Official Journal of
ARRL
The national association
for AMATEUR RADIO

QST

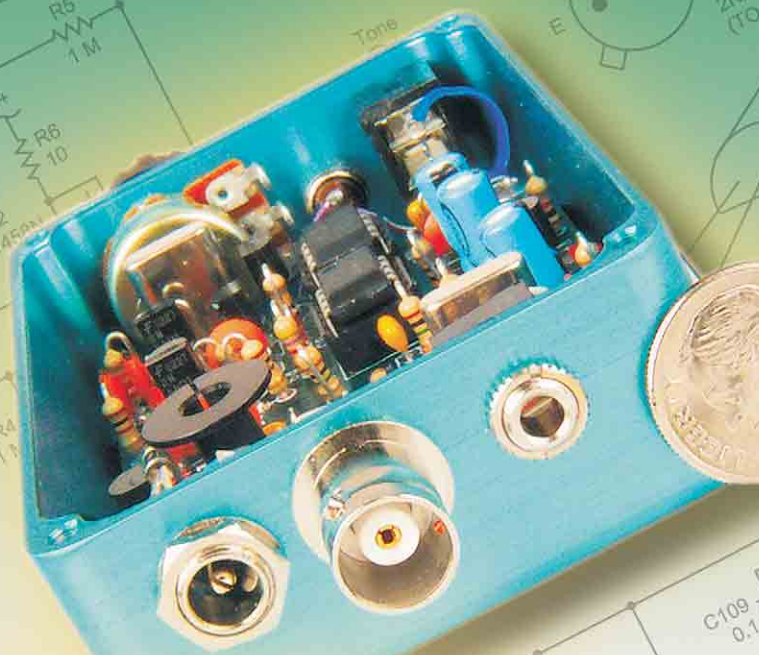
devoted entirely to
AMATEUR RADIO

April 2003

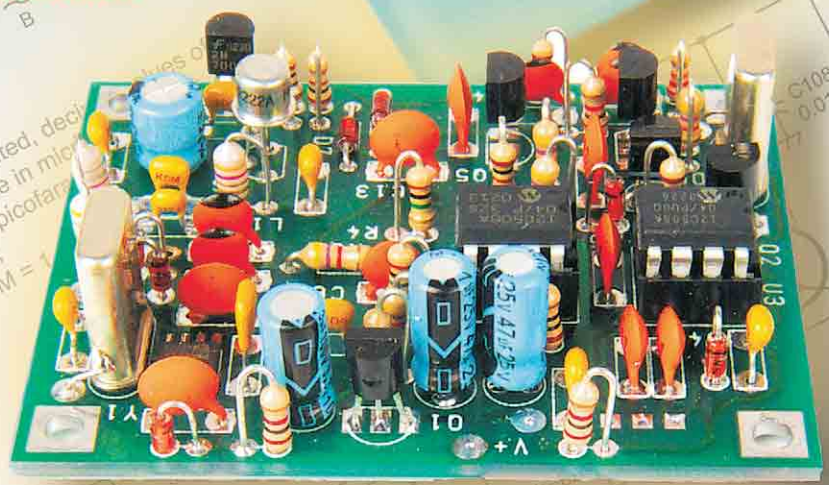
QST reviews

Ten-Tec Argonaut V
HF transceiver

West Mountain Radio
RIGblaster pro
computer-to-radio interface



High Speed Multimedia Radio Arrives



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IC-PCR1000

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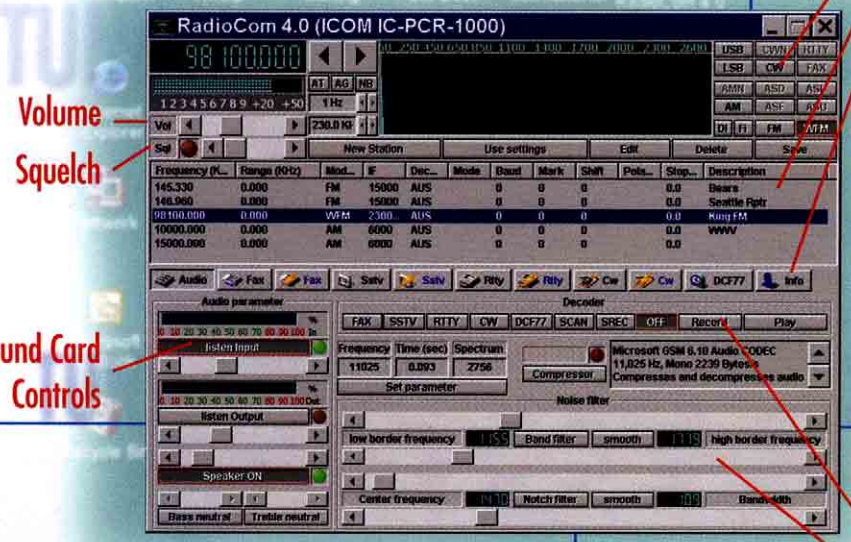
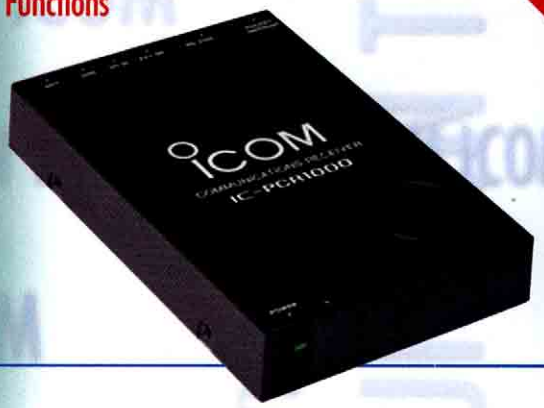
Now with Bonito Software!





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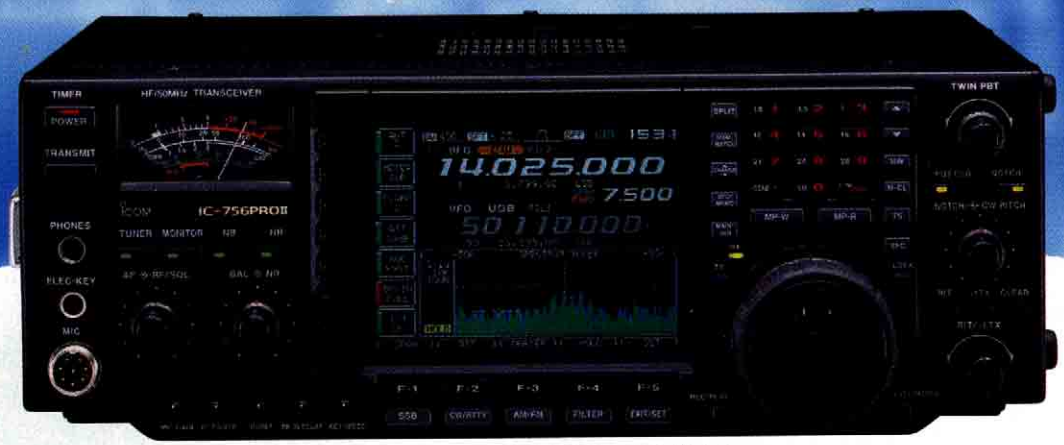

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5" TFT COLOR DISPLAY • SEPARATE RX ONLY ANTENNA JACK • TRANSVERTER I/O PORT • LIVE BAND SCOPE • DIGITAL & ANALOG METER • DUAL RECEIVE • DIGITAL VOICE RECORDER

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- *Remote Control Head*
- *100% Duty Cycle*
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Can be used with *ANY* HF, 6M, or HF/6M transceiver.

PS-125 DC Power Supply

- 25 Amps Continuous
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Hy-Gain rotators are the first choice of hams around the world!
Hy-Gain's world famous Bell Shaped Rotator™ design is the standard that other rotators are measured against.

Its bell construction gives you total weather protection for super reliable operation. Its super heavy duty steel gear drive gives you years of superior and trouble-free performance. Many Hy-Gain rotators still provide excellent service after over 25 years of outstanding performance.

The last thing you want to fall apart is your rotator that's mounted on the top of your tower. You won't make any compromises when you buy and install high quality Hy-Gain rotators.

And we're the only manufacturer to offer a full line of rotators that are completely MADE IN THE USA.

HAM-IV, $559.95. *The heavy duty Ham-IV is the most popular rotator in the world!* It is designed for medium size antenna arrays up to 15 square feet wind load area when mounted in-tower, or 7.5 square feet when mast mounted with an optional lower mast bracket. New alloy ring gear gives extra strength up to 100,000 PSI for maximum reliability. New low temperature grease permits normal operation down to -30 degrees Fahrenheit. New wire-wound potentiometer gives reliable and precision directional indication, new ferrite beads reduce RF susceptibility, new Cinch plug connector plus 8-pin plug at control box (no screwdriver needed). Dual 98 ball bearing race for load bearing strength. Strong electric locking steel wedge brake prevents wind induced antenna movement. Easy-to-use Control Box has illuminated directional meter with North or South center of rotation scale, separate snap-action brake and rotation switches. Uses low voltage control for safe operation. Accepts masts up to $2^{1}/_{16}$ inches diameter. Rotator size is $13^{1}/_{2}$Hx8D inches.

T-2X, $649.95. *Extra heavy duty Tailtwister antenna rotator!* For large antennas up to 20 square feet wind load when mounted in-tower, or 10 square feet when mast mounted with optional support bracket. Triple 138 ball bearing race, strong electric locking steel wedge brake. Control Box has an illuminated directional indicator with North or South center of rotation scale, separate snap-action brake and rotation control switches. Accepts masts up to $2^{1}/_{16}$ inches diameter. Rotator size is $14^{1}/_{16}$Hx$9^{3}/_{16}$D in.

CD-45II, $389.95. *Medium duty antenna rotator.* Handles antenna arrays up to 8.5 square feet windload area when mounted in-tower, or 5 square feet when mast mounted with supplied lower support. Dual 48 ball bearing race, disc brake system. Control Box has an illuminated directional indicator with North or South center of rotation scale, separate snap-action brake and rotation control switches with disc brake release. Accepts mast sizes up to $2^{1}/_{8}$ diameter. Includes light duty lower mast support, Rotator size is $17^{3}/_{8}$Hx8 D inches.

AR-40, $289.95. *Lightweight antenna rotator.* Handles smaller ham antennas and large TV/FM antennas up to 3.0 square feet windload area when mounted in-tower, or 1.5 square feet when mast mounted using the supplied lower support bracket. Dual 12 ball bearing race, disc brake system. Silent, automatic control box -- just dial and touch for desired direction. Accepts mast sizes up to $2^{1}/_{8}$ diameter. Includes light duty mast support. Rotator size is $17^{3}/_{8}$Hx8D inches.

Call your dealer for your best price!

Rotator Specifications	T2X	HAM-IV	CD-45II	AR-40
Wind Load capacity (inside tower)	20 sq. ft.	15 sq. ft.	8.5 sq. ft.	3.0 sq. ft.
Wind Load (with mast adapter)	10 sq. ft.	7.5 sq. ft.	5.0 sq. ft.	1.5 sq. ft.
Turning Power (in pounds)	1000	800	600	350
Brake Power (in pounds)	9000	5000	800	450
Brake Construction	Electric wedge	Electric wedge	Disc brake	Disc brake
Bearing Assembly/How many	Tripl race/138	Dual Race/96	Dual race/48	Dual race/12
Mounting Hardware	Clamp plate	Clamp plate	Clamp plate	Clamp plate
Control Cable Conductors	8	8	8	5
Shipping Weight (pounds)	28	24	22	14
Effective Moment (in tower)	3400 ft/lbs.	2800 ft/lbs.	1200 ft/lbs.	300 ft/lbs.

HAM IV
$559.95
Suggested Retail

T-2X
$649.95
Suggested Retail

CD-45II
$389.95
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AR-40
$289.95
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• UPS Shippable • High Wind Rating • Fiberglass Radome • DC Grounded • Stainless Hardware

X500HA (UHF-Conn.)
X500HNA (Type-N Conn.)
Ruggedized Base/Repeater Antenna

COAX CONNECTION AT BASE END

HEAVY DUTY BASE/ RADIAL ASSEMBLY

STRONG JOINT COUPLINGS

X50NA

The X50NA is an excellent choice where ruggedness is required in a medium–gain, dual-band, base/repeater application.

Features

- Wide frequency bandwidth
- Heavy duty fiberglass radome
- Stainless steel mounting hardware and radials
- Type–N Cable connection
- Compact size for easy mounting/ installation

Specifications:

Freq.: 2m: 144–148MHz
70cm: 440-450MHz
Power: 200 watts
Wind Rating: 135 MPH (no ice)
Height: 5.6 feet

X500HNA

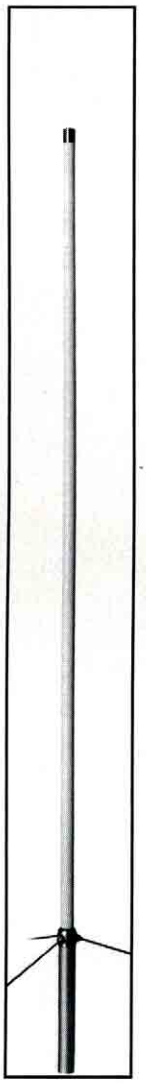
Diamond Antenna's best base station repeater antenna. Designed for strength and performance, the X500HNA is pretuned to achieve maximum gain in both the 2m and 70cm amateur bands.

Features

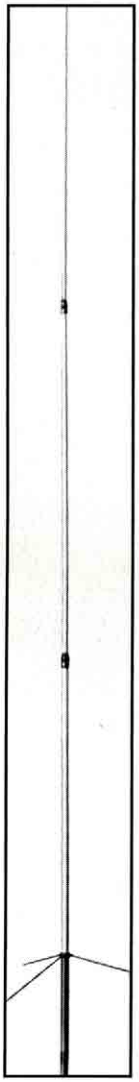
- Heavy duty fiberglass radome
- Overlapping outer shells for added strength
- Stainless steel mounting hardware and radials
- Strong–waterproof joint couplings
- Type–N Cable connection
- Wide band performance

Specifications:

Freq.: 2m: 144–148MHz
70cm: 440-450MHz
Power: 200 watts
Wind Rating: 90 MPH (no ice)
Height: 17.8 feet



X50NA



X500HNA

DIAMOND Mono-Band Base/Repeater Antennas

MODEL	BAND (MHz)	WATTS	CONN.	HT. FT.	RATED WIND MPH (No. Ice)
CP22E [1]	144	200	UHF	9.0	90
DPGH62 [1,6]	50	200	UHF	21.0	78
F22A	144	200	UHF	10.5	112
F23A	144	200	UHF	15.0	90
F718A [2]	440	250	N	15.0	90

DIAMOND Dual-Band Base/Repeater Antennas

MODEL	BAND (MHz)	WATTS	CONN.	HT. FT.	RATED WIND MPH (No. Ice)
X50A	144/440	200	UHF	5.6	135
X50NA	144/440	200	N	5.6	135
X200A	144/440	200	UHF	8.3	112
X510NA [3]	144/440	200	N	17.2	90
X510MA	144/440	200	UHF	17.2	90
X500HNA	144/440	200	N	17.8	90+
X700HNA	144/440	200	N	24.0	90
X2200A	144/222	150	UHF	11.5	112
U200	440/1240	100	N	5.9	135

DIAMOND Tri-Band Base/Repeater Antennas

MODEL	BAND (MHz)	WATTS	CONN.	HT. FT.	RATED WIND MPH (No. Ice)
U5000A	144/440/1240	100	N	5.9	135
V2000A [4,6]	52/144/440	150	UHF	8.3	110
X3200A [5]	146/222/440	100/200	UHF	10.5	112
X6000A	144/440/1240	100/60	N	10.5	112

1 Heavy duty aluminum construction.
2 F-718A: 440-450MHz., F718L: 420-430MHz.
3 X510NJ: 144-147/430-440MHz.
4 1/4λ rated in dBi. Most requirement: 1.4"-2.4".
5 2m: 146-148; 100 watts
6 52-54MHz. only; DPGH62 adjustable from 50-54MHz.

BAND: 144=144-148MHz., 222=222-225MHz., 420=420-430MHz.,430=430-440MHz., 440=440 450MHz., 1240=1240-1300MHz.

www.rfparts.com/diamond
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April 2003 ♦ Volume 87 Number 4

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Technical

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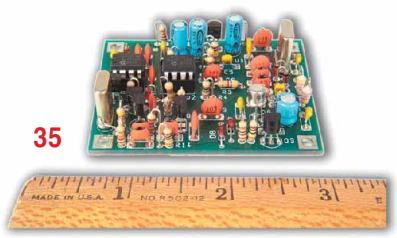

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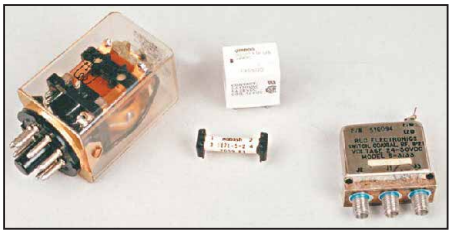
News and Features

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

QST Workbench



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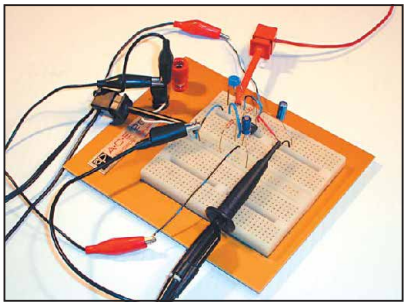

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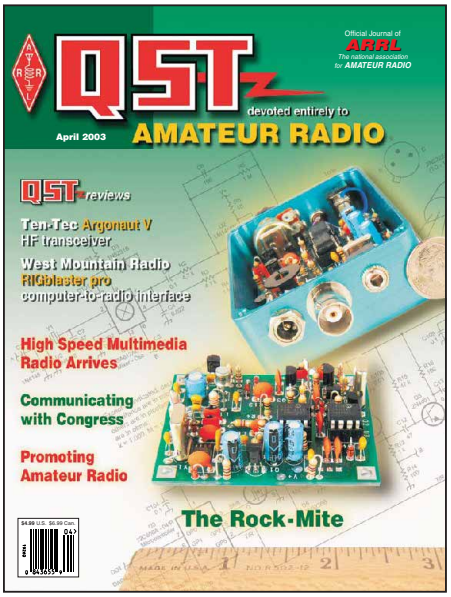
Operating

Departments



Our Cover
A half-watt on either 40 or 20 meters is your reward for building this cleverly designed crystral-controlled transceiver. The article begins on page 35.

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, $34. 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, $850.* Membership and *QST* cannot be separated. Libraries and institutions, $39 per year. Single copies $5.

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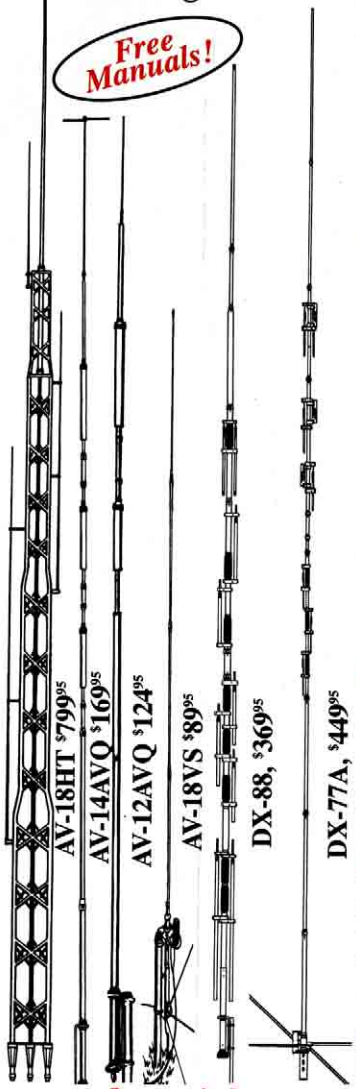


hy-gain® Classics

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

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

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

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

AV-18HT, $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. The 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.

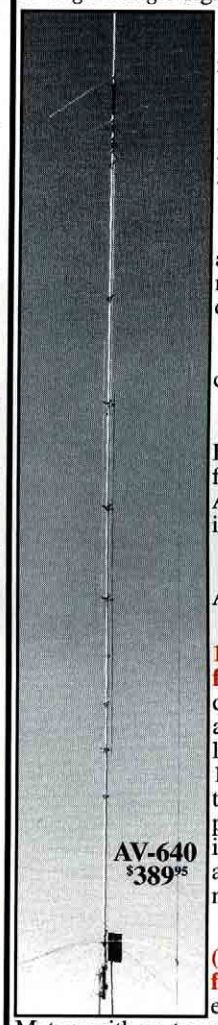
DX-88, $369.95. (10, 12, 15,17,20,30,40,80 Meters, 160 Meters optional). 25 ft., 18 lbs. All bands are *easily* tuned with the DX-88's *exclusive* adjustable capacitors. 80 and 40 Meters can even be tuned from the ground without having to lower the antenna. Super heavy-duty construction. DX-88 OPTIONS: 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® 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.

Automatic bandswitching
Single coax cable feed. Each band is individually tunable. Extra wide VSWR bandwidth. End fed with broadband matching unit.

Sleek and low-profile
Low 2.5 sq. ft. wind surface area. Small area required for mounting. Mounts easily on decks, roofs and patios.

Full legal limit
Handles 1500 Watts key down continuous for two minutes.

Built-to-last
High wind survival of 80 mph. Broadband matching unit made from all *Teflon®* insulated wire. Aircraft quality aluminum tubing, stainless steel hardware.

hy-gain® warranty
Two year limited warranty. All replacement parts in stock.

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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Antennas, Rotators & Towers

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144 220 +440

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- Special weather channel RX mode
- 435 memory channels, multiple scan functions
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[1] Note that certain frequencies are unavailable. [2] 5W output

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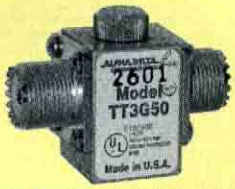

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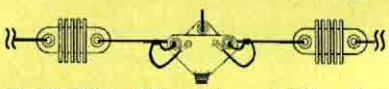

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"IT SEEMS TO US..."

WRC-03 and 40 Meters: Coming Down to the Wire

As this issue of *QST* begins to reach ARRL members there are about ten weeks remaining before the delegates to the World Radiocommunication Conference, WRC-03, begin to assemble in Geneva. The lion's share of the preparatory work has been done. Regional and national proposals addressing the more than three dozen agenda items have been prepared. Where do things stand with regard to the key agenda item for radio amateurs, realignment of the allocations around 7 MHz to eliminate the overlap between amateurs in the Americas (Region 2) and broadcasters elsewhere (Regions 1 and 3)?

There is encouraging news. Thanks to the efforts of International Amateur Radio Union volunteers and other supporters of Amateur Radio there are now more than *30 countries* that have gone on record as supporting one of two favorable formulas for realignment. We need more and should be able to get more, but this is a good start.

The most popular method of realignment is the one called Method B in the CPM Report (see February 2003 *QST*, p 79). This approach calls for a transition to be accomplished in three stages. On January 1, 2005, amateur stations in Regions 1 and 3 would be allowed to use 7100-7200 kHz on a secondary basis. Broadcasting stations in Regions 1 and 3 would be allowed to continue using this part of the band until April 1, 2007; on that date they would shift into the band 7350-7450 kHz and 7100-7200 kHz would be allocated to the amateur, fixed, and certain mobile services on a primary basis. The final stage would occur on October 25, 2009, when broadcasting stations would shift out of 7200-7300 kHz and into 7450-7550 kHz, amateurs would gain exclusive use of 7100-7200 kHz, and the band 7200-7300 kHz would be allocated on a primary basis to the amateur, fixed, and certain mobile services. Thus, when the dust settles amateurs would have access to 7000-7300 kHz worldwide, albeit with 100 kHz shared with fixed and mobile stations in Regions 1 and 3, and broadcasters would have access to 7300-7550 kHz worldwide. Here in Region 2 the 7000-7300 kHz allocation would remain unchanged as exclusively amateur, but we would finally be free of broadcasting interference throughout the 300-kHz amateur band and would have a much easier time cohabiting with fixed and mobile outside the Americas than we have had with the high-powered broadcasters.

Method B is now a European Common Proposal (ECP) that has been initially supported by 17 CEPT administrations: Austria, Denmark, Czech Republic, Germany, Norway, Sweden, Hungary, Estonia, Belgium, Slovak Republic, Netherlands, Switzerland, Ireland, Lithuania, Finland, Poland and Bulgaria. Congratulations are due to IARU Region 1 and its member-societies in these countries, whose volunteers have been working ever since the closing gavel of WRC-2000 to achieve an acceptable ECP on this difficult issue. At least three other countries in Africa, Asia, and the Pacific have also expressed support for Method B. The IARU team is now working hard to gain the support of additional administrations in Regions 1 and 3, either for Method B or Method A (which is similar, but without the sharing with fixed and mobile).

Here in the Americas IARU Region 2 has been hard at work along similar lines. A notable breakthrough was achieved at a CITEL meeting in Orlando in early February, when 12 countries agreed to support an Inter-American Proposal (IAP) that is virtually the same as CPM Method D. The proposal calls for a three-stage process leading to 7000-7300 kHz being exclusively amateur, worldwide, with broadcasting in Regions 1 and 3 at 7300-7550 kHz and broadcasting in Region 2 at 7300-7350 kHz. Canada, the original sponsor, was joined by Argentina, Costa Rica, El Salvador, Guatemala, Mexico, Paraguay, the Dominican Republic, Venezuela, Colombia, Honduras, and Peru. IARU Region 2 is now working to expand the list of Region 2 countries supporting the IAP.

An obvious question is: Where is the United States? The US has long supported a 300-kHz worldwide, exclusive allocation for the amateur service. At the major World Administrative Radio Conferences in 1979 and 1992 the US proposed to realign the amateur and broadcasting allocations to provide for the amateur requirement of a 300-kHz worldwide allocation. In 1995 the National Telecommunications and Information Administration (NTIA) study *U.S. National Spectrum Requirements: Projections and Trends* noted this requirement and observed that a realignment to a worldwide amateur allocation of 6900-7200 kHz "is consistent with proposals made by the United States at WARC-92." The FCC WRC-03 Advisory Committee has recommended that Method A be a US proposal. Unfortunately, this has not yet been agreed to by the NTIA. Acting on behalf of the federal government users of the radio spectrum, the NTIA has been advocating "no proposal" from the US, a position that the ARRL is working hard to overcome. A small number of federal agencies claim to be concerned that their backup circuits on HF would be affected by an upward shift of broadcasters. This is difficult to understand and accept, given that their even greater concerns about losing spectrum below 7 MHz already have been accommodated and that the usefulness to them of the 7300-7600 kHz range is severely limited by the extensive out-of-band broadcasting already taking place there.

Also unfortunate is that some broadcasters persist in trying to link the 7-MHz agenda item with another about the adequacy of broadcasting spectrum between 4 and 10 MHz, a separate issue with an entirely different genesis. In the meantime the shift of major international broadcasters away from HF continues, with Deutsche Welle the latest to announce that they will cease HF broadcasting to North America, Australia, and New Zealand on March 30, 2003.

The next few months, until WRC-03 ends on July 4, promise to be very interesting indeed. Stay tuned!—*David Sumner, K1ZZ* QST

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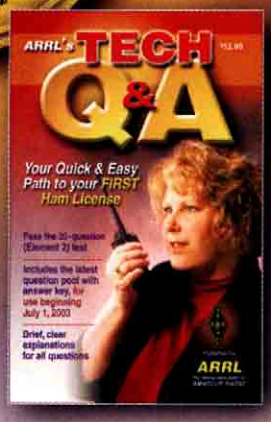

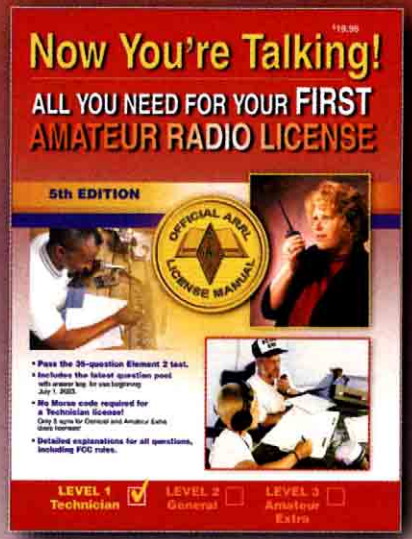

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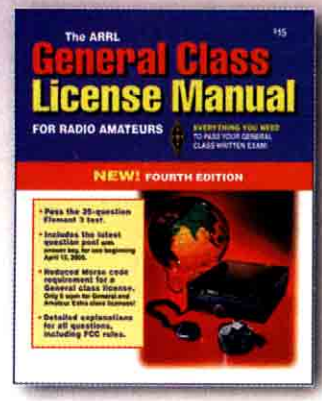

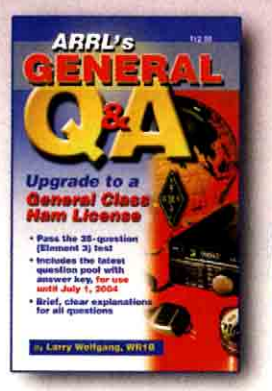

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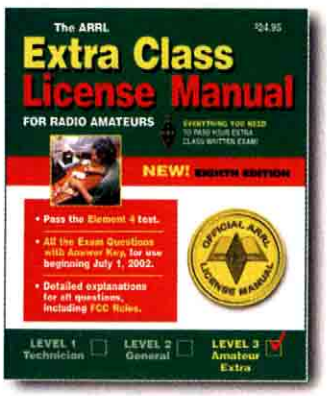

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QST 4/2003

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ARRL in ACTION

***YOUR* membership at work**

By Dave Hassler, K7CCC, dhassler@arrl.org

Miller Leads EmComm Class Seminar at Mississippi Convention

There was plenty of EmComm give-and-take as ARRL Emergency Communications Course Manager Dan Miller, K3UFG, spoke at the Mississippi State Convention in Jackson January 31. Miller gave a four-hour seminar on ARRL's emergency communication classes, Amateur Radio Emergency Communication Courses (ARECC) Levels 1, 2 and 3. Although open to all, the seminar was geared toward the key players in local implementation of the classes, including certification mentors, instructors and examiners.

"We talked about their responsibilities in their positions and what they can expect from [ARRL] in terms of support," Miller said, noting that volunteers are the linchpins of the program. "The participants were pleased with the information. They got their questions answered and left with new enthusiasm and a better understanding of the program."

DAN MILLER, K3UFG

Amateurs soak up the instruction at a recent Amateur Radio Emergency Communication Class, gaining knowledge that will aid in providing accurate, efficient and reliable communication in a time of crisis.

Miller also brought back valuable information on the local implementation of the ARECC program, area-specific conditions and emphasis, and where improvements and updates need to be made. One of the bigger things he hears from seminar participants is how there is a real need for more organizations to open their doors to Amateur Radio as an EmComm resource. More information on ARECC and other ARRL educational programs can be found on the ARRL Web site at **www.arrl.org/cce**.

PR Provides Avenues for Service

Building positive awareness of Amateur Radio in a community is a boon to all hams. Neighbors, local governments and legislators are a lot more responsive to the capabilities and needs if they have an understanding of what Amateur Radio is and does. This is where ARRL Public Information Coordinators and Public Information Officers come in. Documenting what hams do and getting that word out to the public—often through media outlets—is the work of the PIO and PIC.

"ARRL PICs and PIOs are absolutely vital to the League's grassroots network," said ARRL Media Relations Manager Jennifer Hagy, N1TDY. "They truly make a difference in their communities, and their efforts should be applauded. Anyone with the determination to see ham radio continue to thrive can do it, and the League is here to support our PR volunteers every step of the way."

When reporters are looking for a "local angle" on an Amateur Radio story, ARRL Media Relations Manager Jennifer Hagy, N1TDY, frequently refers them to Section PICs and area PIOs.

Coordinating media coverage of a club's ARRL Field Day and emergency communication activities is just one job of the PIC and PIO. Writing press releases about ham activities such as Kid's Day, JOTA scouting events, special events like a lighthouse activation or even a local amateur who takes her handheld VHF radio with her every day on her morning walk while "canine-exercise-mobile" can enlighten the public as to just who hams are and what it is we do. There are numerous avenues for service to Amateur Radio through public relations. An in-depth treatment of the subject can be found in Hagy's article elsewhere in this issue. And don't forget to stop by **www.arrl.org/pio/** for useful PR materials, tools and ideas.

Ham Hurricane Watchers Hear of ARRL Support

February 2 found ARRL Field and Public Service Team Leader Steve Ewald, WV1X, in Miami for the Eighth Annual Amateur Radio Hurricane Conference, held at the National Hurricane Center. Ewald spoke at the conference to let ham hurricane trackers know that ARRL is in full support of their efforts and offers significant resources for severe-weather watchers.

"I talked about the [Amateur Radio] Emergency Communication Courses program and the support we have with the facilities of the ARRL Field Organization, such as ARES and the National Traffic System," he said. "There were representatives there from a number of islands in the Caribbean as well as the US. We got to share information, get updates on various operating activities and learn from hurricane specialists how they convert data from ham operators to assist in making forecasts."

Amateurs are using the latest communication technology to get data and traffic where it needs to go as efficiently and reliably as possible. Resources like VHF radio-Internet programs EchoLink and IRLP are being used, along with Automatic Position Reporting System data, satellite and traditional HF communication. The National Hurricane Center has a ham station on its premises, W4EHW, to provide an interface for amateur data. The station has a Web site at **www.fiu.edu/orgs/w4ehw**.

Mail Merge Program Helps SKYWARN Event

Those churning out the certificates for the third annual National Weather Service-ARRL SKYWARN Recognition Day special event December 7, 2002, got some extra help from ARRL as DXCC Manager Bill Moore, NC1L, teamed up with Midwest Division Vice Director Bruce Frahm, KØBJ, to reduce the labor involved with hand-endorsing hundreds of certificates.

There were over 100 NWS amateur stations on the air for SKYWARN Recognition Day and approximately 22,000 QSOs were made. Moore helped design a printing program using MS Mail Merge to speed the process of creating 435 custom certificates.

Roiling clouds and streaks of lightning don't diminish the shine on the radome or the yagi and flag featured on the certificate for the 2002 SKYWARN Recognition Day special event. This certificate, which went to N4MM, has 14 custom bits of information for endorsements. Some custom programming work by ARRL DXCC Manager Bill Moore, NC1L, helped make the production of the certificates go a bit easier.

"In the past, [event organizer] Scott Mentzer, NØQE, and his folks have done the certificates individually, but with a call sign and 15 individual endorsements that can be earned during SRD, this was a very tedious task," Frahm said. "With Bill's help, they are now just loading up a database program and mass-producing the certificates." Frahm and his son Jon, KBØMBS, collaborated on producing the graphic and design of the certificates.

The National Weather Service and ARRL developed SKYWARN Recognition Day in 1999. More information on the event can be found on the Web at **hamradio.noaa.gov**.

ARRL Volunteer Counsel Helps Illinois Ham

It all looks good. The new house is perfect for the family and the zoning ordinance in your new town allows a moderate support structure for antennas. But after buying the house and submitting tower plans and engineering reports to the city for a permit, your new town council schedules your request for a planning commission hearing, where angry and misinformed neighbors clamor for you to be stopped. What looked so good now looks like a nightmare.

That's just what happened last year to ARRL member Carmen Ambroggio, WA9GFP. He faced accusations that ranged from Amateur Radio being a source of RFI to adversely affecting both property values and pacemakers to ham radio—"a plaything"—having no real public value.

After a call to ARRL Headquarters, Ambroggio was put in touch with an attorney from the ARRL Volunteer Counsel list. In an article elsewhere in this issue of *QST*, ARRL VC Sheldon Epstein, K9APE, tells the story of how he and Ambroggio successfully defended a ham's right to put up a reasonable antenna that met city regulations. Epstein, who is also an electrical engineer and Amateur Extra licensee, is listed in the VC database on the ARRL Web site at **www.arrl.org/FandES/field/regulations/local/vci.html**. Attorneys are listed by state and the database is searchable.

VC Program goals include, when necessary, opposing local ordinances and statutes that might have a detrimental effect on the Amateur Radio Service. The League does not expect a VC to represent an amateur free of charge and when HQ makes referrals, the point is made that VCs make their living practicing law. Volunteer Counsels are asked, however, to provide an initial consultation at no charge so that the amateur may knowledgeably decide what further steps to take.

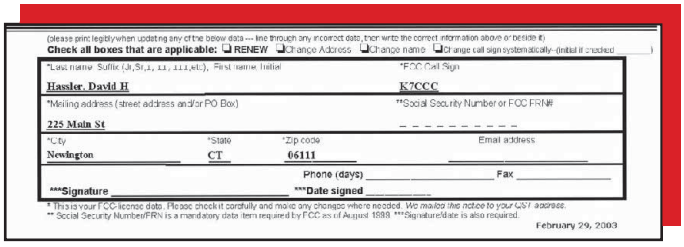
League's Renewal Reminder Keeps Members on the Air

Because it doesn't happen very often in the life of a ham, remembering to renew your Amateur Radio license can slip the mind. ARRL members have nothing to fear in that department, as the League sends out automatic reminder notices to all members whose tickets are about to expire. Better still, ARRL provides the tools you need to renew a license right in the same envelope.

"Not everyone finds the current FCC e-filing system user friendly," said ARRL Volunteer Examiner Coordinator Manager Bart Jahnke, W9JJ. "We have provided this service for a number of years, but we haven't publicized it much. These days, we mail this [letter] to all members. On the reverse side of the letter are helpful suggestions for using the FCC's Universal Licensing System (ULS). Also included are an NCVEC Form 605 and an RF safety information worksheet, considering that when [amateurs] renew, we have to sign a statement declaring that our stations meet FCC standards for RF exposure."

The FCC allows hams to renew during a 90-day window before the license expires; all a member has to do to renew is fill in an FCC Federal Registration Number (FRN) or Social Security Number, sign and date the form, apply postage to the provided ARRL-addressed envelope and mail it. Address or name changes can be made at the same time as renewal, or they can be made at any other time by sending a Form 605 to ARRL in this same fashion.

Jahnke said the ARRL's FCC license renewal and license updates feature has proved to be highly valued by members. "It's a small part of what we do, but an important one since it's our license to operate Amateur Radio that's involved."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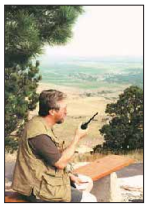
*Last name Suffix (Jr,Sr,I, II, III,etc), First name Initial: Hassler, David H
*FCC Call Sign: K7CCC
*Mailing address (street address and/or PO Box): 225 Main St
**Social Security Number or FCC FRN#:
*City: Newington
*State: CT
*Zip code: 06111
Email address:
Phone (days):
Fax:
***Signature:
***Date signed:
* This is your FCC license data. Please check it carefully and make any changes where needed. We mailed the notice to your QST address.
** Social Security Number/FRN is a mandatory data item required by FCC as of August 1998. ***Signature/date is also required.
February 29, 2003

After it comes in the mail, returning this simple form—with its accompanying material—is all a member needs to do to renew a soon-to-expire license and stay on the air uninterrupted.

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. Do you 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.

Educational Materials

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

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.

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.

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 860-594-0230.

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), M-F only, 8 AM to 8 PM Eastern Time.

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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Contests	Dan Henderson	860-594-0232	**contests@arrl.org**
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Write for QST	Joel Kleinman	860-594-0273	**qst@arrl.org**

Can't find the department you're looking for? Call 860-594-0200 or e-mail **hq@arrl.org**. Sending e-mail to any ARRL Headquarters staff member is a snap. Just put his or her call sign (or first initial and last name) in front of **@arrl.org**. For example, to send mail to Martin Cook, QSL Service Manager, use **n1foc@arrl.org** or **mcook@arrl.org**. If all else fails, send a message to **hq@arrl.org** and it will get routed to the right person or department.

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

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

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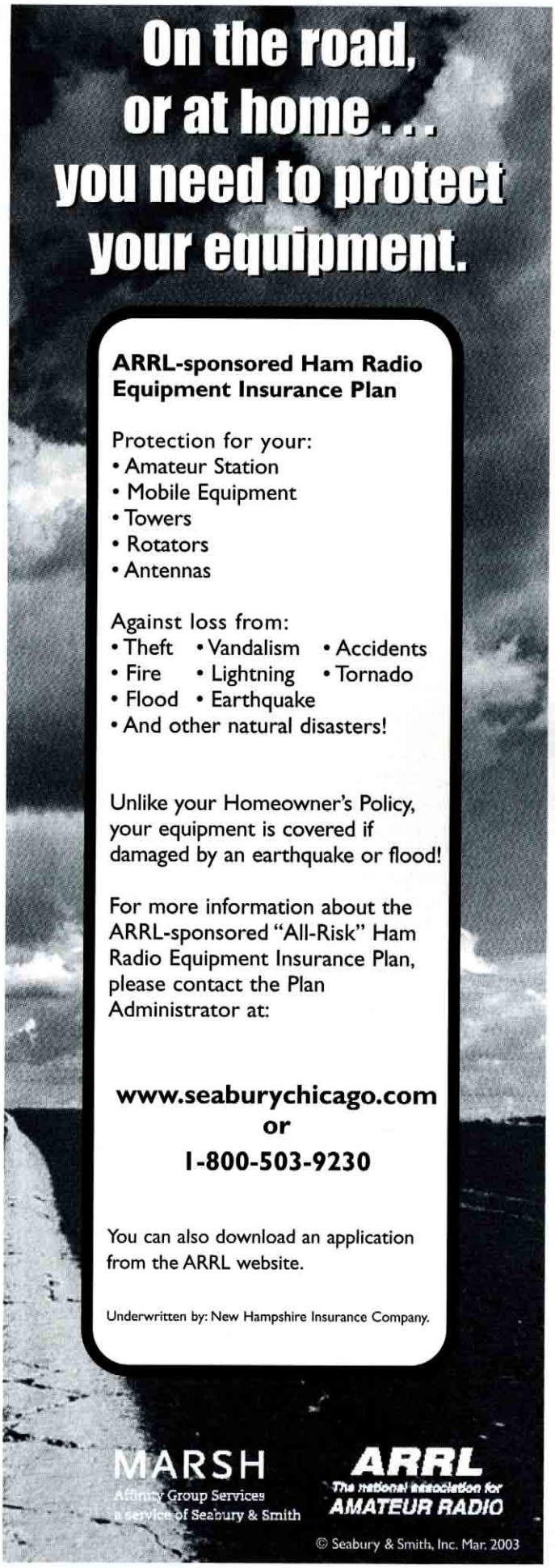

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How much time and money have you spent on your ham radio equipment? What if a natural disaster strikes, forcing you off the air? You'd want to be up and running again as soon as possible with the least amount of financial worry.

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Don't wait for lightning to strike and leave you with damaged equipment and high replacement costs. Get protection now so you can avoid the financial burden of rebuilding your station. For more information, contact Marsh Affinity Group Services toll-free at 1-800-503-9230. Or, visit them on the web at www.seaburychicago.com.

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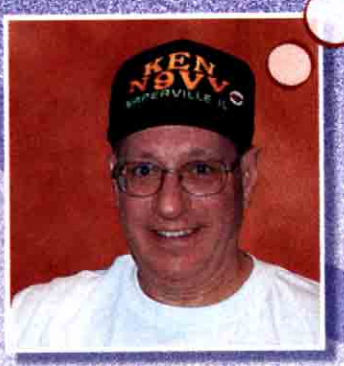

Illinois ham N9VV knows it's no dream. He sounds great with STUDIO ONE and his Jupiter!

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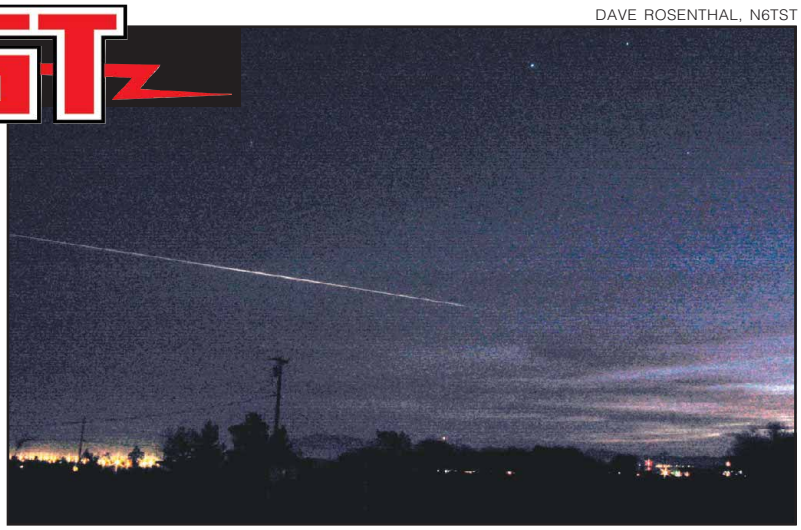
S&H cost for Jupiter in 48 states is $16. With Power Supply, $21.

JOHN KRAY, KA2CNG

STS-1—first shuttle: **In the wake of the shuttle *Columbia* disaster and the search for debris in which Amateur Radio volunteers played a vital role, John F. Kray, KA2CNG, of Vestal, New York, sent us this image of a piece of ham history. "STS-1 could be called the 'Father of the ARISS' program," he writes. "I hope you might see fit to print this QSL card in a coming issue in tribute to all the cosmonauts and astronauts who have brought Amateur Radio into space and the classrooms around the world." A subsequent *Columbia* mission, STS-9, carried the first ham-astronaut, Owen Garriott, W5LFL, into space in November 1983.**

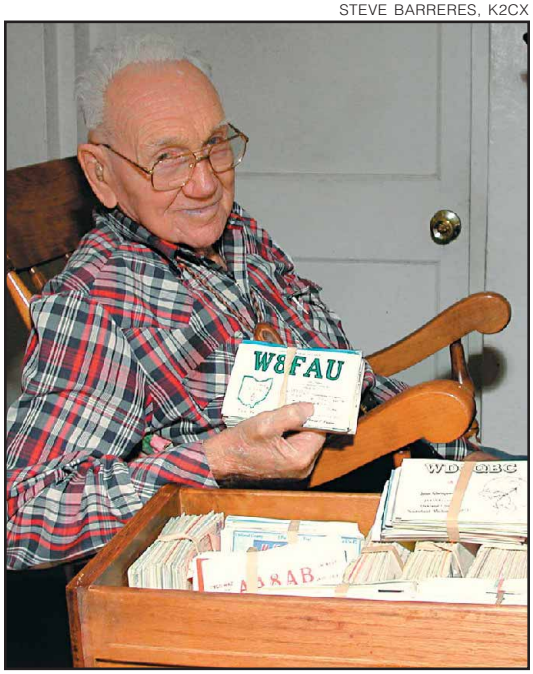
DAVE ROSENTHAL, N6TST



Re-entry: **I shot this photo of the shuttle *Columbia* from my backyard in the Mojave Desert on its reentry path before dawn (for us in California) February 1. I shot this 15-second time-exposure at 5:55:42 AM, totally unaware of what was happening. It wasn't until I was pulling the image from the digital camera that I got an e-mail telling me they'd lost contact with the spacecraft.—*Dave Rosenthal, N6TST***

Unusual license plate for a New Yorker...: **I'm convinced that my Amateur Radio license plate (which I had ordered when I had my previous call sign) was manufactured early on a Monday or late on a Friday. Fortunately, it took only a phone call to straighten out the error—and the letter W.—*Ron Lumachi, W2CQM, Brooklyn, New York***

STEVE BARRERES, K2CX

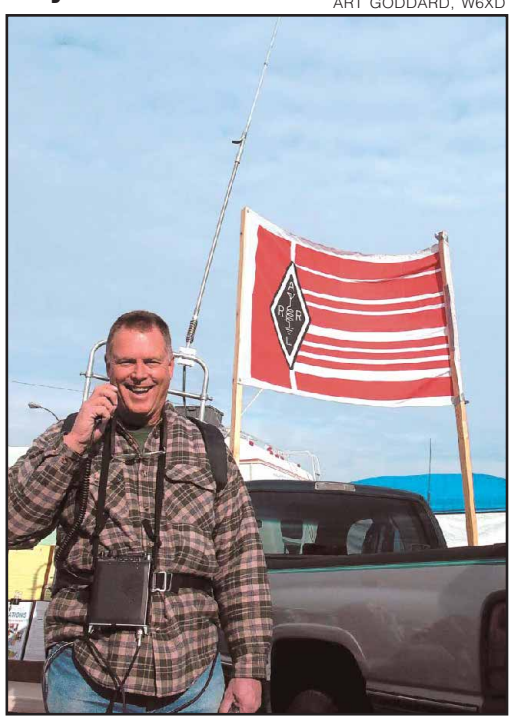


"Tex" Burdick, W5BQU, of El Paso, Texas, who will celebrate his 103rd birthday on September 25, may well be the oldest Amateur Radio operator in the US. And he remains active on the HF bands to boot. You can find him almost daily on 10, 15 or 20 meter phone bands, in that order, conditions permitting. He is real rag chewer who enjoys a good chat. You can count on him QSLing a contact with his unique self-styled card. Look for Tex on the air and communicate with some amateur history.

What's the Fashion-Conscious Ham Wearing These Days?

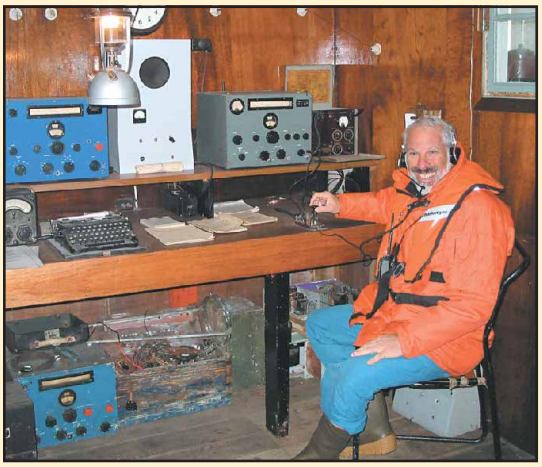
ART GODDARD, W6XD

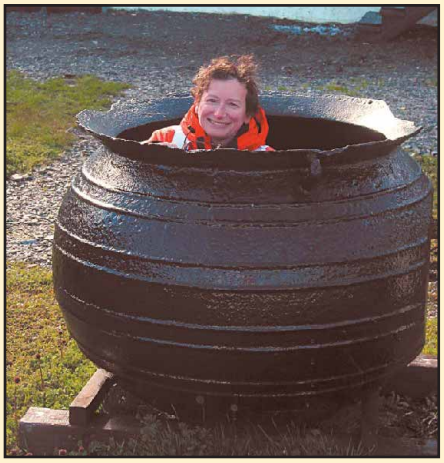
We all know that hams are some of the most fashionable folks around. And if you're into pedestrian HF mobile operations, you're bound to turn heads almost anywhere—including the recent Superstition ARC Hamfest in Mesa, Arizona, where Bob Kimbrell, W7KU, drew a crowd as he sauntered around the swapmeet all the while chatting with his fellow HF Pack cronies on 18.1575 MHz. Bob's rig consists of a Yaesu FT-817, an aluminum backpack frame, a whip antenna and a single radial wire trailing behind. As Bob explained, "To schedule portable operations you go to a Yahoo Group named **hfnow**. And there's a great Web site at **www.hfpack.com**."



As W7KU demonstrates, worldwide shortwave communications on foot are definitely the "in thing" this year.

Adventure travelers: **Charles and Mary Starke, NX2T/N2HXX, of Briarcliff Manor, New York, have just returned from a memorable cruise on the ship *Explorer*. As Charles tells it: "We rounded Cape Horn and went to Antarctica and South Georgia. I was ship's doctor, and had to take care of all the penguins. We visited the antique radio station at Port Lockroy, Antarctica, and Mary found some cannibals at a whaling station on South Georgia!"**





CHARLES STARKE, MD, NX2T

Kid's Day on the Missouri: **Since the Rich ham family lives near Independence, Missouri, the home of President Harry S. Truman, where else would 13-year-old Rebecca, KBØVVT, want to operate on Kid's Day but the USS *Missouri.* Now a museum in Pearl Harbor, Hawaii, the battleship was the site of the Japanese surrender in 1945. Rebecca, along with mom Barbara, KGØUT, and dad David, KGØUS, found a warm welcome from Battleship Missouri ARC, KH6BB, trustee John H. Peters, K1ER, himself a former Missouri resident. Rebecca and Barbara kept a station on CW and another on SSB throughout Kid's Day. The Missouri Association allowed parents with kids who were visiting the ship to come into the radio room, fire up the rigs and with a kid as control operator, talk to other kids near and far. The event garnered publicity from several TV networks and made the 6 o'clock news. Several newspapers also sent a reporter and photographer. In addition, the Missouri Association held a Teacher's Workshop to coincide with Kid's Day to provide local teachers the opportunity to learn ways to enhance their instruction in history—and ham radio.—*tnx John D. Peters, K1ER/KH6BB***

PAUL DEPETRILLO, W1PRA

Princess in Providence: **Having visited special event station KM1CC at nearby Eastham, Cape Cod, Massachusetts, the previous day, Princess Elettra Marconi contacts KM1CC while visiting W1OP, the station of the Providence (RI) Radio Association January 19. The special event commemorated the 100th anniversary of the first successful transatlantic message transmitted by Guglielmo Marconi. The princess, his youngest daughter, visited the two stations as part of the 100th anniversary festivities. On January 18, 1903, Marconi sent wireless greetings on behalf of President Theodore Roosevelt to Great Britain's King Edward VII.**

JACK CLARK, K7VII

After 6 years of operating with this hidden antenna, Jack Clark, K7VII, of Port Angeles, Washington, reports: "I used schedule 40 PVC pipe and inserted a Hy-Gain model 18AVT/AB-A vertical antenna. Since I live where wind is a factor, I used the house as a support. Of course, I use a matchbox (MFJ model 989C) and my rig is an ICOM IC-751A backed into the IC2KL amplifier. I have worked the US without problems. The antenna is mounted on a piece of pipe and the base is at ground level so the PVC can sit on the antenna base without noticeable change in the pipe-to-ground look.

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FINEST CREW

♦ This evening we received the sad news that space shuttle *Columbia* and all members of the crew, among them three radio amateurs KD5ESI, KC5ZTC and KC5ZSU, were lost.

This shuttle Mission carried a Danish research project concerning the measurement of the astronauts' blood pressure and heart condition before, during and after the mission. Today, space travel may seem routine. It is not. It is on the forefront of technology, employing state-of-the-art equipment and procedures—and the finest of crew. Among them you will find radio amateurs.

Exploration of uncharted territory has never been without danger: When Eric the Red sailed his Viking fleet across the North Atlantic to explore Greenland and North America, when Christopher Columbus embarked for India to find the Americas instead, when the Apollo space program successfully "put a man on the Moon and brought him safely back" in 1969, it was not without risks; but the endeavor to stretch out for new knowledge and technological breakthroughs in combination with personal courage, skill and determination was even stronger.

We all share the grief for the astronauts, their families and their countries. —*Sven Lundbech, OZ7S, President and CEO, EDR (Experimenterende Danske Radioamatører/Experimenting Danish Radio Amateurs), Odense, Denmark*

USE THE ALIAS

♦ I have witnessed many instances in the last few years where a QSL card customer will have to reorder cards because of a change in Internet provider. I always recommend that they utilize the **@arrl.net** alias and if they are not a member, this one service is worth the cost of membership.

I personally feel this is one of the best services made available to the members in many years.—*Wayne Carroll, W4MPY, Monetta, South Carolina*

[To sign up for the **@arrl.net** alias, go to the Member Data Page on the ARRL Web and click on Modify Membership Data. —*Ed.*]

VALUABLE TOOL

♦ Many times over the last several years I have heard others say that contests have no place or value in Amateur Radio.

Where other than in a contest can you evaluate your station effectiveness and your personal operating skills in a stressful situation that best simulates the duration and complexity of an emergency?

Where other than during a contest are you put in a situation where your Effectiveness, Accuracy and Stamina are tested?

Where and in what way can you effectively test your antenna selection and equipment effectiveness with varied band conditions and propagation variations within a limited time?

Where can you get a numeric value (Score) of your effectiveness, and then compare previous efforts and future effectiveness?

The only place within Amateur Radio where these questions can be answered is during a radio contest, where your skills and operating setup can be field-tested under live action conditions.

I would rather contest in my chosen mode of operation, where I can learn what I need to know, than be put into the fire untrained and untested in an Emergency situation.—*Joe Puett, N5QYC, ARES District Emergency Coordinator, Harrison, Arkansas*

WHAT WE CALL OURSELVES

♦ Jay Kolinsky's idea of a nationwide ID [Op-Ed, Feb 2003, p 95] is very good, but I would like to go one step further and advertise the fact that we are licensed: FLRO (Federal Licensed Radio Operator) or how about LEC (Licensed Emergency Communicator)?—*Harvey D. Easton, K7UQ, Fruitland, Idaho*

♦ For the wording on jackets worn by hams doing public service, I suggest "Licensed Radio Operator" or "Licensed Amateur Radio Operator." This conveys the crucial fact that although we are hobbyists, we have earned licenses and can do things that other volunteers cannot. It's analogous to "Licensed Pilot," which is what amateur aviators quite rightly call themselves.—*Michael Covington, N4TMI, Athens, Georgia*

♦ I suggest that "Volunteer Radio Operator" better answers the question, "What are they doing here?" But spell the label out! It could help hams explain themselves to officials at a site, and the idea of volunteer radio should intrigue the public more than yet another acronym. I should add that a "Volunteer Radio Operator" label might apply just as well to all volunteer operators. The operator would display an appropriate service acronym and/or badge (ARES, RACES, MARS, etc) with the label.—*Marcus Brooks, K5MWB, Austin, Texas*

♦ I'm very pleased to be called a radio amateur. I was licensed in 1958 and over the years have been teased by non-ham friends as I imagine NE2Q has. However, this teasing has all been good-natured. Get used to it. We are amateurs and should be proud of it and of the many accomplishments by radio amateurs all over the world.—*Bert Holtje, W2TQS, Tenafly, New Jersey*

TRAFFIC: YOU CAN HANDLE IT

♦ I have been a CW traffic handler for over 57 years, having been taught the noble art by my Elmer, a sometime commercial operator and RCAF signals officer. Unfortunately, not all new hams are as lucky as I to be exposed to the magic of ham radio in such a demanding operating application.

There is much to enjoy in ham radio, and traffic handling as one's principal operating interest is not everyone's cup of tea. However, an ability to handle written message traffic using the simplest means possible, and to keep operationally trained and current, is an important demonstration of ham radio's ability to serve the public in an emergency when called upon. I'm talking about old-fashioned one-on-one relaying of written message traffic when there is no twisted pair, no cellular telephone, no computer, no commercial power—zip. The amateur able to operate SSB or CW using battery power and 100 W or less and who can handle error-free traffic under the stress of less than optimal conditions is the true "professional" operator. It does not happen automatically. It requires regular practice.

I see an underlying malaise in our hobby in this area. Traffic counts are declining. Newly licensed amateurs interested in traffic handling are virtually nonexistent, and those left to carry what little load there is are getting tired and frustrated as their number dwindles and

interest in handling traffic declines. Transcontinental Corps (TCC) assignments are missed more frequently than they used to be. "Pride, Service, Tradition, Innovation"—the motto of NTS—seems to be losing some of its luster. Maybe we (the ARRL through *QST*) could help recover some of that.

If you took the time to read this, might you be able to take the time to investigate your local, section and region nets, CW or SSB. Get involved in traffic handling. You will meet some fine operators. It doesn't stop you from enjoying other facets of the hobby, but it could be important. Eventually, I believe there will be sufficient pressure on governments to force reassignment of our precious HF frequencies to commercial interests, as they see little of real value in their current use by amateurs and no evidence of future change. We have to do more than just ragchew, hunt DX, contest and experiment to justify their retention. John Healey, KH6GRV, makes this point very well [Correspondence, Feb 2003, p 24].—*Terry Ussher, VE3AWE/VE3EF, Nobleton, Ontario*

BEHIND THE SCENES

♦ Thank you so very much for the wonderful photograph of the folks behind the scenes of the DXCC, Contest and Membership Services of the ARRL [ARRL In Action, Feb 2003, p 13], along with the data on the outgoing QSLs. While it might seem at times to be somewhat thankless for the staff, I'm sure I speak for thousands who would say we appreciate the excellent work effort and dedication you all put forth to keep that aspect of the hobby going.—*Nate Williams, W9GXR, Middleton, Wisconsin*

VIBROPLEX

♦ I have just finished reading the article, "Vibroplex—The Company and its Classic Key" [Jan 2003, pp 48-49]. Although I have never operated a "bug," I found the article to be very interesting—as much for its human element as for the history of the device. The last two paragraphs in particular contained some of the finest writing I have ever seen in *QST*. Thanks to the author, N2XE, and to *QST* for bringing us this fine article. dah-di-dah.—*Mike O'Byrne, AE4AV, Clyde, North Carolina*

HOMESCHOOLED HAMS

♦ A great way to introduce ham radio to kids is by volunteering to teach a short class at your local homeschool group. Groups such as these love challenging self study projects and since the kids are homeschooled, their hours can work around yours. My husband contacted our local homeschool group (yours can be found by searching on-line or by contacting your local school board) and when they said they were interested he gave them a list of supplies ahead of time: the Technician study guide, a build your own radio kit from the local electronics store, and an optional Morse code CD. After one evening going over basics, everyone went home pretty excited and is now studying. Our next step is to contact some local VEs and get them licensed! Even some dads and a mom or two are studying!—*Jason and Sherrie Lyle, KD7GXU and KD7JIZ, Torrington, Wyoming*

CASUAL CONTEST FUN

♦ I read the article about casual contesting with the FT-817 ["Pray for Snow!" Feb 2003, pp 53-54]. In fact, I read it and reread it. You made it look like so much fun I had to try it myself. I used my new FT-817 for the first time in the 2003 DX CW Contest—my first, not counting Straight Key Night. Also in use for the first time was a Buddipole out on the car (70 feet of coax to the apartment) and a tiny BullDog paddle. Everything went well. I found that I could listen to them calling over and over until I got the call down, then answered the loud ones. I always got called back. I worked only on 10 meters. It was fun!

I took a break on Saturday so my wife could test. She passed and is now a ham, too. What a great weekend! Thanks for the inspiration.—*Roland Whitsitt, N5VWN, Stockton, California*

NO EXCUSES

♦ Last month I was thinking about how great the article "'No Excuses' QRP Transceiver" was [Dec 2002, pp 28-34]. I've even bought the bobbin spool and started collecting parts. In January you had several articles about vintage equipment, and that two tube tuna can transmitter—*wow*! Keep up the good work. I think the construction articles with easily attainable parts are great.—*John W. Schneider, W2GGY, Tonawanda, New York*

GET OUT THE WOUFF HONG!

♦ The image of 1AW's 1923-vintage QSL in December 2002 *QST* [Happenings, p 77] was a very interesting snapshot of history. In particular, note the "Best 73's" down at the bottom, which of course translates to "Best best regardses." Even The Old Man himself was guilty of this one!—*Ned Conklin, KH7JJ, Honolulu, Hawaii* QST

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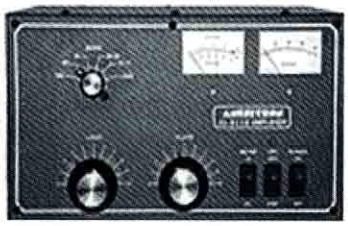

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New class of *Near Legal Limit*™ amplifier gives you 1300 Watt PEP SSB power output for *65%* of price of a full legal limit amp! Four rugged *Svetlana* Russian 572B tubes. Instant 3-second warm-up, plugs into 120 VAC. Compact 8½Hx 15½Dx14½W in. 160-15 Meters. 1000 Watt CW output. Tuned input, instantaneous RF Bias, dynamic ALC, parasitic killer, inrush protection, two lighted cross-needle meters, multi-voltage transformer.

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You get a full kilowatt PEP output from a whisper quiet desktop linear. It's a compact 8½Hx14Dx15½ inches and plugs into your nearest 120 VAC outlet. Covers 160 to 15 Meters, including WARC and MARS (user modified for 10/12 Meters with license).

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Replace 5 coax feedlines with a single coax. 1.2 SWR at 250 MHz. Useable to 450 MHz. 1 kW at 150 MHz. **RCS-4, $139.** 4 position remote HF switch.

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By Kris I. Mraz, N5KM

High Speed Multimedia Radio

Data, voice and video—simultaneously! Experiments are demonstrating the feasibility of low cost, low power technology for the new ham radio "Hinternet."

High Speed Multimedia (HSMM) Radio

HSMM radio is based on what is commercially known as Radio Local Area Network (RLAN) Technology.[1] Take a look at Figure 1. Each PC (desktop or laptop or palmtop) has an inexpensive (less than $100) radio transceiver/antenna unit attached to it. Radio repeaters, called nodes and known commercially as Access Points (APs), are scattered around the home or office to receive their radio signals.

Now those PCs are no longer tied down. They are free to roam the local area, untethered by an access cable. And, like your cell phone, as you roam around the city, your signal can be lost by one node but picked up by the next—you're always connected. Just don't roam too far. These RLAN radios, with their little antennas and QRP transceivers, aren't made for weak-signal work, though. Their indoor range is typically less than 200 feet!

The Technologies

What are the technologies that allow RLANs to work? The radio component consists of a low power microwave transceiver that uses a form of spread spectrum (SS) modulation. Spread spectrum modulation is a way to spread modulation frequencies over a very wide signal bandwidth while at the same time reducing the power transmitted at any specific frequency. The SS transceivers most studied are manufactured under a standard called IEEE 802.11b and the signal occupies a bandwidth of 22 MHz (11 MHz either side of the channel's center frequency).

A small built-in antenna is used on the desktop PC or laptop so it can communicate with the AP node. Devices using the IEEE 802.11b standard (known as *WiFi* commercially) use frequencies in the 2.4 GHz range. That standard must be robust enough to handle the uncertainties of the radio medium as well as deal with problems that a wired LAN has never heard of. Therefore, we're looking at the marriage of radio and software technologies in a leading-edge advancement of networking.

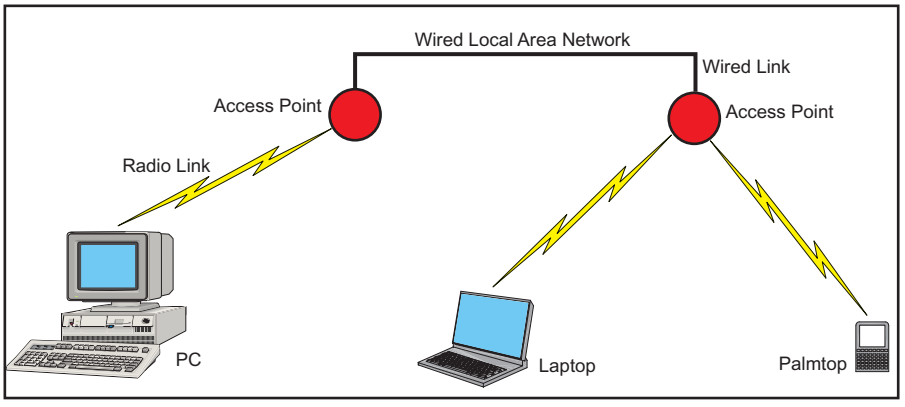


Figure 1—Radio Local Area Network. Devices such as PCs, laptop and palmtop computers are connected to a LAN via microwave.

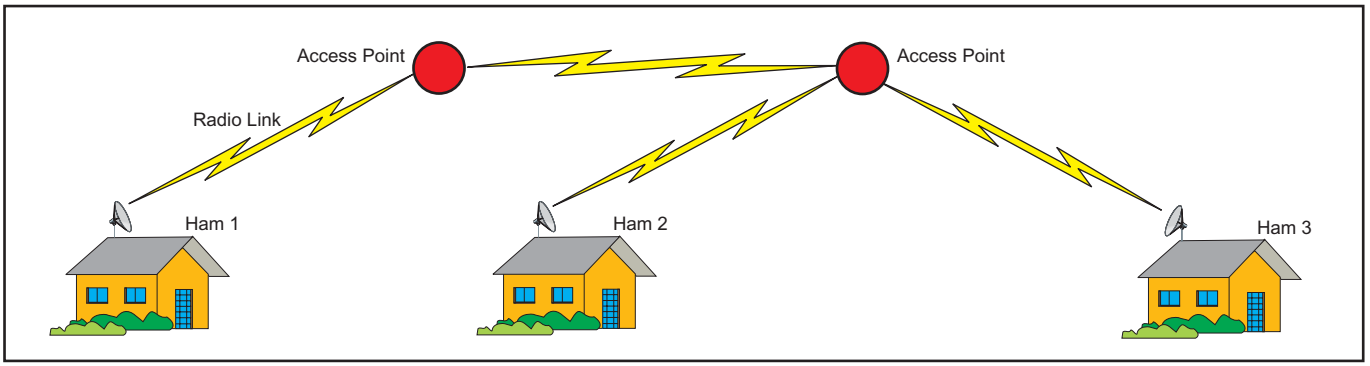


Figure 2—Part 15 microwave radios can be adapted to establish communications among many hams over a large area.

[1]Notes appear on page 34.

What Does all this Have to do with Amateur Radio?

IEEE 802.11b transceivers, sometimes called *WiFi* devices, actually operate through the range of the 13 cm amateur band and beyond. How can they operate in the ham bands? All of these wireless devices operate under FCC Part 15 rules. This means they are unlicensed users of the band and, as such, they must not cause interference to licensed users (hams) and must accept any interference caused them. That is the way the FCC handles Part 15 band sharing among the various services. Hams can take advantage of the availability of low-cost Part 15 IEEE 802.11b hardware by applying it to our Part 97 service. Imagine your own Part 97 wireless network running high (relative) power with high gain antennas tied together in a nationwide network.

Figure 2 takes the same technology illustrated in Figure 1 and shows how many amateurs over a wide area are able to communicate via data, voice and video. Veteran hams will recall that the adaptation of commercial FM equipment to the 2 meter band enabled FM repeaters to proliferate in the 1970s.

Table 1
IEEE 802.11b Spread Spectrum Channel Assignments for the 2400-2483.5 MHz Band

Channel	*Center Freq, MHz*	*Comments*
1	2412	Channels 1-6 are used in the US and other countries by 802.11b devices. Their emissions fall within the 2400-2450 MHz amateur band.
2	2417	
3	2422	
4	2427	
5	2432	
6	2437	
7	2442	Channels 7-11 are used in the US and other countries by 802.11b devices, but cannot be used in the Amateur Service.
8	2447	
9	2452	
10	2457	
11	2462	
12	2467	For use in Europe only.
13	2472	For use in Europe only.
14	2484	For use in Japan only.

Applications

What if you had the ability to build networks like these? What would you do with them? Well, one of the exciting characteristics these networks share is their high throughput capacity. This means they have the ability to move *lots* of data from one point to another with high reliability. RLAN technology also allows a single data source to send to a single receiver or to many receivers using multicast technologies.

Aside from expected Internet-type usage—e-mail, Web browsing, FTP, IRC (chat) and Instant Messaging—many potential applications could be built with this technology.

Emergency Communications

Emergency communications offer the greatest opportunity for RLAN technology to excel and for amateurs to push the envelope in the public service sector, using the technology. Low power requirements, low cost, portability, point-to-point, point-to-multipoint and multicast capabilities, coupled with high bandwidth, make RLANs an excellent technology for "on-the-spot" emergency communications. An emergency volunteer can be equipped with a laptop or a wireless PDA (Personal Digital Assistant) with a microphone and a small video camera. He or she now has the tools needed to act as a mobile set of eyes and ears in the midst of a communications emergency.

Since the 9/11 tragedy, Amateur Radio has taken on a heightened role in national, regional and local area emergency communications. Emergency communication organizations like RACES and ARES are establishing emergency response plans with government organizations such as the National Communication System (NCS) and the Federal Emergency Management Agency (FEMA). Along with traditional communication channels, such as HF/VHF nets, packet radio and APRS, wireless LANs need to become an integral part of the Amateur Radio response.

Two-Way Streaming Video (ATV)

Imagine a local Amateur Radio videophone network that can be operated from a PC, but with an RLAN communications medium. Each station can use a simple webcam attached to a PC and that PC can be connected to the network via a simple wireless access device. Such a network would support both point-to-point and multipoint video calls.

Full Duplex Streaming Audio

Imagine never having to say "over" to transfer transmission. One of the great barriers to truly conversational contacts has always been the simplex communication modes we traditionally use. Whether it's SSB, CW, AM, FM, RTTY or advanced digital, other than talking over the OSCAR satellites, we typically wait for the other operator to finish a transmission and then commence sending. Full-duplex operation is the ability for all parties in a contact to be able to talk to and hear all other parties simultaneously. That is how our telephones and cell phones work—and we generally prefer it. RLAN technology allows for full-duplex operation in voice, video and data communication modes.

Voice over IP (VoIP)

VoIP applications such as eQSO, iLink, EchoLink, IRLP and WIRES are all practical operations using the HSMM mode.[2] Explore and let your imagination go to work in these areas!

Digital Voice

Digital voice lets us use RLAN technology to add exciting new capabilities to the old DX PacketCluster operation. Formerly, we just used a terminal program to enter DX information and retrieve WWV reports or we chatted by keyboard with other amateurs on the network. Now we can take advantage of a widespread, high-speed network with wireless connectivity and enhance these capabilities to make them more interesting and effective. Instead of just seeing a DX item, we could click on that spot and hear the actual sound of the DX signal at the spotter's location. We could also turn that "talk" function into a real two-way voice communication tool.

Remote Control

Ever think about putting your station in a perfect, uncompromised location and operating from the comfort of your home? Well, an RLAN approach could be the solution, with the right capabilities at the right price. With a single link from your home to a remote site, you could run full-duplex audio and integrated control of your distant station.

Table 2
ARRL 13 cm Band Plan (2400-2450 MHz)

Band, MHz	*Amateur Usage*
2400-2403	Satellite
2403-2408	Satellite high-rate data
2408-2410	Satellite
2410-2413	FM repeaters (25 kHz spacing) output
2413-2418	High-rate data
2418-2430	Fast-scan TV
2430-2438	Satellite
2433-2438	Satellite high-rate data
2438-2450	Wideband FM, FSTV, FMTV, SS, experimental

Wireless Internet

This is the one application that has caused the most excitement in the Part 15 wireless community. Non-profit Part 15 user groups have sprung up in the Boston, Seattle, San Diego, the San Francisco Bay areas and in many other parts of the world. While community-based networking may seem like the latest and greatest thing, hams have already been there. In the mid-1980s through the '90s, amateurs used a TCP/IP protocol implementation called Network Operating System (NOS) written by Phil Karn, KA9Q, to interconnect packet radio with the Internet, creating what was then called the AMPRnet. Now, with commodity-priced RLAN cards and the additional privileges that Part 97 conveys, we should be able to attract Part 15 enthusiasts to the Amateur Service.

The Bands

The FCC has authorized spread spectrum devices on three bands: 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz. US hams have spectrum in all three of these bands: 902-928 MHz, 2400-2450 MHz and 5650-5925 MHz. For the time being, we'll limit our discussion to the 2.4 GHz band. This is where most commercial low-cost hardware is available and where most of the activity is taking place.

Let's take a look at how Part 15 devices use the 13 cm band. Table 1 shows that the band is divided into 14 channels spaced 5 MHz apart. The US and Canada are limited to channels 1-11 while Europe and Japan have different assignments. The spread spectrum signal is spread ±11 MHz around the channel center frequency. So in order to prevent co-channel interference two networks can be on channels that are separated by 5 channels. For instance, channel 1 and channel 6 would provide adequate separation.

Channels 1 and 6 fall completely within the amateur band 2400-2450 MHz and could be used by amateurs under Part

Antennas for the Hinternet

By Neil Sablatzky, K8IT

Figure A—The design of the slot antenna allows it to be easily reproduced with a milling machine.

In order to minimize interference to FCC Part 15 users, the ARRL HSMM Working Group recommends the strict use of horizontal polarization. This is because the majority of Part 15 users are vertically polarized. It is important to note, however, that the wireless industry uses diversity antennas to achieve both space and polarization diversity. Space diversity is used to reduce the effects of reflections and RF nulling. Polarization diversity is used to maximize signal strength when portable devices such as laptop computers are positioned without respect to the receiving Access Point's polarization. For amateur use, the majority of our links will be at greater distances than those in an office environment. In fact, our goal is to be able to network over many miles of separation. In this case, using a common polarization with high gain antennas will maximize that communication distance.

There is an issue, however. In a network, you want each station to hear all other stations in the same RLAN. This calls for omnidirectional, as opposed to directional, antennas. You say omnidirectional, horizontally polarized, high gain antennas? Yes!

Thanks to Trevor Marshall, **www.TrevorMarshall.com/**, such an antenna (a slot array) is not only possible, but is relatively easy to build. The K8IT version of a 32 slot, 15 dBi gain antenna is shown being machined in Figure A. Two completed antenna prototypes can be seen in Figure B. The antenna provides an omnidirectional radiation pattern with most of its RF energy aimed at the horizon. Additional information about this slot antenna design can be obtained at K8IT's Web site.[1]

Some commercial manufacturers such as M² Antennas[2] and ICOM[3] have recently announced a desire to enter the Amateur Radio market with products compatible with the Hinternet. Please contact these manufacturers directly for product information.

[1]An assembled Amateur Radio version of the slot antenna can be obtained from K8IT at **www.k8it.com/**.
[2]**www.m2inc.com/**.
[3]**www.icomamerica.com/wlan**.

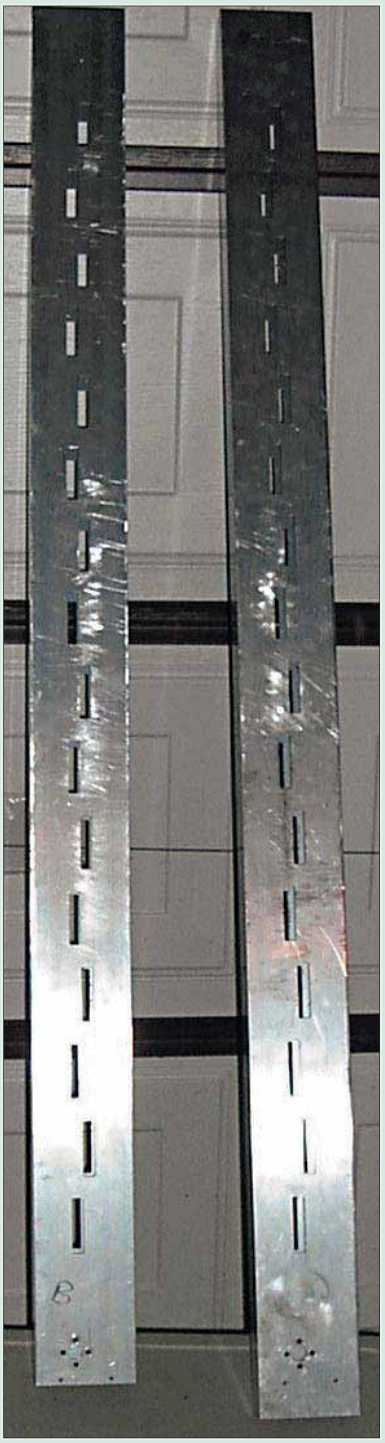


Figure B—Two freshly machined prototype slot antennas ready for finishing.

97 of the FCC Rules permitting spread spectrum operation. However, Channel 1 high power spread spectrum operations by hams could cause interference with other hams operating weak signal and narrow bandwidth modes, so it should be avoided by Part 97 users. Hams should try to confine their IEEE 802.11b spread spectrum use to channel 5 (2432 MHz), whenever possible, as this offers the least chance of interference with narrowband users. We will cover more of this later.

There are other occupants in this band aside from wireless LAN users. This is known as the Industrial, Scientific and Medical (ISM) band operating under Part 18 rules. Basically ISM is unlicensed, non-communication use of the band for such things as Magnetic Resonance Imaging (MRI), diathermy machines and microwave ovens, to name but a few. On this band, ISM rules… other users have to accept whatever interference they get from ISM. Being an amateur band, however, there are ham occupants there that we need to be aware of. Table 2 shows the (1991) ARRL Band Plan for the 2400-2450 MHz portion of the 13 cm band. The IEEE 802.11b protocol did not exist when the ARRL Band Plan was structured.

The Amateur Service has an allocation in the 13 cm band that differs somewhat in various countries. In the United States, however, the Amateur Service has a secondary allocation in the 2400-2402 MHz segment, a primary at 2402-2417 MHz and a secondary at 2417-2450 MHz. This band (actually a larger band of 2400-2483.5 MHz) is used by a number of unlicensed low-power devices, such as cordless telephones and radio local area networks. These include IEEE 802.11b devices. The trade press and some manufacturers often mischaracterize this band as "unlicensed spectrum," which may indicate they're either unaware of the amateur primary or secondary allocations or they don't want to alarm potential customers. Additionally, the FCC, on petition from the ARRL, issued a Notice of Proposed Rule Making, proposing an upgrade of the 2400-2402 MHz allocation to amateur primary status.

Off-the-Shelf Equipment

IEEE 802.11b presents the Amateur Radio community with an opportunity to use the inexpensive Radio Interface Cards (RIC) for high-speed multimedia applications including streaming video. While most prices presently hover around $100, some are available at about half that price. Although the APs are more expensive by virtue of lower sales volumes, they are available for under $200. External antennas with higher gain are available for commercial installations but these can be quite expensive. Some amateur antenna manufacturers are getting up to speed, however, and they should soon have products for the amateur market. Additionally, homebrew antennas are a possibility, if you feel comfortable using simple machine tools. (See the *Antennas for the Hinternet* sidebar for information on the construction of a high gain amateur antenna.)

Comparison of Part 15 and Part 97 Rules

Amateurs operating spread spectrum are permitted many times the power of unlicensed Part 15 stations. Hams can run up to 1 W of transmitter power output without so-called automatic power control (APC) and up to 100 W if APC is used.[3] Part 15 users are limited to 1 W, however, with typical wireless Radio Interface Cards running much less than this—on the order of 30-200 mW.

Amateurs also have more freedom in antenna selection—we can use whatever antennas we want. Unlicensed Part 15 users are limited as to what antenna types may be attached to their wireless devices, however. In general, built-in antennas can't be removed or replaced. Transmit power must be reduced if a replaceable antenna is replaced with a higher gain antenna.

Using APRS to Locate Amateur HSMM (IEEE 802.11b) Stations

By Jeff King, WB8WKA

Some readers may be familiar with the use of APRS (Automatic Position Reporting System) in tracking mobile stations, but APRS can also be used to announce the location and parameters of amateur IEEE 802.11b stations. The APRS community has provided a symbol for the use of amateur IEEE 802.11b stations. It is the black gateway icon with the symbol: ◊ 8.

Amateurs can beacon their position using packet radio on the APRS frequency of 144.39 MHz. One can use a simple TNC with the beacon text listing the latitude and longitude in APRS format or use one of the many APRS display programs. More info on APRS can be found at Wes Johnston, KD4RDB's Web site at **wes.johnston.net/aprs/**.

Jim Jefferson, KBØTHN, has adapted his Web site **www.aprsworld.net/** to help hams locate amateur IEEE 802.11b stations even if they are not on APRS. Jim's locator can be found at **db.aprsworld.net/datamart/wifi-search.php/**. Simply click the search button to find all stations using the IEEE 802.11b standard.

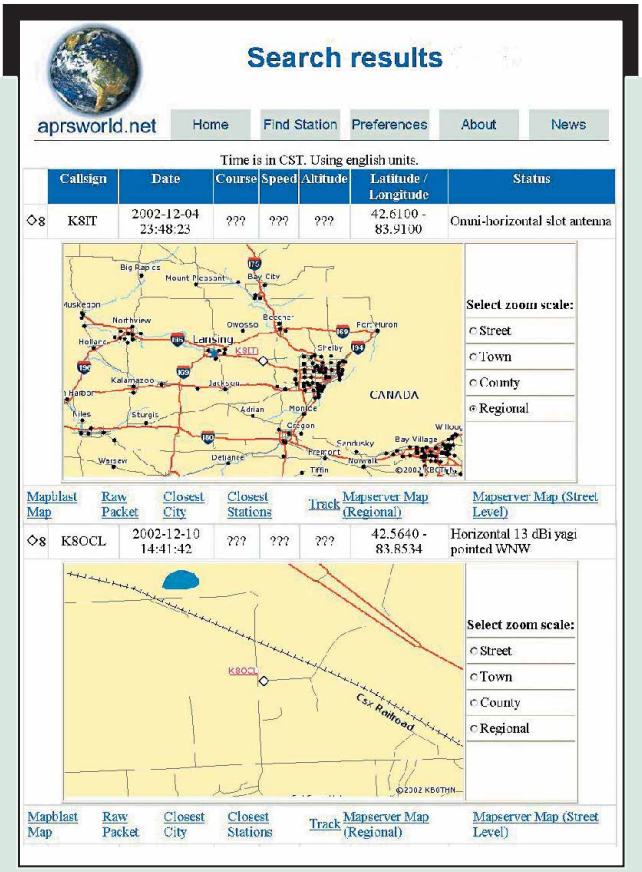


Figure C—APRS map showing the location of IEEE 802.11b stations, K8IT and K8OCL.

An amateur station using IEEE 802.11b must identify periodically, according to Part 97. Some experimenters have considered modification to the IEEE 802.11b protocol to map station call signs into frames in a manner similar to that used in AX.25. The simplest way, at least for now, is to identify in the text of the message, so that anyone with a normal IEEE 802.11b card can read the identities of the stations transmitting.

As we all know, information privacy is a major concern in the public Internet. Strong data encryption is used to protect sensitive personal information. For Part 15 networks this is not a problem. Hams are not allowed to encrypt, however. This is a situation we're all used to and it should not be a problem. Just as you wouldn't transmit your credit card number over the air, you wouldn't transmit it as data over a wireless connection, either. Additionally, Part 15 devices may share certain frequencies of operation with the Amateur Service. Users of these devices have a responsibility for mitigating interference to licensed Part 97 users. And, of course, Part 97 users cannot use this spectrum for any commercial or business use, in compliance with FCC regulation.

Interference Factors

While the Amateur Service has primary and secondary allocations in the 2400-2450 MHz band and Part 15 devices operate there without a license and must not interfere with or claim protection from licensed services, there are difficulties. The amateur licensee looks at the regulatory status and surmises there is no need to take Part 15 devices into account before transmitting. If interference from Part 15 devices is present, the amateur might be able to seek investigative and enforcement action from the FCC.

On the other hand, that Part 15 user just paid about $100 or so for an RLAN card and expects it to operate. He or she may not be happy that it doesn't work or that it operates more slowly than expected because of interference. They could become convinced that the cause of the problem is an amateur station.

Unfortunately, there are many more Part 15 users than there are Part 97 users. A large number of complaints directed at the FCC from commercial users could pose a problem and that outcome might not be "advantageous" for the Amateur Service. While we may have the legal right to complain about interference due to Part 15 operations, it is friendlier and more prudent to try to coexist. How many of those experimenting Part 15 folks would enjoy becoming hams? Reach out when you can. It would be far more advisable to consider mitigation of any interference to and from Part 15 RLANs in an amateur network rather than becoming confrontational or litigious.

Amateur-to-amateur interference is another matter with which we must concern ourselves. The requirement to avoid harmful interference from spread spectrum operation is in the rules—Section 97.311(b) says that SS stations must not cause interference to stations using other authorized emissions. Comparison of Table 1 with Table 2 reveals that it is not possible to pick an IEEE 802.11b channel within the 1 to 6 range without bumping into another use specified in the band plan. Bear in mind, however, that there may be some local variations. While it is good practice to operate within the applicable band plan, some flexibility does exist. Generally, an amateur station operating in accordance with a band plan has some precedence over a station not operating under one. The important issue is to avoid harmful interference to users operating in accordance with that agreement. *The ARRL Repeater Directory* lists some, but not all, users of the band. The local repeater coordinator should have additional information about who is doing what in order to avoid interference to existing users.

There's also the potential for internetwork interference between co-located RLANs. Networks typically select channels separated by 25 MHz (for instance, channel 1 and channel 6) so that the "sidebands" from an adjacent channel are down at least 30 dB from its center frequency. If this 25 MHz channel separation can't be accommodated in a given area, there are other techniques that

Glossary

Access Point (AP)—A low power repeater or node, usually used to facilitate a wireless link (from a RIC) to a wired network. In our application it can also be a node to link to another wireless AP via radio.

Automatic Power Control (APC)—A method to use only as much power as necessary to access a distant receiving site. Transmitter power is automatically scaled up or down depending on the signal level at the receiving site.

FCC Part 15—Part 15 of Title 47 of the FCC rules that regulates low power, unlicensed devices. This equipment may share certain frequencies of operation with the Amateur Service and, as such, all services are vulnerable to interference from each other on these frequencies. Part 15 outlines, among other things, certain responsibilities of these services with regard to that possible interference.

FCC Part 97—Part 97 of Title 47 of the FCC rules regulates and governs the Amateur Radio Service. The governmental rules under which the Amateur Radio Service exists.

Hinternet—HSMM + Internet.

HSMM—High speed multi-media radio communication. A term coined for very fast bilateral data rates usually using the IEEE 802.11b standard over an Amateur Service radio network.

IEEE 802.11b—The IEEE 802.11 specifications are wireless standards that specify an "over-the-air" interface between a wireless client and a base station or access point, as well as among wireless clients. 802.11b applies to wireless LANS and provides 11 Mbps transmission (with a fallback to 5.5, 2 and 1 Mbps) in the 2.4 GHz band. 802.11b uses only DSSS (Direct Sequence Spread Spectrum) modulation. 802.11b is an IEEE copyrighted trademark.

Radio Interface Card (RIC)—A PC wireless transceiver capable of interfacing to a wireless network. These usually run between 30-200 mW of RF output power.

Radio Local Area Network (RLAN)—A communications system facilitating two-way data transmission among clients and APs using network protocols via radio links.

Spread Spectrum (SS)—A digital modulation technique whereby the modulation sidebands are spread over many frequencies. In the 2.4 GHz band, the modulation bandwidth is typically 22 MHz. A pseudo-random code at several times the information data rate usually modulates the carrier. Because of frequency interleaving effects and a much lower spectral power density, SS signals are less prone to interference than conventionally modulated signals. *Direct Sequence Spread Spectrum (DSSS)* is the coding and modulation scheme used by the IEEE 802.11b standard.

TCP/IP—A set of protocols developed to allow cooperating computers to share resources across a network.

VoIP—Voice over Internet Protocol. A protocol designed to allow voice transmission using high speed two-way data transmission over a network, principally the Internet. (See S. Ford, WB8IMY, "VoIP and Amateur Radio," *QST*, Feb 2003, pp 44-47, to learn more about the VoIP networks currently implemented in Amateur Radio.)

WiFi—Wireless Fidelity (WiFi) is the wireless LAN industry's name for the IEEE 802.11b standard. Many *WiFi* devices have been marketed for wireless networking and these form the basis for Amateur Radio use.

Figure 3—The Livingston County HSMM Experimenters Team displays a completed slot antenna at a Christmas get-together. Left to right: Mark, AB8LN; Randy, KC8MSB; John, K8OCL; Neil, K8IT; Larry, KB8QJE, and Ernst, N8EK.

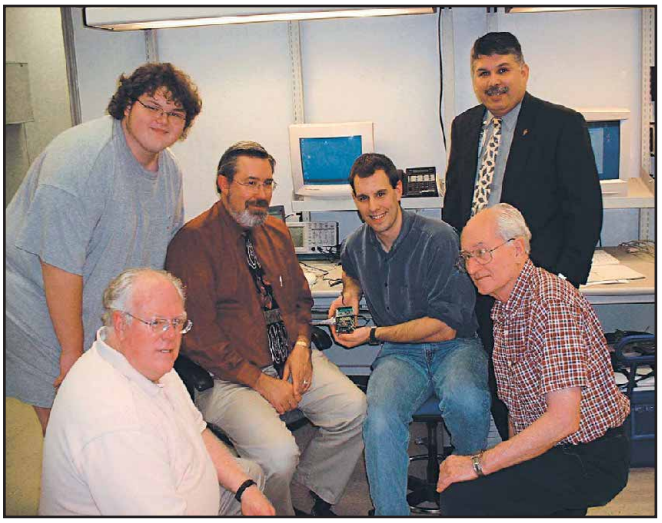


Figure 4—The members of the San Antonio ARRL HSMM Radio Group shown at a recent meeting. From the left: Joshua Davis, KD5LSX; Walt DuBose, K5YFW, HSMM WG member; Jack Riegel, N5JAK; Jason Beens, KBØCDN, of Sense Technologies holding a 900 MHz radio; Ray Martinez, N5VRE (standing), and Ray Ware, W5MLW.

can be applied to reduce interference, such as the use of directive antennas or power reduction.

Caution: The ARRL HSMM Working Group respectfully requests that *all* stations using the IEEE 802.11b standard, whether unlicensed (Part 15) or FCC licensed (Part 97), avoid the use of Channel 1, 2401-2423 MHz. This is to prevent possible harmful interference to the most prominent user of the 2.4 GHz band, the international Amateur Radio satellite services spacecraft (currently AMSAT-OSCAR 40) operating on those frequencies.

Current Activity

An example of current amateur experimentation with HSMM radio is a group of amateurs in Livingston County, Michigan, **www.hsmm.us/** (see Figure 3). The group is in the process of implementing what might be the first Amateur Radio high speed multimedia (data, voice and video) network based on IEEE 802.11b technology and readily available, inexpensive parts. They are coordinating their experiments with the ARRL High Speed Multimedia Working Group (HSMM) and the Michigan Area Repeater Council (MARC).

Current plans for the Livingston County group call for using 802.11b channel 5 with a center frequency of 2432 MHz. This approach will place the 22 MHz spread spectrum signal at what appears to be the most logical frequency for such testing. Approximately half of the signal is in the experimental portion of the band (2438-2450 MHz) already designated for spread spectrum use. The other half of the signal is in the currently unused satellite sub-band and the 2.4 GHz fast-scan ATV sub-bands. If interference to these users does occur, the rules require the spread spectrum operator to correct the interference or shut down. However, there is no known Amateur Radio activity on this portion of the 2.4 GHz band in Livingston County. The situation in your area may be different, so be cautious before starting your own HSMM station. If effective APC techniques can be developed, the experimenters plan to use an RF output power in the range of 2-10 W. With small, horizontally polarized dish antennas and horizontally polarized omnidirectional slot antennas, these experimenters hope to achieve throughputs in the range of 4-5 Mb/s over a range of 10 miles or more. Even greater range is possible, of course. Having favorable terrain is just as important as is power.

Station identification will be accomplished dependent on the type of data being transmitted. For text messaging, call signs will be typed in, as part of the text. Normal voice identification will be used for streaming audio. Normal Amateur TV (ATV) identification methods will be used for streaming video contacts.

One of the first applications to be attempted will be the use of Microsoft NetMeeting for full-duplex streaming audio and video between two nodes 1.6 miles apart.[4] As experimentation progresses, making use of higher power and higher gain antennas, this small network will become a larger one, covering a wider area and including many more amateurs.

Another group has recently organized—the San Antonio ARRL HSMM Radio Group in San Antonio, Texas (Figure 4). Initial plans call for three to five station nodes and an AP node, which is connected to the Internet. Their Web site is **k5yfw.ham.org/**.

Getting on the Air

If you want to start experimenting, you can set up your own basic HSMM station with readily available components. The HSMM Working Group recommends beginning with a LinkSys WET11 or an ORiNOCO Wireless LAN Client, either a USB or PCMIA version, for setting up a point-to-point connection between two stations. This RIC runs 30 mW and has provisions for an external antenna. For an antenna use a parabolic grid, which will provide about 24 dBi of directional gain. Use low loss coax to connect the antenna to the RIC. LMR-400 cable is recommended for this purpose. It is low in cost and has 6.8 dB loss per 100 feet at 2400 MHz. Your antenna must be high enough to be in line-of-sight with the other station's antenna. Try to limit the total feed line length to less than 50 feet to avoid excessive power loss and be sure to use some sort of strain relief on the RIC end of the coax.

Using provided (with the card) software, configure the RIC for ad-hoc network mode, set the SSID to "hsmm" and select channel 5 (2432 MHz). Stations in your

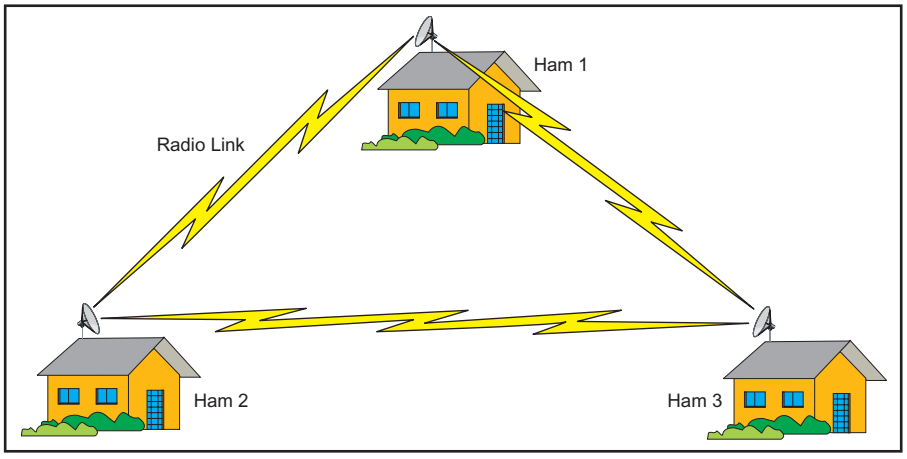


Figure 5—If the stations are within range they can communicate directly without the help of a repeater node (AP). This is known as an ad-hoc network.

network should choose IP addresses from the 192.168.xxx.yyy address range.[5] As an initial test, try to set up two stations in the same room (using the RIC's internal antennas) and enable a simple ping of the other station to test connectivity. As a next step, you can try using Microsoft NetMeeting to establish voice and data communications. Once you're satisfied that your configuration is good, go back to your home locations and try the same test using parabolic antennas. Be sure they are aimed accurately at each other. Hopefully, both stations will be able to connect. And remember, this is a Part 97 network. Be sure to identify at least every 10 minutes. Figure 5 shows direct ad hoc communication without the use of an Access Point (AP).

Initial Deployment Recommendations

- Coordination Frequency: 446.0 MHz simplex calling frequency.
- Frequency (channel 5): 2432 MHz center frequency (avoid channel 1).
- Modulation type: Direct Sequence Spread Spectrum (DSSS).
- Antenna type/polarization: Omnidirectional or unidirectional with horizontal polarization.
- Space diversity: Nodes may deploy one (primary) or both (plus secondary) AP antennas.
- Service Set ID: hsmm.
- Secondary Service Set ID (if provisionable): hsmm/callsign.
- Station ID method: Manually, depending on mode of QSO: Text, voice or video.
- Other configurable parameters: WEP and all encryption must be off.

Opportunity Knocks

Wireless technologies are opening up new opportunities for amateurs. We can apply real world communication experience and use our technical abilities to solve current problems and develop new capabilities. Some of the challenges that need to be addressed are:

- Omni and directional horizontally polarized antenna designs.
- Definition of a standard, "single board" solution for a wireless node.
- Development of techniques to avoid cochannel interference.
- Development of techniques/protocols to handle a large number of users in a wireless cell.
- Development of low cost bidirectional amplifiers (amplifiers that have receive preamps and transmit PAs along with high speed T/R switches).
- Design of routing protocols to allow independent networks to be tied together.
- Design of Automatic Power Control (APC) techniques.
- The use of satellite relays to tie remote networks together.
- Interoperability between IEEE 802.11b networks and other high-speed technologies, such as the ICOM D-Star system.
- Rule changes to encourage amateur spread spectrum experimentation and networks.

Conclusion

This article has described just the first step in the evolution of the Amateur Radio High Speed Multimedia Network. As this network matures it will take on more and more ham radio characteristics. Our goal should be to enable it to evolve into a stand-alone, nationwide Amateur Radio network, with the ability to run Amateur Radio applications.

There are many Part 15 users and usergroups actively looking into expanding this new technology. We need to look upon this as an opportunity to recruit these experimenters into the Amateur Radio fold.

Acknowledgments

The following members of the HSMM Working Group made valuable contributions to this article: John J. Champa, K8OCL, Chairman, High Speed Multimedia Working Group, **k8ocl@arrl.net**; Walt DuBose, K5YFW, HSMM Webmaster and Deployment Planning, **k5yfw@arrl.net**; Alex Fraser, N3DER, **n3der@arrl.net**; Jim Idelson, K1IR, HSMM Applications Database, **k1ir@arrl.net**; Jeff King, WB8WKA, **jeff@aerodata.net**; Paul L. Rinaldo, W4RI, Manager, ARRL Technical Relations, **w4ri@arrl.org** and Neil Sablatzky, K8IT, **k8it@arrl.net**.

Further Reading

802.11 Wireless Networks: The Definitive Guide, by Matthew S. Gast. Published by O'Reilly & Associates, Inc, **www.oreilly.com/**. Available from the ARRL Bookstore, **www.arrl.org/shop**. $44.95 plus $8 shipping ($10 outside the US). Order no. 8884. Tel toll-free in the US 888-277-5289, or 860-594-0355; e-mail **pubsales@arrl.org**.

Building Wireless Community Networks, by Rob Flickenger. Published by O'Reilly & Associates, Inc, **www.oreilly.com/**.

Wireless LANs 802.11 - End to End; First Edition, by Walter R. Bruce, III. Published by John Wiley & Sons, Inc, **www.wiley.com/**. Available from **www.fatbrain.com/**, a BarnesandNoble.com company.

Notes

[1]The HSMM web site is located at **www.arrl.org/hsmm/**. You will find additional information on the current activities of the HSMM Working Group, RLAN technology and links to related sites.

[2]S. Ford, "VoIP and Amateur Radio," *QST*, Feb 2003, pp 44-47.

[3]The Automatic Power Control (APC) rule requires a station's transmit power to be reduced, based on the signal strength at the receiving station. This is the FCC's way of enforcing the "minimum power necessary" rule.

[4]Microsoft *NetMeeting* is available for free download at **www.microsoft.com/windows/netmeeting/download/**.

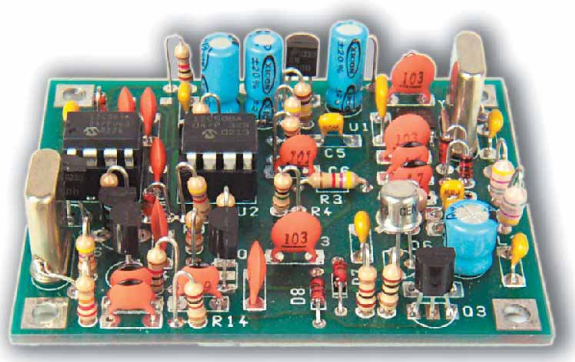
[5]Addresses in the 192.168.xxx.yyy range (for example: 196.168.100.010) are reserved for private networks and do not appear on the Internet.

Kris I. Mraz, N5KM, was first licensed in 1967 as WN4FNR. He holds both BSEE and MSEE degrees from the Georgia Institute of Technology. Kris has 24 years of experience at Rockwell-Collins and Alcatel USA as a telecommunications software engineer. He enjoys DXing, contesting and experimenting with HF antennas and is currently on the trail of the final three elusive zones for 5BWAZ. Kris is a member of the ARRL HSMM Working Group. You can reach the author at 470 Kinney Dr, Murphy, TX 75094 or at **n5km@arrl.net**.

By Dave Benson, K1SWL

The RockMite—A Simple Transceiver for 40 or 20 Meters

There's something wondrous about an effective rig that's little bigger than a PL-259 connector. This minimalist ½ W transceiver has several sophisticated features—built-in keyer, PIC µcontroller, one-button control—and it fits in an Altoids tin.



It All Started Innocently Enough...

It's refreshing to take a step back and pursue a project that promises fun without an investment in complexity. In June 2002, I'd been eagerly awaiting several gatherings with amateur friends. Upon discussing our plans for these events, colleague Doug Hendricks, KI6DS, and I agreed that nothing could be more rewarding than giving away a kitted construction project at these get-togethers.

The challenge was to design a compact and simple transceiver, which could be kitted inexpensively, yet wouldn't wind up in the scrap bin after one or two frustrating contacts. There's something fundamentally appealing about using a minimalist radio on the air successfully, so it's not surprising that the topic has been visited before. Wes Hayward, W7ZOI's Mountaineer[1] stands out as an example of this genre, as does the work of the late Doug DeMaw and the others who followed. DeMaw's Tuna-Tin transmitter[2] has retained a faithful following with builders for more than a quarter century.

When designing for maximum simplicity consistent with good signal quality, one is drawn almost inexorably to the crystal-controlled transceiver. This article describes the *RockMite*, named naturally enough for its crystal control and its small size. The printed-circuit board measures 2.0 × 2.5 inches and fits in the Altoids tin that is beloved by the QRP community as an enclosure. It uses the familiar direct conversion (D-C) receiver scheme.

Figure 1 shows a simplified block diagram of the direct-conversion transceiver. There isn't much to it—an oscillator and a mixer convert received signals directly to audio and an amplifier boosts that audio to usable levels. On transmit, the same oscillator serves as the transmitter frequency source, and only gain and keying stages are needed to bring the oscillator signal up to levels usable for making CW contacts.

Several crucial details are missing from this oversimplified picture, however. The operator who calls "CQ" with a crystal-controlled D-C rig will most likely get replies on zero-beat with his signal and without some means of shifting frequency (offset) between transmit and receive, will copy only low-frequency thumps. Additionally, the joy of sending CW will be somewhat tempered by the lack of a sidetone circuit to monitor one's own sending.

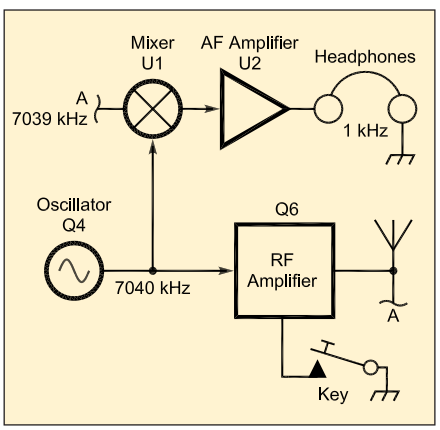
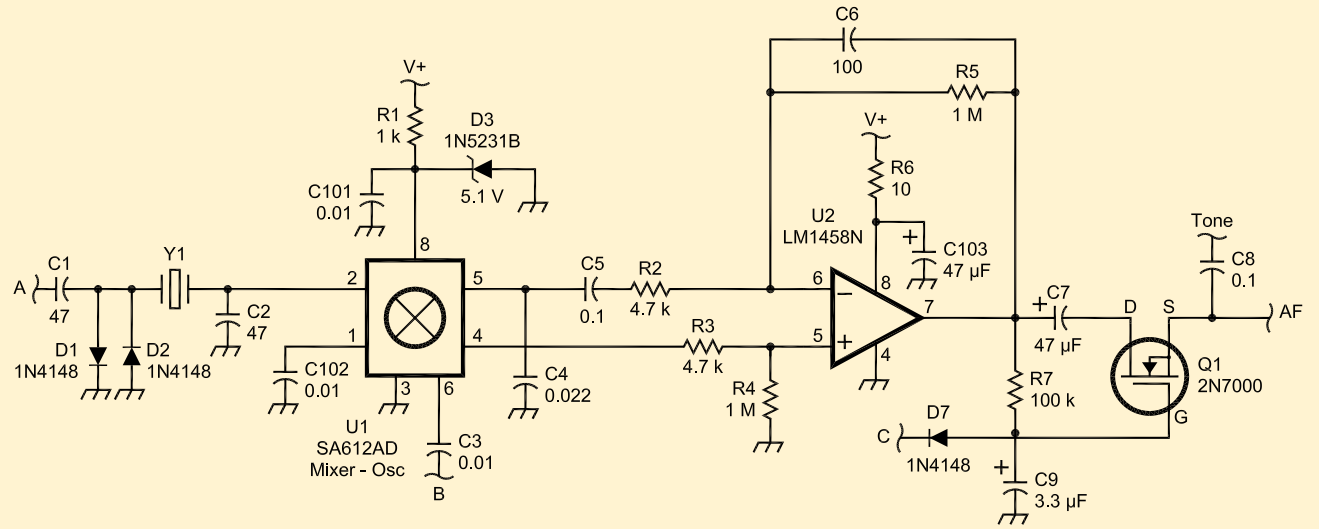


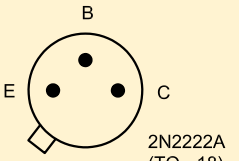
Figure 1—The 40 meter RockMite transceiver simplified block diagram.

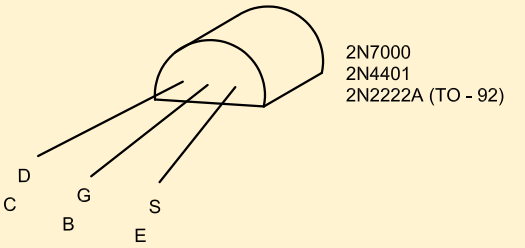
I couldn't resist adding a new wrinkle to the rock-bottom-radio saga. By using an 8-pin PIC microcontroller, it becomes possible to add an iambic keyer along with other functions. This can be done with minimum cost and with little printed circuit board acreage. Having made the decision to use a controller chip, a spare pin on that IC was dedicated to providing a 700 Hz sidetone during key-down conditions. The controller also supplies a TR control signal and a shift signal. This shift signal merely provides a dc voltage level to a varicap (tuning) diode to pull the crystal oscillator frequency between transmit and receive. "Heck, I don't need a computer to do that!" True enough, but the TR offset is reversible, as described later, so that the RockMite offers two possible operating frequencies. This function has traditionally been done with a double-pole switch, but it's easier and cheaper to perform that function in firmware.

There is one other noteworthy trick employed in the RockMite. Builders of simple receivers for 40 meters have all

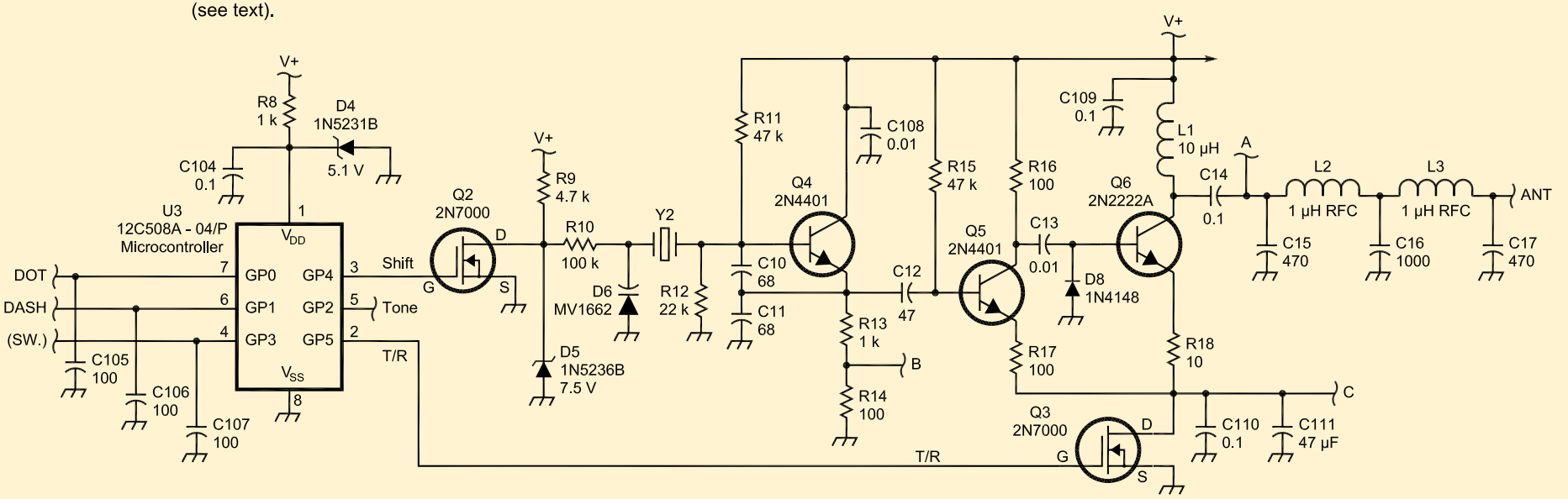
[1]Notes appear on page 38.







Except as indicated, decimal values of capacitance are in microfarads (µF); others are in picofarads (pF); resistances are in ohms;
k = 1,000, M = 1,000,000.
Values are for 40 meter version.
Contact author for 20 meter parts values (see text).



experienced the joys of listening to shortwave broadcasts mixed in with their CW. For most simple gear, the high levels of broadcast RF cause intermodulation distortion (IMD). This can be mitigated by the use of more robust (higher-current consumption and complexity) receiver front ends. Another approach is to ensure that the broadcast signal levels reaching the receiver mixer are attenuated enough to avoid their IMD effects. If you're interested in only a small segment of an amateur band, a sharply tuned (narrow) band-pass filter may be used to good effect to accomplish that. The RockMite uses this approach by utilizing a second crystal at the operating frequency at the receiver front end. The performance improvement with the added crystal is significant.

Figure 2—The 40 meter RockMite schematic. All resistors are 5%, ¼ W, carbon composition. Part numbers are Mouser unless otherwise specified. Mouser Electronics, 1000 North Main St, Mansfield, TX 76063, tel 800-346-6873; local 817-804-3888; fax 817-804-3899; www.mouser.com/; sales@mouser.com. Hosfelt Electronics, 2700 Sunset Blvd, Steubenville, OH 43952-1158, tel 888-264-6464; fax 800-524-5414; e-mail tonia@hosfelt.com; www.hosfeltelectronics.com. Avnet, www.avnet.com/.

C1, C2, C12—47 pF NPO disk capacitor, 5% (140-50N5-470J).
C3, C13, C101, C102, C108—0.01 µF disk capacitor (140-50Z5-103M).
C4—0.022 µF monolithic capacitor (80-C322C223K5R).
C5, C8, C14, C104, C109, C110—0.1 µF monolithic capacitor (80-C322C104M5U).
C6, C105-107—100 pF disk capacitor (140-50S5-101J).
C7, C103, C111—47 µF, 25 V electrolytic capacitor (140-XRL25V47).
C9—3.3 µF, 50 V electrolytic capacitor (140-XRL50V3.3).
C10, C11—68 pF NPO disk capacitor, 5% (140-100N5-680J).
C15, C17—470 pF disk capacitor, 5% (140-50S5-471J).
C16—0.001 µF (1000 pF) C0G monolithic capacitor 5% (80-C322C102J1G).
D1, D2, D7, D8—1N4148 diode (625-1N4148).
D3, D4—1N5231B Zener diode, 5.1 V, 0.5 W (625-1N5231B).
D5—1N5236B Zener diode, 7.5 V 0.5 W (625-1N5236B).
D6—MV1662 varicap diode (Hosfelt MV1662).
L1—10 µH RF choke, 10% tolerance (434-22-100).
L2, L3—1 µH RF choke, 10% tolerance (434-22-1R0).
Q1, Q2, Q3—2N7000 FET (512-2N7000).
Q4, Q5—2N4401 transistor (512-2N4401).
Q6—2N2222A transistor (610-2N2222A).
R1, R8, R13—1 kΩ.
R2, R3, R9—4.7 kΩ.
R4, R5—1 MΩ.
R6, R18—10 Ω.
R7, R10—100 kΩ.
R11, R15—47 kΩ.
R12—22 kΩ.
R14, R16, R17—100 Ω.
U1—SA612AD mixer/oscillator IC (Avnet).
U2—LM1458N dual op-amp IC (512-LM1458N).
U3—12C508A-04/P microcontroller IC (Digikey, Mouser—see Note 5).
Y1, Y2—7.040 MHz (40 meters), 20 pF load, HC49/U crystal (see Note 6) (14.060 MHz for 20 meters).

Walk This Way, Please...

The RockMite schematic is shown in Figure 2. Local oscillator Q4 is a crystal-controlled Colpitts oscillator and runs continuously. Its operating frequency is determined by crystal Y2 and the surrounding components. Diode D6 is a varicap (tuning) diode and it furnishes a voltage-dependent capacitance. This effect is used to pull the crystal oscillator frequency about 700 Hz between transmit and receive to provide a beat-frequency offset. The voltage applied to D6 through resistor R10 is 0 V with Q2 turned on (conducting) or it is the rated Zener voltage of D5 with Q2 off.

A sample of the local oscillator signal is coupled to the base of Q5. Q5 provides no voltage gain but instead serves to improve key-up isolation between the local oscillator and the antenna. This ensures that the key-up energy to the antenna (back-wave) is negligible. Equally important, the lowered signal level at the antenna terminal prevents blocking effects from desensitizing the receiver.

The output of the buffer stage is coupled via C13 to the power amplifier stage, Q6. I'll concede that term (power) is being stretched a bit to encompass a 2N2222A transistor. Diode D6 provides a clamp function, making it easier to drive the base of Q6. Transistor Q6 runs Class C, is driven hard and, in theory, has only conducting and nonconducting states for high efficiency. The waveform at Q6's collector would ideally be a square wave. In practice, there's considerable waveform distortion at that signal point and, in any case, it's nothing you'd want to apply directly to an antenna.

Capacitor C14 couples this waveform to the output harmonic filter, which comprises L2 and L3 and C15, C16 and C17. In an effort to save space and reduce construction complexity, sub-miniature epoxy-molded RF chokes were used instead of the traditional toroids. For the frequencies and power levels encountered in the RockMite, performance appears adequate—loss and self-heating were not significant. The signal at the antenna has a maximum harmonic content of –34 dBc (–33 dBc for 20 meters) and it complies with FCC requirements for spectral purity. Power output is about 500 mW with a 13 V dc supply. Incidentally, it will work at lower supply voltages—one intrepid experimenter reports making contacts with 30 mW of output power at a supply voltage of 6.8 V.

The receiver is continuously connected to the antenna through coupling capacitor C1. Diodes D1 and D2 limit the key-down voltage swing appearing at the receiver front-end to safe values. The presence of Y1 at the receiver front-end may seem somewhat startling, but it serves as a narrow band-pass filter to keep RF energy from frequencies far removed from the operating frequency to a minimum. The SA612 mixer, which does the conversion from RF to audio, needs all the help it can get.

Readers may recognize the circuit as an adaptation of a Roy Lewallen, W7EL, circuit—a widely used series-LC TR switch. The inductance in this circuit is being furnished by crystal Y1 at a frequency slightly off its series-resonant point. Perhaps less obviously, capacitor C2 forms an L network in combination with a portion of the crystal motional inductance. It's impedance step-up; there's about 10 dB of voltage gain prior to the mixer input (U1, pin 2). The values of C1 and C2 were twiddled empirically to yield a 6 dB bandwidth of about 2 kHz and to straddle the two operating frequencies fairly evenly. Receiver filter response is –35 dB at 7100 kHz and up. Although this value of ultimate rejection is unacceptably poor for typical crystal filters, here it needs to be only good enough to yield significant improvement in IMD performance.

The mixer IC, U1, converts the received signal from the operating frequency to audio; that signal appearing at pins 4 and 5 of U1. C4 provides some low-pass filtering to cut unwanted audio hiss. U2 is a garden-variety dual op-amp (one-half is unused) configured for a gain of about 200 (46 dB). This boosts the mixer's output audio to headphone-usable levels. Capacitor C6 provides an additional pole of audio low-pass filtering.

Transistor Q1 provides a simple mute function to reduce the amount of key-down thump. It disconnects the audio amplifier from the headphones whenever the rig is keyed. The large (transmitted) signal appearing at the receiver during key-down yields a dc offset at the mixer output, which is amplified to a large transient by the audio amplifier. The muting isn't perfect but it's a lot less fatiguing than none at all. Key-up recovery time is set by C9—this value may be reduced if you prefer quicker QSK (break-in).

U3 is a 12C508A microcontroller device and has been custom programmed to provide iambic keyer (Mode B) and fre-

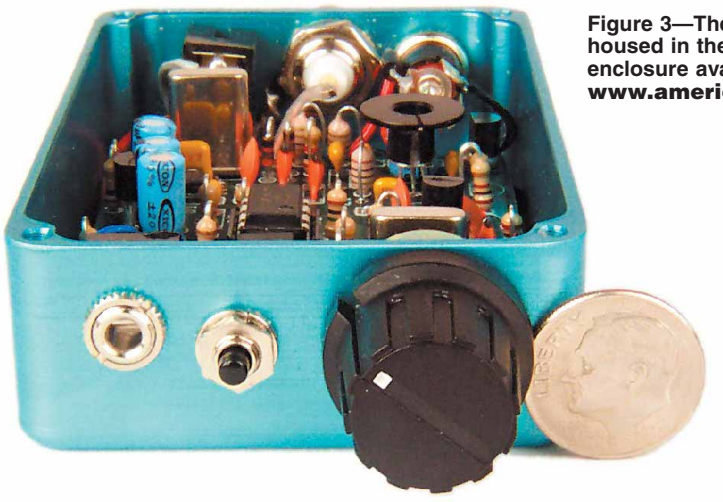


Figure 3—The RockMite housed in the aluminum enclosure available from www.americanmorse.com/.

quency shift functions. U3 pins 6 and 7 are typically connected to a pair of paddle inputs to provide the keyer functions. If a straight key is your cup of tea, ground one of those two inputs during rig power up and the RockMite will use the other input for the straight key. (This also facilitates the use of a more capable external keyer.)

There are two operator controls on the RockMite and they're both implemented via a push-button switch closure, in order to ground controller pin 4. The two functions are discriminated by the duration of the switch closure, to wit:

A brief (< 250 ms) closure on the switch reverses the offset to provide a second operating frequency. When you wish to work another station, use this function to select the *higher* of the two pitches on a received signal. Note that the pitch at the converse setting is a measure of how close to zero-beat you are; ideally it would be just a low-frequency thump. If the two selections yield a high pitch and a still higher pitch, you probably won't be able to work the other station.

A longer closure on the switch input puts the keyer in a speed-adjustment mode. The RockMite outputs a Morse code S to acknowledge entry into this mode. Tapping (or holding) the dot paddle speeds up the keyer, the same operation on the dash paddle slows it down. The default (power-up) speed is approximately 16 WPM and the speed range is about 5 to 40 WPM. If no dot/dash inputs are received after about 1 second, the RockMite outputs a lower-frequency tone and reverts to normal operation. The Morse S and subsequent tones are not transmitted on the air.

The idea of a transceiver whose only control is a pushbutton switch probably flies in the face of recent trends in transceiver design. If you feel the need to "manage" your radio, resistor R5 may be replaced with a 1 MΩ audio taper potentiometer (wiper and one end-terminal used) to serve as a volume control. Figure 3 shows the RockMite packaged in a commercially available enclosure.

Does It Really Work?

The receiver is direct-conversion, so the audio you hear is busier than what's typically found in a big rig. There's some audio low-pass filtering, but it still doesn't have the sharp roll-off characteristics prevalent with crystal IF filtering. Because the D-C receiver receives both sidebands equally well, there are twice as many signals as you'd expect of a more capable receiver. Once you get the hang of selecting which of the two operating frequencies to call someone on, the operation is pretty straightforward.

Other Frequencies

The RockMite became practical because of the economics of purchasing crystals in large quantities. Changing the RockMite frequency is a matter of replacing the two (identical) crystals with frequencies of your choosing.[3] If you change bands, however, the output harmonic filter and C10/C11 must be scaled accordingly and the value of Zener diode D5 may need to be changed to adjust the TR offset. Modification information is maintained at the URL listed later in this article.

Did I Mention "Innocently"?

This project started out as a party favor and indeed, it was initially dubbed "a wireless code practice oscillator"—somewhat tongue-in-cheek. Once the first samples were available, it became clear that the RockMite was a usable radio. Seabury Lyon, AA1MY, wrote:

> That first night thriller of real operating with the RockMite was on 7/11/02 on 40m; G3JFC, Brian; 559 him, 339 me. That set the tone and high expectations for many fun evenings later on when the "starter batch" of 'Mites began to multiply. In early August, KD1JV and NØRC floated the idea of a "Mite Nite." Starting on 8/7/02 I worked between eight and 22 stations per night, proving that…once you get used to it, the 'Mite really worked!

At present, the distance record with the 20 meter version is held by Jerry Brown, N4EO, with a contact from his home in Columbia, Tennessee, to Dunedin, New Zealand—a distance of 8485 miles.

Much of this success can be attributed to the QRP community's use of 7040 kHz (and 14,060 kHz for 20 meters) as a watering hole. Many QRPers monitor those frequencies when they're in the shack and your chances of success with a "CQ" are surprisingly good. That 40 meter frequency (7040 kHz) is used by QRPers here in North America (it's 7030 kHz in Europe) and 14,060 kHz is used universally on 20 meters. Needless to say, the RockMite has caught on like wildfire! As of this writing, about 1000 have already been assembled by builders of all ages.[4] There's even a great Web site maintained by Rod Cerkoney, NØRC—a gallery of construction pictures, modification information, links and related topics. See **www.qsl.net/n0rc/rm/**.

Acknowledgments

A special thanks to Doug Hendricks, KI6DS, for his material support with this project and to Rod Cerkoney, NØRC, for his enthusiastic Web site support. Thanks also to Steve Weber, KD1JV, for design suggestions during the development phase.

Notes

[1]W. Hayward, W7ZOI, "An Ultra Portable CW Station—The 'Mountaineer,'" *QST*, Aug 1972, p 23.

[2]D. DeMaw, W1FB, "Build the Tuna-Tin 2," *QST*, May 1976, p 14.

[3]Custom frequencies are available from International Crystal Mfg; **www.icmfg.com/**. Specify HC-49/U, 20 pF loading, 0.01% frequency tolerance.

[4]A complete kit of parts including two 7040 or 14,060 kHz crystals, PC board, all on-board parts, ICs and instructions is available from the author for $27 including shipping (US), $30 elsewhere. Specify 40 or 20 meters, and send the order to Dave Benson, K1SWL, 32 Mountain Rd, Colchester, CT 06415. The 12C508A supplied with the kit is preprogrammed. Educator/Scouting inquiries are welcomed. A European (7030 kHz) version is available from **www.qrpproject.de**.

[5]The 12C508A as available commercially is a blank (unprogrammed) device. Programmed ICs alone are available from the author for $5, including shipping. RockMite object code is available to individuals, for non-commercial use only, upon request to the author.

[6]7040 kHz or 14,060 kHz crystals (two required) are available from Doug Hendricks, KI6DS, 862 Frank Ave, Dos Palos, CA 93620, for $3 each, including shipping.

Dave Benson, K1SWL, is a frequent contributor to QST, *a QRP fan and an inveterate builder and designer. He can be reached at* **dave@smallwonderlabs.com**. QST

By Steve Gradijan, WB5KIA

Beginners' Computer Programming for Ham Radio

Part 3—Get ready to feast on the results of these programming recipes.

Personal computer programs work because programmers developed written procedures to accomplish such specific tasks as performing electronic calculations, sorting data, picking specific values out of a list and determining a satellite's position at any moment. These procedures are called *algorithms*. Algorithms are important because they describe how to do something. If you can find an explanation of how to do or calculate something in a technical book or magazine, the procedures and mathematics can be transformed into an algorithm to work with your *Delphi*, *Visual Basic* or other language compiler. If you link enough algorithms together in your program code, you have the basis for an Amateur Radio application.

Writing an algorithm is similar to developing and wiring a breadboard circuit. Good breadboard design practice leads to clean, hum-free signals, error-free operation and a successful project. Good computer-algorithm design leads to faster execution, compact applications and avoidance of compiler errors or user errors in your programs. There are many ways to place components on a breadboard and there are many ways to code a process.

Having a library of recipes, or algorithms, available makes the coding of future projects easier. It's like having an *ARRL Handbook* handy when you decide to build an electronic project for which you don't have an appropriate circuit diagram. Several algorithms specific to Amateur Radio processes are described here; they provide a basic toolbox for your coding efforts. The source code and executable files for the examples described in this article are available on the ARRLWeb.[1] When you are ready to write your own algorithms, take note of the algorithms developed by those who pioneered and wrote the classic Amateur Radio programs described in Listing 5 in the download package (see Note 1). Improve on their techniques (if you can) and adapt the algorithms they developed using the expanded functions and graphics available with modern programming tools. Add the results to your toolbox of Amateur Radio algorithms.

Some Useful Algorithms for Ham Radio

Grid-Square Locators

Articles in *QST* and *amatørradio* magazines by W1XX, N5JTY, SM5AGM and LA6PV[2,3,4] describe how to calculate grid square locators from latitude and longitude-coordinate data using various methods. The *Visual Basic* and *Delphi* code snippets in Listing 1 are the core mathematics adapted from an unsigned *BASIC* grid-square program described in the December 1984 issue of *amatørradio*. The algorithm calculates grid square locators from geographic coordinate data.

The *Visual Basic* translation of the algorithm results in straightforward code because of *Visual Basic's* flexibility in the handling of text strings that appear in the algorithm. *Delphi* string handling requires manual, helper code and results in slightly more complicated code. The *Delphi* and *Visual Basic* grid programs described later contain the full source code and provide routines to reduce user error. Error-checking routines handle the

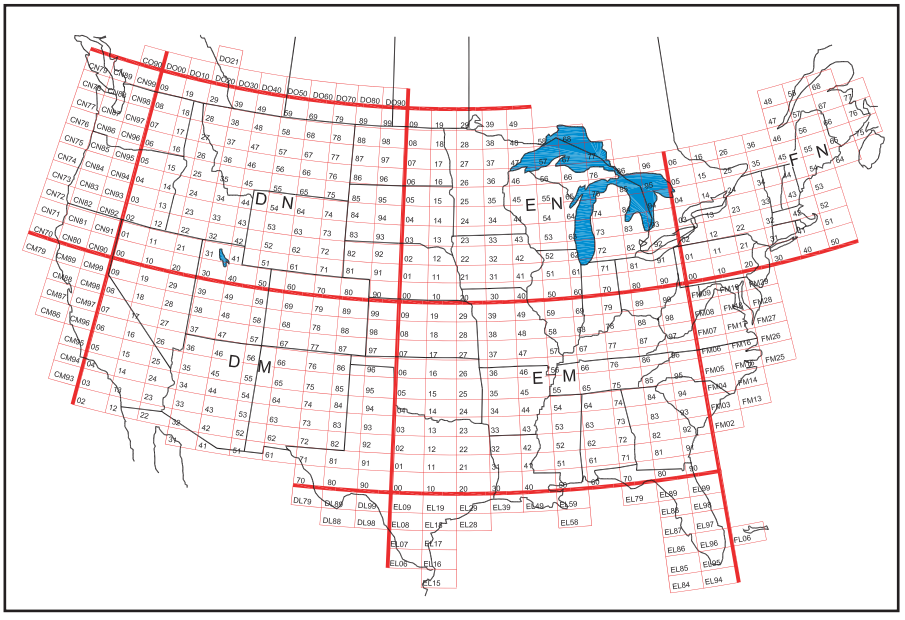


Figure 1—The grid squares shown for the United States are used by VHF enthusiasts to quickly determine locations of stations.

[1]Notes appear on page 44.

Listing 1

Algorithm to Convert Latitude and Longitude to a Grid Locator and Vice Versa
[code adapted from December 1984 *amatørradio* (p 350) *BASIC* program listing]

VISUAL BASIC

```
' Calculate the grid from latitude and longitude data
'R is the latitude in degrees, N+, S-
' P is the longitude in degrees, W+, E-
' A$ is the resulting 6 character grid locator

    P = (P + 180) / 20: R = (R + 90) / 10
    Y = Int(P): X = Int(R): P = (P - Y) * 10: R = (R - X) * 10: C = Int(P): D = Int(R)
    A$ = Chr$(Y + 65) + Chr$(X + 65) + Chr$(C + 48) + Chr$(D + 48)
    A$ = A$ + Chr$(Int((P - C) * 24) + 65) + Chr$(Int((R - D) * 24) + 65)
    A$ = A$
    Text3.Text = A$
```

DELPHI 5

```
// Calculate the grid from latitude and longitude data
// R is the latitude in degrees, N+, S-
// P is the longitude in degrees, W+, E-
// grid square is the resulting 6 character grid locator

// Delphi has different string handling capabilities from VB and requires
// different code

P := (P + 180)/ 20;
R := ( R + 90)/ 10 ;

Y := round(P);
X := round(R);
Y1 := int(P);
X1 := int(R);
P := (P-Y)*10;
R := (R-X)*10;
P1 := (P-Y1)* 10;
R1 := (P-X1)*10;

C := round(P);
D := round(R);
c1 := int(P);
D1 := int(R);

firstterm := round(y1 + 65);
secondterm := round(x1 + 65);
thirdterm := trunc(c1 + 48);
fourthterm := trunc(d1 + 48);
Ystring := chr(firstterm) + chr(secondterm)+chr(thirdterm) +chr(fourthterm);
Ystring  := Ystring+CHR((trunc((P-C1)*24)+65))+CHR((round((R-D1)*24)+65));

gridsquare := Ystring;
```

VISUAL BASIC

```
' A1$ = the grid one wants to convert to latitude and longitude
' Lb = longitude
' -La = latitude

'Calculate the latitude and longitude from the grid designation

    For k = 1 To 6
    A(k) = Asc(Mid$(A1$, k, 1))
    Next k
    La = -180 + (A(1) - 65) * 20 + (A(3) - 48) * 2 + (A(5) - 64.5) / 12
    Lb = -90 + (A(2) - 65) * 10 + A(4) - 48 + (A(6) - 64.5) / 24
    Longitude = Lb
    Latitude = -La
```

DELPHI

```
// s = the grid one wants to convert to latitude and longitude
// Lb = longitude
// -La = latitude

//Calculate the latitude and longitude from the grid designation

for counter := 1 to length(s) do
 begin
     value := ord(s[c]);
     a[c] := value;
 end;

 La := -180 +(A[1]-65)*20+(A[3]-48)*2+(A[5]-64.5)/12;
 Lb := -90 + (A[2]-65)*10+A[4]-48+(A[6]-64.5)/24;

 Longitude := FloattoStrf(Lb,ffFixed,4,3);
 Latitude := floattoStrf(-La,ffFixed,5,3);
```

The complete code listing is available at the ARRLWeb.

input of inappropriate data that could cause a program crash.

Day of Year Number

The day of year number is needed when making calculations involving the equation of time, the difference between the mean sun time and the real sun time, see Figure 6. The equation of time is used to determine the declination of the sun.

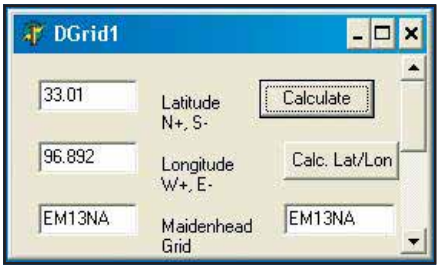


Figure 2—The *Delphi* version of *Grid Square* calculates grids from latitudes and longitudes; it also calculates latitude and longitude from grids.

Listing 2
Day of Year Algorithm in *Visual Basic*

```
' Algorithm to calculate day of
' year number

' check for leap-year
If  (Year1/4)=Int(Year1/4)Then
    leapyear = 1
End If
Select Case Month1
   Case 1
          Yday = 0
   Case 2
          Yday = 31
   Case 3
          Yday = 59
   Case 4
          Yday = 90
   Case 5
          Yday = 120
   Case 6
          Yday = 151
   Case 7
          Yday = 181
   Case 8
          Yday = 212
   Case 9
          Yday = 243
   Case 10
          Yday = 273
   Case 11
          Yday = 304
   Case 12
          Yday = 334
End Select
daynumber = Day1 + Yday
If Month1 > 2 Then
daynumber = leapyear + daynumber
End If
```

Year1 is the year in xxxx format, *Day1* is the day and *Month1* is the month. The daynumber result is the value of *daynumber*.

If the day of the year is known, it is possible to determine sunrise or sunset times or make radio-propagation predictions. The *Visual Basic* algorithm for determining the day number shown in Listing 2 will determine that 1 January 2003 is day 1, and 4 July 2003 is day 185.

Julian Date

The Julian Date is required to calculate the positions of celestial bodies or communications satellites. If you are interested in EME communications or the OSCAR satellites, you may write a program to track the moon or the satellites and find the algorithm in Listing 3 handy to get your antenna pointed correctly.

Using Lists to Enter Data from a Text-File Database

List boxes can be used to choose data from flat files or text files with a mouse click. Data stored in a file can be selected from a list box instead of entering the data into a program manually. The Listing-4 example code shows how to use a small text-file data set to enter location data into a *Visual Basic* program. Similar code works with *Delphi*.

A text file containing the location data is called smaloc.txt. Edit SMALOC.TXT with the *Notepad*[5] text editor or produce your own "personalized" data set for your particular needs. You can use location databases from shareware and commercial programs with the example application if those databases are in ASCII format. If the location database can be read with a text editor, you can load the files into your program using a similar code snippet. You will need to change the values in the Right, Left and Mid *Visual Basic* string handling functions to parse the substituted data set with *Visual Basic*. It might be necessary to load each piece of data separately with a comma-delimited text file. *Delphi* lacks these specific string functions; appropriate string-handling routines must be coded by hand.

The location data could also be loaded using binary files instead of a text file. The programming required to use binary files is more involved than can be described in this article. I'll put some code on **www.qsl.net/wb5kia/** if there is any interest.

Four Projects using the Algorithms

Once a sufficient toolkit of algorithms is acquired, you can combine them to code applications with more features. The source code and the executable files for four utility programs for your radio shack are available on the ARRLWeb. One project contains code that can be adapted to the projects discussed in Part 2 of this series to increase their user friendliness.

Grid Square—How to Calculate the Maidenhead Grid-Square Locator from Latitude and Longitude Coordinates

VHF enthusiasts are familiar with grid square locators (Figure 1). The core mathematics for a *Grid Square* calculation utility is based on the mathematics described in *amatørradio*, December 1984, p 350. When we link the mathematics to appropriate visual tools, the results are a utility to calculate the grid-square locator for any location. You need to know the latitude and longitude as shown in Figures 2 and 3.

Between Grids—How to Calculate the Distance between Grid Squares

The code for *Between Grids* is a combination of the code from *Grid Square* and *Bearing/Distance* programs described in Part 2. Simple error-trapping routines are included. The utility reports the distance calculated between grid-squares in kilometers. You may want to convert the output units to miles. If you have programming software, change the

Listing 3
Algorithm to Calculate the Julian Date in *Visual Basic*

```
If Month1 > 2 Then
       Month1 = Month1 - 3
ElseIf Month1 <= 2 Then
       Month1 = Month1 + 9
       Year1 = Year1 - 1
End If

partA = 146097 * (Year1 / 100) / 4
partB = 1461 * (Year1 Mod 100) / 4
partC = (153 * Month1 + 2) / 5 + day1 + 1721119
juliandate = partA + partB + partC      'JULIAN DATE
```

Year1 is the year, *Month1* is the month and *juliandate* is the Julian date.

Visual Basic Caption property of the Text3 text box to the six-letter designator representing your grid square to avoid entering your grid every time you use the program. Alternatively, create an "ini" or a text configuration file that contains your grid-square information. Put the code you write to access the text file in your program's main form loading event handler to load your call sign and/or grid locator when the program starts. The main form of the *vbgtog.exe* utility is shown in Figure 4.

Sunrise/Sunset— For any Date and Location

Sunrise/Sunset (Figure 5) simultaneously determines sunrise/sunset times for two locations. Use the calculated sunrise/sunset times as a guide for predicting gray-line propagation. The *Sunrise/Sunset* code was developed from the mathematics described in a *BASIC* program listing in *amatørradio*[5] and formula described in *Practical Astronomy with your Calculator.*[6] Several articles describe how to get started in gray-line DXing using this type of information.[8-11] Code a feature to streamline the selection of the input coordinates for both stations. A list box works well although the selection of station coordinates could also be accomplished by loading and using a database file. The procedures in the *Using Lists* algorithm described below will help you develop this code.

Sunrise/Sunset uses the equation of time to correct the sunrise and sunset times based on the day of the year. The program breaks down the equation of time into several mathematical formulas and uses the appropriate formula depending on the current day number. The resulting predictions are accurate within several minutes.

Using Lists

Using Lists (Figure 7) is an example of how to use List controls to enter data into your programs. To significantly improve the performance of several of the programs described in this series, add the code in Listing 4 or similar code and link it to the appropriate input boxes. You will also want to change the database file. Are you getting good at programming by now? I have left this implementation to you.

The *Using Lists* example works with a very small text-database file called SMALOC.TXT that it links to a List Box control. Location points can be easily added or modified in the text file using the *Notepad* editor.

Mining the Literature

Articles describing *BASIC* source code listings for ham radio were very common in the Amateur Radio press a few years ago. One would expect lots of *Delphi* or *Visual Basic* source code listings for Amateur Radio projects to follow, but few have appeared in ham radio or programming literature. Much of the number-crunching code, that is, algorithms, from the articles describing *BASIC* software code listings can be translated into *Visual Basic* or *Delphi* Object Pascal. You'll need to develop your own input/output and graphics routines, but those activities are relatively easy to master with modern compilers.

Listing 5 in the download package (see Note 1) describes articles that discuss techniques to develop computer programs related to radio propagation, satellites, finding directions, logging, CW sending by keyboard, various technical topics, station/radio control and display, Amateur Radio education and so on. When you review these articles, pay particular attention to the discussions regarding the mathematical basis for the process and the routines embedded in a *BASIC* code listing. Isolate the routines and rewrite them in your language.

BASIC language program listings are also available in books by the *ARRL, CQ Magazine, 73 Magazine, ham radio* and others. Sources of material suitable for designing computer-program algorithms include *QST*, *The ARRL Handbook*, various books and technical magazines. *BASIC* code is fairly easy to translate into *Visual Basic* and it is only a little more difficult to convert to the object *Pascal* language *Delphi* requires. Be careful

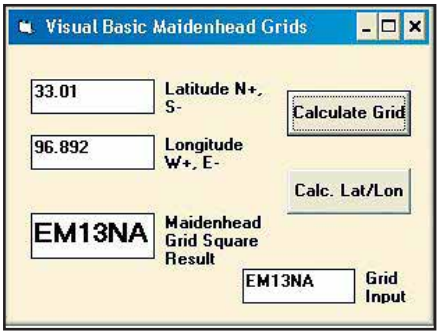


Figure 3—The *Visual Basic* 3 version of *Grid Square* looks almost like the *Delphi* version and calculates identical results although the code is different.

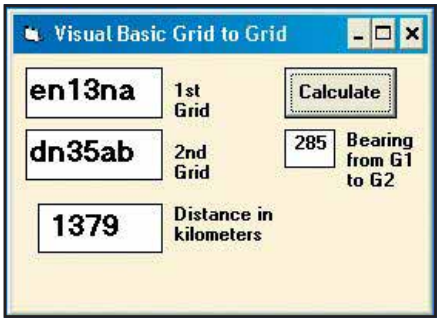
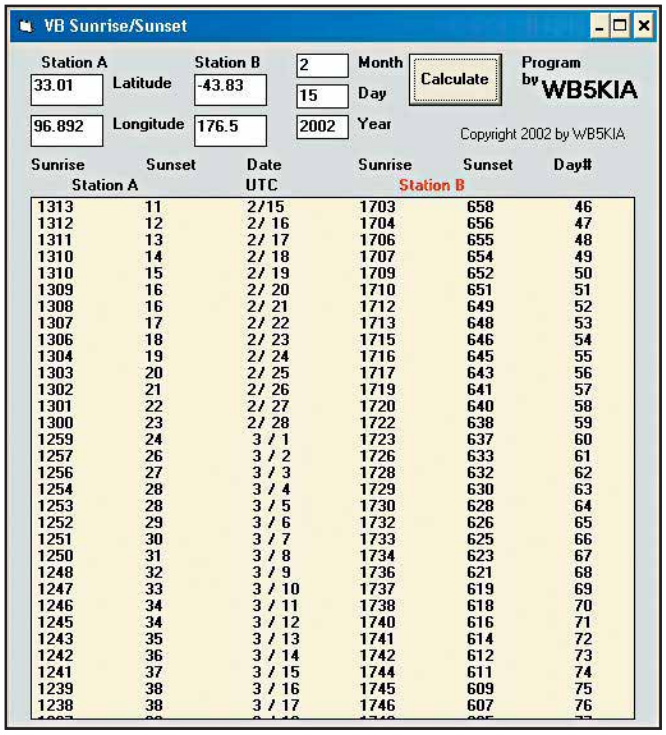


Figure 4—*Grid to Grid* is a combination of the *Bearing/Distance*, developed in Part 2, and the *Grid Square* programs in *Visual Basic*. Combining algorithms results in programs that are more powerful.



Sunrise Station A	Sunset Station A	Date UTC	Sunrise Station B	Sunset Station B	Day#
1313	11	2/15	1703	658	46
1312	12	2/ 16	1704	656	47
1311	13	2/ 17	1706	655	48
1310	14	2/ 18	1707	654	49
1310	15	2/ 19	1709	652	50
1309	16	2/ 20	1710	651	51
1308	16	2/ 21	1712	649	52
1307	17	2/ 22	1713	648	53
1306	18	2/ 23	1715	646	54
1304	19	2/ 24	1716	645	55
1303	20	2/ 25	1717	643	56
1302	21	2/ 26	1719	641	57
1301	22	2/ 27	1720	640	58
1300	23	2/ 28	1722	638	59
1259	24	3 / 1	1723	637	60
1257	26	3 / 2	1726	633	61
1256	27	3 / 3	1728	632	62
1254	28	3 / 4	1729	630	63
1253	28	3 / 5	1730	628	64
1252	29	3 / 6	1732	626	65
1251	30	3 / 7	1733	625	66
1250	31	3 / 8	1734	623	67
1248	32	3 / 9	1736	621	68
1247	33	3 / 10	1737	619	69
1246	34	3 / 11	1738	618	70
1245	34	3 / 12	1740	616	71
1243	35	3 / 13	1741	614	72
1242	36	3 / 14	1742	612	73
1241	37	3 / 15	1744	611	74
1239	38	3 / 16	1745	609	75
1238	38	3 / 17	1746	607	76

Figure 5—*Sunrise/Sunset* calculates sunrise and sunset for any two locations and date. It should be useful for hams interested in gray-line propagation. Obviously, these two stations won't make a contact benefiting by this mode's signal enhancement.

when typing the code from the paper listing. A few listings from these sources may have typographical errors introduced in the publishing process, so be cautious!

Mining the Internet

Ham-radio related *Windows* source code available on the Internet is limited, but I hope some of you programmers will soon make your source code available. Many radio amateurs and others post source code on their personal Web sites in various programming languages. Some of the code might be adapted to your use. The available source-code material is difficult to find. Words and simple phrases that help search engines find

To Run either *VBGrids* or *D5Grids* (the GRID SQUARE program)

Enter both the latitude and longitude. Click on CALCULATE GRID to calculate a grid from coordinates that you enter in the text boxes. Enter the grid designator in the block that shows the text "EM13NA" and change it to the grid you want. Click the CALC LAT/LONG button. The program calculates the latitude and longitude corresponding to the grid locator entered.

To Run *VBGtoG or D5GridtoGRID* (the GRID to GRID program)

Enter two grid designators into the text boxes. Click on the CALCULATE button to display the distance between the two grids in kilometers and a bearing from the first grid to the second.

To Run *Sunrise/Sunset* (the sunrise and sunset program)

Enter the latitude and longitude for the locations of the two stations for which you want to calculate sunrise and sunset times. The program will calculate 31 days of the actual sunrise/set times (not visual sunrise/sunset) for the two locations entered starting at the month, day and year you enter in the text box. The year is important to handle leap-year dates.

To Run *Using Lists* (the module demonstrating use of simple databases and lists)

Clicking on the LOAD DATABASE button loads the SMALOC.TXT database. Select an item from the list box with a mouse click and the data is loaded into the Label and two text boxes.

The *Visual Basic* 3 programs require the helper file, vbrun300.dll, The *Visual Basic* 5 programs require the file msvbvm50.dll. If you have the compiler, the file is already on your system. *Delphi* requires no helper.

Listing 4

Two Algorithms to use a List Box to Enter Data from a Text File Database

The following algorithms link a list box to a text file database. Put a Command button, List box, Label and two Text boxes on a *Visual Basic* form. Put the following code in the Command1 Click procedure:

```
Sub Command1_Click ()
Dim FileName, Msg, textLine         ' Declare variables.
     FileName = "smaloc.txt"        ' name your file whatever you
                                    ' call it
     'The database file needs to go in the same
     'directory as the EXE file to work properly.
     If Dir(FileName) <> "" Then    ' Check if file exists.
     Open FileName For Input As #1  ' If it does, open it.
     Do While Not EOF(1)            ' Keep looking until all the
                                    ' info is read
     Line Input #1, textLine        ' Get complete line.
     List1.AddItem textLine
     Loop
     Close #1                       ' Close file.
     Else                           ' No File
     Msg = "Could not find the Data file"
     MsgBox Msg                     ' Display message.
     End If
End Sub
```

Put the following code in the List box Click procedure:

```
For I = 0 To List1.ListCount - 1
     If List1.Selected(I) Then      'get the highlighted line
      End If
     label = List1.List(I)
     label1 = Left(label, 29)       'get the prefix and area
     lon = Right(label, 6)          'get degrees west longitude
     lat = Mid(label, 30, 7)        'get degrees north/south
                                    'latitude
     text1.Text = lon               'put in text box so it can be
                                    'used
     text2.Text = lat               'put in text box so it can be
                                    'used
Next
```

Note that Delphi comparable code is part of the source code on the ARRLWeb. Remember to download the smaloc.txt database from the Web.

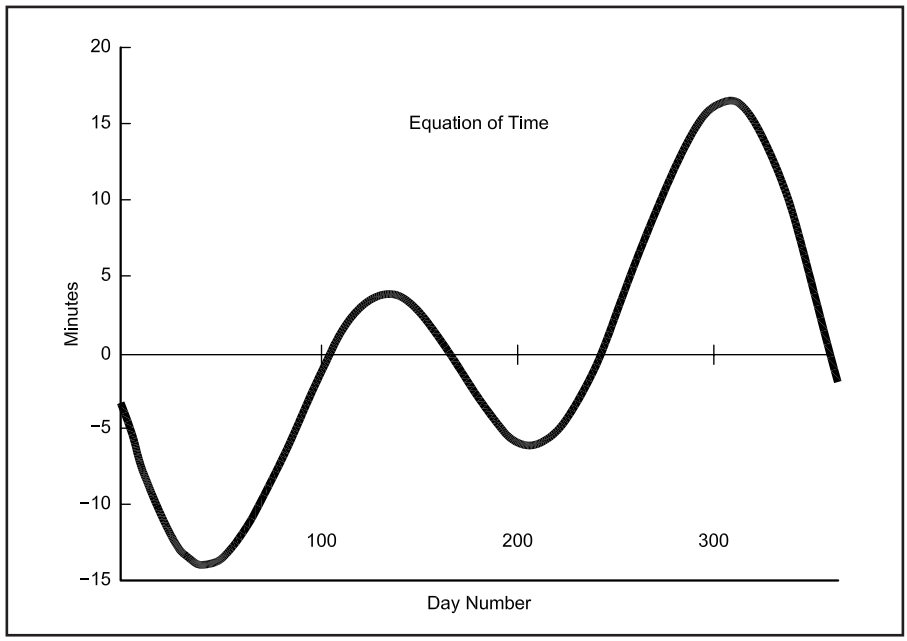


Figure 6—The equation of time is used to correct sunrise/sunset data for the time of year.

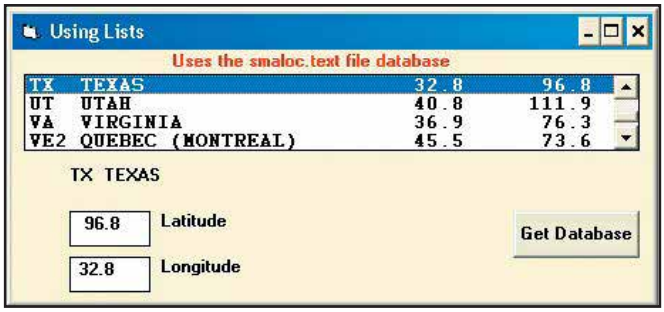


Figure 7—*Using Lists* shows one how to load a flat-file database and access the data using a list box. Add the code to other projects and avoid keyboarding location data.

source code on the Internet might include: ham, "*Visual Basic,*" "source code," *Delphi*, psk, RTTY, "Amateur Radio" and more. Use these key words in combinations to search for code.

Internet sites I found helpful were identified in Part 1 of this series. "Amateur Radio Software: It Keeps Getting Better" in the Sep/Oct 2002 *QEX* also has numerous references to sources for *Delphi* and *Visual Basic* source code projects and code snippets. An *Acrobat* file of the original article is available at **www.qsl.net/wb5kia/**.

Two very nice algorithms that *Visual Basic* programmers should have in their toolbox were developed by Brian Cieslak, K9WIS. One is a function to determine a station's country based on its call sign (*DXChecker*). The other is a series of procedures that help quickly develop a Morse memory keyer (*CwKeyer*) that will key your serial port's DTR line if your compiler has the MSComm control. Both 'algorithms' are described at **www.qsl.net/nq9rp/computerhamming.html**. The *DXChecker* code is in *Visual Basic* and is presented as a text file. The *CwKeyer* source code is provided in *Visual Basic* 3. Since Brian's VB3 forms were saved in binary form (rather than using the text option), a copy of *Visual Basic* 3 is needed to read the VB3 forms and convert them to text format. The form files then can be read using a text editor and translated to *Delphi* code or converted to 32-bit *Visual Basic*. I did the conversion to *Delphi*. Be warned: The translation took almost six hours. *Delphi*'s Case statements don't accept strings, and I had to create numerical pointers using a TStringList. Not hard; just lots of code.

If you are new to Amateur Radio and don't have a backlog of radio magazines, search the ARRLWeb archives for various projects published in *QST* and *QEX*. Go to **www.arrl.org**, navigate to the *QST* or *QEX* page and follow the link there to the download files. The Amateur Radio freeware/shareware files at **QRZ.com** occasionally include source code in the zipped packages.

When you do some interesting Amateur Radio oriented programming in *Visual Basic* or *Delphi*, share your efforts on your Web site. If you are making your application available to hams free of charge, include the source code along with the program. Your fellow amateurs will appreciate it. Web search engines will find your personal Web site easily if it is described with the appropriate HTML code. Ensure that your title page includes some of the search phrases mentioned above. Would you rather not bother establishing your own Web page? I would be glad to list your code snippets on a site created especially for that purpose by KD5HTB at **www.qsl.net/wb5kia/**.

Conclusion

If you managed to load and modify the code presented in this series, congratulations, but now it's time to start writing your own applications. Think big, start simple, elaborate on your strengths! Start building and sharing Amateur Radio software kits!

Acknowledgments

The following radio amateurs and capable programmers inspired this series with their freely available source code and tools posted on the Internet. Thanks to, in no particular order, JE3HHT, WAØTTN, N1MM, N8ME, AE4JY, G4ILO, VE3ERP, DF4OR, K9WIS/AE9K, WØDZ, AA6YQ, SV2AGW and non-ham Dave Pape.

My apologies if I haven't found your site yet. I'm grateful also to the programming pioneers who published their *BASIC* code in numerous journals in the '80s and '90s. There are too many of you old-time programmers to mention. KD5HTB developed the Amateur Radio programming Web site mentioned above. KU7G did the editing and asked the right questions.

Notes

[1]You can download this package from the ARRLWeb **www.arrl.org/files/qst-binaries**. Look for the file 0304Grad.zip.

[2]J. Lindholm, W1XX, "VHF/UHF Century Club Awards," *QST*, Jan 1983, pp 49-50.

[3]E. Tyson, N5JTY, "Conversion Between Geodetic and Grid Locator Systems," *QST*, Jan 1989, pp 29-30 and 43.

[4]SM5AGM, a BASIC program revised by LA6PV in "Avstandsberegning," *amatørradio*, Mar 1985, pp 93, 94.

[5]*Notepad* is a simple text editor that comes with all versions of Microsoft Windows.

[6]K. Arneberg, LA9YF, "Beregning av soloppgang og solnedgang," *amatørradio*, Mar 1985, pp 75-77.

[7]P. Duffett-Smith, *Practical Astronomy with your Calculator* (New York: Cambridge University Press, 1988).

[8]J. Devoldere, *Low Band DXing* (Newington, CT: ARRL, 1999).

[9]T. Russell, "An Introduction to Gray-Line DXing," *QST*, Nov 1988.

[10]K. Arneberg, "DX på lave frekvenser," *amatørradio*, Apr 1986, pp 99, 101-104.

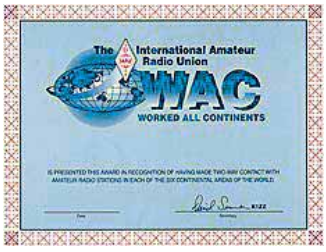
[11]T. Frenaye, "The KI Edge," *QST*, Jun 1994, pp 54-56.

A ham since 1963, Steve Gradijan, WB5KIA, holds an Extra class license. Computer programming has been his second hobby since the late '70s. He was previously licensed as WA8KBK and LAØDY. His wife Chris is WD5EML (ex-LAØDZ), and their 17 year old son Francis is KD5HTB. You can contact Steve at 1902 Middle Glen Dr, Carrollton, TX 75007-2419; **www.qsl.net/wb5kia; wb5kia@arrl.net**.

STRAYS

WAC AWARDS

◊ Sponsored by the International Amateur Radio Union (IARU), the Worked All Continents award is issued for working and confirming all six continents (North America, South America, Oceania, Asia, Europe and Africa) on a variety of different bands and modes. A 5-Band WAC certificate and a 6-Band sticker are also available. For US amateurs, cards are checked at ARRL HQ.



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NEW BOOKS

HF TRIBANDER PERFORMANCE: TEST METHODS & RESULTS

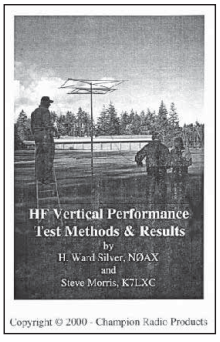
HF VERTICAL PERFORMANCE: TEST METHODS AND RESULTS

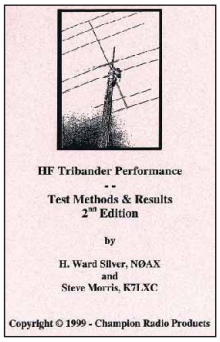
By H. Ward Silver, NØAX, and Steve Morris, K7LXC

Champion Radio Products, Box 572, Woodinville, WA 98072; tel 206-890-4188; e-mail **championradio@aol.com**; on the Web at **www.championradioproducts.com**. *Each book 8½× 11 inches, spiral bound, 63 pages with B&W illustrations. $17 each, plus shipping.*

Reviewed by L. B. Cebik, W4RNL

◊ The performance claims in antenna ads usually defy comparison. Into this no-man's land of controversy stepped Ward Silver, NØAX and Steve Morris, K7LXC, a perfect combination of antenna installation, testing and measurement expertise. They investigated multiband parasitic arrays and then turned their attention to multiband vertical antennas. Two worthy books emerged: *HF Tribander Performance: Test Methods & Results* and *HF Vertical Performance: Test Methods and Results*.





Some readers will be most interested in the results. The intrepid duo reviewed the performance of the GEM quad, the Force-12 C-3 and C-31XR, the Mosley TA-33 and Pro-57B, the Cushcraft X-9, the Bencher Skyhawk, the KLM-34-XA, and the Hy-Gain TH-7DX and TH-11. With another test protocol, they tested the Cushcraft R8, the Butternut HF6V, the Hustler 6BTV, the Force-12 ZR3, and V-3, the Diamond CP-6, the MFJ-1798, and the GAP Titan.

Equally important is the discussion of the test protocol used in each of these studies. They based each protocol on three Rs: it must be *reasonable* in both set-up and evaluation; it must be *repeatable* to encourage others to make their own measurements; and it must be *relative* to a known standard. The HF beam standard was a full-size dipole, and the vertical standard was a ¼-wavelength monopole. Throughout, the authors adhered to an over-riding principle: to be as fair as humanly possible.

Each of the main topics of the reports—the test results and the test protocol—appears in two separate sections. There is a discursive section on the test results, with full discussions, tables and interpretations. As well, an appendix lists the test results for each subject antenna. Likewise, each volume thoroughly discusses the development and implementation of its test protocol. A companion appendix provides an extended outline of each protocol element and test standard. I recommend that you read the two parts of each topic together to obtain the most complete view.

The differences in beam and vertical test protocols are reflected in the categories used to evaluate arrays. The authors conclude the HF beam study by listing high points: the biggest over-achiever, the loudest, the best front-to-back, and the most consistent across the three bands. In contrast, the HF verticals fall into niches: the all-band suburban/rural antenna, the low-band (80/40) antenna used as a back-up for the upper bands, the restrictive-covenant antenna requiring no ground screen, the apartment or townhouse antenna that permits no ground-level installation, and the portable/expedition antenna. Interestingly, virtually every one of the tested verticals has an assigned niche or two. However, a number of well-known multi-band HF beams fail to receive mention in any of the "high-point" listings.

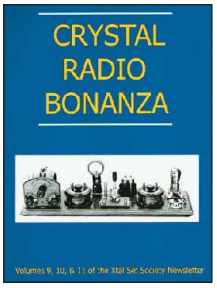
Commercial antenna designs and designations come and go, but solid test protocols are a foundation upon which future generations can build. The volumes have a permanent place on my bookshelf more for what they teach about testing antennas than for the ranking of any of the antennas tested—at least until I am in a position to upgrade my antenna system.

CRYSTAL RADIO BONANZA

Published by The Xtal Set Society, PO Box 1625, Norman, OK 73070; tel 800-927-1771; **xtalset@midnightscience.com**; **www.midnightscience.com**. *8½×11 paperback, 226 pages, B&W illustrations. $19.95 plus $3.95 shipping and handling.*

Reviewed by Steve Ford, WB8IMY
QST *Editor*

◊ The Xtal Set Society has gathered nearly three years' worth of its popular newsletter into a single tome titled *Crystal Radio Bonanza*. This compilation covers January 1999 through November 2001.



For those unfamiliar with The Xtal Set Society, this is a group of "roots radio" enthusiasts who enjoy the pleasures of building simple receivers and exploring designs that were all the rage in the early days of radio. Some authors are hams, but others are not. The theme that unites them is a love of basic—and I do mean *basic*—hands-on radio.

Despite the title of the book, not all the articles revolve around crystal radio designs. In *Crystal Radio Bonanza* you'll also find simple tube and transistor projects. How about a two-tube regen that covers 1.5 to 18 MHz?

Of course, the book contains quite a few variations on the tried-and-true crystal receiver. There are discussions and designs for optimizing the coil and capacitor tuning stages. Some of the material is surprisingly technical. There are also delightfully wacky (and I mean that as a compliment) articles such as using iron pyrite (fool's gold) as a detector and making variable capacitors out of all those abandoned AOL CDs (or any other junk CDs).

If you have a love of radio in its most fundamental form, *Crystal Radio Bonanza* is a must-have reference. Even today children are amazed by radios that seem to operate without a power source. Many adults are, too. Now where is my iron pyrite? QSTz

STRAYS

I would like to get in touch with...

◊ amateurs who are also police officers or involved with law enforcement. I am collecting uniform patches for a police support group called COPS that aids families of officers killed in the line of duty. *—Richard Silverman, K8NKB, 15216 W 9 Mile Rd, Oak Park, MI 48237*

◊ anyone who has a Dow-Key bug or who has information about them. I am writing a history of the Dow-Key Company and am doing a census of Dow-Key bugs. *—Lynn Burlingame, N7CFO/VA7CFO, 15621 SE 26th St, Bellevue, WA 98008, tel 425-641-5488, e-mail* **n7cfo@ix.netcom.com**.

By Derek Riker

Communicating with Congress

Members of Congress are very busy. You're very anxious to support legislation that furthers the goals of the Amateur Radio Service. What's an ARRL member to do?

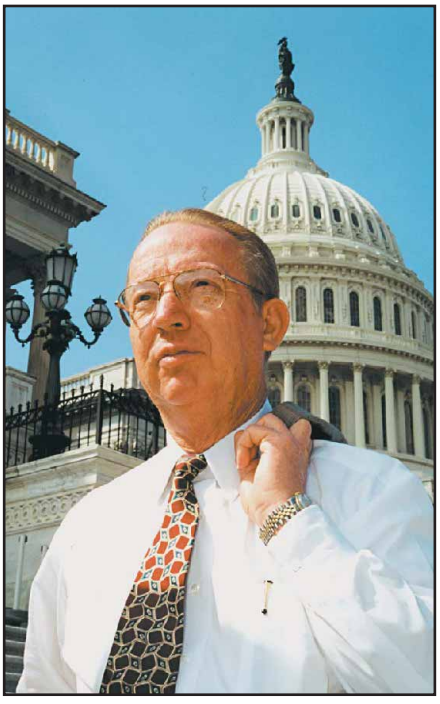
With the US Congress back in session, and Members and their staff gearing up for the usual legislative battles, now is an opportune time to review how Amateur Radio licensees can become "players" in the Washington legislative arena. By following these suggestions, anyone can make a difference on Capitol Hill without ever leaving their hometown.

108th Congress Amateur Radio Agenda

The ARRL has already been actively networking its key issues with Members of Congress and their legislative staffs throughout the early part of this year. The Amateur Radio Spectrum Protection Act has been reintroduced in the House as HR 713 and is expected to be reintroduced in the Senate. We also expect the Amateur Radio Emergency Communications Consistency Act to be introduced in both bodies of the US Congress this year. The ARRL's Washington Team of the general counsel, staff, volunteers and government relations consultants will continue to trek through the halls of Congress, increasing support for these bills and ensuring Amateur Radio's voice is heard in dozens of others. Their mission is not complete without grassroots and constituent support, however.

Your Role in Supporting Amateur Radio

Elected officials view their constituents as "resources" and want to hear from them. They need input from their constituents to gauge positions on a piece of legislation and determine how it will impact their district. It also assists in how a legislator will vote on an issue. As a licensed Amateur Radio operator, you can provide a valuable resource to your member of Congress. The insight you offer as to why a particular piece of legislation may affect hams could be the difference in whether or not the Member will support Amateur Radio.



ARRL President Jim Haynie, W5JBP, spends time in Washington, keeping FCC and Congressional staffs up-to-date on the issues of most interest to Amateur Radio operators.

Members of Congress do not have sufficient resources to allow for a full understanding of every issue that comes before them. Although they rely on staff who are tasked with monitoring specific issues, such as telecommunications, each legislative assistant has a varying degree of knowledge of these issue areas. More often than not, their knowledge of Amateur Radio is fairly limited. Therefore, your combination of being a constituent and a federally licensed operator can help make the difference in ensuring that your Member of Congress and his staff receives the balanced information they need to make good decisions on Amateur Radio related legislation.

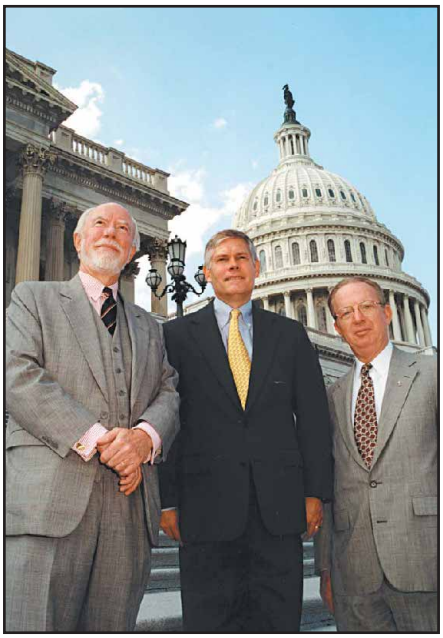
Call to Action

The ARRL will be providing its membership with timely updates on the Washington Team's progress in getting these bills introduced and moving through the legislative process. Although we will be working hard to further the Amateur Radio cause, we cannot do it alone. We need your help! Members of Congress work for you, their constituent. Your commitment to assist in the ARRL's government relations efforts is crucial to the success of our legislative agenda.

Contact Congress!

Letters and E-mails

Many people question whether there is a difference between a letter and an e-mail to a Member of Congress. The answer is no and yes. Both are treated equally as they come into the office. Postal mail is opened, scanned to identify an issue and then forwarded to the appropriate legislative staff. E-mails move through a similar manner. The difference comes in timeliness. Due to security procedures, an e-mail may arrive



This Congressman knows the issues: **Rep Pete Sessions (center), a Texas Republican, was an original co-sponsor of the Amateur Radio Emergency Communications Consistency Act. That's ARRL President Jim Haynie at the right and the Dutch Consul General at the left.**

at its intended recipient a bit quicker. More often than not, however, both of these types of correspondence generally sit on a staff person's desk until downtime hits and they have a chance to respond to them.

The following are keys to a well constructed correspondence to a member of Congress.

Remember your address: The most important, yet often most overlooked, aspect of a written correspondence to a Member of Congress (especially e-mails!) is including your mailing address. Without this incredibly important piece of information, your Member of Congress, or more likely his staff, will immediately stop reading and file it in the trash bin. With so many contrived and mass mailings these days, legislative staff only have time to address letters and e-mails that are certain to have come from their district.

Send your correspondence to the right person: When sending a letter to a Member of Congress, be sure that person represents you. Contacting a Member who does not represent you may be a bigger waste of your time than failing to include your address. Each Member of the House represents upwards of 600,000 constituents. They are not looking for any more, especially those who do not vote in their elections. If you are unsure of who your Members of Congress are, check the House and Senate Web sites (**www.house.gov/** and **www.senate.gov/**). Each site includes complete contact information for every Representative and Senator.

Beyond just ensuring that you are writing to the right person, be sure you are contacting the correct body. A Senator will likely have very little interest in a House bill that has not come before the Senate. If, for example, a bill of interest to you is pending before the House of Representatives, but no similar bill is in the Senate, feel free to contact your Senators about the issue itself. Do not ask them to support HR XXX, however, since they are not considering it.

Be brief, but not too brief: Try to be brief and organized in your letter or e-mail. You should state the issue you are writing about early in the correspondence. If you are referring to a specific bill, use the correct name and bill number. Remember to address only one issue per correspondence. Also, and this is generally targeted toward e-mailers, a one line "Vote for HR XXX" or a cut and paste of a news clipping on a particular issue is not likely to wow a Member of Congress. Most staff will not even respond to such casual requests. If a writer could not take time to tell them about an issue, they likely won't take time to respond.

Let them know your credentials: Be sure to tell the Member of Congress that you have been licensed by the federal government as an Amateur Radio operator. It will add some additional credibility to any technical aspects you may bring up in your letter. There is no need to provide an extensive resume of all of your Amateur Radio activities, however, such as your Extra Class license and ARES activities, unless it is directly related to the matter at hand. Remember—be brief.

Let them know you are a part of a larger group: Be sure to mention that you are a member of the ARRL. It is important for Members of Congress to know that you are part of a larger group that has an interest in the issue.

Be courteous and constructive: Yes, your Member of Congress works for you, but that does not mean he has to do everything for you. Do not let a Member's particular party allegiances influence how you write. Letting the Member know that you "have been a life-long supporter and contributor to his party" will not likely gain you any extra favors. More importantly, though, telling the Member you are opposed to their political thinking may lead you to the bottom of her "to do" pile. Express strong support for your position, but do not threaten. If you know the Member is opposed to your position, suggest a compromise instead.

Say thank you: If your Member of Congress has agreed to support your request, feel free to send a thank you to acknowledge this. Too many people forget that this is a relationship; you cannot keep asking them to do something for you if you don't make the effort to respond when the Member commits to supporting Amateur Radio.

One final thought on letters and e-mails. Members of Congress are impressed by large volumes of mail from their constituents on a particular issue. They are decidedly not impressed by 300 copies of the identical letter, however. If you choose to use a sample letter, be sure to personalize it in some way.

Phone Calls

Speaking directly with a legislator may not be feasible, especially if you do not have a prior personal relationship with him or her. Making a phone call to their office can be an important first step, however.

Whom to speak with: Begin by establishing a relationship with the staff person who deals with your issue. In this case, ask for the person on staff who handles telecommunications or FCC issues.

Be ready to talk: Some people get a

What the Bills Would Do

The Amateur Radio Emergency Communications Consistency Act would require private land-use regulators to "reasonably accommodate" Amateur Radio antennas consistent with the limited federal preemption known as PRB-1. PRB-1 now applies only to states and municipalities.

The measure contains but one sentence: "For purposes of the Federal Communications Commission's regulation relating to station antenna structures in the Amateur Radio Service (47 CFR 97.15), any private land use rules applicable to such structures shall be treated as a state or local regulation and shall be subject to the same requirements and limitations as a state or local regulation." Although the bill died in the House during the last session, it is expected to be reintroduced in both the House and Senate this year.

The Amateur Radio Spectrum Protection Act would require the FCC to provide equivalent replacement spectrum should it ever be necessary to reallocate Amateur Radio frequencies for some other purpose. Similar bills died in the House and Senate last year, as Congress was preoccupied with other matters.

little stage fright when put on the spot. Staff has very limited time, even for constituents, to focus on an issue. Tell them who you are and that you are a constituent and licensed amateur, why you are calling, a brief background on the issue and why you are urging their boss (the Congressman or Senator) to support it.

Don't be discouraged: If you are unable to speak with the Member or staff person, leave a message. Members in particular but also their staff are extremely busy and you should not feel offended in the least. Give the staff person a few days to return the call. If you don't hear back, try again. Use your best judgment in deciding when too many messages are enough.

Follow up but don't become a pest: Follow your phone conversation with a letter detailing your position and expressing your appreciation. You should feel comfortable calling the staff person in the future, but their time is limited and you should not call every time something small arises. If you have valid issues to discuss, a good rule of thumb is one phone call every six months.

Personal Visit

One of the best ways to make a meaningful and lasting impact with your Member of Congress is to meet with them personally. Your congressional representatives likely spend at least a few weekends back in the state and district each month. During certain parts of the year, Members of Congress have an extended opportunity to work out of their home (state and district) offices. Unlike "meet and greets" during your family trips to Washington, DC, this is a real opportunity to get some quality face time with your elected officials.

Make an appointment in advance: Call your Senator or Representative's office and ask his or her staff about the possibility of setting up a meeting. Let them know what your issue is and signal to them that you will keep the meeting brief. Be patient and open to scheduling an appointment several weeks in advance.

Participants: You should certainly feel comfortable meeting on your own; however, if it would make the situation more relaxed, arrange to bring one or two other individuals with a similar interest in your topic to the meeting. Avoid walking in with a large group, however; it may be distracting. One or two people should be sufficient to deliver your message.

Have a plan: In advance, know who will speak and how you will approach the legislator. You should be brief but concise in your issue. Having a handout with some key bullet points will help the legislator focus and understand the issue. Members of Congress and their staff are usually inundated with material that is hard to follow and never gets read. Do not offer something that will not be useful. Make your material stand out. If you need some assistance in developing a handout, contact ARRL Headquarters for assistance. Try to keep the meeting focused as well. Legislators are very busy and will appreciate a well-timed meeting.

Jim Haynie paid a visit to Rep Greg Walden (R-OR), WB7OCE, recently. The other ham currently in Congress is Mike Ross (D-AR), WD5DVR.

Get an answer before you leave: At the conclusion of your meeting, ask your legislator for their stance on your issue.

When meeting in person with your elected officials, do not be nervous or intimidated. You are certainly going to be offering them a great deal of education on the subject of Amateur Radio, and they will likely look forward to learning about its importance.

Keep the ARRL Informed

Whenever you make a contact with a Member of Congress or their staff, be sure to keep the ARRL informed. As legislative issues begin to move on Capitol Hill, information will be provided to you as to how to best communicate with your contacts. By copying your letters and e-mails to ARRL Hq (Government Relations, ARRL, 225 Main St, Newington, CT 06111; **govrelations@arrl.org**), we can ensure that the correct staff receives your correspondences in a timely manner. In addition, relaying responses that you may have received, either written or personally, on the requests for support you have made, help the Washington Team develop a more precise agenda as to who needs to be contacted and targeted for supporting Amateur Radio.

Amateur Radio Ambassador

As you can probably imagine in just your own interactions with friends, coworkers and neighbors, trying to describe the intricacies of Amateur Radio can sometimes be a challenge. When you hear "Yagi" you think "antenna." On the other hand, most people probably think of a cartoon bear robbing picnic baskets. Technical equipment and operating issues that are the everyday norm for a ham may never register on the radar screen of a Member of Congress or their staff. Remember that whenever you speak with elected officials or their staff, you are serving as an ambassador of Amateur Radio. These people will be looking to you for guidance on ham radio issues as much as you will be looking to them for their support.

Be patient in serving as a resource. Every contact a ham makes with a Member of Congress and their staff is another step toward furthering Amateur Radio's agenda on Capitol Hill and defending it in the legislative arena.

Derek Riker is Vice President, Government Relations for Chwat & Company, Inc, in Alexandria, Virginia. Chwat & Company represents the ARRL on Capitol Hill as part of its Washington Team. The author can be reached at Chwat & Company, Inc, 625 Slaters Ln, Ste 103, Alexandria, VA 22314; tel 703-684-7703; **derek.riker@chwatco.com**.

FEEDBACK

◊ In "The Doctor is IN" [Mar 2003, p 56], the photo captions are missing. The top left photo is Figure 2A, the top right is Figure 2B, the bottom left is Figure 3A and the bottom right is Figure 3B. The captions should read as follows:

Figure 2A––Modulation (square-wave) that results from an unfiltered key line.

Figure 2B––A shaped and filtered square-wave keying signal.

Figure 3A—Key clicks caused by unfiltered keying result in a wide noise spectrum.

Figure 3B—A filtered keying line reduces these spurious signals noticeably.

◊ In the "Hints and Kinks" column [Mar 2003, p 67] the caption for Figure 2 should read "A pair of finished termination resistors."

By Clay McClendon, W5ACS

Mississippi Club Loads Up Brooklyn Bridge

Why? Because it was there!

One of the best reasons to belong to a radio club is to go out and play with people who like to play with radios. The latest game the Mississippi Coast Amateur Radio Association played was to use an abandoned steel truss bridge as an antenna. It started as a joke, and like most unusual ideas, soon grew. It was simple to take a bizarre idea and actually do it—with the right help, occasional encouragement and an ability to ignore disbelief.

The first concern was who could do this. Obviously a wide variety of abilities was required. Clyde, W5CR, had experimented with antennas for years, although not bridges. Don, W5DJW, was a former air traffic controller who had an HF portable rig, in case we found some way to match impedances. Norm, WB4YBY, an electronics engineer, knew what he was doing. This was considered useful, although a bit odd. The author could get the use of a building in which the group could bunk for a weekend. Mike, KA8JRM, was an experienced operator and a Navy chaplain. We surely would need him in one capacity or the other.

We already had the bridge. When a new bridge was built across Black Creek at Brooklyn, Mississippi, the existing steel truss bridge was left in place to carry utilities across the creek. We made a trip to the site and found no sign prohibiting the use of the bridge as a radiator. The roadway had been removed from the ends, but a short ladder would allow the group to climb onto the deck. Since this was also a canoe landing, we had road access right to the bridge and wouldn't have to carry equipment far.

We Contest by Night and Bridge by Day

We then had to decide on a date. We had been running radio demonstrations at a Boy Scout camp a few miles from the bridge for several years, and had strung a loop for 160 meters over the parking lot for an SSB contest last year. We decided to do both at the same time. We were allowed the use of a building from which to operate and another building in which to bunk. We could "contest" at night and "bridge" during the day. All we had to do was to agree to another demonstration at the camp in the spring.

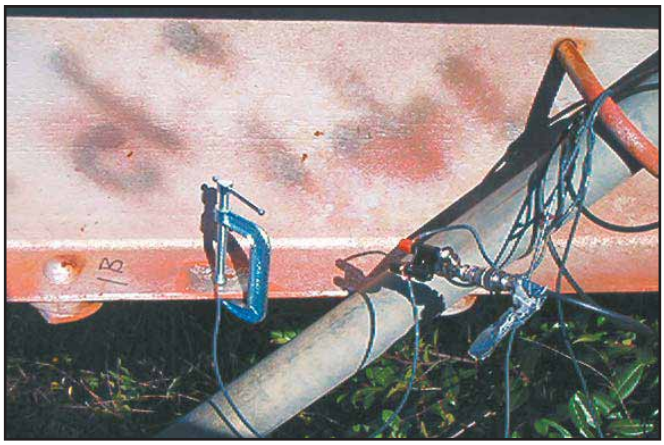
Since none of us had previous experience loading a bridge, we spent some time going through all the antenna books and articles we had. Sadly, none really addressed our situation. We then asked the old-timers how to do this. Once they quit laughing, they told us it could be done, but none were sure how. We at least had a variety of different approaches to try. Finally, Pat, W5THT, told us we could delta-match the bridge. This seemed the best approach to us. It at least had the virtue of simplicity. Since Norm had access to a mysterious piece of equipment called a network analyzer, he told us if we kept attaching wires at different places he could quickly tell us the impedance at different frequencies. Surely, we could find an impedance we could match with a tuner in some amateur band.

We now had enough in place to think we could succeed. We decided that a goal was necessary. One contact would define success.

As the date approached we gathered equipment, and made innumerable drawings and checklists. The weekly club meetings at a restaurant became devoted to this project. Several bundles of napkins were used for sketches. Everyone present

Our antenna spans Black Creek in Brooklyn, Mississippi.

Clyde, W5CR; Don, W5DJW, and Norm, WB4YBY, determine that the Brooklyn Bridge can be loaded—thanks to the network analyzer.



Two views of how we loaded up the unusual radiator.

Mike, KA8JRM; W5CR; W5DJW; WB4YBY and the author set up the station for the contest.

was interested, although not all wanted to be associated with our wild idea.

We Press Ahead

Finally, the time came. With the customary attitude of loading the checklist equipment first and then loading everything else we could think of anyway, we headed for the woods. We set up for the contest Friday night, incidentally providing a close station for that one contact, just in case. We spent Friday night on 160. We were really not contesters, but we had a good time and will be better next time.

The local hams had invited us to have breakfast with them Saturday morning. We explained what we were trying to do and they did not know what to say. Finally one said we were doing something from the old days—there was no reason to do this, there was no real value, no one knows how to do it—but why not try to do it anyway.

Saturday afternoon we headed for the bridge. Since electronics was Norm's field, he took the lead. He insisted on doing things in a logical and organized fashion. Since we all have our failings, and the rest of us had no idea of what to do, we let him have his way.

We first marked several locations on the bridge. With Mike connecting leads to different locations and Norm running the analyzer, we soon had a record of impedances at different frequencies at several locations. We found locations with impedances we could match on several bands. We then photographed the connection points and sketched their locations. We made a record of what we did. We had moved from a wild idea to an *experiment*.

It was now late in the afternoon. We decided to check into the 75-meter Mississippi Section Phone Net. Since it was well before the start, we called CQ, but received no reply. Actually, we didn't even hear anyone on frequency. Clyde and Clay went back to the camp. It seemed that a contact with the camp station might be our only contact and we wanted to make it. We would surely be talked about (some more) and wanted something to brag about.

Success!

Once at the camp, they tuned up on the net frequency. A short call brought a response. We had succeeded. Expecting at least a short conversation, Clyde and Clay were surprised when Don only said he heard them. It seems he was more concerned with explaining our activities to the deputy sheriffs who had arrived on site. He explained that we were amateurs; Norm explained what we were trying to do, and Mike tried to look innocent. Once a few explanations were made and accepted, if not believed, we were free to continue. When the net started, the "bridge portable" checked in and received signal reports from the farthest reaches of the state. We had succeeded beyond our wildest hopes.

After packing up we drove into town for supper and discussion. It was decided that a great day was ending. We had taken a wild idea, researched it, planned an approach, successfully implemented it, kept a record and even avoided arrest. Since this worked, we made plans to do more. Maybe someday you will contact us and talk to the Brooklyn Bridge.

Photos by the author.

Clay McClendon was first licensed in the'60s as WN5IID and later WN5EIN. Thirty years later he earned KD5BEG. His current call, W5ACS, was held by the ham who taught him code when he was 10 years old. Clay, who enjoys giving demonstrations and working with antennas, is an instructor at Mississippi Gulf Coast Community College. You can reach the author at 1709 22nd St, Gulfport, MS 39501; **w5acs@arrl.net**.

By Sheldon L. Epstein, K9APE

Winning the Tower Battle in Park Ridge, Illinois

Defending a zoning application for an antenna support structure can be difficult when faced with neighbors and municipal officials who are unfamiliar with Amateur Radio. Carmen Ambroggio persevered in the face of these difficulties—and won.

Carmen Ambroggio, WA9GFP, and his brother built a successful machine tool business. Carmen and Marie, his wife, raised their children and did all that was expected of them. With the sale of the business, it was time for Carmen to retire and spend more time with his favorite hobby.

Carmen and Marie decided to move so that they could be closer to their daughter and grandchildren. They found a house in the Michaeljohn subdivision of Park Ridge, Illinois, that they liked. Before he signed a contract to purchase the house, Carmen went to City Hall to ask about Park Ridge's zoning ordinance. He was given a copy, which states, in part:

- All antennas shall be approved by the Planning and Zoning Commission,
- All antennas shall be designed, constructed and located so as to be as small and inconspicuous as possible, and
- No ground-mounted antenna shall exceed seventy-five feet in height.

That looked good to Carmen.

Just to be on the safe side, Carmen sent the City a letter in which he described his plan to build a 21 to 54-foot retractable tower and cubical quad antenna. The City replied with its letter telling him he could do so providing he complied with the zoning ordinance. Carmen and Marie then purchased their house in January 2002.

Carmen next went to City Hall with his building plans, stress analyses, professional engineer's report and application for a building permit. The City promptly placed a large sign on his front lawn advertising that he had requested a zoning hearing and scheduled his application for the August 2002 meeting of its Planning & Zoning Commission.

The Neighbors Protest

Upon learning of Carmen's plans, some of his immediate and not-so-immediate neighbors began organizing a protest. They sent letters to the Commission and testified at its August meeting. Their principal objections were (1) radio and telephone interference, (2) appearance and adverse impact on property values, (3) safety and (4) effect on cardiac pacemakers. Despite its staff recommendation that Carmen's site plan be approved, the Commission deferred action until its September meeting.

Carmen Ambroggio, WA9GFP (left), and his attorney, Shel Epstein, K9APE, after winning tower site approval from the Park Ridge Planning & Zoning Commission.

Carmen asked the ARRL for advice and assistance. ARRL recommended that he retain an attorney selected from the ARRL's Volunteer Counsel list, which is on the Internet at **www.arrl.org/FandES/field/regulations/local/vci.html**. Carmen called me, and I agreed to represent him for an hourly fee.

My first act was to file an eight-page brief with the Commission. This brief included a short résumé of my qualifications as an Electrical Engineer, Amateur Radio Extra Class licensee and attorney, an abstract of the history of Carmen's application showing that he had complied with the zoning ordinance and a rebuttal to the neighbors' arguments. The rebuttal emphasized that FCC regulations prohibit municipal regulation of Amateur Radio transmission based on interference concerns, that nobody ever received a reduced property tax assessment because a neighbor had an Amateur Radio tower and antenna, that Carmen had produced plans stamped by a Professional Engineer showing that his proposed commercially built antenna is safe and that implanted cardiac pacemakers are required by the FDA to be immune to RF interference. This last information was provided by Dan Kamm, K9JPB, a Registered Professional Engineer specializing in medical devices.

The September Commission meeting did not go well for Carmen and me. His neighbors were well organized and presented to the Commission letter and testimony arguments. They contended that Amateur Radio is a plaything, that Amateur Radio no longer serves the public interest in emergencies because everyone

has a cell phone, that Amateur Radio operators are not permitted to charge for their services and therefore the neighborhood should not be burdened by their operations, that the proposed antenna is an "Erector Set" lacking mechanical strength, that the proposed antenna is not inconspicuous, that Carmen did not consider a smaller or lower alternative antenna, that the FCC's PRB-1 ruling does not apply, and even if PRB-1 did apply, it is not recognized by the courts. They even contended that subdivision deed restrictions prohibited towers, even though there were no towers.

The Commission gave Carmen and me an alternative of deferring a vote until its October meeting, which we accepted in the face of a certain denial at the September meeting. The Commission also ordered its staff to obtain a report from the City Attorney on controlling law and a report from Northwestern University Prof Allen Taflove, WA9JLV, on whether there was a better or smaller alternative tower and antenna.

We "Work All Park Ridge"

My first thought was to rally support of Park Ridge Amateur Radio operators. I downloaded the FCC license list from the ARRL's Web site and wrote a *C#* program to convert the list to label-printing format. Carmen sent a letter to 103 of his Amateur Radio neighbors (10 were undeliverable). That produced only a handful of responses, most of which wished us luck and told us that the author was afraid to say anything in public for fear of retribution from neighbors or the City.

Plan Two was then initiated to "Work All Park Ridge." Carmen and I drove to every licensee site and took a photograph of each of the 20 Amateur Radio antennas that we found. We sent a second letter to Park Ridge amateurs containing the addresses of the 20 antennas and again asked that they attend the October Commission meeting and testify. That brought a big response and it was positive.

The October meeting opened with about 15 Park Ridge amateurs and a smaller number of objecting neighbors in attendance. I had submitted a full brief to the Commission and supplemented it with a 65-slide presentation comprising pictures and addresses of each of the 20 Park Ridge amateur antennas. We also retained a court reporter to record all of the testimony and deliberations.

My argument rebutted all neighbor allegations and showed that Amateur Radio antennas were well accepted in Park Ridge. My pictures also illustrated that Carmen's antenna would not be the biggest or tallest amateur antenna in the City. Having searched City records, I was able to state that there was no instance of the Commission ever having refused approval of an amateur antenna that complied with the zoning ordinance.

The Commission then directed its attention to Prof Taflove's report, which was based entirely on ARRL publications. Prof Taflove recommended an A3S Yagi at 35 feet. This would require a 10+ foot guyed tower section on the roof that would not have cleared surrounding trees. Prof Taflove's recommendation clearly was not acceptable to anyone and I was left with the opportunity to explain why Carmen's proposed antenna was superior to all alternatives offered by Prof Taflove and objecting neighbors (attic, vertical and flagpole antennas).

Next, argument turned toward interpretation of the City Attorney's report. The City Attorney stated:

> For better or worse, the objecting neighbors have rather missed the point in this discussion. This isn't an issue of whether the imposition of City regulations is in compliance with FCC requirements. The point is that the City has adopted regulations with which the applicant is willing to comply. . . . Neither the staff nor the Planning and Zoning Commission, nor the City Council have the jurisdiction to deny an application that is in compliance with our rules.

On December 19, 2002, Carmen Ambroggio, WA9GFP (left), and Joe Herreweyers, N9EMC, watched Joe's Satellite-By-Choice workers place finishing touches on the concrete and steel base for Carmen's 54-foot retractable tower.

Need Assistance?

If you're looking for some help with your attempt to install an Amateur Radio antenna structure, there's good news. You can find the help you need in two places: the ARRL Volunteer Counsel (VC) program and an ARRL book and CD devoted to the subject.

The ARRL maintains a list of attorneys who are capable of representing amateurs involved in antenna disputes. There's more about the VC program on the ARRLWeb at **www.arrl.org/FandES/field/regulations/local/vci.html**. Securing counsel is encouraged, as zoning codes vary widely and each situation is slightly different. The process can be lengthy, the amateur must be prepared to stay the course, and trained counsel can familiarize the amateur with the process.

Antenna Zoning and the Radio Amateur (**www.arrl.org/catalog/?item=8217**) is a comprehensive resource for hams and their attorneys. It includes a discussion of previous successful cases, tips on how to prepare for a hearing and a CD with case law, customizable forms and additional legal reference material.

Victory!

That did not satisfy some Commission members, who believed that the Commission was not limited to making only a judgment on whether a proposed antenna location was the most inconspicuous. After two hours of argument and deliberation, a vote was taken and the result was 5-2 in favor of approving Carmen's application. Once the building permit was issued, construction on the tower base began.

The question of Amateur Radio antennas in Park Ridge has been resolved for Carmen but it may still be open for other amateurs. One alderman has promised to bring the question before the City Council for review. Park Ridge amateurs should check the City Council's agenda regularly at the City's Web site at **www.parkridge.il.us** and be prepared to defend their operating rights.

In closing, a reporter for the Park Ridge *Herald Advocate* was correct in quoting me as saying, "Civil rights has benefited in Park Ridge. I'm proud to be Ambroggio's attorney and I want to thank all the ham radio operators for coming tonight."

Shel Epstein is a graduate of MIT and Columbia Law School and operates a private practice. You can contact the author at Law Office of S. L. Epstein, PO Box 400, Wilmette, IL 60091-0400; **shel@k9ape.com**.

By Jennifer Hagy, N1TDY

Spreading the Word

Volunteers drive the efforts to tell the world about all the good things hams are doing. You can be one of them!

Most of us "on the inside" are well aware of the many great things ham radio offers today, from first-rate public service capabilities to the sheer excitement of making contacts around the world. But what about the people in your community, including your immediate neighbors? Do your town officials know anything about ham radio? The next time you want to put up a tower or host Field Day on the green, having people in the community informed about ham radio could help your cause immensely.

This is where the power of public relations comes in. Building positive awareness of ham radio, whether it's through giving a talk to a Rotary group, or getting a newspaper article published, goes a long way in educating people about the many aspects of Amateur Radio today.

Getting the word out is also important when it comes to the League's work in Washington. When a member of ARRL's Washington team walks into a congressman's office with a newspaper article documenting that hams in his district helped during a recent emergency situation, that certainly sends a message. And it's quite possible that the story wouldn't have been told if a local PR volunteer didn't take the initiative to collect the facts and contact a reporter.

Promoting ham radio is a continuous effort at ARRL Headquarters, but it's a big job, and we're very fortunate that we don't have to go it alone.

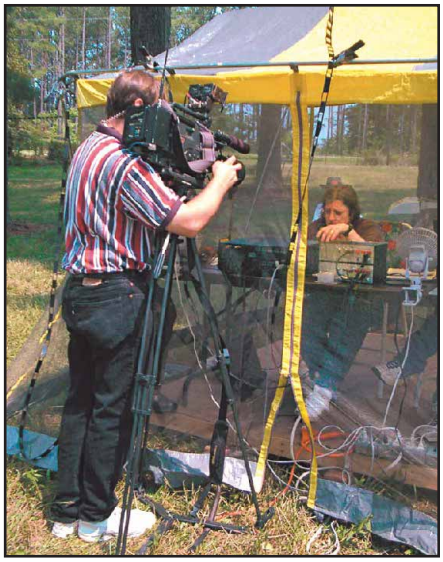
ARRL's Eyes and Ears "in the Field"

ARRL's Public Information Coordinators (PICs) and Public Information Officers (PIOs) are a vital part of the League's grassroots network. The PIC is a section-level official appointed by the Section Manager (SM). PIOs are appointed by the section PIC, with the approval of the SM. These are the men and women who help put Amateur Radio on the map in their states and local communities by initiating publicity and activities that get ham radio into the public spotlight. They serve as official contacts for media inquiries, and often assist the HQ media relations office when a reporter is interested in the "local angle." When they're not drafting press releases, you might see them at Field Day answering visitors' questions, or setting up a display at a library or another popular public spot. It's all about getting the word out, and letting people know that Amateur Radio is very much alive and well in the 21st Century. And, as ARRL member Jim Bassett, W1RO, recently commented, "If we don't teach them (non-hams) about ham radio, who will?"

GARY PEARCE, KN4AQ

A young visitor stops to see all of the places the Raleigh (NC) ARS group contacted during Field Day.

GARY PEARCE, KN4AQ



ABC affiliate WTVD covers the RARS Field Day event.

Success Stories

Promoting ham radio isn't always an easy task. It often takes time, practice and a bit of patience to see the effort pay off. Once it does, though, what a difference it can make!

Field Day is traditionally one of our best opportunities to showcase Amateur Radio to the media and the public. According to North Carolina PIC Gary Pearce, KN4AQ, the Raleigh Amateur Radio Society (RARS), has always gotten good publicity during Field Day, but in past years, the club has been somewhat out of the public view. For the group's 2002 event, Pearce decided that setting up on the grounds of the state capitol sounded like a good idea, so he went to work. After going through the proper channels, RARS was given the green light.

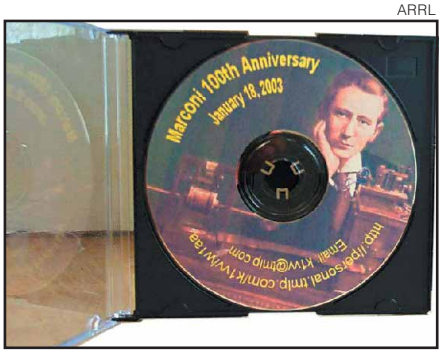
Pearce sent out the usual round of press releases, made the appropriate follow-up calls and received the "usual expressions of interest but no promises" from the local paper and television stations. Turns out that on Field Day weekend, RARS was visited by two of the local TV stations. One came because of the press release, he said, and the other crew happened to be passing by and grew curious about the activity on the capitol lawn.

The 2002 setup definitely turned out to be a success in terms of getting the group out in front of the public. Pearce reports that he hung signs on the doors to the operating tents explaining Field Day and Amateur Radio. Fellow club member Dick Orander, KD4ISC, hung up

ARRL

Carl Aveni, N1FY, is interviewed by Marshfield, Massachusetts radio station WATD at the KM1CC special event station.

ARRL



Bob "Whitey" Doherty, K1VV, scored a lot of media hits by mailing this CD to media outlets prior to the Marconi anniversary celebration.

You're Not Alone

So, you've signed on to help with Amateur Radio public relations. Now what? You don't need a degree in public relations or communications. You don't even have to know how to write a press release—at first. The League offers a variety of tools to assist anyone with an interest in getting out there and spreading the good word about ham radio.

- **PR Department Web Page**

This is your source for up-to-date information to assist you with your PR efforts. We offer "backgrounders" on ham radio that you may include in your press kits, or use as a basis for your own background handouts. You'll also find sample press releases for Field Day and other ARRL-sponsored events, information on ham radio public service announcements and more. Visit **www.arrl.org/pio** and see what we have to offer!

- **PR Reflector**

ARRL's PR Reflector is an on-line forum designed for PICs, PIOs and anyone with an interest in Amateur Radio public relations. Participants include League appointees, club PR volunteers, some League officials, and a lot of talented hams who work in public relations or the media. This is the perfect place to ask a question or share recent PR successes and challenges. To sign up, simply send your name, call and e-mail address to Media Relations Manager Jennifer Hagy, N1TDY, **jhagy@arrl.org**.

- ***"Contact!"***

Contact! is a monthly on-line newsletter with tips and articles to help you get the most mileage out of your PR efforts. The newsletter can be found on the PR Department Web page.

- **PIO Handbook**

ARRL's *Public Information Officer Handbook* was updated and largely rewritten by members of the national PR committee in 2002. This comprehensive document delves into just about every aspect of public relations or media relations that you're bound to encounter. Look for a chapter that interests you, or download the entire document at **www.arrl.org/pio/handbook**. Chapter 1 does a nice job of covering the basics of public relations and why getting involved is so important.

a map so the group could place stickers on the states they worked. Pearce also said, and this is the perfect job for a local PIO, that they had hams available to walk around and talk to visitors.

"If you have the manpower and the interest, the rewards of doing Field Day in full public view are as great as seeing your score posted at the top of your category," said Pearce.

Last year, Parke Slater, N4KFT, and a few area hams planned a "mini-DXpedition" to a remote island on Virginia's Chesapeake Bay. The plan was to operate from the location in hopes of helping the county bring attention to the New Point Comfort Lighthouse, a 197-year-old structure ravaged by time, vandals and the sea.

While the focus of their event was to perform a public service, the group quickly realized the potential to get some positive press for ham radio too. And that they did.

With support from the local historical society, and others, the group was ready for the special K4L event, and had arranged for transportation to be provided for any members of the press who wanted to visit the operating site on the island.

The first news story appeared after the county-sanctioned event was mentioned at a governmental board of supervisors' meeting. The historical society prompted a second story detailing the plans for K4L. The team then put together a press release and via USPS, e-mail and fax, distributed it to six television stations and four newspapers, including the *Richmond Times-Dispatch*. After the preliminary media hits, the *Dispatch* covered the K4L operation, along with one television station and two local newspapers. The operation definitely brought some public attention to the lighthouse, and garnered plenty of good press for Amateur Radio. Parke Slater's article detailing the group's PR success can be found in the February 2002 issue of *QST*.

In January, the 100th anniversary of the first transatlantic wireless message transmitted by Guglielmo Marconi made a lot of headlines in Massachusetts and elsewhere. Much of that good press was due to a rather unique media pitch made by Bob "Whitey" Doherty, K1VV, of the Marconi Radio Club. Doherty put together a CD-ROM presentation, using pictures and audio, to promote the anniversary of Marconi's feat and special event station KM1CC, which was in operation for nine days from the Coast Guard Station in Eastham.

Doherty sent the CD, along with a cover letter to 45 media outlets. The special event station attracted television and radio coverage, and generated numerous newspaper articles. A representative from the United Press International (UPI) wire service also covered the story. Doherty reports that almost every reporter who came to the event mentioned the CD and said that was why he or she was there. A lot of time and effort went into making the CD presentation, but Doherty's unique approach certainly paid off!

Up for a New Challenge?

Whether you've just been bitten by the ham radio bug, or you've been licensed for years, getting into the PR game may be just the thing for you. *You* can have a hand in ensuring that Amateur Radio continues to get the positive publicity and public exposure it deserves. Even the smallest of efforts can reap big benefits.

Right now, ARRL has 51 PICs and 466 PIOs. That means that not all ARRL sections currently have a PIC and we certainly could use more active PIOs in all parts of the country. If you're interested in learning more about becoming a PIC or PIO, contact your Section Manager (see page 16 of this issue) today!

Jennifer Hagy, N1TDY, is ARRL Media Relations Manager. She can be reached at **jhagy@arrl.org**.

By Dennis Lazar, K4KLQ

Proving the QRP Equation: 1 W+RI = 1000 W+ FL

A tale of a "killer watt" at a time long ago and a QTH far away.

CQ CQ CQ DE K4KLQ/QRP K. Again the empty hiss of the 20 meter band issued from my padded earphones. Working the world with the 2 W output of my little Heathkit HW-8 is always a challenge. But that is what makes it fun. The glow of having received a 569 report from EC6TX just an hour ago was beginning to fade. But now, after several unreturned calls to faint DX stations and multiple unsuccessful CQs, I was becoming a bit impatient. Things had been different back in 1967, I mused.

As I tuned slowly over the band, my thoughts wandered back to a tiny, isolated island 20 miles off the coast of Sitka, Alaska. Those nights on 40 meters were wonderful. A quick DE KL7FSX promised instant gratification as "lower 48" hams lined up to get a contact...especially since I was running only 1 W!

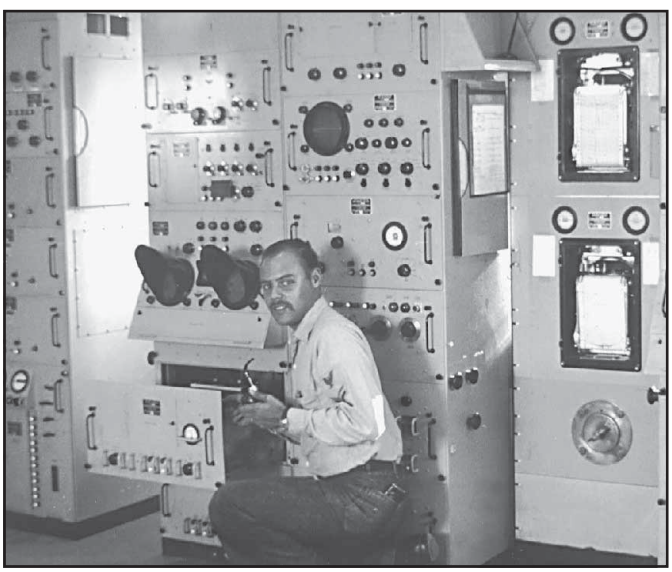
All Expenses Paid

I was stationed, together with 16 other sailors, on Biorka Island, all expenses paid courtesy of the US Government. As a Coast Guard electronics technician, I was enjoying the obligatory year of isolated duty on one of many far-flung megawatt LORAN transmitting stations in operation around the world. It was a good feeling to know that due to our vigilance, ships, fishing boats and aircraft throughout the Pacific would stay safe and on course. It was our responsibility to keep the transmitters up and running and, of utmost importance, in continuous sync with the other stations in the LORAN chain.

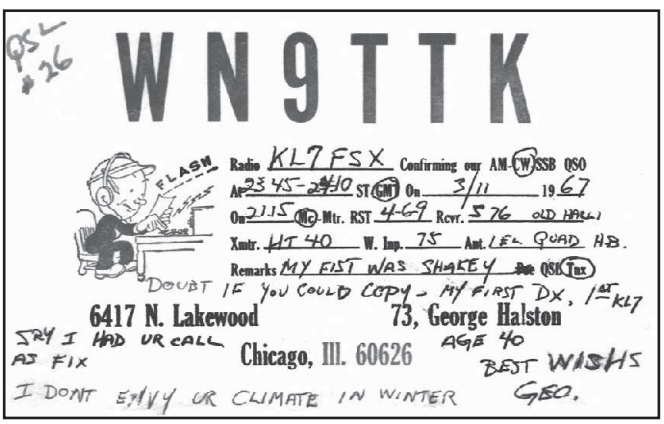
After several months on the station, I discovered that working the night watch, from 11 PM to 7 AM, offered several very real advantages, especially to a ham radio operator. First, there was no additional work, such as preventive maintenance, parts inventory or floor mopping. Second, I could work the night bands, interrupted only by the hourly transmitter meter readings and an early morning topping off of the generator diesel oil tanks. Should the transmitter poop out or lose sync with the other two stations in the chain, bells would ring, horns would blare and the other four techs on the station would be right there to help. So, life was good on the night shift and, selflessly, I volunteered to stand that watch permanently.

My major problem was that the ham shack, well equipped with Hallicrafters HT-44 transmitter, SX-117 receiver, HT-45 linear amplifier and triband beam, was located in a loft on the second floor of our big aluminum Quonset hut-style building. But I was obligated to stand watch in the ground floor control room. This called for ingenuity.

Fortunately, there was a Collins 75A4 receiver built into the control room console. Although its purpose was not ham radio, that could easily be remedied. Now for a transmitter...One thing we had in abundance on Biorka Island was radio parts. We needed to be able to repair any-



The author, then KL7FSX (1967), tunes up one of two megawatt transmitters on the US Coast Guard LORAN Station, Biorka Island, Alaska.



One of the QSLs still in my collection after 36 years. I was glad to have been George's "first DX."

thing on the station without having to wait for parts to be shipped in with the supply boat, which visited only every other week.

This Calls for a 2×4

Keeping in mind that the year was 1967, a nocturnal ham in search of transmitter construction materials would be looking not for ICs, circuit boards and other wimpy stuff, but for a red-glowing, high-voltage-sizzling vacuum tube. And, not having any aluminum sheet handy, I just knew that this project called for a 2×4. It took about four hours to put it all together. Using old and new parts, including a few nails, screws and a metal cased 6AG7 pentode—all powered directly from the 120 V line—this was the epitome of junk box QRP.

The Killer Watt was a funny sort of Pierce oscillator and amplifier all in one tube. I put in a pi network to match the 50 Ω transmission line impedance. The key and meter, also fastened to the board, were in the cathode lead. "Would it chirp like a canary?" I thought. The tank coil was a wonder...everyone wondered why it was so big. Since the junk box yielded up some beautiful 12-gauge copper wire, I wound 11 turns of it on an old Teletype paper roll and spaced it at three turns to the inch: A 1000 W coil on a 1000 mW rig. I drilled holes in the 2×4 and pressed in the ends of the coil. An alligator clip provided tuning. When the plate was dipped carefully, there was no chirp and the rig put out a clean signal.

The only possibility for an antenna that combined little work with minimal cost (my criteria for any project) was a dipole outside my control room window. I hoped the LORAN transmitter tower, only a few thousand feet away, would not overpower the receiver while I was listening for weak CW on 40 meters.

Funny thing about living with a LORAN transmitter...you soon get used to clicking. With megawatt pulses of RF permeating the station, strange things happened. The toilet stalls in the bathroom clicked annoyingly; bedsprings had been known to click in the night. In fact, if you had a metal filling that was not well bonded and could act as a diode, I am sure you could copy LORAN in your head. I was certain that after my year was over, I would leave Biorka Island with some sort of tick or twitch...if I didn't emit a pulsating glow in the dark.

In any event, the dipole worked just fine, although the SWR was a tad high. But hey, I had one whole watt to work with!

That first night on the air was an experience to remember. I really had no preconceived ideas as to how my "killer watt" might get out. In fact, given the 2:1 SWR, I hoped fervently that something would emerge from the far end of the coax. I inserted a crystal for 7.125 MHz, right in the middle of the Novice portion of 40 meters. Hopefully these folks would be desperate enough to come back to my tiny CQ. Without a VFO and only three crystals, CQ was the only way to go.

The LORAN station wasn't much to look at, but it was in a prime location for nocturnal QRP DX.

I tuned the Collins to zero beat with the 2×4. I was in luck. No one on frequency. CQ CQ CQ DE KL7FSX KL7FSX I keyed twice. Then....KL7FSX DE UA0KZD. I very nearly fell off the chair. Siberia! It was 1967, after all, and I was sure that everyone in Siberia was either flash-frozen or in jail. But Alexi was operating a club station in Novosibersk, possibly the only place colder than Biorka Island in January.

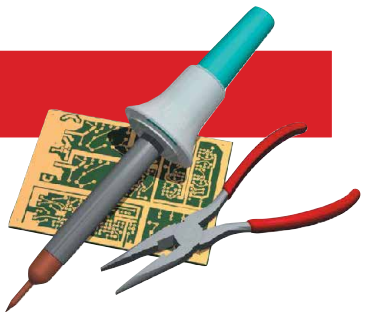
FB DR DENNIS ES 73. Obviously the Soviet op spoke little or no English. But I did get a 439 and a first contact that was "DX." In places like Alaska and Hawaii, DX has a slightly different meaning, in that Siberia isn't all that far from where I was in Alaska.

I'm Getting Out!

From then on, it was nonstop. KNs and WNs by the truck load along with JAs and KHs and UAs. It illustrated well the QRP equation: 1 W + remote island QTH = 1000 W + Florida (substitute New York, Ohio, etc). Keep in mind that I discovered this annoying formula two years before Ten-Tec announced its first Power Mite QRP transceiver, before QRP was more than just another pretty Q signal.

So now, searching for the call of someone who desperately needs a Florida QSL (yeah, right!), I fantasize about one day retiring to a development with a name like "Paradise Island." If I send my call fast and the QTH slow, maybe someone will mistake me for DX and get excited. Just like in the old days.

First licensed in 1960 as K8TSQ, Dennis Lazar became KL7FSX in 1967 while stationed in Alaska. He moved to Florida in 1973 and became K4KLQ. He holds a General Commercial Radio Telephone license with ship radar endorsement. As president of Palm Beach Publishing Co, he published a statewide radio magazine in which he promoted Amateur Radio to Citizen's Band operators during the 1970s. Dennis has also been hobby radio columnist for the Palm Beach Times*, a daily newspaper. He is now a naturopathic physician and Registered Nurse Therapist. You can reach the author at 227 Stebbins Terr, Port Charlotte, FL 33952; tel 941-766-1875;* **lazarcorp@cs.com**.



The Doctor is IN

QBrian Ward, KG4KGW, has a legal operating question: "I am a General Class operator and am trying to find the answer to an operating question one of my Technician friends had the other day. The FCC rules clearly state that a non-ham may operate from your station as long as you are the control operator and are at the control point of the station at all times while they are using your station. I would have to assume, in this scenario, that they would be operating with your license. What do you do when it is another ham? For example, my Technician friend wants to try his hand at the HF bands just to get a taste of it. When operating would he use his call sign? Could I act as the control operator for his/my station while he operates on the HF bands? What would be the proper procedures for this type of operation?"

ANo non-amateur may *operate* an amateur station, even if you are present. Such "third parties" can *participate* in the operation of an amateur station as long as a licensed amateur is present and in control of the station operation. (Third-party communication can only take place with countries with which the US has a third-party agreement.[1]) If a licensed amateur wants to use your station, there are several different ways that this can be done legally. They, too, can be third-party participants. In that case, they would use your call sign and you would be the control operator. With your permission, they can be the control operator of your station, using your call sign, but only in the parts of the band where their license authorizes them to operate. You could also loan them all of your equipment and they could use their call sign from your location again under their own privileges.

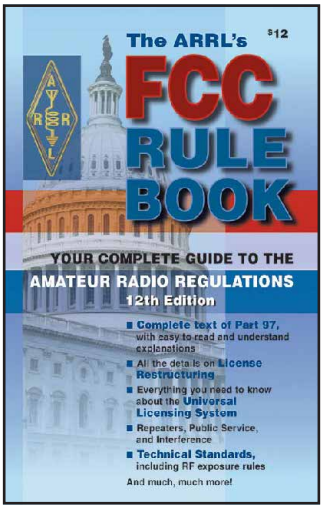


Figure 1—*The ARRL's FCC Rule Book* answers most questions about the FCC rules.

You can also operate the station of a lower-class licensee. If you do, you can use his or her call sign in the part of the band they are authorized to operate. If you want to operate their station under your privileges, you can do so, but you then need to identify with their call sign, followed by your call sign (ie, KA1JPA / W1RFI). If you were W1RFI, on voice, you could say: "This is KA1JPA being operated by W1RFI." If the other operator loans you his or her equipment, you can also use your call under your own privileges.

[1]**www.arrl.org/FandES/field/regulations/io/3rdparty.html**

In any case, no matter who is operating your station or what class license they hold, the designated control operator and the station licensee are jointly responsible for the legal operation of that station. If your call sign is being used, however, the FCC will contact you first for any violations, so you want to be careful about allowing others to use your station under your call.

This question is often asked of the ARRL HQ Regulatory Information Branch. They have answers to many common questions on their Web page at **www.arrl.org/FandES/field/regulations**. Every ham should also have a copy of *The ARRL's FCC Rule Book*, **www.arrl.org/shop/?item=7857**.

QB.R. Bear Carson, AC7HI, writes, "I have looked through *The ARRL Handbook*, *The ARRL Antenna Book*, *QST* and TIS pages and cannot find a really informative article on how to select good relays for a remote antenna switching system. There are several tidbits here and there, but nothing I could find discussed the physical properties needed for a good RF relay and how RF affects the performance specifications of various relays. How can one minimize the RF "bump" the relay might cause on the system impedance? There's a lot of stuff out there about relays for conventional ac/dc applications but RF applications seem to be lacking. I think I remember something about how to build a switch box somewhere, but its source eludes me. Anyway, with all the relays on the market, how do I pick the right one? Also, is there anything about how to fabricate your own coax switches?"

ATo be ideal, coax switch contacts should maintain a constant impedance throughout. To do so requires transmission line type of construction, which is why regular relays always present an impedance bump. The only way around it would be to construct a relay exclusively for this purpose. Such RF relays do exist commercially, but they can be expensive, even for a simple 1-port in, 2-port out arrangement.

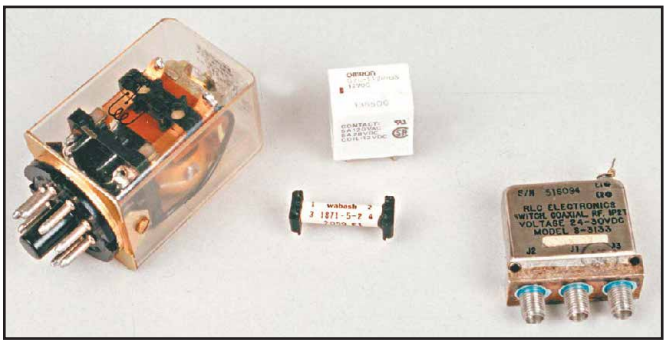


Figure 2—The RF characteristics of these different relay types will be very different from band to band. For UHF and microwave, relays with integral RF connectors, as seen on the relay on the right, are a must.

The best a homebuilder can expect to do at reasonable cost is to minimize the losses inside conventional relays, making the impedance bump insignificant. Transmission line should be used at the inputs and outputs of the relays to confine the effect to the relay itself. In fact, some of the commercially available remote switch boxes (such as the units available from Array Solutions) use this technique, except that these switches often use circuit board traces to form transmission lines.[2]

QST has had a number of projects for antenna switches, most recently, H. Rosenthal, W5AN, "A Remote Antenna Selector Switch," *QST*, Aug 1997, p 40.

The relays in these switches should be suitable for any sort of design you might care to come up with. None of the published designs use any circuit boards, however, so you would be on your own if you wanted to take that approach. Personally, I would just stick with sections of good quality coax at the relay input and output terminals.

Q Tom, W8ESN, says, "I'm relatively new to 40 meters. That's kind of odd I guess, because I've been a ham for some 30 plus years. I've just not spent too much time on 40 over the years. Why is it that the background noise level on 40 is pretty consistently anywhere from S7 to S9? I don't have the same problem on 20, 15 or 17, for example. These bands are usually pretty quiet. The noise I'm speaking of isn't local QRN from power lines, etc or low level QRM buzz. It's simply inherent atmospheric noise on the 40 meter band. I just wonder why it's so loud."

A The lower one goes in frequency, the stronger the atmospheric noise becomes. In the summertime, 80 and 40 meters can have S9+ static "crashes," caused by lightning strikes over as much as a few thousand mile radius. The good news is that in the wintertime the band will be a lot more quiet. Forty meters is actually a decent QRP and DX band at night in the winter.

Don't discount electrical noise as part of your problem, however. Although static crashes can be tens of dB over S9, in a city environment a steady S9 background noise is usually caused by the cumulative effect of all of the electrical devices surrounding you. This can be related to power lines or the growing number of electrical devices and microprocessor chips found in everyday household products. Fortunately, that, too, gets lower as one goes higher in frequency.

Q Phil, K6EID, writes: "Our utility is planning to install new 230 kV tap lines on 130 foot poles less than a quar-ter mile from my location. They have put out an Environmental Assessment that says the lines will have no impact on radio reception. Is there any study that I can refer to that would show the effect of these lines on noise impacting ham radio reception? I would like all the ammo I can get to refute their claim. The folks out here are pushing to get them to bury the lines but the utility is against this because of cost. Our county has put a moratorium on this for other reasons but we expect that they will take the county to court to break this. If we can refute the EA, we stand a chance in getting them to be more receptive to burying the lines."

A The truth of the matter is, while these lines may be big and ugly, if they are properly designed and built they are not normally the source of significant RFI from arcing. Unless you live almost directly under the lines where you might be affected by corona noise, a new line is not necessarily going to be a problem. There are several reasons for this. The hardware is massive and designed specifically to reduce corona and arcing noise. (There are no sharp edges, the bolts are recessed, helical spring washers are used on the bolts to keep them tight.) Unlike most utility poles found in residential neighborhoods, the high-voltage towers are made of steel, and hence they do not swell and shrink over time as wood does as weather conditions change. Most of the power-line noise we deal with here comes not from transmission lines, but from distribution lines mounted on wood poles that may be quite old.

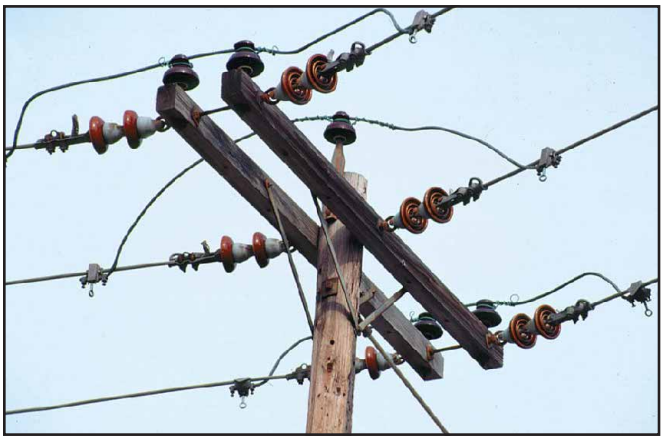


Figure 3—The power lines found in most residential neighborhoods are a more likely source of RF noise than properly constructed high voltage lines.

Although burying the lines may reduce the interference potential slightly, if there is a problem it may be a lot harder for the power company to fix. Buried lines would have to be cooled with oil, a difficult and expensive undertaking.

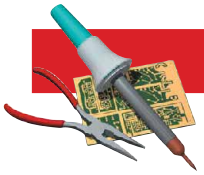
If you do have a problem with power-line or electrical interference, first read the ARRL "RFI-Electrical" information at **www.arrl.org/tis/info/rfi-elec.html**. If necessary, then contact the ARRL RFI desk at **rfi@arrl.org** for advice and help.

Q From Blair, K3YD, comes this: "Do you have any suggestions for bringing feed lines through modern Anderson-type windows for a short-term interval (2-3 months)? I recently moved into a new home and until I can construct a proper basement shack with a bulkhead for cable feedthrough, I plan to operate from a spare bedroom using modest power levels (20-50 W). My wife thought my solution to drill through the sash frames was a bit extreme."

A Since you have a basement, it may be more practical to bring the feed line in through the floor. I suspect your new home may have hot water radiators. There may be enough space around the radiator pipes to bring in RG-58 type coax, if you remove the decorative metal plates used to hide the holes. RG-142 type Teflon coax will easily take the heat of a typical home heating system. Also, see the *QST* article elsewhere in this issue by W6TOY, "My Antenna is a Compromise—and It Works!" The author has some excellent suggestions for bringing feed lines through sash windows.

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/. Add your comments: "The Doctor is On-line" at www.arrl.org/members-only/qst/doctor/. QST

[2]Array Solutions, 350 Gloria Rd, Sunnyvale, TX 75182; 972-203-2008; **www.arraysolutions.com/**.



By Bruce Muscolino, W6TOY

My Antenna is a Compromise—and It Works!

Does your present antenna have you down? Uplift your spirits — W6TOY has been there for 45 years…you're not alone.

In 1996, I took the biggest step of my life. I bought a house. Not any house, mind you, but a very large house…with tall trees and lots of yard. For the third time in my life as a ham, I thought I might again have an outside antenna. It was the perfect place to put up an antenna...until I met the homeowners' association.

I have been licensed since 1956, some 47 years. For only five of those years could I put up whatever type of antenna I wanted and for three of those years, only sort of. When first licensed, I lived on the family farm. It was only 5 acres, but large enough to let me have a 1000 foot wire if I so wanted. I settled for a 135 foot Windom-type (an off-center fed wire) antenna back then. I could afford the wire and it was easy to hang. Some time later, I lived in The Netherlands. Back then, antenna restrictions were based more on common sense and I had a variety of antennas.

However, for most of the time I have been licensed I have lived in apartments or condominiums or in my present antenna-restricted neighborhood. I have been on the air for most of that time and I have been fairly active. I have also earned every operating award I ever wanted. I have placed well in the contests. And I have done it all with compromise wire antennas!

What is a Compromise Antenna?

A compromise antenna is any antenna that is not the antenna of your dreams. It is one that is not as long as you want or not as directional or not as high or just not as "whatever." But this antenna can still work; almost any antenna can be optimized. Your signal may be down a few dB, but you are still being heard. Isn't that better than no antenna at all?

So, how does one choose a compromise antenna? Very carefully! A few things you might want to consider include the following. What antenna restrictions does your property have? What feelings do you have about putting up an outdoor antenna? What structures do you have that could act as supports for your antenna? There are more, but these will at least point you toward a solution.

Deciding

By this time one point should be absolutely clear: Your compromise antenna will be unique, tailored to your particular station and your particular environmental situation. Anything less will be even more of a compromise. You can get lots of interesting antenna designs by looking on the Internet, at antenna compendiums and by accessing other antenna references.[1] The one thing that sets these designs apart from each other is that they all worked for that designer…at his particular home, in his neighborhood. He probably lives in an entirely different environment than you do. If you choose to use his antenna without recognizing that fact or you fail to understand how his antenna works, you will be unhappy.

Reading is cheap and easy…do it. Antennas have followed the same basic principles and laws of physics for 100 years. There is very little new material. Learn the basics and modify an existing design. Don't be afraid to try things. If I had been afraid to modify designs I would have been relegated to VHF/UHF repeaters or gone off the air 30 years ago. You can do it…I did and I really don't think I am special.

Why have my antennas worked so well (for me)? Perhaps I am lucky. Perhaps radio waves like and respect the experimenter. I'd like to think that I have learned a few things about end-fed wires. The first few antennas I put up did not use a ground system. I wasn't that sophisticated back then. I used to think the term "ground" meant the stuff outside my apartment, in the flower beds.

RF Ground

I learned about antenna counterpoises and grounds in Holland, courtesy of a trap vertical. A vertical without a decent counterpoise is one of the best and flattest dummy loads you will find. I bought a trap vertical from an engineer who was going back to the States after his assignment in Holland was completed. I installed it in the backyard on a 6 foot pole. I thought that because I was paying a tax to keep the water pumped down to some level below the surface, a good counterpoise wouldn't be a problem.

How wrong I was! The antenna displayed a perfect 1:1 SWR from below 14 MHz to above 30 MHz. The DX record was in the TV sets in the houses behind mine. To say the least, I had a problem. I was going to be there for three years. I had to make this antenna work or take up another hobby.

Another hobby wasn't in the cards, but a proper ground was the secret to making this antenna work. I made a set of four radials and connected them to the base of the antenna. Suddenly my SWR had meaning, just like the curves shown in

[1]Notes appear on page 61.

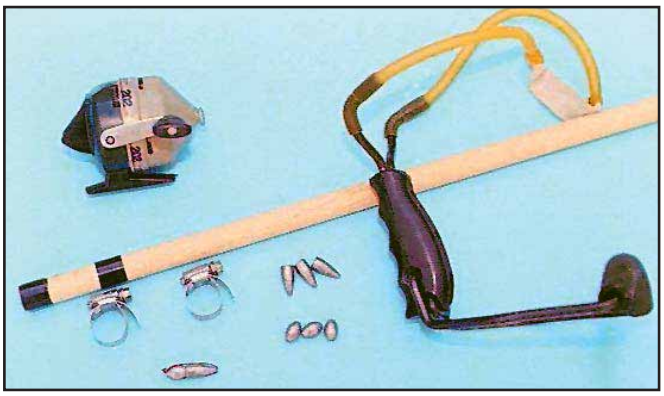


Figure 1—The antenna launcher. It consists of a slingshot, a cheap fishing reel and a wooden dowel. The various hose clamps attach the reel to the dowel. The fishing weights are used to control the line trajectory. Commercial versions are available.

The ARRL Handbook. About 65 feet of zip cord made all the difference.

I used this vertical as my only antenna for about 18 months. I earned WAS, WAC and DXCC with it. Then I sprung for a 5 band vertical, which I installed on my chimney. I was very careful to install ground radials there, too. I repeated the performance.

When I came home with my newly acquired knowledge of counterpoises, I put it to good use. The temporary antenna at my mother's condominium got a set of quarter wave radials, under the carpet. The improved performance was worth it. I actually worked England on 80 meter CW with a Heathkit HW-8 QRP transceiver and 3 W, using my newly modified antenna.

End-fed Wires Work

I like end-fed antennas. After 25 years I think I can safely say that they have worked for me. I have worked almost everything I could hear. They have rewarded me with several operating awards. So why do many folks say they don't work? I guess it's because they haven't learned the secrets behind them. Use a tuner or transmatch that will handle an end-fed wire. Use a good RF ground (it's not always easy to do…see *The ARRL Handbook* and *The ARRL Antenna Book* for tips) but most of all, be patient.

I have earned two awards and scored pretty well in the QRP division of Sweepstakes. But it wasn't done all at once. By taking time I was able to overcome the directionality inherent in a nonresonant antenna. I was able to wait for the stations I wanted to work, even if it meant waiting another year.

Outdoor Versus Indoor

Outdoor antennas are better than indoor ones. Since most of us are not forced to live under a radome, I recommend indoor antennas only for temporary situations. I have used them with surprisingly good results, but I would not recommend them for permanent use. With some ingenuity an outdoor antenna can almost always be made to work for you.

In 1976, I moved to an apartment in southern California. The landlord was the wife of a ham. I thought that most of my antenna problems were solved. How wrong I was! I asked if I could put a wire antenna on the roof. "No…you will damage the property and get into the other neighbors' TV." I offered to indemnify the building against damage and I vowed to keep quiet hours for all TVI complaints. Still, the answer was *no!*

I put up an outdoor antenna anyway. To be sure, it wasn't "on the roof"—it was under the eaves of the building—but it *was* outside. It was short (45 feet), but it did radiate well on 40, 20 and 15 meters. I had many memorable contacts with it. Was it a perfect antenna? No. Did it radiate in the directions I wanted? No. Did it get me on the air? *Yes!* Was it a compromise antenna? Of course.

Indoor Antennas

I have used indoor antennas, mostly on a temporary basis, but a couple of times as semi-permanent, experimental antennas. In 1975, I went back to Maryland for a Christmas vacation. I took my Kenwood TS-520 transceiver along. After spending a couple of days listening, I decided I wanted to get on the air. I found a piece of #14 wire about 20 feet long, laid it on the floor of the bedroom and proceeded to work up and down the eastern seaboard on 80 and 40 meters. The condo was on the third floor of a four story building. I went back to California happy.

I don't recommend the indoor use of any antenna except on a temporary, experimental basis. I understand that many amateurs do routinely use indoor antennas successfully as their primary antenna. It is one compromise, however, that I don't choose to make. Antennas are outdoor creatures…they are much happier when they can live as nature intended. Additionally, indoor antennas can pose a greater RF radiation hazard, as the operator is often closer to the antenna.

Putting It Up

I have had two very successful compromise outdoor wire antennas in the last 25 years. The first was a vacation antenna at my mother's condominium in Silver Spring, Maryland. That antenna was the subject of an article in *QST*.[2]

The article was mostly concerned with a method for launching the antenna quickly and easily…so the neighbors would be unaware of my efforts. I took a page from my first job as a torpedo engineer and designed a simple wire coil to hold the antenna wire. It was designed to release the wire in response to the pull of a slingshot. I used this design every time I came home to visit. In 1994, when I moved back permanently, it became my principal antenna.

One thing you may have to watch for with compromise antennas is being seen installing them. By using the slingshot with a wire coil, I've been able to solve this problem. I have used a slingshot to put up antennas since 1982. I purchased mine from K-Mart, where it was on sale for about $9. Using fishing line weights, I am able to control where the shot goes. I consider the slingshot critical to success. It allows me to reach up into tall trees without hazard and it is unobtrusive. What good is a hidden antenna if your neighbors watch you climbing trees to install it?

Figure 1 shows my antenna launching kit. There are various antenna launcher systems made from slingshots that are convenient and easy to use. Look at them carefully and see if they fit your needs. Using the slingshot with either a fishing line followed by the wire, or the wire alone solved my quick-launch problem.

The antenna did have its problems. It was made out of #26 magnet wire. The wire would break about every three weeks. This wasn't a problem for a two-week vacation, but it wasn't adequate for permanent use. The antenna used no insulators. I used a short length of spaghetti tubing, insulating the wire where it went out through the window frame. I depended on the good graces of a friendly tree at the other end. All in all, it was about 40 feet long, but it worked well.

In 1996 I bought my present house. I thought about antennas and settled on an end-fed wire, temporarily. It is still up there, in its third incarnation. It's about 150 feet long and it meanders up and out from a ground floor window to a friendly

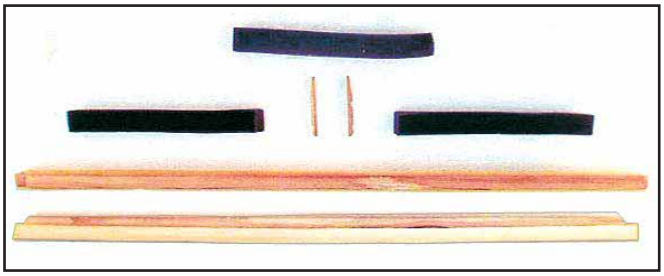


Figure 2—Getting the compromise antenna out of the house. Two pieces of wood fit in the bottom of the window sill. They are lined with freezer foam on their mating surfaces. The wire is clamped between them and the assembly is clamped in the bottom of the window. The larger pieces of foam tape are used to fill in any spaces in the window.

tree limb and then across the backyard to another tree. I replaced it once because I wanted a longer antenna, and once again because the wire broke. My total investment was $14 for 500 feet of #14 electrical wire from Home Depot. I earned WAS and DXCC with this configuration.

Both of these antennas used no feed lines. They were fed directly from the tuner output. I have used almost every kind of tuner known to man, from the small and cheap to the large and expensive. They have all worked equally well.

Getting the RF Out

Once you have decided on an antenna type and how to put it where you want it, you must get it out of the house. I know you can drill a hole in the wall, but if you don't want to deface the walls or you live in an apartment, you will probably want to find another way to get outside. I have used two different ways to go out a window.

In the condominium, I ran the antenna out through a steel frame window. I used only a short length of insulated spaghetti tubing around the wire. The window was simply closed and clamped on the tubing. This worked at both the 100 W and the 5 W levels. But remember, the antenna started life as a temporary portable radiator. It was to be used only while I was on vacation.

Later, when I moved to my present home, I was still concerned about defacing the walls. I looked at the idea of clamping the wire in the window frames, but that would have damaged the frames. I came up with the method shown in Figure 2. I took two lengths of 1 by 2 inch board and cut them to fit the window. I put foam tape on the two sides that were to be against each other and ran the wire out through this foam sandwich. This method can also be used for coax. Just drill a large enough hole to pass the coax through the sandwich and you're in business. Figures 2 and 3 show this method. The thick freezer foam seals the windows where they are open. In Figure 3 the antenna lead can be seen coming in through the wooden sandwich.

Conclusion

Start by asking yourself what an antenna is supposed to do. Quite simply, it should radiate and receive radio signals as efficiently as possible. It gets more complicated when you have to factor your environment, your finances and your homeowner's association or landlord into the efficacy equation!

Since most of us no longer live on the family farm, we cannot have wire antennas that go for miles. Many of us cannot afford a tower and a beam, even if our property laws would allow it. We are faced with the problem of making do, often with compromise antennas.

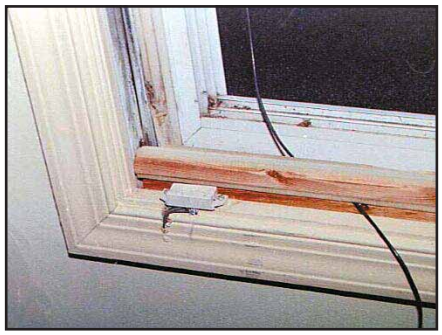


Figure 3—The antenna in place. This is a single wire. Coaxial line can also be used by drilling a larger hole in the mating surfaces.

I wholeheartedly recommend the use of outdoor end-fed wires. They will reach exactly from here to there, without pruning. They will load easily (with a tuner) and perform well, if you understand them…and they cost almost nothing. They can be installed as many different configurations. Some folks prefer wire verticals but I just decide where I can put a horizontal wire and I "go for it." Clearly, they're my compromise antennas of choice…try them yourself!

Notes

[1]A search for "wire antennas" on the Internet brings up many interesting sites, including **www.hard-core-dx.com/nordicdx/antenna/wire/**; **www.dxzone.com/catalog/Technical_Reference/Antennas/Wire/** and the ARRL Technical Information Service: **www.arrl.org/tis/**. Antenna references include, among others, *The ARRL Antenna Compendium,* Volumes 1-7, the ARRL's *Wire Antenna Classics* and *More Wire Antenna Classics* and, of course, *The ARRL Antenna Book.*

[2]B. Muscolino, W6TOY, "A Practical Stealth Antenna," *QST*, Jul 1995, pp 58-60.

Bruce Muscolino, W6TOY, may be contacted at 2813 Village Ln, Silver Spring, MD 20906; **w6toy@erols.com**

NEW PRODUCTS

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Price: $8 (for USA orders). For more information, visit **www.MrHamRadio.com** or send e-mail to **kb9k@MrHamRadio.com**.

SkySweeper

SkySweeper is a multifaceted software package that turns your sound-card-equipped *Windows* PC into a powerful signal analysis and decoding system. It will decode and display a broad range of signals, both commercial and amateur. *SkySweeper* will also *transmit* several modes including RTTY, Hellschrieber, PSK31, SSTV, CW and MFSK16.

Both in their print advertising and on their Web site, SkySweep Technologies promotes *SkySweeper* as software designed for professionals. This is an accurate statement. *SkySweeper*, while useful for Amateur Radio, is intended for people who know their way around DSP, signal analysis and sound cards.

Flexibility

SkySweeper's strength is its extraordinary flexibility. Not only can you decode more than a dozen modes (including ACARS and satellite WEFAX), you can change the decoding parameters to adapt *SkySweeper* to the signal environment. In addition, audio levels can be adjusted on the fly without having to bring up mixer panels and the like. You simply click and drag on the slider near the display window. You can even select which displays you prefer to see, move them independently on the screen and then adjust them to any size.

In the DSP mode, you can create filters to suit your particular needs—low-pass, high-pass, band-pass or bandstop. While listening to a group of CW signals, I was able to create a DSP filter so sharp that only one signal was audible. The only annoyance is that you have to make your adjustments and then click the APPLY button before you hear the results. You can't hear the effect of the filter while you are creating it, so you may find yourself going through several tweak-and-test steps before you get it right.

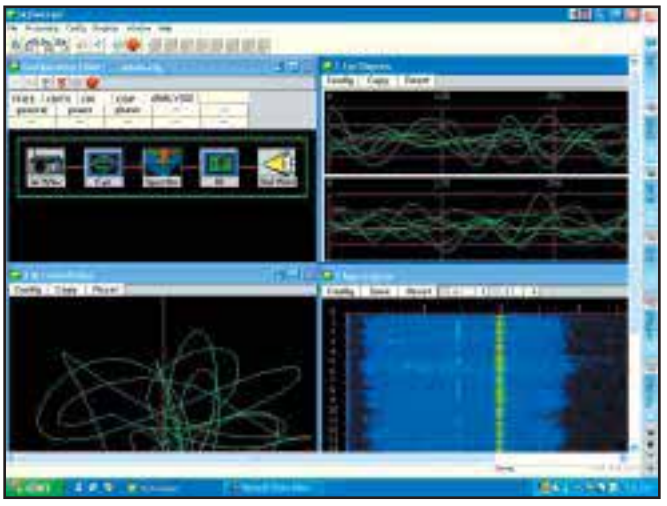
With *SkySweeper* you can create an array of decoders, encoders, filters and so on by adding "blocks" to the system block diagram shown in the Configuration Editor. You can then save the entire configuration for later use. For example, in the CW decoder mode I can insert a filter block, create a 50-Hz DSP band-pass filter, and then save the entire decoding configuration as "CW Narrow" and make a button label so I can recall it later.

There are detailed sub-menus that allow you to observe the performance of your sound card. You can make adjustments such as sampling rate and clock frequency. *SkySweeper* can also function as a sophisticated audio signal generator for testing purposes. The software even allows you to create a "*SkySweep* server" for remote control via the Internet (this function was not tested for this review).

SkySweeper Operation

I spent several days using *SkySweeper* to gain a sense of its capabilities as an Amateur Radio digital signal encoder/decoder. In the CW mode, *SkySweeper* did a passable decoding job, but it performed best with strong signals and steady fists. *SkySweeper* seemed to have difficulty locking onto weaker CW signals that I could readily decode by ear.

SkySweeper successfully received and transmitted PSK31 signals, but hams who've grown to love user-friendly PSK31 software such as *DigiPan* will be disappointed. Unlike amateur PSK31 programs that allow users to tune by clicking on



signal signatures in scrolling "waterfall" displays, *SkySweeper* restricts point-and-click signal selection to its "FFT" window. The FFT window is often a jumble of signal peaks, making selection difficult. There is a "waterfall" (spectrogram) window, but you cannot click in this window to select a signal. I wish *SkySweeper* would use the spectrogram for PSK31 tuning, or at least give users the choice to do so.

RTTY was much easier because the classic dual-peaks for mark and space signals are easy to spot in the FFT window. I was able to create a RTTY configuration with a 350-Hz band-pass filter and the performance was impressive.

MFSK16 was problematic because *SkySweeper* does not provide a useful tuning indicator for this mode. Instead, you have to click on the lower-frequency signal peak in the FFT window and hope for the best. It took several tries to lock and decode an ongoing MFSK16 conversation.

SkySweeper's lack of tuning aids was most painfully apparent in the SSTV mode. There was nothing in the various display windows to indicate when I had an SSTV signal properly tuned. It was strictly hit or miss. An indicator for lining up the SSTV sync pulse would have been helpful. On the other hand, the slant correction is one of the best I've ever seen—very easy to use.

Is *SkySweeper* for You?

My suggestion is to download the *SkySweeper* demo and try before you buy. Make sure you download and read the manual (in PDF format) shown on the same page. Some amateurs will find this software too complex for casual use. On the other hand, more technically minded amateurs will enjoy the versatility and sheer wealth of information *SkySweeper* provides. In either case, you'll need at least a 400-MHz Pentium system with about 128-Mbytes of RAM. *SkySweeper* requires a reasonable amount of computer power to work its magic.

Manufacturer: SkySweep Technologies, Espoo, Finland. Distributed in the US by Computer Aided Technologies, PO Box 18285, 1112 Francais Dr, Shreveport, LA 71118; tel 888-722-6228. Registration $99. A demo version can be downloaded from the SkySweep Technologies Web site at **www.skysweep.com/** *or from Computer Aided Technologies at* **www.scancat.com/dowload.html**.

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

Experiment #3—Basic Operational Amplifiers

Let's give transistors a rest this month and take a look at one of the most popular components in electronics—the op-amp. The most widely used circuits are two simple amplifiers and an adder circuit.

Background

Op-amp is an abbreviation for *operational amplifier*, a term coined 70 years ago. Complicated mathematical equations were then solved by analog computers. Amplifiers were used to add, multiply, integrate, or perform other "operations" on signals. Originally made with vacuum tubes, integrated circuit op amps—such as the 741—started a revolution in electronics.

Op-amps generally have a high voltage gain, a high input impedance and a low output impedance. These properties make designing op-amp circuits easy because they simplify the design equations, as we'll see.

Terms to Learn

Inverting (–) and non-inverting (+)—signals at the inverting input cause the op-amp output to respond in the opposite "direction" and, for signals at the non-inverting input, in the same direction.

Negative feedback—routing some of a circuit's output back to the input in such a way as to oppose the effect of the input signal.

The Operational Amplifier

Figure 1 shows the basic op-amp symbol, including the inverting and non-inverting inputs. *The 2003 ARRL Handbook* incorrectly shows the pin-outs for several popular op-amps on page 24.27—the inverting and non-inverting input connections are *reversed.* The industry standard for single op-amp ICs is that pin 2 is the inverting input (–) and pin 3 the non-inverting input (+).

The bypass or decoupling capacitors (C1, C2) shown in Figure 1 keep the power bus clean and help prevent feedback paths that might cause the op-amp circuit to oscillate. They bypass the power connections to ground, hence "decoupling" ac signals from the circuit.

An op-amp has a huge capacity to amplify—80 dB or more of voltage gain at dc! Most of the time that's far too much gain, but so-called "negative feedback" can control that gain, creating useful behavior. Consider that the op-amp's gain is acting solely on the voltage differential between its two inputs. The trick is to connect components from the output to the inputs so that when the output is doing what we want, the voltages at both input pins are balanced. This is a "correction" or "feedback" signal. It stabilizes the op-amp output by correcting its input. If the input changes—even a little bit—the high gain immediately causes the op-amp to react, changing its output and the feedback signal until its inputs are balanced once again. When feedback is used we refer to the circuit being "closed-loop."

The Non-Inverting Amplifier

Figure 2A shows a non-inverting amplifier. The input signal, V_I, is connected directly to the non-inverting (+) input, while resistors R_f and R form a feedback network. Remember that the op-amp has a very high input impedance, so we can

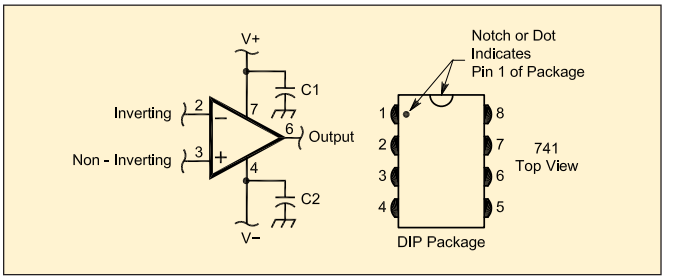


Figure 1—The operational-amplifier schematic symbol and typical package details.

treat the series combination of R and R_f as a voltage divider connected between the output pin and ground. The voltage at the inverting (–) input of the op-amp, V_i, must be:

$$V_i = V_{out}\, R / (R + R_f)$$

Since the op-amp's inputs must balance, $V_i = V_I$ and the circuit's gain, A_v must be:

$$A_v = V_{out} / V_I = (R + R_f) / R = 1 + R_f / R \qquad [1]$$

The non-inverting amplifier's gain is always greater than 1 and is determined only by the ratio of R_f and R. There's no magic—the op-amp is just connected so that when its output is the correct amount larger than the input signal, both inputs balance.

Testing the Non-Inverting Amplifier

• Design the amplifier to have a gain of 2. That requires R_f = R. Use a value of 1 kΩ for this first circuit. Your power supply should be set to at least ±12 V (+12 V if you are using a single-polarity supply). Caution—do not apply signals above or below the power supply to the op-amp inputs or you may damage the IC.

• Build the circuit as shown in Figure 2A, including a 10 µF bypass capacitor to ground at each power supply pin. The 1 kΩ potentiometer will serve as an adjustable voltage source for V_I. Set the potentiometer so that the resistance from the wiper to ground is about 100 Ω. After checking all your connections, apply power and measure V_I and V_{out}. V_I should be approximately 1.2 V (one-tenth of V+) and V_{out} should be close to twice the value of V_I.

• The voltage at the inverting input, V_i should follow V_I very closely.

• Adjust the potentiometer output voltage up and down while measuring both V_I and V_{out}.

• You need a ±12 V power supply for this step. Replace the potentiometer with a function generator supplying a 1 $V_{p\text{-}p}$, 1 kHz sine wave. Use the oscilloscope to measure the output—it should be just like the input, but with twice the voltage.

• Experiment by changing the ratio of R and R_f to obtain different gains. (Keep resistor values above 100Ω.)

• Make a unity-gain voltage follower by removing R and replacing R_f with a direct connection as shown in Figure 2B. This circuit is frequently used to isolate a sensitive input or drive a heavy load.

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

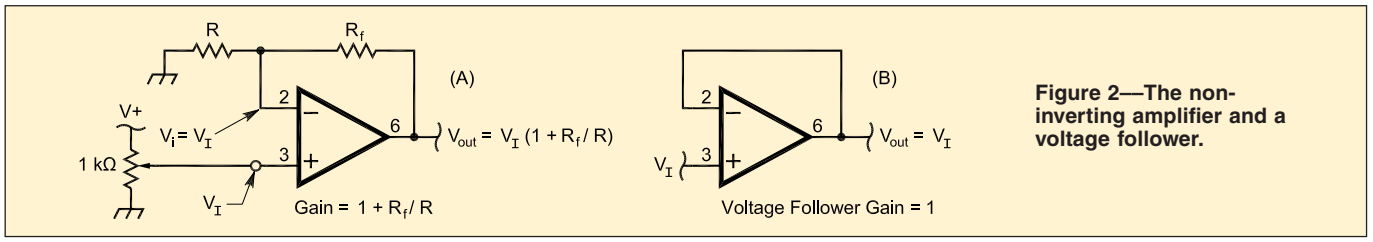


Figure 2—The non-inverting amplifier and a voltage follower.

The Inverting Amplifier

The high-impedance of the op-amp input can be used to create an inverting amplifier whose gain is also set by the ratio of two resistors. In Figure 3, R and R_f are again connected to the inverting input, but the input signal is connected to the free end of R and the non-inverting input is grounded. How does this work? Remember that the op-amp inputs are balanced, so the inverting input must also be at ground potential. It's not grounded, it's just at ground potential. This is called a "virtual ground."

With the inverting input at 0 V, the current through R must be $I_I = V_I / R$. Remember, too, that the op-amp input impedance is very high, so the input current must be balanced by the op-amp's output removing just as much current through Rf as flows through R. By Ohm's Law, the output voltage is then:

$$V_{out} = 0 - (I_I)\, R_f = -(V_I / R)\, R_f = -V_I\, R_f / R$$

and the gain must be:

$$A_v = V_{out} / V_I = -(V_I R_f / R)/V_I = -R_f / R \qquad [2]$$

Testing the Inverting Amplifier

• Design the amplifier to have a gain of –4. Select a value for R of 1 kΩ. This requires R_f to be 4 kΩ. The closest standard value is 3.9 kΩ. You will need a ±12 V power supply to test this amplifier configuration.

• Build the amplifier as shown in Figure 3 and connect a 1 V_{p-p}, 1 kHz sine wave to the input. You should see a 3.9 V_{p-p} sine wave at the output, but inverted with respect to the input. Look at the inverting input to verify that it is at ground potential.

• Use different resistor ratios to change the gain. (Keep resistor values above 100 Ω to limit how much power the op-amp must supply.) Input a dc voltage by using the 1 kΩ potentiometer as before and see if the circuit output is of the opposite polarity.

The Summing Amplifier

The circuit of Figure 4 shows how more than one signal can be combined and amplified by a summing amplifier. As for the inverting amplifier, the op-amp must balance all of the currents at the inverting input—even if current comes from more than one source!

The current from each input signal equals V_{in} / R, so the total current in R_f must be their sum:

$$I_f = V_{in1} / R_1 + V_{in2} / R_2$$

Using the same reasoning as before, the output voltage must be:

$$V_{out} = -(V_{in1} / R_1 + V_{in2} / R_2)R_f \qquad [3]$$

The gain for either input signal is still the ratio, $-R_f / R$.

Testing the Summing Amplifier

• Design the amplifier to have a gain of –1 for each input by setting all three resistors (R_1, R_2 and R_f) to 10 kΩ. You will need a ±12 V power supply to test this amplifier configuration.

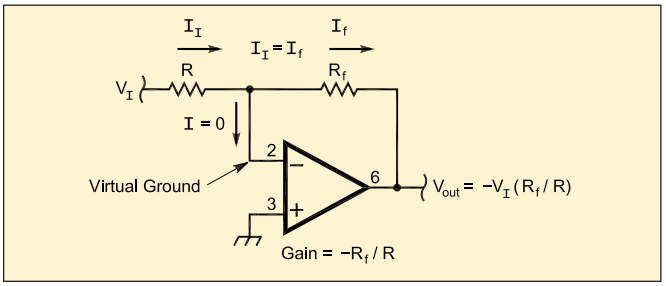


Figure 3—The inverting amplifier.

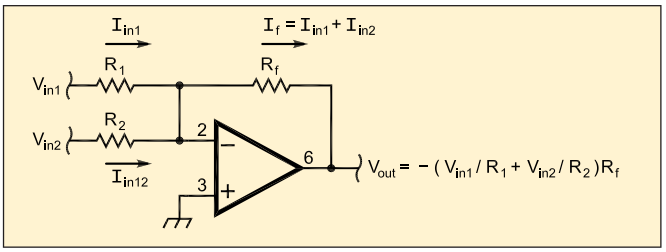


Figure 4—A summing amplifier.

• Build the circuit and input the 1 V_{p-p}, 1 kHz sine wave to input 1. Use the 1 kΩ potentiometer as before to supply input 2.

• Vary the potentiometer while watching the output on your oscilloscope. You will see the inverted sine wave from input 1 shifted up and down as the dc level at input 2 changes.

• Experiment by altering the ratio of either input resistor and R_f to observe the effect on the addition of signals. Replace R_1 or R_2 (or both) with a 10 kΩ potentiometer and vary the channel ratios independently. Congratulations—you've just built a 2-channel mixer!

Suggested Reading

The 2003 ARRL Handbook, pp 8.32-8.35; Horowitz and Hill, *The Art of Electronics*, chapter 4, sections 4.01-4.08; Ian Poole, G3YWX, "An Introduction to Op Amps," *QST*, Feb 1999, pp 55-56. The ARRL Web site for this series is **www.arrl.org/tis/info/html/hands-on-radio/**. Use it!

Shopping List

You'll need the following components:

• 741 op-amp—The part may be labeled as an LM741CN, MC1741CP1, µA741C, etc. The prefixes and suffixes identify the manufacturer, package style and temperature grade. RadioShack part number 276-007 will fill the bill.

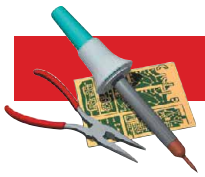
• ¼ W resistors of the following values: 1 kΩ (2 ea), 3.9 kΩ, 10 kΩ (4 ea) and miscellaneous values between 1 kΩ and 10 kΩ.

• 1 kΩ and 10 kΩ potentiometer (single or multi-turn).

• 2—10 µF capacitors with a voltage rating of 25 V dc or more.

Next Month

Op-amps are frequently used as the engine driving an active filter. Sprinkle on a few capacitors and resistors and next month we'll see just how easy creating an audio filter can be. QST



HINTS & KINKS

A PUSH-BUTTON MEMORY ANTENNA TUNER FOR $2!

◊ When I travel, I like to take along a simple, lightweight dipole. It usually serves my needs for average operation within a limited timeframe. Without fail, however, I always seem to hear more activity on a band *not* covered by that particular antenna. Perhaps suddenly, one band goes dead and a different band springs to life! With (literally) all the "ups and downs" involved, changing bands or fine-tuning a dipole antenna can be a real pain, particularly in a vacation situation. It all adds up to lost operating time and increased frustration.

At home, my multiband antenna and autotuner provide me with push-button tuning. Traveling dictates small size and convenience, however, so I seldom haul along a tuner. Consequently, I quickly tire of wrapping, unwrapping and rewrapping wire dipole ends, measuring the resonant frequency, then doing it all over again. Plowing through the tuning process, the ends of the antenna wire always become twisted and kinked making adjustment increasingly difficult. One day, I stumbled onto a nifty solution to speed the tedious task of dipole tuning and found I had the basis for an inexpensive, multiband travel antenna as well.

While strolling with my wife through her favorite sewing store (trying *very hard* not to look bored), I noticed a package of the familiar little barrel-shaped, spring-loaded retainers used to keep drawstrings from pulling out. Commonly called "cord stops" or "stoppers," the devices are about an inch long, made of metal or plastic and, typically, shaped like a little barrel or antique milk can (see Figure 1). They have a single hole through the side to accommodate the drawstring and an internal spring to hold it snugly closed. You squeeze the two ends of the barrel together to release pressure on the drawstring, then reposition it. When you release pressure, it locks down on the drawstring again.

It occurred to me that these inexpensive retainers could easily hold the desired "resonant" position of a dipole-antenna end (similar to the cable clamps on a tower's guy wires), if the antenna wire were reasonably flexible. So, I bought a pack of "stoppers" for $2 and spent the rest of the day at the workbench experimenting. Since discovering these neat little retainers, I have used them on all kinds of portable and attic dipoles.

You can build a pocketsize, multiband travel dipole using cord stoppers. I have had particularly good results with Flex-Weave[1] bare antenna wire because the cord stoppers grip the Flex-Weave well and the wire is very travel-friendly.

[1]Flex-Weave is available from Radio-Ware, PO Box 209, Rindge, NH 03461; tel 800-457-7373; **www.radio-ware.com**

Figure 1—Metal (A) and plastic (B) push-button cord holders can be found at local sewing shops and outdoor stores.

Calculate the length of the element for the *lowest* frequency on which you want to operate. Cut two lengths of Flex-Weave 8-10 inches longer than your calculated element length and slip two or three "stoppers" onto each leg (see Figure 2). Pass the tip of the wire through the end insulator and fold it back along itself. Next, slide one "stopper" down the antenna element wire, (encompassing the excess wire as well), and right up against the end insulator. Wrap the wire once, *lightly* around itself and place another "stopper" at the tip of the excess wire, clamping it to the element wire.

Fine-tune the length for minimum SWR on the lowest operating band of interest (longest element length) by releasing the "stopper" and slightly changing the element length as needed. Then, reposition the "stoppers" with one flush against the end insulator and another one at the tip of the folded-back wire, clamping the tip of the excess wire against the element wire. This shorts the wire out right at the end insulator, where it's folded back on itself, and, finally, at the other "stopper" at the tip of the excess wire. Therefore, all excess wire is electrically cancelled from the antenna's element length, but it's still available if you need to lower the frequency later.

Next, we borrow an age-old trick. Mark the point where the tip of the folded-back wire ends up on the element leg with tape or a permanent marker. This is the "memory" position for your lowest frequency band. Then, adjust (shorten) the antenna for the next *highest* frequency of interest, and, again, mark the spot where the folded-back wire tip ends up on the element. For example, the outer-most mark on each leg could indicate resonance on, say, 17 meters, the next mark toward the feed point might indicate 15 meters and the mark closest to the feed point could indicate 12 meters. You might do CW and SSB frequencies within the same band. Whatever your pleasure.

The marks on the wire, combined with the "stoppers," now provide for fast, easy "memory tuning" of a single dipole for

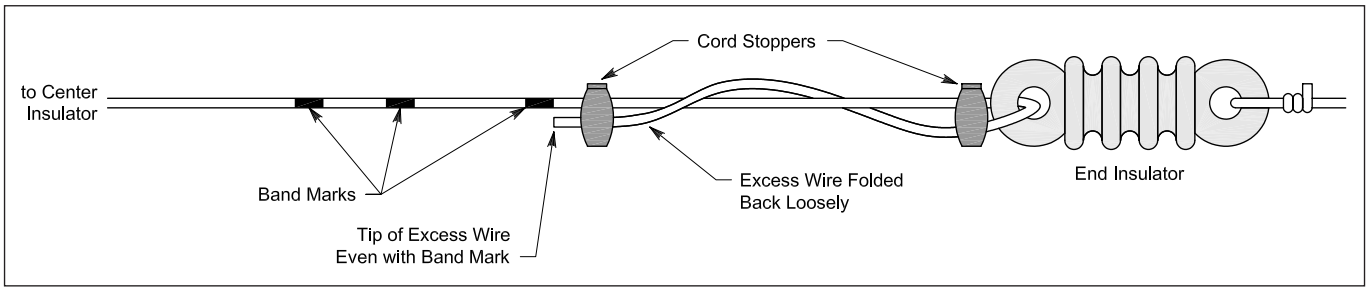


Figure 2—WØFM's push-button tuned antenna.

Bob Schetgen, KU7G ♦ Senior Assistant Technical Editor ♦ h&k@arrl.org

multiband use! When you want to readjust the antenna's resonant frequency, simply position the innermost "stopper" just outside the desired band mark. Press the button to release the stopper and pull the antenna wire through the stopper to align the tip with the desired band mark. Then, simply reposition and release the outer stopper at the insulator, and *voila!* Your antenna is tuned for the new frequency.

"Stoppers" work best with center-supported dipoles or inverted Vs, where there is minimal pull at the ends of the antenna. Obviously, a heavy 80-meter dipole supporting the weight of the center insulator and feed line might not be a good candidate for the cord-stopper trick. Nonetheless, I have supported some reasonably heavy dipoles in my attic using three stoppers at the end of each antenna leg. (Thankfully, high winds and ice loading have yet to be an issue *inside* my attic!)

Operating from a hotel room during vacations to Grand Cayman, I have used stoppers to tune a single-element dipole for 20-17-15-12 and 10 meters, quickly and with very good results. This technique would also seem good for Field Day or QRP backpacking.

Add a "stopper" antenna to your travel bag. Imagine the looks when you tell your friends that you've built a multiband, push-button memory tuner for 2 bucks!—*Terry Schieler, WØFM, 104 Ladue Woods Estates Dr, St Louis, MO 63141;* **w0fm@arrl.net**

QUIETLY KEY THAT AMPLIFIER!

◊ I like operating full-QSK CW with my Kenwood TS-850. Kenwood made adding an amplifier to the TS-450 and TS-850 very easy. A simple menu setting activates an internal relay that can key most modern amplifiers. The TS-850 is usually very quiet while operating QSK, but switching on the internal amplifier-keying relay changes that! The relay is very noisy, and I found it distracting even while wearing headphones. My initial solution was to switch the relay off when not using the amplifier. While this meant digging for the appropriate menu setting each time, at least I avoided listening to that relay!

Since I like to chase DX, I wanted to find a way to key the amplifier without using the internal relay. Then I could quickly switch on the amplifier when needed. I noticed that keyed +12 V was available on the rear ACCY connector. I designed a simple circuit (Figure 3) that uses the 12 V from the ACCY connector to key the amplifier without using the noisy internal relay. The initial design was Q1 (Zetex ZTX-657-ND or equivalent) plus the two 1 kΩ $^1/_2$-W (RadioShack 271-1118 or equivalent) biasing resistors that I had in the parts box. I used a 1×1-inch piece of circuit board and built the circuit "ugly-style." As an afterthought, I added D1 (1N4002 or equivalent) to protect the rig from any transients generated by the amplifier. The completed breadboard was placed inside the amplifier near the jack for the keying line. It was held in place with three drops of RTV sealant. The result is a noiseless alternative to the internal relay in the TS-850. This circuit can easily be adapted to any rig with a positive keyed voltage available.

I've used this circuit for over two years without any problems. It has allowed me to operate quiet QSK running 100 W and quickly switch on the amplifier to chase that new one! —*Tom Branch, K4NR, 1910 Douglas Dr, San Angelo, TX 76904-5024;* **k4nr@arrl.net**

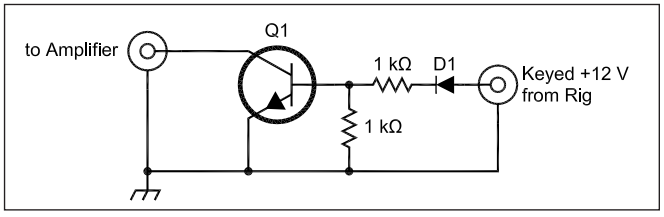


Figure 3—K4NR's simple circuit uses +12 V to key amplifier. Q1 should be rated at 300 V, 0.5 A. D1 is rated at 100 V PIV, 1 A.

BOOSTING HF RECEIVE

◊ Whether your radio is a scanner or the new Kenwood TH-F6A, you can easily improve HF reception with one of the three methods pictured in Figure 4. With some hookup wire, just wrap about 30 turns around a small, non-metallic tube and place it over the supplied antenna. For a more elaborate fix, you can use an active antenna in place of the supplied duck (but be careful not to transmit or you can burn it out!). Finally, "quick and dirty," wrap a few turns of a telephone receiver cord (remaining attached to the telephone) around the rubber duck. With simple devices like these, most of these radios become very satisfactory HF receivers!—*Bill Breuer, KE4SGV, 2351 Winston Ave, Louisville, KY 40205;* **ke4sgv@juno.com**

Figure 4—Several ways to boost the HF reception of general-coverage handheld radios with small flexible antennas.

ASTRON RS-20A POWER-SUPPLY RFI PROBLEM

◊ When working with some temporary antennas, I noticed that when my transceiver was at full power output the voltage from my Astron RS-20 power supply would fold back to about 10 V. This caused erratic operation of the transceiver unless I reduced the output power substantially.

I traced the problem to RF getting into the shack on the shield of the coax cable. I placed some ferrite beads on the cable. That reduced the problem, but did not eliminate it. I believe that the RF entering the power supply was being rectified and causing the regulator IC to reduce the output voltage.

A look at the power-supply schematic indicated that some capacitors had been added at the factory for RF filtering, but I noticed that a few sensitive areas of the circuitry still seemed susceptible to RF. I added four 0.01-µF capacitors at the following circuit points: across the voltage adjustment divider (R6, R5, R7), across the V_{cc} lead to the regulator chip (IC1 pin 12 to pin 7), and across each of the dc filter capacitors (C1, C5).

I can now operate at full power and without any ferrite chokes on the coax cable. There is no indication of RF impacting power supply performance any longer.—*Harvey Mandell, WA2AAE, 18 Bishop Ln, Hicksville, NY 11801-4534*

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Ten-Tec Argonaut V MF/HF Transceiver Model 516

By Rick Lindquist, N1RL
ARRL Senior News Editor

Face it. The *Argonaut* name still evokes powerful magic. It stirs fond memories of the original Argonaut Model 505—a 5-W analog transceiver that's now a classic (and collectible) piece of US-made gear that continues to be much-beloved within the low-power (QRP) community. To judge by comments posted on the Internet, diehard Ten-Tec fans—a number of whom rushed out to buy this latest "Argo" largely on the basis of its name alone—appear to be thrilled with this latest version.

It's been more than a decade since Ten-Tec's last Argonaut, the Argonaut II—a strictly 5 W unit, but with more features than the original. Ten-Tec, in the same breath, also offered the higher-powered, but largely otherwise-identical, Delta II; we reviewed both in the January 1992 issue of *QST*. Now we've jumped to the economically priced Argonaut V, also known as the Model 516.

This latter-day unit is not exactly a QRP transceiver, but, of course, you can adjust the power level down to the requisite 5 W. At full throttle, the Argo V boasts 20 W of output and many other features Ten-Tec has not included on some of its higher-priced rigs, such as a general-coverage HF receiver. To borrow a phrase, this is not your father's Argonaut, although there are some similarities to the Argonaut II.

We've prodded, probed, pushed and twisted this latest Argonaut version to put it through its proverbial paces. Here's what we found out about this fun little radio.

The Box

Panel labels aside, the Argonaut V Model 516 looks just like Ten-Tec's Model 526 *6N2* multimode VHF transceiver (see "Product Review," *QST*, Oct 2001). The black box is smaller than the Argonaut II's—roughly 3.5×8.5×9.5 inches (HWD), counting the heat sink and the big front feet, but not the fold-down bail that lets you tip up the front of the radio for better viewing, depending on where you have it situated in terms of eye level. In other words, this is not the smallest radio on the market, but it's fairly compact.

From a stylistic standpoint, the Argo V has a solid, plain-vanilla, no-nonsense look about it. With its big American knobs, an analog S/power meter, an appropriately weighted tuning knob (with the now *de rigeur* dial-spinning dimple), it nicely complemented my early 1990s-vintage transceiver.

The LED display offers greenish-yellow half-inch-tall digits that read out to the 10-Hz position, whether or not you need that level of precision. There's a sub-display with slightly smaller characters that reads out such things as RIT/XIT, passband tuning and memory settings. Three smaller knobs (two of them concentric controls), a dozen pushbuttons (most handling more than one function) and the microphone and headphone jacks round out the front panel.

Software-Defined Radio Comes to QRP

Ten-Tec says the Argonaut V is "an IF-DSP software-defined radio for QRP." In this regard, the Argo V definitely parts company with is predecessors, not to mention a lot of other radios now on the market. What Ten-Tec has done is to define the heart of the Argonaut V's functionality in software—or, to be more accurate, firmware. What this means, aside from IF-level digital signal processing (DSP), is that owners can update their radios to the latest "model" simply by downloading a file from the Web, **www.rfsquared.com**, and loading it into the radio's flash read-only memory (ROM) via a built-in, nine-pin RS-232 connector on the rear apron. (The same serial connector lets users control the Argo V with a PC using third-party software.) By the way, the radio flashes the latest software version on the display when you turn it on. Ours had version 1.06.

"Should the 60-meter [5-MHz] band be allocated for Amateur Radio use, your transceiver will be ready the day the band opens," Ten-Tec says, pointing out the advantages of flash-ROM updating on its Web site, **www.tentec.com**.

Another really slick feature is that the Argo V lets you wire up directly to your PC soundcard to operate digital modes such as PSK31, so many of which have become available via software. You don't need any kind of interface to do this, but, unless you enjoy soldering to DIN connectors, you might want to pick up Ten-Tec's accessory cable (part number 46176) to simplify matters. Its $10 cost is cheap insurance against burned fingers and strained eyes.

Bottom Line

Ten-Tec's "QRP" HF rig provides a great deal of bang for the buck, and the ability to update with firmware is very nice.

On the Airwaves with the Argo V

You can work CW, SSB, FM and AM with the Argonaut V. AM? We wondered about that too. I'm not sure how many

Brennan Price, N4QX ♦ Assistant Technical Editor ♦ n4qx@arrl.org

Table 1
Ten-Tec Argonaut V, serial number 08C10452

Manufacturer's Claimed Specifications	Measured in the ARRL Lab
Frequency coverage: Receive, 0.5-30 MHz; transmit, 1.8-2, 3.5-4, 7-7.3, 10.1-10.15, 14-14.35, 18.068-18.168, 21-21.45, 24.89-24.99, 28-29.7 MHz.	Receive and transmit, as specified.[1]
Power requirement: Receive, 0.5 A; transmit, 7 A; 12-14 V dc.	Receive, 1.0 A; transmit, 7.5 A. Tested at 13.8 V.
Modes of operation: CW, SSB, AM, FM, AFSK.	As specified.
Receiver	**Receiver Dynamic Testing**
SSB/CW sensitivity, 2.4 kHz bandwidth, 10 dB SINAD: 0.5 μV.	Noise floor (MDS), 500 Hz bandwidth: 1.0 MHz –121 dBm 3.5 MHz –133 dBm 14 MHz –132 dBm
AM sensitivity: 6 kHz bandwidth, 10 dB SINAD: 1.2 μV	10 dB (S+N)/N, 1-kHz tone, 30% modulation: 1.0 MHz 7.2 μV 3.8 MHz 1.2 μV
FM sensitivity: 15 kHz bandwidth, 12 dB SINAD: 1.2 μV	For 12 dB SINAD: 29 MHz 1.27 μV
Blocking dynamic range: Not specified.	Blocking dynamic range, 500 Hz filter: *Spacing* *20 kHz* *5 kHz* 3.5 MHz 112 dB 67 dB 14 MHz 118 dB 67 dB
Two-tone, third-order IMD dynamic range: Not specified.	Two-tone, third-order IMD dynamic range, 500 Hz filter: *Spacing* *20 kHz* *5 kHz* 3.5 MHz 85 dB 61 dB 14 MHz 85 dB 62 dB
Third-order intercept: +4 dBm.	3.5 MHz –4.5 dBm –30 dBm 14 MHz –3.4 dBm –29 dBm
Second-order intercept: +66 dBm.	+47 dBm.
FM adjacent channel rejection: Not specified.	20 kHz channel spacing: 29 MHz, 64 dB.
FM two-tone, third-order IMD dynamic range: Not specified.	20 kHz channel spacing: 29 MHz, 64 dB.*
S-meter sensitivity: 50 μV at S9.	S9 signal at 14.2 MHz: 39 μV.
Squelch sensitivity: Not specified.	At threshold: SSB, 14 MHz, 0.11 μV; FM, 29 MHz, 0.99 μV.
Receiver audio output: 2.0 W into 4 Ω @ 5% THD.	2.7 W at 5% THD into 4 Ω
IF/audio response: Not specified.	Range at –6 dB points, (bandwidth): CW-N (500 Hz bandwidth): 394-1015 Hz (621 Hz); USB: 158-2030 Hz (1872 Hz); LSB: 166-2382 Hz (2216 Hz); AM: 111-2642 Hz (2531 Hz).
Spurious and image rejection: 70 dB.	First IF rejection, 72 dB; image rejection, 84 dB.
Transmitter	**Transmitter Dynamic Testing**
Power output: 20 W (high), 1 W (low).	Typically 18 W high, <1 W low.
Spurious-signal and harmonic suppression: >43 dB	44 dB. Meets FCC requirements for spectral purity.
SSB carrier suppression: >50 dB.	As specified. 62 dB.
Undesired sideband suppression: >60 dB.	As specified. 70 dB.
Third-order intermodulation distortion (IMD) products: Not specified.	See Figure 1.
CW keyer speed range: Not specified.	5 to 44 WPM.
CW keying characteristics: Not specified.	See Figure 2.
Transmit-receive turn-around time (PTT release to 50% audio output): <20 ms.	S9 signal, 24 ms.
Receive-transmit turnaround time (tx delay): Not specified.	SSB, 25 ms; FM, 25 ms. Unit is suitable for use on AMTOR.
Composite transmitted noise: Not specified.	See Figure 3.
Size (height, width, depth): 2.8×8.5×9.7 inches; weight, 5 pounds.	

Note: Unless otherwise noted, all dynamic range measurements are taken at the ARRL Lab standard spacing of 20 kHz.
*Measurement was noise-limited at the value indicated.
Third-order intercept points were determined using S5 reference.
[1]Transmit range extends a few kHz beyond the edges of each band (example 1795-2006 kHz for 160 m). Receive sensitivity reduced below 1.5 MHz.

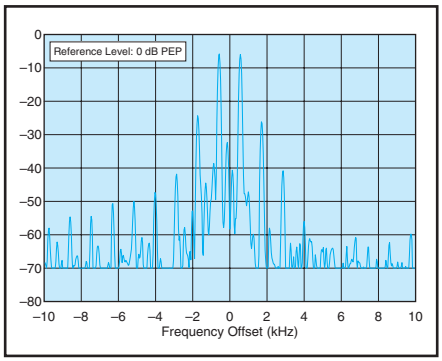


Figure 1—Worst-case spectral display of the Argonaut V transmitter during two-tone intermodulation distortion (IMD) testing. The worst-case third-order product is approximately 25 dB below PEP output, and the worst-case fifth-order product is approximately 41 dB down. The transmitter was being operated at 20 W output at 1.850 MHz.

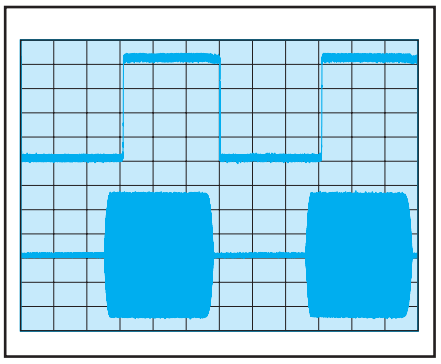


Figure 2—CW keying waveform for the Argonaut V showing the first two dits in full-break-in (QSK) mode. The equivalent keying speed is 40 WPM, rather than the ARRL Lab standard 60 WPM. The upper trace is the actual key closure; the lower trace is the RF envelope. Horizontal divisions are 10 ms. The transceiver was being operated at 20 W output at 14.2 MHz.

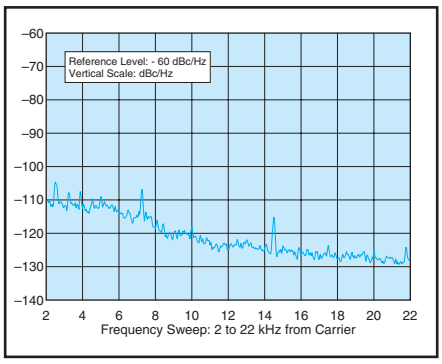


Figure 3—Worst-case spectral display of the Argonaut V transmitter during composite-noise testing at 14.020 MHz. Power output is 20 W. The carrier, off the left edge of the plot, is not shown.

Figure 4—Rear panel of the Argonaut V. Note the sizeable cooling fans (right). Firmware updates are received through the SERIAL port (lower left). The Argonaut V and the computer may be connected with a standard 9-pin serial cable.

low-power AMers are out there, but I have a suspicion you could count them on one hand. On the other hand, I recall that my first forays into AM phone on 40 meters at 10-20 W output in the late 1950s and early 1960s yielded many successful and enjoyable contacts.

In that same vein, the 20 W available on SSB and CW is plenty of power to literally work the world. In comparison with strictly 5-W QRP operation, you'll be about one S unit louder at full output. A simple twist of the knob cuts you back to whatever power level you want, up to 20 W, of course.

The Argo V scores at least a 9 on the 10-point "can-I-figure-this-thing-out-without-looking-at-the-manual?" scale. Ten-Tec is correct when it says that the Argo V offers "solid HF radio performance in a user-friendly format."

Once you've got your Argonaut V all hooked up, the first thing you have to do is turn it on. There's no power button, however. You power up the Argonaut V by turning the AF knob, which incorporates the power switch. It's a bit retro, but, hey, it works! (No, you don't then have to wait for the tubes to warm up.)

Operation is very straightforward, and it should not take long for anyone already familiar with a typical HF transceiver how to figure out how to make almost everything work. You control a good deal of the radio's operation via the MULTI (multifunction) knob. Each button (sometimes you need to press the FUNC button first) gets you into a sub-menu (there's no *big*, main menu). For example, enabling passband tuning (PBT) is as simple as pressing the PBT button. The PBT setting will appear in the box at the right of the display. The PBT works very well and has a range of ±2.99 kHz. Less intuitive, but certainly mighty convenient, is the process of clearing the PBT setting (and your RIT/XIT settings) by holding the appropriate button down for one second or longer.

For CW work, the internal keyer is excellent and Ten-Tec's legendary QSK flawless (provided you remember to remove any hang time settings via the VOX menu—see below). The keyer starts out at 5 WPM and is supposed to top out at 50 WPM, although we measured 44 WPM in the Lab. The front panel reads out the speed in words per minute. The KEYR menu also includes the rarely adjusted dot-dash ratio (weighting), as well as CW pitch (400-999 Hz) and sidetone level. You don't have to step through these functions each time you need to set the speed, however. Once the keyer is enabled, just press the KEYR button; it's the first thing on the menu. Hit FUNC or another button to escape.

We'd complained that the Argonaut II gave you no option *but* QSK. The Argonaut V lets you use semi-break-in mode (VOX) by setting the VOX hang time (delay). The problem is that the hang time setting is common to SSB and CW (although the manual seems to suggest that they are mode-dependent). This means that if you set the hang time for one mode, it will apply to the other—whether you have VOX turned on or not. You can't change the CW "sideband."

SSB operation is as simple as plugging in the provided hand-held microphone, stepping through the bands (it only goes one direction: up) and modes to an appropriate frequency and sideband and setting the concentric MIC and PWR controls. As noted, the Argo V includes VOX, but it does not have any kind of audio processor or signal monitor. It worked very nicely with my Heil Pro-Set Plus headset, too. Audio reports were uniformly excellent with either the supplied mike or with the Heil.

The noise blanker level is adjustable (very helpful, because too high a level can lead to received-signal distortion and pop-

ping), but it's only accessible as a secondary function (FUNC+A-B/NB button).

Another minor gripe: The MULTI knob, which is so important to many menu and function settings and adjustments, turns continuously, *not* in discrete steps. As a result, it slips easily from one setting (eg, a memory channel) to the next, unless you're very careful manipulating it. Some may actually prefer this approach; it's a matter of individual preference.

Just like many "big rigs," the Argo V includes a band-stacking feature that's really handy for those who like to keep two frequencies and/or modes in a given band at their fingertips. Pressing FUNC + BAND switches to the second frequency in a given band. The bandwidth setting sticks with the band and mode setting.

The S/power meter also can display a sort of relative SWR reading as well as the power amplifier current. You can also change the meter's range—especially handy for checking your output in the 0-5 W range—but you can only do this while in transmit, and the meter range goes back to the default range when you return to receive.

The Argo V actually sounds decent on AM—listening and transmitting. I listened to several AM broadcast stations, and it's got good sensitivity on the *standard broadcast* band. Inconvenient is that in order to initially get to a "general-coverage" frequency, you have to start at one of the default ham-band settings and dial up the frequency you want. Once you get a few frequencies pinned down in memory, however, you can go to those, then flip back to VFO mode. Speaking of memories, there are 100 of them.

In the "but-wait-there's-more" department, the Argo V offers scanning features. You can scan memories or a range of frequencies and even skip a stored frequency. Given the MF/HF range of the Model 516, this is not something you'd be likely to use much outside of 10-meter FM (in fact, that might be something you'd not be likely to use either, but you have it if you want it).

The fan kit is a desirable option for high-duty-cycle modes such as PSK-31 and AM, where power already is limited to 5 W output. The optional fans can be noisy. We tried out two Argonaut Vs, and the cooling fans (there are two of them that slide onto the heat sink) were whiny on both units. They emit a sort of throbbing whine, and the noise was slightly different for each of the two cooling fans. It was worse on one of the radios than on the other (the fans on one unit sounded slightly slower).

We've heard noisier cooling fans, and these won't drive you out of the room or anything like that. They're pretty tiny, however, and look as though they *should* be really quiet.

A Standing Ovation for DSP

The 35 IF-DSP receive filter settings are what really make the Argonaut V sing. Press the BW button, and you can set from 200 to 1000 Hz bandwidth in 50-Hz steps, and from 1000 to 3000 Hz in 100-Hz steps. (For AM, filters range from 400 Hz to 6 kHz; the filter setting is fixed in FM mode.)

On SSB, you can get down to around 850 Hz and still decipher audio, which gives you an idea of how the filters are shaped. For my purposes, I sometimes wanted a narrower filter than 200 Hz for CW (this is also great for PSK31); perhaps this is something that can be added in a future flash-ROM update.

While the software-defined DSP filters in the third IF work pretty well, the difference between them and traditional crystal filters and the DSP in the Argo V was obvious. A strong nearby signal will "pump" the radio's AGC. This is characterized by downward fluctuations in receiver gain that match the interfering signal's peaks. You won't necessarily *hear* the other signal if you have the bandwidth set to narrow, but you can see the effect on the S meter. Incidentally there is no AGC adjustment; it's set automatically according to mode.

It was in situations like the above that the attenuator came in handy. Oddly, there's no front-panel indication that the 20-dB attenuator is engaged. Ten-Tec advises the user to check the S meter to tell, which is less than convenient. There's no RF gain control on the Argonaut V, and, given that most operators leave that control wide open, most will not miss it.

The Argonaut V's DSP does not include any kind of notching or noise-reduction features.

Making Sense of the Numbers

The Lab numbers in Table 1 spell out how well the Argonaut V performs in technical terms. From a receiver standpoint, the dynamic range numbers are the most important, in my opinion. This goes back to the "if-you-can't-hear-'em-you-can't-work-'em" school of thought. The higher the two-tone, third-order intermodulation distortion (IMD) numbers, the better the receiver will be able to pull out a weak signal in the presence of stronger signals.

We measured, worst case, 85 dB at the ARRL standard spacing of 20-kHz. This is in the ballpark for a transceiver in this price class and, perhaps coincidentally, the same as we'd measured a decade earlier for the Argonaut II. Closer in, we found two-tone, third-order IMD dynamic range dropped to 67 dB at 5-kHz spacing.

SSB/CW sensitivity, measured in terms of noise floor, indicated a rather "hot" front end. The AM and FM numbers were decent, too. The third-order intercept was in the negative numbers using the two-tone, third-order IMD dynamic range numbers at the 20 and 5-kHz spacings.

Another anomaly was the S meter calibration. Ten-Tec says the S meter is calibrated to 50 μV at S9; we measured 39 μV for S9 on one of our units.

Me an' my Argo Go Contesting

I've run lots *less* power in various contests, so the 20 W the Argonaut V provides was almost like operating with an amp, comparatively speaking. That power level held up surprisingly well, even on a band full of competitors during the CW World Wide 160-Meter Contest and the ARRL International DX CW Contest. Even with a ton of signals in close proximity—many of them quite loud—the Argonaut was able to pick out the ones I wanted to hear; more often than not, the 20 W made it possible to work them.

During the ARRL event, I was able to work nearly everything I heard using wire antennas. That included contacts with Europe and South America on 80 meters during the late afternoon and early evening hours.

Odds and Ends

The *Operator's Manual* is superb. Ten-Tec includes a *Quick Reference* card you can keep handy in case you forget something important—like how to turn on the radio. The manual includes a complete set of schematics as large—and readable—foldouts. The last chapter is an excellent glossary and index that even explains the technical terms (*buffered-T voltage* is one that comes to mind) and includes page references where appropriate. The guts of the manual are the 22 pages devoted to describing how to make the radio do what you need it to. Then, there are nine pages that go with the schematics and describe the theory of operation for each of the five subassemblies. For example, if you want to know how the Argonaut V's two codecs work together in the signal path, *it's in there*, as the spaghetti sauce ads say.

Ten-Tec has thoughtfully included a little plastic envelope that contains a stereo plug for the miniature (3.5-mm) key jack (Ten-Tec advises users to "resist the temptation" to use a quarter-inch-to-

3.5-mm adapter, which, owing to its length and size, could damage the jack); a spare four-pin microphone plug; a spare power connector; a spare 7.5-A fuse, a mobile microphone holder (plus hardware) and a small hex wrench to remove or tighten the knobs. A minor gripe is that Ten-Tec used the 3.5-mm jack for the key in the first place, especially when most transceivers use the ¼-inch jack. Then again, most QRP transceivers are really tiny and use the smaller jack.

By the way, Carl Moreschi, N4PY, offers a PC control program (a version of his Pegasus/Jupiter control software) for the Argonaut V. It's on his Web site, **www.ralabs.com/n4py**.

Who Wants One of These?

There's a sort of "spiritual connection" between some amateurs and Ten-Tec gear than can defy objectivity at times. For example, one fellow posted his opinion that the Argo V was "more radio" than the original ICOM IC-706. At the very least, that's a very highly debatable issue given the capabilities of the latter radio.

Anyway, a lot of folks will buy the Argonaut V simply because it's from Ten-Tec; the Argonaut moniker alone will sweeten or perhaps clinch the deal for others. The 20 W suggests QRP with an edge, but it's a great power level for those who enjoy the slow lane, and it's demonstrably plenty of power to work DX, even in a contest environment. It's also sufficient to also enjoy casual contacts, and, as a bonus, you don't have to worry as much about RFI issues. We didn't try taking the Argonaut V on the road, however. There just did not seem to be any particular advantage. It might be a great rig to take to the field, although it does draw 7.5 A in transmit at full output (about 1.0 A on receive with the volume control wide open).

Current Argonaut V owners seem to have registered few complaints. Some have noted the lack of an RF-gain control. Owners have also offered helpful suggestions, such as one to use the memory feature to store frequencies in each band to permit moving more easily from band to band.

Overall, we found the Argonaut V to be a capable little transceiver that's easy to use and incorporates a lot of handy features in a compact, well-constructed package.

Manufacturer: Ten-Tec, 1185 Dolly Parton Pkwy, Sevierville, TN 37862; 800-833-7373; **sales@tentec.com**; **www.tentec.com**. Argonaut model 516 transceiver, $795; with optional temperature-compensated crystal oscillator (TCXO), $849; model 308 fan kit, $15; model 309 mobile bracket, $19.95; model 937 matching power supply, $89; model 705 desk microphone, $99.95.

RIGblaster Pro

By Steve Ford, WB8IMY
QST *Editor*

Is there such a thing as an "ultimate" transceiver/computer interface? Perhaps not, but West Mountain Radio has introduced a strong candidate for the title in the new RIGblaster Pro. The RIGblaster Pro certainly has every bell and whistle I could imagine, plus some I didn't even think of. Of course, with such versatility comes increasing complexity. The "Pro" part of the model name should be taken at face value. This unit is designed for amateurs who have (or want) complete computer/radio integration and don't mind taking the time to become familiar with a full-featured interface. If all you care about is a simple box to link your sound card to your radio so that you can operate PSK31 or other soundcard modes, the RIGblaster Pro is gross overkill. But if you want to make your computer and radio true partners in a high-performance multimode station, the Pro is a godsend.

Microphones, Headphones and LEDs

The RIGblaster Pro is housed in a flat metal box about 8 inches long, but only an inch thick. The front panel features an 8-pin microphone jack, a 1/8-inch auxiliary mic jack and two headphone jacks—1/8 and 1/4 inch. The purpose of the auxiliary mic jack is to allow you to plug in a headset microphone without having to unplug your main mic. When the headset plug is inserted, audio from the main mic is interrupted automatically.

The output level control is conveniently located on the front of the box for easy access. Tweaking this little knob to adjust transceiver drive is easier than grabbing your PC mouse and calling up your software audio mixer screen.

The LEDs are informative and serve as valuable troubleshooting tools when necessary. Just by glancing at the LEDs, you'll know that sound is reaching the Pro from your computer, that the FSK keying signal is active for RTTY and so on.

Then there is the PROCESS toggle switch and LED. Contrary to what you might think, the RIGblaster Pro does *not* have an internal speech processor. However, you can do a very nifty thing with the Pro's PROCESS function, as we'll see later.

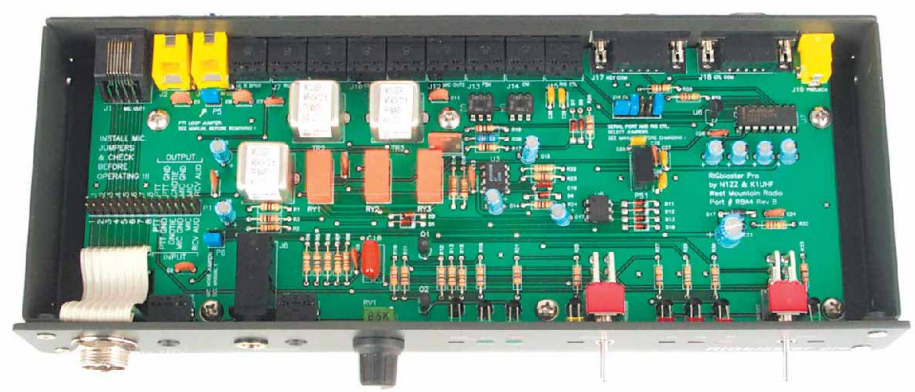
Built-in Rig Control

Using computers to control amateur transceivers has become quite popular. Most modern transceivers have computer-control ports and, with the right software, your computer can become a versatile tool for either local or remote manipulation of your radio. The catch is that you usually need a hardware interface to do the signal translation between the computer's RS232 serial port and the transceiver's TTL port. This means an additional purchase and another device dangling from your PC.

Not so with the RIGblaster Pro. The Pro features a *built-in* RS232-to-TTL interface that will work with ICOM, Yaesu, Kenwood and Ten-Tec transceivers that support computer control. The Pro also offers serial port pass-through for radios that support direct RS232 control (newer Yaesu and Kenwood transceivers).

Dual Serial Jacks

When you look at the rear panel of the RIGblaster Pro, your eyes are drawn immediately to the dual DB9 serial jacks. Considering the fact that most sound card interfaces sport only a single serial jack, this may seem puzzling. The answer to the mystery is that the RIGblaster Pro is designed to handle *two* serial lines from your computer *simultaneously*. A typical use for this feature might be with the popular *WriteLog* contesting software. In a RTTY competition, for instance, you can have *WriteLog* doing radio control on COM 1 and FSK keying on COM 2. With



An interior view of the RIGblaster Pro. Note the shielded transformers.

The rear panel of the RIGblaster Pro is festooned with input and output jacks.

the dual serial inputs, the RIGblaster Pro brings everything together in one box and allows you to sort the functions accordingly.

The RIGblaster Pro also gets quite a bit of mileage out of a single serial port in some situations. If you happen to be running *HamScope* or *MixW* software, you can control your transceiver push-to-talk function for PSK31 and other modes, *and* CW keying, on the same serial port.

Installation and Operation

The RIGblaster Pro comes with a detailed manual. You need to read the instructions carefully, then determine which modes you wish to operate and how you wish to do so. The answers will be different for everyone, so I can only offer my own station as an example. I wanted to be able to use the Pro's capability in several applications:

- Rig control for use with *WriteLog* and *TRX Manager*
- CW keying
- FSK RTTY
- PSK31, MFSK16 and slow-scan TV
- *Echolink*
- *WSJT* (for 6-meter meteor-scatter fun)
- SSB and FM with either my standard microphone or a headset mic.

The first step is to open the Pro and install the jumpers for the microphone, COM port and rig-control blocks. The manual shows several microphone jumper configurations, depending on the radio you own. The jumpers have to be set correctly so that the microphone pin assignments on your radio ultimately correspond with the pins on the Pro's front-panel microphone jack. It is important to note that the Pro connects to your rig's mic jack through an RJ45 telephone-style jack on the Pro's rear panel. My ICOM IC-706 also uses an RJ45 jack, so making the connection was relatively easy. Other radios may require adaptors.

Like most computers, my mongrel machine has two COM (serial) ports. The Pro package includes one DB9 serial cable, which I ran from COM2 to the Pro for rig control with *WriteLog* and *TRX Manager*. With another cable I dedicated COM1 to PTT (push to talk) control for my *MixW* software for CW, PSK31and MFSK16, as well as my *EchoLink* and *WSJT* applications. I also set up *MMTTY* and *WriteLog* to use COM1 for FSK RTTY keying.

The Pro includes independent, fully isolated CW, FSK and PTT keying outputs. This means that once you've installed the RIGblaster Pro, you won't need to swap cables to transition from mode to mode. You can jump from CW to FSK RTTY, to PSK31, for example, by just loading the proper software. The Pro does the rest.

I plugged my computer speakers into the Pro and connected the audio lines to and from the PC. (The thoughtful folks at West Mountain Radio not only include a generous number of audio cables, they add a set of color-coded adhesive labels maintain order in the cable chaos.) My microphone connected to the front-panel eight-pin jack and the wall-wart power supply (included with the Pro) plugged into the rear panel. Total setup and installation time: about 30 minutes.

The RIGblaster Pro worked perfectly from the moment I applied power. It was a pleasure to hop from one program and mode to another without pulling cables and throwing switches. And speaking of programs, the Pro package includes a CD with an astonishing number of freeware and shareware programs. Most of the applications are for *Windows*, but there are *Mac* and *Linux* applications on the CD as well.

But what about that PROCESS switch? Well, if you have audio processing software on your computer—such as the software found on the RIGblaster Pro CD—you can toggle the PROCESS switch and route your microphone audio through your sound card *before* it is applied to your radio. This allows you to use the software to process your audio characteristics in any way you desire. I also used the Process function with my headset microphone in contest operating to send the mic audio through the computer for virtually seamless live/recorded voice keying. I was even able to use the Process function to route the headset through my computer for nonham uses such as voice chats with *Windows Messenger*.

Conclusion

Is the RIGblaster Pro for everyone? No. As I stated at the beginning of this review, you don't need a RIGblaster Pro for basic computer PTT keying. But if you consider your computer an essential part of your Amateur Radio experience regardless of mode, the RIGblaster does a superb job of integrating all of your activities in a way that adds substantial enjoyment and convenience. Some may find the Pro's price tag a little intimidating, but I found the per-dollar value to be quite good, especially considering the quality of design and construction. The RIGblaster Pro is definitely the Rolls Royce of interfaces.

Manufacturer: West Mountain Radio, 18 Sheehan Ave, Norwalk, CT 06854; tel 203-853-8080; **www.westmountainradio.com**. $299. QST

TECHNICAL CORRESPONDENCE

GAMMA MATCHING

R. H. Barker, G4JNH, 171 Leicester Rd, Ashby de la Zouch, Leicestershire LE65 1TR, Great Britain

◊ I have been convinced for years that the gamma match is the best system available for coupling coax line to Yagi antennas and that it doesn't get the attention it deserves. I was very pleased therefore to see Ward Silver's comprehensive review article in the December 2002 issue of *QST*. There are, however, a few points raised in the article on which I would like to comment.

Ward's summary of the model of the gamma match that I proposed in the May/June 1999 *QEX* article[1] is misleading. In that model, the gamma capacitor and gamma rod are not part of the impedance-transformation network. One arm of the network is the inductive reactance and radiation resistance of the driven-element gamma section, and the other arm is the capacitive reactance and radiation resistance of the rest of the driven element. The function of the gamma rod is merely to deliver power to the gamma tap on the driven element. The gamma capacitor is needed to tune out the inductive reactance of the gamma rod plus any residual reactance from the impedance transformation network.

Elsewhere in his article, Ward repeats a point that I have seen in print before: There can be high RF currents circulating in the matching components. I can't see how such circulating currents can arise. If the gamma match is working as it should and giving a good match to the line, the current in the line should be flat and equal to that flowing through the gamma capacitor, along the gamma rod, through the shorting bar and through both connections to the driven element. Furthermore, the system must satisfy Kirchhoff's first law, which (when applied to a three-conductor junction such as both connections to the driven element) requires the current on any one conductor to equal the vector sum of the currents on the other two conductors. It follows that the maximum current in any one conductor cannot exceed the arithmetic sum of the currents in the other two conductors. A vector analysis based on the model I proposed in the *QEX* article shows that in a typical situation where the gamma match is lifting the impedance from 20 to 50 Ω, the current in the gamma section of the driven element would be about 10% greater than the antenna current. The actual values were as shown in Table 1.

Table 1
Current in Components of a Gamma Match

Gamma Rod	1.41 A	0.0°
Gamma section of Driven Element	2.40 A	63.8°
Antenna	2.18 A	–80.6°

It should be possible to measure these currents using a clamp-on RF ammeter, and this is something I hope to be equipped to do in due course. If anyone reading this has taken such measurements, I would be very interested to know what they found. Incidentally, the situation with the omega match could be very different, the additional capacitor completing a loop that under some conditions could carry very high circulating currents.

My personal experience of setting up gamma matches on two commercial antennas from different manufacturers is that their setup recommendations were of little help. Setting up a gamma match can be very time-consuming and frustrating, as Ward pointed out, but it need not be so. If, instead of measuring SWR, readings of resistance and reactance are taken, much of the trial and error involved in obtaining the perfect match is eliminated. The resistance and reactance measurements can be made using an impedance or admittance bridge or an antenna analyzer, but such readings must be made at the antenna terminal. Better yet, they could be derived from remote readings using a Smith Chart or a remote-impedance-measuring computer program, such as I described in the Sep/Oct 2001 issue of *QEX*. (It can be downloaded from the ARRL Web site.[2]) Changing the length of the gamma section affects both the resistance and reactance whereas changing the value of the gamma capacitor affects only the reactance. For this reason, it makes sense to adjust the resistance to the required value before attempting to adjust the reactance, unless the latter is so great that the readings are beyond the range of the instrument being used.

To increase the resistance, the length of the gamma section must be increased, which will make the reactance more inductive. To remove inductive reactance, the reactance of the gamma capacitor must be increased (which lowers its capacitance) and vice versa to remove capacitive reactance. I have found that a useful guide for the initial settings is to make the gamma-section length equal to 2 inches per meter of wavelength and make the capacitor 5 pF per meter of wavelength. For the midpoint of the 20-meter band, this would require the gamma-section length to be set at 42 inches and the capacitor at 110 pF.

I look forward to checking out the adjustment method mentioned by Ward, where the antenna is oriented vertically with the reflector on the ground. This method was suggested to me when I was setting up my first gamma matched antenna about eight years ago, but I was not able to take advantage of it. Due to the belligerence of the local planning authority, the siting of my tower prevents it being fully tilted without partially dismantling the antenna to avoid hitting a greenhouse installed by a previous owner of the real estate. Earlier this year, after some very strong gales, I decided that the greenhouse had become dangerous, and it was duly dismantled and disposed of about a month ago. As and when time permits, I intend to measure the impedance with the reflector on the ground and to compare it with measurements at various heights up to the maximum of 55 feet.

I want to make one final point, which is not related to any of the points mentioned by Ward. A very good VK friend of mine, John, VK2SB, is also a believer in the virtues of the gamma match and has many year's experience of its use. We have both independently formed the opinion that a correctly adjusted gamma match gives a wider SWR bandwidth than the beta match on an otherwise identical antenna. We would be interested to know the experience of others on this point.

Author Ward Silver Responds:

Ron—thanks for the lengthy reply to the article. Addressing Ron's concerns:

[1]R. Barker, G4JNH, "A New Look at the Gamma Match," *QEX*, May/Jun 1999, pp 23-31.

[2]You can download this package from the ARRL Web at **www.arrl.org/qexfiles/**. Look for Barker0901.ZIP.

Bob Schetgen, KU7G ♦ Senior Assistant Technical Editor ♦ tc@arrl.org

1. Model description—I apologize for over-simplifications in the pursuit of editorial brevity. If more space is available for a better description of his model, please print it.

2. Circulating currents—I think there is a typographical error (probably mine) in the article, and I should not have used the word "circulating," which implies a resonant effect. I was referring to the high current that can occur in the gamma section if the rod is very short (its resultant inductive reactance is very low) or the line spacing is very small (resultant impedance of the gamma section is likely to be very low). Ron is correct that in a properly designed gamma section, this is not a concern. My intent was to warn antenna designers that very short or narrow gamma elements may work on paper, but will have serious problems when built. The limit on gamma-rod length should be 0.025 λ (about $^1/_2$-meter on 14 MHz) and the limit on gamma-rod spacing should be 0.0025 λ (about 5 cm on 14 MHz). The length value is in agreement with Ron's gamma-rod-length guideline.

3. Adjustments—I agree with Ron that using R and X measurements directly would give a much better idea of how to make the adjustments. I highly recommend using an SWR analyzer (such as the Autek RF-1) that provides R and X values. The bulk of amateurs use just the SWR measurement, of course, which gives less information.

INTERFERENCE THE OLD FASHIONED WAY— *THROUGH HARD WORK*

By Murray Green, K3BEQ, 5730 Lockwood Rd, Cheverly, MD 20785-1127; **k3beq@arrl.net**

◊ Over the past several years, the 2-meter Amateur Radio Service FM repeater spectrum in the Washington DC metropolitan area has been bothered by interference from paging systems. As you can imagine, the Nation's Capital is saturated with communications of all types. Computerized listings of transmitters boggle the mind and when you look at a spectrum analyzer over a range of frequencies, it is almost a solid green block. There are many kinds of paging systems. One system has a ring of 24 computer-controlled transmitters, operating in the 150-MHz spectrum. This particular system has created interference problems on three occasions; but with the cooperation of amateurs and company representatives, they were resolved amicably.

The first occurrence started when a signal of unknown origin began intermittently activating a number of area repeaters (the Ping-Pong effect). Additionally, the alleged interfering signal tended to deteriorate weak to moderate amateur signals arriving at the repeaters. This was coupled with a low-level buzzing sound that could be heard in the background.

We were fortunate to detect the problem quickly because our particular repeater system is more active than most. Since the Ping-Pong effect was intermittent and bothered only weak/moderate signals, it would not necessarily be detected on a less busy repeater. Additionally, the low-level background buzzing sound could be easily mistaken for a mobile problem associated with the vehicle or even its movement. Adding to the problem, the interfering signal moved up/down a portion of the band. It simply wasn't always where you expected it. But, we got lucky.

A genius with a spectrum analyzer was able to pinpoint the specific frequency. By slowly narrowing down the spectrum, you could see the alleged interfering signal come up on the screen concurrent with the repeater's signal, repeatedly. Armed with the specific 150-MHz frequency, we then copied it's call sign(s). We were fortunate; pager systems need not necessarily identify in CW; digital identification is permissible, so I'm told.

With the call signs and frequency, but before contacting the company, we selected two receivers and listened to the pager tones on one and the repeater output on the second. Now, you need to understand that listening to pager tones for any length of time can drive you up a wall. In this instance, however, it reinforced the spectrum-analyzer evidence and was worth the extra work. When the pager activated our repeater system, its tones were associated with the activation. When the tones stopped, the repeater dropped off. This was verified repeatedly. Additionally, we had low-power amateur stations transmit to the repeater and listened to the paging tones. The buzzing *matched* the pager's activation/deactivation, and to a certain extent, the sound of the tones. It was time to contact the pager company.

Thanks to the FCC Web page (**wireless.fcc.gov/uls/**), all you need do is click on Licenses, enter the call sign and bingo, all 24 transmitters, their locations, owners (only one in this case), contacts and telephone numbers were there. After several telephone calls were made by the repeater's trustee, we reached the technician responsible for the paging transmitters, and the problem was explained together with our findings. A few days later he called back to confirm that there was a problem, and it would be corrected within the next 72 hours. True to his word, the interference stopped. The quiet was beautiful.

About four months later, the interference returned. Within 48 hours, the problem was again corrected.

An eight-month period had elapsed when the pagers once more reared their ugly heads. For the third time the faulty transmitter was isolated and corrected. The technician also informed us that they were vacating the 150-MHz frequency and moving up to the 800-900 MHz spectrum. Someone is watching over us.

That's our success story. Who knows what tomorrow will bring? We have had our share of other interference problems. They were resolved amicably but not without a lot of search-and-locate activity. Time off from work, checking frequencies, direction finding, spectrum analyzing, walking around suspected sites, listening and more listening. You can avoid some detective work by installing CTCSS. It may resolve the Ping-Pong effect, but once the repeater is open, in comes the interference. The one thing we have learned from these experiences is that you must get up and go after a problem. It has already come to you; but it is somewhere out there mixed in with thousands of other signals.

Epilog: A recent check of the 150-MHz pager frequency reflects a marked decrease in pager tone activity. It appears that the frequency move has already begun. I would like to thank Riley Hollingsworth, FCC, for offering his services if required. We came close to calling him, but it worked out. We appreciate the offer. As many of you may know, Mr Hollingsworth wears two hats: enforcement for the Amateur Radio *and* Commercial Services. A big thank you to Joe Nunemaker, KD3VR; Roy Ashlin, N3NGA, and all of the members of The Green Mountain Repeater Association who assisted in isolating and correcting the interference problem. It was a team effort.

Amateur Radio Spectrum Protection Act Reintroduced

The Amateur Radio Spectrum Protection Act, an ARRL legislative initiative, has again been introduced in the US House of Representatives. Florida Republican Michael Bilirakis put the latest version of the bill, HR 713, into the legislative hopper February 12. It has been referred to the House Committee on Energy and Commerce.

The House version quickly garnered two cosponsors, Reps John Boozman, Arkansas, and Patrick Tiberi, Ohio. Both cosponsored last year's bill. Introduction of a Senate version of the bill was pending at press time.

HR 713 is aimed at ensuring the availability of spectrum to Amateur Radio operators. It would protect existing Amateur Radio spectrum against reallocations to or sharing with other services unless the FCC provides "equivalent replacement spectrum" elsewhere. Bilirakis has twice before sponsored similar legislation at the League's recommendation.

The measure would amend the Communications Act to require the FCC to provide "equivalent replacement spectrum" to Amateur and Amateur-Satellite services in the event of a reallocation of primary amateur allocations, any reduction in secondary amateur allocations, or "additional allocations within such bands that would substantially reduce the utility thereof" to amateurs.

The ARRL is urging members of the Amateur Radio community to contact their representatives in Congress and request that they cosponsor HR 713. Experience has shown that, while most members of Congress understand and appreciate the benefits of Amateur Radio, some may be reluctant to sign onto a technical piece of legislation without some indication of support from their constituents.

The text of HR 713 is available via the Thomas Web site, **thomas.loc.gov/**. Enter "HR713" in the "Bill Number" window. ARRL asks those soliciting their members of Congress to cosponsor this legislation to copy their correspondence to the League via e-mail to **specbill03@arrl.org**.

ARRL Has Mixed Feelings on *Spectrum Policy Task Force Report*

The ARRL has registered mixed feelings about the FCC's *Spectrum Policy Task Force Report* issued in November. In comments to the FCC, the League called the report "a positive first step" in developing a comprehensive national spectrum management approach. At the same time, the ARRL said, the SPTF *Report* "fails to address the needs and goals" of the Amateur Service. It urged the FCC to not abandon long-standing allocation policies based on engineering.

"Overall, ARRL asks that the Commission not adopt the SPTF *Report in toto*, but rather use it as a basis for future planning on an ongoing basis," the League said January 27 in its comments. "Spectrum policy reform should be viewed as an ongoing process, not as a wholesale paradigm shift to be accomplished in half a year." The ARRL said the report's orientation toward commercial services makes it not wholly applicable to the Amateur Service. Among other factors, the League said, services such as public safety and Amateur Radio cannot pay for spectrum access.

Cautioning the FCC to not continue an apparent "rush to judgment," the ARRL said there's not been enough time to study the report's recommendations thoroughly, let alone deploy them immediately. The League also warned against basing allocation policy on anticipated advances in technology.

The ARRL again called on the FCC to consider greater use of "negotiated rulemaking" to expedite allocation decisions. "Instead of acting as the judge and jury, the Commission could act as more of a facilitator among competitors for spectrum," the League said.

In terms of sharing schemes, the ARRL said it supports "to a limited extent" the concept of "interference temperature" calculations and measurements. But, it pointed to the 2400-2450 MHz band as "an example of a failing attempt at interservice sharing" that some predictive calculations might have alleviated. The ARRL said the explosion of Part 15 devices coupled with relaxed rules on power, antenna gain and duty cycles of high-powered unlicensed devices "has rendered the band unusable in some areas."

Once again asserting that the FCC "has pushed the Part 15 concept beyond the point that it works," the ARRL took advantage of the comment opportunity to express its view that unlicensed devices "cannot be authorized by the Commission under current statutes" without first determining that they do not pose a significant interference potential to licensed services.

AMATEUR RADIO COMMUNITY MOURNS COLUMBIA LOSS

The flags of the United States, the ARRL and the International Amateur Radio Union (IARU) flew at half staff during February at ARRL Headquarters as the Amateur Radio community joined the rest of the world in mourning the loss of the seven shuttle *Columbia* astronauts. Through the Space Amateur Radio EXperiment (SAREX) and Amateur Radio on the International Space Station (ARISS) programs, amateurs have enjoyed a special relationship with the astronaut corps, many of whom are Amateur Radio operators. Three of the *Columbia* astronauts were licensees.

"The ultimate in public service was just given by these astronauts," said ARRL President Jim Haynie, W5JBP, after hearing the news. "It's a sad thing that's occurred, and our thoughts are with the families of the astronauts who died doing what they loved. They were part of us."

The STS-107 crew, headed by Commander Rick Husband, included Pilot Willie McCool, Mission Specialists Kalpana "KC" Chawla, KD5ESI; David Brown, KC5ZTC; Laurel Clark, KC5ZSU, Michael Anderson, and Payload Specialist Ilan Ramon, the first Israeli astronaut.

"The world has lost seven great heroes," said ARISS International Chairman Frank Bauer, KA3HDO, a NASA employee. Bauer said the *Columbia* catastrophe "clearly demonstrated the challeng-

Rick Lindquist, N1RL ♦ Senior News Editor ♦ n1rl@arrl.org

ARRL Pacific Division Director Jim Maxwell, W6CF, SK

ARRL Pacific Division Director Jim Maxwell, W6CF, died February 6 at his home in Redwood Estates, California. He was 69.

"Jim Maxwell was a gentle giant of a man," said ARRL President Jim Haynie, W5JBP. "He was one of the best assets Amateur Radio could have in a leadership position."

ARRL Chief Executive Officer David Sumner, K1ZZ, called Maxwell "one of the most brilliant people I have ever had the privilege to know," as well as one of the most unselfish and modest. "Putting them all together, he was truly in a class by himself. To say he will be missed is a gross understatement," Sumner added.

Maxwell was elected Pacific Division Vice Director in 1994 and Director in January 2000 following the retirement of past Director Brad Wyatt, K6WR. A Life Member of the League, Maxwell also previously served as Santa Clara Valley Section Manager.

Prior to being elected Vice Director, Maxwell served as an ARRL emergency coordinator from 1991 to 1999 and on the DX Advisory Committee from 1988 through 1994.

An avid DXer, Maxwell belonged to many DX and contest clubs and organizations, including the Northern California Contest Club. Maxwell had an abiding interest in preserving Amateur Radio and ARRL history, and he and his wife Trudy, KC6NAX, initiated an archiving effort at ARRL Headquarters that continues.

Pacific Division Director Bob Vallio, W6RGG.

Maxwell held doctoral degrees in aeronautical engineering and biomechanics. He retired from Lockheed as a technical consultant in 1992 and from Scitor Corp in 1998.

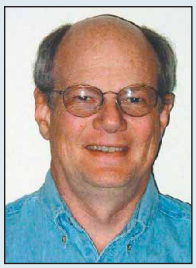
Pacific Division Vice Director Bob Vallio, W6RGG, has succeeded Maxwell as Pacific Division Director. An active amateur for more than 50 years, Vallio serves as a director and secretary of the Yasme Foundation and is a member of the Northern California DX and Northern California Contest clubs. He's also an active member of the Alameda County Sheriff's Communications Team (Radio Amateur Civil Emergency Service—RACES). He is retired from Pacific Bell.

Before becoming Vice Director, Vallio had served for more than two decades as East Bay Section Communications Manager and Section Manager. He serves on the ARRL Board of Directors' Membership Services Committee.

Andy Oppel, N6AJO, Named Vice Director

On February 20, Haynie appointed East Bay Section Manager Andy Oppel, N6AJO, as the new Pacific Division Vice Director. Oppel will serve out the balance of Vallio's term, which expires in 2005.

"I've been working with Bob Vallio for more than 20 years," said Oppel, who lives in Alameda and took over the East Bay Section Manager's position from Vallio in January 2000. Prior to that, he was an Assistant SM in East Bay for eight years under Vallio's section leadership. Oppel said their long-term working relationship definitely will be an asset as he and Vallio take on their new Pacific Division leadership roles.



Pacific Division Vice Director Andy Oppel, N6AJO.

A ham since 1977 and a General-class licensee, Oppel, 50, said his interest in emergency communications is what helped to get him into ham radio. He serves as a mentor for the Amateur Radio Emergency Communications Level I course.

As the new Pacific Division Director, Vallio greeted Oppel's appointment enthusiastically and said he planned to continue the agenda he and Jim Maxwell had begun together three years ago. "Jim wasn't done with the things that he wanted to do, and I wasn't done trying to help him do them," Vallio said.

ARRL Field and Educational Services Manager Rosalie White, K1STO, has appointed Dennis Franklin, K6DF, of Fremont to take over the reins from Oppel as East Bay SM.

ing and sometimes sobering aspects" of human spaceflight. "Our quest for space must continue despite these tragic losses," he said.

ARISS International Secretary Rosalie White, K1STO, recalled meeting "KC" Chawla at an ARISS meeting at Johnson Space Center. "Kalpana was intelligent, quiet—a professional scientist with a genuine smile," she said. She also noted that Laurel Clark had done some "terrestrial SAREX QSOs" from W5RRR at Johnson Space Center with students in Kansas and New Mexico. The "terrestrial" SAREX QSOs took place at a time when the demand from schools for radio contacts with astronauts was high but the number of scheduled shuttle flights was very low.

The lost shuttle also had a ham radio history. Built in 1981, *Columbia* was the oldest in NASA's shuttle fleet and became the first to carry Amateur Radio in November 1983, when now-retired astronaut Owen

NASA

***The* Columbia *crew members during training:* Seated, front, from the left: Mission Commander Rick Husband; Mission Specialist Kalpana "KC" Chawla, KD5ESI; and Pilot Willie McCool. Standing, from the left: David Brown, KC5ZTC; Laurel Clark, KC5ZSU; and Michael Anderson—all mission specialists—and Ilan Ramon, a payload specialist from the Israeli Space Agency.**

Garriott, W5LFL, operated from *Columbia*. Thousands heard W5LFL, and hundreds had direct QSOs with him on 2 meters. *Columbia* carried no Amateur Radio gear on its last mission into space, however.

Hams Assist in Debris Search

First in Texas and later in other states farther west, Amateur Radio Emergency Service volunteers were among those assisting federal, state and local officials in a search for shuttle *Columbia* debris that might shed light on the cause of the catastrophe.

"Ham radio has proven to be the only reliable communications options during the recovery effort," said Tim Lewallen, KD5ING, of Nacogdoches, a North Texas ARRL Public Information Officer. "The communications systems used by other federal and state organizations cannot penetrate 'The Pine Curtain' as we know it in East Texas," he said, adding that even local authorities experienced radio problems.

Shuttle Loss Impacts Amateur Radio in Space

The future of Amateur Radio in space—at least in the near term—could depend on how fast NASA pins down the cause of the shuttle disaster and fixes the problem. With the shuttle fleet grounded until it does—and further International Space Station construction on hold as a result—attention promptly turned to the well-being of the all-ham ISS Expedition 6 crew of Commander Ken Bowersox, KD5JBP, Don Pettit, KD5MDT, and Nikolai Budarin, RV3FB.

Under normal circumstances, a shuttle mission would have brought a fresh crew to the ISS and returned Bowersox and his crewmates to Earth in March. With a Progress 10 cargo rocket delivery February 4, the Expedition 6 team has sufficient supplies to sustain it until June, NASA said. Now, the Russian *Soyuz* capsule could become the principal crew transport vehicle for the ISS. A *Soyuz* taxi crew was scheduled to visit the ISS this month to drop off a new vehicle and return the one now attached to the ISS.

The extended stay could have an unintended consequence for Amateur Radio, since the temporarily stranded crew likely would have more spare time on its hands. NASA also has said it would not mothball the ISS and leave the spacecraft without a crew.

Bowersox, Budarin and Pettit spoke publicly about the incident during news conferences in mid-February. Crew members said that while they grieved the loss of the shuttle *Columbia* crew, human space exploration must continue, and they're ready to spend up to a year in space if necessary.

The Expedition 6 crew has been aboard the ISS since November.

NASA

A-OK for a longer stay: **The all-ham ISS Expedition 6 crew of Commander Ken Bowersox, KD5JBP (top right), Don Pettit, KD5MDT (bottom), and Nikolai Budarin, RV3FB.**

AMATEUR RADIO BOOSTS MARCONI COMMEMORATION INTO ORBIT

The magic touch of a princess helped to put Amateur Radio center stage January 18 on Cape Cod, Massachusetts, during events marking the 100th anniversary of the first transatlantic wireless message transmitted by Guglielmo Marconi. For the occasion, Marconi's youngest daughter—Princess Elettra Marconi—launched greetings into space via an Amateur Radio on the International Space Station (ARISS) hookup to ISS Expedition 6 Commander Ken Bowersox, KD5JBP.

"One hundred years ago today, my father, Guglielmo Marconi, sent the first wireless message across the Atlantic Ocean from Cape Cod," Princess Elettra said from a packed auditorium at the Cape Cod National Seashore. "In this same spirit of his achievement and also from Cape Cod I send this wireless greeting to you in space. Cordial greetings, good wishes and God bless you!"

Replied Bowersox from NA1SS, "It's wonderful to hear your voice across the radio waves. It's amazing how far our societies and radio communication have come in the past 100 years."

On January 18, 1903, Marconi sent wireless greetings on behalf of President Theodore Roosevelt to Great Britain's King Edward VII. Events leading up to the ARISS contact included two Amateur Radio special event stations. KM1CC operated from a shoreline site not far from Marconi's original Cape Cod radio station, transmitting a commemorative message from President George W. Bush and retransmitting Marconi's original 1903 text. Another special event station, WA1WCC, was on the air from the former WCC shore station in Chatham, where Marconi relocated operations after the ocean threatened to claim the antenna support towers of his original station.

Following Princess Elettra's introductory remarks, eight students from Provincetown High School, Cape Cod Technical and Vocational School and Nauset Regional High School took turns firing questions at Bowersox as hundreds of visitors and some two dozen news media representatives looked on. The students' curiosity ranged from research goals to whether Bowersox had any desire to undertake a trip deeper into space—perhaps to Mars.

Bowersox said his wife has forbidden him to go to Mars—a comment that drew a chuckle from the audience—but said he'd volunteer for a deep-space mission if he could bring his family along.

"I think someday we're going to leave Earth," Bowersox predicted in response to one of the students' questions. "We're going to move on out of our solar system out to the stars, and we're just taking the baby steps now. Your generation will take us a lot farther, I hope."

NEW ARRL SECTION MANAGERS ELECTED IN FOUR SECTIONS

Roy Rabey, AD5KZ, has been elected the new North Texas Section Manager after he topped a field of three candidates that included the incumbent. Rabey, who lives in Bedford, outpolled first-term North Texas SM Larry Melby, KA5TXL, and Glenn Warnstaff, K5CPD. Rabey received 576 votes to Melby's 499 and Warnstaff's 303. In addition to Rabey, new SMs take office this month in Montana, Wyoming and Oklahoma. Incumbents were re-elected without opposition in five other ARRL sections. Votes cast in all contested races were counted February 18 at ARRL Headquarters.

In Montana, Doug R. Dunn, K7YD, defeated James Fuller, N7VMR, 234 to 73. Dunn will take over the reins from current Montana SM Darrell Thomas, N7KOR, a 10-year veteran who decided

With assistance from ARISS Chairman Frank Bauer, KA3HDO, Princess Elettra Marconi speaks to the ISS crew from Cape Cod via ham radio.

not to run for another term.

In Oklahoma, John Thomason, WB5SYT, of Edmond, topped Melvin Miller, K5KXL, 520 to 148 for the section's top job. Thomason will take over the job being relinquished by Charlie Calhoun, K5TTT, who decided not run again. Calhoun has been Oklahoma SM since 1999.

In Wyoming, Jay E. Ostrem, W7CW, of Gillette, was unopposed for election and was declared elected. Ostrem will succeed outgoing Wyoming SM Bob Williams, N7LKH, who did not run for another term. Williams has served as SM since 1997.

Incumbent ARRL SMs in five other sections were unopposed for re-election to new two-year terms and were declared elected. They are John Meyers, NB4K, Kentucky; Cliff Hauser, KD6XH, Arizona; Malcolm Keown, W5XX, Mississippi; Joe Brown, W6UBQ, Orange; and Jim Lasley, NØJL, Iowa.

All new terms of office begin April 1.

FCC News

FCC SAYS POWER LINE COMMUNICATIONS TECHNOLOGY SHOWS PROMISE

♦ According to an Associated Press report, the FCC's Office of Engineering and Technology has found that power line communications (PLC)—which can enable high-speed Internet access over electric power lines—shows promise. The OET has said that PLC is "beginning to look like a viable alternative to cable and DSL connections to the Internet," AP reported. At present, no regulations prevent the use of power lines to provide Internet access. The FCC wants to ensure that the technology does not cause interference problems with other services, however.

PLC devices use overhead power lines and/or residential electrical wiring to communicate digital signals—for networking within a home or to provide Internet services to entire neighborhoods.

Some PLC devices use digital signals that occupy spectrum into the upper HF range. These signals can be radiated efficiently by some electrical wiring, so there can be a significant potential impact on Amateur Radio. ARRL Lab Supervisor Ed Hare, W1RFI, chairs an IEEE C63 "RFI" *ad hoc* working group on the topic. "The problem with PLC is that if a company wants to supply Internet service via PLC, it's going to happen at HF, and it will radiate," Hare said. The International Amateur Radio Union (IARU) Administrative Council, noting growing use of PLC for high-speed data, has expressed concerns that PLC radiation could interfere with amateur reception. As a result of strong opposition from the Japan Amateur Radio League, Japan's government last summer decided it was too soon to allow PLC devices in that country between 2 MHz and 30 MHz, due to its interference potential.

Amateur Enforcement

♦ **FCC warns unlicensed ops, rescinds repeater's automatic control authority:** The FCC has sent warning notices to 10 individuals—eight of them amateur licensees—for operating without a license in the 11-meter band. Most live in the Greater New York City area. FCC Special Counsel Riley Hollingsworth January 15 cited "monitoring information before the Commission" indicating that the individuals were transmitting on 26.540 and/or 26.555 MHz, frequencies allocated for government use. He warned that fines for unlicensed operation can run as high as $10,000.

In other enforcement actions, the FCC rescinded the automatic control authority of a repeater operated by Daniel Granda, KA6VHC, of Whittier, California. The action means a control operator must be present at all times at the control point of the KA6VHC repeater. FCC Los Angeles District Director Catherine Deaton wrote Granda January 13 to say the action was being taken because Granda's repeater was under review by the Enforcement Bureau for apparent rules violations. Alleged violations include obscene and indecent communications, inadequate station control and deliberate interference. Hollingsworth also said the FCC would not renew Granda's license until the enforcement issues were resolved.

Last October, the FCC dismissed Granda's complaint against the KD6ZLZ and WA6NJJ repeaters on 223.82 and 223.84 MHz. The FCC told Granda that his 16-year-old coordination document "was insufficient to establish coordination" and that he bears primary responsibility for preventing interference to the two repeaters because he cannot show current coordination. Granda has told the FCC that he's been using the two frequencies "continuously for over 25 years."

The FCC also wrote a Florida amateur, John S. Gregory, W3ATE, letting him know that the Wireless Telecommunications Bureau had set aside his General-class upgrade based on complaints that Gregory, on more than one occasion in 2002, had operated his station on 20 meters while still licensed as a Technician.

SECTION MANAGER ELECTION NOTICE

To all ARRL members in the Colorado, Eastern Washington, Georgia, Los Angeles, Sacramento Valley, San Francisco, South Texas, Western Washington and West Virginia 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 of the _____ division, hereby nominate _____ as a 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 June 6, 2003. Whenever more than one member is nominated in a single section, ballots will be mailed from Headquarters on or before July 1, 2003, to full members of record as of June 6, 2003, which is the closing date for nominations. Returns will be counted August 19, 2003. Section Managers elected as a result of the above procedure will take office October 1, 2003.

If only one valid petition is received from a section, that nominee shall be declared elected without opposition for a two-year term beginning October 1, 2003. If *no* petitions are received from a section by the specified closing date, such section will be resolicited in the October 2003 *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*

No Lights, No Telephone—Just the Radio

By John D. Trolinger, W4ZKK

North Carolina is famous for its trees, especially its pines, from which come the nickname the "Tar Heel State" as in the tar produced by the numerous firs. Unfortunately, the state is prone to annual icing events and one could say that North Carolina is the belt buckle of the Ice Belt. Add this with local codes that do not allow buildings to rise above the tree line and one can see how social status in the state could be based on proximity to an electrical substation or power generation facility, ie, how soon power and telephone is restored after a storm.

Orange County is in the center of the state and although lightly populated, thanks to the Duke Foundation and The Duke Forest, there are concentrations of residential areas around Duke and Chapel Hill universities. Given that there is a local brain trust, one might expect to have a very active and leading-edge radio club. That is, in fact, the case. The Orange County Radio Amateurs—OCRA—have been operating as W4EZ since 1992 and have a regular schedule of meetings and nets. In association with OCRA, the Orange County ARES (Amateur Radio Emergency Service) operates in support of the county and the Red Cross chapter. The group holds its own drills weekly on the air via the W4UNC repeater and is mobilized at least once a year.

On Thursday morning, December 5, 2002, when the sun came up over Orange County, not a rural household had commercial electrical power or (more critically) landline telephone service. The wireless phone system was also unusable for local calls and 911. The weather forecast was unknown since the NOAA Weather Radio produced static and the National Weather Service (NWS) station from Raleigh was off the air for the first time in memory.

On that Thursday morning the 442.150 MHz W4UNC repeater was alive, presumably ice laden and on emergency power. "Calling the Orange County ARES net, calling the Orange County ARES net, this is W4EZ." It was our Emergency Coordinator, Dave Snyder, W4SAR, bringing up the net and there was no need for him to state that this was not a drill or that we were going into stand-by mode. This was the communications emergency for which we had prepared and practiced. It arrived in textbook fashion, as predicted by the NWS three days in advance. After 30 minutes, the net session closed, and volunteer operators deployed to each shelter and the EOC.

In the following two days, OC ARES was the sole communicator between the Red Cross chapter, its shelters, public transportation and the Emergency Operations Center. Operations extended to a total of five days for a logged 400 hours plus several times that in undocumented work.

"We are out of coffee cups, send more." "We are out of cots and blankets." "I am looking for my mother and she might be in your Orange County shelter or in Durham."

"The generator is not working and we are relocating the shelter to Woollen at UNC."

All of the above and many more messages were passed—accurately—by OC ARES. Third-party traffic was common as the shelters needed to talk with the chapter about shift changes and logistics. Telephone service was not available for the first two days.

Without OC ARES, the Red Cross shelters would have been in a mess. Instead there was a very pleasing sentence in each of the local news stories about the ice storm that stated the Red Cross shelters were taking in anyone who needed a warm place to sleep and three meals a day. In fact, the Governor activated the National Guard, then sent them door-to-door to pass the message: the shelters are open.

"You guys are life savers." *—Orange County Red Cross EOC Representative*

Red Cross and Amateur Radio sat on opposite sides of the room in the EOC (emergency operations center). We were connected by hand signal and a radio scanner tucked under the representative's shoulder that monitored the net. The other EOC desks—information, social services, transportation, dispatch, and command—benefited from the proximity by hearing the reports shouted, "Firewood is available at…" "The store at Hillsboro is open, but cash and checks only and until sunset." "The generator is on the way to the animal shelter." The information desk would often send calls to our phone extension with

JANE MILLER, N3ZXO

This is the state road into town two days after the ice storm. Power, telephone and cable lines are still on the road. Telephone service was restored seven days after the storm.

"An obstacle course." This was a typical scene on the main road to the Orange County EOC two days after the ice storm.

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

inquiries on the whereabouts of shelter clients and traffic to be passed and verified.

APRS stations and digipeaters that did have emergency power shut down after the first few hours following the ice storm. APRS was used by W4SAR to learn when his home station was back on the grid. A few messages were passed to adjacent counties between EOCs, but without power for computers the main value of APRS came from EOC in watching the location of stations that came back up when power was restored.

"The Weather Outside was Frightful"

First we did what we could at our house. Store up the water in the bathtubs; check for damage. There was no damage to the house, but the power phone and cable lines are on the ground out on the road. We are very fortunate. All of the neighbors had property damage. Our radio shack table is made from wood; 2×4s and plywood. I have knocked on that table often while telling our story both on the air and to family and friends. We slept under the same radio shack table on the night of the ice storm.

Next were the neighbors, two with holes in the roof and two with full-sized tree trunks breaking the apex of the roof. We handed out our tarps and offered chain saw services. Some accepted.

Chain saws were needed down by the well house as without power there is no water for two hundred persons here. I broke my first chain saw on that run, but we cleared the way and had water. Everyone around pitched in to move the downed trees.

Then came ARES. I had signed us up when we moved here, even went to a meeting and participated in the annual drill. Mostly, I thought about the weekly net but seemed to miss checking into it. This Thursday morning the home station was still up with the 2 m and 70 cm J-poles. The 160 meter antenna was down, but 40/20/10 meters were okay. Next was the "go kit," a bag with the handheld radio, batteries and frequency list.

A look at the sky provided a view of trees loaded with ice, and they were hanging over us. How or why the trees stood with that load is beyond the scope of this discussion, but they did. We headed for the truck/mobile, which seemed to urge us to get out of the carport. Umbra, our dog, was stationed between us on the lookout. We checked back into the ARES net as mobile around 8 AM.

With no pressing need to man a station (all the station assignments had deployed), we pulled our travel trailer out of storage and set it up in view of the sun with the solar power in mind. Water, power, and heat. Oh boy! We were now ready to help others.

A roll call came via the W4EZ ARES net late on Thursday, and it came up short an operator for Friday at the EOC. Jane, N3ZXO, and I stepped up and volunteered for the next shift. Our community service had begun.

It took passing two downed trees and a bunch of ice, but we made it to the EOC Friday morning. For the next four days it was operations and traffic handling. Keep your batteries charged!

With a hockey team nicknamed the Hurricanes and with the state nickname of The Tar Heels, one might be advised to be prepared for the weather in North Carolina. By learning from the Orange County Radio Amateurs and Amateur Radio Emergency Service, we were able to help ourselves first, then help others with community service.

Field Organization Reports

Compiled by Linda Mullally, KB1HSV

Public Service Honor Roll
January 2003

This listing is to recognize radio amateurs whose public service performance during the month indicated 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.

646
K6SOJ
610
W9RCW
591
W6DOB
585
W2MTA
545
N9TVT
470
N2CCN
430
N2LTC
415
W7TVA
350
KA2ZNZ
348
K2CSS
303
K2YS
300
AB2IZ
290
W8JEB
280
K2ZTF
270
KB2RTZ
254
NN2H
249
N2YJZ
237
N9VE
230
KB2SNP
K9JPS
220
AD4BL
N5NAV
215
KB2CCD
211
KB2ETO
210
KB2KOJ
180
W5ZX
170
WI2G
158
WN0Y
W6IVV
156
N1IST
KC2DAA
155
N8IO
152
N2IKR
150
K0PY
145
W3YVQ
142
N2OPJ
140
W7ARC
135
KB2VRO
130
KK1A
KD5SWI
KB8ZYY
N2GJ
WB2UVB
126
KG9B
125
WB1CHU
K4DND
N2HQL
123
N8JAT
122
N2RTF
120
W1GMF
KW1U
WB0TAQ
AF2K
AC5XK
WB5ZED
W3BBQ
WA4DOX
K0IBS
KG4CHW
AD5KE
AG9G
K9FHI
W4ZJY
WX4J
K4RLD
W4EAT
K4IWW
118
W5IM
N4TAB
KA0DBK
117
N3WAV
116
NB4K
114
KB8GFC
KO4OL
N2JRS
113
N0BN
110
KK3F
N1VXP
KB0DTI
K4BEH
KG4FXG
AF4NS
N1LKJ
WA1FNM
NZ1D
N7YSS
N3SW
WA1JVV
WA2MSU
W6QZ
W5GKH
N5OUJ
WB5NIC
KD4GR
WA2YL
KC4ZHF
KC5OZT
K5UPN
KB9KEG
K2UL
W7QM
W7ZIW
N7YSS
WX4H
NR2F
KK5GY
WA5OUV
N5IKN
KE4JHJ
K5MC
108
WA1QAA
107
N3RB
106
W7GB
105
KG4MLC
K9LGU
WA9ZTY
104
WB4GGS
KE4PAP
AG4DL
101
N2ECR
W5JYJ
K4YVX
K4FQU
100
K9PUI
W0WWR
N2AKZ
WB2GTG
KB2KLH
N1IQI
KD1LE
N1TPU
W1QU
KS7O
WD9F
W1ALE
AF4QZ
K7GXZ
KA4UIV
K4DZM
W7GHT
WA8SSI
KC2EOT
WB2QIX
K3SS
KV4AN
KG4OTL
WA9VND
KB5TCH
W9CBE
AA8SN
K8AE
KD4CQJ
W7LG
N9MN
NJ5M
KG4OQA
K5IQZ
99
WB2KNS
WD4LSS
98
W5ARS
KA2IWK
KB0YTM
97
K1HEJ
K5DPG
95
KC3Y
WA9JWL
W7EP
W9YCV
K8VFZ
WJ2F
KJ7SI
94
N9KNJ
AL7N
KC0HOX
93
N3WKE
W5RXU
KA4FZI
N0SU
92
KA2BCE
WA4EIC
91
W4CC
W4DLZ
90
AA3GV
AA3SB
KA1GWE
W4WXA
K1FP
K4WKT
K4FUM
NG1A
K2BCL
K6IUI
N8DD
N8OD
KG2D
WB2IJH
N5SIG
K3CN
K2VX
W5OMG
WX8Y
AA2SV
WA2CUW
W4CKS
W4PIM
K4WWV
WA2WMJ
KF6OIF
89
WB9OFG
WA2YOW
88
AA4BN
W2CC
87
KL5T
86
WB4PAM
WD9FLJ
85
W6JPH
K8CQF
K2DBK
KF4OCU
KU6Z
84
N3WK
WB4BIK
W7VSE
AC5SU
82
KB2GEK
W0HXB
KJ5YY
W5PY
81
W2GUT
80
N3OR
N1LAH
KG4MLD
KG4QIP
KE4UOF
WA8DHB
W2MTO
W4NTI
KF4WIJ
K1JPG
W5XX
AA4YW
WA5LQZ
KB4KA
79
AK6DV
WB7VYH
N3KB
K2PB
W5NK
77
KE2SX
WB6UZX
75
W0OYH
N7LV
WA4JPK
74
W1JTH
N1JBD
N5GG
73
W3CB
N5KWB
72
K8SH
WB4UHC
W4DGH
W7DPW
W8IM
71
KC7SGM
K5ER
70
K4BG
KD1SM
K1TSV
K4NJN
K1VDH
KC6NBI

The following stations qualified for PSHR points in December, 2002, but were not recognized in this column: WB0TAQ 120, WD4LSS 110, N8DD 90, W0HXB 87, N0BN 84, K8KV 80, N7LV 71.

Section Traffic Manager Reports
January 2003

The following ARRL Section Traffic Managers reported: AK, AL, AR, AZ, EB, EMA, ENY, EPA, EWA, CO, CT, ID, GA, IA, IL, IN, KS, KY, LA, MDC, ME, MI, MS, NC, NE, NFL, NH, NLI, NNJ, NTX, NV, OH, OK, OR, ORG, SB, SC, SD, SDG, SFL, SJV, SNJ, STX, TN, VA, VT, WI, WMA, WNY, WPA, WWA.

Section Emergency Coordinator Reports
January 2003

The following ARRL Section Emergency Coordinators reported: AK, AR, AZ, CT, EWA, IA, IL, IN, KS, KY, LA, MDC, MN, MO, NC, NE, NLI, NNJ, NV, SC, SNJ, STX, SV, WMA, WNY, WPA.

Brass Pounders League
January 2003

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	40	1310	1246	64	2660
W1GMF	0	741	1653	28	2422
W4ZJY	0	711	761	1	1473
N2LTC	0	609	600	58	1267
WX4H	0	474	602	0	1076
W0WWR	0	127	799	5	931
K9JPS	1	453	33	443	930
N1IQI	384	116	412	0	912
W9RCW	0	420	12	389	821
K7BDU	22	398	349	7	776
KW1U	0	446	323	7	775
WB5ZED	5	339	337	35	716
KF5A	0	326	374	0	700
K2BCL	1	292	248	61	602
W6IVV	0	295	302	0	597
NG1A	0	293	293	0	586
K5UPN	27	267	243	3	540
W4EAT	0	238	292	2	532
W6DOB	40	156	302	23	521
WA9VND	7	289	187	21	504

BPL for 100 or more originations plus deliveries: K9GU 191, WB1CHU 160, NJ5M 143, N9VE 142, KK1A 128, KK5GY 116, K8CQF 106.

April 18 Marks Annual Amateur Radio Day

The theme for this year's Amateur Radio Day is "Amateur Radio Supporting Technology Education in the Classroom." Amateur Radio Day marks the founding of the International Amateur Radio Union in 1925. Across the world amateurs are always looking for ways to help educate children in technology—including Amateur Radio.

In the US, the ARRL's Amateur Radio Education and Technology Program, or the "Big Project" as it is known, is just one of the many ways US amateurs are supporting this theme. Reaching the classroom with Amateur Radio is difficult when one considers that in most classrooms the teachers are not Amateur Radio operators. In other countries, especially smaller or less-populous nations, not only are the classrooms not staffed with amateurs, but there may not be any amateurs around to help. Recently in Dominica and Bhutan there have been stellar efforts to educate interested people about Amateur Radio. In order for hams to support technology in the classroom there must first be amateurs.

TRAINING IN DOMINICA WILL LEAD TO ADDITIONAL AMATEURS AND MORE TRAINING

George Wagner, K5KG, has been going to Dominica, J7, for the last few years to work DX and operate contests as J75KG and J75A. He operates from the remote, northeastern coast of the island near the village of Calibishi. Although there are approximately 75 licensed hams in J7, there are none in this part of the island.

Mr Lambert Charles, J73LC, has assisted George in obtaining his J7 licenses and with local logistics necessary to carry out his operations. Through J73LC, George met Mr Augustus, a merchant in Calibishi. On George's visit to Dominica in July 2002, Mr Augustus asked George to assist in helping local residents interested in ham radio to obtain their radio licenses.

George contacted ARRL Chief Executive Officer David Sumner, K1ZZ, and requested ARRL assistance with training materials for his next visit to J7. Dave provided a supply of training books and a code practice tape. On George's return visit to J7 in November 2002 for the CQWW CW DX contest he conducted a class that lasted several hours and gave a broad overview of ham radio to a group of seven. In return, the group helped in putting up antennas Field Day style! Raymond Joseph, J73RJ, Education Director of the Dominica Amateur Radio Club (DARC), assisted with the training. Raymond and Augustus made plans to continue the training and the class members agreed to provide a "kitty" to fund the cost of DARC members coming to this remote part of the island to conduct an ongoing training program.

George will be going back in May 2003, and will continue to promote the training. George plans to solicit donations of used handhelds and small HF transceivers to help get the trainees on the air.

This is an enthusiastic and needy group of J7-hopefuls. Having licensed hams in remote Calibishi is very important, especially when the island is hit with another hurricane (which is only a matter of time).

K5KG

The gentleman on the right wearing a yellow Dominica Amateur Radio Club (DARC) shirt is Raymond, J73RJ, a police officer in Dominica and Education Director of DARC. He assisted George, K5KG, in kicking off training for the local group of seven J7-hopefuls. Third from left is Augustus, who helped organize at the local training effort. The man at the front left is Don-Ford, who climbed tall palms and hung antennas.

TINY HIMALAYAN BHUTAN, HOTBED OF AMATEUR ACTIVITY

After many years with little or no Amateur Radio activity, beautiful and mysterious Bhutan has blossomed into a country with numerous amateurs and others with knowledge of the Amateur Service. Spurred along by the work of Jim Smith, VK9NS, and others, the Bhutan government has created an Amateur Service with realistic regulations and also has worked to allow substantial increases in the numbers of its own citizens who become amateurs—largely through the efforts of foreign teachers.

Ray Gerrard, HSØZDZ/G3NOM/A52OM, has recently visited Bhutan to help train the local folks who have signed on to Amateur Radio. Ray says:

> Regarding Bhutan, I still have to make a proper report for the magazines, but my feet haven't touched the ground since returning from there. I ran a training course for three weeks for technical and Morse code. Seventeen students passed the technical and 5 WPM Morse exams and received technician licenses. One person passed the technical only, and received a novice license. The last week there I spent in Puentsholling on the border with India, setting up a new club station—A5ØB. This is the site of the Royal Bhutan Polytechnic and other technical institutions. One of the students in my class. A51SD, is a lecturer at the campus, and he is now training 90 students in Amateur Radio. He has set up another club station in the Royal Bhutan Technical Institute—A5ØC. He is in desperate need of teaching materials for the students. I gave him CDs and some handbooks and he had copies of my course notes as well. They would benefit from textbooks of any kind, and such basic things as Morse keys. Incidentally I used the books donated by ARRL for training the Bhutan hams.

HSØZDZ

One of the trainers explains a schematic at a class in the A5ØA station.

HSØZDZ

Ray Gerrard, HSØZDZ/A52OM, poses with his graduates at the Bhutan Telecommunications Authority.

Ray hopes to return to Bhutan in 2003 to continue his work.

Dr Glenn Johnson, WØGJ/A51B, is another who has donated time and effort toward educating the local Bhutanese about Amateur Radio. Glen and his family have made multiple trips to the country combining his medical work, tourism and Amateur Radio.

As in these examples, sometimes all it takes to promote interest in Amateur Radio is a visit by an enthusiastic amateur and a little assistance through training materials and time. Most countries have an IARU member-society that can also lend assistance with logistics and other interested people. QST

Hints for a DXpedition Newbie

By Jeff Davis, NØDY

I was a complete novice at DXpeditioning when I left for C53M/C56R last November. Much of what follows is probably obvious to most of you, but here is some advice I wish I had had before I left.

Be Flexible

Probably the best all-around DXpedition/travel advice I can give. Things won't always work out the way they were planned in advance, and overcoming challenges makes for great stories after it's all over. Did I ever tell you about how we got the wireless network up by finding CAT 5 UTP cable and RJ45 connectors in The Gambia?

Study the Propagation in Advance

Maybe not you, but somebody on the team needs to do this. You need to know what areas are the difficult ones and when to work these areas. You might have to ask NA or EU to stand by during these times to work the tougher areas. Asia was tough for us in C5.

Lots of times you're going to be operating by yourself while others sleep or cavort on the beach. You have to be able to make the call when to change bands and where to point the antennas. I wasn't as well-versed on this as I should have been. I had a pretty good picture of propagation to the US, but I found it difficult to get a C5-centric propagation picture in my head.

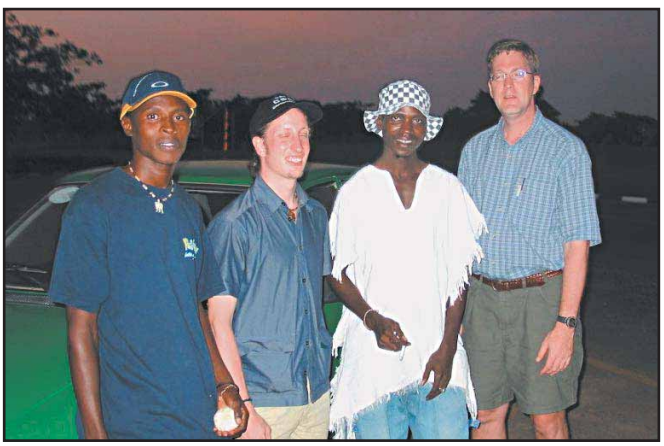
Bring Small Gifts for the Other Team Members

I didn't think to do this and was both pleased to receive them from other team members and embarrassed that I didn't have any of my own to give. The items I was given will be treasured mementos of the Gambia DXpedition for a long time in the future. It doesn't have to be anything extravagant. The Latvians brought everyone a traditional Latvian hat—it was great!

Stop at the Duty Free Shop

You'll want to offer hospitality to your new teammates as soon as you're settled in. If your teammates are Norwegians, Finns, and Latvians, be sure to stock up on a good supply of WØDKA!

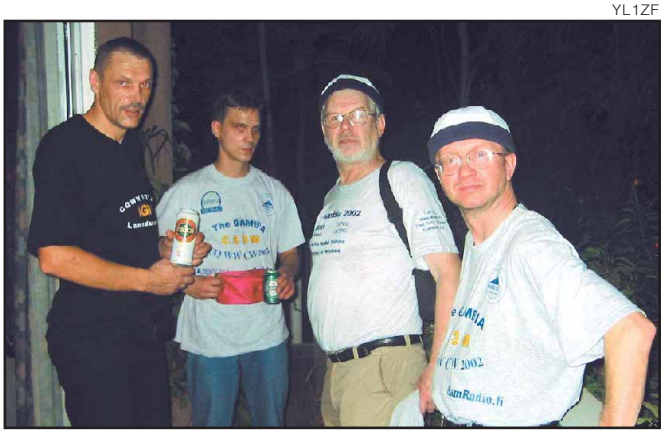
Erecting antennas on the hotel roof. Girts, YL2KL, on the left explaining things to LA6FJA (center) wearing traditional Latvian hat. On the right is Arvis, YL2LY.



Waiting at the airport for the rest of the team. From left: Pa Momo "Joseph" Kargbo; Rag, LA7FJA; Kunta Kombo, and Jeff, NØDY.

YL1ZF

YL2KL (front) and YL3CW (back) working the pileup with intense concentration.



Team members Girts, YL2KL; Juha, OH9MM; Rami, OH3BHL, and Kimmo, OH9MDY, enjoying each other's company in the evening. OH3BHL and OH9MDY wear traditional Latvian hats.

Bernie McClenny, W3UR ♦ 3025 Hobbs Rd, Glenwood, MD 21738-9728 ♦ w3ur@arrl.org

YL1ZF

The C53M Team (with flags!) Back row standing, from left: Kas, YL1ZF; Rag, LA7FJA; Arvis, YL2LY; Jeff, NØDY; Larry, YL3CW; Rami, OH3BHL. Kneeling, front, from left: Juris, YL2GM; Franz, DL9GFB; Juha, OH9MM; Girts, YL2KL; Kimmo, OH9MDY.

NØDY visiting the village of his favorite taxi driver, Kunta Kombo. Shown are Kunta's family and friends.

Mark all of your Equipment

Everything seems to have legs as it moves from place to place to meet various needs. I remember one time needing a CD-ROM that I remembered I had left in my computer. Unfortunately my computer had moved across the street to another hotel and a 10 minute walk. When it's time to pack up, you want to be able to identify your stuff.

Bring Some of your Home QSL Cards

You're going to make great new friends with the other folks on the DXpedition. Your home QSL has all the pertinent contact information and you can fill it out for an eyeball QSO to commemorate the event.

Bring Your National Flag

I don't know why, but it seems that everyone wants a team picture with all the national flags represented. So make sure to bring one. I was quite surprised by the degree of national pride evidenced by some of the European operators—their national flag got displayed prominently at their operating station—so of course, I had to put the Stars and Stripes up, too!

Practice Handling Pileups

Point the beam at Europe, turn on the amp, and call CQ on a Saturday morning. This maybe isn't so easy if you have a small station at home. But the pileups on a DXpedition can be huge and can get unruly if it's perceived that the operator isn't firmly in control. (Sometimes even then.) I'm not much of a phone operator and I found the phone pileups to be difficult at first. A 10-15 kHz wall of loud, incomprehensible Donald Duck signals was pretty intimidating. Plus my operating style wasn't too efficient at first. But I did learn and get better.

The wireless network, complete with CAT 5 UTP cable and RJ45 connectors obtained in Serekunda, The Gambia.

For CW, I can't recommend anything better than *PED*, a freeware program that unfortunately works only under DOS. It depends on your sound card being at a specific address, so it doesn't always work on newer PCs. I have an older HP at home that I keep just for that purpose. I practiced with *PED* about 20 minutes a day every day for 2 months before I left.

Know 12, 17 and 30

I don't operate much on the 12, 17 and 30 meter bands. My antennas aren't very good there and there's no contest activity. But on a DXpedition you'll be called on to work them in addition to the normal contest bands. Make sure you know the frequency allocations. You might not have a reference handy at the time! I learned the 12/17/30 allocations for long enough to pass my license test, and then promptly forgot them. I was embarrassed to have to ask someone what was the bottom end of the 12 m phone band.

Make Sure You Know the Calls of all your Buddies Back Home

It's really fun to work your buddies in the pileup, and to be able to say "Hi Fred!" when you hear them. On the other hand, it's really embarrassing to hear a call that you recognize you should know but can't connect a name to it. In the heat of a pileup, particularly after a few hours of operating, even familiar facts can fail to come to mind. Next time I'll bring a cheat sheet so I can look up my friends (sorry, Doug).

Plan to Leave Some Things Behind

Chances are, you're going to make some new friends with local people. And if you're on a DXpedition, it's likely that you're going to a Third World country where the cost of your airfare alone is many times the average person's annual earnings. So you'll probably want to leave some gifts with people you get to know. In The Gambia, clothing was greatly appreciated—particularly anything that would be considered "cool" back home. You could tell people who had had a lot of contact with tourists because they'd be wearing logoed T-shirts for various famous sneaker makers. So bring a hat, a T-shirt or two, and you'll be a hit with your new friends.

WRAP UP

That's all for this month. Thanks to Jeff, NØDY, for his article. Until next month, see you in the pileups!—*Bernie, W3UR* QST

April Fool's

The April issue of many magazines occasionally inserts an "April Fool" article to see how sharp their readers are. I admit to falling for more than one, most notably the "Fuse Tester" back in the 1970s in one of the magazines. It was a circuit that had a box, a switch, a light and a fuse holder. The box said, "If the light lights, fuse is good." But if you pushed the unlabeled switch, which was wired across the light, the fuse would blow.

I built a safer version with an isolation transformer later on and had a ball with it at work. I put it on the break room table at the local telephone company, with a pile of new fuses by its side. It was fun watching the puzzled looks on my friends' faces, as the fuses would blow, one right after the other. Usually by the second or third blown fuse they would catch on, and everyone had a good laugh. Of course the date was April first.

The "Milkotron"

I always enjoy reading the early *QST* magazines. Sometimes I spot an "April Fool" type article in an issue other than April. Such an article appeared in the November 1930 issue of *QST* on page 31, and until recently I thought it was a joke. It was titled, "The Milkotron, as told to the Old Connecticut Yankee, by Woody Darrow, W3JZ, of Philadelphia." It is about a strange tube built inside an old milk bottle by the De Forest Company. If you have an old *QST* or the 1930-39 *QST View* CD, read it and you'll see what I mean.

Recently my friend Jerry Vanicek found a Milkotron tube and wrote about it in the *Tube Collector*, the publication of the Tube Collectors Association. I'll let him tell you the story.

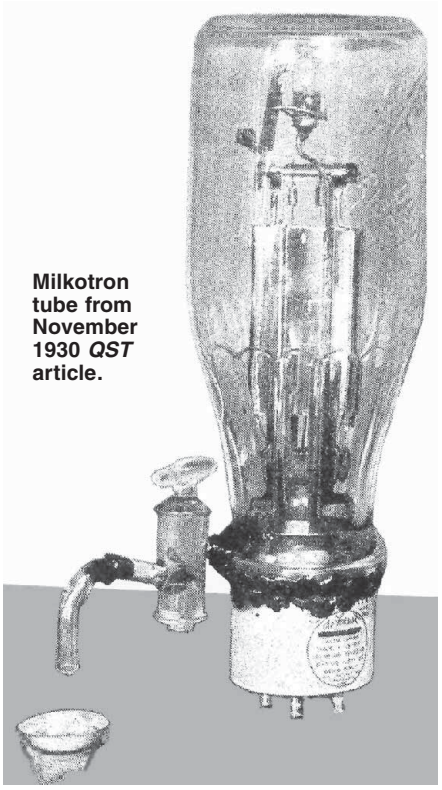
The MILKOTRON, Another De Forest Invention?

By Jerry Vanicek

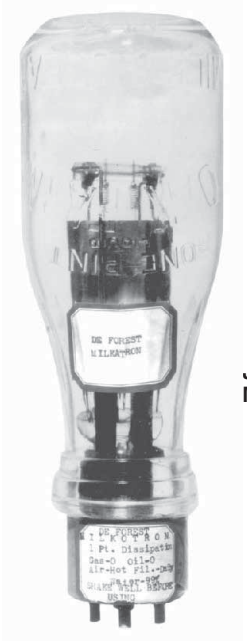
Very little is written about one of the rarest of the De Forest tubes, the MILKOTRON. The writer first became acquainted with this device in 1964, while reading through a stack of old *QST* magazines. At that time I thought that the tube must have been long since destroyed.

However, in the 1970s I found a second reference to this unique device. The subject of the MILKOTRON came up while visiting Gerald Tyne. [Gerald Tyne, ex-8KN and a SK, was an expert and well-known author on tubes. His book, *Saga of the Vacuum Tube* is highly regarded.—Ed.] In answer to my questions, he produced a De Forest Company photograph of the tube. In the picture, the tube type is spelled in two different ways. The label on the envelope (one-pint milk bottle) states "MILKATRON," while the label on the base says "MILKOTRON."

Until recently, the writer had found nothing more on the MILKOTRON. However, I recently bought an early

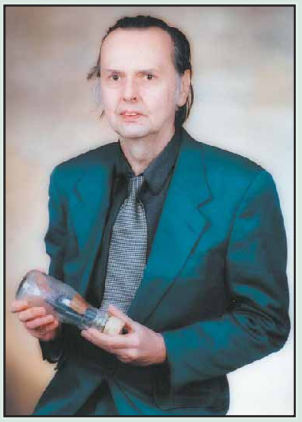


Milkotron tube from November 1930 *QST* article.



Jerry's Milkotron tube.

Profile: Jerry Vanicek



Jerry Vanicek with his Milkotron tube.

Jerry Vanicek is a graduate of Southern Illinois University with a degree in Electrical Engineering. He is retired. Although not presently licensed, he has held the Amateur Radio calls WA9RJD and KC9JS.

He is a Founder, Board Member and currently President of the Tube Collectors Association.

He collects items pertaining to, and has researched, the field of radio and radio related items for the past 38 years. He has been a member of the Antique Wireless Association (AWA) since 1968. He was awarded the AWA's highest honor, The Houck Award and has presented several lectures at National AWA conventions.

An author, he has written numerous articles for the following publications: AWA's *Review* and *Old Timers Bulletin*, *Antique Radio Classified* and the *Tube Collectors Association Bulletin*.

He has contributed a great number of exceedingly rare tubes to The Manhattan College Tube Display, which is one of the best in the country. For the past six years he has worked part-time as a volunteer for the Museum of Science and Industry in Chicago. His work there is in the Special Collections Department.

John Dilks, K2TQN ♦ 125 Warf Road, Egg Harbor Township, NJ 08234-8501 ♦ k2tqn@arrl.org

De Forest company photo of tube found by Jerry Vanicek.

Mark Richardson, W7HPW, with his big station. Shown from left are the Western Electric LD-T2, Johnson Desk KW, Johnson Viking II, Johnson KW Matchbox, Johnson Ranger I and his Hammarlund SP-600-JX-17 receiver.

Close-up of the label on Jerry's tube.

De Forest Oscillion from a dealer selling on eBay. The dealer was from New Jersey, only a stone's throw away from Passaic—the latter-day home of the De Forest Company's tube factory.

After buying the Oscillion, I instinctively asked him if he had any other old tubes for sale. He replied that he had sold most of them but still had a De Forest AUDION, VT-4-B which "some fool had stuck in an OAK FARM milk bottle."

I immediately purchased the tube. While awaiting its arrival, I wondered if this could be the long-lost MILKOTRON. I located Tyne's photograph. The tube pictured did have an OAK FARM milk bottle for an envelope. I also located the *QST* article. To my surprise, the MILKOTRON pictured in the article differed from that in the De Forest Company picture. There were two MILKOTRONs! Was De Forest capable of capitalizing on the idea of another inventor?

The MILKOTRON arrived after several days. It is the exact one pictured in the De Forest Co photograph. It had fared reasonably well during the last 70-plus years. The label on the base was missing. The upper label on the bottle is brittle and darkened but still bears its typed DE FOREST MILKATRON legend. The creases on this label are in the same exact locations as those in the De Forest Co photo.

Jerry is still seeking information on this unusual tube. Did the De Forest Company use the picture in an advertisement or circular? Hopefully more will turn up. You can reach him by e-mail at **audion@ameritech.net**. For more about the Tube Collectors Association, please check their Web site at **www.tubecollectors.org**.

WESTERN ELECTRIC

In 1963 I went to work at Western Electric, installing telephone offices. It was my ham radio background that drew me to this industry. I heard about the Overseas Radio stations in New Jersey belonging to AT&T, and had visited one once when I was 15. I wanted to work on the radios there. As luck would have it, I quickly found a niche in the emerging Electronic Switching Systems, a telephone office switch, and didn't get to the radio stations very often.

The AT&T sites were awesome. Outside there were huge fields of antennas; inside: long rows of large receivers in the Manahawkin location, and even longer rows of very large transmitters at their Oceangate and Lawrenceville locations. When I was younger I dreamed of owning one of these big transmitters some day. Recently AT&T shut down Oceangate, their remaining New Jersey radio transmitting station, and it is currently awaiting its fate as the building finds new owners.

When my January *Electric Radio* (ER) magazine arrived, I was "blown away" by an article about Mark Richardson, W7HPW, who had one of the huge Western Electric LD-T2 transmitters, on the air, in his home. With his permission, here is a short version of how he came to own such a radio. (For the entire story, you can purchase the January 2003 issue from *ER* by contacting Ray Osterwald, NØDMS, at PO Box 582, Pine, CO 80470-0582. Single issues are $3.75. Their Web page is **www.ermag.com**.)

World's Largest Ham Radio?

In 1985 Mark was attending Utah Valley Community College, whose building used to be a technical school back in the 1950s. In 1964 the school purchased the transmitter, serial number 11, for use as a teaching tool. In 1985 it became surplus and was to be scrapped. Mark submitted a bid of $100 and took it away piece by piece, as it was too large to move intact. He was lucky to find all of the prints and original paperwork in a closet.

He placed it in storage for several months, then moved it, piece by piece, to a machine shop where he worked nights. After it was back together, he hooked up the 230 V, 3-phase primary power, and it came to life. He used the transmitter as a communications project and received an A.

Loaded onto a trailer, it was placed back in storage until he purchased a home in 1993. There he disassembled it again and reassembled it in his basement. This took until 1997.

The LD-T2 weighs 4500 pounds and covers 4-24 MHz, using AM, USB and LSB. It is capable of 4 kW PEP output using a single 3X2500F3 final, driven by a pair of 4-400s.

This Man Loves His Radio

In 1998 Mark's neighbors were unhappy with his antennas and he was forced to move. He found a new location and built a home there. The transmitter was dissembled again, and then reassembled in his new home.

Since 1997 he has put 400 hours on the transmitter and used it with his club, the Utah Amateur Radio Club's Olympic special event, logging 2165 contacts on all bands from 80-10 in 48 hours of operation.

A WE Linear?

My friend at AT&T tells me that Western Electric made the LC-T1, a 60 kW linear in the late 1930s. It took four water-cooled triode tubes, was 6 feet tall, 4 feet deep and about 12 feet long, and weighed over 6000 pounds. One was installed in the Lawrenceville station for the Moscow circuit, and was used until about 1972. The high voltage transformer was located outside the building and provided 14,000 V at over 10 A.

If anyone knows where one of these is, please contact Mark. He'd love to find one and add it to his cellar, just for looks of course.—*K2TQN* QST

VHF Contests Reexamined: Changes in the Wind

For the final half of the last decade and continuing to the present, the number of logs submitted to the VHF+ contests sponsored by the ARRL has generally been declining (see Table 1). In January 2002, the ARRL Board of Directors asked the Membership Services Committee to study the problem and devise means to increase the level of activity in both the VHF+ contests and the ARRL VHF+ awards. A survey was developed, and last October contest participants in particular and VHF+ community members were asked to respond. At its January 2003 meeting, the ARRL Board began to discuss the results of that survey and consider alterations to enhance both the contests and awards programs.

The problem is real. There is no question (based on Table 1) that this phenomenon is actually occurring. Based on the maximum scores, arguments have been made that activity itself is not declining even if log numbers are decreasing. These arguments are likely to be incorrect for a number of reasons. If one looks at scores in the major VHF contests and the UHF contest (Table 2) of Single-Operator High-Power (SOHP) stations, the scores vary in part due to conditions but are generally flat or tend to decline. (The average columns reflect general performance, rather than that of one station.) One would have expected the numbers to rise for two reasons. There are an ever-increasing number of rovers representing contacts with the same station from several different grid squares, and popular amateur transceivers with capabilities on one or more VHF/UHF bands have appeared.

The reasons for the declining number of logs are unclear, but to probe the VHF use of HF/VHF+ transceivers by primarily HF operators, I conducted an admittedly unscientific survey of Potomac Valley Radio Club members who owned such radios. Do they use them in VHF contests and, if so, do they submit a log—and why? The results from operators in the greater Washington, DC, area and from places like North Carolina and southwestern Virginia are edifying but not promising. Low rates, low scores, low activity and lack of interest in boring contests are some of the problems. Respondents also mentioned limited and/or restricted space for antennas, the length of the contests, a lack of achievable goals (working towards awards, listings and so on) and the complexity of assembling competitive multiband stations.

Table 1
Number of Logs Submitted to ARRL VHF+ Contests, 1993-2002
Highest number is in bold face.

	Year									
Contest	*2002*	*2001*	*2000*	*1999*	*1998*	*1997*	*1996*	*1995*	*1994*	*1993*
Jan	809	799	818	963	1088	1206	**1250**	1195	1150	1037
June	674	680	749	701	865	837	**923**	837	781	818
UHF	156	149	170	**250**	164	191	199	202	249	223
10-GHz	**134**	121	92	76	74	80	78	75	80	83
Sept	540	553	582	606	610	**753**	717	695	715	621
EME	121	161	189	198	210	224	195	166	**239**	215

Table 2
Maximum and Average Scores (×100k) of Single-Operator High-Power Entrants Submitted to Selected ARRL VHF/UHF Contests, 1997-2002

Contest	Sep		June		Jan		UHF	
Year	*Max*	*Avg*	*Max*	*Avg*	*Max*	*Avg*	*Max*	*Avg*
2002	303	225	481	326	387	251	261	148
2001	543	377	433	295	378	209	161	125
2000	385	217	374	345	466	309	190	100
1999	388	261	379	252	416	280	350	192
1998	466	285	626	481	358	250	137	68
1997	395	279	395	301	468	320	238	143

What follows are some suggestions for changes in the ARRL VHF contests based on my own personal observations and those of others with whom I have discussed these issues. Most of it will focus on the two VHF QSO parties, the VHF SS and the UHF contest, but the concepts should be applicable to many of the VHF+ contests.

The major ARRL VHF Contests are de facto microwave contests—If there is, or you can generate, sufficient microwave activity, everything else becomes secondary except a large 6-meter E_s opening—because of the grids that the latter produces and *not* the contact points. The lower VHF bands are merely places to find potential microwave contacts and move them to the microwaves. Nowhere else in the contest world is there a set of contests like these, which can be won without consideration of the usual operating skills and geographic location. Under the present scoring rules, the primary goal appears to be to increase activity on the higher VHF+ bands and provide documentation of the activity at these frequencies. These are worthwhile objectives, but they lead to a contest, which is *not* very interesting to many of the potential participants. Those who like microwave contests participate and submit their logs. Others may or may not participate, but they rarely, if ever, submit logs.

These VHF contests are boring—Well, not to me but apparently to many others. By and large, all of these contests have the same format with certain small differences: The VHF SS tilts the scoring rules even further toward the microwaves and the UHF contest eliminates 6 and 2 meters. The contests could be enlivened by altering the rules to take advantage of propagation at the different times of the year. We also need some fresh blood. One source is operators who already have VHF+ capability from HF/VHF radios

This Month

April 4	144 MHz Spring Sprints 7-11 PM local
April 12	222 MHz Spring Sprints 7-11 PM local
*April 13	Very good EME conditions*
April 19	432 MHz Spring Sprints 7-11 PM local
April 26-27	Southeast VHF Society Conference (**www.svhfs.com**)

*Moon Data from W5LUU

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but either don't use it or refuse to send logs. Another more difficult source to tap is the legion of hams whose entire radio universe is the FM repeater. What kind of solutions might work?

Change the scoring metrics—Most operators enter a VHF contest not because it is a contest but for the opportunity to work new stations, preferably far away or on new bands. This is so because contests are times of reasonable activity on all VHF bands. Most VHFers would agree that the scoring system should reward contacts that are far away and relatively difficult to work. The current system is out of date. It fails to recognize that reliable gear for the higher VHF+ frequencies and even the microwaves is readily available on the commercial market (from DEM and DB6NT, for example) and can be used by operators with even modest technical capabilities. Given a little help from someone more experienced, even 10-GHz equipment can be readily assembled and is no longer very exotic. Yet, the rules remain biased to the point that a 10-km contact on 10 GHz is worth 4 or 6 times a contact 800 km away on 2 meters.

Differentiate one contest from another—Here are some possibilities. Distance scoring could be tried in September, a month that often has good tropospheric conditions. Distance scoring might also be considered in the UHF contest. The details of how to achieve distance scoring are unclear, but they are likely to be somewhat different from those used by the Europeans because they have no rovers. Perhaps the June contest, with 6-meter E skip as its most prominent feature, should be only the bottom four bands. For those who worry incessantly about level playing fields, think how that would generate some new interest: a contest that clearly puts the East coast at a disadvantage. The January SS traditionally emphasizes club competition and often features both terrible propagation and terrible weather. The current scoring rules might be retained in this contest where generally "local" contacts are all one can usually work. Yet, even here we should think about whether the microwave "bonus" needs to be reduced.

Return to the original rover scoring rules—One very promising development over the last decade is the appearance of rovers who travel from grid to grid. Changes were made in the original rover scoring rules to fix a problem in club competition. The present rules, for strategic reasons, strongly inhibit rovers from visiting rare grid squares particularly if they are isolated and in odd directions from population centers. One obvious solution is to return to the original rover scoring rules, but do not allow rovers to submit scores for clubs, so their scores will not distort the club competition. If a club is a real VHF club and has many active members, each one of their scores will benefit immensely from the operation of even a single rover in club territory. Thus, the rover is a benefit to a club but is permitted to travel freely from grid to grid without being constrained by the scoring rules.

The VHF contests are too long—Again not for me but apparently for many folks. We already have a Single Operator Portable class that runs QRP power for the whole contest. What if we had a new category, a QRP Portable with a limited time—say six hours or so. Perhaps we could allow the same station to be used for six hours in each of two separate locations. This would also deal with the problem of bad locations and restricted or limited antenna space, both of which were prominently mentioned in that unscientific PVRC survey I previously mentioned. Just like the rover category, these portables could enliven the contest and increase the amount of fun for both their operator and all the others on the bands. [Thanks to W1XX and K1JX for this idea.]

There are too few VHF contests—Besides the big weekend-long HF contests, there are dozens and dozens of smaller and shorter duration activities covering almost every aspect of HF operating on any given weekend of the year. In Europe, there are VHF contests almost every weekend of the year as well as shorter weeknight events from time to time. In England alone, the RSGB sponsors in excess of 70 contests a year, some daylong, some only a few hours and some cumulative (see **www.blacksheep.org/vhfcc/rules/03rules/index.htm**).

I think that there is a need for, and potential interest in, two kinds of contests that do not exist now. One is a series of perhaps short-duration microwave contests at times of the year other than the summer, when the ARRL UHF contest is held. The other is an appeal to the FM-only operators—an FM-only contest probably also of limited duration or with a mandatory time-out(s) so that there is no need to operate through the middle of the night.

The ARRL probably does not have the physical resources to run these contests. Nevertheless, we have a precedent in the Sprints, which are now run by the East Tennessee DXA and the Southeastern VHF Society. Are there clubs out there who are willing to run such contests and report the results on the Web? I am thinking of some of the groups that I mentioned in my January column. Almost all of them are dedicated to encouraging newcomers to the weak-signal world and plenty of them specifically emphasize the microwaves.

Reduce administrative hassle: the ARRL robot and Cabrillo—I strongly applaud the move to submission of Cabrillo files for the VHF contests and for all ARRL contests. This foundation of log scrutiny will vastly improve the accuracy of participants. Unfortunately, it has not been a smooth transition. Some versions of contest software do not produce error free Cabrillo headers. Many casual operators lack the ability to submit Cabrillo-compliant logs. Many folks do not understand that Cabrillo is a machine-readable format that allows a machine to do log checking. They mistrust the robot and therefore do not want to submit their logs.

The ARRL BoD and the Membership Services Committee—As I write this, the results of the VHF survey are still being considered and decisions in many areas have not been made. What is known is that there will likely be an expansion of

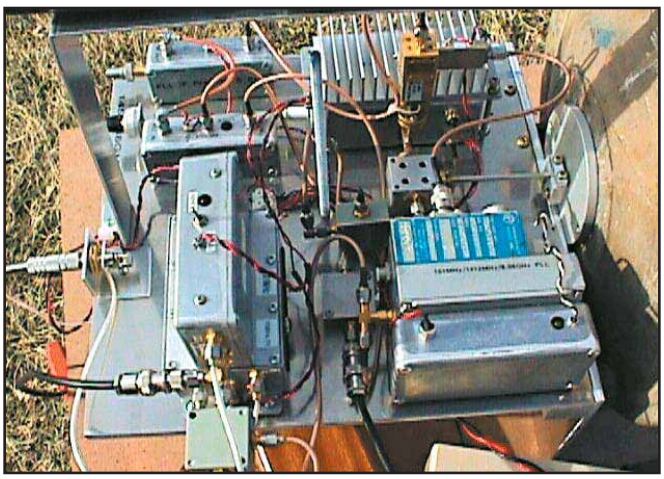

Figure 1—The rig used to set a new world record on 145 GHz by WA1ZMS (used with permission from the MGEF Web site www.mgef.org).

the club competition and plaque program to the June VHF QSO Party and the UHF Contest. Moreover, at some point all digital modes in addition to SSB and CW will be allowed in the EME contest. There is a possibility that a Cabrillo-compliant form will be created for the more casual participants. Structural changes such as those contemplated in this column or others will await further analysis.

ON THE BANDS

After all the excitement from the past year, the bands were strangely quiet during January. My thanks for reports to W3CMP, N3UM, K5YY, K6LMN, K6QSY, KC8CCD, NØJK, G4UPS and YV4DDK not otherwise acknowledged.

EME

The ARRL Bill Leonard, W2SKE, Professional Media award honors the News Director and Assistant News Director of KPAX-TV in Missoula, Montana, for producing a news segment featuring Jenna Rettenmayer, KD7MAD, a Missoula High School senior making her initial CW EME contact with VE7BQH at the station of Lance Collister, W7GJ. Meanwhile two interesting events are reported on 6 meters using JT44. Dan NØURW (EN41go) reports his first ever 6-meter JT44 EME QSO with SM7BAE (JO65op) on December 31. Ned AA7A reports success using a slightly elevated 3.2λ rope Yagi to make 6-meter EME contacts with W7GJ (DN27), W7ALW (DN36) and SM7BAE.

Microwaves

On January 12, 2003, Brian, WA1ZMS/4, claimed a new World and North American record on 145 GHz (see Figure 1). Located in EM96wx, he worked W2SZ/4 (WA4RTS op with W4WWQ and KA4YND) in FM07fm at a distance of 79.6 km. This also was grid #5 for W2SZ/4 leading to the first VUCC on 145 GHz.

6 Meters

The most interesting series of 6-meter contacts this month was from Kerry, ZL2TPY, (RF70) to the southern tier of the US: W3UUM (EL29), KC5OAO (EL39), N5HYV (EL59), AC4TO (EM70), K4RX (EM70), W4GF (EM83) and XE1BEF (DK89) via a TE spread-F to E_s link. Otherwise, it was a reasonable secondary short-skip season with single-hop E_s reported on several days during January, especially at the beginning of the month. A 3-hour+ E_s opening enlivened the January SS. During this time Mick, W1JJM (FN41), reports an unusual contact with NH7RO (BK29). NH7RO heard only one other US station WØRSJ (FN20) but was unable to work him. Pam (W9ULF) and Pam (N5KW) claim the first US YL to YL WSJT contact on 6 meters. Are there any others?

DXpedition news comes from two sources this month. Big John, WZ8D, and Joe, W8GEX, report limited E_s to the US Midwest and East Coast from special-event station N8Z in St Croix (KP2, see Figure 2). Numerous contacts were made into the Caribbean and TE to Brazil was evident almost every evening. Arriving too late for last month's column was news of the PJ2/WB9Z expedition to Curacao.

Figure 2—W8GEX and WZ8D from the special events station N8Z in St Croix.

Jerry worked 288 stations throughout the US on 6 meters with additional contacts in Central America and Hawaii, running only 5 W with an IC-505.

HERE AND THERE

Spring Sprints. The East Tennessee DX Association sponsors the Spring Sprints. The dates are listed in the sidebar "This Month." Further details and log sheets are available at the ETDXA Web site **www.etdxa.org/vhf.htm**.

Microwave Update. The Pacific Northwest VHF Society (PNVHFS) is host for this year's conference in the Seattle, Washington, area September 25-28, 2003. Registrations for the joint conference will be accepted beginning April 1, 2003. Further details can be found at **www.microwaveupdate.org**. "White papers" are currently being solicited from potential authors and speakers for publication in the 2003 conference *Proceedings*. White papers should be e-mailed directly to K7ND, at **k7nd@att.net**. Requests to make presentations should be directed to NU7Z (**nu7z@aol.com**); for presentations at the PNVHFS conference sessions, contact N7CFO (**n7cfo@ix.netcom.com**).

W1LP/MM no more. Via Shelby, W8WN, comes a letter from Clint, W1LP, indicating that the *Marine Chemist*, the oil tanker on which he served has been sold and that he (Clint) will probably take a full-time position as a Harbor pilot ferrying ships through the Cape Cod Canal. Clint has been the source of many water grids for me and for others. Good show, OM!

New 10 GHz Beacon. K1JCL/B, a new 10-GHz beacon located in Coventry, Connecticut (FN31us), has been activated on 10368.265 ± 10 kHz. Located 60 meters above a base elevation of 250 meters, the beacon runs 200 mW output to a 16-slot 10-dB gain waveguide. You can send reports to K1JCL at **al15@mindspring.com** or K1GX at **k1gx@snet.net**.

In this issue is an interesting article by Kris Mraz, N5KM, of the High Speed Multimedia Working Group about the use of spread-spectrum communication modes such as 802.11b by amateurs for the transmission of voice, data and images at microwave frequencies, particularly 2.4 GHz. This exciting new technology involves the marriage of state-of-the-art digital and microwave techniques. In one fell swoop it has the ability to bring Amateur Radio networking into the modern era. Read the article—you will be intrigued. QST

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, issued in order of date received. The numbers following the call signs indicate claimed endorsement levels. The totals shown are for credits given from December 7, 2002 to February 7, 2003.

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

1272	KC5YKX
1273	WA8WV
1274	AL7OC
1275	N9WBR
1276	WB7VVD
1277	K7NII
1278	N4JQQ
1279	K4GTR
1280	VE3XK
VE3SYK	250
ZL3AAU	250
KA0JGH	625
NØLL	825
WB1FLD	300
N1NUM	175
W3EP	900
W4WTA	675
AA5XE	675
K6UM	450

144 MHz

100

612	N3RN
W8WN	375

222 MHz

50

111	W4FSO
112	KØRZ

432 MHz

50

301	N5HYV

1296 MHz

25

K2AN	35

10 GHz

5

131	K1DS

142 GHz

5

1	W2SZ/4

Satellite

100

124	AA4QE
N1HOQ	200
W5BTS	250

QST

STRAYS

ANTIQUE QSLs

◊ These framed QSL cards are at Susan Parrish Antiques, an American Folk antique store in Greenwich Village, New York City. She enlisted me to help her find something about them. I wonder whether any old timers might either recognize the calls or have information on the stations whose QSLs are in the collection.—*Peter Krulewitch, W2YG,* 225 W 86th St, New York, NY 10024; **peter.krulewitch@verizon.net**.

PETER KRULEWITCH, W2YG

Recognize these call signs? If so, W2YG would like to hear from you.

The Sierra—a QRP Success Story

The Northern California QRP Club (NorCal) broke new ground in 1994 by kitting a simple 40-meter CW transceiver, the NorCal 40. Designed by Wayne Burdick, N6KR, this small monobander not only started a revolution in QRP transceiver design but a boom in home construction. NorCal quickly followed this with a new generation multiband CW QRP kit rig (another N6KR design), built with portability and low current drain in mind. It was called Sierra. By mid-1996 the Sierra had become *the* low power rig of choice for the QRP fraternity.

While NorCal had definitely hit a home run with the NorCal-40 and the Sierra, both rigs were kitted for only a very brief period. Wayne and Bob Dyer, K6KK (ex-KD6VIO), formed Wilderness Radio as a commercial company and started offering the NC-40A and the Sierra as part of their product line. Sales went through the roof and the Sierra established itself as the premier QRP transceiver of the mid to late 1990s.

A view of the Wilderness Radio Sierra multi-band QRP CW transceiver pictured with one of its band modules. You can add as many modules to cover the bands you need to work.

What's so Great about the Sierra?

A review of the Wilderness Radio Sierra in the June 1996 issue of *QST* raised a few eyebrows. The rig used for this review just happened to be my original Sierra, and even I was surprised at the ARRL Lab results. No one was quite ready for a multi-band QRP transceiver kit, costing just over $200, which featured outstanding receiver performance, very low power budget and extreme portability. While the Sierra covered all nine Ham bands, you only needed to purchase the band modules you were interested in, thereby customizing the radio to your particular operating habits while holding costs down. The Sierra has been featured in the *ARRL Handbook for Radio Communications* for the last several years, which is an indication of its immense popularity and the impact this transceiver kit has had on the QRP fraternity.

The Sierra covers 150 kHz on each of the nine HF ham bands, relative to the band module installed. The innovative idea of using band modules eliminates the need for complex band switch wiring and PIN switching diodes. This greatly simplifies construction, dramatically reduces receiver noise and further serves to reduce overall current consumption of the radio. The Sierra draws about 30 mA on receive and up to about 300 to 450 mA on transmit, depending upon RF output, making it very attractive to campers, hikers, backpackers and wilderness/extreme QRPers.

The receiver uses Gilbert Cell mixer technology in the form of NE602 (NE612) mixer/oscillators. Manufacturer's claimed specs are: MDS –135 dB; BDR 110 dB; two-tone DR 88 dB. Tests performed in the ARRL Lab correlate closely with the manufacturer's specs, with MDS varying from –126 dBm on 160 meters to –138 dBm on 17 meters. BDR was 103 dB on 80 meters and 110 dB on 20 meters. Finally two-tone DR ranged from 80 dB on 80 meters to 88 dB on 20 meters. These are quite respectable performance figures, considering the simplicity of the overall design.

Selectivity is variable between 150 and 1500 Hz, thanks to an innovative variable bandwidth (ABX) feature that controls the passband of a 4-pole Cohn crystal filter. The filter is adjustable from the PC board but can be remoted to the front. There is an additional single-pole crystal filter after the IF amplifier circuit.

The receiver also features a receiver incremental tuning (RIT) circuit that moves the receive frequency approximately 2 kHz away from the transmit frequency. The manual describes how to increase this RIT swing to around 10 kHz by changing R33. This mod will enable you to operate with enough frequency agility to bag most DXpeditions using split frequency operation.

Power output is between 2 and 3 W depending upon the band and the supply voltage. The RF output tends to be reduced on 15 meters and higher. My current Sierra has a PA mod; I replaced the stock 2N3553 transistor with a Motorola MRF237. This boosts my power output to over 3 W up to 15 meters and a solid 2.5 on 15 and above.

The VFO, a series-tuned Colpitts oscillator, operates between 2.935 and 3.085 MHz, providing excellent linearity over the 150 kHz tuning range. An 8:1 vernier drive slows the turning rate to an acceptable level, providing easy tuning of incoming signals. Advertised drift is less than 100 Hz after a 15 minute warm-up time; however, I have noticed virtually no drift from a cold start on any of my Sierras.

The Kit

The Sierra is a relatively easy build. I have built three of these kits, and they all have worked the first time power was applied. This speaks volumes about the extremely well-written instructions that come with all of the Wilderness kits. While I would not recommend a Sierra as a first-time project for someone new to kitting, if a newcomer took the time, read and followed the instructions carefully, there is no doubt the result would be a fully functional Sierra upon completion. Average building time is around 10 hours. This does not include the band modules, which take an average of about 45 minutes to an hour to complete per module. The main thing to remember, as with any kit radio, *don't rush your work,* and don't work on the kit when you are tired or feeling under par.

The Sierra has one mother board that

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is relatively densely populated. There are no surface-mount components; everything is through-hole mounting. The PC board(s) is plated-through on all the holes; so double-check your component placement prior to soldering—it is a real chore to remove soldered components from plated-through holes. The band modules plug vertically into the motherboard via a multi-pin edge connector. This is a robust, physically solid scheme and I have never had a band module loosen up or fall out of the edge connector in the many, many hours I have used my Sierras in the bush.

This photo shows one band module installed inside the rig. The Sierra features the KC-2 memory keyer/audio VFO module installed. The LCD display shows operating frequency, S-meter and RF power output.

Options

Wilderness Radio offers several options for the Sierra that will definitely enhance operation. First is the KC-1 iambic keyer and audio digital frequency readout. Costing only $45, the KC-1 is an inexpensive answer to having both a memory iambic keyer (either Mode A or B, and 8-50 WPM), along with CW readout of your rig's frequency.

The KC-2 digital display/memory keyer module requires a new front panel for the Sierra (sold separately). The KC-2 features dual programmable keyer memories while the display functions as a true digital frequency display, RF power output and S meter. Cost of the KC-2 is $75 plus $15 for the new front panel.

The BuzzNot is a novel little noise blanker that installs in the IF strip. This is a variable-width pulse noise blanker that is quite effective in cleaning up short duration noise. Cost of the BuzzNot is $19.

Band modules cost $31 plus shipping. Changing bands requires removing the top cover on the radio (secured with two plastic snaps), pulling out the band module and installing the new band module. Total time: less than 15 seconds.

On-Air Performance

The Wilderness Radio Sierra is, without a doubt, one of the best QRP rigs that I have ever used. I'm not alone in my opinion. Hundreds of Sierra owners regularly use their rigs to chase DX, contest, ragchew, participate in beacon competitions and operate from the bush. This little rig is a very versatile transceiver that can fill the bill as the main station radio or a tag-along rig for camping and hiking trips. The main advantages of the Sierra are its total analog design and its extremely battery-friendly nature. A 7 Ah gel-cell will operate this rig for an entire weekend from the bush without a recharge. The Sierra is also a very intuitive radio to get to know. Performance is rock solid with no surprises. The controls are well laid out and operation is straightforward.

While it can be argued that the Sierra does not provide a "QRP Full Gallon" (5 W output), I have found, after extensive on-air testing, that the difference between my Sierra running 3 W output and another QRP rig running 5 W output is negligible. There is virtually no difference in signal reports from distant stations. Of course, there is a major difference in power budget when it comes to supplying dc power to run the radio. Obviously, if you can communicate running 3 W, why waste the extra energy to power the radio at 5 W, when the receiving station will realize less that ½ S-unit increase in signal strength?

While the Sierra technology is dated (mid-1990s), the Sierra remains, even by today's standards, an excellent performer. Stacked side by side with any of the newer "digital" kits, the Sierra will definitely hold its own. The Sierra receiver is very quiet and a pleasing receiver to use for extended periods. The obvious advantage here is the ability of the Sierra to hear really weak stations without tiring the operator.

Bottom line on the Sierra: an exceptional kit and a wonderful performer. The Sierra is a very well behaved radio that offers dazzling performance in a relatively small, 2.6 × 6.3 × 5.3 inch (HWD) package weighing in around 2 pounds. The rig will run on a dc supply anywhere from 10 to 16 V. Even in today's rush to embrace the digital world, this analog radio is a winner. The Sierra starts at $215 for the basic radio without any modules up to $369 for the rig plus any six-band modules. Check out the Wilderness web site: **www.fix.net/~jparker/wild.html**. Or write Bob Dyer, K6KK, at Wilderness Radio, PO Box 734, Los Altos, CA 94023-0734, tel 650-494-3806.

HW HANDBOOK

Several months ago Mike Bryce, WB8VGE, contacted me to help edit his rewrite of the *HW Handbook*, a compilation of modifications to the Heathkit HW-7, 8 and 9 transceivers. This edition of the book is a complete rewrite featuring a new material, lots of high quality diagrams and pictures, as well as the best mods and information from the original handbook.

The *HW Handbook* is not for sale… yet. However, in a recent communication, Mike told me he would have plenty of copies for sale at the Dayton Hamvention. So, if you have one of the Heath HW-series radios and want to improve its performance, contact Mike (e-mail **prosolar@sssnet.com**) and obtain a copy of his new *HW Handbook*. QST

STRAYS

POLICE EVENT

◊ US International Police Association Radio Club is sponsoring a special event in remembrance of fallen peace officers from 0000Z April 27 to 2359Z May 11, 2003. Main operating frequencies are 28.355, 21.410, 14.240 and 3.850. This is the fifth annual event, with worldwide participation. US section members will be using 1×1 calls. QSLs should be sent to the individual stations contacted. Annual Contest for CW will be held from 0000Z May 3-2359Z May 4. All stations are welcome to work the event and contest. For more information, go to **www.iparc.org**. QST

A Very Special YL

There are many stories behind the lives of YLs, especially those who have been in the hobby for many years. One very special YL was Helen Schmock, W8GJX, of Manistee, Michigan, who became a Silent Key last year. She was first licensed in 1929 and enjoyed high-speed CW up to the late 1990s. She was also a storyteller herself, authoring many children's books including one about a YL radio operator that continues to touch many lives. The following is from an article published in the September 2000 edition of the Pawtuxet Valley (RI) Amateur Radio Club newsletter.

> While looking at some books in an antique store, one of them jumped out at me. The title was *Sim Barton, Girl Radio Operator*. It's all about a girl who gets her commercial radio license and then goes looking for a job on the Great Lakes. Of course, I bought it. When I got the book home I looked at it more carefully and found it was written in 1952 by Helen Cloutier, W8GJX. Further investigation showed me that the book was inscribed inside as follows: "With best wishes for a long, lasting friendship. 33. Helen Cloutier W8GJX. (since 1929)." It's a first edition signed by the author. Of course I now had to find the author. She was indeed still in the FCC database, but with a different name, Helen Schmock. She was still in Michigan. Could this be the same woman (now about 92 years old)? I sent her a letter and it came back after about 10 days.... Curiously, the new address was on the label. I sent the letter out again. It's been many days now and I haven't heard anything. I hope I find Helen."

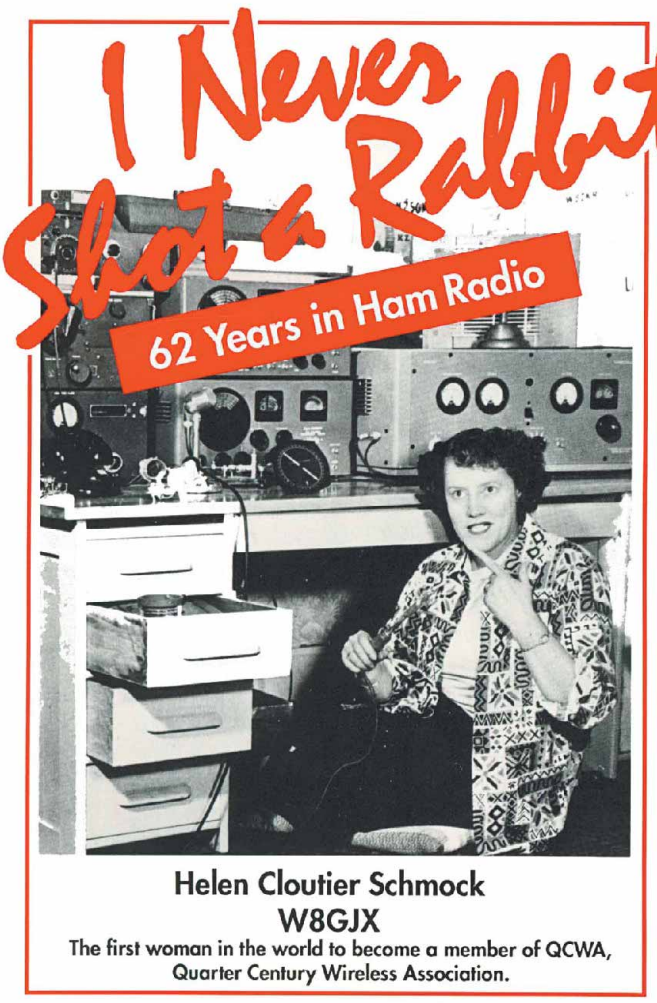
The article was written by newsletter editor Ken Carr, KB1AWV, a high school science teacher. He and his wife Camille, N1WRZ, got their answer a few weeks later. "We received a package from Helen's son, Charlie Cloutier. His mom had recently entered a nursing home and was in relatively good health at 91 years old," Ken said. Charlie had also sent a copy of *I Never Shot A Rabbit*, which is Helen's autobiography and full of interesting events that helped mold her life.

From the books he read and conversations with her son, Ken said Helen was a very active woman. Besides her activities in ham radio, she taught music and was a DJ at a radio station. "Helen was independent and wrote about the difficulties women had getting into male-dominated fields," Ken told me. "In her stories girls had a hard time getting into radio and working onboard ships."

The introduction in one of her books really shows her "spunk." It begins: "Ham radio, a bigamist, two husbands, many hobbies, some which later became a part of my '17' careers, any one of which could have been a life's work.... It is the story of the FIRST female to become a member of the world-wide Quarter Century Wireless Association and how Ham radio became an integral part of my life." Helen signed that book to Ken, KB1AWV, inscribing it "Best wishes Ken, 73's from Helen Cloutier Schmock, W8GJX, 91 years old and Shooting for 100, September 18th, 2000."

Helen was pictured along with her radio equipment on the front cover of *Radio-Electronics* magazine in the 1950s. "Back then she was active on the Michigan Buzzard's Roost net on AM," wrote Doran Ditlow, WA8EOW, of Grant, Michigan. "Even into the 1990s Helen operated quite a bit on the W8HVG linked repeater system covering all of Western Michigan. I talked to her several times on 2 meter FM."

"There was a lot more to Helen than what I can recall," he said. Sounds like there certainly was a lot to Helen Cloutier Schmock, W8GJX, SK.



The descriptive cover of Helen Schmock's autobiography.

AROUND THE BANDS

Look for a new YL in Sudan, Reem, ST2YL. She is looking for YL contacts and can often be found on 14,210 around 1700Z.... A tip from Helen Archibald, VE2YAK: "When I operate from DXpeditions, I always tell the OMs to mark their cards in BIG letters YL contact, because otherwise they get back a standard card that doesn't say they worked an OM. We do thousands of cards at a time." ... Speaking of QSLing, Carolyn Donner, N8ST, the YLCC Award Certificate Manager says, "My biggest number of questions about the YLCC award deal with QSLs. I make the contacts but can't get the YLs to QSL. How do I get the award if the YLs just won't QSL back?" She encourages all YLs to send return QSLs, as there are many hams looking for those special YL awards.—*33, Diane, K2DO*

Diane P. Ortiz, K2DO ♦ PO Box 296, Bellport, NY 11713 ♦ k2do@arrl.org

SILENT KEYS

It is with deep regret that we record the passing of these amateurs:

W1AHJ, John W. Batchelder, Pittsfield, ME
K1ANM, Monroe P. Bean, Hollis Center, ME
KC1BL, Gerald J. Gomolak, Peoria, AZ
N1ELP, Seth F. Hunt, Dover, NH
W1HDW, Stanley W. Novak Sr, Columbia Falls, ME
N1ICU, Adam J. Mendelson, North Kingstown, RI
W1LFZ, Richard L. Nutter, Bangor, ME
KA1PCP, Norman F. Carlow Jr, Presque Isle, ME
N1PNK, Ivan E. Smith, Franklin, ME
W1QFJ, Robert J. Lareau, Southbridge, MA
K1QV, Sam W. Edwards Sr, Arcadia, FL
W1QZM, Harold F. Preble, Dover Foxcroft, ME
K1RWN, Lawrence E. Parlin, Augusta, ME
W1UCL, Wendell Jewett, Lutz, FL
WA1UKR, Harry Thanos, Harrisville, RI
W1VSA, Harry A. Preston Jr, Charlotte, VT
*W1WLE, Robert K. Little, Saint Petersburg, FL
WA1ZCD, Clifford A. Woollam, Swansea, MA
K2AQM, Louis H. Hendler, Gainesville, FL
WA2EOB, Ron Blakeslee, Pitman, NJ
W2EOV, Lodewyk A. Van Den Berg, New Milford, NJ
K2GHV, Robert H. Greenquist, Montvale, NJ
WB2IDM, Henry L. Fazzari, Jupiter, FL
*KB2IP, Paul M. Trepanier, Fairport, NY
W2LKO, Norman L. Riemenschneider, Warren, NJ
KA2OEC, George C. Shipston, Worthington, OH
W2OJW, F. G. Powell, Oradell, NJ
W2PFZ, Cornelius J. Griffin, Dover, NJ
KF2Q, Al A. Stark, La Grange, KY
WA2VAQ, Richard P. Wells Jr, Newton, NJ
WB2WYY, Cornelius L. Kelly, Hazleton, PA
W2ZLM, Martin Enghauser, McLean, VA
‡W3CDU, Virgil A. Grilli, New Eagle, PA
AD3T, Stanley P. Cole Jr, Washington, PA
K3UKO, John G. Kurzenknabe, Camp Hill, PA
WK3V, Rube Chernikoff, Temple Hills, MD
KA3ZWR, Charles W. Goodspeed, North East, PA
WA4ATY, William J. Teasdale, Boca Raton, FL
K4BRK, Carl S. Horner, Winchester, VA
KM4ED, George Sherrill, Athens, TN
KA4EEF, Harvey Wittner, Lutz, FL
N4EMZ, Otto D. Sledd, Radford, VA
W4FGW, Fred G. Wright, Atlanta, GA
KE4IZZ, Fontella W. Spratley, Garner, NC
ex-W4JUR, Paul J. Nutter, Fredericksburg, VA
W4LRA, Wilmer E. Broadus, Winter Haven, FL
WB4MAV, Arlon P. Click, Nicholasville, KY
W4MYJ, David C. Harris, Cleveland, TN
WA4NAH, Floyd B. Handsor, Columbus, GA
*W4OBA, Jack Wacher, Lantana, FL
W4QCI, Hugh F. McCarron, Wesley Chapel, FL
WT4T, Bruce Egalka, Saint Petersburg, FL
W4USW, Robert B. Miller, Charleston, SC
KZ4Y, Fred L. Horton, Roanoke, VA
KD4YP, D. Pearce Chauncey, Vero Beach, FL
KS4ZW, John B. Brown, Hendersonville, NC
KB5EOU, Perry Funderburg, Amory, MS
KD5ESI, Kalpana Chawla, Houston, TX
ex-W5EXM, Lucille E. Schmitz, Carrollton, TX
KD5GEA, Mike L. Rogers, Marlow, OK
K5HAN, Dwight E. Smith, New Orleans, LA
KC5IWN, Ray V. Barron, Houston, TX
W5JME, Robert E. Ard, Midwest City, OK
W5JSV, Dorothy B. Fulton, La Marque, TX
WJ5L, Lester L. Grant, Vicksburg, MS
WB5NLY, Hallye B. Douglas, Corpus Christi, TX
N5OAC, James F. Nash Sr, Waco, TX
KC5TWH, Damond D. Day, Mesilla Park, NM
WB5UGE, Gordon R. Tyrone, Calico Rock, AR
KE5VT, Stanley B. Prestwich, Waco, TX
K5YYQ, Glen O. Corbett, Albuquerque, NM
N5ZRR, Floyd M. Sawdey Sr, Dardanelle, AR
KC5ZSU, Laurel B. Clark, Houston TX
KC5ZTC, David M. Brown, Friendswood, TX
W6CCM, David E. Manescu, Lakeside, CA
*W6CF, James A. Maxwell, Redwood Estates, CA
KE6DEJ, Douglas H. Statham, Fresno, CA
KE6DM, Robert J. Leonard, Silver City, NM
WB6EHH, Saul S. Elkin, Fresno, CA
KF6FIL, James W. Isgrigg, Fresno, CA
WA6HMB, Thelmar Bales, Madera, CA
N6LHE, Leonard L. Greene, Troy, NC
W6LUA, Robert E. Kupps, San Pedro, CA
W6MQK, John W. Maver, Pasadena, CA
KD6OJK, Le Roy S. Takakjian, Porterville, CA
W6PNI, Harold E. Taylor, Sunnyvale, CA
KD6QA, Lenore P. Austin, Modesto, CA
W6QOK, Paul E. Black, Santa Ana, CA
WB6QWT, J. W. Powers, Fresno, CA
N6XW, Laszlo Barabas, Long Beach, CA
AC6YP, Alex Meltzer, Woodland Hills, CA
N7JFU, Harmon V. Averyt, Yuma, AZ
KK7JI, Gene T. Keech, Dewey, AZ
W7JY, Warren L. Green, Seattle, WA
KA7OAB, Ronald L. Farrar, Kapaa, HI
W7PJ, Roy Hanson, Bend, OR
K7ROD, Rodney E. Hunter, Prescott, AZ
W7RQO, John A. Andrews, Florence, OR
N7USU, John H. Hopkins, Panaca, NV
K7WUG, Hugh L. Thompson, Phoenix, AZ
AB7WZ, Bobby G. Eason Sr, Round Mountain, NV
WA8ACW, Raymond T. Van Coney, Cincinnati, OH
W8FUS, Harold L. Ferguson, Parkersburg, WV
WD8IGE, William M. Rader, Pigeon Forge, TN
ex-WD8IGN, Billy Buskirk, Logan, WV
N8IOL, Stanton B. Tenney, Fredericktown, OH
WW8J, Bradford J. Smithwick, Cincinnati, OH
WD8KQJ, Joseph C. Zaremba, Alamogordo, NM
K8LBT, Angelo G. Dalambakis, Dayton, OH
WD8NMW, Eugene F. Hoffman, Cincinnati, OH
W8PAR, Paul Anderson, Parkersburg, WV
K8PER, Arden J. Marlatt, Newcomerstown, OH
KC9ADN, Kent W. Gildow, Ft Wayne, IN
KA9CAL, Ray F. Kreml Jr, Naperville, IL
N9CRO, Jones L. Jordan, Chippewa Falls, WI
WD9FQF, Henry R. Faubel, Peoria, IL
K9IN, John R. Reed, Pekin, IL
W9LQL, John R. Truitt, Wheaton, IL
WA9MJJ, Roger H. Swanson, Chicago, IL
W9MYI, George Allinger, South Bend, IN
K9PQQ, Gordon A. Watts, Decatur, IN
WA9REQ, Glen B. Dickinson, Carthage, IL
W9RYO, Roy F. Witt, Beloit, WI
W9UFW, Fred Stolte Jr, Salem, NH
K9VJJ, Paul Klein, Rockford, IL
WB9ZNB, Charles E. Ginn, Phoenix, AZ
WØBCJ, Clark L. Joslin, Cambridge, MN
WØCQE, William M. Boppart, Kansas City, MO
KØDVI, Willard H. Solfermoser, Fort Collins, CO
*WØFT, Dennis H. Corder, Quinter, KS
WØFXY, George Ayers, Lees Summit, MO
WØGJS, Robert M. Freshman Sr, Omaha, NE
KØHPP, Albert C. Victor, Marion, IA
WØJJE, Joan J. Ehlis, Pueblo, CO
KØPXY, Vincent J. Dorsey, Cozad, NE
WØSAL, Earl A. Hawkins, Cedar Rapids, IA
KØSRZ, Alden L. Seats Sr, Trinidad, CO
NØUQJ, David J. Lee, Pueblo, CO
KØVMW, John Anderl, Collegeville, MN
WBØYGP, Eugene Marchand, Kansas City, MO
VE3GEN, D. L. Dewey, Whitby, ON, Canada

*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

STRAYS

ARRL PERMISSION POLICY

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I would like to get in touch with . . .

◊ all DL4, F7 and other friends from 1956 on when I was the OH2OJ on SSB and from 1957 as OHØNC. The DL4 and F7 stations were American occupation forces in Europe after WW II. I lost contact with them when I moved on to VHF/UHF/SHF in 1961 and they went back home.—*Sam Granholm, OHØNC, e-mail* **f228.n20.z2.fidonet.org**

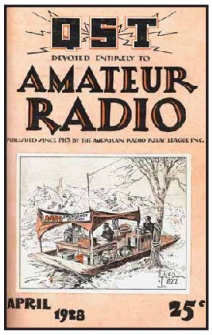
◊ others who have done radar restoration or those who might have available radar parts. I am near completion of the restoration of the mid 1943 SJ-1 submarine radar, located aboard the USS *Cobia*, docked in the harbor adjacent to the Wisconsin Maritime Museum.—*Tom Aschenbrenner, WA9EXS, Dallas, Texas*

QST congratulates. . .

◊ Burt Ludin, N3YVH, of Hatboro, Pennsylvania, who was named GMAC Mortgage Volunteer of the Month for December for his long-term dedicated community service in the greater Philadelphia area. Among his many volunteer activities, Burt is an active member of the Warminster Amateur Radio Club. QST

75, 50 AND 25 YEARS AGO

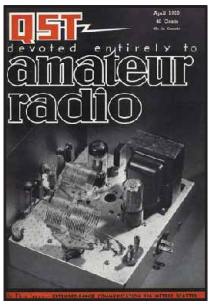
April 1928



♦ The cover art by Clyde Darr, 8ZZ, is a dramatic look at an A.R.R.L. emergency station maintaining radio contact from a flat-bottomed boat lashed to a friendly tree in the midst of a flood. The editorial further discusses the impact on Amateur Radio of the new radio regulations, which will become effective January 1, 1929.

"Some Investigations of Short Waves at Nijni-Novgorod," by Wladyslaw Grsybowski, r1WX, tells about radio experiments in the U.S.S.R. using a 50-kilowatt transmitter. S. P. McMinn, 2WC, discusses "Low-Power, Flexible Crystal-Control for Four Amateur Bands." D. E. Replogle presents "Notes on the Design of Iron-Core Reactances Which Carry Direct Current." In "Strays," D. B. Parke notes, "It is said that you don't have to be crazy to be a radio enthusiast, but it certainly helps a lot if you are." The article about "8DPO" comments, "This station is built for the future." Beverly Dudley, 9BR, discusses "Keying Master-Oscillator Circuits." F. Austin Lidbury tells how he rebuilds variable capacitors for "Easy Tuning in the Short-Wave Bands." James Lamb, 3CEI, describes "A Portable Receiver."

April 1953



♦ The cover photo shows W1JEQ's compact crystal-controlled transmitter that uses one of the new TV sweep tubes. The editorial discusses the new Conelrad requirements that amateurs must observe, lest a ham radio signal provide a homing beacon for an incoming enemy bomber.

Oswald Villard, W6QYT, and Allen Peterson, W6POH, tell about "Meteor Scatter," the new propagation technique that can provide extended-range communication in the 15- and 20-meter bands. Ed Tilton, W1HDQ, gives "TVI Hints for the V.H.F. Man." Bill Wrigley, W4UCW, discusses "Folded and Loaded Antennas," which are of interest to the mobile ham and to those hams with space restrictions at home. Emmett Jennings, W6EI, tells about "A Different Approach to High-Power Mobile," using low-level AM modulation and a linear final amplifier, with a pair of 4X150A's running 250 watts of carrier on 75 meters. Vern Chambers, W1JEQ, in the cover article, tells about "A Sweep-Tube C.W. Rig for 3.5 and 7 Mc." The monthly column, "YL News and Views," tells about a number of YL operators who are operating on the V.H.F. bands. The "Fourth 10-Meter WAS Contest Results" reports that 91 stations turned in scores. In "How's DX?" Rod Newkirk, W1VMW, shows a photo of KL7AFR, the only DXCC member in the Alaska Territory.

April 1978

♦ The cover photo shows a compact solid-state "20-meter receiver on a circuit board." The editorial discusses "Simple Equipment, and WARC."

Jay Rusgrove, W1VD, describes "A 20-Meter High-Performance Direct-Conversion Receiver." Howard Berlin, W3HB, describes "The State-Variable Filter," which combines the functions of low-pass, high-pass, band-pass, and notch filtering in a single filter network. Wes Hayward, W7ZOI, tells how to modify your digital frequency display so it will remember a frequency and enable you to return to it at the push of a button, in "Frequency Memory for Receivers with Digital Readout." Jerry Sevick, W2FMI, tells about "Short Ground-Radial Systems for Short Verticals." In "His Computer Does the Operating," Charles Harris, WB2CHO, tells how VE3SAT has assembled an automated station "that's years ahead of its time." Charles also presents the latest FCC approach to handling interference complaints, in "George, the TV Is Acting Up Again!" Part 3 of "The Lure of 2 Meters" is presented by Paul Phelps, WA8ZLJ; Fred Bonavita, W5QJM; Jeff Boyce, W7INR; and Ed Braddock, W1XV. 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	10PM	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 1.818, 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 from 10 AM until noon and from 1 PM until 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, President's Day, Good Friday, Memorial Day, Independence Day, Labor Day, Thanksgiving and the following Friday, and Christmas Day and the following day. QST

COMING CONVENTIONS

SOUTHEASTERN VHF CONFERENCE

April 25-26, Huntsville, AL

The Southeastern VHF Conference, sponsored by the Southeastern VHF Society, will be held at the Marriott Hotel, 5 Tranquility Base. Doors are open Friday 8 AM to 9 PM, Saturday 8 AM to 5:30 PM. Features include technical presentations, conference proceedings, antenna measurements, noise figure measurements, auction, flea market, vendor displays, exhibits, annual business meeting, QSL card checking, banquet (Saturday, 7 PM; $35). Conference fee is $40. Tables are $5 (Friday night flea market). Contact Robin Midgett, KB4IDC, 3232 Beckwith Rd, Mt Juliet, TN 37122; 615-773-4198; **kb4idc@arrl.net**; **www.svhfs.org/**.

SETI CONVENTION

April 25-27, Trenton, NJ

The SETI Convention (3rd Annual Technical Symposium and Annual Membership Meeting), sponsored by the SETI League, will be held at The College of New Jersey, 2000 Pennington Rd. Doors are open Friday noon to Sunday 1 PM. Features include technical programs, microwave workshops, equipment vendors, hospitality suite, committee meetings, awards banquet. Admission is $40 in advance and $50 at the door for SETI League members; $90 in advance and $100 at the door for non-members. Contact Dr H. Paul Shuch, N6TX, 121 Florence Dr, Cogan Station, PA 17728; 570-494-2299; **drseti@setileague.org**; **www.setileague.org/seticon**.

MIDWEST DIVISION CONVENTION

May 2-3, Lebanon, MO

The Midwest Division Convention, sponsored by the Lebanon ARC, will be held at the Cowan Civic Center, 500 E Elm St. Features include huge indoor flea market; commercial vendors; forums; special guest ARRL President Jim Haynie, W5JBP; Amateur Radio Emergency Communications Course seminar (Friday, 1-5 PM; Dan Miller, K3UFG, 860-594-0340; **k3ufg@arrl.org**); VE sessions (Saturday, 12:30 PM, preregistration required; Bob Sharp, KØYS, 417-345-8299, **bflobob@positech.net**); QSL card checking; banquet (Friday, 7 PM, $15; Wallace Building, 325 Harwood Ave; special guest speaker Riley Hollingsworth, FCC Special Counsel for AR Enforcement); Wouff Hong ceremony. Talk-in on 145.47. Admission is $6 in advance by Apr 15, $8 at the door. Tables are $10 with additional tables $5 each if reserved in advance by Apr 15; after Apr 15 $15 with additional tables $7.50 each (Mike Edwards, WB9M, 417-532-9111 days or 417-588-1535 eves; **wb9m@socket.net**). Contact Bill Wheeler, KØDEW, 500 E Elm St, Lebanon, MO 65536; 417-532-4642; **djb@llion.org**; **members.socket.net/~wb9m/Publish**.

INTERNATIONAL DX CONVENTION

May 2-4, Visalia, CA

The International DX Convention, sponsored by the Northern California DX Club, will be held at the Holiday Inn Hotel and Conference Center, 9000 W Airport Dr; located at the intersection of State Hwys 99 and 198. Features include vendors, exhibitors, forums (DX, Top Band, Contest), programs, technical talks, VE sessions, QSL card checking, banquet, barbecue (US Tower manufacturing facility, Marcin Rd), DXpedition speakers. Admission is $60 in advance by Apr 21, $65 at the door. Contact Dick Letrich, W6KM, 3686 Kirk Rd, San Jose, CA 95124; 408-267-2624; **dlw6km@aol.com**; **www.ncdxc.org/Ncdxc/Convention**.

March 21-22
Nebraska State, Norfolk*

March 28-29
Maine State, Lewiston*

March 29-30
Maryland State, Timonium*

May 30-June 1
Rocky Mountain Division, Estes Park, CO
Atlantic Division, Rochester (Henrietta), NY

June 7
Georgia State, Marietta

***See March *QST* for details.**

SOUTH CAROLINA STATE CONVENTION

May 3, Greenville

The South Carolina State Convention, sponsored by the Blue Ridge ARS, will be held at the Piedmont Interstate Fairgrounds, 275 Fairgrounds Rd (Spartanburg); 3 miles S of Business I-85, Exit 4 (Hearon Circle), Hwy 56 S, follow signs. Doors are open for setup on Friday 6-9 PM, Saturday 6 to 8 AM; public 8 AM to 2 PM. Features include large outdoor tailgating area, indoor exhibitors, vendors, dealers, ARRL forum, QCWA table, DXCC Card Checking, foxhunt, RV camping with full hookups (Friday night, $10), VE sessions (11 AM, off site), handicapped accessible, refreshments. Talk-in on 146.61, 146.82. Admission is $4 in advance, $5 at the door; under 12 free. Tables are $11, electricity $5, chairs $1. Contact John Hoyt, W5UGD, 125 Wyatt Oaks Ct, Easley, SC 29642; 864-859-8316; **hamfest@brars.org**; **www.upstatehamfest.org**.

ALABAMA STATE CONVENTION

May 3-4, Birmingham

The Alabama State Convention, sponsored by the Birmingham ARC, will be held at the Zamora Temple, 3521 Ratliff Rd; I-20 to Exit 135 exiting westbound turn left, go to stop sign, turn left, follow signs; exiting eastbound turn right, go to stop sign, turn left, follow signs. Doors are open Saturday 9 AM to 5 PM, Sunday 9 AM to 4 PM. Features include flea market, commercial vendors, exhibitors, tailgating (Dan Morgan, KB4MDI, 205-822-5242), forums, VE sessions (Saturday, 9 AM and 1 PM sharp; Sunday 9 AM only), banquet (Ed Pitchford, KD4AY, 205-823-4373), continental breakfast. Talk-in on 146.88. Admission is $5 (good both days); under 12 free when accompanied by a paying adult. Tables are $20 in advance, $25 at the door (good both days). Contact Glenn Glass, KE4YZK, 8368 Country Cir, Pinson, AL 35126; 205-681-5019 (after 6 PM); **ke4yzk@bellsouth.net**; or Ellis Dobbins, K4LI, 205-608-1866; **k4li@arrl.net**; **www.w4cue.com**.

WEST TEXAS SECTION CONVENTION

May 3-4, Abilene

The West Texas Section Convention, sponsored by the Key City ARC, will be held at the Abilene Civic Center, 1100 N 6th St; I-20 to Pine St Exit, S on Pine to the intersection of Pine and N 6th, Civic Center on NW corner. Doors are open Saturday 8 AM to 5 PM, Sunday 9 AM to 2 PM. Features include commercial dealers, forums, VE sessions, on-site transmitter hunts, foxhunt (Saturday eve), limited RV parking (nominal fee), handicapped accessible, free parking, refreshments. Talk-in on 146.76. Admission is $7 in advance (must be received by Apr 29), $8 at the door. Tables are $7. Contact Peg Richard, KA4UPA, 1442 Lakeside Dr, Abilene, TX 79602; 915-672-8889; **ka4upa@arrl.net**; **www.qsl.net/kcarc/hamfest.html**.

THE ARRL NATIONAL CONVENTION

June 20-22, Arlington, TX

Join hams and League officials from across the country at the 2003 ARRL National Convention, to be held June 20-22 at the Arlington Convention Center in Arlington, Texas. The event is sponsored by Ham-Com. For information, call 214-361-7574; e-mail **chairman@hamcom.org**; **www.hamcom.org**.

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 **April 1** to be listed in the **June** 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.)

†ARRL Hamfest

Alabama (Albertville)—Apr 19. Buddy Smith, AC4B, **kc4url@bellsouth.net**.

Alabama (Birmingham)—May 3-4, Alabama State Convention. See "Coming Conventions."

Alabama (Huntsville)—Apr 25-26, Southeastern VHF Conference. See "Coming Conventions."

†**Arizona (Sierra Vista)—May 3,** 6 AM to 1 PM.

Gail Iannone ♦ Convention Program Manager ♦ giannone@arrl.org

Spr: Cochise ARA. Green Acres, 2756 Moson Rd; from the intersection of Fry Blvd and State Hwys 90 and 92 (at the Target store), go E on Hwy 90 (an extension of Fry Blvd), 4 miles to Moson Rd, go S (right) on Moson Rd for 2 miles, Antenna Farm on right. VE sessions. *TI:* 146.76 (162.2 Hz). *Adm:* $5. Tables: $7. Pat Thies, KD7HAB, 5041 S Santa Aurelia Ave, Sierra Vista, AZ 85650; 520-378-6829; **kd7hab@earthlink.net**; **www.qsl.net/k7rdg**.

†Arkansas (Little Rock)—Apr 25-26; Friday 4-8 PM, Saturday 8 AM to 4 PM. *Sprs:* Arkansas Radio Emergency Service and several other central Arkansas clubs. Little Rock Expo Center, Exit 128 off I-30 in SW Little Rock, near the Pulaski County line. Flea market, computer and equipment dealers, vendors, tailgating ($15 per space), special exhibits and displays, forums, technical table (test your own equipment), contests, VE sessions, NWS Storm Spotter Course (9:30 AM to noon), handicapped accessible. *TI:* 145.13. *Adm:* $7. Tables: $30 (dealers), $20 (flea market); electricity ($5 per outlet). Jim Blackmon, K5VZ, 1008 Pine St, Arkadelphia, AR 71923-4919; 870-246-6734 or 870-246-7833; fax 870-246-6736; **k5vz@ezclick.net**; **www.aristotle.net/~hamfest/**.

†California (Kingsburg)—Apr 26, 7 AM to 2 PM. *Spr:* Fresno ARC. Riverland Resort, 38743 Hwy 99; from Hwy 99 take the 384 Exit, 10 miles from Visalia and 20 miles S of Fresno. Swapfest, AR equipment, foxhunt, VE sessions, BBQ. *TI:* 146.94. *Adm:* $1, under 12 free. Bill Hoey, KF4EOP, 751 Whittier Ave, Clovis, CA 93611; 559-298-1915; **billh@qnis.net**; or Kim Davis, KF6ZSW, 559-645-6849; **www.qsl.net/w6to**.

†California (Sonoma)—Apr 26; set up 7 AM; public 8 AM to noon. *Spr:* Valley of the Moon ARC. Sonoma Valley Veteran's Memorial Building, 126 First St W, 1 block N of the central Sonoma Plaza, Hwy 12. Indoor and outdoor electronics swapmeet ($10 per space; no charge for Amateur Radio organizations for informational tables and displays), VE sessions (walk-ins, register 9 AM, exams 10 AM, all license elements), operating QRP station, AMSAT, display of homebuilt equipment, beginner's DF transmitter hunt, ULS registration, full breakfast (8-10 AM, $5). *TI:* 145.35 (88.5 Hz). *Adm:* Free. Darrel Jones, WD6BOR, 358 Patten St, Sonoma, CA 95476; 707-996-4494; **wd6bor@vom.com**.

California (Visalia)—May 2-4, International DX Convention. See "Coming Conventions."

Colorado (Longmont)—Apr 5. LARC, **larc @qsl.net**.

†Connecticut (Waterford)—Apr 12; set up 9 AM; public 10 AM. *Spr:* Radio Amateur Society of Norwich. Waterford Senior Center, Rte 85; from Hartford take Rte 2 S to Rte 11 to Rte 85 S; from the shoreline take Rte 95 to Rte 85 N. Amateur equipment auction (bring your gear to sell; 10% commission to RASON), handicapped accessible, free parking. *TI:* 146.73 (156.7 Hz). *Adm:* Free. Tables: Free. Gary Divan, WT1SND, 67 Plain Hill Rd, Baltic, CT 06330; 860-884-4218; **witsend@portone.com**; **www.rason.org**.

†Florida (Gainesville)—Apr 26; set up Friday 4-8 PM, Saturday 6 AM; public 8 AM to 2 PM. *Spr:* Gainesville ARS. Alachua County Fairgrounds, 3400 NE 39th Ave (SR-222); ½ mile E of SR-24 (Waldo Rd). Hamfest/Computer Show, vendors, tailgating ($6, plus admission), VE sessions (1:30 PM, no walk-ins), camping ($10 per night). *TI:* 146.82. *Adm:* $5, under 12 free. Tables: $7 (plus admission). Patricia Callaway, K4HFJ, 3515 NW 50th Ave, Gainesville, FL 32605; 352-378-0512; **k4hfj@arrl.net**; **www.gars.net/hamfest**.

†Florida (Jacksonville)—Apr 5, 7 AM. *Spr:* Greater Jacksonville Hamfest Assn. Dog Fanciers Association Field, Morse Ave; I-95 S to I-295, get off on Blanding Blvd, go N approximately 2 miles to Morse Ave, turn left at Bakery, Field is on left just before I-295 (there is no exit off I-295 to Morse Ave). Good old-fashioned tailgate only, self-contained camping, refreshments. *TI:* 146.76. *Adm:* $5. Deborah Lusk, KG4ADZ, 4459 Hudnall Rd, Jacksonville, FL 32207; 904-739-9713; **rsmythe2 @bellsouth.net**; **www.jaxhamfest.com**.

†Florida (Tampa)—Apr 19, 8 AM to 1 PM. *Spr:* Tampa ARC. TARC Clubhouse and grounds, 7801 N 22nd St; I-275 to Sligh Ave Exit, E to 22nd St, turn N (left) at light to Clubhouse at end of street. Tailgating, refreshments. *TI:* 147.105 (103.5 Hz). *Adm:* $2. Tables: $15 (6-ft with power). Biff Craine, K4LAW, 13515 Greenleaf Dr, Tampa, FL 33613; 813-265-4812; **k4law@arrl.net**; **www.hamclub.org**.

†Georgia (Calhoun)—Apr 26, 8 AM to 2 PM. *Spr:* Cherokee Capital ARS. Sugar Valley Community Center, Hwy 136; from I-75 take Exit 320, travel W on Hwy 136 to Connector, turn left onto Connector, travel approximately 5 miles to hamfest site on left. New equipment dealers, free tailgating (with paid admission), VE sessions, on-site camping (no hookups), free parking, refreshments. *TI:* 146.745, 145.23. *Adm:* $5. Tables: $5. Felton Floyd, AF4DN, 1054 Mountain Loop Rd NW, Sugar Valley, GA 30746; 706-629-0369; **ffloyd@pointlink.net**; **www.qsl.net/k4woc**.

†Idaho (Caldwell)—Apr 26. *Spr:* Snake River ARC. Vallivue Middle School, 16412 S 10th Ave; Exit 35 off I-84, turn toward Sugar Beet Factory, at light turn left onto Karcher Rd (Hwy 55) toward Marsing to 10th Ave, at light turn right to Middle School on right. *TI:* 147.2. *Adm:* $2. Tables: $10. Rob Robertson, KJ7XK, 11967 Bonnie Ln, Nampa, ID 83651; 208-468-9817; **kj7xk@msn.com**.

†Idaho (Idaho Falls)—Apr 26, 8 AM. *Sprs:* Eagle Rock ARC and Eastern Idaho UHF Society. Army National Guard Building, 575 W 21st St. Swapfest, radio talks, VE sessions. *TI:* 147.15, 443.0 (123 Hz). *Adm:* advance $5, door $7. Tables: $10. Jay Greenberg, WA4VRV, 2470 Harold Dr, Idaho Falls, ID 83402; 208-524-1388; **wa4vrv@arrl.net**; **myweb.cableone.net/wa4vrv/hamfest.htm**.

†Illinois (Arthur)—Apr 27, 8 AM to noon. *Spr:* Moultrie ARK. Moultrie/Douglas County Fairgrounds, SE edge of Arthur, just off Rte 133, behind High School. 41st Annual Hamfest. *TI:* 146.655 (162.2 Hz), 444.275 (103.5 Hz). *Adm:* $5, under 14 free. Tables: 8-ft $10 (paid in advance). Ralph Zancha, WC9V, c/o MARK, Box 91, Lovington, IL 61937; 217-543-2178 (days) or 217-873-5287 (eves); **rzancha@one-eleven.net**.

†Illinois (Galva)—Apr 27. *Spr:* Area AR Operators. High School Gym, 1000 N Center Ave; Exit 34 (Woodhull) off I-74, go E 15 miles; I-80, Exit 27 (Atkinson), go S 15 miles, follow signs. VE sessions, foxhunt, handicapped parking, handicapped accessible. *TI:* 145.49 (88.5 Hz). *Adm:* advance $5, door $7. Tables: $10. Matt Bullock, W9SIX, 419 E College St, Kewanee, IL 61443; 309-856-7111; **mbullock@theramp.net**; **www.qsl.net/aaro/index.html**.

†Illinois (Godfrey)—Apr 26. *Spr:* Lewis and Clark RC. Lewis and Clark Community College (River Bend Arena), 5800 Godfrey Rd; 25 miles N of St Louis, MO on Rte 67, 3 miles N of Alton, IL. Indoor hamfest, VE sessions. *TI:* 145.23. *Adm:* advance 3 for $5, door 2 for $5. Tables: $10. Chris Holland, N9WHH, 965 N Woodriver Ave, Woodriver, IL 62095; 618-254-9465; **n9whh @ezl.com**; **k9ham.cargodog.net**.

†Illinois (Sandwich)—May 4; set up 6 AM; public 8 AM to 1 PM. *Spr:* Kishwaukee ARC. Sandwich Fairgrounds, just N of Rte 34 intersection of Suydam and Gletty Rds; from Chicago area take US 34/Ogden Ave W, 7 miles W of Rte 47 to Gletty Rd, go N over RR tracks to Fairgrounds; from the W take US 34 E to Gletty Rd, go N over RR tracks to Fairgrounds, follow signs. Flea market, commercial vendors, free tailgating, overnight camping (electric hookup $15), free parking, refreshments. *TI:* 146.73 (100 Hz), 146.52. *Adm:* advance $5 (double stub), door $6 (single stub). Tables: $10. Make checks payable to KARC and send with SASE by Apr 20 to KARC, Box 371, DeKalb, IL 60115; or contact Bob Yurs, W9ICU, 815-895-3219 or 815-895-5049; **w9icu@arrl.net**; **www.qsl.net/wa9cjn**.

Indiana (Columbus)—Apr 12. Marion Winterberg, WD9HTN, 812-342-4670.

†Iowa (Des Moines)—Apr 26. *Spr:* Des Moines RA Assn. Iowa State Fairgrounds, Hall of Law/Hall of Flame Building); E on University to 30th, go S to main gates on Grand, go E to buildings. Meetings, VE sessions. *TI:* 146.94. *Adm:* $5. Tables: $10. JoAnn Deaton, KCØBTV, 2261 E Grand Ave, Des Moines, IA 50317; 515-265-6264; **dmraa@aol.com**; **www.qsl.net/dmraa**.

†Kentucky (Louisa)—May 3, 8 AM to 2 PM. *Spr:* Big Sandy ARC. Louisa Middle School, 644 Bulldog Ln; turn off US 23 onto Rte 32 then right on Rte 2565, go 1 mile to Rte 644, at flashing light turn right onto Bulldog Ln, across from Three Rivers Hospital. ARRL meeting (with KY SM John Meyers, NB4K), VE sessions. *TI:* 147.39. *Adm:* $4. Tables: $4. Fred Jones, WA4SWF, 511 N Lackey Ave, Louisa, KY 41230; 606-638-9049; **wa4swf@arrl.net**; **www.bsarc.org**.

†Maine (South Portland)—Apr 19; set up 6:30 AM, public 8 AM to noon. *Spr:* Portland Amateur Wireless Assn. American Legion Hall, Post 35, 413 Broadway; from Maine Tnpk, Exit 7, turn N on Main St (US Rte 1), at Cash Corner turn right on Broadway, continue to site. Electronics flea market, vendors, parts and equipment, dealers, Country Store Consignment, limited paved tailgating, VE sessions (10 AM), vintage AM demo station, forums, handicapped accessible, free parking, refreshments. *TI:* 147.09 (100 Hz). *Adm:* $5, accompanied children free. Tables: advance $8, door $10 (includes 1 admission). Don Littlefield, AA1ZY, Box 1605, Portland, ME 04104; 207-874-0150 or 207-831-4078; **aa1zy@arrl.net**; **www.qsl.net/pawa/fleamarket.html**.

†Maryland (Easton)—Apr 13, 7 AM to 4 PM. *Spr:* Easton ARS. Talbot County Community Center, 10028 Ocean Gateway; on W side of US Rte 50 at mile marker 64, approximately 3 miles N of the center of Easton. Eastern Shore Hamfest and Computer Show, flea market, tailgating (open at 6 AM; $5 per space), electronics, vendors, handicapped accessible, free parking, refreshments. *TI:* 147.045 (156.7 Hz), 146.52. *Adm:* $5. Tables: $15 (includes admission). Tinsley Meekins Jr, K3RUQ, 5538 Mt Holly Rd, E New Market, MD 21631; 410-228-8888 or 410-770-3715; **k3ruq@arrl.net**; **www.k3emd.com/hamfest.htm**.

Massachusetts (Cambridge)—Apr 20. Nick Altenbernd, KA1MQX, 617-253-3776.

†Massachusetts (Framingham)—Mar 30. *Spr:* Framingham ARA. Walsh Middle School, Brook St; Rte 9 to Edgell Rd, go N 1.3 miles to Brook St, right onto Brook St, go approximately 1 mile to school on left, follow green signs. Flea market, VE sessions. *TI:* 147.15. *Adm:* $4. Tables: advance $10, door $15. Beverly Lees, N1LOO, 31 Ridgefield Dr, Framingham, MA 01701; 508-626-2012; **b-blees@juno.com**; **fleamarket.fara.org**.

†Michigan (Cadillac)—May 3, 8 AM to 1 PM. *Spr:* Wexaukee ARC. Cadillac Jr High School, Chestnut St; US 131 to Exit 177, Mitchell St to Pine St, turn W, continue ½ mile to School. Swap and Shop, commercial vendors, various meetings, VE sessions, QCWA Luncheon. *TI:* 146.98. *Adm:* $5. Tables: $8. Brian Polk, KC8TXT, 13826 Serenity Dr, Marion, MI 49665; 231-743-6860; **bandb@netonecom.net**; **members.fortunecity.com/wexaukee/**.

†Minnesota (Faribault)—Apr 19. *Spr:* AR Emergency Response Team. Moose Lodge, 1810 4th St NW; take 35 W (either N or W), go S to either Exit 55, 56 or 59. *TI:* 146.79. *Adm:* $5. Tables: $5; commercial vendors $15. Larry Schmidtke, NØZXH, 851 Faribault Rd, Apt 315, Faribault, MN 55021-6661; 507-331-5582; **lws@cvtel.net**.

†Missouri (Kansas City)—Apr 19, 8 AM to 2 PM. *Spr:* Ararat Shrine ARC. Ararat Shrine Temple, 5100 Ararat Dr; take I-70, turn S on I-435, turn right onto Eastwood Tfwy, go N on Ararat Dr. Commercial vendors, forums, VE sessions, free parking. *TI:* 145.13. *Adm:* advance 3 for $5, door $3 each. Tables: $15. Ray Pautz, NØRP, 13 SE 125th Rd, Warrensburg, MO 64093; 660-747-5002; **rpautz@charter.net**; **www.homestead.com/dowdy/hambash2000.html**.

Missouri (Lebanon)—May 2-3, Midwest Division Convention. See "Coming Conventions."

New Jersey (Trenton)—Apr 25-27, SETI Convention. See "Coming Conventions."

†Nevada (Reno)—May 10, 7 AM to 1 PM. *Spr:* Reno Area Metro Simplex ARC. Salvation Army Headquarters Parking Lot, 1931 Sutro St; Freeway I-80 (Reno), turn off on Wells Ave, go N approximately 1 mile to the corner of Oddie and Sutro (N corner). Swapfest, VE sessions (11 AM; Don Freeman, W7FD, 775-851-1176; **donald_freeman@sbcglobal.net**), static display, emergency vehicles, refreshments. *TI:* 147.06 (123 Hz). *Adm:* Free. Tables: Bring your own. Gary Grant, K7VY, 11040 Broken Hill Rd, Reno, NV 89511; 775-851-3716; **k7vy@netzero.net**; **www.nvrams.org/**.

†New Jersey (West Orange)—Apr 26, 8 AM to 1 PM. *Spr:* Roseland ARC (IRAC). West Orange Senior High School, 600 Pleasant Valley Way; from N and S take Garden State Parkway to I-280, Exit 7; turn right, 2 lights to High School on right. Commercial vendors, VE sessions, free parking, refreshments. *TI:* 146.415 + 1 MHz (85.4 Hz), 447.875 (156.7 Hz). *Adm:* $5. Tables: advance $15 (first table), $12 (each additional table); door $20 (first table), $15 (each additional table). Harvey Moskowitz, W2YWC, 7 Burlington Rd, Livingston, NJ 07039; 973-994-0637; **harvmosk@aol.com**; **www.qsl.net/k2gq**.

†New Mexico (Las Cruces)—Apr 27. *Spr:* Mesilla Valley RC. Mesilla Valley RC Clubhouse, Wilt and Jefferson Sts; Hwy 70 to Wilt St, go 5 blocks S to Jefferson. Meal at noon. *TI:* 146.64 (100 Hz). *Adm:* Free. Karl Larsen, K5DI, Box 74, Mesilla Park, NM 88047; 505-524-3303; **k5di@arrl.net**.

†New York (Newark)—Apr 12, 7 AM. *Spr:* Drumlins ARC. Marbletown Firehall, Silver Hill Rd; from Rte 31 go S on Rte 88 for 1 mile to Silver Hill Rd, turn left, go 1 mile to hamfest. Flea market, VE sessions (held at the State EMO, Rte 31). *TI:* 146.745. *Adm:* $5. Tables: $3. Irv Walter, WA2SOK, 2881 Macedon Ctr Rd, Lot 57, Palmyra, NY 14522; 315-597-2192; **wa2sok@rochester.rr.com**; **www.drumlinsarc.com**.

†New York (Owego)—May 3, 8 AM to 2 PM. *Spr:* Binghamton ARA. Tioga County's Marvin Park Fairgrounds, Rte 17C; 1 mile W of Owego. Flea market, vendors, tailgating ($2 per spot), VE sessions, refreshments. *TI:* 146.76. *Adm:* $5. Tables: $10 (indoor table). Brian Adee, K2DLB, 1060 Bunn Hill Rd, Vestal, NY 13850; 607-624-4153; **k2dlb@sysmatrix.net**; **norton-gw.me.binghamton.edu/bara/**.

†New York (Poughkeepsie)—Apr 27. *Spr:* Mt. Beacon ARC. Tymor Park, Tymor Park Rd, Unionvale; from the intersection of Rtes 55 and 21 (located 2.3 miles E of the intersection between Rtes 55 and 82) turn N onto Rte 21, look for hamfest signs. VE sessions, refreshments. *TI:* 146.97 (100 Hz), 146.895 (100 Hz). *Adm:* $5, spouses and kids free. Tables: $10. Ken Akasofu, KL7JCQ, 8C Hudson Harbor Dr, Poughkeepsie, NY 12601; 845-485-9617; **kl7jcq@arrl.net**; **www.qsl.net/mbarc**.

†North Carolina (Morganton)—Apr 19, 8 AM to 4 PM. *Spr:* McDowell ARA. Burke County Fairgrounds, Bost Rd, Hwy 181 N; from I-40 take Exit 100, proceed N on Jamestown Rd for 1.5 miles crossing US Hwy 70, proceed 1.3 miles (road name changes to Independence Blvd) to NC Hwy 181, turn left on Hwy 181, turn right on Bost Rd at 1st traffic light, Fairgrounds are ¼ mile on left. Catawba Valley Hamfest and Computer Fair, flea market, tailgating (opens at 7 AM; free with paid admission), dealers, special guest Riley Hollingsworth, handicapped accessible, refreshments. *TI:* 147.15. *Adm:* advance $4, door $5 (Don Beam, KK4NI, 828-652-3102; **dbeam@wnclink.com**). Tables: $10. Larry Withrow, AF4HX, 2583 Nix Creed Rd, Marion, NC 28752; 828-652-4195; **af4hx@worldnet.att.net**; **cvhamfest.org**.

†North Carolina (Raleigh)—Apr 13, 8 AM to 4 PM. *Spr:* Raleigh ARS. North Carolina State Fairgrounds Jim Graham Building, 1025 Blue Ridge Blvd; I-440, Hillsborough St Exit, go W. Huge electronics flea market, dealer booths, vendors, forums (ARRL, ARES/NTS, MARS, QRP, PSK-31), VE sessions, hospitality supper (Saturday eve, 7-8 PM), QSL card checking, contests (homebrew, QLF, QBH), RV parking ($15 per night), free parking. *TI:* 146.64. *Adm:* advance $5, door $6, under 17 free when accompanied by paying adult. Tables: $14 each in advance (by Apr 5), $15 each after Apr 5. Chuck Littlewood, K4HF, 2005 Quail Ridge Rd, Raleigh, NC 27609; 919-872-6555; **k4hf@arrl.net**; **www.rars.org/hamfest**.

†Ohio (Athens)—Apr 27; set up 7 AM; public 8 AM to 1 PM. *Spr:* Athens County ARA. Athens Community Recreation Center, 733 E State St; US 33 or 50, Exit E State St, hamfest at 2nd light. Free outdoor paved flea market (with paid admission), indoor exhibits, computer equipment, handicapped accessible, acres of parking, refreshments. *TI:* 145.15. *Adm:* $5, nonham spouses free. Tables: $8. Drew McDaniel, W8MHV, 61 Briarwood Dr, Athens, OH 45701; 740-592-2106; **mcdanied@ohiou.edu**; **www.seorf.ohiou.edu/~xx150/**.

†Pennsylvania (Fredericksburg)—May 10. *Spr:* Appalachian AR Group. Fredericksburg Fireman's Park, Rte 343; from Rte 22 turn S on Rte 343, go 1.3 miles to site on left. Tailgating ($5 per space). *TI:* 146.64. *Adm:* $5. Tables: $15 (plus admission; with electricity). Neil Shatto, N3JQM, 1452 Mumma Rd, Harrisburg, PA 17112; 717-469-7357; **n3jqm@juno.com**; **www.aa3rg.org**.

†Pennsylvania (Wrightstown/Bucks County)—May 4, 6 AM to 1 PM. *Spr:* Warminster ARC. Middletown Grange Fairgrounds, Penns Park Rd; vicinity of Rtes 413 and 232, 25 miles N of Philadelphia. Unlimited tailgating ($10), 60 indoor spaces with electricity, VE sessions, equipment check-out table, free parking, refreshments. *TI:* 147.09 (131.8 Hz), 146.52. *Adm:* $5. Tables: $15. Mark Hinkel, WA3QVU, 1573 Fitzwatertown Rd, Willow Grove, PA 19090; 215-659-4449; **hamfest@k3dn.org**; **www.k3dn.org**.

†Pennsylvania (York)—Apr 13, 6 AM to 3 PM. *Spr:* York Hamfest Foundation. 4-H Club Center, 771 Stoverstown Rd; at US 30 and SR 116 intersection proceed toward Hanover for 1.5 miles to Stoverstown Rd, event is 0.5 mile on left. Seminars, VE sessions, indoor/outdoor tailgating, Amateur Radio displays and exhibits. *TI:* 147.33. *Adm:* $5. Tables: advance $15, door $20. John Shaffer, W3SST, 2596 Church Rd, York, PA 17404; 717-764-8193; **w3sst@yorkhamfest.org**; **www.yorkhamfest.org**.

Rhode Island (Forestdale/North Smithfield)—May 10. Rick Fairweather, K1KYI, 401-725-7507 (7-8 PM only).

South Carolina (Anderson)—Apr 26. Tom Kozel, W4JKC, 864-224-2834.

South Carolina (Greenville)—May 3, South Carolina State Convention. See "Coming Conventions."

†Tennessee (Mountain City)—May 10. *Spr:* Johnson County ARC. National Guard Armory, S Shady St; Johnson City Hwy 321 and 67 to Mountain City, Boone Hwy 421 to Mountain City, Abington Hwy 58 to Hwy 91 to Mountain City. Swapfest, VE sessions. *TI:* 146.61. *Adm:* $1. Tables: $2. Frank Liberstein, W4FRL, Box 155, Trade, TN 37691; 423-727-0723; **quailrun@preferred.com**; **n4nna.net/w4mct**.

Texas (Abilene)—May 3-4, West Texas Section Convention. See "Coming Conventions."

†Texas (Belton/Temple)—Apr 5, 7 AM to 3 PM. *Spr:* Temple ARC. Bell County Expo Center, 301 W Loop 121; from I-35 take Exit 292, go W on Loop 121 for approximately ¼ mile to the Expo Center on left. Swapfest, commercial vendors, dealers, new equipment, used gear, accessories, huge tailgate area, VE sessions (1 PM), handicapped accessible. *TI:* 146.82 (123 Hz), 444.7 (123 Hz). *Adm:* $1. Tables: $25. Mike LeFan, WA5EQQ, Box 4511, Temple, TX 76505; 254-773-3590; **expo@tarc.org**; **www.tarc.org**.

†Virginia (Chesapeake)—Apr 12, 8 AM to 3 PM. *Spr:* Chesapeake AR Service. Hickory Ruritan Club, 2746 S Battlefield Blvd (Hwy 168 S); from I-64 take Exit 291B to Rte 168 S toward Nags Head (this is the 168 Bypass), take 2nd Hillcrest Parkway Exit ramp, follow Hillcrest to 168 Business S, Club is approximately 2 miles on right. Amateur Radio and Electronics Flea Market, tailgating, refreshments. *TI:* 146.82. *Adm:* $6. Tables: $6. Ruth Bigio, KB4LIF, 1653 Tallwood St, Norfolk, VA 23518; 757-583-1703; **ruthis23505@yahoo.com**; **www.qsl.net/cars**.

†Washington (Stanwood)—May 10, 9 AM. *Spr:* Stanwood-Camano ARC. Stanwood Middle School, 9405 271st St NW; N or S on I-5 to Exit 212, W on SR 532, turn right at 3rd stoplight, turn left on 271st St, proceed to School on right. Flea market, electronics, computers, VE sessions, refreshments. *TI:* 145.19. *Adm:* $5. Tables: advance $15 (before Apr 30), door or after Apr 30 $20. John McCann, N7MZ, Box 941, Stanwood, WA 98292; 360-629-2921; or Vic Henry, N7KRE, 360-387-7005; **huppert@whidbey.net**.

†Washington (Yakima)—Apr 5, 9 AM to 4 PM. *Spr:* Yakima ARC. Masonic Center, 501 N Naches Ave; Exit 33 off I-82 to Yakima Ave City Center, turn right onto Naches Ave and proceed to site. Flea market, VE sessions, EWA Section ARES/RACES meeting, self-contained RV parking, breakfast (7-10 AM), lunch (11 AM-1 PM), handicapped accessible. *TI:* 146.66 (123 Hz). *Adm:* $5. Tables: $10 (plus admission). Ken Kester, K7IJB, 11808 Bristol Ct, Yakima, WA 98908; 509-965-5967; **k7ijb@arrl.net**; **w7aq.ykm.com**.

†West Virginia (Ripley)—May 4; set up 8-9 AM; public 9 AM to 2 PM. *Spr:* Jackson County ARC. Ripley Middle School, School Rd off Klyondyke Rd; from Exit 33 off ramp from Charleston turn right, go to 3rd stop light, turn right on Klyondyke Rd to first left at Ripley Middle School. Flea market, VE sessions (registration 8:30 AM, testing 9 AM), refreshments. *TI:* 146.67. *Adm:* $4. Tables: $4. Roy Moore, KB8ZSG, 25 Daniel Run Rd, Spencer, WV 25276; 304-927-4412; **kb8zsg@citynet.net; 132.235.1.249/xx150/jcarcfest.html**.

†Wisconsin (Stoughton/Madison)—Apr 13; set up Saturday evening; public Sunday 8 AM. *Spr:* Madison Area Repeater Assn. Mandt Community Center, Stoughton Jr Fairgrounds, S 4th St; enter Stoughton on Hwy 51 (Main St), turn S on 4th St, cross bridge, Mandt Park is on left. Dealers, VE sessions, free parking. *TI:* 147.15 (123 Hz). *Adm:* advance $4, door $5. Tables: $14 to $18. Paul Toussaint, N9VWH, c/o MARA Swapfest, Box 8890, Madison, WI 53708-8890; 608-455-3005 or 608-245-8890; **n9vwh@arrl.net**; **www.qsl.net/mara/**.

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CONTEST CORRAL

Feedback

In the 2002 September VHF QSO Party, the winner of the Local Category club gavel should have read the **Delaware Valley VHF Society.**

W1AW Qualifying Runs are 9 AM EST Thursday, Apr 3 (35-10 WPM), and 4 PM EDT Tuesday, Apr 22. The K6YR West Coast Qualifying Run will be at 9 PM PDT Wednesday, Apr 9 (10-40 WPM). Check the W1AW Schedule for details.

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, HP—High Power >150 W, LP—Low Power >5 W and <150 W, QRP is <5 W

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 to publication. In order to publicize the maximum number of contests, readers will be referred to an earlier issue of *QST* if the rules have been published within the past year.

April/May

VHF Spring Sprints—CW/SSB—sponsored by the Eastern Tennessee DX Association as follows: 50 MHz—2300Z May 10—0300Z May 11; 144 MHz 7-11 PM local time, 4 Apr; 222 MHz—7-11 PM Apr 12; 432 MHz—7-11 PM Apr 19; Microwave—902 MHz and higher—6 AM-1 PM May 3. Fixed and Rover categories. Exchange is Grid Square only, count 1 pt per QSO. Score is QSO Points × Grid Squares, score each sprint separately. Rovers and Microwave sprints total all points and all grids worked from each grid. For more information—**www.etdxa.org/vhf.htm**. Logs must be e-mailed or postmarked within four weeks of the contest to **springsprints@etdxa.org** or Jeff J. Baker, 8218 Foxworth Tr, Powell, TN 37849.

April 5-6

Missouri QSO Party—CW/SSB—sponsored by the Boeing Employees Amateur Radio Society of St Louis (BEARS) from 1800Z Apr 5-0500Z Apr 6, and 1800Z-2400Z Apr 6. Frequencies (MHz): CW—40 kHz from band edge and 1.810; Phone—1.850, 3.980, 7.280, 14.280, 21.380, 28.310, work MO stations once per band and mode. Categories: Fixed, MO Mobile, MO Rover. Exchange: RST, serial number, and MO county or SPC. QSO Points: CW—2 pts, Phone 1 pt. Score: MO stations—QSO Points × States + Provinces + MO counties + 1 for DX; non-MO stations—QSO Points × MO counties. Multipliers count only once. QSOs with WØMA count additional 100 QSO points. For more information—**www.qsl.net/w0ma.** Logs due 30 days after the contest to **n0aj@arrl.net** or James L. Kinser NØAJ, 2147 Encino Dr, Florissant, MO 63031-7627.

Montana QSO Party—Phone/CW/Digital—sponsored by the Flathead Valley Amateur Radio Club from 2300Z Apr 5-2300Z Apr 6. Frequencies: 160 meters-70 cm, no categories, repeaters and IRLP permitted. Exchange: RST and SPC or MT county. If a station changes counties, it can be worked again. Score: QSOs × SPC + MT counties (counted only once). Logs due May 10 to **k7lyy@arrl.net** or **rosscons@digisys.net** or FVARC, 117 Rainbow Dr, Kalispell, MT 59901.

MARAC County Hunters Contest—SSB—sponsored by The Mobile Amateur Radio Awards Club from 0000Z Apr 5-2400Z Apr 6. Frequencies (MHz): 3.880, 7.240, 14.275, 21.340, 28.340, work fixed stations once/band and mobiles once for each county and band. Exchange: RST and county or SPC. County line QSOs count as one QSO but separate multipliers. QSO Points: Fixed stations in NA—1 point, Mobile/Portable—15 points, DX—5 pts, one station must be in a US county. Score is QSO Points × US counties (count only once). Mobile/Portables sum score from each state. For more information—**www.countyhunter.com**. Logs must be postmarked by May 10 to (US logs) Duane Traver, WV2B, 99 Oregon Hill Rd, Lisle, NY 13797-1002 or (non US logs) Scott Nichols, VE1OP, 387 Rudderham Rd, Point Edward, NS B2A 4V6, Canada.

EA RTTY Contest—sponsored by the Unión de Radioaficianados Españoles (URE) from 1600Z Apr 5-1600Z Apr 6. Frequencies: 80-10 meters, according to IARU band plan. Categories: SOAB, SOSB, MOAB, SWL. Exchange: RST and serial number or EA Province. QSO Points: 10-20 meters: own continent—1 pt, diff cont—2 pts.; 40 and 80 meters: own cont—3 pts, diff cont—6 pts. Score is QSO points × (DXCC entities + EA provinces + W/VE/JA/VK call areas) counted once per band. If operating portable, sign /call area. Logs must be e-mailed as ASCII text or Cabrillo format or postmarked by May 10 to **ea1mv@retemail.es** or Antonio Alcolado EA1MV, PO Box 240, E-09400 Aranda de Duero, (Burgos) Spain.

47th Annual QCWA QSO Party—CW/Digital/SSB—sponsored by the Quarter Century Wireless Association from 1900Z Apr 5-1900Z Apr 6. Frequencies (MHz): CW—1.910, 3.540, 7.035, 14.040, 21.050, 28.050; Phone—1.810, 3.890, 7.244, 14.262, 21.365, 28.325 plus all VHF/UHF bands, no crossband or repeater QSOs. 15 QSOs with each station maximum and only one QSO with stations in home QCWA chapter. Exchange: Last two digits of year licensed and QCWA chapter or SPC. QSO Points: Phone—1 pt, CW/Digital—2 pts. Score: QSO Points × QCWA chapters + SPC counted once per band. W2MM counts as a 3-point multiplier on each band. For more information—**qcwa.org/2003-qso-party-rules.htm**. Send logs to WØHXL, Dick Newsome, 2924 North 48th St, Omaha NE 68104-3726.

SP DX Contest—CW/SSB—sponsored by the PZK Polish Amateur Radio Union and the SP DX Club from 1500Z Apr 5-1500Z Apr 6. Frequencies: 160-10 meters, according to the IARU Region I band plan, no crossmode QSOs. Categories: SOAB and SOSB (CW, SSB, or Mixed), MS Mixed (incl. nets, packet, Internet), SWL Mixed. Exchange: RS(T) and serial number or Polish province letter abbreviation. QSO Points: 3 pts for each Polish contact, Polish stations count 3 pts outside EU, 1 pt for EU (no pts for SP-SP QSOs). Score is QSO points × provinces (counted once per band and mode) or DXCC entities (for Polish stations). For more information—**www.qsl.net/la0fx** or **sp6cik@op.onet.pl**. Logs must be e-mailed (Cabrillo format preferred) or postmarked by 30 April to **spdxc-logs@pzk.org.pl** or to Polski Zwiazek Krotkofalowcow, SPDX Contest Committee, PO Box 320, 00-950 Warszawa, Poland.

April 9-11

DX YL to North American YL Contest—CW—sponsored by YLRL from 1400Z Apr 9-0200 Z Apr 11 (Phone—April 16-18). Same rules as YL-OM Contest (see Feb *QST*, p 103). For more information—**www.qsl.net/ylrl/ylcontests.html#DX%20YL%20to%20NA%20YL.**

April 12-13

QRP ARCI Spring QSO Party—CW—sponsored by the QRP ARCI, from 1200Z Apr 12-2400Z Apr 13. (Same rules as Fall QSO Party; see Oct *QST*, p 90 or **personal.palouse.net/rfoltz/arci/arcitst.htm**).

EU Spring Sprints—SSB: Apr 12—managed by G4BUO, CW: Apr 19—managed by I2UIY, from 1500Z-1859Z. Frequencies (MHz): SSB—14.250, 7.050, 3.730, CW—14.040, 7.025, 3.550. SO category only, EU stations work everyone, non-EU stations work EU only. Exchange: your call, the other station's call, serial number starting at 001, your name—both stations must repeat both call signs. If any station initiates a call (CQ, QRZ?, etc) he is permitted to work only one station on the same frequency and must move at least 2 kHz before he may call another station or before he may call CQ again. Score is the total QSOs (1 point/QSO). For more information or contest software—**www.qsl.net/eusprint**. Logs must be e-mailed in ASCII format or postmarked within 15 days of the contest to **eusprint@kkn.net** or to (SSB) Dave Lawley, G4BUO, Carramore, Coldharbour Rd, Penshurst, Kent TN11 8EX, England, UK, or (CW) Paolo Cortese, I2UIY, PO Box 14, 27043 Broni (PV), Italy.

Japan International DX Contest (JIDX)—CW—sponsored by *Five-Nine* Magazine from 0700Z Apr 12-1300Z Apr 13 (Phone—Nov 8/9). Frequencies: 80-10 meters. Categories: SOAB and SOSB (-HP >100 W, -LP), MO, Maritime Mobile. Exchange: RST + JA prefecture number or CQ Zone. QSO Points: 80 or 10 meters—2 pts, otherwise 1 pt. Score: QSO Points × JA prefectures + JD1 provinces (JA stations use DXCC entities). For more information—**je1cka.jzap.com/jidx**. Logs due May 31 to **jidx-cw@ne.nal.go.jp** or JIDX "PHONE/CW" Contest, c/o *Five-Nine* Magazine, PO Box 59, Kamata, Tokyo, 144 Japan.

Georgia QSO Party—CW/SSB—sponsored by SECC and SEDXC from 1800Z Apr 12-0359Z Apr 13 and 1400Z Apr 13-2359Z Apr 13, no time limit. Frequencies: 80-10 meters. Categories: SOAB, MS, MM, Rover, Novice/Tech, HP, LP (<150 W), or QRP (<5 W). Rovers must activate at least six GA counties. Mobiles and portables must move the complete station including antennas at least 100 yards to change counties—no county line operations. Exchange RST and GA county or SPC. QSO Points: SSB—1 pt, CW—2 pts. Score: QSO Points×GA counties (GA station use states and provinces) counted only once per band and mode. For more information—**gqp.contesting.com**. Logs due May 17 to **jshort@mindspring.com** or Jeffrey Short, KD3UC, 5106 Cypress Ct, Alpharetta, GA 30005.

YU DX Contest—CW/SSB—sponsored by SRJ (Amateur Radio Union of Yugoslavia) and YUDXC (YU DX Club) from 1200Z Apr 12-1200Z Apr 13. Frequencies: 160-10 meters. Categories: SO-CW, SO-SSB, SO-Mixed, MS. Exchange: RST + ITU Zone. QSO Points: with own zone—1 pt, own continent—3 pts, diff. cont—5 pts. Score: QSO points×ITU zones + YU prefixes (counted once per band). For more information—**solair.eunet.yu/~yu1ab/awards/rules.htm**. Logs due 30 days after the contest to **yu0srj@EUnet.yu** or Savez radio-amatera Jugoslavije, YU DX Contest, PO Box 48, 11001 Beograd, Yugoslavia.

European EME Contest—sponsored by *DUBUS* Magazine from 0000Z Apr 12-2400Z Apr 13. Frequencies: 144 MHz, 1.3 GHz, 10 GHz. Categories: QRP and QRO (determined by EIRP), Pro (non-ham antennas). Exchange: both call signs, TMO or RST, and R. QSO Points: random QSOs—100 pts, scheduled QSOs—10 pts, any QSO on 10 GHz—100 pts. Score: QSO points×DXCC entities + states or provinces in W/VE/VK. Only random QSOs can count for multipliers. For more information—**g3sek@ifwtech.co.uk**. Logs due 30 days after the contest to **f6hye@ref-union.org** or Patrick Magnin, F6HYE, Marcorens, F-74140 Ballaison, France.

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

April 16-18

DX YL to North American YL Contest—Phone (see Apr 11-13).

April 19-27

Michigan QSO Party—CW/SSB—sponsored by the Mad River Radio Club, from 1600Z Apr 19-0400Z Apr 20, no time limit. Bands: 80-10 meters. Frequencies: CW—45 kHz from band edge, Phone (MHz)—3.850, 7.225, 14.250, 21.300, 28.450. Work stations once per band and mode, MI-to-MI QSOs allowed, mobiles and portables can be worked from each county. Categories: SO, MO, and Mobile. Exchange: serial number and MI county or SPC. QSO Points: CW—2 pts, Phone—1 pt. Multipliers for MI stations are states, provinces and MI counties; multipliers for non-MI stations are MI counties. Multipliers count once per mode. Score: QSO points × multipliers. For more information—**www.miqp.org**. Logs must be e-mailed or postmarked with 30 days of the contest to **mqp@contesting.com** or to Mad River Radio Club, c/o Dave Pruett, 2727 Harris Rd, Ypsilanti, MI 48198.

GACW DX Contest "Mr Samuel Morse Party"—CW—sponsored by the Grupo Argentino de Radiotelegrafia (GACW) from 1200Z Apr 19-1200Z Apr 20. Frequencies: 80-10 meters, everyone works everyone format. Categories: SO-SB and SO-AB (HP, LP and QRP), MS and MM categories, no time limit. MS category subject to 10-min band change rule—see Web site. Exchange: RST and CQ Zone. QSO Points: same continent—1 point, diff cont—3 pts, DX-to-South America add 2 points, own country—0 pts (but counts for zone and country credit). Score is QSO points × DXCC, WAE and GACW countries + CQ Zones from each band. For information and software—**gacw.no-ip.org.** Logs due May 30 to **uranito@infovia.com.ar** (ASCII text) or GACW DX Contest, PO Box 9, B1875ZAA Wilde, Buenos Aires, Argentina.

TARA PSK31 Rumble—sponsored by Troy ARA, 0000-2400Z Apr 19. Frequencies: 80-6 meters, work stations once per band. Categories: Normal (100 W), Great (20 W), Super (5 W), Novice, SWL. Exchange: Name and SPC. Score: QSOs × (W + VE + JA + VK call areas + 1 point per entity). Multipliers count once per band. For more information—**www.qsl.net/wm2u/rumble.html** or **www.n2ty.org**. Logs due May 17 via the contest score entry form at **www.qsl.net/wm2u/score.html** or e-mail to **wm2u@n2ty.org**.

Holyland DX Contest—CW/SSB—sponsored by the Israel Amateur Radio Club from 0000Z-2359Z Apr 19. Frequencies: 160-10 meters according to IARU Region I band plan, work Israeli stations once per band and mode. Categories: SO (Mixed Mode, – CW, SSB), MS, MM, SWL. Exchange RST and serial number or Israel district. QSO Points: 1.8 or 3.5 MHz—2 pts; other bands 1 pt. Score: QSO Points × districts counted once per band. For more information—**www.iarc.org**. Logs must be emailed or postmarked by May 31 to **4Z4KX@iarc.org** or to Contest Manager 4Z4KX, Israel Amateur Radio Club, Box 17600, Tel Aviv, 61176, Israel.

Ontario QSO Party—CW/Phone—sponsored by the Ontario DX Association from 1800Z Apr 19-1800Z Apr 20. Frequencies (MHz): SSB—1.870, 3.735, 3.860, 7.070, 7.260, 14.130, 14.265, 21.260, 28.360; CW—30 kHz above band edges; VHF-SSB: 50.130, 144.205, 432.105; VHF-FM 52.540, 146.550, 446.1, no repeater QSOs. Categories: SOAB and SOSB (HP, LP <150 W HF and 50 W VHF, QRP <5 W) in CW, Phone and Mixed Modes, SO VHF FM QRP (< 5 W), MS, SWL, Mobile, Rover. Exchange: RS(T) and SPC or Ontario QTH. QSO Points: HF SSB—1 pt, HF CW—2 pts, VHF—5 pts (work stations once per VHF band), 10 bonus pts for each QSO with VE3ODX and VA3RAC. Score is QSO Points × Ontario QTHs (non-VE3 stations) or SPC + Ontario QTHs (mults count once per band). For more information—**www.odxa.on.ca/oqphome.html**. Logs due May 31 to **ve3sre@rac.ca** or Ontario QSO Party, Ontario DX Association, PO Box 161, Station "A," Willowdale, ON M2N 5S8, Canada.

EU Spring Sprint—CW—see Apr 12-13.

Low Power Spring Sprint—CW—sponsored by the Slovak Amateur Radio Association (SARA) from 1400Z-2000Z Apr 21. Frequencies: 160-10 meters. Categories: A (1 W), C (5 W), Q (25 W) X(50 W), Y (100 W), SOSB, SO-2 or 3 bands, SOAB. Exchange: RST, Grid Square and Power Category. (RST-only OK from non-contest stations.) QSO Points: with own continent—3 pts, diff cont—9 pts, OM station—18 pts. Score: QSO points × grid squares + WPX prefixes (multipliers counted once per band). Logs due 30 days after the contest to **om3kfv@zoznam.sk** or Radioclub OM3KFV, PO Box 129, 036 01 Martin 1, Slovakia.

Spring Lites QSO Party—all modes—sponsored by the Amateur Radio Lighthouse Society from 0001Z Apr 19 through 2359Z Apr 27. Frequencies (MHz): CW—1.830, 3.530, 7.030, 14.030, 18.070, 21.030, 28.030; SSB—1.970, 3.970, 7.270, 14.270, 18.145, 21.370, 28.370. Exchange: ARLHS member/lighthouse number or year first licensed, name, and SPC. Score: 1 pt/QSO except 2 pts for ARLHS member, 3 pts for ARLHS lighthouse. For more information—**arlhs.com/spring2003.html**. Logs must be mailed by May 15 to Dave Ruch, NFØJ, PO Box 20696, Bloomington, MN 55420-0696.

April 26-27

Florida QSO Party—sponsored by the Florida Contest Group from 1600Z Apr 26-0159Z Apr 27 and 1200Z-2159Z April 27, no time limit, work FL stations. Frequencies (MHz): CW—35 kHz from band edges (Novices/Technicians—10 kHz from segment edge), Phone—7.260, 14.260, 21.335 and 28.485, no 160 or 80 meters, VHF/UHF. Categories: SO, MS, MM (one signal per band), Mobile, Novice/Technician, School Club, SWL all categories can enter as HP/LP(150 W) / QRP (5 W) and Mixed Mode/CW/SSB (except MM and SWL). Exchange: RST and FL county or SPC. QSO Points: CW—2 pts., SSB—1 pt. Score: FL stations—QSO points × SPC (W/VE/KH6/KL7 do not count as DXCC entities) × power multiplier; non-FL stations—QSO points × FL counties × power multiplier. All multipliers count once per mode. Power multiplier—HP ×1, LP ×2, QRP ×3. For more information—**www.qsl.net/fqp**. Logs due May 27 to **FLQSOParty@aol.com** as ASCII text or in Cabrillo format or to Florida QSO Party, c/o Ron Wetjen, WD4AHZ, 5362 Castleman Dr, Sarasota, FL 34232.

Nebraska QSO Party—CW/SSB—sponsored by the Heartland DX Association 1700Z Apr 26-1700Z Apr 27. Frequencies (MHz): 160-2 meters; CW—1.805 and 35 kHz above band edge; Phone—1.915, 3.865, 7.265, 14.265, 21.365, 28.465, 146.460; Novices/Technicians—10 kHz above band edge and 28.465. Categories: SO, MS, Mobile. Work stations once per band/mode and NE mobile stations can be worked again in each county. County lines count as one QSO. Exchange: RST and NE county or SPC. QSO Points: CW—2 pts, Phone—1 pt. Score is QSO Points × SPC for NE stations or NE counties (multipliers count once only) × Power Multiplier (QRP ×3, LP ×2, HP ×1). For more information—**www.qsl.net/hdxa**. Logs must be e-mailed or postmarked by May 31 to **hdxa@qsl.net** as ASCII text or to Nebraska QSO Party, PO Box 375, Elkhorn, NE 68022-0375.

Helvetia Contest—CW/SSB/Digital—sponsored by Union of Swiss Short Wave Amateurs (USKA) from 1300Z Apr 26-1300Z Apr 27. Frequencies: 160-10 meters. Categories: SO-Mixed, SO-QRP, SO-Digital, MO-Digital, MO-Mixed, SWL. Exchange: RST and serial number (Swiss stations add canton abbreviation). QSO Points: 3 pts/QSO. Score: QSO points × Swiss cantons (Swiss stations also count DXCC entities). For more information—**www.uska.ch/html/en/index_e.htm**. Logs due 31 days after the contest to **contest@uska.ch** or to the USKA HF Traffic Manager, Hermann Stein, HB9CRV, Brüelmatten 13, 4410 Liestal BL, Switzerland. QST

NEW PRODUCTS

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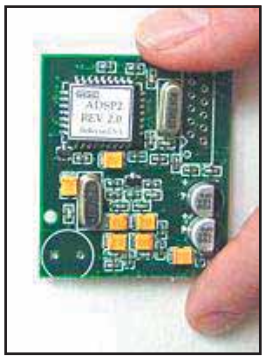

instructions for use with various transceivers. The board can be installed by the user, by a dealer or by the SGC factory service center.

Price: $180 (plus a $49.95 installation fee for upgrading SG-2020 transceivers at the factory). SG-2020 users can upgrade for $120 until June 30. All SG-2020 upgrades will be done at the factory. For more information, point your Web browser to **www.sgcworld.com** or tel 800-259-7331.

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◊ Thanks to its built-in digital signal processor, Gap Antenna's new "Hear It Speaker" is said to offer improved audio clarity and noise reduction in a compact communications speaker. Usable with SSB, AM and FM signals, the unit uses active, adaptive DSP technology to remove unwanted background noise from your radio's audio output, which improves clarity and intelligibility—even if your rig already employs on-board DSP filtering.

Features include eight noise-reduction settings (typically up to 20 dB), an input sensitivity control, a two-color activation/status LED, an adjustable mounting bracket for easy installation, a 6-foot audio input cable, and more. The speaker weighs less than a pound, operates on 12 to 28 V dc and measures about 3×5×2 inches HWD.

For pricing and product details, contact Gap Antenna Products at 99 N Willow St, Fellsmere, FL 32948; tel 772-571-9922, fax 772-571-9988, **www.gapantenna.com**.

SPECIAL EVENTS

Irving, TX: Charles Caffey, K5I. 1300Z **Apr 4**-2200Z **Apr 5**. Irving, TX, Centennial Celebration. 28.370 21.350 14.260 7.250. QSL. Charles Caffey, N5CRC, 824 S Delaware, Irving, TX 75060.

Waterville, ME: Waterville Area Wireless Association, WA1WA. 1500Z-1700Z **Apr 5**. Kids on the air. 14.280. QSL. Waterville Area Wireless Association, R4 Box 8043 Matheson Ave, Winslow, ME 04901.

Marathon, NY: Skyline Amateur Radio Club, K2IWR. 1400Z **Apr 5**-2100Z **Apr 6**. The Long Tradition of Maple Syrup Production In New York. 14.267. QSL. Skyline ARC, PO Box 5241, Cortland, NY 13045.

Tulsa, OK: Tulsa Health Department Amateur Radio Club, K5THD. 0000Z-2359Z **Apr 7**. World Health Day 2003. 28.365 21.365 14.265 7.265. QSL. Tulsa Health Department Amateur Radio Club, 5051 S 129th E Ave, Tulsa, OK 74134.

Indian Orchard, MA: Yankee Wireless Association, W1MGY. 1330Z **Apr 11**-0527Z **Apr 15**. Commemorating the 91st anniversary of the *Titanic* disaster, and 40 years of the *Titanic* Historical Society. 14.260 14.033 7.033 3.860. QSL. *Titanic* Historical Society QSL, PO Box 51053, 208 Main St, Indian Orchard, MA 01151-0053. **www.titanichistoricalsociety.org**.

Hawthorne, NJ: Bergen Amateur Radio Association, K2BAR. 1400Z-2200Z **Apr 12**. Hawthorne Schools CEL-EARTH-BRATION. 28.335 21.335 14.335 7.235 possible AO-40, 146.535 FM. Certificate. Fred Buchner, 202 Tenth Ave, Hawthorne, NJ 07506.

Reno, NV: Sierra Nevada Amateur Radio Society, W7TA. 1700Z-2400Z **Apr 12**. 35th Anniversary of the Sierra Nevada Amateur Radio Society. 21.361 7.261. QSL. SNARS, PO Box 7727, Reno, NV 89510-7727.

Marcus Hook Rear Range, DE: Amateur Radio Lighthouse Society, W3IYQ. 1400Z-2000Z **Apr 19**. ARLHS Spring Lights QSO Party. 14.270 SSB 14.035 CW. Certificate. John L. Sielke, 1353 Samuel Dr, Vineland, NJ 08360.

Hopkinton, MA: Southboro Rod & Gun ARC, W1SRG. 0000Z-2400Z **Apr 21**. Kilometer 1 Marathon (start of the Boston Marathon). 28.305 21.305 14.235 3.855. Certificate. Southboro Rod & Gun ARC, PO Box 1276, Westboro, MA 01581.

Norman, OK: South Canadian Amateur Radio Society, W5NOR. 1500Z-2300Z **Apr 26**. Commemorating the Land Run of 1889 that opened Oklahoma Territory. 28.389 21.389 14.289 7.289. QSL. SCARS, PO Box 720993, Norman, OK 73070.

Piscataway, NJ: Piscataway Amateur Radio Club, K2VOA. 0000Z-2400Z **Apr 26**. Former Voice of America relay station WBOU. 28.370 21.370 14.270 7.270. Certificate. Bill Toth, W2BT, 6 Rivercrest Dr, Piscataway, NJ 08854.

Farmville, NC: Brightleaf ARC, W4AMC. 1200-2400Z **Apr 26** and 1200-1800Z **Apr 27**. The 16th Annual Farmville Dogwood Festival. 28.440 21.340 14.240 7.240. QSL. Brightleaf Amateur Radio Club, PO Box 8387, Greenville, NC 27835.

Lexington, KY: Bluegrass BSA Council, AG4LB. 0000Z **Apr 26**-1800Z **Apr 27**. Xtreme Scouting. General SSB freq and PSK31, 10-80 m. QSL. Lou Berry, 160 W Tiverton Way, Lexington, KY 40503. For more information: **loulin@alltel.net**.

Jacksonville, TX: Cherokee County/Texas Amateur Radio Club, K5JVL. 1800Z **Apr 26**-1800Z **Apr 27**. 2nd Annual Drakes on the Lake. 21.375 14.275 7.275 3.875. Certificate. KC5DEF, PO Box 87, Gallatin, TX 75764.

Manitowoc, WI: USS *Cobia* Radio Club/ Mancorad Radio Club, N9BQV. 1400Z **Apr 26**-2200Z **Apr 27**. WWII USS *Cobia* AGSS-245 sub radio reactivation. 28.343 21.343 14.243 7.243. QSL. Fred Neuenfeldt, W6BSF, 4932 S 10th St, Manitowoc, WI 54220.

Marion, IN: Grant County ARC, W9EBN. 1700Z-2200Z **Apr 27**. McNatt United Methodist Church Ham Sundy Fellowhip Event. 7.255 14.255 28.410 146.79. Certificate. L. B. Nickerson, 517 N Hendricks Ave, Marion, IN 46952.

Wells County, IN: Grant County Amateur Radio Club, W9EBN. 1700Z-2200Z **Apr 27**. McNatt United Methodist Church Ham Sunday Fellowship Event. 146.79 28.410 14.228 7.228. Certificate. L. B. Nickerson, K9NQW, 517 N Hendricks Ave, Marion, IN 46952.

Mentor, OH: Lake County Amateur Radio Association, N8BC. 1400Z **Apr 28**-0200Z **May 11**. State of Ohio Bicentennial Celebration. 28.410 21.310 14.310 7.235. QSL. LCARA, PO Box 868, Painesville, OH 44077-0868.

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 **Jun** *QST* would have to be received by **Apr 1**. Submissions may be mailed (Attn: Maty Weinberg), faxed (860-594-0259) or e-mailed (**events@arrl.org**) to ARRL HQ. QST

Maty Weinberg, KB1EIB ♦ Special Events ♦ events@arrl.org

2003 IARU HF World Championships Announcement

Date: 1200 UTC July 12 - 1200 UTC July 13, 2003

How to participate: Amateurs across the globe work as many amateurs as possible on 160, 80, 40, 20, 15 and 10 meters. Single Operators may participate as Mixed Mode, CW-Only or Phone-Only. All Multioperator stations participate as Mixed Mode only. There is no power differentiation in any category.

What to say: Most stations will send a signal report and their ITU zone. If you use standard abbreviations and phonetics, you will find yourself being asked for fewer repeats. The ITU zone is different from the CQ Zones—so be careful. A list of ITU zones and call sign prefixes is found at **www.arrl.org/contests/announcements/prefixtable.html** and an ITU zone map is found at **www.iaru.org/ituzonesc.gif**.

Special Exchange Abbreviations: Stations designated as IARU society headquarters will be sending a signal report and their society abbreviations (ARRL, IARU, RSGB, etc). Stations representing members of the IARU Administrative Council and the three IARU regional executive committees will send a signal report and either AC, R1, R2 or R3.

Quirks: Stations may be worked on both CW and phone for QSO credit on each band. However, multipliers only count once per band, not once per band and mode. For example, if you work the IARU HQ multiplier NU1AW on 20-meter Phone and 20-meter CW, it counts as only one multiplier on the 20-meter band.

Best reason to participate: Since it is only a 24-hour contest, you can have a fun time contesting and still enjoy time with friends and family during the weekend. With many ITU member societies making a special effort to be on the air, it is relatively simple to earn the IARU "Worked All Continents" or 5-Band WAC in one weekend. Experience what summer DX propagation is really like with activity worldwide.

Relative challenge: DX contesting in the Northern Hemisphere in the summer can be challenging, but you will find lots of stations to work. Watch for those night-time summer openings on 20 meters. Remember that it's winter below the equator and those stations will be looking for you on 80 and 40 meters, even though it's noisy during summer in the north.

Scoring: Contacts within your own ITU zone or with an IARU society HQ station count for 1 point each. Contacts within your own continent but with a different ITU zone count 3 points. Contacts with a different continent and ITU zone count 5 points. Multipliers count only once per band. HQ stations are a special multiplier and are counted separately from ITU zone multipliers. Final score is total QSO points times multipliers.

How to report your score: You must send in your entry by August 12, 2003. E-mail a log in Cabrillo format to **iaruhf@iaru.org**. E-mailed and diskette logs must be in Cabrillo format. Send paper logs and a complete summary sheet to IARU HF World Championships, Box 310905, Newington, CT 06111.

Complete rules: The complete rules may be found at **www.iaru.org/contest.html**. Contest forms and rules may also be obtained by sending an SASE with 2 units of postage (2 air-mail units for non-US delivery) to IARU HF World Championships Forms, Box 310905, Newington, CT 06111.

For more information: E-mail **n1nd@iaru.org** or phone 860-594-0232. QST

By Dan Henderson, N1ND

Straight Key Night 2003

Does the name Harvey Savage mean anything to you? Probably not, unless you are a *real* old-timer. But looking back at the results of the original Straight Key Night—held December 31, 1970 starting at 8 PM local for five hours—you will find that Harvey, K4MD, is credited by former ARRL Communications Manager George Hart, W1NJM, as the person who originated the idea of SKN.

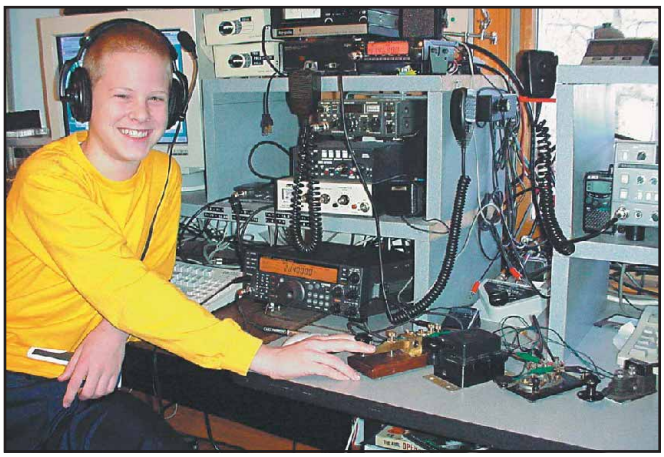
SKN hasn't changed much since the original version—except it is now a 24-hour event. The purpose is still the same—dust off the old straight key and enjoy some ragchewing the old-fashioned way. For 2003 we received a total of 164 entries, accounting for 1516 QSOs. Congratulations to Steve, WA4VWV, of Mystic, Connecticut, who reported a total of 56 QSOs for the event. Runner-up was Don, KA7T, of Meridian, Idaho, who logged 50 contacts.

SKN night has no score or "winners" but it does honor the ones whose peers feel did an exceptional job during the event. Garnering the most votes for Best Fist in 2003 was Bill, KØCDJ, with four. Seven other operators each pulled in the support of two participants to tie for second.

There were lots of interesting QSOs being made during the weekend, as *nine* different operators tied for Most Interesting QSO with two votes each. These included Ellen, K3LN; John, WA2QQF; Richard, K8QLM; Carl, WA7CS; Ken, KF3DC; Dan, W2AU; Brice, W9PNE; Bill, KØCDJ, and Bob, WR3K. We'll let them share their tales of interest and duke it out for the *real* most interesting QSO.

New for 2003 is the addition of Straight Key Night to the ARRL On-line Soapbox. Be sure to visit **www.arrl.org/contests/soapbox** where 26 SKN participants have posted photos and stories of their participation. Very often you will see that SKN participants will also utilize vintage gear during the event. The marriage of old Collins, Heathkit and Viking gear meshes well with a wide range of personalized hand keys.

The charm of SKN is that straight key can really mean low key. You don't find QSO rates of hundreds an hour. Perhaps SKN should be measured by the number of times metal strikes metal to close the circuit to create a dot or dash. And perhaps Harvey Savage would be pleased with the outcome of his idea so many years ago.



Andrew Slater, K4PUF, of Sandston, Virginia, logged QSOs on five different keys.

National Contest Journal **Editor Carl, K9LA, used an old Ranger II and Drake 2B (his General station back in the early '60s) with a J-38 key.**

Participants Submitting Entries

AA9DH, AA9K, AB1BA, AB2AF, AB2AN, AB7MP, AD4E, AD6YU, AG6RT, HP1AC, JJ1BDX/3, K1PDY, K1RDD, K2NPN, K2NV, K3LN, K3MD, K4BYF, K4NCG, K4PUF, K6CTW, K6ETM, K6PBQ, K7TUC, K7ZX, K7ZYV, K8AG, K8BBM, K8QLM, K8SB, K8SOM, K9KEU, K9LA, K9LCK, K9PS, K9QH, K9UQN, K9VKY, K9YA (N9BOR, op), KA1BNO, KA2HDO, KA2SSX, KA3AVB, KA3LOC, KA7T, KB1JFC, KB3AAY, KB8PGW, KB8SCI, KB8TXZ, KC2EQB, KC2HRP, KC2KFC, KC5EXU, KC6T, KC7PM, KD1XU, KD5JOM, KD5RFC, KD7CNJ, KE6QR, KF3DC, KG2OR, KG4KLR, KG4LDD, KG4SZM, KG4TJQ, KG6TH, KG6ZR, KJ6CA, KK5FX, KN5L, KN6YD, KO6YG, KOØZ, KW7D, KØCDJ, KØLWV, N3BF, N3IW, N3MVX, N4BV, N4EDE, N4NTO, N5AF, N5KY, N5PV, N5SR, N7CFO, N8CDN, N8XMS, N9ADG, NJ3K, NMØL, OH3WD, ON6ZJ, OZ1EQC, UX7CQ, VE3NBJ, VE3WMB, VE7NI, W1NJN, W1RO/7, W1TPB, W1TS, W2AU, W2GIW, W2JSF, W2LID, W2TI, W2WSC (W2USF,op), W3CEI, W3DCG, W3MGL, W3TZW, W3UHP, W4AGI, W4QBE, W4YE, W5CN, W5EKF, W5ETK, W5KL, W5WAX, W5XU, W6ABX, W6PRI, W6RLF, W6SGJ/7, W6VNR, W7BGA, W7FOX, W7IZE, W7KTY, W7TVI, W7ZMD, W8HYD, W8WTS, W9PNE, WA1ABI, WA1RGS, WA2QQF, WA3GQU, WA4CIT, WA4OAB, WA4PSO, WA4VWV, WA6BOB, WA7CS, WA8OKR, WA9PWP, WA9QWX, WAØVKC, WB2AWQ, WB4FDT/3, WB5LLI, WB6IYM, WB8DQT, WB9CIS, WB9LPU, WB9MII, WD4CBZ, WY7W, WØCGV, WØCUX, WØTF

By **Dan Henderson, N1ND**
Contest Branch Manager

Silver Anniversary 25th Annual ARRL International EME Competition

The sheer Lunar-cy continues...

The year was 1960 and the world was caught up in the space race. We were just starting to hear of *Sputnik* and *Explorer*. Laika, the Russian space dog and the US Vanguard rocket were just coming into our vernacular. And Amateur Radio was getting caught up in the cosmic exploration frenzy.

Sam Harris, W1FZJ, had attempted to contact the club via the EME path of 144 MHz but soon discovered that while a signal was faintly detected, that 1296 MHz was a better choice. By May 1960, he was using the W1BU antenna system to receive his own signals. Finally, teaming with O.H. Brown, W6HB, history was made. On July 17, 1960 faint signals were exchanged between these two pioneers, and on July 21 signal reports and call signs were exchanged coast to coast via the EME path.

During the ensuing 28 years, the amateur space race began to blossom. From OSCARs to more elaborate EME arrays, amateurs around the globe crossed into the realm of "out of this world" communication.

In 1978 the ARRL decided to further encourage Amateur Radio and experimental technology. The announcement for the very first ARRL International EME Competition included the statement that "Putting an EME station together isn't quite as simple as getting on the 'low bands' but it can be done by almost anyone."

The statement probably is still valid, but with 25 years of technological improvements and experiences you can understand that today's EME enthusiast is far more prepared than those of a generation ago.

G4CHH utilizes as much space as possible on his small lot to be competitive on 1296 MHz.

Familiar names still are found throughout the results of the 25th annual ARRL International EME Competition listings. Congratulations to Ernst, OE5EYM, who took top honors in the Single Operator Multi Band category. The top Single Operator Single Band winners included Alex, RU1AA (144 MHz), Ray WA4NJP (222 MHz), Jan, DL9KR (432 MHz), Dominique, HB9BBD (1296 MHz), Stig, OZ4MM (2304 MHz), Amato, I6PNN (5760 MHz), and Josef, OK1UWA (10 GHz). The Multioperator team winners included HB9Q (multiband), I2FAK (144 MHz), OH2PO (432 MHz), W1ZK (1296 MHz) and I4TTZ (10 GHz).

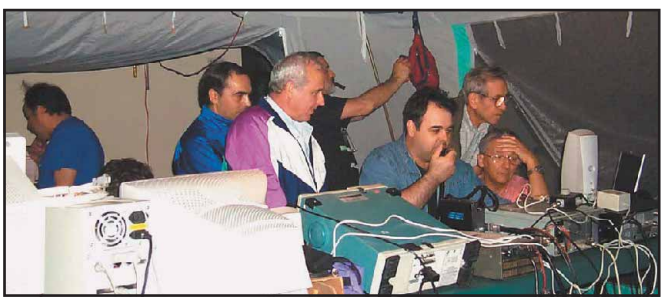
The dates for the 2003 competition will be announced later this spring. Be sure to check the Contest Calendar online and start planning now.

Expanded Results, Line-Score Printout Available

For complete contest results on-line please visit **www.arrl.org/contests/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.

The antenna system of the HB9Q Multioperator Multiband winning entry.



The I4TTZ multioperator station includes lots of operators and visitors getting their first taste of EME activity. QST

ANAHEIM, CA
(Near Disneyland)
933 N. Euclid St., 92801
(714) 533-7373
(800) 854-6046
Janet, KL7MF, Mgr.
anaheim@hamradio.com

BURBANK, CA
2416 W. Victory Bl., 91506
(818) 842-1786
(800) 854-6046
Eric, KA6IHT, Mgr.
Victory Blvd. at Buena Vista
1 mi. west I-5
burbank@hamradio.com

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(800) 854-6046
Mach, K6KAP, Mgr.
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Hwy. 163 & Claremont Mesa
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Tigard-99W exit
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- V/V, U/U, V/U
- Independent controls for each band
- 200 alphnumeric memories
- Auto repeater
- CTCSS encode/decode w/tone scan
- IRLP compatible

NEW!

IC-T90A Triple Band Transceiver

- 6M/2M/70CM @ 5W
- Wide band receiver 495kHz - 999.999MHz**
- 500 alphnumeric memories
- Dynamic memory scan
- Backlit keypad & display
- CTCSS/DTCS encode/decode w/tone scan
- Weather Alert

LOW PRICE

IC-2100H 25N 2M Mobile Transceiver

- Cool dual display
- 50 watts
- CTCSS encode/decode w/tone scan
- Backlit remote control mic
- Mil spec 810, C/D/E*1
- Auto repeater
- 113 alphnumeric memories

NOW AVAILABLE!

IC-2720H Dual Band Mobile

- 2M/70CM
- VV/UU/VU
- Wide band RX inc. air & weather bands
- Dynamic Memory Scan (DMS)
- CTCSS/DTCS encode/decode w/tone scan
- Independent controls for each band
- DTMF Encode
- 212 memory channels
- Remote Mounting Kit Included

LOW PRICE

IC-207H Dual Band Mobile

- 45W VHF (2M), 35W UHF (70CM)
- AM aircraft RX
- 182 memories
- CTCSS encode/decode w/ tone scan
- Remote head capable
- Auto repeater

LOW PRICE!

IC-V8000 2M Mobile Transceiver

- 75 watts
- ICOM DMS scanning
- CTCSS/DCS encode/ decode w/tone scan
- Weather alert
- Weather channel scan
- 200 alphanumeric memories
- Backlit remote control mic

ICOM ADVANTAGE

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**Cellular blocked, unblocked OK to FCC approved users. ✦FREE Power Supply (PS-125) offer is available for a limited time only. Check with HRO for details or restrictions on any offers or promotions. ***For shock & vibration. © 2003 ICOM America, Inc. AM-5676 Feb 03. The ICOM logo is a registered trademark of ICOM, Inc.

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- DX Packet Cluster Monitor
- 200 Mems., CTCSS
- VC-H1 Messaging Control

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- Backlit Front Key Panel

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- 105 db dynamic range, 100 Mems.
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- Optional 3rd band available • Back-lit mic
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- DSP modem offers great performance on Packet 300/1200,G-tor,Pactor, Amtor,PSK-31
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KPC-3 Plus/KPC-9612 Plus

High-performance, low power TNC. Great for packet, and APRS compatible.

Call For Special Low Price!

Detailed illuminated map shows time, time zone, sun position and day of the week at a glance for any place in the world.Continuously moving – areas of day and night change as you watch.
- Mounts easily on wall. Size: 34 1/2" x 22 1/2".

Reg $1295. SALE $999.95

ICOM

IC-R8500 Wide Band Receiver

- 100 kHz - 2.0 GHz*
- Commercial Grade • All Mode
- IF Shift • Noise Blanker
- Audio Peak Filter (APF)
- Selectable AGC Time Constant
- Digital Direct Synthesis (DDS)
- 1000 Alphanumeric Memories
- PC Controllable w/Optional Equipment

Call For ICOM Receiver Specials

FREE IC-UT106 DSP thru 3/31

IC-R75 Wide Band Receiver

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- Commercial Grade • All Mode
- Synchronous AM Detection (S-AM)
- Optional DSP w/Auto Notch Filter
- Triple Conversion
- Twin Passband Tuning (PBT)
- 1000 Alphanumeric Memories
- Up to Two Optional Filters
- PC Controllable w/Opt. Equipment

IC-R3 Wide Band Receiver

- 500 kHz - 2.45 GHz*
- 450 Alphanumeric Memories
- CTCSS w/Tone Scan
- 4 Level Attenuator
- Telescoping Antenna w/BNC Connector
- Lithium Ion Battery
- 2" Color TFT Display
- Audio/Video Output
- Four Way Action Joystick
- PC Programmable w/Optional Cable & Software

*816-901.995 MHz blocked; unblocked versions available to FCC approved users. FM video range for the IC-R3 is 900-1300 MHz & 2250-2450 MHz

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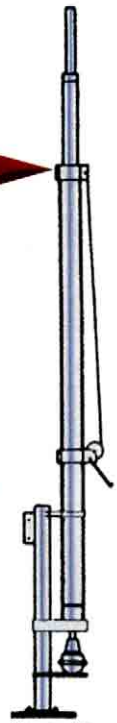

Shown with Optional Rotor Base

MA-40

40' Tubular Tower

REG. $1007
SALE $849.95

MA-550

55' Tubular Tower

Handles 10 sq.ft. at 50mph
Pleases neighbors with tubular streamlined look

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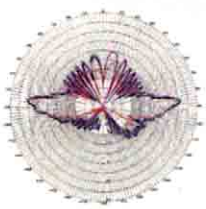
Designed for maximum range and signal strength providing long range point to multi-point wireless connections on the 2.4GHz ISM band.

GP-24

2.4GHz high gain omni-directional antenna for both the 802.11b and 802.11g standards

Gain: Twenty 1/2 waves in phase produce a high gain omni-directional pattern
Length: 5ft 10inches
Conn: Integral N-Female

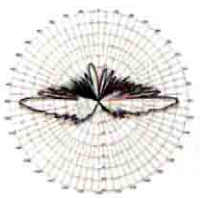


GP-24 elevation pattern

GP-24-3

2.4GHz high gain omni-directional antenna with 3 degree electrical downtilt for both the 802.11b and 802.11g standards. Specially designed pattern with downtilt concentrates the signal for maximum signal strength below the elevation of the antenna.

Gain: Twenty 1/2 waves in phase produce a high gain omni-directional pattern
Length: 5ft 10inches
Conn: Integral N-Female



GP-24-3 elevation pattern

SF-245

2.4GHz medium-gain mobile antenna.

Provides maximum gain in a mobile antenna for "war drivers" and "net stumblers".

Gain: Five 1/2 waves in phase produce a medium gain omni-directional pattern
Length: 18inches
Conn: N-male

Several "no holes" N-type mobile mounts are available including the GR-5N mobile trunk-lip mount

NEW SWR/ Impedance analyzer

From Kuranishi Instruments, Japan

BR-200

A professional grade, laboratory quality test instrument. High quality no drift oscillator. Read SWR and impedance measurements with confidence

Frequency range: 1.8-170MHz
Imp measurement: 12.5-300 ohm
Built-in frequency counter
6 segment LED readout
50 ohm dummy load included
Battery or 12VDC operation

UHV-4

Quad-band 10/6/2M/70cm mobile antenna with fold-over hinge.

Designed primarily for use with the Yaesu FT-8900.

Wavelengths:
10/6M 1/4 wave
2M: 1/2 wave
70cm: Two 5/8 waves in phase
Length: 54 inches
Connector: PL-259

The UHV-4 is easily mounted with the **CP-5M heavy duty universal lip mount** pictured on a rear van lift door. It has 16'6" of deluxe coax cable including 18"of mini RG-188A/U coax for easy entry through the weather seal without causing wind noise, water leaks and/or coax damage.

Challenger Series

Super slim, super flexible dualband mobile antennas.

Dark chrome finish, fold-over hinge included.

C757 and C757NMO

Gain:
2M: 1/2 wave
70cm: Two 5/8 waves in phase
Length: 38inches
Conn: PL-259 or NMO type

C767 and C767NMO

Gain:
2M: 1/2 wave, center phase
70cm: Two 5/8 waves, center phase
Length: 40inches
Conn: PI-259 or NMO type

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Be HEARD not SEEN

A Smartuner™ at your antenna's feed point finds the best match between any antenna and any transceiver.

In this photo, the Smartuner™ is hidden in the decorative wheelbarrow.

SG-231 Coupler
Catalog Number 54-17

Get on-the-air. Get **RADIO-active**! Visit www.sgcworld.com for more information on the entire family of Smartuner™ antenna couplers.

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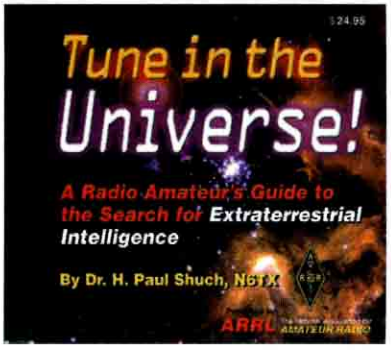

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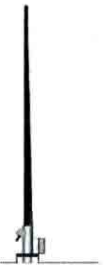

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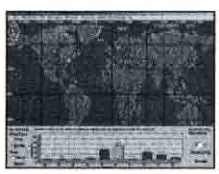

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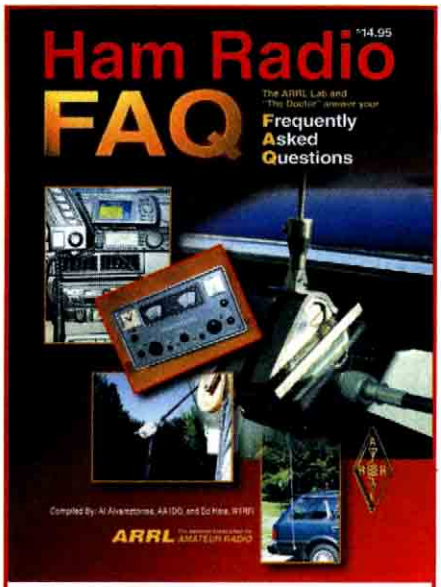

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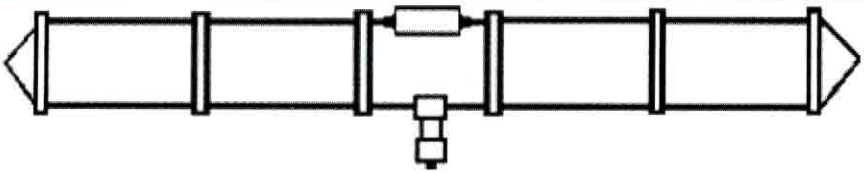

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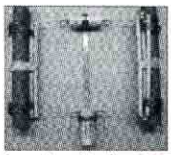

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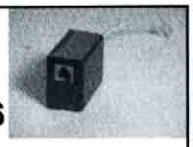

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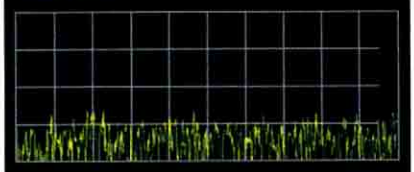

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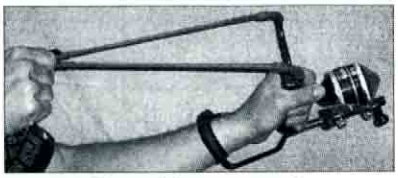

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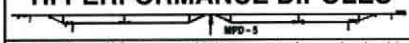

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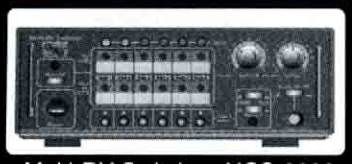

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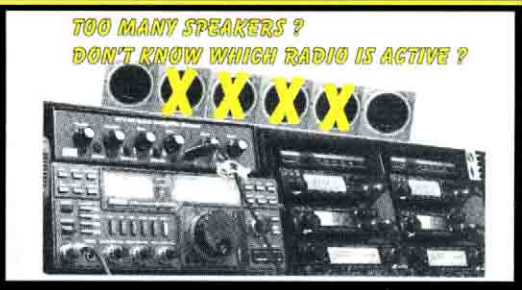

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TH-22ATH Tailored for utmost efficiency, Palm-Sized! (middle) The 144MHz, 5W, FM 22AT is so small and slim, it easily slips into a shirt pocket. Yet, it delivers impressive performance and does not compromise on sound quality with its large speaker, 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 **$219.99**

TH-G71A Sharp Distinction: The brighter side of handy communications. (right) This FM dualbander (144/440MHz) boasts an illuminated keypad and LCD, high-performance antenna, and a stylish yet ergonomic design. The 5W G71A also offers convenience with its memory name function, menu mode, PC compatibility and 200 memories. 2.31"w x 4.44"h x 1.44"d, 11.6 oz **$229.95**

TH-F6A Unique features the competition is still scratching their heads over. The FM 144/220/440MHz F6A offers dual-channel RX capability, 16-key pad, multi-scroll key, 5W, and no fewer than 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 **$329.95**

TM-261A Fully equiped, supremely user-friendly 2M mobile. The 261A puts out an impressive 50 Watts with mid- and low-power settings. For quick access, essential data can be stored in 62 "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 6.56"h x 1.56"d, 2.2 lbs **$149.99**

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 **$269.95**

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 **$399.95**

TM-D700A Harnessing APRS®, GPS and SSTV. This FM 144/440MHz mobile features a built-in TNC offering options including simple packet. However, the brightest spot of the 50/35W D700A is its ability to enable APRS® without a computer. It also has 200 memories, dual receive, built-in CTCSS/DCS, and DX cluster monitoring. 5.5"w x 1.58"h x 7.68"d, 3 lbs **$519.95**

TS-570D(G)* Affordable DSP without compromise. High-end technology doesn't mean a high-end budget. With 16-bit DSP, untouchable digital filtering, heavy-duty transmitter design, and central frequency control system, the 570D(G) provides powerful 160-10M operation. 10.63"w x 3.75"h x 11"d, 15 lbs..... **$1089.95**

TS-570S(G)* Same as the 570D(G), with 6M **$1259.95**

TS-B2000 Distinctive by design, packed for performance. The all-mode, HF, 2M, 6M, 70cm, B2000 is serious about DSP. Its digital technology converts analog waveforms into digital data, enabling such processing as IF filtering, slope tune, auto notch and AGC. Includes PC control software. 10.63"w x 3.75"h x 12.5"d **$1549.95**

TS-2000 Distinctive by design, packed for performance. The all-mode, HF, 2M, 6M, 70cm 2000 is serious about DSP. Its advanced digital technology converts analog waveforms into digital data, enabling such digital processing as IF filtering, slope tune, auto notch and AGC. 10.63"w x 3.75"h x 12.5"d..... **$1899.99**

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IC-V8 Quality, simplicity, anywhere. (right) This 144MHz FM transceiver's front panel and chassis are constructed of tough polycarbonate and die-cast aluminum for durability. The 5.5W V8 offers a 16-button keypad and 100 alphanumeric memories. CTCSS, DTCS and DTMF encoder are standard. 2.13"w x 5.19"h x 1.38"d, 12.3 oz..... © **$119.95**

IC-W32A User-friendly dualbander with independent band controls. (left) Icom's high performance, full-function W32A handheld meets the demands of both novice and experienced operators: simple operation and advanced features. This 5W, 2M/440 HT has separate tuning and volume controls for each band. It also offers simultaneous receive, 200 memories, cloning capability, tone encode/decode, and skip scan. 2.25"w x 5.41"h x 1.31"d, 1 lb ..... © **$269.95**

IC-T90A Surprisingly compact, full featured. The T90A 50/144/440MHz HT offers wideband receive with 5W of power. It features 555 alphanumeric memories with DMS scanning technology. The T90A also provides DTCS/CTCSS, DTMF encode, PC programmability and weather resistance. 2.53"w x 3.44"h x 1.16"d, 8.47 oz..... © **$249.95**

IC-2100H-25N Durable 2M rig with superior RX IMD, performance. The 2100H25N offers 50W on transmit, extending its range. It also features CTCSS tone enc/decode, tone scan and 100 alphanumeric memories. It can be remote controlled using the new backlit mic. 5.5"w x 1.56"h x 7.09"d, 2 lbs, 10 oz © **$149.95**

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IC-756PROII A leap forward for the digital revolution. An all-mode, HF, 50MHz transceiver designed to include customer-suggestions. The PROII not only offers a 32-bit Floating DSP, but also has built-in 24-bit AD/DA converter, enhanced backlighting, selectable IF shape, adjustable noise blanker, and improved audio fidelity. 13.38"w x 4.38"h x 11.19"d, 21 lbs, 1 oz ..... NOW! FREE PS-125 included **CALL**

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VX-150 Designed to perform under the most difficult conditions. (middle) This 2M 5W HT provides exceptional receiver performance with clean, clear transmit. Built to withstand outdoor use, the 16-key 150 is constructed to MIL-STD standards, with high-output, commercial-grade speaker and Omni-Glow™ keypad. 4.3"h x 2.3"w x 1"d, 11.5 oz.....© **$109.95**

FT-50RD/41B Commercial-grade, military spec. (right) It's rugged and simple to operate. Boasting 5W, the 50RD covers 144 and 430MHz while also offering the "widest" band receive allowable. Perfect for outdoor activities. Built with 112 memories, DCS/CTCSS encode, and ARTS. 2.2"w x 3.9"h x 1.2"d, 11.5 oz.....© **$195.95**

VX-7R/VX-7RB The first submersible amateur handhelds. (left) Protected against water by gaskets and weatherproofing techniques, the 50/144/430MHz, 5W 7R/7RB are rated for a 3-foot, 30-minutes submersion. Tough magnesium bodies make them ideal for the outdoors. They include dual/wide-band receive, status strobe, and "internet" key for access to the new WIRES™ system. 7RB sports a black case. 2.4"w x 3.5"h x 1.1"d, 9.2 oz.....© **$299.95**

FT-1500M A masterpiece of RF engineering. This 144MHz FM mobile is the quietest and most efficient radio transceiver ever built. 50-tone CTCSS encode/decode, direct keypad frequency entry, alphanumeric memory, 50 Watts of output power, and 6-pin mini-DIN data port are just the start. 5"w x 1.4"h x 4.9"d, 2.2 lbs© **$139.99**

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 .. **$159.95**

FT-8900R Leading the way in FM mobile design. Quite simply, the 29/50/144/440MHz 8900R has no peer among mobile transceivers. 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 configuration settings. The 8900R also provides 50W (35 on 440MHz), access to internet linking systems, over 800 memories, CTCSS/DCS, built-in duplexer, and versatile scanning. 5.5"w x 1.6"h x 6.6"d, 2.2 lbs.....© **$389.95**

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, the 840 adds a choice of two optional remote auto antenna tuners and a wealth of functions. 9.4"w x 3.7"h x 9.6"d, 12 lbs .....© **$499.95**

FT-100D The smallest full-featured HF/VHF/UHF transceiver. With coverage from HF to UHF, built-in DSP, and 100W HF/50MHz output (50W on 2M, 20W on 430), the 100D keeps you in touch with the world, at home or away. It also features a 500Hz crystal filter, high-stability oscillator, CTCSS decoder, and high-quality speaker. 6.3"w x 2.1"h x 8"d, 6.6 lbs.© **$739.95**

FT-857 The world's smallest HF/VHF/UHF multimode. The 100W (HF/6M), 50W (2M), 20W (70cm) 857 provides wide frequency coverage, outstanding receive, and convenient remote-head use (optional). Includes 200 memories, ease of access to feature, advanced DX features, and CW operating flexibility. 6.1"w x 2"h x 9.2"d, 4.6 lbs..... **$849.95**

FT-897 All-in-one portable base. The all-mode, multi-band 897 features high output 100W (HF/6M), 50W (2M), 20W (70cm), rugged construction, 200 memories, and optional internal power supply and external antenna tuner. 7.87"w x 3.15"h x 10.3"d, 8.6 lbs .....© **$924.95**

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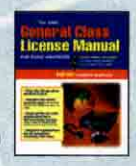

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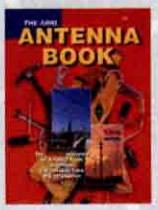

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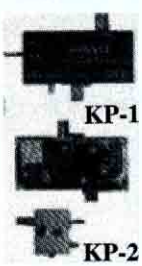

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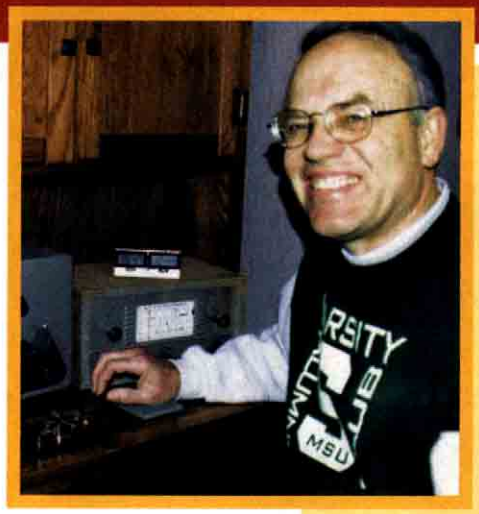

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Find your antenna's true resonant frequency. Trim dipoles and verticals.

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.

Has clear protective window for frequency display and cutouts for knobs and connectors so you can use your MFJ *SWR Analyzer*™ without taking it out of your case. *Look for the MFJ logo for genuine authenticity!*

MFJ-99, $54.85. Accessory Package for MFJ-259/B/249/B/209. Includes *genuine* MFJ-29C carrying case, MFJ-66 dip meter adapter, MFJ-1312D 110Vac adapter. *Save $5!*

New! Tunable Measurement Filter™

MFJ-731, $89.95. *Exclusive* MFJ tunable RF filter allows accurate SWR and impedance measurements 1.8 to 30 MHz in presence of strong RF fields. Has virtually no effect on measurements. Works with all SWR Analyzers.

MFJ *No Matter What*™ warranty

MFJ will repair or replace (at our option) your MFJ *SWR Analyzer*™ for one full year.

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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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More hams use MFJ SWR Analyzers™ than any others in the world!

Position opening at ARRL Headquarters:

ARRL seeks a state-certified teacher with classroom experience--preferably several years at the middle-school level--to coordinate ARRL's Amateur Radio Education and Technology Project, The Big Project, and handle other duties as needed. The candidate should be an Amateur Radio operator, preferably with experience in a wide range of ham activities. The position is at ARRL Headquarters in Connecticut.

For information on skills required and job responsibilities, contact ARRL Field and Educational Services Manager Rosalie White, K1STO, rwhite@arrl.org, ARRL, 225 Main St, Newington, CT 06111. Please, no telephone calls.

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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.

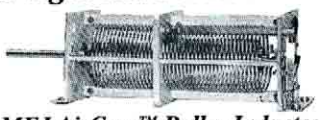
The rugged world famous MFJ-989C handles 3 KW PEP SSB amplifier input power (1500 Watts PEP SSB output power). Covers 1.8 to 30 MHz, including MARS and WARC bands.

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 MFJ-989C (at our option) *no matter what* for one 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* Tuner for Amps

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+6 Meter *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 inches.

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 or MFJ-924 **$69.95**

MFJ-921 covers 2 Meters/220 MHz. **MFJ-924** covers 440 MHz. SWR/Wattmeter. 8x2½x3 inches. Simple 2-knob tuning for mobile or base.

MFJ-922 *144/440 MHz* Tuner

MFJ-922 **$79.95**

Ultra tiny 4x2½x1¼ inch 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**

Creates artificial RF ground. Also electrically places a far away RF ground directly at your rig by tuning out reactance of connecting wire. Eliminates RF hot spots, RF feedback, TVI/RFI, weak signals caused by poor RF grounding. **MFJ-934, $169.95**, Artificial ground/300 Watt Tuner/Cross-Needle SWR/Wattmeter.

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1 Year *No Matter What*™ warranty 30 day money back guarantee (less s/h) on orders from MFJ

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MFJ *Sound Card-to-Rig* Interface

Use sound card and rig for all digital modes!

Plug and Play -- includes software, all cables, AC power supply . . . RFI-proof . . . Isolation transformers -- no hum, noise, distortion . . . Operate PSK-31, packet, APRS, AMTOR, RTTY, SSTV, CW, Meteor Scatter, others . . . Use as Voice Keyer, CW Contest Memory Keyer . . . Monitor On/Off Switch . . .

MFJ1275/M/T
$99.95

New! *Includes AC power supply, RS-232 cable!*

Plug this new MFJ-1275/M/T sound card interface between your transceiver and computer and enjoy operating all digital modes.

Everything you need is included -- software, audio cables, RS-232 serial cable and AC power supply.

Provides fully automatic operation with audio and push-to-talk control. It matches sound card audio, eliminates ground loops and provides microphone override.

Models available for all transceivers with 8-pin round, 8-pin modular (RJ-45) or 4-pin round microphone plugs.

Operate PSK-31, packet, APRS, AMTOR, RTTY, SSTV, CW, high speed CW Meteor Scatter and many others. Also use as Contest Voice Keyer and CW Contest Memory Keyer.

Digital Modes or Normal Operation

Select the ON digital mode -- all connections are made between your rig and computer for instant digital operation.

Select BYPASS normal mode -- your transceiver and computer connections are restored for their normal operation.

Audio Isolation Transformers

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.

Automatic Microphone Override

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.

No Matter What™ Warranty

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.

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.

New! *Super* Sound Card Interface

MFJ-1279/M/T
$129.95

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.
- **Headphone Jack:** Use your stereo headphones so you won't disturb your XYL (also turns off external speaker).
- **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.

New! *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.

DSP Sound Card Programs

MFJ-1296, $129.95. *RadioCom4* integrates PSK31, SSTV, FAX/Sat FAX, RTTY, SITOR, DSP audio filters and radio control.

MFJ-1298, $199.95. *RadioCom5* -- all features of *RadioCom4* plus DSP Audio Filter analyzer, Spectrum Analyzer, Dual Scope Display, Sound Recorder, Time and Frequency Management, Frequency Analyzer, 3D Scanner, Satellite tracking, Rig Control for over 80 radios, more! **Free demo at:** ***www.mfjenterprises.com/freedemo.php***

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COLORADO CHALET with ham gear, www.lostcreekcabin.com. WØLSD Buena Vista, CO.

DXshack FG, J6, 3W, XU, XW TRX+kWAMP+Beam ANT & Bed. URL: //qth.com/dxshack email: xu2a@fsinet.or.jp

GEORGIA: 4 acres, pine forest, 7 mi. from ocean, 250 ft. HD tower, building included. Bring your camper, quiet, relaxed getaway. $49,900. Call Jim at 419-782-8591

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KH6SQ - http://www.seaqmaui.com

NORTHERN AZ QTH Ham operator's paradise on 40 acres, tree covered and fenced. Four bedroom, two bath 2254 sq. ft. home, three car garage, Heritage™ Steel building 44 x 22. Three tower bases ready for self supporting towers, also two telephone poles 1000 foot apart. $202,000.00 928-607-2611 w7src@winlink.org or bootsie@starband.net

MFJ *Pocket size* Morse Code Reader™

Hold near your receiver -- it instantly displays CW in English!

Automatic Speed Tracking . . . Instant Replay . . . 32 Character LCD . . . High-Performance Modem . . . Computer Interface . . . Battery Saver . . .

MFJ-461
$79.95

Is your CW rusty?

Relax and place this tiny pocket size MFJ Morse Code Reader near your receiver's speaker . . .

Then watch CW turn into solid text messages as they scroll across an easy-to-read LCD display.

No cables to hook-up, no computer, no interface, nothing else needed!

Use it as a backup in case you mis-copy a few characters - - it makes working high speed CW a breeze - - even if you're rusty.

Practice by copying along with the MFJ-461. It'll help you learn the code and increase your speed as you instantly see if you're right or wrong.

Eavesdrop on interesting Morse code QSOs from hams all over the world. It's a universal language that's understood the world over.

Automatic Speed Tracking

MFJ *AutoTrak*™ automatically locks on, tracks and displays CW speed up to 99 Words-Per-Minute.

Simply place your MFJ-461 close to your receiver speaker until the lock LED flashes in time with the CW.

Four Display Modes

1. Bottom line scrolls and fills with text, then that entire line is displayed on top line until bottom line refills -- makes reading text extra easy! Automatically displays speed in WPM.

2. Same as **1**, without speed display -- gives you maximum text display.

3. Top line scrolls, bottom line displays speed in Words-Per-Minute.

4. Both top and bottom lines scroll.

Two-line LCD display has 32 large 1/4 inch high-contrast characters.

MFJ Instant Replay

The last 140 characters can be instantly replayed. This lets you re-read or check your copy if you're copying along side the MFJ-461.

High Performance Modem

Consistently get solid copy from MFJ's high performance *PLL* (*phase-lock loop*) modem. Digs out weak signals. Even tracks slightly drifting signals.

Of course, nothing can clean up and copy a sloppy fist, especially weak signals with lots of QRM/QRN.

Computer Interface

The MFJ-461's serial port lets you display CW text full screen on a bright computer monitor -- just use your computer serial port and terminal program.

More Features

When it's too noisy for its microphone pickup, you can connect the MFJ-461 to your receiver with a cable.

Battery saving feature puts MFJ-461 to sleep during periods of inactivity. It wakes up and decodes when it hears CW.

Uses 9 Volt battery (not included).

True Pocket Size

Fits in your shirt pocket with room to spare - smaller than a pack of cigarettes. Tiny 2¼x3¼x1 in. 5½ ounces.

No Instruction Manual needed!

Super easy-to-use! Just turn it on -- it starts copying instantly!

Accessories

MFJ-26B, $4.95. Soft leather protective pouch. Clear plastic overlay for display, push button opening, strong, pocket/belt clip secures MFJ-461.

MFJ-5161, $14.95. MFJ-461 to computer serial port cable (DB-9).

MFJ-5162, $5.95. Receiver cable connects MFJ-461 to your radio's external speaker 3.5 mm jack.

MFJ *Pocket* Morse Tutor

MFJ-418
$79.95

Learn Morse code anywhere with this tiny *MFJ Pocket-sized Morse Code Tutor*™! Practice copying letters, numbers, prosigns, punctuations or any combination or words or QSOs. Follows ARRL/VEC format. Start at zero code speed and end up as a high speed *CW Pro!* LCD, built-in speaker.

MFJ Code Oscillator

MFJ-557
$29.95

MFJ-557 Deluxe Code Practice Oscillator has a Morse key and oscillator unit mounted together on a heavy steel base -- stays put on your table! Portable. 9-Volt battery or 110 VAC with MFJ-1312, $14.95. Earphone jack, tone and volume controls, speaker. Adjustable key. Sturdy. 8½x2¼x3¾ in.

MFJ *Pocket* CW Keyer

MFJ-403P
$69.95

Built-in Iambic Paddle. Thumbwheel speed control. Adjustable weight. Adjustable sidetone with speaker. Iambic modes A or B. Fully automatic or semi-auto "bug" mode. Reversable paddle. Tune mode. RF-proof. Battery Saver. Tiny 2¼x3¼x1 in.

MFJ *miniature* Travel Iambic Paddle

MFJ-561, $19.95. 1¾Wx1¾Dx¾H in. *Formed* phosphorous bronze spring paddle, stainless steel base. 4 ft. cord, 3.5 mm plug.

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WESTERN, WA 3BR, 2B, 1680 sq ft home on 5 acres, 70 ft Rohn 45, KT34XA & 2el 40M beam. Ham BR has 220v, attached 2 car garage, 40 X 30 ft RV storage bldg. $250,000. W6QON, 360-864-6697

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MFJ DX Beacon Monitor

Get *up-to-the-minute* worldwide DX band conditions in *minutes* on 14, 18, 21, 24, 28 MHz bands using the International Beacon Network of 18 worldwide beacons!

MFJ DX Beacon Monitor lets you instantly see on world map which beacon you're hearing on your transceiver . . . No need to copy 22 wpm CW . . . Positively identify beacons even if CW is weak, fluttery or distorted . . . Tells you where to point your antenna . . . Fascinates visitors . . .

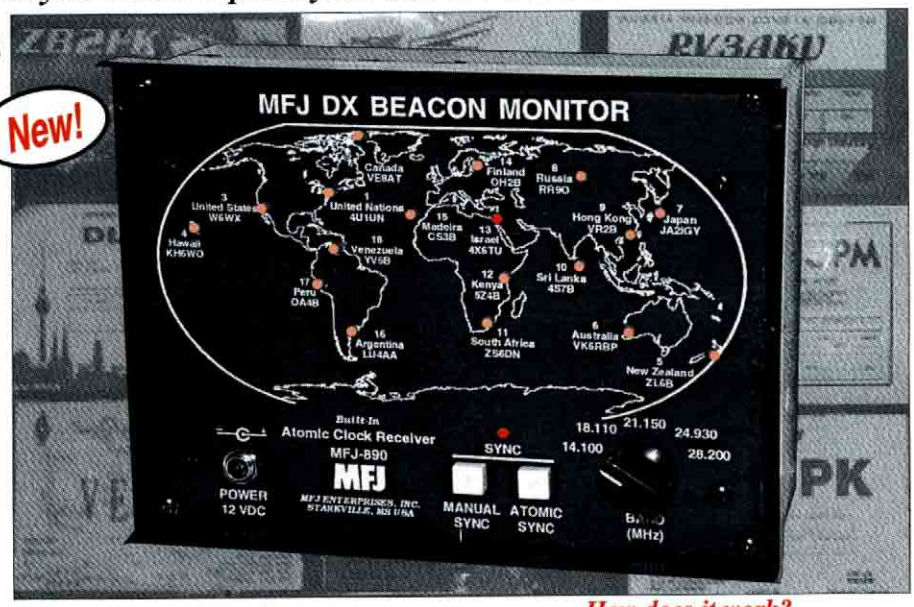
MFJ-890 **$99.95**

Get up-to-the-minute worldwide DX band conditions in minutes on 14, 18, 21, 24, 28 MHz bands using the International Beacon Network of 18 beacons throughout the world!

MFJ's new* DX Beacon Monitor *lets you instantly see which beacon you're hearing on your transceiver -- an LED lights up on its world map to show you the beacon location and where to point your antenna.

It's fascinating to hear and watch each beacon location light up as they become active across the world.

It's great for DXers, contesters, ragchewers and SWLers.



The International Beacon Network

The *International Beacon Network* provides a reliable source of signals for determining HF propagation 24 hours a day.

It consists of 18 beacons evenly located throughout the world.

Each beacon transmits on 14.1, 18.11, 21.150, 24.93 and 28.2 MHz.

The transmit sequence moves westward from New York across North America, Asia, Pacific to Africa, Europe and South America.

On each frequency, each beacon transmits for ten-seconds -- its call sign at 22 wpm CW and a one-second dash at 100 Watts and three one-second dashes at 10, 1, 0.1 Watts.

When each beacon completes a transmission it goes silent on that band and switches to the next higher band.

For more information see Oct/Nov, 1994, Sept, 1997 *QST* and Jan 1999, Sept/Dec 2001, Jan 2002 *Practical Wireless* of U.K.

How are band conditions?

Tune to a beacon frequency. If band conditions are good, you'll hear each beacon identifying in Morse and four dashes each at a lower power level.

The more beacons you hear, the more open the band is to different parts of the world.

The more dashes you hear per beacon, the better the quality of propagation and the more robust the band is. If you hear the 100 milliwatt dashes from many beacons you know *the band is wide open!*

In just three minutes you'll know how band conditions are worldwide.

It's interesting to see how propagation vary from day to day -- what beacons you can hear and at what power level.

You may find that the band is wide open but nobody is on.

Which band is best to reach a particular part of the world?

By storing the beacon frequencies in your transceiver's memory, you can quickly check all five bands to see which band has the best propagation to a particular part of the world.

MFJ DX Beacon Monitor lets you instantly see on world map which beacon you're hearing

You don't have to copy CW at 22 wpm to identify a beacon.

When you *hear* a beacon, an LED instantly lights up on a world map to show you its location. **You** can positively identify each beacon -- even if the signal is weak, and the CW is fluttery or distorted.

The world map display also tells you where to point your antenna.

How does it work?

The transmit sequence of the beacons are precision timed using GPS (Global Positioning Satellites).

The *MFJ DX Beacon Monitor* duplicates this precision timing sequence and lights an LED to show which beacon is transmitting. A microprocessor and a *built-in WWVB atomic clock receiver* provides ultra precise synchronization. Has manual sync for use *anywhere* in the world. MFJ-890 is not a beacon receiver that receives beacons directly.

The MFJ-890 is a self-contained stand-alone unit. It requires no antenna and no connection to your transceiver or receiver. 6¾Wx5¼Hx3D inches. Uses 12 VDC or 110 VAC with optional MFJ-1315, $14.95.

Free MFJ-890 Instruction Manual

Visit *http://www.mfjenterprises.com*

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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-890 *no matter what* for one full year.

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-464 CW Reader with built-in Keyer

MFJ-464 **$179.95**

(Keyboard, paddle not included.)

Plug this new MFJ CW Reader with built-in Keyer into your transceiver's speaker/phone jack and key jack.

Now you're ready to compete with the world's best hi-speed CW operators -- and *they won't even know you just passed the code test!*

Sends and Reads 5-99 WPM. Automatic speed tracking. Large 2-line LCD shows send/receive messages. Use single or iambic paddle or computer keyboard. Easy menu operation. Front panel speed, volume controls. 4 message memories, type ahead buffer, read again buffer, adjustable weight/sidetone, speaker. RFI proof.

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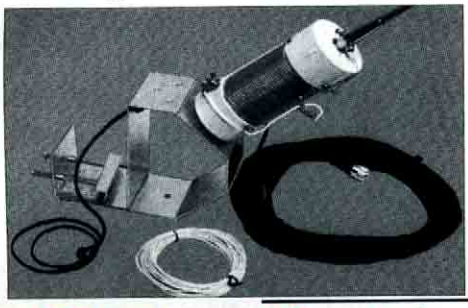
MFJ Apartment Antenna

Covers 40 thru 2 Meters . . . Mounts outdoor to windows, balconies, railings . . . works great indoors mounted to desks, tables, bookshelves



MFJ-1622
$99.95
New!

New MFJ-1622 Apartment Antenna lets you operate 40 thru 10 Meters on HF and 6 and 2 Meters on VHF with a single antenna!

Its universal mount/clamp lets you easily attach it to window frames, balconies and railings. It also works great indoors mounted to a bookshelf, desk, or table. It's not a 5 element yagi, but you'll work your share of exciting DX!

Highly efficient air wound "bug catcher" loading coil and telescoping 5½ foot radiator lets you really get out! Radiator collapses to 2½ feet for easy storage and carrying.

It includes coax RF choke balun, coax feed line, counterpoise wire and safety rope. Handles 200 Watts PEP.

Operating frequency is adjusted by moving the "wander lead" on coil and adjusting counterpoise for best SWR.

MFJ Ground-Coupled Portable Antenna Base

Provides effective RF ground and stable mount for vertical antennas . . . Antennas radiate well with low SWR

MFJ-1904
$99.95
New!

MFJ *Ground-Coupled Portable Antenna Base*™ provides an *effective* RF ground 160 through 2 Meters and a stable mount for vertical antennas.

Capacitive coupling to ground is a *time-proven* principle. It needs no tuning and antenna radiates well and gives good SWR on all bands. Performance is similar to mobile stations when using a mobile antenna but is far better with longer antennas.

The base can support a lightweight multiband vertical antenna -- like the all band Hy-Gain 18AVS and the bandswitching MFJ-1795 -- and provide a semi or permanent installation.

You can easily set up and take down vertical antennas for stealth operation and hide the base by covering it with dirt.

The MFJ-1904 is a 2x2 foot *stainless steel* square with reinforcing bends that greatly strengthens it. Folded and tapered six-inch *stainless steel* legs firmly anchor the MFJ-1904 into the ground.

Built-in antenna mount with SO-239 coax connector and two U-bolts lets you mount most standard and homebrew vertical antennas.

Standard 3/8-inch x 24 mobile mount is built-in for MFJ Mobile Whips, bug catchers, *Hustlers* and screwdriver antennas.

Two handles make carrying and removing the base fast and easy. You can also attach radials for improved performance.

33 Feet Telescoping fiberglass Mast . . .

Collapses to 3.8 feet, weighs 3.3 lbs.

MFJ-1910
$79.95

Super strong fiberglass mast has huge 1¾ inch bottom section. Flexes to resist breaking. Resists UV. Put up *full size* inverted Vee dipole/vertical antenna in minutes and get *full size performance!*

MFJ Vertical

for Antenna Restricted Areas

40, 20, 15, 10 Meters, Automatic Band Switching

MFJ-1795
$149.95
New!

Perfect for permanent or portable operation in antenna restricted areas. Hide behind trees, fences, buildings, *in* bushes -- only 7 to 10 feet tall (adjustable).

Low angle of radiation for DXing, omni-directional, handles 1500 watts PEP, low SWR.

Highly efficient end-loading. Entire length radiates.

Ground mounts with suitable ground such as MFJ-1904 *Ground-Coupled Antenna Base*, radials or ground rods. Or roof mount with radials.

HF mini-Bugcatcher

Highly efficient 40 - 6 Meter base-loaded 5½ foot Bugcatcher mobile antenna . . . Use light duty mounts

MFJ-1624
$79.95
New!

Become an *"HF Mobileer"* almost instantly with this *new* MFJ high-efficiency *mini-bugcatcher* mobile antenna! Have tons of fun rag-chewing and DXing on the HF bands. Turn boring drives into fun-filled ham adventures.

Attach a simple mount to your vehicle (*mounts*: trunk lip, MFJ-347, $39.95; mirror or luggage, MFJ-342, $9.95; tri-magnet, MFJ-338T, $19.95) . . . **Screw** in your MFJ *mini-bugcatcher* . . . **Throw** your rig into your car, plug into cigarette lighter and turn power down to 20 Watts (to avoid overloading your cigarette lighter; MFJ-1624 handles 300 Watts PEP). **Operate!**

Bugcatcher design uses large highly-efficient *air-wound* inductor -- far out performs other compact HF antennas. *Exclusive* built-in inductive matching network keeps SWR low. 5½ foot whip collapses to 2½ feet for easy storage and low garages. Base loaded for minimum wind load and light duty mounts. Change band by moving *wander lead*. 3/8x24 in. mount.

MFJ Portable Antenna

MFJ-1621
$89.95

Operate from apartments, homes, hotels, campsites, beaches or any antenna restricted area. Work all bands 40, 30, 20, 17, 15, 12 and 10 Meters.

DXCC, WAZ, WAC, WAS have been won with the MFJ-1621! Compact 6x3x6 inch cabinet has 4½ foot telescoping whip, built-in antenna tuner, field strength meter and 50 feet coax. Handles 200 Watts.

MFJ Super High-Q Loop

MFJ-1786
$379.95

MFJ's *tiny* 36 inch diameter *high-efficiency* loop antenna performs like a *full-size* dipole! Operate 10 thru 30 MHz *continuously* -- including WARC bands!

Ideal for limited space -- apartments, small lots, motor homes, attics or mobile homes.

Mounts vertically or horizontally. Low angle radiation gives you excellent DX.

Super easy-to-use! Remote control auto-tunes to desired band, then beeps. No control cable needed. Handles 150 watts.

Fast/slow tune buttons and built-in two range Cross-Needle SWR/Wattmeter lets you quickly tune to your exact frequency.

All welded construction, no mechanical joints, welded butterfly capacitor with no rotating contacts, large 1.050 inch diameter round radiator -- *gives you highest possible efficiency*. Heavy duty thick ABS plastic housing has ultraviolet inhibitor protection.

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FOR SALE: Drake L-4B amplifier with beefed-up power supply. Excellent condition. $800.00. W6UNF, 415-564-6528

MFJ *Switching* Power Supplies

Power your HF transceiver, 2 meter/440 MHz mobile/base and accessories with these new 25 or 45 Amp MFJ MightyLite™ Switching Power Supplies!

No RF hash . . . Super lightweight . . . Super small . . . Volt/Amp Meters . . .

MFJ's new adjustable voltage switching power supplies do it all! Power your HF or 2M/440 MHz radio and accessories.

MFJ's *MightyLites*™ are so light and small you can carry them in the palm of your hand! Take them with you anywhere.

No more picking up and hauling around heavy, bulky supplies that can give you a painful backache, pulled muscle or hernia.

MFJ's 25 Amp *MightyLite*™ weighs just 3.7 lbs. -- that's *5 times lighter* than an equivalent conventional power supply. MFJ's 45 Amp is even more dramatic -- *8 times lighter* and weighs just 5.5 pounds!

No RF hash!

These babies are clean . . . Your buddies won't hear *any* RF hash on your signal! *None* in your receiver either!

Some competing switching power supplies generate objectionable RF hash in your transmitted and received signal.

These super clean MFJ *MightyLites*™ meet all FCC Class B regulations.

Low Ripple . . . Highly Regulated

Less than 35 mV peak-to-peak ripple under 25 or 45 amp full load. Load regulation is better than 1.5% under full load.

Fully Protected

You won't burn up our power supplies!

No RF Hash!

MFJ-4225MV
25 Amp
$149.95
plus s&h

MFJ-4245MV
45 Amp
$199.95
plus s&h

No RF Hash!

They are fully protected with Over Voltage and Over Current protection circuits.

Worldwide Versatility

MFJ *MightyLites*™ can be used anywhere in the world! They have switchable AC input voltage and work from 85 to 135 VAC or 170 to 260 VAC. Replaceable fuse.

MightyLites™ . . . Mighty Features

Front-panel control lets you vary output from 9 to 15 Volts DC.

Front-panel has easy access five-way binding posts for heavy duty use and cigarette lighter socket for mobile accessories. MFJ-4245MV has two sets of quick-connects on the rear for accessories.

Brightly illuminated 3 inch meters let you monitor load voltage and current.

A whisper quiet internal fan efficiently cools your power supply for long life.

Two models to choose from . . .

MFJ-4225MV, $149.95. 25 Amps maximum or 22 Amps continuous. Weighs 3.7 pounds. Measures 5¾Wx4½Hx6D in.

MFJ-4245MV, $199.95. 45 Amps maximum or 40 Amps continuous. Weighs 5.5 pounds. Measures 7½Wx4¾Hx9D in.

NEW! 25 Amp MightyLite™

Super light, super compact switching power supply delivers 25 Amps maximum/ 22 Amps continuous at 13.8 Volts DC. Low ripple, highly regulated. ***No RF Hash!*** Five-way binding posts for high current. Quick connects for accessories. Over voltage/current protection. 110 or 220 VAC operation. Meets FCC Class B regs. 3.5 lbs. 5½Wx2½Hx10¾D in.

MFJ-4125
25 Amp
$109.95
plus s&h

MFJ 35/30 Amp Adjustable Regulated DC Power Supply

Massive 19.2 pound transformer . . . No RF hash . . . Adjustable 1 to 14 VDC . . .

MFJ-4035MV
$149.95
plus s&h

MFJ's heavy duty conventional power supply is excellent for powering HF or 2 Meter/440 MHz transceiver/accessories.

A massive 19.2 pound transformer makes this power supply super heavy duty! It delivers 35 amps maximum and 30 amps continuous without even flexing its muscles. Plugs into any 110 VAC wall outlet.

It's highly regulated with load regulation better than 1%. Ripple voltage is less than 30 mV. *No RF hash* -- it's super clean!

Fully protected -- has over voltage protection, fold back short circuit protection and over-temperature protection.

You get front panel adjustable voltage from 1 to 14 VDC with a convenient detent set at 13.8 VDC. A pair of front-panel meters let you monitor voltage and current.

Three sets of output terminals include a pair of heavy duty five-way binding posts for HF/VHF radios, two pairs of quick-connects for accessories and a covered cigarette lighter socket for mobile accessories.

A front-panel fuse holder makes fuse replacement easy. Whisper quiet fan speed increases as load current increases -- keeps components cool. 9½Wx6Hx9¾D inches.

MFJ *High Current* Multiple DC Power Outlets

Power two HF/VHF transceivers and six or more accessories from your 12 VDC power supply

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MFJ-1116
$49.95
plus s&h

MFJ-1112
$34.95
plus s&h

New!
MFJ-1117
$54.95

MFJ-1118, $74.95. This is MFJ's most versatile and highest current *Deluxe Multiple DC Power Outlet*. Lets you power two HF and/or VHF transceivers and six or more accessories from your transceiver's main 12 VDC supply.

Two pairs of super heavy duty 30 amp 5-way binding posts connect your transceivers. Each pair is fused and RF bypassed. Handles 35 Amps total.Six pairs of heavy duty, RF bypassed 5-way binding posts let you power your accessories. They handle 15 Amps total, are protected by a master fuse and have an ON/OFF switch with "ON" LED indicator.

Built-in 0-25 VDC voltmeter. Six feet super heavy duty eight gauge color-coded cable with ring tongue terminals. Binding posts are spaced for standard dual banana plugs. Heavy duty aluminum construction. 12½x2¾x2½ in.

MFJ-1116, $49.95. Similar to MFJ-1118. No 30 amp posts. Has "ON" LED and 0-25 VDC voltmeter. 15 amps total.

MFJ-1112, $34.95. Similar to MFJ-1116. No on/off switch, LED, meter, fuse.

NEW! MFJ-1117, $54.95. For powering four HF /VHF radios (two at 35 Amps each and two at 35 Amps combined) simultaneously. Tiny 8x2x3 inches.

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RF POWER AMPLIFIERS

High Power Amps
144mhz 400watts
220mhz 225watts
440mhz 185watts

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
0550G	5-10	375	59	15/0.7	HPA	524
0552G	20-25	375	54	15/0.7	HPA	486
144 MHz						
1403G	1-5	10-50	6	15/0.7	LPA	163
1405G	1-2	100	14	15/0.7	Standard	295
1410G	5-10	160-200	28	15/0.7	Standard	328
1412G	25-45	160-200	22	15/0.7	Standard	286
1450G	5-10	350+	56	15/0.7	HPA	572
1452G	10-25	350+	52	15/0.7	HPA	525
220 MHz						
2203G	1-5	8-35	5	14/0.8	LPA	168
2210G	5-10	130	20	14/0.8	Standard	346
2212G	25-45	130	16	14/0.8	Standard	316
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						
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
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

Description	Size	Wt	Connectors
LPA=Low-power amp	3x6x5	4lbs	UHF
Standard=Mobile/Base	3x6x11	6lbs	UHF or N
HPA=High-power amplifier	3x10x11	9lbs	UHF or N

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Model 1410G

Model 1452G

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WANTED: KIM's; SYM's; AIM's; SOL's; OMNIBOT's; UNIMAT's & related HW/SW. John Rawley, 1923 Susquehanna Rd, Abington, PA 19001; 215-884-9220; johnR750@aol.com

WANTED: MANUAL AND SCHEMATIC FOR IC-31 (430 MHz) Bob, KI4MB, 6608 N. 18th St., Arlington, VA 22205-1802 (703) 538-4544

WANTED: MOBILE antenna for 462 MHz. KB4QGJ, 703-370-1880; gjrose@laser.net

WANTED: Phillips 777 shortwave automotive radio, Hallicrafters SR-400, and SX-117, KBØW, (916) 635-4994; frankdellechaie@sprintmail.com

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TECH TALK

Filters: To buy or not to buy?

If there is one particular aspect or trait most radio amateurs have in common, it is seeking out the best possible performance-versus-cost ratio in an HF transceiver. The quest holds good merit, but remember to factor options responsible for that high performance (like IF filters and DSP) into the equation before making a buying decision. Adding optional IF filters (up to seven for competitive model transceivers) noticeably increases overall cost, yet excluding such optional filters shortchanges one's full radio enjoyment. What to do? Go first class right from the start with Icom's world famous IC-756PROII, naturally!

FILTERS, SKIRTS AND DSP. Two of the IC-756PROII's leading assets are its extensive digital IF filters and its 32 bit floating point DSP. Combined, they produce over 50 different built-in filter widths and response curves to mate with operating needs and band conditions of the day. There are no optional filters needed! These DSP-based filters, incidentally, utilize computer-type concepts to clock signals in and out of the processor. Further, Icom's 32 bit DSP can process data with less noise than a 16 bit DSP system. That's why its filter curves can be wide for full-bodied audio yet ultra steep-skirted (only 200Hz difference between its –6 and –60dB points in CW) for incredible selectivity. Crystal filters are good and mechanical filters are better, but neither type compare to Icom's DSP filters. It's that simple!

IC–756PROII

ADDITIONAL CONSIDERATIONS. Using IF filters plays a major role in every transceiver's performance, but they must be supported by additional "high end" circuitry to produce a top-line rig—and this is where Icom's IC-756PROII blows away the competition. Its multiple AGC loops support increased receiver sensitivity with a lower noise floor and permit copying weak signals without desensing or "pumping" from strong adjacent-frequency signals. It is a difference you can hear—and appreciate!

Digital Twin PassBand Tuning further separates the IC-756PROII from the competition. By rotating its concentric controls together, you can move IF response up or down. By rotating them separately (one up, one down), you can narrow a filter's width, and by moving only one control, you can tailor only one side of a response curve. As a result, copying weak stations and rare DX is a cinch with Icom's IC-756PROII. Looking for maximum value in an HF transceiver? Put an IC-756PROII in your shack and start hearing what others are missing!

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More Diamond antennas in stock

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IC-756PRO2 ..... In Stock!

The Icom IC-756 PRO2 is an all mode HF and 6m transceiver featuring 32-bit digital signal processing, automatic antenna tuner, 100 watts RF output, digital twin PBT, 5" multifunction color TFT LCD display with band scope function, built-in CW and SSB memory keyers, and more. Supplied with a hand mic and DC power cord.

PW-1 ..... New Lower Price!

The Icom PW-1 is a 1000 watt solid state linear amplifier for HF and 6m operation, featuring a high power automatic antenna tuner, built-in power supply, and a removable front control panel, and more.

IC-746PRO ..... In Stock!

The Icom IC-746PRO is an all mode HF/6m/2m transceiver with 32-bit IF level DSP. The radio features a built-in auto tuner, built-in RTTY demodulator and decoder (reads out on the radio's LCD display), auto notch, digital twin PBT, and more. Supplied with up/down hand mic and DC power cord.

IC-910H ..... In Stock!

All-mode 2m/70cm dual band transceiver, featuring dual data inputs, CTCSS encode/decode, CW keyer, satellite mode, scan, sweep display function, optional 23cm module, optional DSP, and more. Supplied with up/down hand mic and DC power cord.

FT-1000MP-V .... Yaesu Special!

Competition class HF DSP transceiver with auto tuner, 200 Watts RF output, and more!

FT-1000MP-V Field ..... New!

Low power (100W) version of the FT-1000MP-V, with built-in power supply.

FT-920 ..... Yaesu Special!

All mode HF/6m XCVR featuring DSP, automatic tuner, and more. With up/down hand microphone and DC power cord.

Quadra System .... Lower Price!

Solid state 1 kW autotuning amplifier.

FT-897 ..... Now In Stock!

"Backpack" all-mode HF/6m/2m/70cm XCVR offering 100 watts of output power! The radio can be run from optional internal batteries with reduced output of 20 watts, or an optional internal power supply can be installed instead. An optional bolt-on external auto tuner is also available. The FT-897 is a truly self-contained portable!

FT-847 ..... Yaesu Special!

Great all-mode XCVR covering HF/6m/2m/70cm! The radio is perfect for satellite operation, and features DSP, CTCSS tone encode/decode, and more. Supplied with up/down microphone and DC power cord.

IC-706MK2G ..... Icom Special!

The Icom IC-706MK2G is a compact HF/6m/2m/70cm all mode transceiver with digital signal processing, automatic repeater offset, built-in CW keyer, built-in CTCSS tone encode/decode/scan, 107 memory channels and more. A detachable front panel offers convenient mounting, even in compact vehicles.

IC-718 ..... New Lower Price!

The Icom IC-718 is an all mode HF transceiver featuring a front panel mounted speaker, IF shift, optional DSP module, multiple scanning modes, noise blanker, RIT, and more.

IC-2720H ..... New!

Dual band 2m/70cm FM XCVR. Features removeable control panel, CTCSS tone encode/decode/scan, cross band repeat, 1200/9600 bps data jack, dual RX, extended RX, 212 memory channels, and more. Supplied with DTMF hand microphone, mounting brackets, and power cord.

IC-V8000 ..... New, In Stock!

Great 75W 2m mobile XCVR. Features CTCSS tone encode/decode/scan, 207 memories, front panel mounted speaker, and more. Supplied with a DTMF hand mic, mounting bracket, and DC cord.

FT-8900R ..... New, In Stock!

Quad band mobile XCVR covers 10m/6m/2m/70cm, with cross-band repeat, tone encode/decode, and removable control panel for remote mounting.

FT-90R ..... Great Low Price!

Ultra-compact 2m/70cm mobile XCVR. With removeable control head.

FT-2800M ..... New!

Rugged 2m mobile XCVR, built to MIL-STD 810, with 65 watts RF output.

FT-100D ..... Yaesu Special!

Ultra-compact all mode XCVR for HF/6m/2m/70cm.Features DSP, CW memory keyer, tone encode/decode, 200 memories, VOX, and more. Supplied with a DTMF hand mic, DC power cord and mounting bracket.

FT-817 ..... Now In Stock!

A truly tiny self-contained all mode HF/6m/2m/70cm QRP XCVR featuring tone encode/decode, 200 memories, VOX, and more! With hand mic, DC cord and bracket.

IC-T7H ..... Icom Special!

Small 6W 2m/70cm, with full CTCSS tone.

IC-T2H Sport ..... Great Price!

IC-T90A ..... New, In Stock!

IC-V8 ..... New, In Stock!

IC-W32A ..... In Stock!

IC-207H ..... Great Low Price!

A great 2m/70cm dual band mobile XCVR, featuring CTCSS tone encode/decode, 182 memories, removable control panel, and more. With a back-lit DTMF hand mic, mounting bracket, and a DC power cord.

IC-2100H ..... Great Low Price!

Rugged 2m mobile XCVR with CTCSS tone encode/decode/scan, DTMF paging/squelch, 113 memory channels, and more.

IC-PCR1000 ..... Icom Special!

IC-R8500/R75 ..... In Stock!

IC-R2/R3/R10 ..... In Stock!

G-2800DXA $1089

Heavy duty antenna rotator handles 34 sq. ft. of antenna load, and features 450° rotation, preset and variable speed.

G-1000DXA $499

G-800SA/DXA $329/409

G-450A $249

G-5500 ..... $599

G-550 ..... $299

FT-50RD ..... New Lower Price!

VR-120D ..... Yaesu Special!

VR-500 ..... Yaesu Special!

VX-1R ..... New Lower Price!

VX-5R ..... Yaesu Special!

VX-150 ..... Yaesu Special!

VX-7R ..... Now In Stock!

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HF EXCITEMENT

INTRODUCING YAESU'S ALL NEW HF MOBILE

Blending leading-edge technologies developed on the FT-897 and MARK-V FT-1000MP transceivers, the FT-857 is the world's smallest* HF/VHF/UHF Multimode Transceiver, and it's available now!

*Jan. 2003

FT-857 DESIGN HIGHLIGHTS

The FT-857 is a high-performance, ultra-compact transceiver operating on the 160-10 meter HF bands, plus the 50, 144, and 430 MHz VHF/UHF bands. Providing 100 Watts of power on HF/6 meters, 50 Watts on 2 meters, and 20 Watts on 70 cm, the FT-857 is ideal for mobile, vacation, DX-pedition, or home use when space is at a premium.

Utilizing the renowned receiver performance of the FT-897 and MARK-V FT-1000MP, the FT-857 features wide dynamic range, optional Digital Signal Processing, and outstanding audio.

The wide array of convenience features includes a 32-color display; Spectrum Scope; built-in keyer with memory and beacon mode; U.S. Weather Band reception; 200 memories with Alpha-Numeric labels; AM Aircraft reception; detachable front panel (optional YSK-857 required); and much, much more.

You've asked for it, and it's here today: the FT-857 New Mobile. . .from the engineers at Yaesu!

New Remote Control
DTMF Microphone MH-59A8J (Option)

The optional MH-59A8J Remote Microphone provides control of the major functions of the FT-857 from the microphone's keypad. The MH-59A8J includes a rotary control knob for adjusting the operating frequency and the receiver volume level.

UP/DWN keys
SEL/DIAL key and Indicator
LOCK Switch
SEL knob
PTT Switch
9(BAND UP) key
* key
0(CNTL) key
ENT(#) key
Keypad
A key
B key
C key
1(DSP) key
2(MHz) key
3(CLAR) key
4(HOME) key
5(◄ MODE) key
6(MODE ►) key
7(V/M) key
8(BAND DWN) key
F(D) key
ACC key
PWR(FAST) key
P1 key
P2 key

Actual Size

HF EXCITEMENT

FT-857

ULTRA-COMPACT HF/VHF/UHF
100 W* ALL-MODE TRANSCEIVER
(HF/6 m 100 W, 2 m 50 W, 70 cm 20 W)

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.

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TS-570DG TODAY

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Back in 1973, Kenwood introduced the first affordable HF radio to the world, the legendary TS-520. Today 27 years later, the Kenwood TS-570DG HF and the TS-570SG with 6 Meters are by far the most popular HF and HF+6 transceivers on the market. The truth is that Kenwood has built and sold more HF Amateur radios than any other RF product manufacturer...ever! In 27 years, there have been several advancements in Amateur radio: solid state circuits, digital displays for quicker and more accurate tuning, built-in tuner, and Digital Signal Processing (DSP) for cleaner signals unheard of with the TS-520. Ask any experienced Ham which HF radios have the best audio...the answer has always been Kenwood! Whether a CW contester, DX chaser, or a new upgraded General Class Amateur, Kenwood has an HF radio for you. Don't be fooled by big boxes, high price tags, complex operation, and broken promises of performance.

Time marches on and your friends at Kenwood continue to build outstanding products with unparalleled performance and great value. It's not too late to own an "HF Legend," because we are still building them today.


TS-50S Compact Mobile


TS-870S 100% Digital IF DSP

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