

Members of the Auglaize, Mercer and Shelby County (Ohio) ARES teams participated in a mind-boggling Multiple Incident Command Drill June 12 with Shelby County Emergency Response Teams, State and Federal Agencies, the local Hospital, the Red Cross and CSX Transportation. The story line for the drill was amazing, but not out of the realm of possibilities. A Shelby County community is evacuated due to a hazardous materials plume that was moving toward the town. The hazardous materials were released by a terrorist-derailed CSX train car. In a hurry to get the evacuees out of the area, a school bus overturns causing many onboard injures.

Mike Martz, the Assistance Chief for the Perry-Port-Salem Rescue and EMS Commander for the school bus accident could not say enough about the ARES teams for their work during the emergency exercise. "I was faced with a total of 29 patients that needed extricated, triaged, treated and transported. I immediately asked for help from the ARES group, and they provided me two operators. One I kept with me (Nick Sabo, KC8CFI), and one I placed inside our mass casualty supply trailer (Tim Siegel, KC8OIG)."

Sabo acted as Martz's scribe during the drill; and relayed inquiries and details from the scene to the ARES team at the nearest hospital. "I was able to get information about which squads were at the hospital, en route, etc, without ever having to tie up the emergency frequencies," cited Martz. Tim Siegel, KC8OIG, kept busy in the mass-causality supply trailer handing out the medical supplies, documenting what items were requested, and communicated with Martz about the inventory levels of medical supplies.

ARES members were located through out the county, and assisted in the communication needs at the train derailment/HazMat incident scene, the Red Cross shelter, command center, and sheriff's department. Like Mike Martz, the different served agencies expressed praises during the debriefing sessions towards the ARES members, and noted that they were impressed with the actions, skills, and professionalism shown by the ARES teams during the exercise.

Field Organization Reports

Compiled by Linda Mullally, KB1HSV

Public Service Honor Roll July 2004

This listing is to recognize radio amateurs whose public service performance during the month indicted qualifies for 70 or more total points in the following 6 categories (as reported to their Section Managers). Please note the maximum points for each category:
1) Participating in a public service net, using any mode. —1 point per net session; maximum 40.
2) Handling formal messages (radiograms) via any mode. —1 point for each message handled; maximum 40.
3) Serving in an ARRL-sponsored volunteer position: ARRL Field Organization appointee or Section Manager, NTS Net Manager, TCC Director, TCC member, NTS official or appointee above the Section level. —10 points for each position; maximum 30.
4) Participation in scheduled short-term public service events such as walk-a-thons, bike-a-thons, parades, simulated emergency tests and related practice events. This includes off-the-air meetings and coordination efforts with related emergency groups and served agencies. —5 points per hour (or any portion thereof) of time spent in either coordinating and/or operating in the public service event; no limit.
5) Participation in an unplanned emergency response when the Amateur Radio operator is on the scene. This also includes unplanned incident requests by public or served agencies for Amateur Radio participation. —5 points per hour (or any portion thereof) of time spent directly involved in the emergency operation; no limit.
6) Providing and maintaining a) an automated digital system that handles ARRL radiogram-formatted messages; b) a Web page or e-mail list server oriented toward Amateur Radio public service —10 points per item.

Amateur Radio stations that qualify for PSHR 12 consecutive months, or 18 out of a 24- month period, will be awarded a certificate from Headquarters upon written notification of qualifying months to the Public Service Branch of Field and Educational Services at ARRL HQ.

710
W1GMF
520
W7TVA
500
N2LTC
490
N1LKJ
450
KC1ML
400
AB2IZ
370
N2YJZ
361
W2MTA
352
KA2ZNZ
350
KZ7T
338
KD1SM
335
WA2YBM
330
KB2DQ
W7ARC
315
KC2MBC
296
KA0O
282
K7EAJ
269
KB2ETO
265
W1PLW
240
KB2KOJ
W2LC
N2YBB
235
KB2CCD
KK3F
230
KA2GJV
219
K9JPS
211
NN2H
209
WA1QAA
205
WB2ZCM
200
KB2SNP
N8IO
AC5XK
195
KA0DBK
190
K2AN
WI2G
WA9ZTY
W2FPG
183
N2HQL
175
K2MPE
KC2MQU
N2QZ
172
K2ABX
170
KA9RZL
WB1CHU
164
KB3GFC
160
K8AE
153
KB5ILY
150
KC2IYC
N2JBA
145
N1IST
WB7WOW
140
KA2BCE
K1YCQ
KA2YKN
WA2YL
KC2HUV
K7BFL
WB5ZED
139
WB6UZX
138
NN7H
135
AA8SN
AA3SB
W3YVQ
132
KD5ONS
130
K9FHI
K9LGU
KD1LE
WX4J
KA5KLU
W4EAT
VE3EUI
129
W5OMG
128
KB0DTI
126
KO4SY
125
KK7TN
N3RB
W2DWR
AK4EA
W8MMN
KG4OQA
WA9JWL
124
KB5JBV
120
WA2GUP
N5IKN
AG9G
K2UL
AI4DV
N5OUJ
K5DPG
K4BEH
K4IWW
AD4XV
W4DAC
K6YR
119
N2JRS
118
W5PY
115
WB8RCR
N2AKZ
114
KB1HDO
112
WB2KNS
110
KC5OZT
KD4CQJ
WA5OUV
KB9KEG
W9BHL
N2JWW
N1IQI
N7CM
N7YSS
N3SW
KD4GR
KA4FZI
N7EIE
W7QM
N2GJ
W7GB
W6QZ
K0IBS
W3BBQ
W5IM
KD5TXD
NF5B
K5MC
AF4NS
AD5IS
KE4JHJ
W0UCE
108
KC8VOA
107
KC2MHI
105
WX4H
W4LN
KI0BK
104
W5JYJ
103
W5CU
K3JL
100
KB5TCH
WB2QIX
W4ZJY
KK5GY
W9CBE
WA4EIC
KA4UIV
WN0Y
W8IM
NR2F
WA2WMJ
W7GHT
WD8DHC
WA8SSI
KG4OTL
N5SIG
W5XX
N1VXP
KC2GOW
KB2KLH
AB0UY
99
KD4GBA
97
N2OPJ
K8CQF
95
W3ZQN
KJ7SI
WG8Z
93
W4FAL
91
AF2K
W4DGH
KD6YJB
90
KG2D
WB2IJH
N7DRP
KC7SGM
W3TWV
W7ZIW
N9MN
K1JPG
KF4WIJ
K2BCL
K2GW
WA2CUW
N8IY
KA8WNO
WD8Q
K3CN
WB4GGS
K4FUM
W4WXA
K4BG
WD4LSS
KA1GWE
KA1RMV
W2DSX
AA3GV
N3WK
N3OR
89
N1TPU
W2CC
88
W8CPG
K3SS
K5HHS
W3NJ
KF6OIF
87
KO4OL
86
KB8NDS
K8VFZ
85
N1LAH
KG4CHW
84
W7DPW
W5UYH
AC5VN
W9NXC
83
W6ZOH
AI4JW
K3IN
82
N8FXH
81
W5GKH
K4WKT
80
NV5D
W4NTI
KL7OR
KD7ZLF
N3OZP
AB7AN
K7MQF
W2MTO
K7GXZ
AA4YW
AA8PI
K8KV
WA0LYK
N3ZOC
79
AB1AV
KA4LRM
78
K2YYF
AA4BN
77
AE5V
76
W1ALE
WB4BIK
74
WA1JVV
73
KC6SKK
WB4UHC
N1UAN
W3CB
72
N4VVX
AL7N
K8ZJU
71
N2VDK
N2VQA
AD4BL
AC5SU
70
K8SH
N1JX
W4DLZ
KC8BTE
KC6NBI

The following stations qualified for PSHR in previous months, but were not recognized in this column: (June) KA9OIL 154, W3YVQ 130, W4LN 105, WB9USI 81.

Section Traffic Manager Reports July 2004

The following ARRL Section Traffic Managers reported: AK, AL, AR, CT, DE, EB, EMA, ENY, EPA, EWA, GA, ID, IL, IN, KS, KY, LA, MDC, MI, MO, MS, NC, NFL, NH, NLI, NNJ, NNY, OH, OK, OR, ORG, SB, SC, SD, SDG, SFL, SJV, SNJ, STX, TN, VA, VT, WI, WMA, WV.

Section Emergency Coordinator Reports July 2004

The following ARRL Section Emergency Coordinators reported: AK, AR, AZ, CO, ENY, EWA, GA, IN, KS, KY, LA, NC, NE, NFL, NLI, NNJ, SD, SFL, SJV, SNJ, STX, SV, VA, VT, WMA, WPA, WWA, WTX.

Brass Pounders League July 2004

The BPL is open to all amateurs in the US, Canada and US possessions who report to their SMs a total of 500 points or a sum of 100 or more origination and delivery points for any calendar month. All messages must be handled on amateur frequencies within 48 hours of receipt in standard ARRL radiogram format.

Call	*Orig*	*Rcvd*	*Sent*	*Dlvd*	*Total*
KK3F	33	1644	1550	54	3281
W4EAT	0	1235	1222	0	2457
KA5KLU	0	847	1006	29	1882
KW1U	0	931	836	3	1770
N2LTC	0	786	778	29	1593
N1IQI	0	300	1274	0	1574
WB5ZED	48	726	633	44	1451
W1GMF	0	71	1268	19	1358
WX4H	0	602	721	12	1335
K9JPS	0	634	32	606	1272
AK6DV	0	767	442	1	1210
K7BDU	21	531	566	8	1126
W4DAC	7	422	583	10	1022
W7QM	6	439	357	10	812
KW4WIJ	0	385	385	24	792
W4ZJY	0	398	326	0	724
K7BFL	0	360	359	0	719

BPL for 100 or more originations plus deliveries: WB5NKD 225, N5IKN 216, KK5GY 153, W9IHW 127, K2YYF 101.

The following station qualified for BPL in previous months, but was not recognized in this column: (June) AK6DV 800.

Mexico City Amateurs Celebrate World Amateur Radio Day with a Fiesta

Contributed by Carlos F. Narvaez, XE1FOX

While I was reading the April issue of *QST*, I came to realize that April 18 would be World Amateur Radio Day, commemorating the founding of the International Amateur Radio Union (IARU) in April 1925, in Paris, by a group of Amateur Radio visionaries. I was thinking that Amateur Radio has come a long way and this very special day should be as important to amateurs as the Fourth of July is to Americans or September 16 to Mexicans.

I immediately contacted my friend Carlos Sanchez, XE1III, President of the Asociacion de Radioaficionados del DF (ARDF) in order to share these thoughts and to propose that this very special date should not go unnoticed to Amateur Radio in Mexico City. Mexico takes pride in being a founding member and host of IARU Region 2 back in 1964.

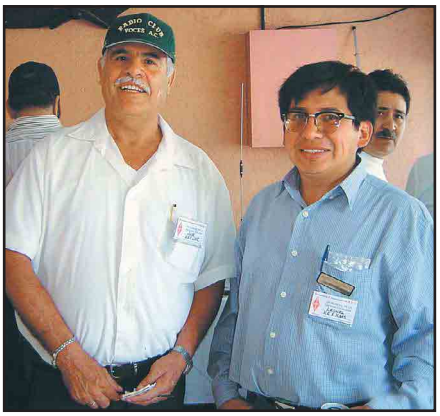
CHARLIE NARVAEZ, XE1FOX

The banner greeting attendees reads: "Radio Amateurs: Pioneers in bridging barriers to world understanding."

COURTESY ALBERTO MONTIEL, XE1APT

Charlie Narvaez, XE1FOX, and Carlos Sanchez, XE1III, the founding and current Presidents of the Asociacion de Radioaficionados del DF (ARDF).

COURTESY ALBERTO MONTIEL, XE1APT



Here are Jose Machorro, XE1JMC, President of Radio Club Voces, and Leo Santana, XE1XMS, President of Radiocomunicadores del DF.

So Carlos started contacting the Presidents of the five Amateur Radio clubs in Mexico City, all active members of ARDF. They are Radio Club Azteca (President: Eduardo Echeverria, XE1PE), Radiocomunicadores del DF (President: Leonel Santana, XE1XMS), Radio Club Internacional Azteca de Oro (President: Jesus Perez, XE1JB), Agrupacion Radio Ajusco (President: J. Marcelino Flores, XE1MFB) and Radio Club Voces (President: Jose Machorro, XE1JMC).

As you can imagine, we were all working to organize an event on short notice because it was only three weeks until April 18, and one of the weeks, right in-between, was Holy Week, a major holiday here in Mexico.

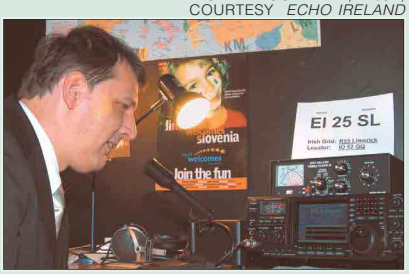
On Sunday, April 18, over 300 people—amateurs and their families from the five Mexico City clubs—showed up, as well as hams from neighboring states of Mexico, Puebla and Hidalgo. The day was bright and sunny. Additionally, a cake was cut to celebrate IARU's 79th birthday. A huge flea market was probably among the most visited parts of the Fiesta as well as a big raffle that included over 50 dual-band antennas, baseball caps, a walkie-talkie and a 2 meter mobile radio, all sponsored by our good friends at Syscom. Everybody left very happy. In future years, just in case you may want to join us, the Fiesta will be held on the third Sunday of April. Amateur Radio will be celebrated here in Mexico City! Salud and Viva IARU! *Hasta la vista amigos!*

Briefs

◊ ***RAC sends formal Morse testing proposal to Industry Canada:*** Radio Amateurs of Canada (RAC) has proposed formally that Industry Canada (IC) eliminate Morse code as a ham radio testing requirement for operation in bands below 30 MHz in Canada. RAC wants Industry Canada to continue to make Morse testing available to Canadian amateurs who wish to have that qualification specified on their certificate, however. At the same time, the RAC wants IC to require applicants for the Basic examination to score at least 80 percent before permitting operation below 30 MHz. "Achievement of at least 80 percent will lead to a new qualification to be called the Intermediate qualification," RAC said. Present Basic plus Morse holders would be considered as Intermediate holders under the proposal. Basic holders who have not passed the Morse exam would continue to hold that qualification with their existing operating privileges.

Under the RAC plan, current Basic-without-Morse licensees who retake the Basic examination and obtain at least 80 percent would get an upgrade to Intermediate. RAC also recommends that the passing grade for the Basic and Advanced examinations be raised to 70 percent when the Morse requirement is dropped. Anyone holding both the Basic and Advanced qualifications would have HF privileges, and the Intermediate qualification or Basic plus Morse would become a prerequisite to obtaining the Advanced. The RAC also wants IC to create a new entry-level qualification "designed to ensure good operating practices and requiring only an introductory level of theory." RAC President Daniel Lamoureux, VE2KA, says Canadian amateurs can anticipate implementation of a first phase of the RAC recommendations by year's end. Complete details of the proposals are available on the RAC Web site (**www.rac.ca**).

RICHARD CULLINAN, EI8JE, COURTESY *ECHO IRELAND*



Radio amateurs in Ireland enjoyed having Mr Anton Rop, Prime Minister of Slovenia visiting EI25SL during celebrations commemorating the enlargement of the European Union. Here, Prime Minister Rop is shown speaking with fellow countryman Ivan, S51DI, from the special event station EI25SL, set up by the Limerick Amateur Radio Club, in Limerick City for the European enlargement celebrations on May 2, 2004. QST

THE WORLD ABOVE 50 MHZ

50 MHz Fireworks in July: A Week to Remember—*Part 1*

As we rolled into July 2004 we faced one of the poorer E-skip seasons in recent years. Nothing had happened in April, not a whole lot in May and the height of the E_s season in June had been disappointing to say the least. DX was relatively scarce, even single hop contacts on 6 meters had not been plentiful and I had heard of only a single E_s contact on 2 meters. So it remained until the week of July 4th when the propagation gods declared their independence from the doldrums and ushered in one of the most remarkable weeks in the history of sporadic E. Before it was over we had experienced what may have been the longest and most widespread E_s opening in the recorded history of 2 meters in the US and more stations made 222 MHz E_s contacts in a single hour than had been made in the history of 222 MHz up till that time.

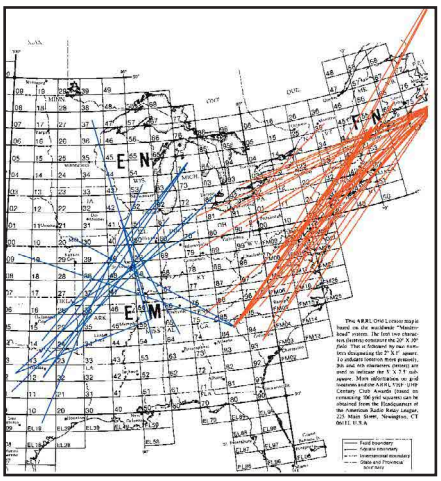


Figure 1—July 5, 2004 2 M E_s. Blue lines—01-03Z opening. Red lines—20-22Z opening.

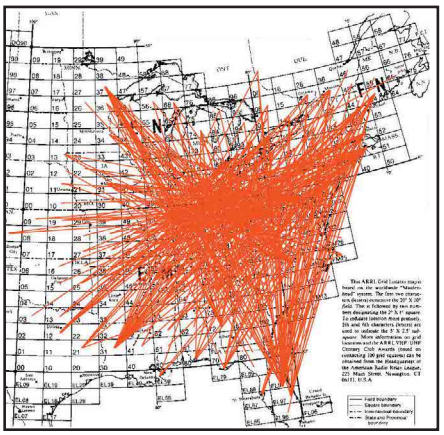


Figure 2—July 6-7, 2004 2 M E_s. Opening of 1515-1555Z from FL to the northeast was repeated during the opening of 2115-0100Z. Note the extreme density of contacts and the wide reflecting zone from EM59-99.

July 5. The festivities began with a one-two punch on July 5. Between 0110 and 0310Z (Figure 1—blue lines), stations primarily in the midwest and southwest enjoyed the first real E_s of the 2004 in the US. The opening ranged from EM01 to the southwest, EL19 to the south, EM84 to the southeast, EN90 to the northeast, EN37 to the north and EM09 to the west. The map shows the cloud to be located roughly around northeastern MO and central IL. My sources are Gary KE8FD (EM84) and the propagation logger at **dxworld.com/144prop. html**. Note from the map that Gary is the only report of E/W propagation; none appears on the prop logger. Was there anyone else seeing that?

The following morning between 1925 and 2205Z, the cloud re-formed, this time supporting a rare opening between the eastern seaboard and the Canadian Maritime provinces and very northern New England (Figure 1—red lines). I am indebted to VE1MR, K4RTS, KE8FD, W8WN and the propagation logger for the information indicated in red in Figure 1. The reflection center appeared to be around the NY/NJ border and this opening was notable for the participation of stations in the far northeast—VO1TJM (GN08) in Nova Scotia and VE1MR, VE1ALQ and VE1CSN in New Brunswick. Contacts extended from as far south as EM84/93, west to EN71 and north to EN92 and as far northeast up the coast as FN20 on the southwestward side.

July 6—2 meters. The next day was truly amazing. I am indebted to 77(!) reporters for the data in this section: AA3ID, AF4HX, AF4O, KØAWU, K1JT, K1OYB, K1TEO, K1TR, K2AXX, K2DRH, K2MF, K2SMN, K4MM, K4QXX, K4RTS, K5MQ, K5QE, K5SW, K9KJM, K9VHF, KA4KOE, KC4PX, KE8FD, KF4DVG, KMØT, KT4JA, KY1K, NØDQS, NØGZ, NØJK, NØLL, NØRQ, NØUK, N2BE, N2SLN/M, N3JPU, N4IS, N4LI, N4XD, N5TF, N8PUM, N9LR, NG4C, NW5E, VA2TOS, VA3SW, VE2DCP, VE2JWH, VE3AX, VE3DSS, VE3FGU, VE3HLS, VE3KKL, VE3SMA, WØGHZ, WØJRP, W1AIM, W1GHZ, W1JR, W3EKT, W3EP, W3WOR, W4UDH, W4VC, W5SNX, W6OAL, W8WN, W9FW, W9GKA, WA1ECF, WA1PBR, WA3LTB, WA4YRK, WA5JCI, WA8RJF, WB4WXE, WZ1V.

This Month

October 6	432 MHz Fall Sprint from 7 PM to 11 PM local time
October 9	Western States Weak Signal Society technical conference
October 9-10	2004 ARRL International EME Contest 50-1296 MHz
October 10	Good EME conditions*
October 15-16	Microwave Update
October 16	Microwave (902 and up) Fall Sprint from 6 AM to 1 PM local time
October 23-24	50 MHz Fall Sprint from 23Z Oct 23 to 03Z Oct 24
October 24	Good EME conditions
October 30-31	2004 ARRL International EME Contest 2304 MHz and Up

*Moon data from W5LUU

How good was it? Listen to these comments: Mind boggling!—WZ1V. What a wild ride—AF4O. Had a blast!—KF4DVG. Wowww! It was like 20 meters!—KU4WW. And from a respondent who will remain anonymous: "My wife told me that she could be dancing naked in front of me and I would not notice."

You can see the extent and the density of the opening in Figure 2. A short opening occurred between 1515 and 1555Z in the morning between Florida and the northeast up through Ontario and Quebec (FN35 the farthest north). Starting around 2115Z and extending until after 0100Z July 7 almost the entire eastern and central US was wide open including the paths covered in the morning. Interestingly the band seemed to open and close almost everywhere except right underneath the center of reflection at roughly the same time. A broad reflection zone—or series of zones—was established from EM59 to EM99, a region that is essentially completely colored in. Both N/S and E/W contacts were found in profusion. A secondary layer around the VA/NC border supported contacts along the Eastern seaboard. The western limits of the opening appeared to be the Dallas area and EM21. Neither stations in more western Texas (EM00 and DM80 were checked) nor stations in CO (thanks W6OAL/Ø) made any contacts that I am aware of. EL96 appeared to be the southward limit. Northeastward the opening extended to FN55 but appar-

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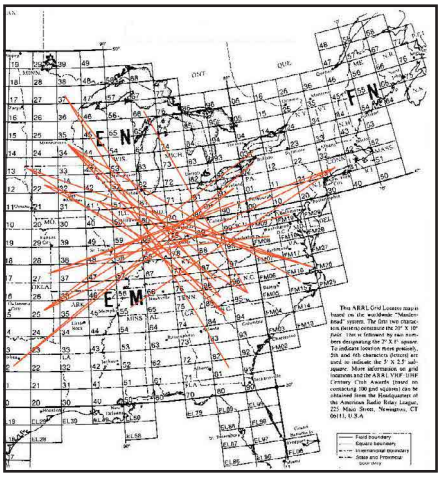


Figure 3—July 6, 2004 222 MHz E_S. The largest 222 MHz E_S opening in history from 2252-2328Z.

Table 1
Longest and Shortest Contacts During the E_S Opening of July 6
MUF via G7RAU MUF Calculator (see text).

Longest contacts (Stations)	*Distance (km/mi)*
K5QE (EM31di)—KY1K (FN54il)	2578/1602
N5TIF (EM12hk)—KU2A (FN42dw)	2532/1573
K5MQ (EM31wq)—KY1K (FN54il)	2442/1517
NØRQ (EM13rg)—W1AIM (FN34uj)	2427/1508
KC5POV (EM13rg)—W1AIM (FN34uj)	2427/1508

Shortest contacts (Stations)	*Distance (km/mi)*	*MUF (MHz)*
WA8RJF (EN91iq)—K4TO (EM77wx)	478/296	338
W3KWH (EN90wj)—N4XD (FM05qr)	534/332	311
K2DRH (EN41vr)—WA8THK (EN82bv)	538/334	310
KC4PX (EL98qg)—K4GMP (FM14cg)	718/446	248
N4SQV (EM78fe)—W3ZZ (FM19jd)	732/455	245

ently not the Canadian Maritimes and northward it included VE2HOG in FN07. The western limits appeared to be EN37, EN13 and EM09. In sheer volume, this had to be the biggest E_s opening ever in the US. Many stations made dozens to hundreds of contacts with some approaching 50 grids worked. In the 23 years since I returned to VHF I have never heard so many stations at one time on 2 meters. Conditions were so good that several reported multiple E_s contacts on FM simplex and repeaters.

The longest and shortest contacts I was able to find in this opening are displayed in Table 1. Marshall, K5QE, and Art, KY1K, and his wife Barb, NK1I, win the prize for the longest actual contact—2578 km which is considerably beyond the normal single hop distance, ~2330 km. The shortest contacts are actually just as interesting as they indicate the state of E layer ionization. In this case, the WA8RJF to K4TO path at 478 km means that the MUF at the midpoint between EN91 and EM77 was 338 MHz according to the G7RAU MUF calculator found at **g7rau.demon.co.uk/muf/default.asp**. Thus, the E layer was both ionized to an unusually high degree and the geometry supported unusually long distances if indeed these were actually some form of single hop contacts. Most interesting was the contact that wasn't. At about 2230Z Gene NØDQS (EN22fd) heard and was heard by Ed VP9GE but no two way contact was confirmed.

July 6—222 MHz. When the 2 meter E_s shortens to well under 1000 km and the band is open to widely spread areas, everyone starts to think of 222 MHz. Prior to July 6, the number of 222 MHz E_s openings could almost be counted on the fingers of one hand and the number of stations who had ever made a 222 MHz contact numbered less than two dozen. That exclusive club has now more than doubled. My deepest thanks to those who sent me reports: AF4HX, K1TEO, K2DRH, K4RTS, K5SW, KE8FD, KMØT, NØLL, N8PUM, N8PUM, N9LR, NG4C, VE3AX, WØGHZ, WØJRP, W4VC, WA8RJF, WZ1V and the 220 MHz Propagation Logger.

Many stations including yours truly kept checking 222 all during the 2 meter opening. Finally at 2252Z WZ1V (FN31) apparently made the first contact—with WØJRP (EM27) and we were off on the greatest 222 MHz opening in history. During the next half hour until 2328Z as many as four dozen or more 222 MHz contacts were made. The geographical extent was more limited by far than on 2 meters (see Figure 3) but the contact paths demonstrate an opening of substantial proportions. The opening extended southwest to K5UGM (EM12), west to NØLL (EM09—thanks for the tape Larry) and KMØT (EN13), north to KØAWU (EN37) and N8PUM (EN66), northeast to WZ1V and K1TEO (FN31), and southeast to W4VC (EM81).

I wish I had space to list each and every contact reported, but readers will have to do with a list of most of the fortunate individuals who made one or more contacts: AA4H, AF4HX, AG4V, KØAWU, KØJXI, K1TEO, K2AXX, K2DRH, K4RTS, K5SW, K5UGM, KBØPE, KMØT, KO4YC, NØDQS, NØKP, NØLIE, NØLL, N3LL, N8PUM, N9LR, NG4C, VE3AX, VE3DSS, WØGHZ, WØJRP, W2EV, W3KWH, W3OR, W3ZZ, W4DEX, W4VC, W4WA, W9UD, WA8RJF, WD4KPD, WZ1V.

July 9. The last major 2 meter E_s opening was almost as long as the one on July 6 but much more tantalizing, as signals were much more scattered geographically and ionization levels may have only fleetingly reached 222 MHz. It appears the first contact was between KAØPQW (EN33) and KT4JA (EL97) at 1439Z. Lots of long distance contacts were noted (see Table 2 for a sample) but not quite so far as the longest on June 6. The center of reflection was displaced to the west around EM77,76,75 with a secondary focus about 3 grids farther west supporting contacts from the southeast out to Colorado. This time the western edge was DM77/79, north to EN37, northeast to FN25 but not penetrating far into New England, south to EL96 and southwest to EL17 and EM00. This was a more typical 2 meter E_s opening—contacts generally proceeded at a slower rate and a particular station tended to stay in a given area for a shorter period. The opening ended a little before 1830Z.

July 11. From K2OVS and the propagation logger comes news of another short 2 meter E_s opening between 19-20Z mostly from the Midwest [EM44, 54, 55] to the east coast [FN30, 31] though a few heard reports (EM31-FN02, EM60-FN23) indicate that the center around EM98 was trying to expand the envelope.

Next month. A series of events of this magnitude deserve more thought than two pages can give them. This month we saw what happened. Next month we will discuss some of the fun things, how to spot these openings, some rumors and what almost happened and didn't happen and some possible mechanisms for long distance E_s contacts on 2 meters [and above—we should all live so long].

ON THE BANDS

The magic week of July 4 generated a lot of the most interesting 6 meter stuff and we were treated to a fairly large aurora that normally would have been the star of this month's reports.

6 meters. Two big expeditions were July highlights. Jimmy W6JKV departed Dominica on July 4 after 10 days operation with 1143 total QSOs and an amazing 542 in Europe and 52 countries. He was using 700 W to a 7 element M^2 on a 13 m boom from a location on a cliff overlooking the ocean. As someone said he turned a bad season into a good season. Meanwhile Mario K2ZD and Jim K4BI activated PJ7M

Dutch Sint Maarten from July 2-12.

Most of the magic band excitement occurred early in the month. July 3-6 was particularly good to the Mediterranean [5B, 7X, CN, CT, EH, EH8, G, CT2, CT3 and ZB] and Caribbean [PJ7, V4] as reported by east coasters WV1K, K3CHP, N3DB and W3EKT, and K4PI to the south. KØHA (EN10) made it to 5T5JN on the 6th. Smitty W4UDH (EM52) worked 5B4FL for #100 with 10 W. N3JPU (FM19) reports an opening further north into G and GI and G4UPS (IO91) report a reciprocal opening to New England. The 9th was the other really good day reported by K4PI (getting WAC), KE4WBO and K5XX, with contacts into 5B, 7X, CN, 5T, CT, CT3, EH6, 8 9, IT9 and PJ7. After a year with nothing new, I got 3 new countries in one day. VP9/WA4PGM was heard working multiple hops west to EN10 KØHA and CM88 K6QXY on July 11. Julio NP3CW reported big openings to the States on July 5, 7, 18, 26 and 31 and on 4 days to Europe especially on July 6.

The disturbances triggered some rare openings from Alaska to ME and CO in the summer—N1RAM (FN65) worked KL7NO on the 23rd and NL7Z and KL7HBK on the 25th, and KØJY (DM68) worked NL7ZW (BP71) on July 29. K6QXY (CM88) reports KL7 on both the 3rd and the 15th and that JA2DDN spotted K6FV/B (CM87) on July 12. N3DB reports some equally rare summertime TEP to LU1DMA and LU8DO on the 25th and the LU1DMA beacon on the 30th.

Tropospheric ducting. W5UWB (EL17) saw some enhancement to the northeast on July 4 to W7CNK (EM15) on 2 and 432. N5TIF (EM12) reached out to EM31,41,42 on the 3rd, DM73, EM34,41,44,45,56 on 2 and EM27,35 on 432, and DM73 on 2 and EM44 on the 5th. On the 28th NØJK operating portable from EM18 worked into EM49. Maybe August will be better.

Digital and EME. W5UWB notes a contact with AA9MY (EN50) on 222 MHz FSK441A with 25 W and his third different JT65B single Yagi to single Yagi EME contact on 2 meters with NJØU. Hamad A71AW details the first EME contact from the Persian Gulf between himself (100 W, 3 m dish) and HB9Q on December 13, 2003.

Aurora. Commencing on July 25 and extending until July 27, Sunspot 652 produced plenty of action. Coronal mass ejections produced A indices of 122 (25th) and 162 (27th) with corresponding Kp values of 8 and 9. The interplanetary magnetic field (Bz) was often pointed south, accentuating the effect of solar winds that reached in excess of 1000 km/s around 0200Z on the 27th. I am indebted to N1BUG, K2OVS, K3MF, N8PUM, NØJK and the 144 and 220 MHz Propagation Loggers for the following information.

The 2 meter opening was marked by extremely widespread activity ranging from VE1 (FN96) south to K5CM (EM25), WQ5W (EM12), west to DM04, northwest to VE7SL (CN89) and north to VE5LY (DO70). This Au had several interesting characteristics. Stations is the very northern regions who are often underneath the auroral curtain and thus do no participate well in major auroras were spared this time. Major performances were produced by N1BUG (FN55) KØAWU (EN37) N7EPD (CN87). The major penetration southward was from Texas to California. In fact the western US was as active as in any recent auroral event I have seen. KØGU (DN70) worked numerous stations both a long distance east, south and west of him. I saw many DM and DN stations listed on the prop loggers that I rarely see. The 27th marked another unusual feature, a strong morning aurora between 1000 and 1450Z. A southward Bz certainly helped this one and contacts were made from N1BUG (FN55) in the northeast westward to VE7SL.

Given the high K values one would have expected and got some excellent conditions on 222 MHz. Activity included the period from 2115Z July 25 0155Z July 26, returning around 0030Z till 0220Z on July 27 and then recommencing at 1040 until 1400Z for the morning aurora. In fact it appeared that the final morning aurora might have been the best session of all. N1BUG celebrated his new transmitter with a large number of contacts ranging from K8GUN (FM09) in the south to the likes of K9HMB (EN52) in the west. Again stations from the most northern regions dominated—KØAWU, N8PUM (EN66), WBØWAO (EN84), N7EPD, K2YAZ (EN74), for example. Western stations also had an unusual amount of success like W6OMF (CM98), K7XC (DM09) and N7CZ (DN47).

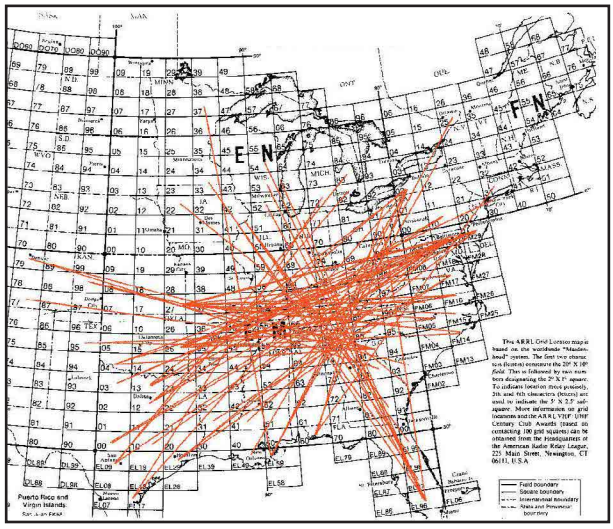


Figure 4—July 9, 2004 2 meter E_S. From 1440-1830Z.

Table 2
Longest Contacts During the E_S Opening of July 9

Longest contacts (Stations)	*Distance (km/mi)*
W3XO (EM00kd)—K2TXB (FM29pu)	2465/1531
W5UWB (EL17ax)—VE3ZX (FN02cw)	2330/1447
W3XO (EM00kd)—W3ZZ (FM19jd)	2236/1389
W5AK (EL29ft)—K2TXB (FM29pu)	2199/1367
W5AK (EL29ft)—AA2UK (FM29pn)	2186/1358

HERE AND THERE

2004 ARRL International EME Contest. This year is a new format for this moonbounce competition—three full 48 hour periods. From 0000Z Oct 9 to 2359Z Oct 10 is 50-1296 MHz. From 0000Z Oct 30 to 2359Z Oct 31 is 2304 MHz and up. The third period, the first weekend in Dec back on 50-1296 MHz, will be described in the December column. Multipliers are states, Canadian provinces and DXCC countries.

Fall Sprints. The Southeastern VHF Society sponsors this fine fall event on different days for different bands. Down East Microwave will again sponsor a participation award for the 222 and Microwave (902+) Sprints. Complete details can be found at **www.svhfs.org/fall_sprint_rules.htm**.

Western States Weak Signal Society (WSWSS). The WSWSS is celebrating its 10th anniversary. Organized in May 1994 at Ventura County, California, their 10th annual fall technical conference will be held October 9 in Fresno at the M^2 Antenna Systems facility. For more information or tickets, contact David, KI6FF, at 714 891-5752 or at **ki6ff@juno.com**.

Microwave Update (MUD). Sponsored by North Texas Microwave Society, this year's conference will be held in Dallas October 15-16. With many technical presentations and the always popular surplus tour, this is a fine way to take in the state of the microwave art. Further details may be found at **www.ntms.org/Update.htm**.

Six meter operating aids. Pat, W5OZI, writes to tell me of a fabulous new page on the SMIRK Web site, **www.smirk.org/opaids.htm**, which provides everything you ever wanted to know about the magic band and more. This long needed resource has band plans, beacons, operating tips, equipment, propagation (by K6QXY), the meaning of K/A indices (by K9LA) and a wealth of Internet links and information.

John Kraus, W8JK, SK. Internationally famous astronomer and antenna designer John Kraus, W8JK, passed away at the age of 94 on July 18. He was well known to hams for his W8JK bi-directional array, the corner reflector and the helix. His classic antenna textbook was the most authoritative in the field. Look up to the heavens and say farewell to one of the real giants.

Due the large amount of activity information this month, the 432 MHz standings will be published next month.

Correction

In the September column I should have ascribed the first 6 meter EME contact to the teams of K5WVX (now K5CM) and W5WAX (now K5SW), and W5SXD and WA5HNK (now W5HNK). My apologies to K5SW and W5HNK.

This One Almost Got Away

I want to start off this month by thanking my friend Ray Chase, KA2JQG, of Plainfield, New Jersey. Ray is a collector who regularly attends local and national auctions looking for radios. At one general household auction in New Jersey he won a homebrew transmitter that had few bidders. The following day he telephoned me to see if I was still planning to attend the Dunellen Hamfest on the next weekend, as he had something for me.

Since I had traveled to the hamfest the night before it started so I could get a good spot for my museum, I was already there when Ray pulled in the next morning. I went over to help him set up. Buried in the back of his van was a 2 foot high relay rack. To see it, we would have to dig out everything else first.

When we finally got to it, it was too heavy to move as one unit, so out came the panel screws and we removed the chassis one at a time and set them on the ground. It looked to be a very well made 2 meter VHF AM transmitter from the 1960s.

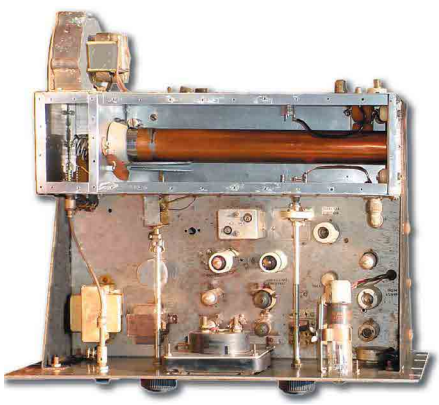
The early birds gathered around as we unloaded and Ray sold about half of his things right away. I was surprised that no one asked about the transmitter. Perhaps they thought I had already bought it.

For some reason I was in a negative mood that morning and suggested that Ray try to sell it, that someone would buy it just for the modulator. Ray tried to get me to change my mind, but I felt too lazy to carry it all the way across the field to my museum, probably because it was so heavy. Reluctantly Ray put a $40 price tag on it and I went looking around the fest.

I passed Ray two times that morning, and both times the transmitter was still there. Each time I stopped to look at it, remarking that I couldn't believe no one wanted it, especially at 40 bucks. Both times Ray told me to take it.

At 9 o'clock I opened the museum and for the next two hours I was pretty busy with visitors and friends stopping in. Shortly after 11, Ray stopped by and told me I had to take it, as he wasn't allowed to bring it home again. So I caved in and said okay. I packed up the museum and drove around the field to Ray's location and he helped me load it for the ride home.

The next day I opened the museum and set up a strong table next to it so I could examine the VHF transmitter more closely. The more I looked at it, the more I was impressed. After about a half hour, I came in the house and called Ray to thank him. I told him it was very well designed and was the most complex transmitter for its size I had ever seen. Everything on the front panels was perfectly symmetrical. It really looked good. So good in fact that I at first thought it might have been some manufacturer's prototype. Surely several engineers must have spent a lot of time working on the layout and the design to get it so perfect.



The Specs

It is a 2 meter transmitter, probably about 150-200 W with either a 4X50 or a 4CX250 in the final. It is capable of 100% AM plate modulation with a pair of 6146 tubes in the modulator. It also operates on CW, MCW, FM or on SSB with an external exciter. It is well metered with all the usual readings at every stage. Plus it has a built-in SWR circuit, a separate modulation meter and an FM deviation indicator. Frequency control is switched between five crystals or VFO input. It even has a spot switch for zero beating the transmitter frequency on the receiver.

The modulator unit controls on the combo mod-power supply unit are PHONE PATCH, MCW GAIN, MCW TONE, MIC GAIN, COMPRESSOR and MASTER GAIN.

There are separate input jacks for MICROPHONE, CW KEY, MCW KEY, PHONE PATCH, one external crystal and VFO. A TRANSMIT switch, MODE switch, an AM-CW switch and power ON-OFF switches round out the front panel controls.

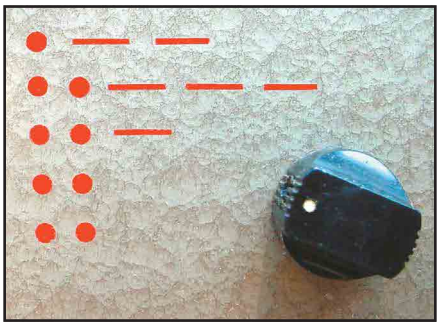
The rear of the transmitter chassis is even more interesting. There are jacks for connecting oscilloscopes, and controls to balance out the scope displays. The SSB input connector is there as well, and even a fast and slow blower switch is provided.

On the rear of the power supply there are a heavy-duty ground connector, three fuses and two auxiliary ac receptacles. The antenna relay jack and audio jacks are located there as well.

Who Built This?

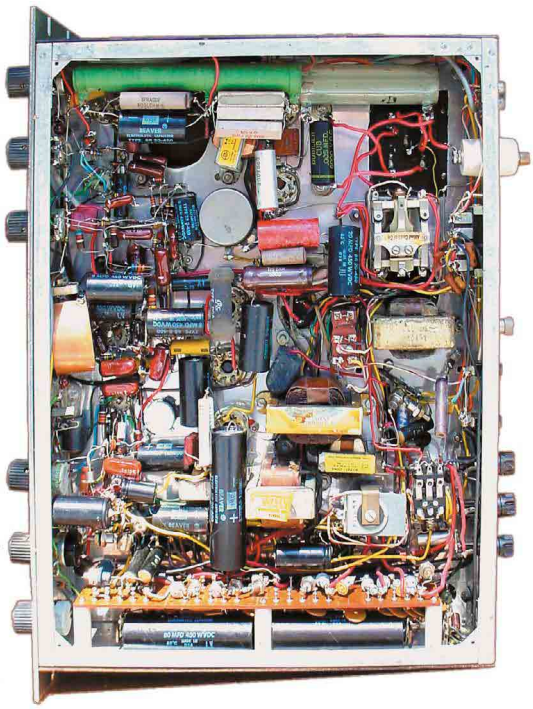
On the front of the transmitter, stenciled in red ink, are five letters in Morse code. They read W2UII. Looking up the call in a

John Dilks, K2TQN ♦ 125 Wharf Road, Egg Harbor Township, NJ 08234-8501 ♦ k2tqn@arrl.org



Dino Mastrojohn, W2UII, carefully stenciled his call letters in Morse code on the front panel. This is the first time I have seen someone do this.

Rear view of the power supply and modulator chassis.



I was amazed at the number of components under the power supply and modulator chassis, and how neat the wiring and layout is.

Under the transmitter chassis is a "Handbook" quality wiring job.

late 1960s *Callbook* I found the name Dino Mastrojohn. Checking QRZ.com I found the call listed to him in Florida. I called the telephone number listed for that address and learned that Dino was a SK.

Searching on-line, I found a few phone numbers of Mastrojohns in New Jersey and started to call them. I finally found a relative, who gave me the name and telephone number of Dino's son, Jim Mastrojohn, now living in another state. Jim, who was formerly licensed as WB2QPA, told me about his father and the story about the transmitter.

W2UII

Born in 1918, Dino served in World War II as a bombardier using the Norden bombsite. After WW II he went into TV repair at Daidone Electronics in West Orange, New Jersey. Later he worked in Flushing, Long Island, in electronics. Still later he worked at Channel 13 as a Broadcast Engineer and Camera Technician, and was one of the first to use 3/4 inch videotape. In the late 1960s he experimented with it and had a home Video Production Company making TV commercials.

Dino was self-taught. He spent all of his spare time reading technical books and magazines, and building ham radio equipment in his cellar workshop.

Jim told me he helped his dad build this transmitter at home, that it was all his dad's design and work. I was surprised, thinking all the time a team of engineers designed and built this, never expecting a regular ham would build something this fine. Jim said there was also a matching receiver with a built-in oscilloscope on the front panel and a separate VFO that went with it.

Jim also told me that he and his dad had taken this transmitter, and all of the other necessary gear, to the top of a mountain one Field Day and worked a lot of stations. (This transmitter weighs over 100 pounds. That must have been some project by today's standards in view of our 5 and 10 pound rigs.)

When Dino was planning his move to retire in Florida, he sold his station to friends. This is where I lose the trail. Somewhere out there is Dino's homebrew receiver with the built-in scope and his VFO. I sure hope they have survived, and perhaps someday his station could be put back together again. What a wonderful display it would make for a New Jersey radio museum.—*K2TQN*

Standalone Reefs and Intervening Lands

By Martti Laine, OH2BH

Finding Another New One?

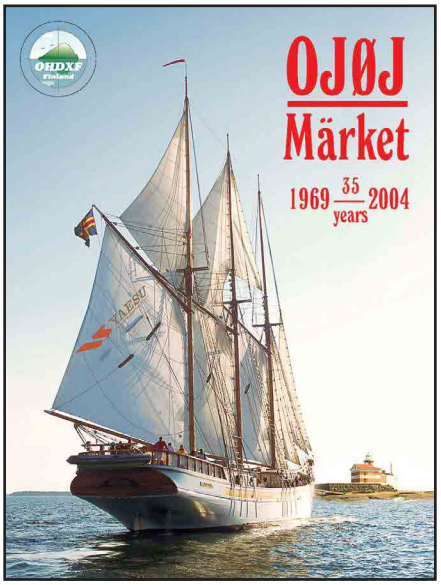
Being involved in researching new DXCC entities, discovering another new one is a game in itself with some very interesting and educational rewards. It seems that coming across new counters goes in cycles, and such entities tend to surface in reflection of world affairs and related demands of the DX multitudes as well the evolution of the DXCC program itself.

Those doing research are few in number, but they are so dedicated that soon another volcano will be discovered in the ocean or at least many of the conflicts in the world will produce another break-up. For example, see how many DXCC entities came out of the historic clean-up in the Balkan Peninsula and you will agree there are no grounds to think that the world will ever be completely happy.

Market Reef (OJ) was quite a rich experience to me personally, leading my life—DX-wise—to many interesting happenings and people, and obviously to more new entities. The search can be a lifelong journey and today's geostationary satellites offer a very handy way of measuring distances, since many of the old sea charts have turned out to be particularly inaccurate. In two recent cases—H4ØAA and TXØDX—maps were not useful, but satellites provided accurate data and produced qualifying results.

Reef Era of the 1960s

Those active in the 1960s no doubt faced many new countries based on reefs and intervening lands. Two figures of those years, Gus Browning, W4BPD, and Don Miller, W9WNV, were associated with some interesting discoveries. There seemed to emerge a new country (reef) somewhere every second week. Gus led the game to Geyser Reef (1G5A) and Blenheim Reef (VQ9A/BR) in the Indian Ocean while Don produced them one after another in the Pacific Rim. Maria Theresa (FO8M), Minerva Reef (1M4A) and many others surfaced from otherwise deep waters. Claiming a Costa Rica-owned land, Comoran Reef (TI9C) and Ecuador-owned Ebon Atoll (HC8E) in the Pacific raised many eyebrows. But those were the times that shaped DX history.



This beauty of a sailing ship was the symbol of the 2004 expedition. The 160 foot schooner *Linden* was an impressive sight in Market Reef waters.

But there's one! Following in the footsteps of Gus and Don, there were a few DX scholars in the North who did not want to miss any chance and they were fortunate enough to come up with a "reef country" in Europe, one that still stands. By accident, but as a result of burning desire, OH2KK, OH2NB and OH2BH were able to present Market Reef (OJØ) successfully to the highly respected Mr DXCC, the late Bob White, W1CW, at ARRL.

Reasoning Behind Market Reef

To the west of the Republic of Finland lie Åland Islands (OHØ), an autonomous region of Finland, thus qualifying for DXCC. But situated behind Åland Islands is a small rock administered by Finland because of a lighthouse operated there. Therefore a piece of Finland lies behind another "intervening" DXCC country. There were rules in those years when autonomous regions constituted new countries and intervening land of another DXCC country resulted in yet another one. These rules are long gone now, but once adopted, the "grandfathering" allows them to remain on the list. The continued presence of Market Reef on the list is a unique case in Europe and it has been that way now for the past 35 years.

What is This all About?

Upon our first landing on Market Reef in the winter of 1969, we discovered a happy bunch of lighthouse keepers work-

Odds are that you've worked one of these ops: Standing from left: OHs 1MA, 3UU, 2KK, 4NS, 2KH, 5NE, 2BAA, ØRJ, 1XX, 2BAD, 2BR, 1NOR, 1NM, 1TV, ES1AR, OHØNA/OJØMA, 2PM, 2TA, 2WC, 2BH, ØXX; kneeling: 1TX, 5NQ, 2QV, 2MM and 2BC.

The entire reef of 300 × 80 meters (1000 × 300 feet) has a low profile, and in stormy weather only the lighthouse structure remains above water. Although the light is run by gas, much of the weather-related equipment is powered by solar panels. The reef is divided between Finland and Sweden.

Bernie McClenny, W3UR ♦ 3025 Hobbs Rd, Glenwood, MD 21738-9728 ♦ w3ur@arrl.org

The third building is full of weary generators from the old days. Only a recent 10 kW affair at the far back is powering visiting DXpeditioners.

The expedition group cooking their dinner by an open fire on the reef. From left: OH5NE, OH2BH, OH2MM, OH2TA, OH2PM and OHØRJ.

Life is plain and simple at the remote lighthouse. Pekka, OH2TA, at the controls of OJØJ. Behind the laptop is a small (17 lb), compact solid-state kW amp.

ing in two-week shifts and winding a mechanical spring of the actual light once every 45 minutes, allowing it to turn and guide heavy sea traffic in these troubled waters.

It is just a lighthouse sitting on an otherwise barren rock—no harbor, no jetty, no way to land safely when the sea is rough. DXCC counters come with DXotica and so does Market Reef. During the first expedition (OJØMR), we got stuck at the lighthouse and spent a most memorable New Year's Eve there. The sea rolling over the entire country made us DX types wonder (not wander) at the light bulb and marvel at the power of Mother Nature. This had to be the beginning of something new and it obviously sold us on the DX game instantly and forever.

Serving Visiting DXers

Lars "Lasse" Nikko, OHØRJ, has been involved with Market Reef activities for the past 35 years, and he has rendered unselfish service to visiting DXers. Lars has seen DXers from many walks of life. In the late 1980s, Lars airlifted a 10 kW generator to the lighthouse and solid 220 V ac is available on all power outlets throughout the lighthouse complex. Lasse's trademark "Market Reef Power Company" is known the world over as a source of lifelong friendships, which he treasures. In recent years Lars has been partnering with Seppo, OH1VR.

In the course of the third outing (OJØDX), we met the rest of the permanent lighthouse staff and no wonder, a permanent Amateur Radio operator at Market Reef was born! Karl-Erik Eriksson, OJØMA (now OHØNA), started his long service to the DX community, on the bands and on the reef for many visiting DXpeditioners. The equipment was provided by the Northern California DX Foundation (NCDXF).

But then the year 1976 resulted in the full automation of the light and the lighthouse was left vacant just to remind passing ships of the golden years when friendly voices were heard from the manned rock. During these many years, many OHs and visiting DXers from near and far have visited Market Reef and discovered the mystique of that old lighthouse while also experiencing the never-ending pileups—the highlight of any DXpeditioner.

Those Passing 35 Years

The OJØDX outing witnessed a rescue at sea when the 100 foot schooner *Astrea* hit the rocks and was washed ashore on the reef following a sudden storm. The leaking vessel was towed to the Åland Islands, splitting the expedition between those aboard the rescued ship and those left on the reef. Amateur Radio ended up on the front pages of the local press and we were very low-key, not boasting of our newly won fame.

Some years later John Crovelli, W2GD, fell on the icy reef during the winter outing in the course of a 160 meter contest, injuring his shoulder and requiring a quick helicopter rescue operation. But at that time the closest choppers were deployed in Finland and it was a long and expensive rescue mission.

Sigge, OHØNI, was the prime mover of several initial outings to the reef. Sigge and his son Bjorn perished at sea when they were drowned in their tiny sailing boat in these same stormy waters. We had lost an original team member and a trusted friend of the first and many subsequent expeditions. But we were glad to see Lars, OHØRJ, taking his place.

Jubilee of 35 Years of Reef Time and DX

To honor these 35 exciting years, Lars, OHØRJ, invited the original OJØDX team with their friends once again to visit Market Reef and enjoy the camaraderie of those other years.

Out of the 12 men taking part in the original exercise, 8 responded positively, and 3 had passed away. The bond was so strong that everyone wanted to do it again—35 years later. But this time it was done more in style! The 160 foot luxury schooner *Linden* was hired with its first-class restaurant, a genuine onboard Finnish sauna and the "Seven Seas DX Orchestra" entertaining the group. Hoisting 630 square meters (6800 sq ft) of sail and going back to the early years of sailing ships made the departure of this team of 26 DXers a memorable sight.

Everyone was looking forward to an exciting Zodiac landing during the nightless night of these northern latitudes. But Market Reef did show her mighty power that night and the party was suddenly frozen amid an icy fog and heavy seas. Landing was not possible and the ship had to sail back to the Åland Islands with no completed mission. Nevertheless, it was a fun experience enjoyed by all.

But a Happy Ending—DX-Wise

DXers being a tough bunch, a small operational detachment was at it again the following day, and with marginal landing conditions they landed on Market with a small dinghy on the leeward side of the reef. Half a dozen boat rides were needed and six men were happily landed on the coveted reef with two radios. A dream of 35 years ago was repeated and the spirit of a rare DXCC counter was reignited. OHØRJ, OH2MM and OH2BH, from the original crew, along with OH2PM, OH2TA and OH5NE, were at the helm of Club Zero (OHØAB) call sign OJØJ and 12,414 QSOs were logged during this brief weekend visit.

Market Reef remains the North European hotspot and another adventurous location for those who Deserve—at both ends of the radio circuit. QST

OP-ED

My Struggle to Become a Ham Radio Operator

By Fred Olver, N9BSO

Have you ever considered the difficulties you would encounter if you had tried to become an amateur without vision? Have you ever considered the ongoing problems you would face in keeping current with the hobby and your equipment?

When I was 12, I passed the test for my Novice license while attending a school for the blind. Now I, too, could get on the air. After failing the General exam the next year, I was off the air until 1977 when I again passed my Novice test. With the advent of transceivers, the fact that they were one unit made it almost impossible for blind hams to be able to tune them up. You see, when you had separate receivers and transmitters you could tune up using your hearing by peaking one item to its loudest point and dipping another, thus decreasing the loudness of the transmitted signal being tuned and then re-peaking for output power.

In 1979 I started studying for my General exam again and passed it in October. With most 2 meter radios there is very little tuning necessary, so it was easy to pick up the microphone and start talking. It was a different thing, though, when it came to making use of the VFOs and working sideband. Although there was a digital readout on the front of the radio I had purchased, the concept of voice readout didn't exist. I soon traded my radio for a Kenwood TS-700, which could emit a signal every 100 kHz.

In the early '80s, I became aware of Ten-Tec and the fact that they had a synthesizer available for use with most of their radios for a mere $290, a large price to pay for a frequency readout, but a small price to pay for independence. My dream was to own a TS-440S. Finally, in the '90s I did. Although I could tell what frequency I was on, there was no possibility of knowing what output I was at. When I could hear my signal through my computer speakers I knew I was close to 100 W out.

Although technology has progressed far from where it was when I first got on the air in the mid-'60s, for those of us who are blind hams the technology seems to have taken a few steps backward. Although radios now come with optional speech synthesizer boards, in the case of menu-driven radios, that accessibility is denied those of us who use speech output to gain information. On one manufacturer's Web site, although manuals are there, they are only accessible if one is willing to spend the $1000 to invest in a specifically made for a blind and visually impaired scanning program. This is on top of the $900 software package used as a screen reader that one must purchase in order to access *Windows* software, and so on. As the unemployment rate among the legally blind in this country is more than 70%, wouldn't it make more sense and be much less expensive to end users to make these files available as some type of zip file?

When I consider a radio for purchase, I first of all need to figure out how accessible it will be, the information, the menus, and so on. Although some well-meaning organizations provide us with manuals, they seem to feel a need to edit the information. Would you want someone to do that to you—that is, edit the manual before you get to see it, determining what you need to know? Don't get me wrong—I applaud these organizations and the manufacturers' efforts to make use of software to control their radios. I also appreciate the fact that some of the software is even useful with the current speech output programs, which those of us who are blind use every day to get our e-mail, cruise the Web and read books.

I'm afraid there may be a paternalistic attitude on the part of manufacturers, however, in that their expectation levels of what blind hams can accomplish on their own is limited to what these "sighted" engineers feel or think they would be able to do if they were blind. I doubt that they've even considered the possibility that they would even become ham radio operators, let alone purchase complicated radios like the ICOM IC-746PRO and Kenwood TS-2000. It seems that without too much trouble they could enlarge the vocabulary of the speech synthesizer software to allow blind hams to access the menus, receive information that appears on the front of the radios, and so on. In truth, a lot of sighted hams might find this added aspect very useful, especially hams who operate mobile.

Although blind, I am not necessarily limited by my blindness. I tend to be more limited by the inability of others to recognize my abilities than my disability.

You can reach the author at 2881 Parkman Rd NW, Apt 155, Warren, OH 44485; **creacher@onecom.com**.

QST Op-Ed Policy

The purpose of Op-Ed is to air member viewpoints that may or may not be consistent with current ARRL policy.

1) Contributions may be up to two-thirds of a *QST* page in length (approximately 900 words).

2) No payment will be made to contributors.

3) Any factual assertions must be supported by references, which do not necessarily have to be included in the body of the article to be published.

4) Articles containing statements that could be construed as libel or slander will not be accepted.

5) The subject matter chosen must be of general interest to radio amateurs, and must be discussed in a way that will be understandable to a significant portion of the membership.

6) With the exception that the article need not be consistent with League policy, the article will be subject to the usual editorial review prior to acceptance.

7) No guarantee can be made that an accepted article will be published by a certain date, or indeed, that it will be published at all; however, only articles that we intend to publish will be accepted, and any article we have decided against publishing will be returned promptly.

8) Send your contributions to ARRL Op-Ed, 225 Main St, Newington, CT 06111.

STRAYS

CALL FOR PAPERS

◊ For information on submitting a paper for the 7th annual international symposium on advanced radio technologies (ISART 2005), contact Jeanne Ratzloff at 303-497-3330; **ratzloff@its.bldrdoc.gov**. The conference will be held March 1-3, 2005, in Boulder, Colorado.

I would like to get in touch with...

◊ anyone with information and references on the use of the metal alloy Invar in variable capacitors.—*Louis L. D'Antuono, WA2CBZ, 8802 Ridge Blvd, Brooklyn, NY 11209.*

COMING CONVENTIONS

PACIFIC DIVISION CONVENTION

October 15-17, San Ramon, CA

The Pacific Division Convention (Pacificon 2004), sponsored by the Mt Diablo ARC, will be held at the San Ramon Marriott Hotel, 2600 Bishop Dr; take Hwy 680 to Bollinger Canyon Rd Exit, go E on Bollinger Canyon Rd, take first left onto Sunset, then left onto Bishop Dr, hotel is on left. Doors are open Friday 7 AM to 9 PM, Saturday 6 AM to 7 PM, Sunday 6 AM to 1 PM. Features include antenna seminar (Friday, 8 AM to 5 PM, $10), MDARC meeting (Friday, 7:30-9 PM), Public Service DVD Demo (Friday, 7:30-8:30 PM), opening breakfast buffet (Saturday, 6:45 AM, $12.50; special guest speaker Randall Larson, Editor of 9-1-1 Magazine), electronics swapmeet (Sunday morning only in hotel parking lot, 6 AM to noon; admission is free to buyers, $20 for double-car slot minimum for sellers), vendors, exhibitors, manufacturers, forums and seminars (public service, technical information, general ham interest, internet linking/digital voice/data communications, legal), T-hunts (Sunday 8 AM and 9 AM; beginners and advanced), banquet (Saturday, 7 PM, $39; special guest speaker ARRL Vice President Kay Craigie), Special Events Station, Wouff-Hong ceremony (Saturday at midnight), VE sessions (Saturday and Sunday, 9 AM to noon; Technician through Extra Class, nominal fee). Talk-in on 147.06 (100 Hz). Admission is $10 in advance, $15 at the door. Contact John Schulze, KR6CR, c/o PACIFICON, Box 272613, Concord, CA 94527; 925-932-6125; **pacificoninfo@astound.net**; **www.pacificon.org**.

SOUTH CAROLINA STATE CONVENTION

October 23, Sumter

The South Carolina State Convention (18th Annual Sumter Hamfest and Computer Show), sponsored by the Sumter ARA, will be held at the Sumter County Fairgrounds, American Legion Memorial Building, 700 W Liberty; I-95 to Rte 378 E, turn right onto Alice Dr, left on Liberty, site is 4 blocks on right. Doors are open 8 AM to 4 PM. Features include forums, dealers, vendors, VE sessions, fellowship, refreshments. Talk-in on 147.015 (156.7 Hz). Admission is $5 in advance, $6 at the door. Tables are $10. Contact Carl Ecabert, AA1MD, 6105 Debose Siding Rd, Sumter, SC 29153; 803-469-0113; **aa1md@ftc-i.net**; or Tom D'Anella, KC4ZTC, 803-236-4741; **www.geocities.com/CapeCanaveral/2695/sara.htm**.

MICHIGAN STATE CONVENTION

November 5-6, Holland/Zeeland

The Michigan State Convention (Great Lakeshore Super Swap), sponsored by the Holland ARC, will be held at the Harbor Lights School, 3600 152nd Ave (off Riley); 3.5 miles W of US-31 at Riley. Doors are open Friday at 6 PM for banquet (Holiday Inn in Holland; special guest speaker ARRL President Jim Haynie), Saturday 8 AM to 2 PM for swap. Features include dealers, vendors, forums (NTS, ARES/RACES, CW, FCC, MARS, ARRL with Jim Haynie at noon on Saturday), VE sessions, Wouff Hong Ceremony, awards, DXCC card checking, free parking. Talk-in on 147.06 (94.8 Hz). Admission is $5 for hamfest, $22.50 for convention; under 13 half price. Tables are $10 ($2 additional for electricity). Contact Chuck Rich, W8GCW, 300 Wildwood Dr, Holland, MI 49423; 616-396-2294; **w8gcw@arrl.net**; **www.hollandarc.org**.

GEORGIA STATE CONVENTION

November 6-7, Lawrenceville

The Georgia State Convention (Stone Mountain Hamfest and Computer Expo), sponsored by the Alford Memorial RC, will be held at the Gwinnett County Fairgrounds, 2405 Sugarloaf Parkway I-85 (N of Atlanta) to Hwy 316 E, take second exit (Sugarloaf Parkway), go E to Fairgrounds. Doors are open Saturday 9 AM to 5 PM, Sunday 9 AM to 3 PM. Features include indoor flea market, tailgating ($8 per space, good both days), commercial tailgating ($20 per space for the weekend), huge boneyard, commercial vendors, dealers, computer equipment, forums, contests, VE sessions (register at 8:30 AM, testing starts at 9 AM sharp both days), camping, free parking, refreshments. Talk-in on 146.76 (107.2 Hz), 145.45, 444.25 (131.8 Hz). Admission is $6 in advance, $8 at the door (good both days); under 16 free (students with ID, $6). Tables are $20 ($25 with electrical hookup; includes 1 admission). Contact Randy Bassett, KR4NQ, Box 1282, Stone Mountain, GA 30086-1282; 770-663-4244 (x-3989); **kr4nq@arrl.net**; **www.totr-radio.org**.

September 17-18
W9DXCC, Elk Grove Village, IL*

September 17-19
Illinois State, Peoria*

September 18
Arkansas State, Jacksonville*

September 18-19
Roanoke Division, Virginia Beach, VA*

September 24-25
Nebraska State, Norfolk*

September 25
Eastern Washington Section, Spokane*

October 1-2
Pacific Northwest VHF Conference, Moses Lake, WA*

October 8-9
AR Lighthouse Society Operating Specialty, Kill Devil Hills, NC*

October 9
Northern New York Section, Lake Placid*

October 10
Connecticut State, Wallingford*

November 13-14
Indiana State, Fort Wayne

December 4-5
West Central Florida Section, Palmetto

***See September *QST* for details.**

Attention Hamfest and Convention Sponsors:

ARRL HQ maintains a date register of scheduled events that may assist you in picking a suitable date for your event. You're encouraged to register your event with HQ as far in advance as your planning permits. Hamfest and convention approval procedures for ARRL sanction are separate and distinct from the date register. Registering dates with ARRL HQ doesn't constitute League sanction, nor does it guarantee there will not be a conflict with another established event in the same area.

We at ARRL HQ are not able to approve dates for sanctioned hamfests and conventions. For hamfests, this must be done by your division director. For conventions, approval must be made by your director and by the executive committee. Application forms can be obtained by writing to or calling the ARRL convention program manager, tel 860-594-0262.

Note: Sponsors of large gatherings should check with League HQ for an advisory on possible date conflicts before contracting for meeting space. Dates may be recorded at ARRL HQ for up to two years in advance. QST

HAMFEST CALENDAR

Attention: The deadline for receipt of items for this column is the **1st of the second month preceding publication date**. For example, your information must arrive at HQ by **October 1** to be listed in the **December** issue. Hamfest information is accurate as of our deadline; contact sponsor for possible late changes. For those who send in items for Hamfest Calendar and Coming Conventions: Postal regulations prohibit mention in *QST* of prizes or any kind of games of chance such as raffles or bingo.

(Abbreviations: *Spr* = Sponsor, *TI* = Talk-in frequency, *Adm* = Admission.)

†**Arizona (Tucson)—Oct 16**; set up 6 AM; public 7 AM to Noon. *Sprs:* Old Pueblo RC, Tucson Repeater Assn, and Radio Society of Tucson. Kino Sports Park, 2500 E Ajo Way; turn N on Forgeus Ave at traffic light, nearest I-10 freeway exits are Kino Blvd N or Palo Verde Blvd N. Swapmeet, tailgating/vendors (parking fee $5), VE sessions, Scout Jamboree on the Air for live Amateur Radio talk, refreshments. *TI:* 147.3 (110.9 Hz). *Adm:* Free. John Clor, N7SQQ, 1934 Avenida Planeta, Tucson, AZ 85710; 520-400-6446; **w7gv@aol.com**.

†**Arkansas (Bentonville)—Sep 24-25**. Buster Morrow, AD5AM, 479-631-9231.

California (San Ramon)—Oct 15-17, Pacific Division Convention. See "Coming Conventions."

†**Connecticut (Waterford)—Oct 30**; set up 9 AM; Auction 10 AM. *Spr:* Tri-City ARC. Senior Citizens Center, Waterford Municipal Complex, 1000 Hartford Rd (Rte 85); S of Exit 77 off I-395, on right before Crystal Mall; or N of Exit 82 off I-95, on left past Crystal Mall. Ham equipment auction (bring your items to be auctioned), handicapped accessible, refreshments. *TI:* 146.97 (156.7 Hz). *Adm:* Free ($1 per bid card). Darryl Del Grosso, WA1DD, 860-443-7799; **DDelgrosso@aol.com**; or Liston Harley, K1EQ, 860-464-2058; **sparrow43@comcast.net**; **www.qsl.net/tricityarc**.

†**Florida (Jacksonville)—Oct 16**, 8 AM to 4 PM. *Spr:* Greater Jacksonville Hamfest Assn. Morocco Shrine Auditorium, 3800 S St John's Bluff Rd, 1/2 mile S of Beach Blvd (US 90), just N of The University of North Florida Campus; I-95 S to JTB (John Turner Butler), turn left, go approximately 3 miles to St John's Bluff Exit, turn left, go 4 miles

†ARRL Hamfest

Gail Iannone ♦ Convention Program Manager ♦ giannone@arrl.org

to Auditorium on left. VE sessions. *TI:* 146.76. *Adm:* $6. Tables: $20. Larry Rich, W1LR, Box 2123, Orange Park, FL 32067-2123; 904-272-1472; **w1lr@arrl.net**; **www.jaxhamfest.com**.

†**Florida (Tavares)—Nov 6**, 8 AM to 5 PM. *Spr:* Lake ARA. Lake Agricultural Center, 30205 SR 19; 1½ miles S of Hwy 441. Inside vendors, outside tailgating ($7 per space), VE sessions. *TI:* 147.255. *Adm:* $5. Tables: $10. John Gabele, W8KCE, 11146 Springdale Ave, Leesburg, FL 34788; 352-394-2723; **w8kce@vol.com**; **www.qsl.net/k4fc**.

†**Florida (Titusville)—Oct 23**; set up 6 AM, public 7 AM to 1 PM. *Spr:* North Brevard ARC. Disabled American Veterans Chapter 109, 435 Singleton Ave; take Exit 220 (Garden St) off I-95, go E to Singleton Ave (first light), turn N, proceed 3 blocks to facility. Tailgate Hamswap, VE sessions. *TI:* 145.49. *Adm:* Free. Tables: $10. Bobby Jones, N6USP, 4743 Cambridge Dr, Mims, FL 32754; 321-264-2622; **n6usp@gnc.net**; **www.northbrevardradioclub.org**.

†**Georgia (Evans)—Oct 9**, 9 AM to 3 PM. *Spr:* ARC of Augusta. Evans Middle School, 4318 Washington Rd; I-20 to Belair Rd, take Belair Rd to Washington Rd to School on left. New and used equipment dealers, tailgating, forums (ARRL, ARES), VE sessions. *TI:* 145.49. *Adm:* $5. Tables: $10. Henry Arostegui, KN4AV, 2013 Ashley Dr, Augusta, GA 30906; 706-793-1625; **kn4av@bellsouth.net**; **www.qsl.net/w4dv/**.

Georgia (Lawrenceville)—Nov 6-7, Georgia State Convention. See "Coming Conventions."

†**Georgia (Rome)—Oct 16**, 8 AM to 2:30 PM. *Spr:* Northwest Georgia ARC. Rome Civic Center, Civic Center Hill. Hamfest/Computer Show, vendors, dealers, tailgating (free with paid admission), VE sessions, free parking, barbeque, refreshments. *TI:* 146.94 (88.5 Hz). *Adm:* $5. Tables: $10. Jim Couch, N4SJ, 696 Billy Pyle Rd, Rome, GA 30165; 706-235-9062; **couch@daviscore.com**; **www.W4VO.org**.

†**Indiana (Goshen)—Oct 3**, 8 AM to 3 PM. *Spr:* Goshen ARC. Elkhart County 4-H Fairgrounds, 17746-D County Road 34; take US 33 to Monroe St (CR 34), go E on Monroe St to Fairgrounds Gate 1, enter through Gate B. Northern Indiana Hamfest (formerly South Bend Hamfest), swapmeet, vendors, VE sessions, free parking, refreshments. *TI:* 145.43 (131.8 Hz). *Adm:* $5. Tables: $15. Sandy Swartzendruber, W9JOE, 16722 County Rd 40, Goshen, IN 46526; 574-642-4263; **w9joe@arrl.net**; **www.goshenarc.org/hamfest/**.

†**Iowa (Des Moines)—Oct 24**, 8 AM to 1 PM. *Spr:* Tikva Tracers ARC. Iowa State Fairgrounds 4-H Building, E 30th and University Ave; exit I-80 at Hubble Ave Exit, enter Fairgrounds at E Grand Ave gate, follow signs to 4-H building. VE sessions. *TI:* 146.82 (114.8 Hz). *Adm:* $5. Tables: $10. George Davison, NØZEZ, 2746 Lynner Dr, Des Moines, IA 50310; 515-274-5209; **n0zezgfd@juno.com**.

Kansas (Wichita)—Oct 9. James Cochran, KØRH, 316-755-2283.

†**Louisiana (Pineville)—Oct 16.** *Spr:* Central Louisiana ARC. Kees Park, Hwy 28 E; from US Hwy 167 (N or S) take LA Exit 28 E (Jonesville/Ferriday Exit), go E approximately 1/4 mile to event on right. Forums (APRS, SSTV), VE sessions, RV parking. *TI:* 147.33. *Adm:* Free. Tables: $10. J. J. Wages, KD5MDQ, 126 O'Banion, Pineville, LA 71360; 318-641-6635; **jjkd5mdq@yahoo.com**; **www.clarc.us**.

†**Maryland (West Friendship)—Oct 2**; set up Friday (Oct 1) after noon; Saturday 6 AM (tailgaters), 8 AM to 4 PM (public). *Spr:* Columbia ARA. Howard County Fairgrounds, 2210 Fairgrounds Rd; take I-70 to Rte 32 S (Exit 80), follow Rte 32 for 1 mile to Frederick Rd, go W on Frederick for 1 mile to Fairgrounds entrance. Amateur Radio and Computer Show, indoor displays, large outdoor tailgate area ($10 per space plus admission), vendors, VE sessions (free). *TI:* 147.135. *Adm:* $6. Tables: $20 each (1-4 tables, plus admission); $18 each (5 or more tables, plus admission). David Prestel, W8AJR, 10160 Tanfield Ct, Ellicott City, MD 21042; 410-552-2652; **info@carafest.org**; **www.carafest.org**.

†**Maryland (Westminster)—Oct 31**, 8 AM to 2 PM. *Spr:* Carroll County ARC. Carroll County Agricultural Center, 700 Agricultural Center Dr; Rte 140 W to Center St, left on Center St to Gist Rd, right on Gist Rd to Smith Ave, right on Smith Ave, hamfest at top of hill. VE sessions, refreshments. *TI:* 145.41. *Adm:* $5. Tables: $12. Steve Beckman, N3SB, 2145 Bethel Rd, Finksburg, MD 21048; 410-876-1482; **n3sb@qis.net**; **www.qis.net/~k3pzn**.

Massachusetts (Cambridge)—Oct 17. Nick Altenbernd, KA1MQX, 617-253-3776.

†**Michigan (Benton Harbor)—Nov 7**, 8 AM to Noon. *Spr:* Blossomland ARA. Playland Hall, 1050 Nickerson Rd; take I-94 to Exit 28 (M-139), go N 1/2 mile to Nickerson, at stoplight turn right onto Nickerson, go ¼ mile to Hall on right. Special guest ARRL Great Lakes Division Vice Director Dick Mondro, free parking. *TI:* 146.82 (88.5 Hz), 146.72 (131.8 Hz). *Adm:* advance $4 (before Oct 27), door $5; under 11 free. Tables: advance $4 (before Oct 27), door $5. Gary Wallis, KB8VIM, Box 682, St Joseph, MI 49085; 269-429-3629; **w8mai@comcast.net**.

Michigan (Holland/Zeeland)—Nov 5-6, Michigan State Convention. See "Coming Conventions."

†**Michigan (Sterling Heights)—Oct 31**, 8 AM to 1 PM. *Spr:* Utica Shelby Emergency Communications Assn. American Polish Century Club, 33204 Maple Ln; I-696 to Exit 23 to Van Dyke Ave (M53) N, proceed 3 miles, turn right (E) on 14 mile, go 1 1/4 miles E, turn left (N) on Maple Ln, proceed N 250 ft to club on right. Seminars, VE sessions, free electronics test bench, refreshments. *TI:* 147.18 (100 Hz). *Adm:* $5. Tables: $15. Scott Madison, WN1B, 2700 Glen Valley Dr, Leonard, MI 48367; 248-628-4756; **wn1b@k8uo.com**; **www.useca.net**.

†**Minnesota (St Paul)—Oct 23**, 8 AM to 2 PM. *Spr:* Twin City FM Club. RiverCentre, Wilkins Auditorium, 175 W Kellogg Blvd at W 7th St; Marion St/Kellogg Blvd Exit off I-94 in downtown St Paul. Flea market, seminars, forums (youth, ARRL with ARRL Dakota Division Director Jay Bellows, BPL with ARRL Lab Manager Ed Hare), VE sessions. *TI:* 146.76 (114.8 Hz). *Adm:* advance $7, door $10 (under 18 free). Tables: $20. Gale Allen, NØMGQ, 10509 Audubon Ct, Eden Prairie, MN 55347; 612-810-7050; **gallen@ece.umn.edu**; **www.hamfestmn.org**.

†**Mississippi (Brookhaven)—Sep 18**, 9 AM to 2 PM. *Sprs:* ARRL Mississippi Section and Southwest Mississippi ARC. Sports Complex, City Park; exit any Brookhaven exit off I-55, follow signs to Sports Complex. Annual Section Picnic/ARRL Day in the Park, free tailgating, tour of W8XV antique radio museum. *TI:* 146.85. *Adm:* Free. Homer Richardson, WB5ASP, 1545 Friendship Ln NW, Brookhaven, MS 39601; 601-833-4126; **wb5asp@arrl.net**; **swmarc.cjb.net**.

Missouri (Grandview)—Oct 16. Donna Quick, KBØYJN, 816-537-7464.

†**Missouri (Springfield)—Oct 30**, 8 AM to 2 PM. *Spr:* Southwest Missouri ARC. Teamsters Local 245 Meeting Hall, 1850 E Division St; turn E onto Division St from Glenstone Ave, go approximately 300 ft E on Division St, turn S into Teamsters Hall parking area, follow signs to entry door. Vendors, VE sessions. *TI:* 145.19. *Adm:* advance $4, door $5. Tables: $6. Lance Riffle, KCØKBL, Box 11363, Springfield, MO 65808; 417-827-1274; **kc0kbl@arrl.net**; **www.smarc.org**.

†**Missouri (St Louis)—Oct 30**, 7:30 AM to 1:30 PM. *Spr:* St Louis ARC. Kirkwood Community Center, 111 S Geyer Rd; I-270 N or S to Dougherty Ferry Rd, go E to Geyer Rd, go S to hamfest. Halloween Hamfest, over 100 indoor swapfest and vendor tables, VE sessions, made-to-order breakfast. *TI:* 146.91. *Adm:* advance $2 each or 3 for $5; door $3 each or 2 for $5. Tables: private $10, commercial $15. Ken Craig, WAØIYY, 1216 Summers End Dr, Fenton, MO 63026; 314-397-1893; **WA0IYY@STL-OnLine.Net**; **www.halloweenhamfest.org/**.

Montana (Bozeman)—Oct 16. Laura Lubner, KJ7UN, **mail@gallatinhamradio.com**.

Nebraska (Brownville)—Sep 25. Todd Weaklend, WØTAW, 402-883-2256.

†**New Mexico (Socorro)—Oct 30**, 8 AM to 3 PM. *Sprs:* Socorro ARA, Tech ARA, and the City of Socorro. NM Firefighters Training Academy, Academy Rd SW; go to traffic light at California and Spring Sts, go W approximately 1/2 mile to 4-way stop, follow signs and go straight up hill about 1 mile. Presentations, seminars, VE sessions, Transmitter Hunt. *TI:* 146.68 (100 Hz). *Adm:* Free. Tables: $10. Al Braun, AC5BX, 722 N California St, Socorro, NM 87801; 505-835-3370; **ac5bx @juno.com**; **www.socorroara.org**.

†**New York (Lindenhurst)—Oct 24.** *Spr:* Town of Babylon AR Emergency Services. Knights of Columbus Hall, 400 S Broadway; LI Expressway (495) from the W take Exit 49 S (Rte 110), stay on service road, cross over Walt Whitman Rd and Rte 110 to Pinelawn Rd (third traffic light), turn right onto Pinelawn Rd (S), Pinelawn becomes Wellwood Ave after crossing over Southern State Pkwy, continue S, cross over Sunrise Hwy, proceed through Lindenhurst Village under overhead railroad tracks (LIRR), continue S for 2 more traffic lights to Montauk Hwy (Merrick Rd), turn right onto Montauk Hwy (Rte 27A), continue W to next traffic light (3 blocks), turn right onto S Broadway to K of C Hall on right two blocks down. Indoor event, VE sessions, refreshments. *TI:* 146.685 (110.9 Hz). *Adm:* $6. Tables: $15. Walter Wenzel, KA2RGI, 373 15th St, W Babylon, NY 11704; 631-669-3714 (days) or 631-957-0218 (eves until 10 PM); **ka2rgi@arrl.net**; **www.tobares.org**.

†**Ohio (Canton)—Oct 31**; set up 6 AM; public 8 AM to 2 PM. *Spr:* Massillon ARC. Stark County Fairgrounds, 305 Wertz Ave NW; from I-77 N take downtown exit, turn left (W) on W Tusc, turn right on Wertz Ave to Fairgrounds; from I-77 S take 4th St NW Exit, turn right (W) into Fairgrounds. All indoors, auction (10 AM, 15% commission charged on all items sold; no computer equipment), handicapped accessible, free parking. *TI:* 147.18 (110.9 Hz). *Adm:* $5, under 12 free. Tables: $12 (8-ft, with electricity). Terry Russ, N8ATZ, 3420 Briardale Cir NW, Massillon, OH 44646; 330-837-3091; **truss@sssnet.com** or **hamfest@marcradio.org**; **www.marcradio.org**.

†**Ohio (Georgetown)—Nov 6**, 8 AM to 3 PM. *Spr:* Grant ARC. ABCEOI Building, 200 S Green St; from Cincinnati take State Rte 125 to Georgetown, the ABCEOI Building is on left as you enter Georgetown, across from Fairgrounds. Flea market, vendors, VE sessions, refreshments. *TI:* 146.73 (162.2 Hz). *Adm:* $2. Rodney Crawford, WD8CTX, Box 76, Buford, OH 45110; 937-446-2338; **wd8ctx@juno.com**; **www.geocities.com/garcohio/**.

†**Ohio (Lima)—Oct 9**, 8 AM to 3 PM. *Spr:* Northwest Ohio ARC. Fair Radio Sales, 2395 St John's Rd; just 0.4 mile off I-75 to the N of Exit 122 on Rte 65 (St John's Rd), just after Yellow Freight Co on E side of road. Boat Anchor and Military Rigs, VE sessions. *TI:* 146.67. *Adm:* $5. Tables: $10. Gary Clements, KCØJDT, 2395 St John's Rd, Lima, OH 45802; 419-227-6573; **kc0jdt@fairradio.com**; **www.nwoarc.org**.

Oklahoma (Enid)—Nov 6. Tom Worth, N5LWT, 580-233-8473.

†**Oklahoma (Kingston)—Oct 29-30.** *Spr:* Texoma Hamarama Assn. Lake Texoma Lodge, on Hwy 70; from Kingston go E 6 miles to Lodge or from Durant go W 6 miles to Lodge. New dealers, outdoor flea market ($5 per space), VE sessions, programs, Ladies Only Lounge. *TI:* 147.39 (114.8 Hz). *Adm:* advance $7, door $8. Tables: $15 (indoor). Henry Allen, K5BUG, 2802 County Rd 2226, Caddo Mills, TX 75135; 903-527-4163; **texbug@ev1.net**; **www.angelfire.com/tx5/TexomaHamarama/**.

Ontario (Ottawa)—Oct 15-17. W. George Roach, VE3BNO, 613-234-0885 (QCWA International Convention).

†**Oregon (Rickreall)—Oct 23**; set up Friday 6-8 PM, Saturday 7-8:45 AM; public 9 AM to 3 PM. *Spr:* Mid-Valley ARES. Polk County Fairgrounds, 520 South Pacific Hwy W; W of Salem where Hwy 22 meets 99W. Swap tables, commer-

cial dealers, meetings and seminars, emergency communications vehicle displays, Country Store (hosted by Salem ARC), self-contained RV camping ($12 per night), handicapped accessible, refreshments. *TI:* 146.86 (186.2 Hz). *Adm:* advance $5, door $7, under 13 free. Tables: with power $20, without power $18; includes 1 admission. Bud Smith, N7BUD, Box 13848, Salem, OR 97309; 503-838-0266; **n7bud@arrl.net**; or Shane Kuehl, WØSPK, 503-589-0496; **w0spk@arrl.net**; **www.swaptoberfest. net**.

†**Pennsylvania (Sellersville)—Oct 17**; set up 6 AM; public 7 AM to 1 PM. *Spr:* RF Hill ARC. Sellersville Firehouse and grounds, 2 N Main St (Bethlehem Pike), 5 miles S of Quakertown and 8 miles N of Montgomeryville. Vendors, VE sessions (10 AM to Noon, all elements; walk-ins welcomed, bring necessary documents), free parking and transportation from remote lot (6:30 AM to 1:30 PM), handicapped parking, refreshments. *TI:* 145.31 (131.8 Hz). *Adm:* $5, nonham spouses and children free. Tables: $12 (indoor); $6 (outdoor spaces; bring your own table), plus admission. Cathy Soete, Box 336, Perkasie, PA 18944; 215-723-7294; **wa3ylq@comcast.net**; fax 215-257-0724; **www.rfhill.ampr.org**.

†**South Carolina (Conway/Myrtle Beach)—Oct 30**, 8 AM to 2 PM. *Spr:* Grand Strand ARC. Conway National Guard Armory, 1621 16th Ave, only 10 miles inland from Myrtle Beach; coming into Conway from the W on US 501 turn right on 16th Ave (next to Walgreen's), go about 1/2 mile to the Armory on the left. Large outside tailgating area, forums, VE sessions, refreshments. *TI:* 145.11. *Adm:* $5. Tables: $8. Jim Wood, KF4CJE, Box 14581, Surfside Beach, SC 29587; 843-238-0800; **kf4cje@w4gs.org**; **www.w4gs.org**.

South Carolina (Sumter)—Oct 23, South Carolina State Convention. See "Coming Conventions."

†**Tennessee (Chattanooga)—Oct 23**, 8 AM to 3 PM. *Spr:* Chattanooga ARC. Camp Jordan Arena, East Ridge; I-75 to Exit 1, take Hwy 41 S for 1 block, turn left onto St Thomas St (before BP station), go 100 ft, turn left onto Fred Pruett Pkwy, Camp Jordan Arena is on right approximately 1/2 mile. Indoor flea market, climate-controlled dealer area, outside tailgating, VE sessions. *TI:* 146.79, 444.1. *Adm:* $5. Tables: $15. Louise Carter, KE4DGW, 107 S Bragg Ave, Lookout Mountain, TN 37350; 423-821-4043; **mtmagnolia@msn.com**; **www.hamfestchattanooga.com**.

†**Tennessee (Clarksville)—Oct 23**, 8 AM to 2 PM. *Spr:* Clarksville Amateur Transmitting Society. Clarksville Fairgrounds, Wilma Rudolph Pavilion, Hwy 48/13; take I-24 to Exit 11, follow 76 Connector (41A Bypass/76/12) W to intersection with Riverside and Cumberland Dr, turn left on Cumberland (Hwy 48/13), proceed about 1/4 mile to Fairgrounds Pavilion on right just past Jaycees Building. Old-fashioned hamfest celebrating 50th year affiliation with ARRL. *TI:* 147.39 (123 Hz). *Adm:* $5. Tables: $10. Art Varga, WA9LXT, Box 30584, Clarksville, TN 37040; 931-553-0977; **wa9lxt@arrl.net**; **www.qsl.net/kf4l**.

†**Tennessee (Oak Ridge)—Oct 16.** *Spr:* Oak Ridge ARC. Fraternal Order of Eagles Bldg, 1650 Oak Ridge Turnpike; 1 block W of Oak Ridge Turnpike and Illinois Ave. Swapfest, new dealers, VE sessions. *TI:* 146.88, 146.97. *Adm:* $5. Tables: $10. Thomas Muncy, AG4SF, 142 Manhattan Ave, Oak Ridge, TN 37830; 865-482-4123; **muncytn@msn.com**; **www.korrnet.org/orarc**.

†**Texas (Austin)—Nov 6**, 8 AM to 1 PM. *Spr:* Austin ARC. St Louis Catholic Church's Wozniak Hall, 7601 Burnet Rd; I-35 to 183N, take Burnet Rd Exit S, Church is SE of the intersection of Burnet and Anderson Ln. Friday eve banquet and Casino Night ($15 each or $25 per couple). *TI:* 146.94. *Adm:* $1. Tables: $10/$15. Lori Schmidt, KM5MQ, 903 Fieldstone Pl, Round Rock, TX 78664; 512-255-6753; **km5mq@arrl.net**; **www.AustinHams.org**.

†**Wisconsin (Menasha)—Nov 7**, 8 AM to 2 PM. *Spr:* Fox Cities ARC. Waverly Beach, N8770 Fire Lane 1; from N or S take US 41 to US 441, Exit 441 S on Oneida St, go straight about 2 miles, cross Hwy 10 and you are on Firelane 1, go 1 block to Lake Winnebago, Waverly Beach indoor event facility is on left. On-site VE sessions, ham demonstrations. *TI:* 146.76 (100 Hz). *Adm:* advance $5, door $5.50. Tables: $10. John Ensley, N9RJZ, 163 Main St, Menasha, WI 54952; 920-991-2599; **n9rjz@tponet.com**; **www.w9zl.org**.

†**Wisconsin (Waukesha)—Nov 6**, 8 AM to 2 PM. *Spr:* Milwaukee Repeater Club. Waukesha County Expo Center, N1 W24848 Northview Rd; take I-94 W to County J, go S on County J to Northview Rd, go W on Northview to Expo Center. Pancake breakfast. *TI:* 146.91 (127.3 Hz). *Adm:* $6. Tables: $17. Bob Albert, AB9FB, c/o Milwaukee Repeater Club, Box 2123, Milwaukee, WI 53201-2123; 414-526-7011; **swapfest@mrc91.org**; **www.mrc91.org**.

Attention All Hamfest Committees!

Get official ARRL sanction for your event and receive special benefits such as donated ARRL publications, handouts, and other support.

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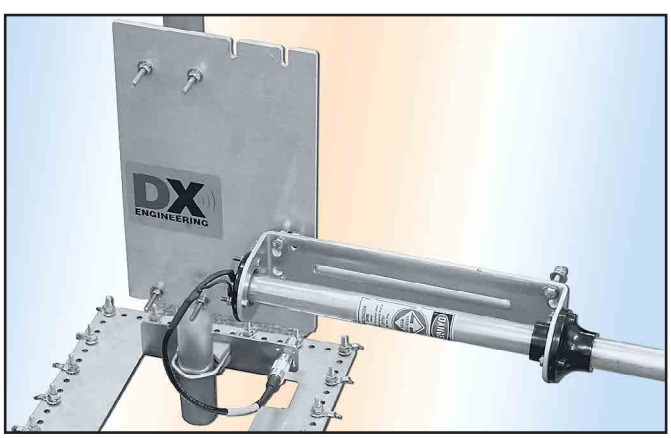
Promoting your event is guaranteed to increase attendance. As an approved event sponsor, you are entitled to advertise your event in *QST* at special rates. Make your hamfest a success by taking advantage of this great opportunity. Call the ARRL Advertising Desk at 860-594-0207, or e-mail **ads@arrl.org**.

NEW PRODUCTS

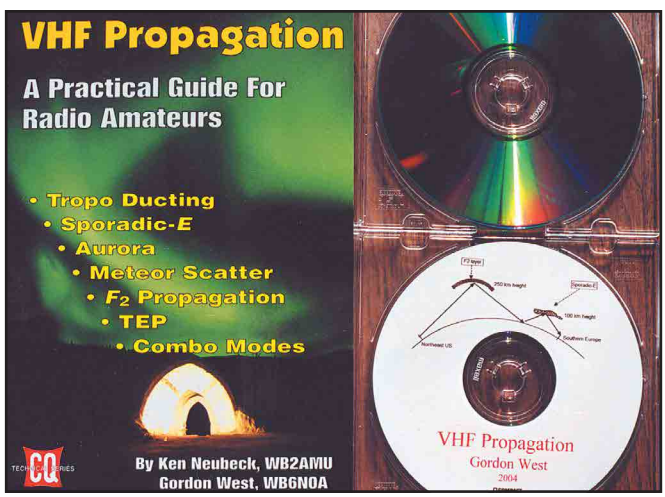
TILT BASE MOUNTING PLATE FOR VERTICAL ANTENNAS

◊ The DX Engineering TB-1P Tilt Base mounting plate enables operators to raise or lower Hustler BTV, Cushcraft and Buttternut vertical antennas while leaving the base attached to the mounting post. The tilt base is designed to allow one person to raise or lower the antenna for adjustment or repair by loosening the flange nuts, lifting and tilting. The Tilt Base is constructed of 1/4 inch 6061-T651 aluminum alloy and is designed to work with the DX Engineering RADP-1P radial plate (shown in photo). Price: $39.95. For more information, contact DX Engineering, PO Box 1491, Akron, OH 44309; tel 800-777-0703; **www.dxengineering.com.**



VHF/UHF PROPAGATION BOOK AND AUDIO CD

◊ Experienced VHF operators Gordon West, WB6NOA, and Ken Neubeck, WB2AMU, have announced their new book, *VHF Propagation*. This book is intended to serve as a practical guide for Amateur Radio operators interested in learning about the various VHF/UHF propagation modes without being dragged through charts and columns of numbers. Topics addressed include atmospheric anomalies, ducting, sporadic E, aurora, meteor scatter, transequatorial propagation and satellite communications. The book is published by CQ Communications; tel 800-853-9797. Price $15.95. Gordon also recorded a companion audio CD with the actual sounds of these propagation modes. The CD is available from Gordon West, 2414 College Dr, Costa Mesa, CA 92626; tel 714-549-5000. Price: $9.95 plus $3 shipping; or book and CD: $20 plus $3.95 shipping.



SILENT KEYS

It is with deep regret that we record the passing of these amateurs:

W1CUW, Salvatore Aliano, Poland, ME
KR1D, William J. Carney, Raymond, NH
WB1DUF, Zygmunt K. Ciucias, East Haddam, CT
KA1PPN, Howard I. Gustafson, Middletown, CT
KA1REF, Richard D. Buxton, Boylston, MA
KA1RMY, Ronald A. Ritchie, Arlington, VT
W1WEX, William C. Stevens Jr, West Hills, CA
W1YW, Timothy J. Cramer, Mechanicsville, VA
N2GKW, James P. McCarthy, Bangor, PA
W2HQF, Hugo P. Oliver, Gilboa, NY
W2JZK, Gerard Lecce, Boca Raton, FL
W2KWN, Ragnar E. Erickson, North Highlands, CA
W2LWB, John A. Chiuchiolo, Milford, CT
K2ROJ, Ralph W. Stockman, Friendship, NY
WA2ZSD, William J. Dolan, Gladstone, NJ
*K3LG, Bernard Schmidt, Harrisburg, PA
W3NHQ, William J. Lawrence, Allison Park, PA
W3SQP, Donald F. Hemenway, Macon, GA
W3CWM, Julius W. Stedenfeld, Hackettstown, NJ
K4AD, Gordon E. Gray, Hillsboro Beach, FL
W4CRE, Thomas L. Stengel, Les Ulis, France
KE4DXL, Irene L. Leitch, Wadmalaw Island, SC
KA4ELW, Gardner E. Wells, Myrtle Beach, SC
W4GUF, E. A. Coleman, Fort Lauderdale, FL
WA4IVU, Virgil McNew, Cold Spring, KY
WB4LGD, Oshel G. McKinney, Morehead, KY
K4LRU, Olin R. Houston, Arlington, VA
KI4MG, Paul E. Harrison Jr, Port Saint Lucie, FL
WA4MHO, Earl L. Oliver, Leeds, AL
N4MTD, Frank R. Spencer, Cleveland, OH
W4OJS, James W. Pierce, Burlington, NC
K4OZI, Doug Hammons, Barbourville, KY
KE4QWP, Ronald T. Cyre, Jacksonville, FL
W4ROM, James G. Waits, Bruce, FL
W4TOQ, Russell L. Holt, Wilmington, NC
‡K4VCL, Donald Worley, Roanoke, VA
W4VOE, Charles K. Morgan, Hillsborough, NC
KS4VZ, J. E. Jones, Versailles, KY
K4WKG, John L. Zimmerman, Jarratt, VA
WF4X, Darryl I. Davis, Defuniak Springs, FL
KR4YJ, W. O'Neal Frost, Huntsville, AL
W4ZCT, Harry A. Albright, Malabar, FL
KF4ZLD, Christopher L. Gross, Mill Spring, NC
W5AXQ, Harry Watson, Florence, MS
K5BCM, Elvin H. Varnado, Irving, TX
W5BDY, Lawrence L. Lodge, Albuquerque, NM
K5HDN, Bertron L. Hamill, Vicksburg, MS
W5IO, Morris Guzick, Round Rock, TX
*W5JB, Joe H. Beler, Richardson, TX
W5LNS, Homer T. Fillingim, Ruidoso, NM
N5MCA, Glynn M. Brashear, Farmington, NM
KC5MQP, Chester R. Cook, Los Lunas, NM
W5SKP, Jack A. Carterette, Fort Smith, AR
WA5TDP, Henry G. Heggins Sr, Vicksburg, MS
KC5THH, Judy Smith, Abilene, TX
W5WPG, William P. Giese, Liberty Hill, TX
N5YWK, Burton D. Cliett, West Point, MS
K6IIA, Maurice E. Hill, Merced, CA
WB6KOZ, Eugene V. Komer, Oxnard, CA
KG6NPD, Donald D. Dixon, Torrance, CA
KE6PZH, Marlon Brando, Beverly Hills, CA
K6TGE, Glen F. Wilcox, Santa Maria, CA
W6TWO, Rolph D. Stoddard, Los Gatos, CA
WB6VXA, Robert Avina, Santa Clara, CA
W6ZAF, Robert S. Flowerman, Grass Valley, CA
W7AMQ, Gale B. Sells, Portland, OR
KB7DOC, Elmer H. Hansen, Bellevue, WA
WA7EDH, Raymond M. Cripps, Phoenix, AZ
W7FFK, Harold A. Thayer, Marysville, WA
KI7LS, William M. Sinton, Flagstaff, AZ
W7OPS, Thomas W. James, Pinedale, AZ
KD7TYH, Ray B. Bakker, Morgan, UT
W7UD, Henry Perozzo, Tacoma, WA
N7WD, Worthie Doyle, Olalla, WA
KC8CUW, Paul R. Newfer, Newaygo, MI
KB8DBR, Charles Govey, Arcanum, OH
N8HK, Hancil M. Kessel, Charleston, WV
K8IZD, Don Pennington, Hinton, WV
W8JK, John D. Kraus, Delaware, OH
WA8JOI, Raymond J. Gasiewicz, Oscoda, MI
*WA8LAY, Harold J. Bell, Lansing, MI
K8NZZ, Wilbur R. Urmson Jr, Rogers, OH
W8OZA, Russell F. Sievert, Columbus, OH
KC8VIX, Thomas L. Wallace, Cincinnati, OH
K9EIC, John C. Grobark, Powers Lake, WI
W9ETU, Edward G. Moore, Montgomery, IL
W9GAA, Herbert W. Bloedel, Schofield, WI
W9IZQ, George J. Pfister Jr, Wauwatosa, WI
KQ9P, Carl H. Seay, Indianapolis, IN
N9PYZ, Marvin E. Stewart, Clinton, IL
K9QMH, Bernard Flathau, Park Ridge, IL
WB9RIF, Raymond V. Hart, Sevierville, TN
KB9SB, Milburn Riddle, Carbondale, IL
WB9SCC, George A. Scheuer, South Bend, IN
W9VOK, Robert J. Calhan Jr, Ottawa, IL
KJ9W, Joseph N. Williams, Maziomanie, WI
WDØBOC, Ronald Robb, Pittsburg, KS
WAØECB, Lewis J. Haller, Grand Junction, CO
WØHY, Addison T. Miller, Lawrence, KS
WØJNQ, William E. Wentzel, Washington, MO
WØJUD, Richard F. Bailer, Fort Collins, CO
KCØNJE, Joyce E. Reeve, Loveland, CO
NØNZ, Dale M. Pfeifer, Norfolk, NE
WØPOL, Robert H. Fricke, Ashland, NE
WAØRTH, Willard T. Moreing, Overland Park, KS
WØZPJ, Raymond E. Heinold, Mesa, AZ
UA3VCS, Artem Popov, Taichung, Taiwan

*Life Member, ARRL
**Charter Life Member, ARRL
‡Call sign has been re-issued through the vanity call sign program.

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

Kathy Capodicasa, N1GZO ♦ Silent Key Administrator ♦ n1gzo@arrl.org

QEX INCLUDING: COMMUNICATIONS QUARTERLY

In the September/October 2004 issue:

- Jim Hall, W4TVI, and Tony Barrett, N7MTZ, bring us their design for a pocket APRS transmitter. It weighs only a few ounces, runs for days from an inexpensive battery and opens a world of possibilities for experimenters. Brian Cake, KF2YN, returns with a third segment on twin-C antennas.
- Steve Gradijan, WB5KIA, describes how to "Build a Super Transceiver."
- Al Christman, K3LC, describes the control networks that make his 4-square array hit the compass points. Contributing Editor L. B. Cebik, W4RNL, brings another segment of his "Tale of Three Yagis" in "Antenna Options." Look for installments of "Outside the Box" and "Tech Notes" by Contributing Editor Ray Mack, WD5IFS.

QEX is edited by Doug Smith, KF6DX, (**dsmith@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; elsewhere by surface mail (4-8 week delivery) it's $31. In Canada by airmail, it's $40. Elsewhere by airmail, it's $59. Nonmembers add $12 to these rates.

Would you like to write for *QEX*? It pays $50/printed page. Get more information and an Author's Guide at **www.arrl.org/writing.html**. If you prefer postal mail, send a business-size self-addressed, stamped envelope to Maty Weinberg, ARRL, 225 Main St, Newington, CT 06111-1494, and request an Author's Guide.

STRAYS

QST congratulates...

◊ ARRL member Barry P. Fletcher, ZS1FJ/G4MFW/ZL1MFW, recipient of the 2003/2004 Icom Award from the South African Radio League.

◊ ARRL member and *QST* author Nickolaus Leggett, N3NL, of Reston, Virginia, who has been granted a US patent for a wireless bus.

◊ ARRL author William O. (Bill) Troetschel, W7LVO, of Saratoga, California, who received the Air Force Space and Missile Pioneer Award and was recently inducted into the Pioneer Hall of Fame for his early satellite work for the US Air Force.

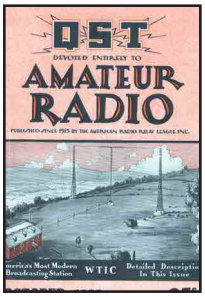
◊ ARRL member Matthew Boarts, AD5GX, of Tucson, Arizona, who recently won the Edwin R. Chess award recognizing him as the Outstanding Company Grade Officer Chaplain of the Air Force for 2003.

◊ Fifteen year old Jonathan Scott, of Hoover, Alabama (son of Nathan Scott, KI4BDL, and nephew of Rod Scott, N1YZ, and Michael Scott, W1NDZ), who recently won not only First Place in the Junior High Science fair Engineering section but also Grand Prize of the whole Science Fair at Shades Mountain Christian School in Birmingham. Jonathan's project was on comparing the characteristics of two antennas he built—a 3 element Yagi and a quarter wave vertical.

◊ Northern New Jersey Section Manager Bill Hudzik, W2UDT, of Gillette, who has been nominated to the Board of Governors for the Northwest NJ Chapter of the American Red Cross. Bill was also recently appointed by the Morris County Freeholder Board to the Morris County Municipal Utilities Authority, which provides drinking water to several municipalities.

75, 50 AND 25 YEARS AGO

October 1929

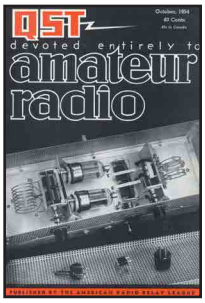


♦ The cover drawing shows Hartford's "WTIC, America's Most Modern Broadcasting Station," with a detailed description in this issue. The editorial revisits the Washington Radio Convention of 1927, making sure the reader has his facts straight about the changes that resulted from that convention.

Technical Editor Jim Lamb, W1CEI, visits "WTIC" and tells about this modern 50-kw. broadcast station. Dale Pollack, W2AEC, describes combination of a monitor, frequency meter, and receiver for both phone and c.w. in "A Worthwhile Combination." Ed Handy, W1BDI, reports on "KHEJ and the 'Untin' *Bowler* Awards," cash prizes for hams who did best in relaying messages received from the flying boat *Bowler* as it attempted to pioneer a polar route from America to Europe. The *Bowler* was swept from its moorings in Port Burwell, Ontario, by gale-force winds and sank (fortunately, with no personal injuries) before the flight could be completed. The sixth entry in the Station Description Contest tells about "G5BY." The "Experimenters' Section" reports on the use of the screen-grid tube as a detector in receivers.

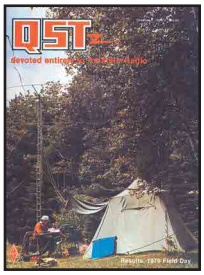
October 1954

♦ The cover photo shows a 120-watt V.H.F. amplifier that will be featured in next month's issue. The editorial announces that this and forthcoming issues of *QST* will publish a series of articles that summarize the contents and flavor of the early *QST*s, now that the magazine is 40 years old. Another editorial topic announces the latest A.R.R.L. publication, "Single Sideband for the Radio Amateur," noting that it was just seven years ago that W6YX and WØTQK made their historic *first* amateur s.s.b. contact.



Vern Chambers, W1JEQ, presents "An R.F. Assembly for Mobile or Fixed-Station Work" that features bandswitching and ganged multiple-circuit tuners. Ed Tilton, W1HDQ, and Mason Southworth, W1VLH, describe "A Step-by-Step Transmitter for the V.H.F. Man," Part I of a series that will get you on 6 and 2 meters. Bill Clasen, W4GMY, tells about "The 'Simple Squirt' Beam," an end-loaded, 2-element, 14-Mc. beam for small spaces. "An Improved Volume-Compression Circuit," by W. D. Brosseau, W5BSU, helps the phone op get more punch into his signal. O. J. Russell, G3BHJ, discusses "Bandspreading the Clapp VFO." "Happenings of the Month" reports that Herbert Hoover Jr, W6ZH, has been named Undersecretary of State under Secretary John Foster Dulles. "*QST*—Volume I," the foreword to an index by Sumner B. Young, WØCO, gives the reader an overview of the early A.R.R.L. as well as the early *QST*. Sumner comments that "Without *QST*, I believe the League would have perished." In "How's DX?" by Rod Newkirk, W1VWM, the master's voice says to Jeeves, who had just played "73S" on the Scrabble board, "But Jeeves, I insist there is NO plural for 73."

October 1979



♦ The cover shows a small tent in the woods, a tower among the trees, and a ham sitting at his operating position—it's the "Results, 1979 Field Day." The editorial says it's time to "Speak Up!" on the issue of whether or not to retain the Morse code requirement for a ham license. The position of the ARRL and the international amateur community is that the code requirement should continue.

Steve Powlishen, K1FO, describes "A Grounded-Grid Kilowatt Amplifier for 432 MHz." Bob Shriner, WAØUZO, and Doug DeMaw, W1FB, tell about "A Simple RF Sniffer." Fred Brown, W6HPH, explains how to get "Better Results with Indoor Antennas." C. A. "Tex" Eubanks, N3CA, tells about building "A Microprocessor-Based Morse Keyboard." Eric Polk, WA1YIW, describes "The CW-150—A Classical Vacuum-Tube Transmitter." Pete Rhodes, K4EWG, tells how to design and build "The Log-Periodic V Array." Bill Hennigan, W3CZ, discusses "Broadband Hybrid Splitters and Summers." A photo in "Strays" shows Connie Marshall, K3CM, who was awarded a special "Combination WAS"; Connie earned WAS, WAS on 50 MHz, WAS on 2 meters, 5BWAS and WAS on 160 meters. Who WAS that masked man? QST

Al Brogdon, W1AB ♦ Contributing Editor

W1AW Schedule

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	TELEPRINTER 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	TELEPRINTER 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				

W1AW's schedule is at the same local time throughout the year. The schedule according to your local time will change if your local time does not have seasonal adjustments that are made at the same time as North American time changes between standard time and daylight time. From the first Sunday in April to the last Sunday in October, UTC = Eastern Time + 4 hours. For the rest of the year, UTC = Eastern Time + 5 hours.

♦ **Morse code transmissions:**
Frequencies are 1.8175, 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 practice text is from the pages of *QST*. The source is given at the beginning of each practice session and alternate speeds within each session. For example, "Text is from July 2001 *QST*, pages 9 and 81," indicates that the plain text is from the article on page 9 and mixed number/letter groups are from page 81.

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 on approximately 3.590 MHz by K6YR. See "Contest Corral" in this issue. At the beginning of each code practice session, the schedule for the next qualifying run is presented. 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. The fee structure is $10 for a certificate, and $7.50 for endorsements.

♦ **Teleprinter transmissions:**
Frequencies are 3.625, 7.095, 14.095, 18.1025, 21.095, 28.095 and 147.555 MHz. Bulletins are sent at 45.45-baud Baudot and 100-baud AMTOR, FEC Mode B. 110-baud ASCII will be sent only as time allows.
On Tuesdays and Fridays at 6:30 PM Eastern Time, Keplerian elements for many amateur satellites are sent on the regular teleprinter frequencies.

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

♦ **Miscellanea:**
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.

Headquarters and W1AW are closed on New Year's Day, Presidents' Day (Feb 16), Good Friday (Apr 9), Memorial Day (May 31), Independence Day (Jul 5), Labor Day (Sep 6), Thanksgiving and the following Friday (Nov 25-26), and Christmas Day (Dec 24). QST

CONTEST CORRAL

W1AW Qualifying Runs are 10 PM EDT Friday, September 3 (0200Z September 4) (10-40 WPM QRL), and 7 PM Wednesday, September 15 (2300Z September 15). The K6YR West Coast Qualifying Run will be at 9 PM PDT Wednesday, September 22 (0400Z September 23). Check the W1AW Schedule elsewhere in this issue for details.

Feedback

In the 2004 January VHF Sweepstakes, South Jersey Radio Association was mislabeled. Their score should be 88,272 points with 8 logs submitted in the Medium Club category. Also, several logs have been added to the on-line database and PDF available at **www.arrl.org/contests/results**.

Abbreviations

SO—Single-Op; M2—Multiop—2 Transmitters; MO—Multi-Op; MS—Multi-Op, Single Transmitter; MM—Multi-Op, Multiple Transmitters; AB—All Band; SB—Single Band; S/P/C—State/Province/DXCC Entity; HP—High Power; LP—Low Power; Entity—DXCC Entity

No contest activity on 30, 17 and 12 meters. Refer to the contest Web sites for information about awards. Unless stated otherwise, regional contests only count QSOs with stations in the region. Publication deadline for Contest Corral listings is the first of the second month prior publication.

Oct 2-3

PSK Rumble (The Fall Classic)—sponsored by Troy ARA, 0000Z-2400Z Oct 2. 80-6 meters. Exchange: name and S/P/C. Categories: Normal (>100 W), Great (<20 W), Super (<5 W), Novice, SWL. Score: QSOs × (W/VE/JA/VK call areas + DXCC entities counted once per band). For more information: **www.n2ty.org/seasons/tara_rumble_rules.html**. Logs due Oct 30 via on-line score submission form at **www.n2ty.org/seasons/tara_rumble_ score.html**.

Oceania DX Contest—supported by the Wireless Institute of Australia (WIA) and New Zealand Association of Radio Transmitters (NZART), Phone 0800Z Oct 2-0800Z Oct 3 (CW is 0800Z Oct 9-0800Z Oct 10). Frequencies: 160-10 meters, work VK/ZL/Oceania stations only. Categories: SOAB, SOSB, MS, MM, SWL. Exchange: RS(T) and serial number. QSO points: 160—20 pts, 80—10 pts, 40—5 pts, 20—1 pt, 15—2 pts, 10—3 pts. Score: QSO points × WPX prefixes counted once per band. For more information: **www.oceaniadxcontest.com**. Logs due Nov 7 in Cabrillo format to **ph@oceaniadxcontest.com** (CW to **cw@oceaniadxcontest.com**) or paper logs (if fewer than 50 QSOs) to Oceania DX Contest, c/o Wellington Amateur Radio Club Inc, PO Box 6464, Wellington 6030, New Zealand.

EU Autumn Sprint—SSB, sponsored by the EU Sprint Gang, 1500Z-1859Z Oct 2 (CW is 1500Z-1859Z Oct 9). Frequencies: 80-20 meters, stations outside EU work EU stations only. SOAB category only. Exchange: your call, serial number, name, other station's call. Special QSY rule—see Web site. Score is number of QSOs. For more information: **www.qsl.net/eusprint**. Logs due 15 days after the contest to **eusprint@kkn.net** or Paolo Cortese, I2UIY, PO Box 14, I-27043 Broni (PV), Italy (CW logs to Karel Karmasin, OK2FD, Gen Svobody 636, CZ-674 01 Trebic, Czech Republic).

California QSO Party—CW/SSB, sponsored by the Northern California Contest Club, 1600Z Oct 2-2200Z Oct 3. Frequencies: 160-2 meters. Categories: SOAB (HP >200 W, LP, QRP <5 W), MS, MM, CA County Expedition, Mobile, Novice/Tech, Club, School. SO work 24 hours only. New 10-minute rule for MS allows unlimited band changes. CW QSOs in CW subbands, except 160. Work CA stations in each county. Stations on a county line count as a single contact for QSO points, but both counties can be claimed as multipliers. Exchange: serial number and S/P/C or CA county. QSO points: CW—3 pts, Phone—2 pts. Score: QSO points × CA counties (max 58) or CA stations multiply by states and VE call areas (max 58). For more information: **www.cqp.org**. Logs due by Nov 15 to **cqp@ contesting.com** or to Alan Maenchen, AD6E, 3330 Farthing Way, San Jose, CA 95132.

RSGB 21/28 MHz Contest—SSB, sponsored by the RSGB, 0700Z-1900Z Oct 3 (CW is 0700Z-1900Z Oct 17). Frequencies: 15 and 10 meters (see Web site for band plan), work UK stations only. Categories: UK and DX SO or MS (Open, Restricted, QRP <10 W) and SWL (Open and Restricted). Exchange: serial number and UK district. QSO points: 3 pts/QSO. Score QSO points × UK districts (UK stations use DXCC entities plus JA, W, VE, VK, ZL and ZS call areas) counted once per band. For more information: **www.rsgbhfcc.org**. Logs due Nov 17 to **2128ssb.logs@rsgbhfcc.org** (**2128cw.logs@rsgbhfcc.org** for CW logs) or to RSGB—G3UFY, 77 Bensham Manor Rd, Thornton Heath, Surrey CR7 7AF, England.

Oct 6-10

ARRL International EME Contest, 0000Z Oct 9-2400Z Oct 10, 50-1296 MHz (see September *QST*, p 98 or **www.arrl.org/contests** for new rules).

YLRL Anniversary Party—CW, sponsored by the YLRL, 1400Z Oct 6-0200Z Oct 8 (phone Oct 13-Oct 15). Frequencies: 160-10 meters. Exchange: serial number, RS(T) and ARRL section/VE province/country. QSO points: US or VE YLs—1 pt, DX YLs—2 pts. Score: QSO points × S/P/C. For more information: **www.qsl.net/ylrl/ylcontests.html**. Logs due 30 days after the contest to **wx4mm@tm-moore.com** or to WX4MM, Mary Moore, 1593 Lee Rd 375, Valley, AL 36854.

10-10 Day Sprint—Phone/CW/Digital, 0001Z-2400Z, Oct 10. One QSO per station, regardless of mode. Logs due Oct 25 (see August *QST*, p 94 or **www.ten-ten.org**).

Oceania DX Contest—CW, 0800Z Oct 9-0800Z Oct 10 (see Oct 2-3).

EU Autumn Sprint—CW, 1500Z-1859Z Oct 9 (see Oct 2-3).

Pennsylvania QSO Party—CW/Phone, sponsored by the Nittany ARC, 1600Z Oct 9-0500Z Oct 10 and 1300Z-2200Z Oct 10. Frequencies (MHz): CW—1.810 and 40 kHz above band edge; Phone—1.850, 3.980, 7.280, 14.280, 21.380, 28.480; Novice/Tech—10 kHz above edge of segment; mobiles 5 kHz below the listed frequencies. Work mobiles and rovers in each county. Categories: SO (HP >150 W, LP, or QRP <5 W), MS, MM, SO or MS Portable, Novice/Tech/TechPlus, Mobile, Rover. Exchange: serial number and ARRL/RAC section (PA stations send PA county). QSO points: CW—2 pts on 160 and 80, 1.5 pts on other bands; Phone—1 pt. Score: QSO points × PA counties (PA stations use PA counties + ARRL/RAC sections + 1 for a DX QSO) ×2 if QRP or ×3 if Novice/Tech. Add 200 points for each QSO with the bonus station (see Web site). PA mobiles and rovers add 500 points for each county with 10 or more QSOs. For more information: **www.nittany-arc.net/paqso.html**. Logs due Nov 15 to PA QSO Party, c/o NARC, PO Box 614, State College, PA 16804-0614.

FISTS Fall Sprint—CW, 1700Z-2100Z Oct 9 (see February *QST*, p 103 or **www.fists.org**).

North American RTTY Sprint—sponsored by the *National Contest Journal*, 0000Z-0400Z Oct 10. Frequencies 80-20 meters. North American stations work everyone; others work NA stations only. Exchange both call signs, serial number, name and S/P/C. The same station can be worked multiple times provided 3 contacts separate the contact in both logs, regardless of band. QSY rule: Stations calling CQ, QRZ, etc, may only work one station in response to that call; they must then move at least 1 kHz before working another station or 5 kHz before soliciting another call. Once you are required to QSY, you may not make a new QSO on the previous frequency until you have made a contact at least 1 or 5 kHz (as required) away. For more information: **www.ncjweb.com**. Logs due 7 days after the contest to **rttysprint@ncjweb.com** or Douglas McDuff, W4OX, 10380 SW 112th St, Miami, FL 33176.

Oct 13-17

YLRL Anniversary Party—SSB, 1400Z Oct 13-0200Z Oct 15 (see Oct 6-10).

Worked All Germany—CW/SSB, sponsored by The Deutscher Amateur Radio Club, 1500Z Oct 16-1459Z Oct 17. Frequencies: 80-10 meters, work German stations only. Categories: SOAB (HP >100 W, LP, QRP <5 W) CW or Mixed Mode, MS, SWL, packet spotting allowed for all classes. Exchange: RS(T) and serial number or DOK code. QSO points: 3 pts/QSO. Germans count DXCC/WAE countries per band. Score: QSO points × DOK codes (Germans use DXCC entities or WAE countries) counted once per band and mode. For more information: **www.darc.de/referate/dx/fedcg.htm**. Logs due Nov 20 to **wag@dxhf.darc.de** or to WAG Contestmanager, PO Box 12 09 37, D-01010 Dresden, Germany.

JARTS WW RTTY Contest, sponsored by the Japanese Amateur Radio Teleprinter Society, 0000Z Oct 16-2400Z Oct 17. Frequencies: 80-10 meters. Categories: SOAB (HP >100 W, LP), MO, SWL. Exchange: RST and age (Multiop sends 99, YL may send 00). QSO points: own continent—2 pts, diff cont—3 pts per QSO. Score: QSO points × DXCC entities + JA, W, VE and VK call areas counted once per band. For more information: **www.edsoftz.com/JARTS**. Logs due Nov 30 to **jarts2004@edsoftz.com** (e-mail logs only).

Asia-Pacific Sprint—CW, sponsored by the Asia-Pacific Sprint Contest Committee, 0000Z-0200Z Oct 17. Frequencies (MHz): 14.030-14.050 and 21.030-21.050. Categories: SO <150 W only. Work Asia-Pacific stations only. Exchange: RST and serial number. Special QSY rule. Score: QSOs × WPX prefixes counted once only. For more information and AP country list: **jsfc.org/apsprint**. Logs due 7 days after contest to **apsprint@kkn.net** (Cabrillo format encouraged; no paper logs accepted).

RSGB 21/28 MHz Contest—CW, 0700Z-1900Z Oct 16 (see Oct 2-3).

Illinois QSO Party—CW/Phone, sponsored by the Radio Amateur Megacycle Society (RAMS), 1800Z Oct 17-0200Z Oct 18. Frequencies: 160-2 meters, CW—50 kHz above band edge, Phone—3.890, 7.290, 14.290, 21.390, 28.390 MHz; Novice/Tech—30 kHz above edge of segment. Categories: SO, MS, Mobile. Work stations in each county, county line contacts count 1 QSO from each county. Exchange: RS(T) and S/P/C (IL stations send county). QSO points: Phone—1 pt/QSO, CW—2 pts. Score: QSO points × IL counties (IL stations use states + IL counties + VE provinces + up to 5 DXCC entities). Count additional DX for points only. One bonus multiplier for each 8 QSOs with the same IL county. For more information: **my.core.com/~jematz/ilqso04.html**. Logs due Nov 15 to **jfunk@fossnorthamerica.com** (Cabrillo format only) or RAMS, c/o John Matz, KB9II, 7079 West Ave, Hanover Park, IL 60133.

Bill Windle QSO Party—CW, sponsored by First Class Operator's Club (FOC), from 0000Z-2359Z Oct 16. Frequencies: 160-10, 6 and 2 meters. Call CQ BW from 15 to 45 kHz above band edge; open to all hams, not just FOC members. Exchange: RST and name or FOC number, if member. Report total QSOs with FOC members, counted once per band, FOC members report total QSOs and total FOC QSOs. For more information: **www.firstclasscw.org.uk/**. QSO totals due Oct 23 to **KZ5D@aol.com**.

H. Ward Silver, NØAX ♦ 22916 107th Ave SW, Vashon, WA 98070 ♦ n0ax@arrl.org

Oct 23-24

USI W/VE Islands QSO Party—CW/Digital/SSB—sponsored by the US Islands Awards Program from 1600Z Oct 23 to 2359Z Oct 24. Frequencies: 160-6 meters. Categories: W/VE-phone, W/VE-CW/Digital, as Non-Island, Island, or Island Rover, plus DX and SWL. Exchange: RS(T), island name and USI or CISA number (S/P/C for non-island stations). Non-island stations work island stations only. Work stations once per island per mode. QSO points: island—5 pts, non-island—1 pt. Score: QSO points × states + provinces. For more information: **www.eng.mu.edu/usislands/usvetest.html**. Logs due Nov 30 to **wa4ja@arrl.net** or to WA4JA, John Almon, 105 Flintlock Dr, Franklin, TN 37064-2351.

QRP ARCI Fall QSO Party—CW, sponsored by QRP ARC International, 1200Z Oct 23-2400Z Oct 24, operate 24 hrs max. Frequencies (MHz): 1.810, 3.560, 3.710, 7.040, 14.060, 21.060, 28.060. Categories: SOAB, SO-High Band (20-6), SO-Low Band (160-40). QSO points: member QSOs—5 pts, non-member same cont—2 pts, non-members diff cont—4 pts. Score: QSO points × S/P/C × Power Multiplier (< 55 mW ×20, <250 mW ×15, <1 W ×10, <5 W output ×7, >5 W ×1). For more information: **2hams.net/ARCI/index.htm**. Submit entry form via contest Web site. Logs due 30 days after contest to **wb5khc@2hams.net** or QRP ARCI Contest Manager, Tom Owens WB5KHC, 1916 Addington St, Irving, TX 75062-3505.

4th Annual FISTS Coast to Coast Contest—CW—sponsored by FISTS Northwest Club, K7FFF, 0000Z-2400Z Oct 24. Frequencies: 80-10 m. Categories: SOAB, MS (QRP/QRO). Exchange: RST, name, state or DX prefix, and FISTS number or power. QSO points and scoring depends on number of times club is worked, for more information: **www.tomochka.com/k7fff/fnw_c2c04.html**. No logs required; just send total score and list of clubs contacted to **FistsC2C@yahoo.com** within 30 days of the contest.

Oct 30-31

CQ World Wide DX Contest—SSB, sponsored by *CQ Magazine*, 0000Z Oct 30-2400Z Oct 31 (CW is 0000Z Nov 27-2400Z Nov 28). Frequencies: 160-10 meters. Categories: SOAB and SOSB (HP >100 W, LP, QRP <5 W), MS, M2 (new), MM. MS have 10 minute rule. Exchange RS(T) and CQ zone. QSO points: same cont—1 pt (NA stations count 2 pts), diff cont—3 pts. Stations in the same country may be worked for zone credit only. Score: QSO points × CQ Zones + DXCC entities and WAE countries counted once per band. For more information: **www.cqww.com**. Logs due Dec 1 (Jan 15 for CW) to **ssb@cqww.com** (CW logs to **cw@cqww.com**) or to *CQ Magazine,* 25 Newbridge Rd, Hicksville, NY 11801.

ARRL International EME Contest, 0000Z Oct 30-2400Z Oct 31, 2304 MHz and higher (see Oct 9-10).

10-10 International CW/Digital Contest, 0001Z Oct 30-2400Z Oct 31. Logs due Nov 15 (see August *QST*, p 94 or **www.ten-ten.org**). QST

NEW PRODUCTS

COMPOSITE FIBERGLASS MAST KITS

◊ Barker & Williamson has begun manufacturing and selling portable telescoping fiberglass mast kits. While these were developed with the soldier or government agency in mind, they may also be useful to amateurs for field or emergency use. The mast poles are made in 4 foot sections that are field assembled with a joiner and pinned together. A locator pin is hammered into the ground to stabilize the bottom of the assembly and a guy ring at the top allows lines to be run to ground stakes. The guy lines incorporate tensioners and snap hooks.

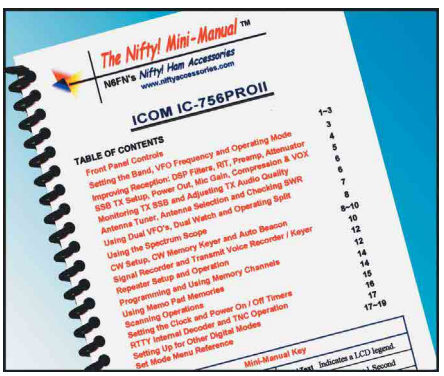
The pole sections are made from fiberglass reinforced plastic that is said to be lightweight, strong and rigid. Other features include bottom locating pins turned from aircraft aluminum and ground stakes made from thermoplastic to avoid rust. All guys and lines are made from polyester, which is specified not to stretch, rot or degrade in ultraviolet light. Kits are available to 24 feet in height. A complete 12 foot mast kit weighs 10 pounds. They are available in forest green and sand colors. For more information, contact Barker & Williamson, 603 Cidco Rd, Cocoa, FL 32926; tel 321-639-1510; **www.bwantennas.com/pro/mast.pro.htm**.

IC-756PROII MINI-MANUAL FROM NIFTY HAM ACCESSORIES

◊ Nifty Ham Accessories has recently added the IC-756PROII Mini-Manual to its series of quick reference guides, providing complete coverage for this ICOM transceiver.

All controls and menus are explained. Condensed step-by-step instructions are designed to simplify operation of the IC-756PROII's many features. Annotations and operating hints are interspersed throughout the guide.

The guide is printed in color and laminated. The 20 page, 4.5×8 inch Mini-Manual is designed to be kept with the radio. Price: $20.85. For further information, see **www.niftyaccessories.com** or contact Nifty Ham Accessories, 1601 Donalor Dr, Escondido, CA 92027; tel 760-781-5522.



STRAYS

JIM WILSON, N2SVN

Among those at the World War II Memorial dedication ceremony in Washington, DC, in May, were Jim Wilson, N2SVN, of Mantua, New Jersey, and his dad, Harry Wilson, a First Sergeant during the War (shown at left with a fellow vet). Jim took his dad to Washington in honor of his 80th birthday.

SPECIAL EVENTS

Alexandria, MN: Runestone ARC—WØALX, WØW. 1100Z **Sep 13**-2300Z **Sep 24**. Kensington Runestone Discovery. 21.070 14.250 14.050 7.200. Certificate. Bill Klundt, 509 Pine St S, Sauk Centre, MN 56378.

Butler, PA: Butler County Amateur Radio Association, W3UDX. 1300Z-1800Z **Sep 18**. Birthday of the Jeep. General bands 80 to 10. QSL. BCARA, PO Box 1787, Butler, PA 16003.

Fredricksburg, TX: North Texas Renewable Energy Group ARC, W5S. 0000Z **Sep 23**-2359Z **Sep 26**. Club will operate a solar powered station at TRE Roundup. 28.400 21.320 14.270 7.260. Certificate. Greg Hall, 18011 Old Preston Ct, Dallas, TX 75252.

Fairmount, IN: Grant County Amateur Radio Club, W9EBN. 1500Z-2200Z **Sep 25**. James Dean Country Where Cool Was Born and Car Show. 146.79 28.430 14.243 7.244. Certificate. L. B. Nickerson, 517 N Hendricks Ave, Marion, IN 46952. **www.grantarc.com**.

West Chester (Cincinnati), OH: West Chester Amateur Radio Association, WC8VOA. 1200Z-2400Z **Sep 25**. 60th Anniversary of Voice of America-Bethany Dedication. 28.305 21.305 14.275 7.275. QSL. WC8VOA, PO Box 913, West Chester, OH 45071. **wc8voa.org** .

Macon, GA: Macon-Bibb Emergency Management Agency Volunteers and Exchange Club of Macon, W4G. 1600Z **Oct 1**-2400Z **Oct 2**. Celebrating the 149th year of the Georgia State Fair. 14.255 7.255. Certificate. Jeff Amerson, Exchange Club of Macon, PO Box 13571, Macon, GA 31208.

Anamosa, IA: Jones County Amateur Radio Club, NØCWP. 1300Z-1700Z **Oct 2**. 16th Annual Anamosa Pumpkinfest and Weigh-Off. 14.260. Certificate. Jim McClintock, 301 Vine St, Morley, IA 52312.

Middletown, RI: Newport County Radio Club, W1SYE. 1400Z **Oct 2**-2100Z **Oct 3**. Norman Bird Sanctuary Harvest Fair—emphasis on youth. 21.350 14.285 14.071 7.260. Certificate. Newport County Radio Club, Box 3103, Newport, RI 02840. **www.qsl.net/w1sye/**.

Wallingford, CT: Meriden Amateur Radio Club, W1NRG. 1600Z **Oct 2**-2200Z **Oct 3**. "Celebrate Wallingford" CT town festival. 28.375 21.375 14.275 7.275. Certificate. Jim Savage, N1ZN, 19 Broadview Dr, Wallingford, CT 06492-3349. **www.meridenarc.org**.

Youngstown, OH: Mahoning Valley Amateur Radio Association, W8QLY. 1300Z-2200Z **Oct 3**. Boardman Oktoberfest. 28.450 21.350 14.250 7.250. QSL. Mahoning Valley ARA, PO Box 2950, Youngstown, OH 44511.

Prince Albert, SK, Canada: Northern Saskatchewan Amateur Radio Club, CG5EEE. 0000Z **Oct 3**-2359Z **Oct 16**. City of Prince Albert's Centennial. 21.220 14.220 7.220 3.720. Certificate. NSARC, c/o 532 - 26 St W, Prince Albert, SK, Canada S6V 4R5. US hams include $2 for certificate requests.

Jefferson, OH: Ashtabula County Amateur Radio Club, K8CY. 1400Z **Oct 8**-2100Z **Oct 9**. Ashtabula County Covered Bridge Festival. 28.460 21.360 14.260. Certificate. ACARC, 722 Lyndon Ave, Ashtabula, OH 44004. **acoc.ashtabula.net/radio/**.

Ellijay, GA: Ellijay Amateur Radio Society, W4A. 2200Z **Oct 8**-0200Z **Oct 18**. 23rd Annual Apple Festival, Ellijay, Gilmer Co, GA. SSB & CW General bands 80 40 20 15 10 m and 1800-1900 kHz. Certificate. Ellijay Amateur Radio Society, PO Box 1371, East Ellijay, GA 30539. **www.qsl.net/w4hhh/**.

Canon City, CO: Royal Gorge Amateur Radio Club, KBØTUC. 1800Z-2100Z **Oct 9**. From the world's highest suspension bridge. 14.260. Certificate. Chuck Ward, NCØA, 1011 Harrison St, Canon City, CO 81212. **www.qsl.net/rghc**.

Forest, VA: Lynchburg Amateur Radio Club, N4J. 1400Z-2200Z **Oct 9**. Thomas Jefferson's summer retreat. 28.365 21.365 14.265 7.265. QSL. Ed Narwid, W4OAF, 1799 Otterhill Rd, Bedford, VA 24523.

Gastonia, NC: Gaston County Amateur Radio Society, N4GAS. 1600Z-2200Z **Oct 9**. 20th anniversary Charlotte Area SKYWARN Net. 145.35 14.260 7.260. Certificate. John Covington, W4CC, PO Box 1604, Belmont, NC 28012. **www.n4gas.org**.

Lake Placid, NY: Northern New York ARA, N2Y. 1400Z-1900Z **Oct 9**. NNY Section Hamfest/Convention. 14.265 14.060 10.110 7.245. Certificate. Richard Sherman, 25 Pines Rd, Malone, NY 12953.

Nowhere, KS: Douglas County Amateur Radio Club, WØUK. 1400Z-2100Z **Oct 9**. Operating from southern terminus of Midland Historical Railway. 28.365 21.365 14.244 7.244. Certificate. Kenneth Blair, KCØGL, 1711 W 19th Terr, Lawrence, KS 66046.

Robbinsville, NC: Smoky Mountains Amateur Radio Team, N4GSM. 1400Z-2000Z **Oct 9**. Anniversary of the opening of Cherohala Skyway. 14.242 7.242. Certificate. SMART, PO Box 517, Robbinsville, NC 28771. **main.nc.us/graham/smart/**.

Shady Valley, TN: Johnson County Amateur Radio Club, K4C. 1300Z-1900Z **Oct 9**. 14th Annual Cranberry Festival. 7.250. Certificate. JCARC, PO Box 155, Trade, TN 37691.

South River, NJ: Raritan Bay Radio Amateurs, K2GE. 1300Z-2200Z **Oct 9**. The 50th anniversary of the Raritan Bay Radio Amateurs. 14.260 14.070 7.220. QSL. Raritan Bay Radio Amateurs, PO Box 392, South River, NJ 08882.

Sterling, VA: Sterling Park Amateur Radio Club, K4NVA. 1400Z-2000Z **Oct 9**. The SterlingFest street festival. 14.240 7.240. QSL. Forrest B. Snyder Jr, Attn: SPARC, 805 S Hoga St, Sterling, VA 20164. **www.qsl.net/sterling**.

Sandwich, IL: Wheaton Community Radio Amateurs, K9BSA. 1400Z **Oct 9**-1700Z **Oct 10**. Three Fires Council Camporall "Scouting the Globe." 21.380 14.280 7.280 3.880. QSL. WCRA, PO Box QSL, Wheaton, IL 60189. **www.w9ccu.org**.

Westfield, NJ: W2LI Tri-County Radio Association Inc, W2LI. 1200Z **Oct 9**-2200Z **Oct 10**. Platinum Jubilee, a 70th anniversary celebration. 449.975 28.460 14.260. QSL. W2LI/AA2ZJ, 77 Pershing Ave, Iselin, NJ 08830.

Festus, MO: Jefferson County Amateur Radio Club, KBØTLL. 1700Z-2000Z **Oct 16**. Great Ozark Chili Cook Out. 147.075 14.250 7.245. QSL. Lori Robinson, KBØWWQ, 3168 Old Hwy A, Festus, MO 63028-4743.

Indian Orchard, MA: *Titanic* Historical Society Inc, W1MGY. 1300Z-2100Z **Oct 16**. Commemorating the 41st anniversary of the *Titanic* Historical Society. 14.260 14.033 7.260 7.033. QSL. W1MGY/*Titanic* Historical Society Inc, PO Box 51053, 508 Main St, Indian Orchard, MA 01151-0053. **www.titanichistoricalsociety.org**.

San Ramon, CA: Mount Diablo Amateur Radio Club, W6CX. 1600Z **Oct 16**-1900Z **Oct 17**. Pacificon convention and the Boy Scout Radio Jamboree. SSB 28.390 21.360 14.290; SSTV14.230. QSL. MDARC, PO Box 23222, Pleasant Hill, CA 94523. **www.pacificon.org**.

Grandfather Mountain, NC: Goldsboro Amateur Radio Club, W4GOL. Beginning 1500Z **Oct 18**. East Coast Mile High Event. 28.490 21.350 14.280 146.580 446.000. QSL. Ray Lane, KD4FV, 612 Gloucester Rd, Goldsboro, NC 27534. **www.geocities.com/dzdz.geo/Garc.htm**.

Oneonta, AL: Blount County Amateur Radio Club, W4BLT. 1500Z-2200Z **Oct 23**. Blount County Covered Bridge Festival. 14.260. QSL. W4BLT, 2745 Co Hwy 39, Oneonta, AL 35121. **www.qsl.net/w4blt/**.

Palestine, TX: Palestine/Anderson County ARC, K5PAL. 1300Z-2200Z **Oct 23**. Hot Pepper Festival. 14.260 7.263. Certificate. David Carnathan, N5XPC, 504 S Micheaux, Palestine, TX 75801. **www.pacarc.org**.

Randleman, NC: Tri-County ARC, NC4AR. 1400Z-1830Z **Oct 23**. 16th Annual NASCAR Day Festival. 14.278 7.268. Certificate. NC4AR, PO Box 747, Trinity, NC 27370.

Brevard, NC: Transylvania County Amateur Radio Club, K4HXZ. 1600Z-2200Z **Oct 31**. Halloween in Transylvania County. 28.335 21.365 14.295 7.237. Certificate. TCARC, PO Box 665, Pisgah Forest, NC 28768.

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.

Special Events Announcements: For items to be listed in this column, you must be an Amateur Radio club, and use the ARRL Special Events Listing Form. Copies of this form are available via Internet (**info@arrl.org**), or for an SASE (send to Special Requests, ARRL, 225 Main St, Newington, CT 06111, and write "Special Events Form" in the lower left-hand corner). You can also submit your special event information on-line at **www.arrl.org/contests/spevform.html**. Submissions must be received by ARRL HQ no later than the 1st of the second month preceding the publication date; that is, a special event listing for **Dec** *QST* would have to be received by **Oct 1**. Submissions may be mailed (Attn: Maty Weinberg), faxed (860-594-0259) or e-mailed (**events@arrl.org**) to ARRL HQ. QST

NEW PRODUCTS

HF WIRE ANTENNAS FROM MFJ

◊ MFJ has announced the availability of a number of wire HF antennas rated at 1500 W. The MFJ-1748 is an 80 meter end-fed zepp including 100 feet of 450 Ω ladder line. Price: $69.95. The MFJ-1742 is a 20 meter extended double zepp with 100 feet of 450 Ω ladder line. Price: $79.95.

There are also two center-fed (with SO-239 coax connectors) two band dipoles: the MFJ-17758 80 and 40 meter dipole priced at $79.95 and the MFJ-177754 40 and 20 meter dipole at $59.95. For more information, contact MFJ Enterprises, Inc, 300 Industrial Park Rd, Starkville, MS 39759; tel 800-647-1800; fax 662-323-6551; **www.mfjenterprises.com**.

Maty Weinberg, KB1EIB ♦ Special Events ♦ events@arrl.org

By H. Ward Silver, NØAX
n0ax@arrl.org

2004 ARRL International DX Phone Results

Break out the low bands!

"Alternating currents are dangerous. They are fit only for powering the electric chair."—Thomas A. Edison

The ARRL DX contest is one of the oldest, if not *the* oldest contest in existence. First run in 1928, it exemplifies the urge to push your operating and station abilities to the maximum. I'm not sure there is any deeper urge in ham radio than to make QSOs at the very limit of your range and then to extend that range. DX is!

Despite the between-cycle funk, the ARRL DX contests remain extremely popular. 929 DX stations and 1337 US stations submitted phone logs, five more than last year. The total number of stations was even higher than last year, judging from the 15 meter QSO totals of K3LR with 2421 and FY5KE with 3467.

Write-up Notes and New Features

This year, I am very pleased to be able to present a Clean Sweep of Division reviews. We also added Europe to the list of continental reviews and a special review of the Caribbean region is included. Please take a moment and thank the writer who took time out to do the analysis from your area. ARRL members can read these exciting additions on the ARRLWeb at **www.arrl.org/contests/results** and selecting the link for the "Web Report."

Also included are features by Jim Idelson, K1IR, who assembled the winning Multi-Single entry for both CW and Phone this year; Doug Grant, K1DG, with a retrospective on "The 1979 ARRL DX Contest—25 Years Ago" and Ken Harker, WM5R, who contributes several sets of maps that give you a new picture of how the contest played out around the US.

Don't forget that the *QST*-style line scores are available on the ARRLWeb, just like they always were in the magazine.

Records

The low-flux years of solar cycles are not the years during which lots of records are set. (The complete set of ARRL DX records for both SSB and CW are available at **www.arrl.org/contests/**.) The Records Set table shows the complete list of the continental, national and district-level records set this year.

The oldest DX record broken this year was the 1988 SO-20 meter South American record previously held by HC1HC. It was convincingly snagged by KK9A operating from the sunny island of Aruba at P4ØA by a margin of nearly a third. The longest-held domestic record that vanished from the scene was the 1995 SO-40 meter record for the 6th call district. Jim, N6IG, added another 3rd to Glen K6NA's old high-water mark this year. The oldest ARRL DX records still standing are both multi-multi efforts from 1979 by KØRF (SSB—10th district) and W7FU (CW—7th district).

The largest proportion by which a record was broken was claimed by Mr Oceania, Mike, KH6ND, operating at KH6YY's station (KH6YY is the new proprietor of the KH7R station) in the SO-Assisted category. Mike's score is nearly six times the old record, set in 1996.

In "The Large Print Giveth and the Small Print Taketh Away" department, Alfredo, HC1HC, set a new record in the SOAB-QRP category, but lost his old SO-20 record to KK9A at P4ØA. Dang!

Exceptional Performances

Paul "The Energizer Bunny" Gentry, K9PG, continues to live in the #1 DX position, taking both modes SOAB-LP this year from WP3R where you may recall that Paul racked up both of the top scores in SOAB-HP last year.

No secret to regulars on the contest scene, Dan Handa, W7WA, is a formidable competitor in the single-band ranks. Low sunspots? No problem, Dan just pushes his 20 meter record up another 20 percent this year! (VE6WQ also pushed the VE 20 meter record by almost as much from the super VE6JY station.)

TI8M, which finished 4th in the Multi-Two category for the world, was ably manned by (back, from the left) Carlos, TI2KAC; Bob, W4BD; Eddie, K4UN, and Brian, NA4BW; (front) Mauricio, TI2MOT; Keith, W4KTR, and Bill, K4WPM.

ARRL HQ staffer Dan Miller, K3UFG, spent time Elmering aspiring ham Jordan Sakal at W1AW.

Expanded Results, Line Score Printouts Available

For complete contest results online, please visit **www.arrl.org/contsts/results**. ARRL members without Internet access may obtain a printout of the complete line scores by sending a self-addressed, stamped envelope to ARRL Contest Results, 225 Main St, Newington, CT 06111. Please be sure to include the contest name and year.

While New England isn't usually considered a tough spot for DX contesting, it can be in some categories and SOAB-QRP was that way this year. Yet Chris Merchant, KA1LMR, pushed a pair of multiband verticals and wire antennas to a score hard on the heels of perennial category champ, N4KG, less than 20 QSOs off the pace.

For sheer persistence, it's hard to beat Tim Duffy, K3LR, proprietor of one of the world's most capable stations. His crew works extremely hard to take advantage of every opportunity and this year they hit pay dirt with a convincing win over M/M archrivals KC1XX and W3LPL, leading all competitors in multipliers on four bands.

What is Jim Pratt, N6IG, doing at the #2 position with a record score, sandwiched in between K4XS (who also set another record this year) and WX4G? In fact, Jim is the only West Coast representative in the Top Ten of this Euro-dependent category.

From the Old Countries, congratulations are due Jiri Sanda, OK1RI, who placed in the SOAB-HP Top Ten with over 50 percent more points than his closest European competitor.

There are many more exceptional efforts, of course. Read the Divisional Write-ups on the ARRLWeb for detailed information about the races in all of the North American divisions, Canada, Europe, the Caribbean and South America.

US and VE Overview

In 2002, the money band was 10 meters, but the excitement has been steadily moving to lower and lower frequencies along with the solar flux.

DX contesting being the geography-dependent business that it is, some things are best shown on maps. Enter Ken Harker, WM5R. Ken has applied the US Census Bureau's on-line Tiger Map Server (**tiger.census.gov/cgi-bin/mapsurfer**) to place US station information on a map of the contiguous 48 states. Ken's maps make geographical trends and variations much clearer. Make sure to see Ken Harker's graphic representations in the web results.

US-VE QRP

The field size fell from 53 entries in 2003 to just 39 in 2004—QRP is tough even in the best of times and the loss of 10 meters hurts QRPers the most. Nevertheless, Tom, N4KG, continues to place at the top. Chris, KA1LMR, roared up to chase Tom and placed a strong second. N8IE moved up to third this year, displacing N1TM to 5th with WØAH between them in 4th. No West Coast entries made the Top Ten last year at all, so a tip of the cap is due K7MM and W6AQ in sixth and seventh place, respectively.

US-VE Low Power

Congratulations to Marv, N5AW, for his win from Texas in this highly competitive category. Marv traded QSO to-

Top Ten

W/VE

Single Operator High Power

VY2ZM	5,647,008
VE3EJ	4,572,756
N9RV	4,295,280
K4ZW	4,079,790
W9RE	3,833,925
VE3AT	3,526,551
AA1K	3,356,298
K3ZO	3,319,470
K3CR (LZ4AX, op)	2,914,377
K3NA	2,914,128

Single Operator Low Power

N5AW	1,029,231
N1UR	965,358
N1SV	823,032
N4TZ	818,730
KS1J	766,800
W1JQ	704,472
KG1E	694,035
N1PGA	692,124
N8WRL	687,192
K8IA	672,360

Single Operator QRP

N4KG	529,584
KA1LMR	424,032
N8IE	378,336
W0AH	267,036
N1TM	201,285
K7MM	130,476
W6AQ	111,321
WA8ZBT	96,159
K4WY	92,856
K3TW	83,880

10

K5RX	36,192
K4WI	35,400
W2KV	18,189
KØRH	15,660
W7UPF	13,674
N6EE	12,852
KØGT	11,844
AA1ZT	9,024
N6HC	7,029
KC9AMM	6,390

15

N7DD	695,196
N4PN	618,636
KVØQ	484,956
N3HBX	468,360
WE2F	458,832
W7AT (W7EW, op)	228,330
AK2P (KC2LLM, op)	225,303
WW4R (K4WX, op)	217,536
W7UT	194,205
W7EB	192,276

20

VE6WQ (@ VE6JY)	933,525
W7WA	767,016
VY2TT (K6LA, op)	625,008
N8OO	299,700
WA6O (@ N6RO)	187,488
K6HNZ	176,715
W9IGJ	170,775
VE3DZ	134,112
W8CZN	126,999
K4BP	100,320

40

K4XS	268,761
N6IG	207,603
WX4G	127,746
K8DJC	44,622
WF2W	40,044
AD8C	38,400
K5GH	34,020
W8JWN	33,930
N2KX	32,376
KSØT	31,098

80

AA1BU	122,553
W4SVO	71,838
W5PR	16,464
N2GC	15,300
VE6JY	11,139
K6OY	9,198
K6OR	5,550
K7ZM	4,371
WI9H	2,940
N8OL	2,871

160

KT1V	7,560
AA4MM	7,134
KK4SI	6,678
W2VO	5,586
W3GH	3,876
WA9IRV	1,575
KD1IA	1,188
VE3MGY	363
K6SE	330

Single Operator Assisted

W2RE	3,948,930
K2XA	3,696,819
K3WW	3,283,344
W2WB	2,492,625
W2GD	2,362,572
K1AR	2,179,584
N3OC	2,004,300
N2MM	1,960,956
K9NW	1,932,336
KØKX	1,738,335

Multioperator Single Transmitter

K1IR	4,051,278
VE3RM	2,833,176
KØDU	2,238,000
NE3F	2,167,011
WW4LL	1,752,651
WØZT	1,656,495
N4BP	1,614,222
NN2W	1,613,403
WB1ADR	1,403,811
VE3RZ	1,267,110

Multioperator Two Transmitters

K4JA	8,245,080
N3RS	6,967,134
W4RM	3,700,584
NK7U	3,627,018
KØTV	3,474,048
K5NA	3,309,411
K7ZSD	3,065,976
VE1JF	3,061,320
W2XL	2,446,632
AA5NT	2,072,340

Multioperator Unlimited Transmitters

K3LR	11,830,950
KC1XX	10,704,474
W3LPL	10,014,840
K9NS	8,904,870
K1RX	6,324,624
KB1H	5,977,128
K1TTT	5,413,356
N3AD	5,089,188
WØAIH	3,316,104
W3PP	3,253,044

DX

Single Operator High Power

8P1A (W2SC, op)	9,468,711
P4ØL (W6LD, op)	6,757,338
CN2R (W7EJ, op)	5,960,034
EA8BH	5,812,992
8R1K (EA4BQ, op)	4,696,704
TO5A (NH7A, op)	4,670,325
WP2Z (N2TK, op)	4,538,226
OK1RI	3,150,504
OA4SS	2,712,060
DL5YY	1,913,994

Single Operator Low Power

WP3R (K9PG, op)	6,028,056
TI5A (W5AJ, op)	5,947,722
J88DR	3,107,160
VP9/W6PH	2,880,495
HK3JJH	1,189,440
PV8DX	888,849
HK6PSG	809,172
XE1XOE	799,968
EA7RM	799,920
EA3CI	756,525

Single Operator QRP

HD8A (HC1HC, op)	1,584,360
TI5N (W8QZA, op)	1,246,050
HI3TEJ	1,028,883
LU1VK	241,302
ZF2NT	170,748
F5BEG	156,375
DF1DX	31,434
SM5ARL	18,150
KL7IKV	16,692
GØDCK	11,997

10

LT1F (LU1FAM, op)	446,220
ZY5G (PP5WG, op)	419,253
PX2W (PY2YU, op)	317,184
HP3XBS	309,024
CE4PBB	223,200
CX1AV	161,280
WP4EDD	145,521
CX4DX	131,880
LU5FII	129,108
LU6HPF	123,585

15

PS2T (PY5EG, op)	490,296
PT5A (PY2EMC, op)	439,890
GIØNWG	387,180
GW4BLE	370,107
LPØH	329,583
CS6T (CT1ILT, op)	326,655
LU7DW	318,603
LU2QC	305,613
CO8ZZ	300,420
IR4T (I4UFH, op)	298,980
HI8/JA6WFM	285,120

20

ZF2AH	612,684
P4ØA (KK9A, op)	607,290
SO2R	507,408
MIØLLL	447,702
ZX5J (PP5JR, op)	438,291
DJ7EO	402,318
XE1L	304,560
HP1XVH	296,826
IU9S	293,694
4M4C (YV4GLD, op)	254,520

40

F6CTT	257,220
OE6Z (OE6MBG, op)	191,160
S53M (S55OO, op)	178,560
SN7Q	172,197
YZ1E	159,543
KL7RA	134,406
T99W	128,790
HA5A (HA8LLK, op)	126,378
EA1DLU	119,295
VK2KPP	116,280

80

GIØKOW	153,285
CO8KA	135,240
YV4BU	130,200
CT3DZ	125,160
YY5YMA	89,358
SP3GEM	74,880
I4AVG	61,476
LX7I (LX2AJ, op)	37,269
T98T	33,480
SP3KFH (SP3JZR, op)	26,418

160

CU2CE	23,760
HA5JI	14,157
YU7AV	2,640
RN6BN	1,680
EA1DVY	648
OM2VL	396
UT3SA	48
LY3ZM (LY1FK, op)	12
LY2OU	12

Single Operator Assisted

KH7X (KH6ND @ KH6YY)	6,205,416
KP4KE (DK8ZB, op)	4,896,774
LU1NDC	2,374,752
ZX2B (PY2MNL, op)	2,289,084
DL1IAO	1,469,412
SP8BRQ	1,433,586
YT7A (4N7DW, op)	1,387,440
PY2YP	989,664
SN8F (SP8FHK, op)	832,506
YL8M (YL2KL, op)	486,975

Multioperator Single Transmitter

VP5B	7,461,300
PJ4G	7,313,220
HC8L	6,537,480
V31MD	4,474,458
KP2A	4,099,104
IR4X	3,063,741
CX5BW	2,892,438
6Y8Z	2,786,085
EA8ZS	2,542,590
IR4M	2,457,750

Multioperator Two Transmitters

PJ2T	12,484,800
FY5KE	11,418,069
V26DX	7,262,541
TI8M	5,464,152
HG6N	2,634,645
RU1A	2,561,685
9A7A	2,536,128
DK6WL	2,350,866
ZX3S	2,188,662
RW2F	2,158,902

Multioperator Unlimited Transmitters

VQ5A	10,867,860
V47KP	6,850,821
9A1A	3,146,610
LZ9W	1,555,092
JA3YBK	1,331,190

tals for multipliers, leading the category in multipliers on 40 through 10 meters. N1UR moved way up this year—from seventh to second—and had the highest LP QSO total. New to the LP Top Ten this year are all five of the 6th through 10th place finishers: W1JQ, KG1E, N1PGA, N8WRL and K8IA.

US-VE High Power

Who is that way in front, Lance Armstrong? No, but it looks like Jeff, K1ZM, in the guise of VY2ZM is going to make a run at Lance's record of wins. Jeff is going to be mighty tough to beat as he increased his score by 10 percent this year. Another Canadian station took the 2nd spot this year as John, VE3EJ, pushed his 2003 total almost 20 percent! There must have been something in the Indiana drinking water this year! N9RV and W9RE rocketed to 3rd and 5th this year from the flat farming country, bracketing K4ZW, a new call to the HP Top Ten this year.

US-VE Assisted

As in the SOAB-HP category, the top scores improved slightly, despite the lack of 10 meter propagation. The term "packet" is really a misnomer in many areas of the world as packet radio clusters are replaced with packets on the 'net.

Congratulations to Ray, W2RE, for coming out on top of this tough category by just a few percentage points. Hotly pursued by Saul, K2XA, and Chas, K3WW, the Assisted category had the closest finish among the Top Ten this year. To give you an idea of how hard these guys were working, the top six HP stations (W2RE, K2XA, K3WW, W2WB, W2GD and K1AR) all logged DXCC on both 20 and 15 meters. K1LD was the runaway leader of the LP group, outdistancing NØFW and WA1Z who were quite close.

Don't forget—if you peek at the spots or your software monitors Internet spotting traffic, you're in the Assisted class. It's okay to send your own spots and chat, as long as you don't receive spots or information about the frequencies of other stations. "Running spots" is fun, but it's not fair to the Single-Op entrant who doesn't have the same advantage. Don't be a "packet poacher."

US-VE Single-Band

As expected, the single-band log total increased to 199. The exodus from 10 meters is on and folks seem to be headed to 15, 20, and 40 meters. 20 meters had the biggest increase and is probably the most popular single-band category throughout the cycle, followed closely by 15 meters. I think 10 meters is the most fun when it's open, but it's not much fun to listen to receiver hiss in the off years. We haven't reached optimum conditions for 80 and 160 meters, but you'll see more logs on those bands in 2005 through 2007. The next few years will be a great opportunity to go after the low-band multipliers to round out a DXCC or add to your band-entity totals.

10 meters: Without belaboring the obvious, 2004 was a very different contest than in previous years. Jim, K5RX, and Courtney, K4WI, did battle from the southern states of TX and AL to a nip-and-tuck finish with K5RX coming out on top 36 to 35 kpoints—a 2.2% difference. Stations farther north and west found the going pretty difficult.

15 meters: One of the most popular bands for DX-ing and contesting, 15 meters kept everyone busy with plenty of action and multipliers to hunt. Making a move from 40 meters last year, Larry, N7DD, picked up a convincing single-band win from AZ on 15 this year with 695 K, outdistancing N4PN's 615 K from NFL and KVØQ's 484 K from CO. There were seven DXCCs logged by the Top Ten—along with the top three finishers, hats off to N3HBX, WE2F, W7UT and N5TW in the hands of KC5YKX.

20 meters: Twenty is a band that's always there, year in and year out, to the point where we kind of take it for granted. Two in particular stand out this year: VE6JY (operated by Joel, VE6WQ) and Dan, W7WA. Not content to just win, Joel

Records Set in 2004

Category	*Call District*	*Call*	*New Record*	*Old Record*	*Year Set*
SOAB-HP	VE	VY2ZM	5,647,008	5,513,712	2000
SO-Assisted	Ø	KØKX	1,738,335	1,576,368	2000
SO-20	7	W7WA	767,016	577,866	2003
SO-20	VE	VE6WQ @VE6JY	933,525	715,428	1998
SO-40	4	K4XS	268,761	245,127	2000
SO-40	6	N6IG	207,603	164,016	1995

Category	*Continent*	*Call*	*New Record*	*Old Record*	*Year Set*
SOAB-LP	NA	K9PG @WP3R	6,028,056	6,011,520	1999
SOAB-QRP	SA	HC1HC	1,584,360	1,223,388	1993
SO-20	SA	KK9A @P40A	607,290	486,330	1988
SO-40	EU	F6CTT	257,220	240,096	1993
SO-Assisted	OC	KH6ND @KH6YY	6,205,416	1,078,680	1996

Continental Leaders

Single Operator QRP		
Asia	JA2MWV	10,815
Europe	F5BEG	156,375
North America	TI5N (W8QZA, op)	1,246,050
South America	HD8A (HC1HC, op)	1,584,360
Single Operator Low		
Africa	EA8/DJ1OJ	3,864
Asia	JM1LPN	207,090
Europe	EA7RM	799,920
North America	WP3R (K9PG, op)	6,028,056
Oceania	FK8HN	250,368
South America	HK3JJH	1,189,440
Single Operator High		
Africa	CN2R (W7EJ, op)	5,960,034
Asia	JH4UYB	1,135,428
Europe	OK1RI	3,150,504
North America	8P1A (W2SC, op)	9,468,711
Oceania	VK4UC	413,478
South America	P40L (W6LD, op)	6,757,338
Single Band 160		
Europe	CU2CE	23,760
Single Band 80		
Asia	RWØMM	2,565
Europe	GIØKOW	153,285
North America	CO8KA	135,240
Oceania	KH6QJ	105
South America	YV4BU	130,200
Single Band 40		
Asia	JA8NFV	51,450
Europe	F6CTT	257,220
North America	KL7RA	134,406
Oceania	VK2KPP	116,280
South America	YW5NN (YV5NWG, op)	106,020
Single Band 20		
Asia	EX2M	135,720
Europe	SO2R	507,408
North America	ZF2AH	612,684
Oceania	YBØECT	23,436
South America	P40A (KK9A, op)	607,290
Single Band 15		
Africa	EA8LS	215,586
Asia	JA7NVF	179,640
Europe	GIØNWG	387,180
North America	CO8ZZ	300,420
Oceania	KH6GMP	71,073
South America	PS2T (PY5EG, op)	490,296
Single Band 10		
Asia	JH1OCC	90
Europe	CU2AF	5,922
North America	HP3XBS	309,024
South America	LT1F (LU1FAM, op)	446,220
Single Operator Assisted		
Asia	UAØSE	39,432
Europe	DL1IAO	1,469,412
North America	KP4KE (DK8ZB, op)	4,896,774
Oceania	KH7X (KH6ND @KH6YY)	6,205,416
South America	LU1NDC	2,374,752
Multioperator Single Transmitter		
Africa	EA8ZS	2,542,590
Asia	JI2ZJS	642,003
Europe	IR4X	3,063,741
North America	VP5B	7,461,300
Oceania	DU9DWV	23,352
South America	PJ4G	7,313,220
Multioperator Two Transmitter		
Asia	JA1YPA	27,081
Europe	HG6N	2,634,645
North America	V26DX	7,262,541
Oceania	AH6NF	23,520
South America	PJ2T	12,484,800
Multioperator Unlimited Transmitter		
Asia	JA3YBK	1,331,190
Europe	9A1A	3,146,610
North America	VQ5A	10,867,860

W/VE Single Operator Region Leaders

Tables list call sign, score and power (A = QRP, B = Low Power, C = High Power).

Northeast Region (New England, Hudson and Atlantic Divisions; Maritime and Quebec Sections)

VY2ZM	5,647,008	C
AA1K	3,356,298	C
K3ZO	3,319,470	C
K3CR (LZ4AX, op)	2,914,377	C
K3NA	2,914,128	C
N1UR	965,358	B
N1SV	823,032	B
KS1J	766,800	B
W1JQ	704,472	B
KG1E	694,035	B
KA1LMR	424,032	A
N1TM	201,285	A
K3TW	83,880	A
WB7OCV	17,136	A
N2JNZ	10,335	A

Southeast Region (Delta, Roanoke and Southeastern Divisions)

K4ZW	4,079,790	C
WA4TII	982,800	C
KZ2I	811,125	C
N8II	756,750	C
N4NW	714,063	C
N8WRL	687,192	B
KC8FS	616,998	B
N4IG	568,080	B
WB3BEL	478,590	B
KT4Q	474,948	B
N4KG	529,584	A
K4WY	92,856	A
KR1ST	26,730	A
WB6BWZ	25,833	A
KQ4YY	19,998	A

Central Region (Central and Great Lakes Divisions; Ontario Section)

VE3EJ	4,572,756	C
N9RV	4,295,280	C
W9RE	3,833,925	C
VE3AT	3,526,551	C
VE3XN	1,082,880	C
N4TZ	818,730	B
K8NVR	511,500	B
VE3CR	508,542	B
KD9MS	360,855	B
K9JE	320,742	B
N8IE	378,336	A
N8XA	57,960	A
VA3JFF	20,520	A
K9WIS	7,920	A
KT8K	6,552	A

Midwest Region (Dakota, Midwest, Rocky Mountain and West Gulf Divisions; Manitoba and Saskatchewan Sections)

WØGG	893,700	C
NØVD	755,580	C
KTØR	597,534	C
WØBH	592,371	C
K5XR (W5ASP, op)	302,679	C
N5AW	1,029,231	B
ACØW	660,600	B
VE5SF	530,550	B
WD5K	508,254	B
KE5LQ	323,637	B
WØAH	267,036	A
WA8ZBT	96,159	A
NØUR	77,922	A
KBØYH	40,194	A
WWØWB	25,086	A

West Coast Region (Pacific, Northwestern and Southwestern Divisions; Alberta, British Columbia and NWT Sections)

K7RL	2,710,950	C
W7GG	1,866,240	C
WA7LT	1,171,500	C
N6AA	1,047,360	C
K5RR	917,448	C
K8IA	672,360	B
N6NF	574,560	B
W7YAQ	400,020	B
VE7NS	377,058	B
N6RV	352,152	B
K7MM	130,476	A
W6AQ	111,321	A
N6AZR	44,376	A
N7IR	44,370	A
WO7T	20,178	A

and Dan both pounded their old records silly, bagging 135 and 134 multipliers, respectively. Both stations are located well away from the traditional "sweet spots"—could it be that operator skill also has something to do with it?

40 meters: As noted in the "Exceptional Efforts" section, the SO-40 Top Ten leapt from coast to coast as Bill, K4XS, ran the table from the WCF section, followed by Jim, N6IG, from SV, and back to Bob, WX4G, in SFL. K4XS and N6IG both set new records for their call districts on 40 meters, an inkling of what's to come in future years. SO-40 log entries were up and I expect that trend to accelerate next year. All three of the top finishers either logged or flirted with a DXCC's worth of multipliers.

80 meters and 160 meters: It was a little surprising that 80 meter scores didn't take off this year, with what should have been better band conditions. As it was, Joe, AA1BU, pushed last year's total up a tad to 122 kpoints, 459 QSOs (29 fewer than last year), and a whopping 89 multipliers (6 more than last year) from WMA. Joe was followed by W4SVO in the SFL section. Two brave souls entered SO-80 running QRP (N8VW in OH) and LP (K2HT in MO)—way to scratch, fellas!

Last year's number two finisher in SO-80, Ted, KT1V, decided to punch the "1.8" button this year and led the pack in SO-160. He was hotly pursued by Leo, AA4MM, and Stan, KK4SI, both down in NFL. 160 Phone is tough in the best of years and we're still a year away from the best conditions.

Multi-Operator Overview

What did I say last year? Something about team operating becoming more popular due to demographics (a kinder, gentler way of saying that we like to sleep), conditions, and better station design options. Well, it didn't play out that way in 2004 as multi-op entries dropped from 110 back to 84. The relative percentages of MM vs M2 vs MS did not change, however.

Multi-Single

K1IR's crew can be proud of themselves this year with a FB score from EMA, more than one-third higher than 2nd place finisher VE3RM. Third-place went to KØDU out in CO, the most westerly of any MS Top Ten score.

Multi-Two

This category turned into a slugfest between the two fine stations of Paul, K4JA, in VA and Sig, N3RS, a few miles north in EPA. Both were just a little off last year's pace. W4RM, another VA station, came in 3rd just ahead of NK7U's OR crew, moving up a place from last year. In fact, both West Coast entries in the Top Ten are from OR as Brad, K7ZSD's teams debuts in the box. VE1JF was another welcome presence for the MAR multiplier in eighth place.

Multi-Multi

The usual suspects led the way in the Clash of the Titans category, with K3LR's crack team successfully shoveling their way to the #1 position just miles from the Ohio border in WPA over KC1XX in NH and W3LPL in MDC. Not nearly as close as last year, 'LR was about 10 percent better than 'XX and you can be sure Matt and Frank will be gearing up to take back the walnut in 2005.

K9NS in 4th place from IL was closer than ever to their East Coast rivals. A win from the Land of Lincoln is not out of the question if the conditions are right, so watch your tails! WØAIH cracked the Top Ten from WI in ninth place and the remaining spots were all from the Atlantic seaboard or New England.

W1AW made an appearance in the MM category with Bob Heil, K9EID, and Joe Walsh, WB6ACU, and a number of ARRL staffers sharing a good time. No word on who had to cook the post-contest dinner in Newington!

Affiliated Club Competition

You can really tell that the club contest chairs were working overtime this year. We had a new winner in every category.

At the top of the Unlimited list, Frankford Radio Club and Yankee Clipper Contest Club traded places from last year with an even closer finish. The 164 FRC scores held off the challenge from 231 YCCC entries by a whisker and take the gavel—only 1.9 percent separates these two vigorous, motivated clubs! Another club—Contest Club Ontario—made the leap to Unlimited from the Medium ranks after placing 3rd in the 2003 Medium category.

In the Medium category, what turmoil! The North Coast Contesters really turned it on this year and zoomed from 10th place to a gavel-grabbing 1st with a 45 percent margin and five fewer scores than the 2nd place Hudson Valley Contesters. Woof! Pretty convincing smackdown, NCC! The North Texas Contest Club also bulked up by 50 percent and leapfrogged to 4th place with the Tenneessee Contest Group in 3rd.

More turnover awaits you in the Local category as the top four spots are all occupied by new names and the gavel was

Sponsored Plaques

Category	*Winner*	*Sponsor*
W/VE High Power Phone	VY2ZM	Frankford Radio Club
W/VE Low Power Phone	N5AW	Jeffrey Briggs, K1ZM
W/VE Single Operator Assisted Phone	W2RE	Pete Carter, K3VW Memorial
W/VE Multioperator Single Transmitter Phone	K1IR	Steve Adams, K4RF
W/VE Multioperator Unlimited Phone	K3LR	Western New York DX Association, W2DXA
W/VE 1.8 MHz Phone	KT1V	Butch Greve, W9EWC Memorial
W/VE 3.5 MHz Phone	AA1BU	K1ZM Communications, Inc
W/VE 14 MHz Phone	VE6WQ (@VE6JY)	William F. Beyer Jr, N2WB
World Single Operator Phone High Power	8P1A (W2SC, op)	North Jersey DX Association
World Single Operator Phone Low Power	WP3R (K9PG, op)	Jerry Rosalius, WB9Z
World Single Operator Phone QRP	HD8A (HC1HC, op)	Southern Arizona DX Association
World Single Operator Assisted Phone	KH7X (KH6ND @KH6YY)	ARRL Contest Branch
World Multioperator Single Transmitter Phone	VP5B	Carl Cook, AI6V/P49V
World Multioperator Two Transmitters Phone	PJ2T	W6NL and K6BL
World Multioperator Unlimited Phone	VQ5A	Stanley Cohen, W8QDQ
World 1.8 MHz Phone	CU2CE	Fred Race, W8FR, in Memory of ZL2BT
World 3.5 Mhz Phone	GIØKOW	Northern Illinois DX Association
World 14 MHz Phone	ZF2AH	Don Wallace, W6AM, Memorial Award
World 21 MHz Phone	PS2T (PY5EG, op)	Long Island DX Association
World 28 MHz Phone	LT1F (LU1FAM, op)	North Shenandoah DX Association NS4DX
Asia Single Operator Phone High Power	JH4UYB	Tim Coad, NU6S
Asia Multioperator Single Transmitter Phone	JI2ZJS	Yankee Clipper Contest Club
Europe Single Operator Phone High Power	OK1RI	Jerry Griffin, K6MD/YI9MD
Europe Multioperator Unlimited Phone	9A1A	Operators at K1TTT
North America Multioperator Single Transmitter Phone	VP5B	Nick Lash, K9KLR
Oceania Single Operator High Power Phone	VK4UC	W7EW in honor of W7BX
Oceania Multioperator Single Transmitter Phone	DU9DWV	AH9B/V73B, D. Craig Boyer
South America Multioperator Two Transmitter Phone	PJ2T	Operators at K1TTT
Central Division Single Operator High Power All Band Phone	N9RV	Society of Midwest Contesters
Central Division Multioperator Single Transmitter Phone	N9DT	Society of Midwest Contesters
Central Division Single Operator Low Power All Band Phone	N4TZ	Society of Midwest Contesters
Rocky Mountain Division Single Operator Low Power Phone	W5GZ	Grand Mesa Contesters
Japan Single Operator Low Power Phone	JM1LPN	Western Washington DX Club
Canada Single Operator Low Power Phone	VE5SF	Contest Club Ontario
World Single Operator Combined Score—High Power	8R1K (EA4BQ/OH0XX, op)	Daniel K. Robbins—KL7Y Robbins Memorial
World Single Operator Combined Score—Low Power	WP3R (K9PG, op)	C. Sharp, K5DX Memorial by the Texas DX Society
World Multioperator Unlimited Combined	9A1A	W2PV Memorial—Schenectady ARA
W/VE Single Operator High Power Combined Score	K3CR (LZ4AX, op)	National Contest Journal
W/VE Single Operator Low Power Combined Score	KS1J	Rochester DX Association K2FR Memorial Plaque
Rocky Mountain Division Single Operator Combined	N6ZZ	Albuquerque DX Association

Plaques are available for most Overall Continental, National and ARRL Divisional winners for most categories. Unsponsored plaques may be purchased for $67 (includes shipping) by contacting the ARRL Contest Branch at 860-594-0295, or **contests@arrl.org**.

Affiliated Club Competition

	Score	*Entries*
Unlimited Category		
Frankford Radio Club	261,812,385	164
Yankee Clipper Contest Club	256,750,851	231
Potomac Valley Radio Club	162,647,469	138
Society of Midwest Contesters	58,312,050	80
Northern California Contest Club	46,076,880	86
Minnesota Wireless Assn	35,367,486	77
Florida Contest Group	32,880,186	63
Contest Club Ontario	32,864,382	54
Medium Category		
North Coast Contesters	48,486,720	14
Hudson Valley Contesters and DXers	33,654,663	31
Tennessee Contest Group	29,025,750	45
North Texas Contest Club	25,869,462	26
Willamette Valley DX Club	21,244,347	17
Mad River Radio Club	19,675,260	26
South East Contest Club	18,824,274	29
Central Texas DX and Contest	18,768,789	19
Southern California Contest Club	17,401,272	40
Rochester (NY) DX Assn	12,290,160	13
Western Wireless Contest Club	10,022,868	3
Southwest Ohio DX Assn	9,303,747	4
Western Washington DX Club	7,818,324	20
Central Arizona DX Assn	7,107,666	33
Grand Mesa Contesters of Colorado	6,686,970	23
Carolina DX Assn	6,569,034	31
East Coast Canada Contest Club	4,048,692	3
Northern Illinois DX Assn	3,794,070	15
Kansas City DX Club	3,630,825	6
Kentucky Contest Group	3,623,973	13
Order of Boiled Owls of New York	3,116,043	11
Empire Contest Club	2,771,055	3
Western Illinois ARC	2,583,666	13
Western New York DX Assn	2,561,172	6
Spokane DX Association	2,455,509	7
Salt City DX Assn	2,406,816	8
BC DX Club	2,185,764	6
Oklahoma DX Assn	1,593,396	8
North Alabama DX Club	1,150,842	4
Bergen ARA	1,065,198	13
West Park Radiops	813,093	10
Northern Arizona DX Assn	796,542	5
Mother Lode DX/Contest Club	762,468	5
Southern California DX Club	728,841	7
Texas DX Society	699,516	3
Eastern Iowa DX Assn	576,450	7
South Jersey Radio Assn	359,808	6
Loudoun ARG	346,527	7
Green River Valley ARS	259,980	4
Burlington County Radio Club	222,570	3
Local Category		
Wireless Association of South Hills	2,047,458	5
Medina 2 Meter Group	1,180,056	3
Northern Rockies DX Association	803,292	5
Stafford (VA) ARA	795,414	3
Sterling Park ARC	728,436	4
Northern Ohio DX Assn	699,003	4
American Red Cross Emergency	588,396	4
Northern New York Contest Club	388,209	5
Cherryland ARC	357,246	4
Old Barney ARC	177,894	4
Redmond Top Key Contest Club	92,004	3

taken by last year's 5th place finisher, Wireless Association of South Hills. Second and 3rd places are occupied by the Medina 2 Meter Group and the Northern Rockies DX Association, respectively.

DX

As a "targeted" contest, ARRL DX gives the DX stations a chance to "set and forget" the rotator azimuth and focus on the US and VE pileups. This gives everyone a chance to take advantage of odd or short openings to North America that are foregone in the "everybody works everybody" format.

DX QRP: As you might imagine, the DX QRPers tended to do a little better than their NA compadres due to that 20 dB a DX prefix tends to impart. Some do a whole lot better. The top three finishers—HD8A (by HC1HC), TI5N (by W8QZA), and HI3TEJ—all broke a million points and would have qualified for the LP DX Top Ten. In the end, Alfredo rode 20 and 15 meters to the top this year from the Galapagos, overcoming the proximity advantage enjoyed by Bill, W8QZA, at Keko's fine station in Costa Rica. Given more difficult east-west propagation, the first EU appearance in the Top Ten comes at the sixth spot, where F5BEG delivered a nice score from the Western edge of the continent again in 2004. JA2MWV just missed the Top Ten boxes with the highest Asian QRP total.

DX Low Power: The top four stations in the SOAB-LP category were all from NA this year. In a very close race, Paul, K9PG, at WP3R claimed the #1 spot over Bob, W5AJ, at TI5A and the pair would have claimed 3rd and 5th in the world, regardless of category! Dave, J88DR, moved up a notch from 4th last year to claim the bronze, followed by Kurt, VP9/W6PH, in the mid-Atlantic. The remainder of the Top Ten are all new entries this year—congratulations! HK3JJH is the top SA station in LP this year. EA7RM and EA3CI represent Europe and round out the Top Ten. FK8HN is the top OC entry at #18 and JM1LPN leads the Asian contingent at #22. EA8/DJ1OJ and ZS4BS were the only Africans in this category. LP is the most popular category for DX stations, as well as the US/VE crowd, with 251 entries.

DX High Power: Six out of the Top Ten HP operators were on an expedition this year and three changed continents to do so. The Top Ten were also fairly well distributed: 3 from NA, 3 from SA, 2 from EU, and 2 from AF. With the exception of the two EU entries (from OK and DL), all of the Top Ten were on or within the warm water "Atlantic Rim."

Tom, W2SC, really dominated the HP category from 8P1A this year with a solid multi-Megapoint victory that just missed record territory. John, W6LD, is new to the Top Ten this year, placing second from P4ØL. John was followed by the two Africans, Jim, W7EJ, as CN2R moved up from the LP category and Martti, EA8BH, in 3rd and 4th, respectively. Jiri, OK1RI, led all European HP entries, a long way from the sunny beaches in the Czech Republic—see the European analysis in the Divisional write-up sidebar on the Web for more about this score.

Other noteworthy scores in HP include KL1V's #13 finish from chilly Alaska, JH4UYB's top Asian score, and VK4UC leading the pack from Oceania.

DX Assisted: I already mentioned that Mike, KH6ND, walloped the old record and all competition using the call KH6X from KH7YY (got all that?). Quite an effort by Mike, don't you agree? I hope he's not getting blase about his #1 streak, because he's fun to listen to on the air. If you're wondering how to improve your technique, listening to KH6ND run a pileup is a great place to start. This was the only category in which the winner was from Oceania.

In 2nd place, with an amazing LP effort, Barney, DK8ZB, operated as KP4KE and was the only LP effort in the Assisted Top Ten. Indeed, the next LP score is in 13th place! LU1NDC and PY2MNL at ZX2B dueled to 3rd and 4th places from SA only 200 QSOs and 6 multipliers apart. DL1IAO led the way from Europe.

DX Single-Band

Single-band entries were up a bit, reversing last year's trend, 396 to 383. This is still down from 2002's 428, but is a sign that activity is holding steady, even with shorter openings to NA on the higher bands. The most popular band was 15 meters, just as in the US and VE, with 171 logs, followed by 20 meters with 112. 40 meters showed the biggest increase from last year's 16, tripling to 48 entries.

10 meters: Three familiar calls grace the 10 meter Top Ten, LT1F (op LU1FAM), ZY5G (op PP5WG), and PX2W (op PY2YU). Taking advantage of the almost exclusively north-south propagation on 10, these guys ran like the wind when the band was open, racking up some big QSO totals of 2479, 2291, and 1792 respectively. NA dented the listings in the form of HP3XBS, on the heels of PX2W, but just a little bit too far north this year. WP4EDD, LW3DX and PJ4/KG9QX submitted the top LP scores on 10 meters this year. KG9QX ran 5 W into a Hamstick on his rental car. FB work! EU and AS were under-represented and AF was entirely absent this year.

15 meters: South America prevailed once again, but this time the competition was from Europe. Brazil was both 1st and 2nd on 15, with PY5EG winning from PS2T and PY2EMC right behind him from PT5A. PY5EG is obviously getting the bands warmed up for WRTC-2006! Both scores had identical multiplier totals (62), but Oms must have talked a little faster with 71 more QSOs. The UK was home to the next two entries by GIØNWG and GW4BLE to lead the way in Europe. A real dogfight followed between LPØH at #5 and CS6T (op CT1ILT) at #6, only 16 QSOs behind. The only NA entry in the Top Ten was CO8ZZ from Cuba. EA8LS was tops in Africa, JA7NVF in Asia, and VK3GK in Oceania. XE1KK was the QRP winner and CO8LY the LP titlist.

20 meters: Where did all those 10 meter stations from last year go? Many of them wound up on the Queen of the Bands, 20 meters where entries increased by 50 percent to 112. As mentioned earlier, ZF2AH's 77 extra QSOs more than made up for the single multiplier advantage of P4ØA, operated by KK9A, to eke out the narrow victory. Europe was represented by SO2R (the station, not the category) in 3rd place with twenty-seven hundred QSOs from Poland. The Top Ten finishers bounced between SA, NA and EU in roughly equal proportions, so the band was open widely this year. XE1L and PY2NY finished one-two running LP.

40 meters: Coming to life in a hurry, but still a tough place to do business, 40 meter phone was the domain of Europe. Operating split and sharing the band with multi-megawatt SWBC stations is no picnic, but F6CTT came out on top, pulling away from the pack. OE6Z (op OE6MBG) and S53M (op S55OO) battled to 2nd and 3rd place from the picturesque mountains of Central Europe. The lone NA occupant of the Top Ten was Rich, KL7RA, in his final operation from Fairbanks. Oceania appears in the #10 spot as VK2KPP. Low power scorers were led by CT3IA and CO2JD.

80 meters and 160 meters: You might think that proximity to NA is pretty much required for a top score on these tough two bands. You would be wrong. GIØKOW was top dog on 80 meters with a great effort, making nearly a thousand QSOs. CO8KD came in second, running LP, and YV4BU 3rd, but seven of the Top Ten are from Europe. All of the 160 meter entries are European, led by CU2CE from the Azores, the westernmost point of land considered European. RN6BN nearly doubled his QSO total of last year to 40 from the far eastern edge of Europe.

DX Multioperator

Multi-Single: The first five finishers in this category were travelers, on a contesting vacation to the Caribbean or other warm water ports of call. VP5B prevailed (just barely) over PJ4B, trading propagation advantages on the low bands (VP5B) versus 10 meters (PJ4G) in a hotly contested victory. Dave, W6NL, and Barb, K6NL, Leeson traded their California mountaintop for one on the equator to place 3rd as HC8L on San Cristobal Island. IR4X was the top European entry and 6Y8Z cracked the Top Ten with low power to claim the 8th spot. African entry EA8ZS was 9th.

Multi-Two and Multi-Multi: The two-transmitter category heated up dramatically with FY5KE challenging PJ2T for bragging rights. They came close, but PJ2T prevailed, very nearly setting a new SA record in the bargain.

Multi-Multi remains a difficult challenge for traveling teams and so remains under-represented in the DX listings. The VQ5A team re-activated the old Kenyan colonial prefix and made some serious noise from the Turks and Caicos. V47KP was a welcome new entry to the MM category, finishing second, but equaling the VQ5A multiplier total—now for some QSOs! 9A1A and LZ9W club stations kept the bands hot from Europe and the JA3YBK team from Asia.

Concluding Remarks

"Happiness is not a state to arrive at, but a manner of traveling."—Margaret Lee Runbeck

I am always amazed at the breadth and variety of the submitted scores from all corners of this big round ball we play with called Earth. Even though the solar cycle is waning, you all found new ways to have fun, new bands that were open, and new challenges to overcome. That bodes well for contesting.

I'm sure that every contester can think of at least one ham—new or old—who would enjoy being invited over for a multi-op or being "given the keys" for a weekend. Don't complain about new blood if you haven't given any!

Until next year, I'll be spinning the globe, wondering where my signal will land and who will answer my "CQ Contest"! QST

2004 ARRL November Sweepstakes Announcement

CW—2100 UTC November 6-0300 UTC November 8

Phone—2100 UTC November 20-0300 UTC November 22

How to participate: W/VE amateurs work as many amateurs in as many ARRL/RAC sections as possible on 160, 80, 40, 20, 15 and 10 meters. Single Operators may participate as all-band High power, Low power, QRP, or Unlimited entries (which is packet assisted at any power level). Multioperator stations are multi-single only. A school club category is available for schools operating without alumni participation.

What to say: Sweepstakes has a more complicated exchange than in other contests. It closely resembles the header of a formal radiogram. A station sends: a consecutive serial number, a letter indicating its operating category (known as precedence), their call sign, the last two digits of the year in which it was first licensed, and their ARRL/RAC section. The precedence abbreviations are: Q = Single Operator QRP, A = Single Operator Low Power, B = Single Operator High Power, U = Single Operator Unlimited, M = Multioperator and S = School Club. (Example: If W1AW was a Single Operator High Power Station, they would send NUMBER 188 B W1AW 37 CT.

Special interest: This is perhaps the most competitive of contests for US and Canadian stations. Because of the more demanding exchange, it really challenges an operator's abilities. Completing a Worked All States award in a weekend is common.

Quirks: You may operate a total of 24 hours of the 30 hour contest period. Off-times must be a minimum of 30 minutes in length. A School Club entry must be comprised of current students and faculty members of the institution. You also may work a station only once, regardless of the band. There is no limit on the number of band changes for a multioperator station in Sweepstakes.

Rule changes this year: **Logs may be submitted via the new Web application found at www.b4h.net/cabforms**.

Best reason to participate: Make 100 contacts during the weekend and you are eligible to purchase the collectible 2004 Sweepstakes CW or Phone Pin ($6 each) —an achievement that is easy to attain. Work all 80 sections for a "clean sweep" and you are eligible to purchase the collectible 2004 Sweepstakes Clean Sweep Mug. Section winners in each operating category earn an attractive certificate.

Relative challenge: Sweepstakes offers you one of the best challenges to improve your operating skills. Accuracy is the key to a successful Sweepstakes. And as we move to the end of the sunspot cycle, the lower bands should prove to be more valuable in making contacts, so strategy becomes more important as well.

Scoring: Each QSO counts 2 points each. Each ARRL and RAC section, plus CNT, counts as a separate multiplier. Count a multiplier only once, not once per band. The final score is QSO points × the number of sections worked (200 QSOs × 2 points = 400 QSO points × 80 sections worked = 32,000 points).

How to report your score: For CW, you must send in your entry **by December 8, 2004**. For Phone, you must submit your entry **by December 22, 2004**. E-mail Cabrillo-format logs for CW to **sscw@arrl.org** and Phone to **ssphone@arrl.org**. Send paper logs and complete summary sheet to SS CW Contest (or SS Phone Contest), ARRL, 225 Main St, Newington, CT 06111. You may also submit your entry using the Web application available at **www.b4h.net/cabforms**.

Complete rules: The complete rules may be found at **www.arrl.org/contests/forms**, where you will also find links to the General Rules for all ARRL Contests, General Rules for ARRL Contests on bands below 30 MHz (HF) and other forms, along with operating aids and log sheets for submitting your entry. If you don't have Web access, you can obtain the complete rules and forms by sending a self-addressed, stamped envelope with two units of postage to November SS Rules, ARRL, 225 Main St, Newington, CT 06111.

For more information: E-mail **contests@arrl.org** or phone 860-594-0295. QST

Clean Sweep Mugs

Commemorate working your "clean sweep" by purchasing your 2004 November Sweepstakes mug. To earn your mug, work all 80 ARRL/RAC sections during the CW or Phone November Sweepstakes. Mug awards are based on claimed scores. The price for the keepsake mug is $13 each (including postage and handling). If you submit electronically, send a paper copy of the first page of your Cabrillo file and indicate how many mugs you are ordering along with your check. If you log by paper, attach a note to the top of your summary sheet indicating how many mugs you are ordering and your check. All orders should be sent to Clean Sweep Mugs, ARRL Contest Branch, 225 Main St, Newington, CT 06111. Your mug will be shipped after all entries and mug orders have been processed and verified. Supplies are limited. We can only guarantee filling orders received by the Phone Submission deadline of December 22, 2004.

VHF/UHF CENTURY CLUB AWARDS

Compiled by Eileen Sapko Awards Manager

The ARRL VUCC numbered certificate is awarded to amateurs who submit written confirmation for contacts with the minimum number of Maidenhead grid locators (indicated in italics) for each band listing. The numbers preceding call signs are the assigned award numbers. The numbers following the call signs indicate claimed endorsement levels. The totals shown are for credits given from June 9 to August 6, 2004.

The VUCC application form, field sheets and complete list of VHF Awards Managers can be found on the VUCC Web site at **www.arrl.org/awards/vucc**. An SASE to ARRL is required if you cannot download these forms. If you have questions relating to VUCC, send an e-mail to **vucc@arrl.org**.

50 MHz
100

1375	KB0USF
1376	W4WM
1377	K5WTA
1378	WQ5W
1379	JJ1IDW
1380	WD9HCF
1381	KB0FHP
1382	K5QWO
1383	CT1EEN
1384	G0THY
1385	KD5KPJ
1386	KF0Q
1387	CO8DM
1388	K4WS
1389	N5BA
1390	W4RBO
1391	W8KNO
1392	VE3DSS
1393	WB8ZTV
1394	AA9MY
VO1GO	425
K2OVS	475
WW2R	150
KN4SM	475
N4HN	200
W5AJX	200
AA5XE	700
W5WVO	200
K6LMN	400
W8WG	275
K8ROX	475

144 MHz
100

634	W3EKT
635	N5TIF
N5BA	150
K6PF	200

222 MHz
50

122	N8AIA

432 MHz
50

308	W3UUM

10 GHz
5

152	K0KFC

24 GHz
5

26	W5ZN

Satellite
100

138	WS4Z
K9HF	375

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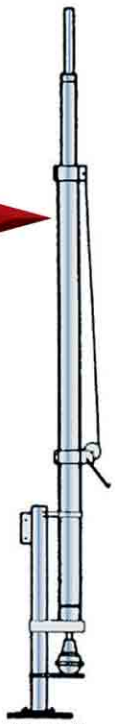

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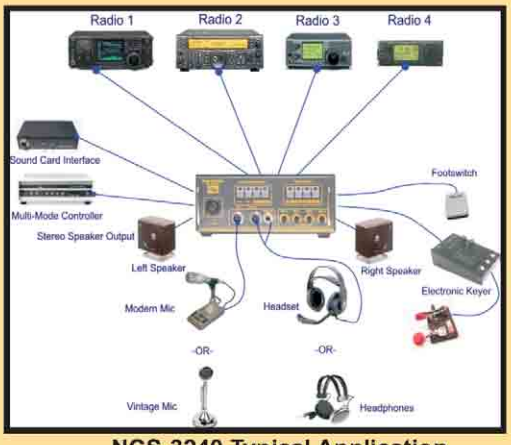

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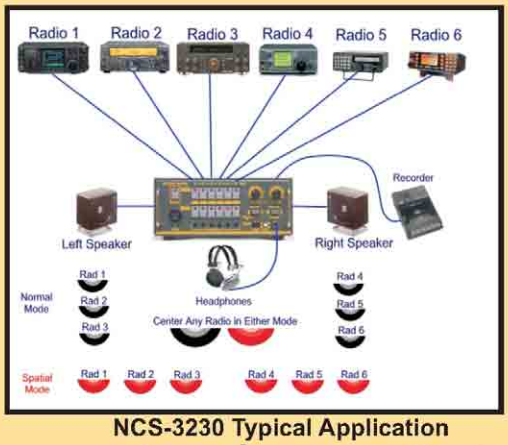

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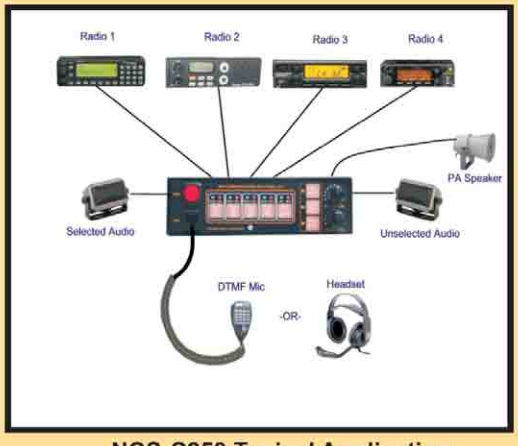

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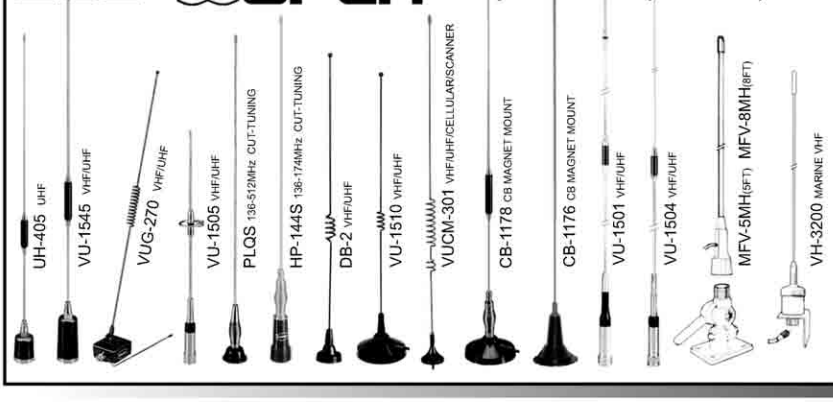

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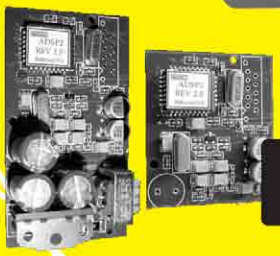

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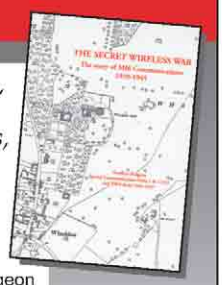

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TH-K2AT A triumph of advanced engineering and design. (middle) This 2M 5W HT is equipped with internal VOX, weather alert/RX, auto simplex checker, auto repeater offset and multiple scans. The K2AT also offers built-in CTCSS, DCS and 1750Hz tone burst. The K2AT meets MIL-STD-810 for resistance to rain, vibration, shock, humidity. 2.44"w x 4.38"h x 1.13"d, 12.5 oz..© **$144.99**

TH-G71A The brighter side of handy communications. (right) This FM, 144/440MHz boasts illuminated keypad and LCD, high-performance antenna, and ergonomic design. The 5W G71A also offers convenience with menu mode, PC compatible and 200 memories. 2.31"w x 4.44"h x 1.44"d, 11.6 oz...© **$214.99**

TH-F6A Head-scratching, unique features. (left) The FM 144/220/440MHz F6A offers dual-channel RX capability, 16-key pad, multi-scroll key, 5W, and 435 memories. Other attractive features include built-in ferrite bar antenna for AM, backlit LCD, lithium-ion battery, and a MIL-STD design. 2.3"w x 3.44"h x 1.18"d, 8.8 oz.....© **$314.99**

KENWOOD

TM-D700A Harnessing APRS®, GPS and SSTV. FM 144/440MHz mobile featuring built-in TNC, including simple packet. The brightest spot of the 50/35W D700A is its ability to enable APRS® without a PC. Also has 200 memories and built-in CTCSS/DCS. 5.5"w x 1.58"h x 7.68"d, 3 lbs...© **$504.99**

TH-D7A(G) Explore APRS opportunities with an HT built for the future. (left) This 5W FM dualband (2M, 440MHz) is equipped with a TNC and provides a range of data communications options. Along with simple packet, use the D7A(G) with APRS and GPS to send positioning data to a friend, who can pinpoint the location. 4.75"h x 2.25"w x 1.5"d, 12 oz .....© **$344.99**

TH-22ATH Tailored for utmost efficiency, Palm-Sized! (right) The 144MHz, 5W, FM 22AT is so small and slim, it easily slips into a shirt pocket. Yet, it delivers impressive performance and does not compromise on sound quality with its large speaker, ensuring loud and clear audio. Features include luminescent DTMF keypad, 40 memories plus 1 call, multiple scan functions, DTSS and page. 2.19"w x 4.63"h x 1"d, 10.2 oz.....Closeout **$199.99**

TM-271A All-terrain performance. On or off road, the 144MHz, 60W 271A delivers powerful mobile performance and other features such as multiple scan functions, 200 memories, NOAA weather, and CTCSS/DCS. This MIL-STD transceiver also provides high quality audio, illuminated keys and large LCD.....© **$169.99**

TM-G707A The essence of ease. From the extra-large panel to Kenwood's Easy Operation mode, the G707A is extraordinarily user-friendly. In addition to its regular profile, it can store four others for instant recall. This 50W/35W, FM dualband (144/440MHz) offers 180 multi-function memories with name function to identify each. 5.5"w x 1.56"h x 7.44"d, 2.65 lbs **$269.99**

TM-V7A Cool Blue: The look of mobile communication. The V7A 144/440MHz FM transceiver marks a departure in ergonomic design with its easy-to-operate control panel and reversible LCD. The "5-in-1" programmable memory, 50/35W, DTSS and pager functions, and dual receive on one band make it a pace-setter. 5.5"w x 1.56"h x 7.44"d, 2.65 lbs .....© **$349.99**

TM-461A Fully equiped, supremely user-friendly 440MHz mobile. The 35/10/5W 461A offers a built-in CTCSS encoder, tone scan and wireless cloning function. For quick access, essential data can be stored in 61 "memory name function" memory channels. Other features include DTSS selective calling, multi-scan capability, and a case built to MIL-STD. 5.5"w x 1.5"h x 6.3"d, 2.2 lbs.....Closeout **$439.99**

TS-570D(G) Affordable DSP. High-end technology doesn't mean high-end budget. With 16-bit DSP, untouchable filtering, tuner and central frequency control, the 570D(G) provides powerful 160-10M use. 10.63"w x 3.75"h x 11"d, 15 lbs.....© **$909.99**

TS-570S(G) Above, plus 6M.....© **$1049.99**

TS-870S DSP at the IF stage. The all-mode, HF 870S incorporates DSP with a full range of features including 100 memories, built-in keyer, interactive menu function, 4-stage attenuator, noise blanker, automatic antenna tuner and 100W power. 13"w x 4.75"h x 13.13"d, 25.35 lbs.....Closeout **$1999.99**

TS-2000 Distinctive design, packed for performance. The all-mode, HF, 2M, 6M, 70cm 2000's advanced digital technology converts analog into digital. The 2000 also features dual channel receive, IF-DSP combined with AF-DSP, built-in TCXO and auto antenna tuner, IF auto notch, built-in 1200/9600bps TNC, 300 memory channels and DX cluster tune. 10.6"w x 3.8"h x 12.5"d .....© **$1599.99**

TS-2000X Same as the 2000 with the addition of 1.2GHz .....© **$2199.99**

TS-B2000 2000 with PC software. 10.63"w x 3.75"h x 12.5"d .....© **$1399.99**

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TS-480SAT New compact all-mode. This 100W HF/50MHz can operate on DC 13.8V and offers two power terminals. The 480SAT also features AF DSP, RX dynamic range, separate LCD control panel with speaker, 100 memories and antenna tuner. Can be controlled from a PC, PSK31 compatible ..© **$939.99**

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MOBILE/BASE AMPLIFIERS

Model	Pin (W)	Pout (W)	Ic (A)	Gain/NF (dB)(dB)	(+13.8V) Type	$ Price
50 MHz						
0503G	1-5	10-50	6	15/0.7	LPA	208
0508G	1	170	28	15/0.7	Standard	367
◆0510G	10	170	25	15/0.7	Standard	319
144 MHz						
1403G	1-5	10-50	6	15/0.7	LPA	163
1405G	1-2	100	14	15/0.7	Standard	295
1406G	25	100	12	15/0.7	Standard	261
1409G	2	150	25	15/0.7	Standard	318
1410G	5-10	160-200	28	15/0.7	Standard	328
◆1412G	25-45	160-200	22	15/0.7	Standard	286
220 MHz						
2203G	1-5	8-35	5	14/0.8	LPA	168
2205G	1-2	70	12	14/0.8	Standard	309
2210G	5-10	130	20	14/0.8	Standard	346
◆2212G	25-45	130	16	14/0.8	Standard	316
440 MHz						
4405G	1-5	15-50	9	12/1.2	LPA	309
4410G	10	100	19	12/1.2	Standard	367
◆4412G	15-30	100	19	12/1.2	Standard	355
4414	35-45	100	14	-/-	Standard	316

HI-POWER AMPLIFIERS

Model	Pin (W)	Pout (W)	Ic (A)	Gain/NF (dB)(dB)	(+13.8V) Type	$ Price
50 MHz						
0548G	.1-.2	170	30	15/0.7	HPA	436
0550G	5-10	375	59	15/0.7	HPA	524
◆0552G	20-25	375	54	15/0.7	HPA	486
144 MHz						
1448G	.25-.5	160-200	29	15/0.7	HPA	471
1450G	5-10	350+	56	15/0.7	HPA	572
◆1452G	10-25	350+	52	15/0.7	HPA	525
1453G	25-60	280	43	15/0.7	HPA	468
1454	60-80	350	40	-/-	HPA	473
220 MHz						
2250G	5-10	225	40	14/0.8	HPA	579
◆2252G	10-25	225	36	14/0.8	HPA	537
2254	75	225	32	-/-	HPA	494
440MHz						
4448G	1-5	75-100	25	12/1.2	HPA	429
4450G	5-10	185	35	12/1.2	HPA	585
◆4452G	25	185	30	12/1.2	HPA	547
4454	60-80	185	26	-/-	HPA	508

HPA=High-power amplifier 3x10x11" 9lbs UHF or N

◆=Most popular models

REPEATER AMPLIFIERS

Model	Pin (W)	Pout (W)	Ic (A)	Gain/NF (dB)(dB)	(+13.8V) Type	$ Price
50 MHz						
0508R	1	170	28	-/-	CD/cc	533
0510R	10	170	25	-/-	CD/cc	485
0550RA	2-6	375	59	-/-	CD/fn	759
0552RA	20-25	375	54	-/-	CD/fn	719
144 MHz						
1406RN	25	100	12	-/-	CD/cc	416
1410RA	4-10	200	27	-/-	CD/fan	579
1412R	25-50	200	22	-/-	CD/cc	455
1452RA	10-25	350	52	-/-	CD/fn	772
220 MHz						
2210R	5-10	130	20	-/-	CD/cc	503
2212R	25-45	130	16	-/-	CD/cc	474
2250RA	2-6	225	40	-/-	CD/fn	829
2252RA	10-25	225	36	-/-	CD/fn	787
440 MHz						
4410R	10	100	19	-/-	CD/cc	529
4412R	15-30	100	19	-/-	CD/cc	521
4450RA	2-6	185	35	-/-	CD/fn	836
4452RA	25	185	30	-/-	CD/fn	798

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Standard=Mobile/Base	3x6x11"	6lbs	UHF or N

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VX-150 Designed to perform under the most difficult conditions. (right) This 2M 5W HT provides exceptional receiver performance with clean, clear transmit. Built to withstand outdoor use, the 150 is also outfitted with commercial-grade speaker and Omni-Glow™ keypad. 4.3"h x 2.3"w x 1"d, 11.5 oz **$119.99**

VX-2R Smallest HT dualband! (left) This 1.5/1W dualband (144/440MHz) handheld offers VHF, UHF, shortwave, marine and aircraft bands, or WIRES™ linking. The 2R's wide band receive includes the AM broadcast band, continuous HF shortwave, VHF/UHF up to 729MHz, plus 800-960MHz (cell blocked). It also includes over one thousand memories (20 groups), CTCSS/DCS encode/decode and auto repeater shift. 1.9"w x 3.2"h x 0.9"d **$179.99**

VX-5R/VX-5RS Setting water resistance standards. (mid-left) Offering 5W (4.5W on 430MHz), the 5R/5RS cover 50/144/430MHz while providing short to microwave reception. Great for outdoors with optional barometric pressure unit. Black or silver. 2.3"w x 3.4"h x 1.1"d, 8.9 oz **$219.99**

VX-7R/VX-7RB The first submersible amateur HTs. (mid-right) Water protected, the 50/144/430MHz, 5W 7R/7RB are rated for 3', 30-minute submersions. Magnesium bodies make them ideal for outdoors. Include dual/wide-band rx, status strobe, and WIRES™ key. Silver or black. 2.4"w x 3.5"h x 1.1"d, 9.2 oz **$309.99**

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FT-7800R Get "back to basics." This FM, 144/430MHz mobile boasts 50 and 40 Watts output and 1000 memories. It also offers one-touch hyper memories, full-featured CTCSS/DCS, WIRES™ internet linking and wide receiver coverage. The 7800R has a large LCD and NOAA weather alert. 5.5"w x 1.6"h x 6.6"d, 2.2 lbs **$255.99**

FT-817ND Self-contained, battery-powered, multi-mode portable. The 5W 817ND is designed for operation on HF, plus 6M, 2M, and 70cm. Whether you perfer SSB, CW, AM, FM, Packet, or SSB-based digital modes, it is ready to join you on your next hiking, camping, or search-and-rescue adventure. Includes 1400mAh NiMH battery and charger. 5.3"w x 1.5"h x 6.5"d, 2.6 lbs... **$619.99**

FT-2800M Cool and quiet 65W operation. The most rugged 2M transceiver ever provides 65/25/10/5W with an extensive 221 memories, alphanumerics and CTCSS/DCS. The 2800M also features NOAA with weather alert, WIRES™ access, SmartSearch™, and excellent receive performance. With a bullet-proof front end and direct keypad entry, it's a dream come true. 6.3"w x 2"h x 7.3"d, 4 lbs..... **$154.99**

FT-8900R Leading the way in FM mobile design. The 29/50/144/440MHz 8900R has no peer among mobiles. This quad bander offers leading edge features like VHF/UHF full duplex, cross band repeat, independent operation on two bands, and six "Hyper Memory" keys to store configurations. The 8900R also provides 50W (35 on 440MHz), access to internet linking systems, over 800 memories, CTCSS/DCS, and built-in duplexer. 5.5"w x 1.6"h x 6.6"d, 2.2 lbs..... **$419.99**

FT-8800R Easy operation, ultimate dualband. This 144/430MHz 50/35W mobile offers simultaneous monitoring of one band while operating the other. Besides extended receive, the 8800R provides 1000 memories, cross band repeat, versatile scan and CTCSS/DCS. Looks similar to the FT-8900R above. 5.5"w x 1.6"h x 6.6"d, 2.2 lbs **$359.99**

FT-897D All-in-one portable base. The all-mode, multi-band 897D features high output 100W (HF/6M), 50W (2M), 20W (70cm), rugged construction, 200 memories, TCXO and optional internal supply and external antenna tuner. 7.87"w x 3.15"h x 10.3"d, 8.6 lbs ... **$879.99**

FT-1000MP MK V Improving the 1000 series Elite-Class. Building on the success of the 1000 series, the HF, all-mode, 200W Mark V offers Class-A PA (75W) operation, interlocked digital bandwidth tracking system and a variable RF front-end filter. 16"w x 5.3"h x 13.7"d, 31 lbs..... **$2049.99**

MK V FIELD Reach the HF Summit! The technology of the 1000D and Mark V in a 100W, self-contained design. This HF all-mode features Class-A (25W) PA operation, interlocked digital bandwidth tracking and a variable RF front-end filter along with an auto antenna tuner and internal switching supply. 16"w x 5.3"h x 13.7"d, 33 lbs **$1739.99**

FT-840 Performance forward. Blending high performance digital frequency techniques with operating convenience, the 840 is a base station that beginners and seasoned operators will appreciate. In addtion to 100W on 160-10M, it adds a choice of 2 optional remote auto antenna tuners. 9.4"w x 3.7"h x 9.6"d, 12 lbs **$579.99**

FT-847 Masterpiece of high-tech design! Ready for action on SSB, CW, HSCW, AM, FM, Packet, SSTV, and RTTY, the 847 expands operating horizons to 6M, 2M and 70cm, featuring DSP and full-duplex satellite. Advanced DSP. 10.2"w x 3.4"h x 10.6"d, 14.4 lbs **$1399.99**

FT-857D The world's smallest HF/VHF/UHF multimode. The 100W (HF/6M), 50W (2M), 20W (70cm) 857D provides wide frequency coverage, outstanding receive, and convenient remote-head use (optional). Includes 200 memories, ease of access to features, advanced DX features, and CW operating flexibility. The 857D model now offers a built-in DSP. 6.1"w x 2"h x 9.2"d, 4.6 lbs **$769.99**

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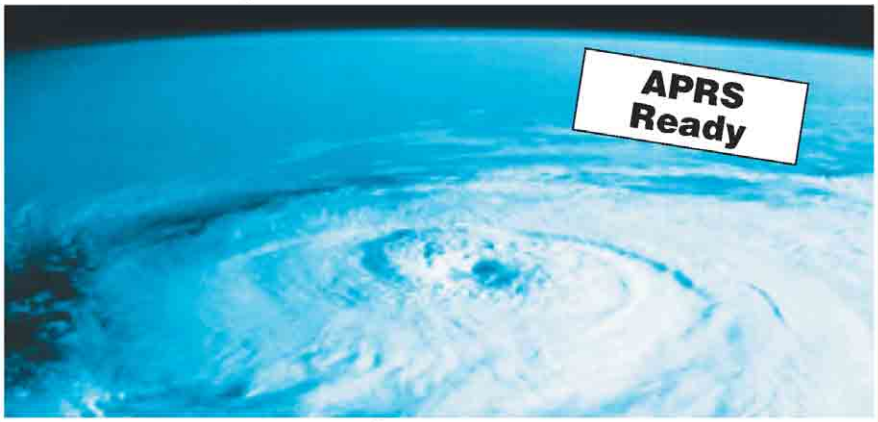

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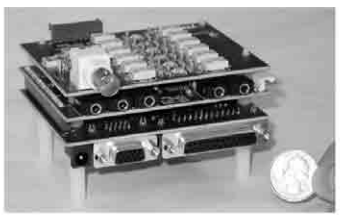

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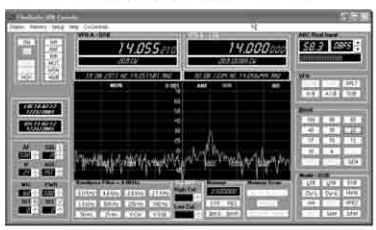

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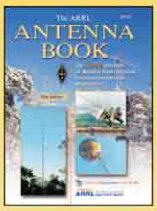

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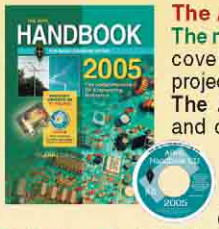

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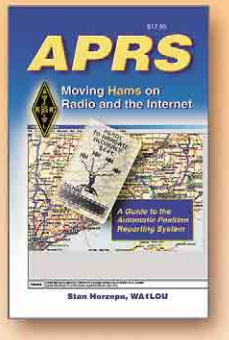

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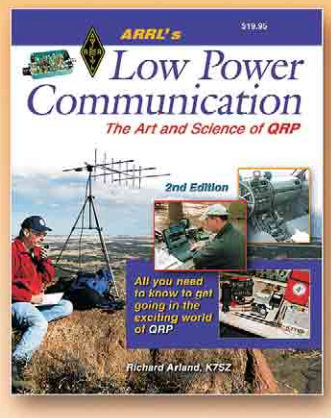

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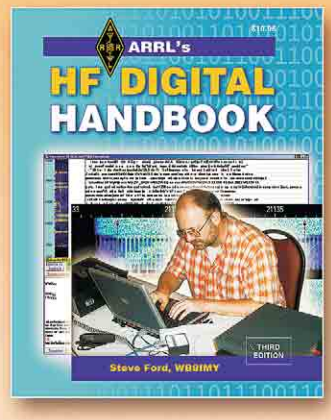

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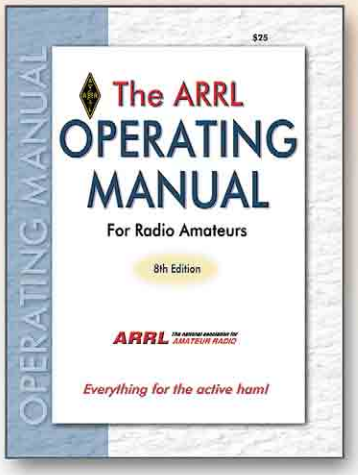

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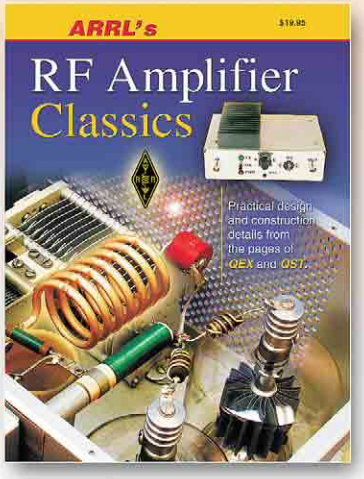

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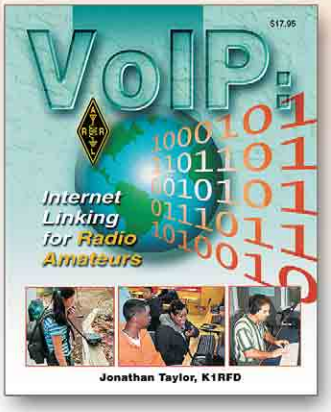

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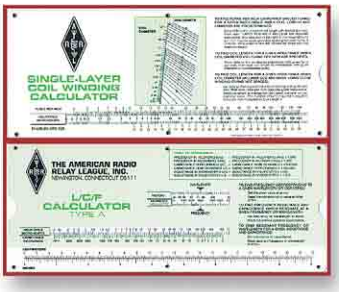

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Power Curve -- typical output power in Watts

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

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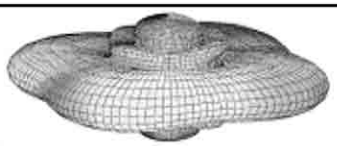

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600 Watt MFJ Automatic Tuner

MFJ-994, **$359.95** **New!**

MFJ-994, *600 Watt IntelliTuner*™ automatic antenna tuner. Similar to MFJ-993 but handles 600 Watts SSB/300 Watts CW, matches 12-800 Ohms. Does not have digital SWR/Wattmeter/LCD display, aural SWR meter/audio feedback, antenna switch or 4:1 current balun for balanced lines. Tuning must be done at low transceiver power with the amplifier bypassed.

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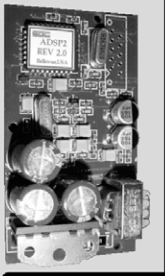

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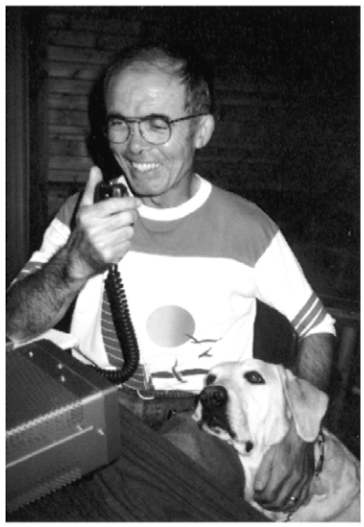

Jerry and guide dog, Kerwin.

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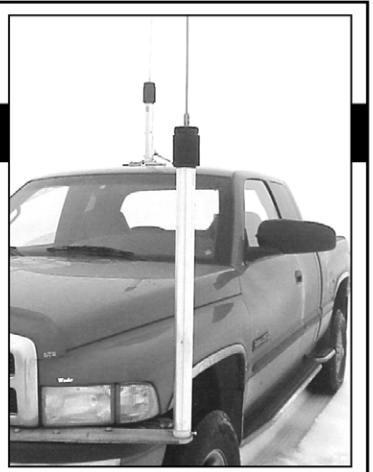

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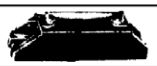

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MFJ *Balanced Line* Antenna Tuner

Superb balance . . . Very wide matching range . . . Covers 1.8-54 MHz . . . Cross-Needle SWR Wattmeter . . . Handles 300 Watts . . . Compact size . . .

The MFJ-974H 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-974H is its successor*. It meets today's needs and even surpasses the Johnson Matchbox outstanding performance.

Everything You Need

The MFJ-974H 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-974H 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-974H 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.

A 1:1 *current* balun is placed on the low impedance 50 Ohm input side to convert the balanced T-Net-work to unbalanced 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.

MFJ-974H **$199.95**

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-974 **$179.95**

MFJ-974, $179.95. Same as MFJ-974H but for 6-80 Meter operation (no 160 Meters).

160-6 Meters All Band Doublet Antenna

MFJ-1777, $49.95. 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 *High Current* DC Multi-Outlet Strips

Choose super versatile 5-way binding posts AND/OR Anderson PowerPole® connectors

Anderson PowerPole® is a registered trademark of Anderson Power Products.

Provide multiple high current DC outlets for transceivers and accessories from your main 12 VDC power supply – keeps you neat, organized and safe. Prevents fire hazard. Keeps wires from tangling up and shorting. Outlets are fused and RF bypassed.

All MFJ DC power strips have *built-in* six foot, eight gauge, flexible color-coded cable with ring tongue terminals -- *no extra cost*. *RF-tight* aluminum cabinet has mounting ears and ground post with wing nut.

Choose MFJ's *super versatile* super heavy duty 5-way binding posts (spaced for standard dual banana plugs) and/or *Anderson PowerPole®* outlets.

Each *Anderson PowerPole®* is individually fused as needed. Standard color coded automobile fuses plug in externally. Extra *PowerPole®* connectors, contacts, fuses are included at *no extra cost*.

Versatile 5-Way Binding Posts

MFJ-1118 **$74.95** **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 with master fuse, ON/OFF switch, and "ON" LED provide 15 Amps for accessories. 12½x2¾x2½ in.

All PowerPoles®

MFJ-1128 **$99.95** ***12 outlets, each fused, 40 Amps total.*** Three high-current outlets for transceivers. Nine *switched* outlets for accessories. Mix and match in-cluded fuses as needed (one-40A, one-25A, four-10A, four-5A, three-1A fuses installed). *Built-in 0-25 VDC Voltmeter*. Includes *extra* 12 pairs of *PowerPole®* contacts and *extra* 10 fuses (2 each: 1, 5, 10, 25, 40A) -- *no extra cost*. 12Wx1¼Hx2¾D in.

MFJ-1126 **$79.95** ***8 outlets. each fused, 40 Amps total.*** Factory installed fuses: two 1A, three 5A, two 10A, one 25A, one 40A. *Built-in 0-25 VDC Voltmeter*. Includes *extra* 6 pairs of *Anderson PowerPole®* contacts and *extra* 5 fuses (1, 5, 10, 25, 40A) -- *no extra cost*. 9Wx1¼Hx2¾ inches.

PowerPoles® AND 5-Way Binding Posts

MFJ-1129 **$109.95** *The best of both worlds!* ***10 outlets, each fused, 40 Amps total.*** Three high-current outlets for rigs -- 2 *PowerPoles®* and 1 versatile high-current 5-way binding post. Seven *switched* outlets for accessories (20A max) -- 5 *PowerPoles®* and 2 versatile binding posts. Mix and match included fuses as needed (1- 40A, 2-25A, 3-10A, 3-5A, 2-1A installed). *Built-in 0-25 VDC Voltmeter*. Includes *extra* 7 pairs of *PowerPole®* contacts, and 10 fuses (2 each,1,5,10, 25, 40A) -- *no extra cost*.12½Wx1¼Hx2¾D in.

MFJ-1124 **$59.95**

6 outlets, each fused, 40 Amps total. Four *PowerPoles®* and two high-current 5-way binding posts, Installed fuses: 1-40A, 2-25A, 2-10A, 1-5A, 1-1A. Includes 4 pair *PowerPole®* contacts, and 5 fuses -- *no extra cost*.

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MFJ tiny Travel Tuner

Tiny 4½x2¼x3 inch tuner handles full 150 Watts! Covers 80-10 Meters, has tuner bypass switch, tunes nearly anything!

MFJ brings you the *world's smallest* full power 150 Watt 80-10 Meter Antenna Tuner. Extra wide matching range lets you tune nearly any antenna.

It's no toy, its got guts! Built with real *air* variable capacitors (600 Volt, 322 pF) and *three* stacked powder iron toroids to handle real power -- not just QRP. Bypass switch lets you bypass tuner when you don't need it.

You can use nearly any transceiver at full power with nearly any coax fed or random wire antenna for portable, home or mobile operation.

It's perfect for compact rigs like Icom IC-706MKIIG, Yaesu FT-100D, Kenwood TS-50, QRP rigs and others with a built-in SWR meter.

Operate anywhere, anytime with a quick easy set-up! Tune out SWR on your mobile whip from inside your car. Operate in your apartment with a wall-to-wall antenna or from a motel room with a wire dropped from a window or from a mountain top with a wire over a tree limb. Great for DXpeditions or field day. Be prepared for emergencies.

MFJ-902 is so small and handy, you'll rely on it wherever you go! It's easy to pack away in your briefcase, suitcase, backpack, glove compartment or desk drawer. It's tiny enough to slide in your back hip pocket! 4½Wx2¼Hx3D in.

MFJ-902
$79.95 **New!**

Tiny Travel Tuner with 4:1 Balun

MFJ-902H
$99.95

MFJ-902H, same as MFJ-902 *Tiny Travel Tuner* but has *4:1 balun* for balanced lines and 5-way binding posts for balanced lines and random wire. 5¾Wx2¼Hx 2¾D inches.

Tiny Travel Tuner with Cross-Needle SWR/Wattmeter

MFJ-904
$109.95

MFJ-904, same as MFJ-902 *Tiny Travel Tuner* but has *Cross-Needle SWR/Wattmeter.* Read SWR, forward and re-flected power all at a glance in 300/60 and 30/6 Watt ranges. 7¼Hx2¼Hx2¾D in.

ALL-in-one *Tiny Travel Tuner* with 4:1 Balun *and* SWR/Wattmeter

MFJ-904H
$129.95

ALL-in-one! MFJ-904H, same as MFJ-902 *Tiny Travel Tuner* but has *4:1 balun for balanced lines* and Cross-Needle SWR Wattmeter. Read SWR, forward and reflected power all at a glance in 300/60 and 30/6 Watt ranges. Has 5-way binding posts for balanced lines and random wire. 7¼Hx2¼Hx2¾D inches.

Long 10/12 foot Telescoping Whips

MFJ-1954
$19.95
10 Feet

MFJ-1956
$29.95
12 Feet

10 foot extended, 19 inches collapsed, MFJ-1954, $19.95. 12 foot extended, 22.5 inches collapsed. MFJ-1956, $29.95. Standard 3/8 inch by 24 threaded stud for use with all standard mounts. Durable 1/2 inch diameter plated brass. Telescopes for full 1/4 wave operation 2 to 12/15 Meters. Cover 17, 20, 30, 40, 60, 80, 160 Meters with loading coil. Use two for multi-band dipoles. Replace screwdriver antenna whip for highly efficient *fixed* mobile operation.

MFJ RF Isolator

MFJ-915 *RF Isolator*

MFJ-915
$29.95

prevents unwanted RF from traveling on the outside of your coax shield into your transceiver. This unwanted stray RF can cause painful RF "bites" when you touch your microphone or volume control, cause your display or settings to go crazy, lock up your transceiver or turn off your power supply. In mobile installations, stray RF could cause your car to do funny things even blow your car computer. Clear up these problems, plug an MFJ-915 between your antenna and transceiver. *Don't operate without one!* 5x1½ inches. For 1.8 to 30 MHz.

Portable Collapsible Antenna Tri-Pod

MFJ-1918
$39.95

Holds 66 pounds of antenna steady. Black *steel* base forms strong braced equilateral triangle 40 inches on a side. Non-skid feet. One inch diameter steel mast extends height to six feet. Strong base and mast locks. Easily add antenna mount or mast extension for greater heights. Collapses to 38 inches by 4 inch diameter. 6¾ pounds.

1500 Watt Lightning Surge Protector

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$39.95

Protect your expensive transceiver from static electricity and lightning induced surges with an ultra-fast gas discharge tube. Plug between rig and antenna, attach ground. DC to 1000 MHz. SO-239s.

All-Band G5RV Antenna

MFJ-1778
$39.95

Cover all bands, 160-10M with tuner. 102 ft. long, 1.5kW. Custom fiberglass insulator stress relieves 450 Ohm ladder line. Use horizontally, as inverted vee or sloper. Marconi on 160M.

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Half-size 52 foot *G5RV Jr* 40-10 Meters, 1500 Watts.

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Package of six. (69 cents each)

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True *1:1 Current Balun/Center Insulator* forces equal currents into dipole halves to reduce coax feedline radiation and field pattern distortion. Reduces TVI, RFI and RF hot spots in your shack. 50 ferrite beads on *Teflon*® coax. 1.5kW, 1.8-30 MHz. Stainless steel hardware. *Direct* antenna connection. 5x1½ in.

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Everything you need is included -- software, audio cables, RS-232 serial cable and AC power supply.

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Audio isolation transformers and relay eliminate ground loops, audio hum, noise and distortion.

RFI-Proof

Extensive RF suppression and line isolation eliminates RF feedback problems.

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Transmit mic audio at any time by pressing PTT to override digital modes -- great for SSTV and Contest Voice Keyer.

More Impressive Features

Serial port -- lets computer control radio to override/interrupt digital transmissions.

VOX Control -- lets you use VOX control when not using computer serial port control.

Level Controls -- for transmitter drive and for receiver-to-sound card drive level. No need to adjust microphone gain or sound card level when you change modes.

Stereo or Mono Audio Input -- A front panel switch selects left, right, or both sound card audio output channels to accommodate various programs.

Off-the-air recording -- for replaying or for use with spectrum analyzer programs.

Monitor on/off switch lets you have a normal QSO and receive SSTV pictures at the same time in the *"monitor on"* position. This is great for modes like SSTV and Voice Keyer operation that may require listening to receive audio during operation.

Rugged Construction -- All aluminum cabinet and surface-mount construction gives you years of trouble-free service.

Use any Transceiver

Internal jumpers program microphone wiring for any brand or model radio -- no soldering required. Order **MFJ-1275** for 8-pin *round* mic plug. Order **MFJ-1275M** for 8-pin *modular* mic (RJ45) plug.

NEW! Order MFJ-1275T, for *4-pin round* mic plug, for Ten-Tec and others.

Plug and Play!

Everything you need is included --audio and RS-232 cables, AC power supply and a CD with a collection of the most popular amateur radio software to operate PSK-31, RTTY, SSTV, PACKET, AMTOR, CW, HSCW Meteor Scatter, Contest Voice Keying and other modes. Use 12 VDC or 110 VAC.

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Protected by MFJ's famous *No Matter What™* one year limited warranty. MFJ will repair or replace (at our option) your MFJ-1275/M/T *no matter what* for one full year.

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Order from MFJ and try it -- no obligation. If not delighted, return it within 30 days for refund less shipping.

New! Super Sound Card Interface

MFJ-1279/M/T
$129.95

New!

This *super* sound card interface has all of the features of the MFJ-1275 ***plus*** . . .

- **Auxiliary Input Jack:** Lets you switch your sound card from MFJ-1279 so you can use your sound card for something else. No more plugging/unplugging!
- **Direct CW/FSK Keying Jack:** Allows direct CW or FSK keying operation.
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- **Footswitch:** Use footswitch or other for PTT (push-to-talk) when not using VOX.

Plug and Play! Includes software CD, RS-232 and audio cables, AC power supply.

Order MFJ-1279 for 8-pin round mic, MFJ-1279M for 8-pin modular (RJ-45) mic, MFJ-1279T for 4-pin round mic.

Add "X" suffix for 220VAC.

Basic Digital Interface

MFJ-1273B
$59.95

Plug and Play! Has sound card, radio, speaker, RS-232 jacks. Includes: software CD and RS-232, audio, mic cables. No external power needed. Has no mic jack or mic switch. **Order** MFJ-1273B for 8 pin round mic, MFJ-1273BM for 8-pin modular (RJ-45) mic, MFJ-1273BT for 4-pin round mic.

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MFJ-1296, $129.95. *RadioCom4* integrates PSK31, SSTV, FAX/Sat FAX, RTTY, SITOR, DSP audio filters and radio control.

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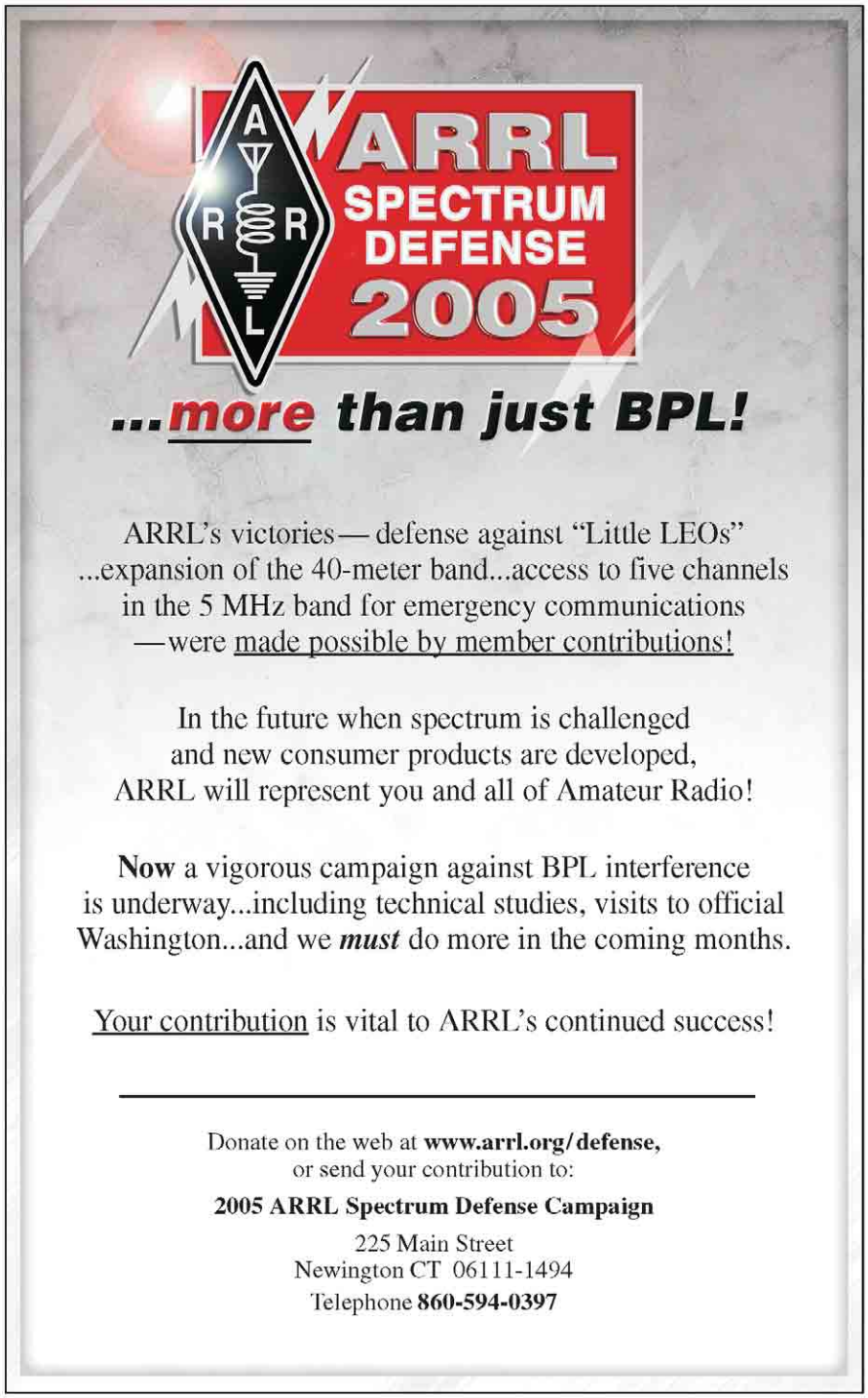

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In the future when spectrum is challenged and new consumer products are developed, ARRL will represent you and all of Amateur Radio!

Now a vigorous campaign against BPL interference is underway...including technical studies, visits to official Washington...and we ***must*** do more in the coming months.

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2. The Ham-Ad rate for commercial firms offering products or services for sale is $2.00 per word. Individuals selling or buying personal equipment: ARRL member 65¢ per word. Non-ARRL member $1 per word. **Bolding** is available for $2.25 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.

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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.

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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, $19.95. For 110 VAC operation. Provides 12 VDC/1.5 Amps.

MFJ-72, $58.80. *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-434
$179.95

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 play back five natural sounding messages in a total of 75 seconds. Uses *eeprom* -- no battery backup needed.

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-434 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.

It's easy to use -- just plug in your 8 pin mic and plug the MFJ-434 cable into your transceiver. Internal jumpers let you set it to your rig. Use your mic or its built-in mic for recording.

Built-in speaker-amplifier. Speaker/phone jack. Use 9 Volt battery, 9-15 VDC or 110 VAC with optional MFJ-1312D, $14.95. 6½Wx2½Hx6½D in.

MFJ-73, $29.95. MFJ-434 Remote Control with cable.

60 dB Null *wipes out* noise and interference

MFJ-1026
$179.95

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, $14.95. 6½x1½x6¼ in.

MFJ-1025, $159.95. Like MFJ-1026 less built-in active antenna, use external noise antenna.

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You can continuously *tune* low pass, high pass, notch and bandpass filters and continuously *vary* bandwidth to pinpoint and eliminate interference.

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Elenco Soldering Stations

Electronically controlled, ideal for professionals, students, and hobbyists. Kit form or assembled, with or without iron.

Features:
- Cushion Grip Handle Soldering Iron (optional) with Grounded Tip for Soldering Static-Sensitive Devices. Easily Replaceable. Uses Long-Life, Plated Conical Tip.
- Heavy Steel, Non-Slip Base.
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- Iron Holder Funnel - Reversible, left or right side.
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Four versions are available (assembled or kit):

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These work with any iron! Turn any soldering iron into a variable iron.

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As Featured in a July 2003 *QST* "Short Takes" Review!

Assembling simple, and even fairly advanced, experimental circuits is as easy as snapping together toy building blocks. Follow the colorful pictures in the manual to build exciting projects such as AM and FM radios, digital voice recorders, burglar alarms, doorbells, and more! (Depending on the specific model) No tools required!

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Contains over 80 parts. Build over 750 different circuits and **70 computer interfaced projects!**

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- Includes NiCd, Charger & Antenna

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- Includes NiCd, Charger & Antenna

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- Resolution to 10 Hz
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- Includes NiCd, Charger & Antenna

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S1325, 30 MHz
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Free Dust Cover and x1, x2 Probes – 2 Year Warranty

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Ideal for Labs, Production Lines, R&D and Hobbyists!

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The world's most popular SWR analyzer just got incredibly better and gives you more value than ever!

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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 in feet.

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You can also 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.

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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 over the entire spectrum 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 approximate Q of traps, stubs, transmission lines, RF chokes, tuned circuits and baluns.

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 much more!

Call your favorite dealer for your best price!

MFJ-259B **$259.95**

Call or write for Free Manual

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, $14.95. Its rugged all metal cabinet is a compact 4x2x6¾ inches.

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, $229.95. Like MFJ-259B, but reads SWR, true impedance magnitude and frequency only on LCD. No meters.

MFJ-209, $139.95. Like MFJ-249B but reads SWR only on meter and has no LCD or frequency counter.

MFJ-219B, $99.95. UHF ***SWR Analyzer***™ covers 420-450 MHz. Jack for external frequency counter. 7½x2½ x2¼ inches. Use two 9 volt batteries or 110 VAC with MFJ-1312D, $14.95. *Free* "N" to SO-239 adapter.

SWR Analyzer Accessories

Dip Meter Adapter

MFJ-66, $19.95. Plug a dip meter coupling coil into your MFJ *SWR Analyzer*™ and turn it into a sensitive and accurate bandswitched dip meter. Save time and take the 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 *genuine* MFJ custom carrying case. Has back pocket with security cover for carrying dip coils, adaptors and accessories.

Made of special foam-filled fabric, the MFJ-29C 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.

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MFJ-224 **$159.95**

MFJ 2 Meter *FM SignalAnalyzer*™

Measure signal strength over 60 dB range, check and set FM deviation, measure antenna gain, beamwidth, front-to-back ratio, sidelobes, feedline loss in dB. Plot field strength patterns, position antennas, measure preamp gain, detect feedline faults, track down hidden transmitters, tune transmitters and filters. Plug in scope to analyze modulation wave forms, measure audio distortion, noise and instantaneous peak deviation. Covers 143.5 to 148.5 MHz. Headphone jack, battery check function. Uses 9V battery. 4x2½x6¾ in.

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Model	MHz	.NF	GAIN	PTT/VOX	$
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SP-2000	144	<.8	20 Adj.	750/200W	250.00
SP-220	222	<.9	20 Adj.	650/200W	250.00
SP-7000	70cm	<.9	20 Adj.	500/100W	250.00
SP-33	903	<.9	20	100/10W	360.00
SP-23	1296	<.9	18	100/10W	360.00
LNA	144	<.4	18	NA	220.00
LNA	432	<.5	18	NA	220.00
SLN	1296	<.4	30	NA	290.00
SLN	2304	<.4	30	NA	290.00

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UTM-1200-1	1 W 1268 MHz. TX-UPCONVERTER	L
GaAsPA20	20 Watt 2304 /2400 MHz. Amplifier	L
UEK-3000S	2400MHz. MstMount Mode "S" Conv NF 0.7dB	460.00
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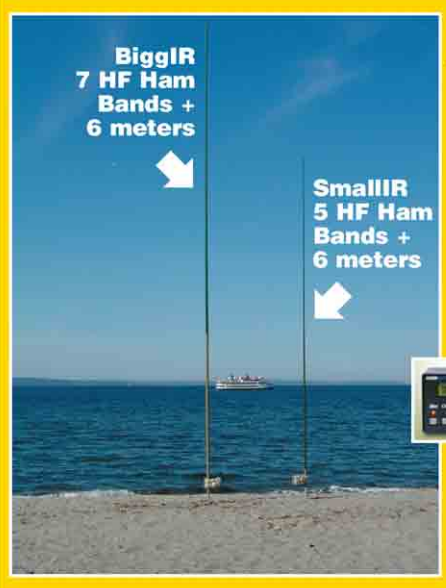

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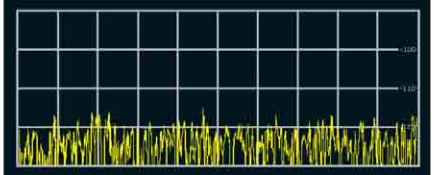

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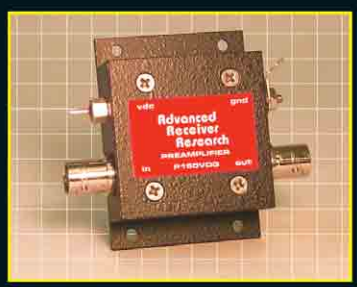

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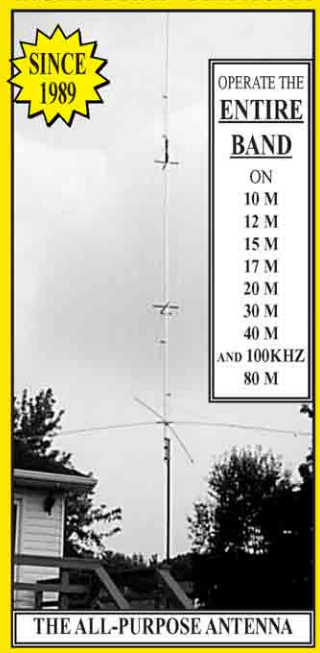

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ALL BAND ANTENNAS

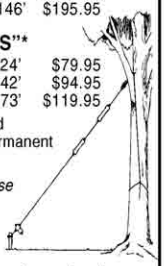
TRAP DIPOLES

Model	Bands	Traps	Size	Price
D-314	12/17/30	4	37'	$109.95
D-42	10/15/20/40	2	55'	$89.95
D-52	10/15/20/40/80	2	105'	$97.95
D-56	10/15/20/40/80	6	82'	$149.95
D-68	10/15/20/40/80/160	8	146'	$195.95

TRAP VERTICALS / "SLOPERS"*

VS-42	10/15/20/40	2	24'	$79.95
VS-53	10/15/20/40/80	3	42'	$94.95
VS-64	10/15/20/40/80/160	4	73'	$119.95

*Can be used without radials *End fed
*Feedline can be buried if desired *Permanent or portable use



ALL TRAP ANTENNAS are *ready to use*
• Coax fed • Factory assembled • Commercial quality • Handles 600 Watts • Comes complete with Deluxe Traps, Deluxe Center Connector, 14 gauge stranded antenna wire and end insulators • Automatic band switching • *Tuner usually never required* • For all transmitters, receivers and transceivers • for all class Amateurs • One feedline works all bands • Instructions included

SINGLE BAND DIPOLES

Model	Band	Length	Assembled
D-10	10	16'	$27.95
D-15	15	22'	$28.95
D-20	20	33'	$29.95
D-40	40	66'	$33.95
D-80	80/75	130'	$39.95
D-160	160	260'	$53.95

Includes instructions • Deluxe Center Connector • 14 gauge stranded antenna wire and end insulators • Coax fed

LIMITED SPACE DIPOLES
• Reduces overall length over 40% • Coax fed • "Shorteners" are enclosed, sealed, weatherproof and lightweight • Complete with Deluxe Center Connector, 14 gauge stranded antenna wire, end insulators, assembly instructions • Use as inverted **V**, or flat-top • Excellent for all class Amateurs

Model	Band	Length	Price
LS-40K	40	38'	$56.95
LS-80K	80/75	69'	$64.95
LS-160K	160	100'	$66.95

Any single band or Trap antenna with PB-1-C Balun instead of Deluxe Center Connector—add $15.00 to antenna price.

PRO-BALUN PB-1 $26.95
• 1:1 for dipoles, beams and slopers • Handles full legal power • Broadband 3 to 35 MHz • Lightweight, sealed and waterproof • Deluxe Connectors require NO soldering • NO jumper wires • Minimize coax and harmonic radiation • Accepts standard PL-259 connector 2" ∞ 6.5"

PRO-BALUN PB-1-C $27.95
Current-type 1:1 radio • 3kW—1.5 to 55 MHz

PRO-BALUN PB-4 4:1 Ratio $27.95

ALL BAND—LIMITED SPACE ANTENNA
• Works ALL bands, 160-10 Meters • Sealed, weatherproof, lightweight shorteners utilize NO-rust terminals • Perfect match for your antenna tuner with balanced line output • Handles full power • Works with all transmitters, transceivers, receivers, etc • Completely factory assembled, ready to install—NO adjustments necessary • Only 70 feet overall length • Perfect for ALL classes of Amateurs • Install as flat-top, sloper, inverted **V**, or almost any configuration • Shorteners provide full 135 feet electrical length with only 70 feet physical length • Utilizes heavy 14 gauge stranded wire • INCLUDES 100 feet of 450-Ω feedline

MODEL AS-2 • $64.95

COMBO SPECIAL—#AS-2-SP AS-2—**All band** antenna with popular MFJ-949E antenna tuner only $199.95 and get an 18" RG-8X interconnect cable **free**!

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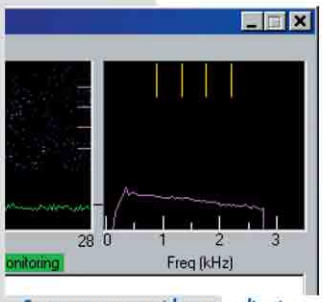
TECH TALK

6-Meter Weak-Signal Work with the IC-7800

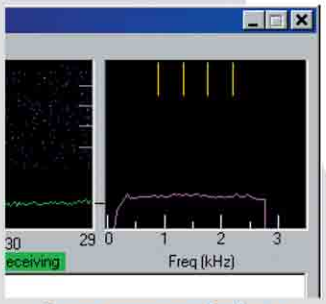
Weak-signal work on 6M demands a stable, sensitive, low-noise receiver and a stable, low-distortion transmitter preferably capable of running more than 100W output. For digital weak-signal modes, frequency *accuracy* is as important as frequency stability. A perfect application for the Icom IC-7800!

On CW and SSB, the '7800's feature set makes working 6M a pure joy. Using the dual receivers, you can simultaneously monitor both 6M weak-signal calling frequencies, 50.110MHz and 50.125MHz. You can monitor a 6M calling frequency while working stations on another 6M frequency. Or you can work DX on the HF bands while silently monitoring 6M for an opening by using the Sub receiver displayed on the high-performance spectrum scope!

QRM is not as severe on 6M as it is on HF bands such as 20M. However, when an opening occurs, the weak-signal portion of the band can fill up fast with SSB signals. The '7800's high-performance DSP-based IF filters can eliminate QRM while you work that really weak one.



System response with no equalization



System response equalized using IC-7800 tone controls

Some openings on 6M can be accompanied by very heavy QSB. When signals fade down into the noise, the IC-7800's DSP-based noise reduction works wonders for the signal-to-noise ratio. Because the '7800's ultimate-performance DSP processors operate at such high speeds, the noise reduction is more efficient than those in other radios!

Some of the most interesting weak-signal work on 6M occurs on new digital modes made possible by K1JT's *WSJT* software[1]. *WSJT* uses the sound card and processing power of your personal computer to implement several digital modes optimized for 6M and VHF propagation: high-speed meteor scatter, "moonbounce" or earth-moon-earth (EME), and ionospheric/tropo scatter. The only external hardware you need is an interface unit to connect your '7800 to your PC sound card.

The IC-7800 has several features that help you optimize 6M *WSJT* modes. For example, a "flat" audio passband is highly desirable. Using the '7800's SSB RX Tone controls, you can compensate for variations in the radio/interface/PC system frequency response. These two screen shots from *WSJT* show the '7800's receiver tone controls equalizing the system frequency response.

The IC-7800's high-gain receiver preamplifier helps amplify those weak meteor "pings" so that *WSJT* has a better chance of decoding them. You can also disable the '7800's AGC circuits to run the receiver "straight through" at maximum gain, another very desirable feature when using *WSJT*. Finally, when you make a schedule for a digital mode QSO, your frequency has to be accurate to within a few hundred Hz. The IC-7800's high-stability master oscillator guarantees that you'll be right on frequency to work that rare one.

The IC-7800: the ultimate transceiver for 6M weak-signal work! See your authorized Icom dealer.

Get into HF!
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[1]J. Taylor, K1JT, "WSJT: New Software for VHF Meteor-Scatter Communication," *QST*, Dec 2001, pp 36-41

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AOR ARD9800 Fast Modem – Digital Voice and Image Interface

Convert Your Analog Transceiver to Digital Voice & Image

In One Easy Step!

No transceiver modifications are necessary.

See Our Product Review in February 2004 QST

Special Purchase Discounts Available for Ham Radio Clubs!

Use any conventional voice transceiver for digital voice communications and images* while you maintain analog capabilities.

The ARD9800 is a breakthrough in communications technology. By simply connecting the ARD9800 to a pair of transceivers, clear, reliable digital communications are a reality.

- **Digital voice communications using existing analog 2way radios.**
The ARD9800 uses the same audio frequencies (300 Hz ~ 2500 Hz) as microphone audio to modulate the voice signal. This allows you to use an analog radio as a digital voice radio.

- **Works on Single Side Band (SSB) mode.**
The Automatic frequency clarifier function adjusts frequency drift automatically in the SSB mode. (Approximately up to +/- 125 Hz). Utilizes the OFDM (Multi Carrier Modulation) circuit that is effective against Multi-path or Selective Fading, a powerful tool against adverse band conditions.

- **Automatic digital receive**
Automatic voice signal detector recognizes the received signal as analog or digital, automatically switching to the appropriate mode.

- **Digital Slow Scan TV***
Built-in video capture function (NTSC). Compresses the signal into AOR's original adaptive JPEG. Send and receive images (similar to analog slow scan TV, but better) in the digital mode. Built-in video output connector (NTSC) allows viewing the picture on an external monitor.

- **Built-in high grade Vocoder (AMBE)**
Utilizing high-grade digital voice compression delivers quality digital voice communications.

- **Built-in FEC error correction**
A powerful error correction circuit delivers stable and reliable communications also allowing "round table" conversations.

- **Small and compact unit. Easy to operate.**
Simply connect the ARD9800 between the microphone jack and microphone. No complicated modifications necessary.

- **Utilizes a uniquely designed high performance DSP engine**

- **Uses the established G4GUO open protocol**

Digital Amateur Radio could be the biggest development on the ham bands since SSB! Be sure to see the FAQ at www.aorusa.com!

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*image feature requires optional memory module.
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Employment Opportunity

ARRL, the national association for Amateur Radio, seeks a

Chief Operating Officer

at its headquarters in Newington, Connecticut.

The primary objective of the position is to manage and direct League operations relating to publications, marketing and sales, membership services, field and educational services, volunteer examinations, laboratory, and web site.

The Chief Operating Officer is accountable to the Chief Executive Officer and is a staff officer of the association.

Major Areas of Responsibility:

1. Employs and directs approximately 70 staff members, principally through seven department managers, and maintains performance standards in the following areas of headquarters operations: publications, marketing and sales, membership services, field and educational services, volunteer examinations, laboratory, and web site.
2. With the Chief Executive Officer, Chief Financial Officer, Chief Development Officer, and Chief Technology Officer, drafts budget plans and manages operations in accordance with approved plans.
3. Identifies future trends that will affect demand for headquarters support and services, and develops plans to adjust operations accordingly.
4. Through the laboratory, provides a technical resource as required in support of ARRL advocacy efforts.
5. Supports the ARRL Board and its committees as required and performs such other duties as the Chief Executive Officer may assign.

Qualifications:

Master's degree in business administration or equivalent experience or education.

Demonstrated success managing in an organization.

Ability to inspire excellence in delivering services and information to members, and support to volunteers.

Ability to work effectively on a team made up of both staff and volunteers.

A strong background in Amateur Radio and the ARRL.

Applications:

Resumes addressing each of these qualifications and providing whatever additional information the applicant wishes to have considered should be sent to:

David Sumner
Chief Executive Officer
ARRL
225 Main Street
Newington, CT 06111

The deadline for receipt of applications is **October 8, 2004**.

ARRL The national association for AMATEUR RADIO

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TECH TALK

IC-756PROII - Contesting: The Icom Advantage

Contesting is unquestionably today's hottest on-the-air activity, and one of the most popular transceivers among leading contesters is Icom's world-famous IC-756PROII. When winning is your goal, Icom's 'PROII is the transceiver of choice!

USING ASSETS ADVANTAGEOUSLY. Successful contesting demands sharp operating techniques and top-line station gear. The 'PROII fills the bill perfectly! In fact, its numerous operating assets even help compensate for someone with limited contesting experience. How so? Thanks to 41 different filter and skirt shapes, plus multiple AGC loops and 32 bit IF level DSP, receiver desensing or blocking by strong signals can be reduced dramatically. As a result, you can copy weak signals through heavy QRM and band noises — interference that often causes even experienced contesters to miss replies, serial numbers and QSO points. The 'PROII also helps minimize operator fatigue with 4 code memories that include automatic QSO numbering for CW and 4 voice memories for SSB. Add a good computer logging program, and most of your work is just pushing buttons and turning knobs. Now that is living!

IC-756PROII

PRESETTING THE ODDS IN YOUR FAVOR. The 'PROII has every imaginable operating feature built-in so tailoring it into a high performance contest machine is a 3-step cinch. First, use convenient menu selections to set filter bandwidths. Typically, a width of 2.0 kHz for SSB or 600 Hz for CW and with steep-sided skirts will cut QRM yet be wide enough for you to notice and work slightly off-frequency stations without retuning. Then, too, you can keep the IC-756PROII's extra-narrow width filters accessible for quick menu call-up if or when needed. Second, set transmit bandwidth and mic equalization for a slightly more narrow-than-usual response curve with a treble peak or boost for punching through pileups. Third, preset the 'PROII's unique Triple Band Stacking Registers so the first press of a band button changes bands, and subsequent punches (of the same button) accesses its 3 VFO registers for each band. This step eliminates extra movements, increases efficiency, and really puts you ahead in the game.

MULTIPLYING YOUR QSO TIME. Have you ever needed to work a particular station but were concerned about lost QSO-scoring time? Use the 'PROII's Dual Receive Capability to tune in two frequencies or QSOs simultaneously and mix their audio on one speaker. You can then concentrate on adding a needed multiplier or country while continuing to hunt and contact other stations. You score high in every endeavor with an 'PROII!

MAKE YOUR OWN SUPER STATION. Finally, we suggest the serious contester's trump card for sure fire success: Icom's IC-PW1 1 kilowatt linear amplifier with built-in power supply and Automatic Antenna Tuner plus Quad Antenna Switch. Just quick-interconnect an 'PW1 and an 'PROII, and you have a totally deluxe station with full selection of bands, antenna switching, and 5 to 1000 watts of power right from the 'Pro's front panel. You select a band, dial a frequency and transmit. Everything follows your lead automatically! Ready for big league contesting at its best? Check out Icom's IC-756PROII and IC-PW1 at your favorite dealer today!

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MFJ TUNERS

MFJ-989C *Legal Limit* Antenna Tuner

MFJ uses super heavy duty components to make the world's finest legal limit tuner

MFJ uses super heavy duty components -- roller inductor, variable capacitors, antenna switch and balun -- to build the world's most popular high power antenna tuner.

The rugged world famous MFJ-989C handles 3 KW PEP SSB amplifier input power (1500 Watts PEP SSB output power). Covers 1.8 to 30 MHz, including MARS and WARC bands.

MFJ's *AirCore*™ roller inductor, new *gear-driven* turns counter and weighted spinner knob gives you exact inductance control for absolute minimum SWR.

You can match dipoles, verticals, inverted vees, random wires, beams, mobile whips, shortwave -- nearly any antenna. Use coax, random wire or balanced lines.

MFJ-989C **$359.95**

You get everything you've ever wanted in a high power, full featured antenna tuner -- widest matching range, lighted Cross-Needle SWR/Wattmeter, massive transmitting variable capacitors, ceramic antenna switch, built-in dummy load, *TrueCurrent*™ Balun, *scratch-proof* Lexan front panel -- all in a sleek compact cabinet (10¾Wx4½Hx15D in).

***MFJ AirCore*™ Roller Inductor**

gives high-Q, low loss, high efficiency and high power handling.

MFJ's exclusive *Self-Resonance Killer*™ keeps damaging self-resonances away from your operating frequency.

Large, self-cleaning wiping contact gives good low-resistance connection. Solid 1/4 inch brass shaft, self-align bearings give smooth non-binding rotation.

MFJ *No Matter What*™ Warranty

MFJ will repair or replace your unit *(at our option)* for 1 year.

More hams use MFJ tuners than all other tuners in the world!

MFJ-986 Two knob *Differential-T*™

MFJ-986 **$329.95**

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. 10¾Wx4½Hx15 in.

MFJ-962D *compact* kW Tuner

MFJ-962D **$269.95**

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. 10¾x4½x10⅞ in.

MFJ-969 300W *Roller Inductor* Tuner

MFJ-969 **$199.95**

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. 3½Hx10½Wx9½D inches.

MFJ-949E *deluxe* 300 Watt Tuner

MFJ-949E **$149.95**

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. 3½Hx10⅝Wx7D inches. **MFJ-948, $129.95.** Economy version of MFJ-949E, less dummy load, Lexan front panel.

MFJ-941E *super value* Tuner

MFJ-941E **$119.95**

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 10½Wx2½Hx7D in.

MFJ-945E HF/6M *mobile* Tuner

MFJ-945E **$109.95**

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, $4.95,** mobile mount.

MFJ-971 *portable/QRP* Tuner

MFJ-971 **$99.95**

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 6x6½x2½ in.

MFJ-901B *smallest* Versa Tuner

MFJ-901B **$79.95**

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-16010 *random wire* Tuner

MFJ-16010 **$49.95**

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 **$79.95**

MFJ-906 has lighted Cross-Needle SWR/ Wattmeter, bypass switch. Handles 100 W FM, 200W SSB. **MFJ-903, $49.95**, Like MFJ-906, less SWR/Wattmeter, bypass switch.

MFJ-921/924 *VHF/UHF* Tuners

MFJ-921/924 **$69.95**

MFJ-921 covers 2 Meters/220 MHz. **MFJ-924** covers 440 MHz. SWR/Wattmeter. 8x2½x3 in. Simple 2-knob tuning for mobile or base.

MFJ-922 *144/440 MHz* Tuner

MFJ-922 **$79.95**

Tiny 4x2½x1¼" tuner covers VHF 136-175 MHz and UHF 420-460 MHz. SWR/Wattmeter reads 60/150 Watts.

MFJ-931 *artificial* RF Ground

MFJ-931 **$89.95**

Eliminates RF hot spots, RF feedback, TVI/RFI, weak signals caused by poor RF grounding. Creates artificial RF ground. Electrically places far away RF ground directly at your rig by tuning out reactance of connecting wire. **MFJ-934, $169.95**, Artificial ground/300 Watt Tuner/Cross-Needle SWR/Wattmeter.

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FBA-10 6-Cell AA case			$14.95
For ICOM IC- V8 etc: (BP-210 includes belt clip)			
BP-210 6w Ni-MH pack	7.2v	1650mAh	$39.95
CBE-210 Batt. Eliminator (12V Mobile use)			$25.95
NEW for ICOM IC- T90 etc: (Lithium ION – NEW!)			
BP-217 5W Li-ION pack	7.4v	1300mAh	$39.95
EMS-217 Desktop Rapid Charger for BP-217			$39.95
For ICOM IC- T8A, T8A-HP, T81A : (BOTH w/ belt clip)			
BP-200XL 5w Ni-MH pk	9.6v	1450mAh	$54.95
BP-197h 6-cell AA Battery case			$29.95
For ICOM IC-Z1A, T22A, T42A, W31A, W32A, T7A :			
BP-173x 5W Ni-MH pk	9.6v	1450mAh	$55.95
BP-170L 6-cell AA Battery case			$25.95
For ICOM IC-W21A, V21AT, 2GXAT choose Black or Grey:			
BP-157x / BP-131h	7.2v	1650mAh	$28.95
For ICOM IC-02AT etc & Radio Shack HTX-202 / 404 :			
BP-8h 3W Ni-Cd pack	8.4v	1400mAh	$32.95
BP-202h pack (HTX-202)	7.2v	1400mAh	$29.95
IC-8 8-cell AA case (w/ Charge Jack!)			$22.95
For KENWOOD TH-F6A / F7: (Lithium ION & Charger!)			
PB-42L Li-ION pack	7.4v	1800mAh	$39.95
PB-42XL Li-ION pack	7.4v	3600mAh	$59.95
EMS-42K Desktop Rapid Charger for PB-42L/XL			$39.95
For KENWOOD TH-G71 / K, TH-D7A : (w/ Belt Clip)			
PB-39 5W Ni-MH pack	9.6v	1100mAh	$46.95
PB-38h 3W Ni-MH pack	7.2v	1800mAh	$39.95
For KENWOOD TH-79A, TH-42A, TH-22A etc :			
PB-34xh 5W Ni-MH pack	9.6v	1100mAh	$39.95
For KENWOOD TH-235A etc. (Hard-to-find!) :			
PB-36 Hi-Cap. Ni-MH pack	7.2v	1650mAh	$29.95
For KENWOOD TH-78A / 48 / 28 / 27 etc :			
PB-13x Short Ni-MH pk	7.2v	1500mAh	$34.95
BC-15A KENWOOD brand Fast Charger			$32.95
For KENWOOD TH-77A, 75, 55, 46, 45, 26, 25 etc :			
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For KENWOOD TH-205 / 215 / 225 / 315 etc :			
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For KENWOOD TR-2500 / 2600 : (Wall charger: $ 12.95 ea)			
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For ALINCO DJ-V5, DJ-V5TH : (includes belt clip)			
EBP-46h 5W Ni-MH pk	9.6v	1100mAh	$39.95
For ALINCO DJ-195,HP,R / 196 / 446 / 493 / 496 / 596 etc :			
EBP-48h 5W Ni-MH pk	9.6v	1650mAh	$39.95
For ALINCO DJ-G5TD,TH,TY / 190T,TD,TH / 191T,TD,TH:			
EBP-36h 5w Ni-MH pk	9.6v	1200mAh	$44.95
For ALINCO DJ-580 / 580T / 582 / 180 / 280T / 480 etc :			
EBP-22xh 5W Ni-MH pk	12.0v	1650mAh	$42.95
EBP-20xh Ni-MH pk	7.2v	1650mAh	$28.95
For ADI AT-600 & REALISTIC HTX-204 (for 5-Watt TX):			
ADI-600x 5W Ni-MH pk	12.0v	1100mAh	$39.95
For STANDARD C228, C528, C558; ADI HT-201, 401 etc:			
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Issue	Reservation Date	Materials Due Date
November 2004	Wednesday, September 15, 2004	Monday, September 20, 2004
December 2004	Wednesday, October 13, 2004	Monday, October 18, 2004

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.375	$.70/ft	1.375"	$1.75/ft
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A6270-13S	$199
AR2/ARX2B	$55/69
AR270/AR270B	$89/99
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C4S	10/12/15/17/20/40m, 7 el	$719
C4SXL	10/12/15/17/20/40m, 8 el	$1019
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STRII, Roof Radial Kit	$125
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CALL FOR MORE BENCHER/BUTTERNUT.

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2M4/2M7/2M9	$95/109/129
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10M4DX, 4 Element 10m	$399
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RT2632, 26 Foot, 9 sq ft	$869

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12-30'/40'	$579/899
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MFJ

259B, Antenna Analyzer	$219
269, Antenna Analyzer	$299
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945E, Antenna Tuner	$99
949E, Antenna Tuner	$139
969, Antenna Tuner	$169
986, Antenna Tuner	$289
989C, Antenna Tuner	$309
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Eagle Guy Kit	$29
Titan DX	$329
Titan Guy Kit	$29
Voyager DX	$409
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Yaesu G-2800SDX	$1089
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FT-60R

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SkyCommand*

TS-2000

* Pending FCC rule change.

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