Official Journal of
ARRL
The national association
for AMATEUR RADIO

QST

devoted entirely to
AMATEUR RADIO

August 2003

QST reviews

Yaesu FT-857
MF/HF/VHF/UHF
transceiver

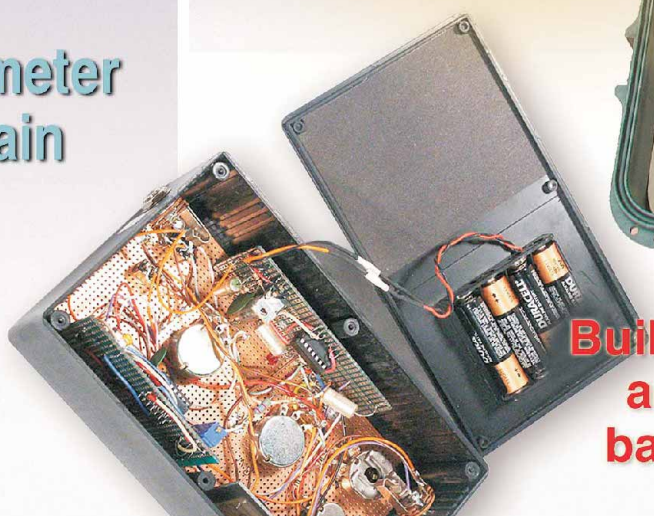
ICOM IC-R5
hand-held receiver

60 meters: Frequently Asked Questions

The optimal radial ground system

A 15 and 10 meter dipole curtain

An APRS weather station—not just for paragliding



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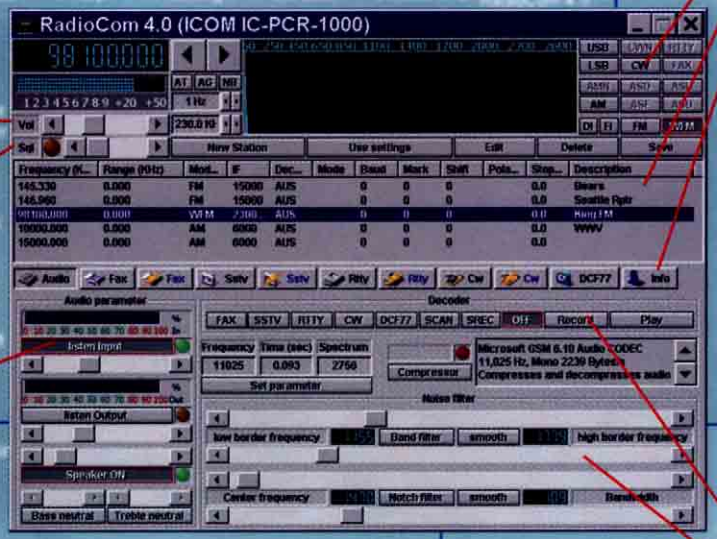

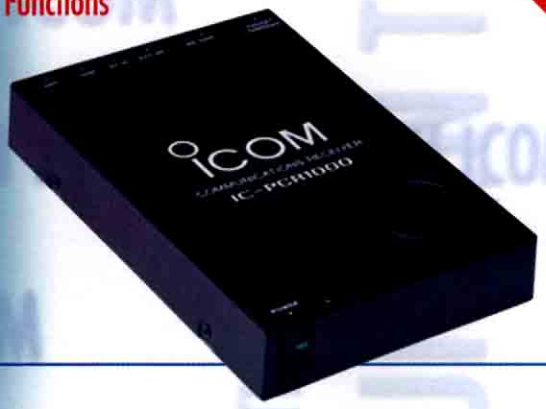

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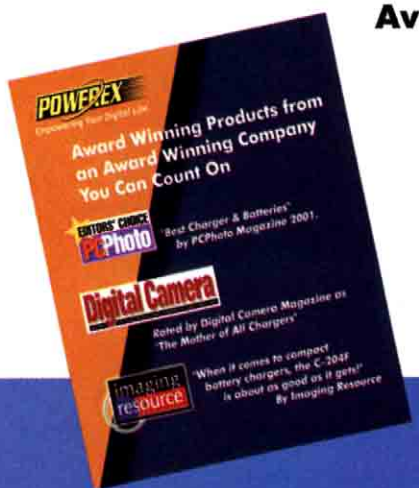

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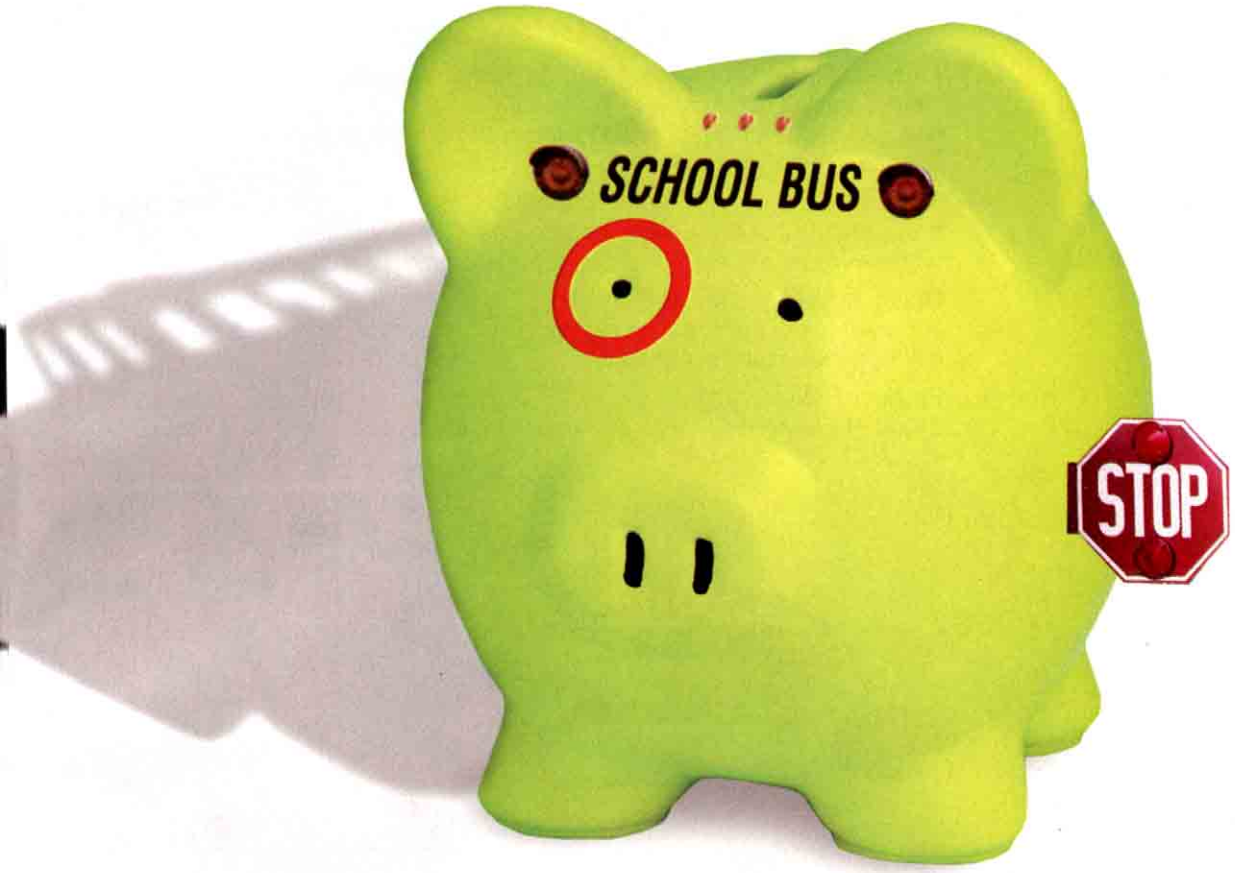

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News and Features

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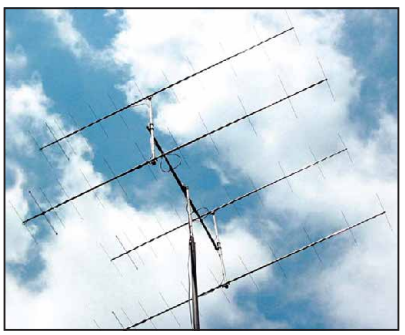

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Operating

Departments

Our Cover
Having access to detailed weather information for a specific location can make all the difference to a paraglider...or to an emergency communicator after a severe storm. Richard Parry, W9IF, marries APRS and the Internet for his remote weather station, described in the article that begins on page 28. At the lower left, K1QW's unusual—and useful—gyrator audio filter. See page 55. Photos by Richard Parry, W9IF, and Larry Coyle, K1QW

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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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.

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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.

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The OUTBACKER eliminates these "big antenna" problems while providing efficient, multi-band performance in a rugged, lightweight, single whip design. Its sleek, low profile design allows use with standard 3/8-24 bases and trunk-lip mounts.

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MODEL	BANDS	POWER	LENGTH	PRICE
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*Breaks down into two 3 ft. sections, includes a cloth carrying pouch				
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*Perfect for HF Radios with added 6 & 2 meter capability				
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*OUTREACH and OUTREACH 500 perfect for use with the OUTPOST, below				
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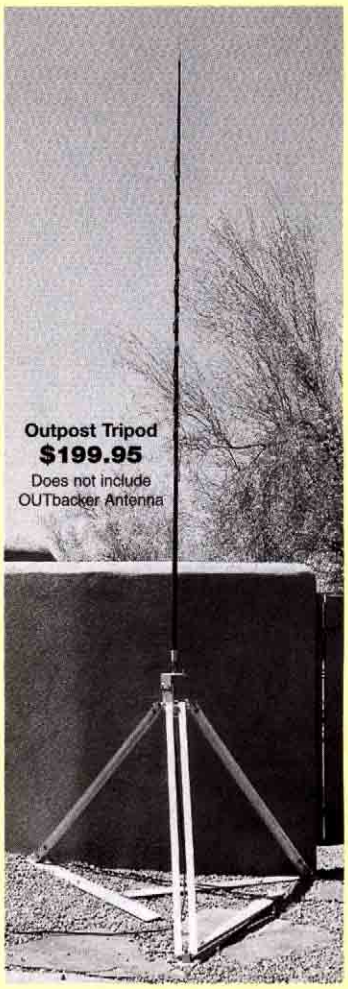
*Marine: 2.182, 4.1, 6.2, 8.2, 12.4, 16.5, 22 MHz • HAM: 75, 40, 20, 17, 10M				
Joey	80-2M + WARC	20W P.E.P.	50 in	**$249.00**
*Improves portable performance of FT-817 and other QRP rigs.				
MicroMount Desktop tripod for Joey, 8 in. tall with 12 ft. counterpoise				**$49.95**



The OUTbacker and Outpost Tripod Antenna System

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"IT SEEMS TO US..."

WRC-03

The words on this page are being written in Geneva on June 23, as the third of four weeks of the 2003 World Radiocommunication Conference (WRC-03) gets underway. This issue of *QST* will not be printed and distributed until after the final gavel falls, on July 4. Thus the writer, who is in Geneva as a member of the observer team of the International Amateur Radio Union (IARU), is in a position similar to that of a sports writer who must describe the entire Super Bowl, having seen only the first half of the game. In fact it's even worse than that. There is no way to keep score at a WRC, where meetings work on the basis of consensus and not by vote; it would be foolhardy to predict the outcome of such a process halfway through. By the time you receive this issue of *QST*, as an ARRL member you will have had access to electronic news of the conference outcome for at least a week or two. Anything said here about where things stand at halftime will be stale news indeed.

So, what can we say about WRC-03? There are more than 2600 registered participants, although not everyone is staying for the full four weeks. Perhaps the most striking contrast to recent conferences is what is *not* happening. At WRC-97 in Geneva and WRC-2000 in Istanbul there were lavish receptions hosted by commercial satellite companies to which all participants were invited. There were no such receptions this year, a reflection of the declining fortunes of the telecommunications industry. The IARU traditionally hosts a reception for 150-200 key conference attendees and radio amateurs who are here in various professional capacities. We did so again this year, providing an island of stability in the boom-to-bust environment.

Still, a few companies were able to find room in their budgets to give away promotional items to delegates, including a couple of very nice, practical gifts. For our part, the IARU is distributing a unique but inexpensive WRC-03 lapel pin featuring the IARU diamond set against an Alpine landscape. We have been producing pins of this kind for many years and some delegates have amassed quite a collection. We are also distributing two different kinds of booklets in three languages, English, French and Spanish. The first contains the conference agenda with relevant resolutions and recommendations in a pocket-sized format that delegates find very useful. The second is a 24-page, full-color explanation of the spectrum requirements of the Amateur Service at 7 MHz.

The conference agenda contains 48 separate items, some of them quite important to future telecommunications development. You may well wonder whether the concerns of the amateur and amateur-satellite services are taken seriously in such a context. The answer is an unequivocal yes. In large part this is because the IARU and its member-societies, working with their respective administrations as well as with the regional telecommunications organizations, have amassed a decades-long record of conducting ourselves at least as professionally as any other interest group. Several of our representatives have been involved in ITU affairs for more than 25 years, including the past Director of the ITU Radiocommunication Bureau, Bob Jones, VE7RWJ, who is serving as a consultant to the IARU at the conference.

One minor agenda item of interest to amateurs was settled early. Revisions to Article 19 of the international Radio Regulations to provide greater flexibility for administrations to assign call signs to amateur stations were among the first decisions to make their way through first reading in the Plenary, which is the final authority at the conference. Administrations will be able to assign amateur stations call signs with suffixes containing up to four characters, the last of which shall be a letter, following the national identifier and the single numeral (the "call area" in the United States and some other countries) specified in the Radio Regulations. There is also a provision for even more than four characters on special occasions, for temporary use. The IARU team was relieved that this issue was resolved early and without using up too many conference resources, which are very limited owing to a budget crisis at the ITU that is related to the sorry state of the telecommunications industry.

While it is part of the larger issue of a complete revision of Article 25 that remains unsettled at this writing, there appears to be agreement among administrations on the elimination of the Morse code as a licensing requirement for HF. It is clear that the outcome will be to leave it to administrations' discretion whether or not to have a Morse receiving and sending requirement. The Morse code will not automatically be dropped from amateur examinations, but there is no doubt that in the next couple of years many administrations will consider doing so.

And what can we say about 40 meters? It has been among the most contentious issues of the conference. With regard to resolving the incompatibility between the amateur and broadcasting services there are three basic schools of thought. One wants to separate them completely over a sufficiently long period of time to ease the transition for broadcasters, with a bit of sharing between the amateur, fixed and mobile services to compensate for some of the impact caused by shifting the broadcasters upward in frequency into a fixed service band. The second wants no changes at all, believing that the benefits are not worth the disruption that would be caused. The third favors a middle ground, eliminating some but not all of the amateur/broadcasting overlap and expanding the amateur band in Regions 1 and 3 (outside the Americas) by 100 kHz over a long period of time. There are only a few days left for the differences to be resolved.

How will things turn out? As I write this, no one knows. By the time you read this, it will be common knowledge. We hope to have the full story in next month's *QST*—and we hope it has a happy ending!—*David Sumner, K1ZZ* QST

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Extemely compact, high efficiency 2-element mono-band 40-meter Yagi.

All models use the OptiBeam Hi-Q coil in the 40-meter elements.

Specifications (number of elements / free space gain in dBi per band)

Model	Boom	Elements	40 meters	20 meters	17 meters	15 meters	12 meters	10 meters
OB21-4	38'	21	3 / 6.87	4 / 9.43		5 / 10.16		9 /10.67
OB12-4	25'	12	2 / 5.57	3 / 7.22		3 / 7.92		4 /8.71
OB8-4M	20'	8	2 / 5.35	2 / 6.19		2 / 6.47		2 / 6.59
OB11-6	24'	11	2 / 5.52	2 / 6.29	2 / 6.68	2 / 6.98	2 / 6.27	2 / 6.95
OB2-40	18'	2	2 / 5.84					
OB2-40M	18'	2	2 / 5.31					

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- **OptiStack 21S** – one OB21-4 and one OB16-3 below it
- **OptiStack 12L** – two OB12-4s and one OB11-3 tribander in the middle
- **OptiStack 12S** – one OB12-4 and one OB11-3 tribander below it
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For Demanding Users Like You!

DJ-596T Mark II Dual-Band HT

VHF and UHF performance in a great looking package. Easy to operate with a large, backlit alphanumeric display, full-size control pad, powerful Ni-MH battery, 6 ~ 16 VDC auxiliary power input, up to 5 watts output. CTCSS encode+decode, DCS, wide and narrow FM modes and new super-accurate frequency stability that meets the toughest standards of demanding users! Want more? Check out the optional digital communications board and the many accessories tailored to your operating needs.

DJ-196T 2 Meter HT

This rugged VHF HT is built for heavy use and keeps coming back for more. Put the power of 5 watts and 40 memories to work for you. The large alphanumeric display makes it easy to manage and the full-size backlit keypad makes field operations easy, with direct frequency input and clearly marked secondary functions. Nothing's held back, with autodial memories, DCS, CTCSS encode+decode, and even a built-in theft alarm!

DJ-296T 222 MHz HT

Finally! A 222 MHz HT that's affordable and built Alinco-tough. If you're not on 222, you're missing a band that's open for action. An amazing 160 memories allows you to store frequencies over a broad service area. This full-power HT sports a Ni-MH battery, external power port, high performance antenna, CTCSS encode+decode, DCS, autodial and more. Are you only using part of your privileges? Alinco can help you get on 222 MHz today!

DJ-496T UHF HT

From 430 to 450 MHz, your DJ-496T opens the door to amazing possibilities, from basic voice communications to controlling repeaters, remote bases, working through cross-band transceivers and more. The 40 memories come up on a large, alphanumeric display and the high capacity Ni-MH battery provides long-lasting power. CTCSS encode+decode, DCS, cable cloning and a host of optional accessories to suit your particular operating needs.

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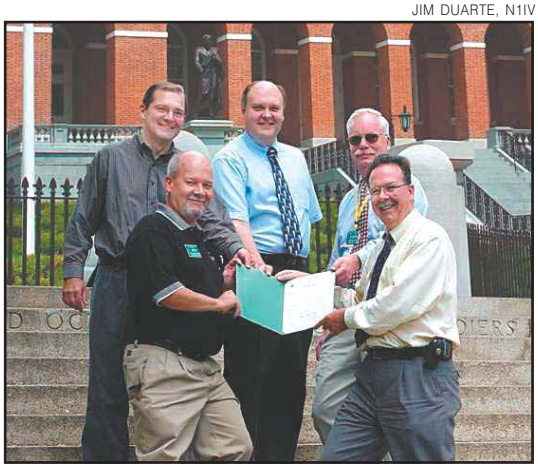
ARRL in ACTION

YOUR membership at work

By Dave Hassler, K7CCC, dhassler@arrl.org

Section Leaders Successfully Petition Governors for Amateur Radio Proclamations

JIM DUARTE, N1IV



Clockwise from lower left are Jim Duarte, N1IV; Shawn O'Donnell, K3HI; Tom Kinahan, N1CE; Eastern Massachusetts SEC Mike Neilsen, W1MPN, and Phil Temples, K9HI. All were instrumental in making the proclamation honoring Massachusetts amateurs a reality.

ARRL Section Managers, Public Information Coordinators and other volunteers in three states have seen their labors bear fruit with statewide proclamations honoring Amateur Radio. In New Hampshire, Gov Craig Benson proclaimed June "Amateur Radio Month," while Gov Mike Huckabee of Arkansas declared June 23 through 30 "Amateur Radio Week." In Massachusetts, Gov Mitt Romney declared June 28 "Amateur Radio Day." A number of other states have also chosen to honor hams with official proclamations, including Illinois, Maine, Nebraska and Oklahoma.

Huckabee designated June 23-30 to honor Arkansas amateurs, as 17 hams from 10 Arkansas Amateur Radio clubs looked on. The proclamation acknowledges ham radio's value to the public by providing free emergency communication to state and local government. The proclamation urges the state's citizens "to pay appropriate tribute and respect" to the approximately 7000 hams in Arkansas. ARRL Arkansas Section Manager Dennis Schaefer, W5RZ, accepted the proclamation on behalf the state's amateurs.

Newly appointed Eastern Massachusetts Section Public Information Coordinator Jim Duarte, N1IV, was given the task of requesting a proclamation from Gov Romney by Section Manager Phil Temples, K9HI. In conjunction with Section Government Liaison Shawn O'Donnell, K3HI, and Massachusetts State RACES Radio Officer Tom Kinahan, N1CPE, and several other hams, Duarte petitioned the governor with a letter and several press releases. The press releases outlined Amateur Radio involvement in many recent disaster situations, severe weather incidents and public service events, including the Boston Marathon.

"The packets contained a cover letter explaining what we wanted and why we were requesting this, the standard ARL Field Day press release…and one we composed detailing Massachusetts Amateur Radio activities over the past nine months, stressing our volunteer role," Duarte said. He and his team also utilized a number of ARRL national news releases about hams volunteering for *Columbia* debris recovery and Amateur Radio's role in homeland security.

New Hampshire governors have proclaimed "Amateur Radio Month" each June for the past 18 years. In the 2003 proclamation, Benson urged all citizens "to recognize the exemplary and voluntary contributions of our radio amateurs [who] provide a backup communications link in times of disaster." The document notes the value of New Hampshire ARES to the state and the special role amateurs play as international goodwill ambassadors.

Stressing Hurricane Preparedness in Florida

DAVE ARMBRUST, AE4MR

From left, Ron Wetjen, WD4AHZ; Jim Frey, W8ISZ; Dave Luehr, K9DAV, and John Link, K4II participate in the statewide "Hurricane Jay" 2003 drill June 4. All four are members of Sarasota County ARES/RACES. Over a dozen hams took part, putting in a combined 101 hours of work.

Hams along the Gulf of Mexico and Atlantic Ocean in the US know a thing or two about hurricanes; bordering both bodies of water, Floridians might know a thing or four. West Central Florida Section PIC Jack Doyle, WX1JAD, was one of five guest speakers at the annual Hurricane Preparedness Seminar sponsored by the City of Venice on May 9. Jim Frey, W8ISZ, and John Palmer, K4JP, were also on hand to answer questions after the presentation. Doyle was part of a panel that included county emergency officials, a local meteorologist and a representative from the American Red Cross.

WCF Section Manager Dave Armbrust, AE4MR, spoke at the Governor's Hurricane Conference June 9-13 at the Tampa Convention Center. A free Amateur Radio seminar was given to attendees and the public June 10. Speakers from all over the state were there, along with representatives from all three Florida ARRL sections.

Just the FAQs for 60 Meters

Getting 60 meters is great, but now what? There are so many questions about how to get going on the five new channels that it's hard to know where to start. Well, have no fear! ARRL Lab Manager Ed Hare, W1RFI, and *QST* Senior News Editor Rick Lindquist, N1RL, have the answers to your questions in the article "60 Meters: Frequently Asked Questions," which begins on page 44 of this issue. The article covers legal modes, getting on frequency, measuring audio bandwidth, antennas, modifying gear, power limits, operating etiquette on a channelized band, what it means to have a "secondary allocation"—and more.

Amateur Interests Represented at WRC-03

The weather was plenty warm outside in Geneva, Switzerland, for the 2003 World Radiocommunication Conference (WRC-03), and the topics of discussion provided a little more heat to the Swiss atmosphere June 9 through July 4 as conference delegates pondered a number of international communication regulations, several of critical interest to Amateur Radio operators everywhere.

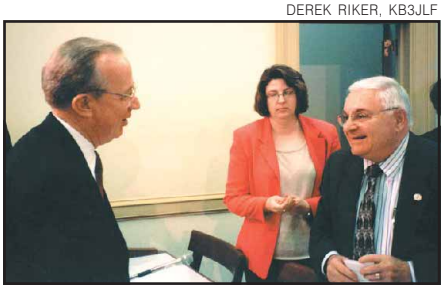
In a report sent after the first week of the conference, International Amateur Radio Union Secretary David Sumner, K1ZZ, said IARU staff—who cannot vote on issues, only observe the proceedings—worked behind the scenes to keep amateur issues in the forefront by talking with individuals and holding receptions for groups of key delegates. The top three issues of note for hams were 40 meter realignment, revision of the regulations governing the amateur and amateur-satellite services, and satellite-borne radar systems that work in the 70 cm amateur band.

Along with Sumner, IARU President Larry Price, W4RA; Wojciech Nietyksza, SP5FM; Michael Owen, VK3KI, and Ken Pulfer, VE3PU, made up the IARU Observer team. Past ITU Radiocommunication Bureau Director Robert W. Jones, VE7RWJ, served as a consultant to the IARU. A member of the IARU core team was assigned to follow each of the agenda items affecting Amateur Radio, but the greatest focus was on 7 MHz. Participating as official US delegates were ARRL Technical Relations Manager Paul Rinaldo, W4RI, and Technical Relations Specialist Jon Siverling, WB3ERA.

While details of decisions made at WRC-03 were not available at press time, IARU representatives worked hard to ensure that ham radio's issues and interests were kept before key decision-makers. The official documents of the conference are on the Web at **www.itu.int/ITU-R/conferences/wrc/wrc-03/index.asp**. Also, visit the ARRL Web site to find Amateur Radio-oriented details of this critical conference; a full report on the decisions affecting amateurs and what they mean to hams will appear in the September issue of *QST*.

ARRL President Testifies Before House Subcommittee

DEREK RIKER, KB3JLF



At left, ARRL President Jim Haynie, W5JBP, chats with Rep Michael Bilirakis (R-FL) before the hearing begins, while Bilirakis' chief of staff Rebecca Hyder listens in. Bilirakis, who is the sponsor of HR 713—The Spectrum Protection Act of 2003—initiated Haynie's appearance in Washington, DC, by recommending him to the committee chair as a witness.

ARRL President Jim Haynie, W5JBP, said Amateur Radio was well received at a June 11 hearing in Washington, DC, called "The Spectrum Needs of Our Nation's First Responders." And he ought to know: he was there to represent the interests of all US amateurs by giving testimony to a Congressional subcommittee.

Invited to testify by US House Energy and Commerce Committee chair Rep Billy Tauzin (R-LA), Haynie said that many lawmakers on Capitol Hill have noted the importance of Amateur Radio. "Especially since September 11, 2001, I've found that Congress, in general, is very amenable and agreeable to listening to me talk about Amateur Radio," he said. "I told the subcommittee that hams are vital in terms of helping to provide agency interoperability during an emergency."

Although he'd never previously testified before a Congressional committee, Haynie said the opportunity to speak was not one to be passed up. "It's an interesting process, listening to this Gordian knot untangle as the committee hears testimony," he added. "The committee heard a lot of emergency first responders, and it has formidable problems to address. As hams, we know about repeater coordination and adjacent channel interference.... We're a vital part of our nation's communication fabric."

Haynie was among 11 witnesses on the panel, which included numerous leaders in emergency response and communications, and governmental agencies. He testified on behalf of the Spectrum Protection Act of 2003, HR 713, which would require the FCC to provide hams with equivalent replacement spectrum, should any existing frequencies be reallocated to other services. Along with several other panel members, he attested to the utility of Amateur Radio in times of disaster. For the full details of the hearing, see the "Happenings" column, elsewhere in this issue.

If You Want to Catch a Fish...

Putting together an Amateur Radio display that catches the eye and holds the interest is no mean feat. One guy who's set up an effective booth is West Virginia Section Manager Hal Turley, KC8FS. Turley's display includes handouts and other literature, posters, computer programs and ARRL's *Amateur Radio Today* video presentation, featuring former CBS News editor and anchor Walter Cronkite, KB2GSD. And it's clear that Turley knows it's not just the material, but also the presentation that counts.

"I use several eye-catching posters that I got from the ARRL Web site and had enlarged and mounted on foamcore," Turley said. "I also purchased several plastic pamphlet and file holders to keep a clean tabletop. It really looks a lot more professional than simply having the information out on a table all helter-skelter."

Turley also uses the package of hamfest materials available to section volunteers through ARRL Headquarters. "The League does a terrific job with its publications and printed information," he said. "The [ARRL] hamfest package...covers about everything." When he travels to local clubs or hamfests with West Virginia SEC Mac McMillian, W8XF, Turley usually totes along a couple of *PowerPoint* presentations and projector that outlines the ARRL Amateur Radio Emergency Service (ARES) structure and emergency communication, in general.

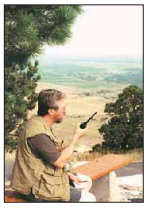
All of this traditional and digital graphical content leads to the most important part of promoting Amateur Radio: talking with people. "It's so important to make face-to-face contact with the other hams in our state, both members and non-members," Turley stated. "We need to be accessible and present a personal touch when representing ARRL in our section."

HAL TURLEY, KC8FS

West Virginia SM Hal Turley, KC8FS, collected material from a variety of sources to create a traveling display that is both professional looking and eye catching.

Guide to ARRL Member Services

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



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

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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**.

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

ARRL News

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

QSL Service

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

Educational Materials

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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.

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

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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.

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BERNIE FULLER, N3EFN*
17668 Price Rd, Saegertown, PA 16433
(814-763-1529); **n3efn@arrl.org**
Vice Director: Bill Edgar, N3LLR
22 Jackson Ave, Bradford, PA 16701
(814-362-1250); **n3llr@arrl.org**

Central Division

GEORGE R. ISELY, W9GIG
736 Fellows St, St Charles, IL 60174
(630-584-3510); **w9gig@arrl.org**
Vice Director: Howard S. Huntington, K9KM
25350 N Marilyn Ln, Hawthorn Woods, IL 60047
(847-438-3452); **k9km@arrl.org**

Dakota Division

JAY BELLOWS, KØQB
997 Portland Ave, St Paul, MN 55104
(651-238-4444); **k0qb@arrl.org**
Vice Director: Twila Greenheck, NØJPH
3333 Owasso Heights Rd, Shoreview, MN 55126
(651-483-1214); **n0jph@arrl.org**

Delta Division

RICK RODERICK, K5UR*
PO Box 1463, Little Rock, AR 72203
(501-988-2527); **k5ur@arrl.org**
Vice Director: Henry R. Leggette, WD4Q
7335 Ginger Snap Cove, Memphis, TN
38125-4732 (901-757-0444); **wd4q@arrl.org**

Great Lakes Division

JIM WEAVER, K8JE
5065 Bethany Rd, Mason, OH 45040-9660
(513-459-0142); **k8je@arrl.org**
Vice Director: Richard Mondro, W8FQT
800 Dover St, Dearborn Heights, MI 48127
(313-730-2111); **w8fqt@arrl.org**

*Executive Committee member

Hudson Division

FRANK FALLON, N2FF
30 E Williston Ave, East Williston, NY 11596
(516-746-7652); **n2ff@arrl.org**
Vice Director: Stephen A. Mendelsohn, W2ML
318 New Milford Ave, Dumont, NJ 07628
(201-384-0570); **w2ml@arrl.org**

Midwest Division

WADE WALSTROM, WØEJ
7431 Macon Dr, Cedar Rapids, IA 52411
(319-393-8982); **w0ej@arrl.org**
Vice Director: Bruce Frahm, KØBJ
PO Box DX, Colby, KS 67701
(785-462-7388); **k0bj@arrl.org**

New England Division

TOM FRENAYE, K1KI*
PO Box J, West Suffield, CT 06093
(860-668-5444); **k1ki@arrl.org**
Vice Director: Mike Raisbeck, K1TWF
85 High St, Chelmsford, MA 01824
(978-250-1235); **k1twf@arrl.org**

Northwestern Division

GREG MILNES, W7OZ
740 SE 24th Ave, Hillsboro, OR 97123-7286
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10312 NE 161st Ave, Vancouver, WA 98682
(360-256-1716); **k9jf@arrl.org**

Pacific Division

BOB VALLIO, W6RGG
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WALT STINSON, WØCP
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(303-770-3926); **w0cp@arrl.org**
Vice Director: Warren G. "Rev" Morton, WS7W
1341 Trojan Dr, Casper, WY 82609
(307-235-2799); **ws7w@arrl.org**

Southeastern Division

FRANK M. BUTLER JR, W4RH
323 Elliott Rd SE, Ft Walton Beach, FL 32548
(850-244-5425); **w4rh@arrl.org**
Vice Director: Sandy Donahue, W4RU
222 Briarhill Ln, Atlanta, GA 30324
(404-315-1443); **w4ru@arrl.org**

Southwestern Division

ART GODDARD, W6XD
2901 Palau Pl, Costa Mesa, CA 92626
(714-556-4396); **w6xd@arrl.org**
Vice Director: Tuck Miller, NZ6T
3122 E 2nd St, National City, CA 91950
(619-434-4211); **nz6t@arrl.org**

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COY C. DAY, N5OK
RR 1, Box 254, Union City, OK 73090-9726
(405-483-5632); **n5ok@arrl.org**
Vice Director: Dr David Woolweaver, K5RAV
2210 S 77 Sunshine Strip, Harlingen, TX 78550
(956-425-3128); **k5rav@arrl.org**

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Delaware: Randall K. Carlson, WB0JJX, 121 Scarborough Park Dr, No. 10, Wilmington, DE 19804 (302-655-6179); **wb0jjx@arrl.org**
Eastern Pennsylvania: Eric Olena, WB3FPL, 284 Blimline Rd, Mohnton, PA 19540 (610-775-0526); **wb3fpl@arrl.org**
Maryland-DC: Tom Abernethy, W3TOM, PO Box 73, Accokeek, MD 20607 (301-292-6263); **w3tom@arrl.org**
Northern New York: Thomas Dick, KF2GC, 4 Jenkins St, Saranac Lake, NY 12983 (518-891-0508); **kf2gc@arrl.org**
Southern New Jersey: Jean Priestley, KA2YKN, 7158 Chandler Ave, Pennsauken, NJ 08110 (856-662-3587); **ka2ykn@arrl.org**
Western New York: Scott Bauer, W2LC, 1964 Connors Rd, Baldwinsville, NY 13027 (315-638-7551); **w2lc@arrl.org**
Western Pennsylvania: John V. Rodgers, N3MSE, 803 S Main St, Butler, PA 16001-6326 (724-287-0424); **n3mse@arrl.org**

Central Division (IL, IN, WI)

Illinois: Sharon Harlan, N9SH, 5931 Alma Dr, Rockford, IL 61108 (815-398-2683); **n9sh@arrl.org**
Indiana: James S. Sellers, K9ZBM, 54676 County Road 8, Middlebury, IN 46540-8710 (574-825-5425); **k9zbm@arrl.org**
Wisconsin: Donald Michalski, W9IXG, 4214 Mohawk Dr, Madison, WI 53711 (608-274-1886); **w9ixg@arrl.org**

Dakota Division (MN, ND, SD)

Minnesota: Randy "Max" Wendel, KM0D, 8539 Bryant Ave S, Bloomington, MN 55420-2147 (952-888-5953); **km0d@arrl.org**
North Dakota: Kent Olson, KA0LDG, 7702 Forest River Rd, Fargo, ND 58104-8004 (701-298-0956); **ka0ldg@arrl.org**
South Dakota: Richard L. Beebe, N0PV, 913 S Gordon Dr, Sioux Falls, SD 57110-3151 (605-332-1434); **n0pv@arrl.org**

Delta Division (AR, LA, MS, TN)

Arkansas: Dennis Schaefer, W5RZ, 181 Schaefer Dr, Dover, AR 72837-7923 (479-967-4372); **w5rz@arrl.org**
Louisiana: Mickey Cox, K5MC, 754 Cheniere-Drew Rd, West Monroe, LA 71291 (318-397-1980); **k5mc@arrl.org**
Mississippi: Malcolm Keown, W5XX, 14 Lake Circle Dr, Vicksburg, MS 39180 (601-636-0827); **w5xx@arrl.org**
Tennessee: Terry Cox, KB4KA, 110 Fisherville Rd, Collierville, TN 38017 (901-854-4191); **kb4ka@arrl.org**

Great Lakes Division (KY, MI, OH)

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Michigan: Dale Williams, WA8EFK, 291 Outer Drive, Dundee, MI 48131 (734-529-3232); **wa8efk@arrl.org**
Ohio: Joseph J. Phillips, K8QOE, 2800 Jupiter Dr, Fairfield, OH 45014-5022 (513-874-0006); **k8qoe@arrl.org**

Hudson Division (ENY, NLI, NNJ)

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NYC-Long Island: George Tranos, N2GA, PO Box 296, Bellport, NY 11713 (631-286-7562); **n2ga@arrl.org**
Northern New Jersey: William Hudzik, W2UDT, 111 Preston Dr, Gillette, NJ 07933 (908-580-0493); **w2udt@arrl.org**

Midwest Division (IA, KS, MO, NE)

Iowa: Jim Lasley, N0JL, PO Box 5, Chillicothe, IA 52548 (641-935-4337); **n0jl@arrl.org**
Kansas: Ronald D. Cowan, KB0DTI, PO Box 36, LaCygne, KS 66040 (913-757-4455); **kb0dti@arrl.org**
Missouri: Dale C. Bagley, K0KY, PO Box 13, Macon, MO 63552-1822 (660-385-3629); **k0ky@arrl.org**
Nebraska: Bill McCollum, KE0XQ, 1314 Deer Park Blvd, Omaha, NE 68108 (402-734-3316); **ke0xq@arrl.org**

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

Connecticut: Betsey Doane, K1EIC, 92 Mohegan Rd, Shelton, CT 06484-2448 (203-929-7759); **k1eic@arrl.org**
Eastern Massachusetts: Phil Temples, K9HI, Apt. 803, 125 Coolidge Ave, Watertown, MA 02472-2875 (617-331-0183); **k9hi@arrl.org**
Maine: William Woodhead, N1KAT, 68 Madison St, Auburn, ME 04210 (207-782-4862); **n1kat@arrl.org**
New Hampshire: Al Shuman, N1FIK, PO Box 119, Goffstown, NH 03045-0119 (603-487-3333); **n1fik@nhradio.org**
Rhode Island: Bob Beaudet, W1YRC, 30 Rocky Crest Rd, Cumberland, RI 02864 (401-333-2129); **w1yrc@arrl.org**
Vermont: Paul N. Gayet, AA1SU, 124 Macrae Rd, Colchester, VT 05446 (802-860-1134); **aa1su@arrl.org**
Western Massachusetts: William Voedisch, W1UD, 240 Main St, Leominster, MA 01453 (978-537-2502); **w1ud@arrl.org**

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

Alaska: David Stevens, KL7EB, PO Box 113242, Anchorage, AK 99511 (907-345-6506); **kl7eb@arrl.org**
Eastern Washington: Kyle Pugh, KA7CSP, 5006 W Houston Ave, Spokane, WA 99208 (509-327-5039); **ka7csp@arrl.org**
Idaho: John J. Cline, K7BDS, 1475 Oriole Way, Boise, ID 83709 (208-376-6045); **k7bds@arrl.org**
Montana: Doug Dunn, K7YD, 216 Fiddle Creek Rd, Livingston, MT 59047-4116 (406-686-9100); **k7yd@arrl.org**
Oregon: Marshall D. Johnson Sr, KK7CW, 1645 9th Ave SE #171, Albany, OR 97322 (541-990-3127); **kk7cw@arrl.org**
Western Washington: Harry Lewis, W7JWJ, 10352 Sand Point Way NE, Seattle, WA 98125 (206-523-9117); **w7jwj@arrl.org**

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

East Bay: **Vacant**
Nevada: Dick Flanagan, W6OLD, 2851 Esaw St, Minden, NV 89423 (775-267-4900); **w6old@arrl.org**
Pacific: Bob Schneider, AH6J, PO Box 131, Keaau, HI 96749 (808-966-8146); **ah6j@arrl.org**
Sacramento Valley: Jettie Hill, W6RFF, 306 Saint Charles Ct, Roseville, CA 95661-5008 (916-783-0383); **w6rff@arrl.org**
San Francisco: Leonard Gwinn, WA6KLK, 2960 Blackhawk Dr, Willits, CA 95490-9704 (707-459-1871); **wa6klk@arrl.org**
San Joaquin Valley: Charles P. McConnell, W6DPD, 1658 W Mesa Ave, Fresno, CA 93711-1944 (559-431-2038); **w6dpd@arrl.org**
Santa Clara Valley: Glenn Thomas, WB6W, 502 Walnut Dr, Milpitas, CA 95035-4133 (408-263-9450); **wb6w@arrl.org**

Roanoke Division (NC, SC, VA, WVA)

North Carolina: John Covington, W4CC, PO Box 1604, Belmont, NC 28012 (704-577-9405); **w4cc@arrl.org**
South Carolina: James F. Boehner, N2ZZ, 525 Barnwell Ave NW, Aiken, SC 29801-3939 (803-641-9140); **n2zz@arrl.org**
Virginia: Carl Clements, W4CAC, 4405 Wake Forest Rd, Portsmouth, VA 23703 (757-484-0569); **w4cac@arrl.org**
West Virginia: Hal L. Turley, KC8FS, 6 Ives Dr, Huntington, WV 25705 (304-736-2790); **kc8fs@arrl.org**

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

Colorado: Jeff Ryan, K0RM, 6721 Northface Ln, Colorado Springs, CO 80919-1508 (719-260-6826); **k0rm@arrl.org**
New Mexico: Joe Knight, W5PDY, 10408 Snow Heights Blvd NE, Albuquerque, NM 87112 (505-299-4581); **w5pdy@arrl.org**
Utah: Mel Parkes, AC7CP, 2166 E 2100 North, Layton, UT 84040 (801-547-1753); **ac7cp@arrl.org**
Wyoming: Jay Ostrem, W7CW, PO Box 1993, Gillette, WY 82717-1993 (307-682-7839); **w7cw@arrl.org**

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

Alabama: Bill Cleveland, KR4TZ, 2113 Wildwood Pl, Mobile, AL 36609-2583 (251-661-3892); **kr4tz@arrl.org**
Georgia: Susan Swiderski, AF4FO, 772 Camelot Way, Norcross, GA 30071 (770-449-0369); **af4fo@arrl.org**
Northern Florida: Rudy Hubbard, WA4PUP, PO Box 843, Milton, FL 32572-0843 (850-626-0620); **wa4pup@arrl.org**
Puerto Rico: Victor Madera, KP4PQ, PO Box 191917, San Juan, PR 00919-1917 (787-789-4998); **kp4pq@arrl.org**
Southern Florida: Sharon T. "Sherri" Brower, W4STB, 736 34th Ter, Vero Beach, FL 32968-1226 (772-562-3240); **w4stb@arrl.org**
Virgin Islands: John Ellis, NP2B, PO Box 24492, Christiansted, St Croix, VI 00824 (340-773-9643); **np2b@arrl.org**
West Central Florida: Dave Armbrust, AE4MR, 3024 Salem Ave, Sarasota, FL 34232 (941-685-2081); **ae4mr@arrl.org**

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

Arizona: Clifford Hauser, KD6XH, 8741 N Hollybrook Ave, Tucson, AZ 85742 (520-744-9095); **kd6xh@arrl.org**
Los Angeles: Phineas J. Icenbice Jr, W6BF, 19323 Halsted St, Northridge, CA 91324 (818-349-3186); **w6bf@arrl.org**
Orange: Joe H. Brown, W6UBQ, 5444 La Sierra, Riverside, CA 92505 (909-687-8394); **w6ubq@arrl.org**
San Diego: Kent Tiburski, K6FQ, 1405 Greenbay St, San Diego, CA 92154 (619-575-1964); **k6fq@arrl.org**
Santa Barbara: Robert Griffin, K6YR, 1436 Johnson Ave, San Luis Obispo, CA 93401-3734 (805-543-3346); **k6yr@arrl.org**

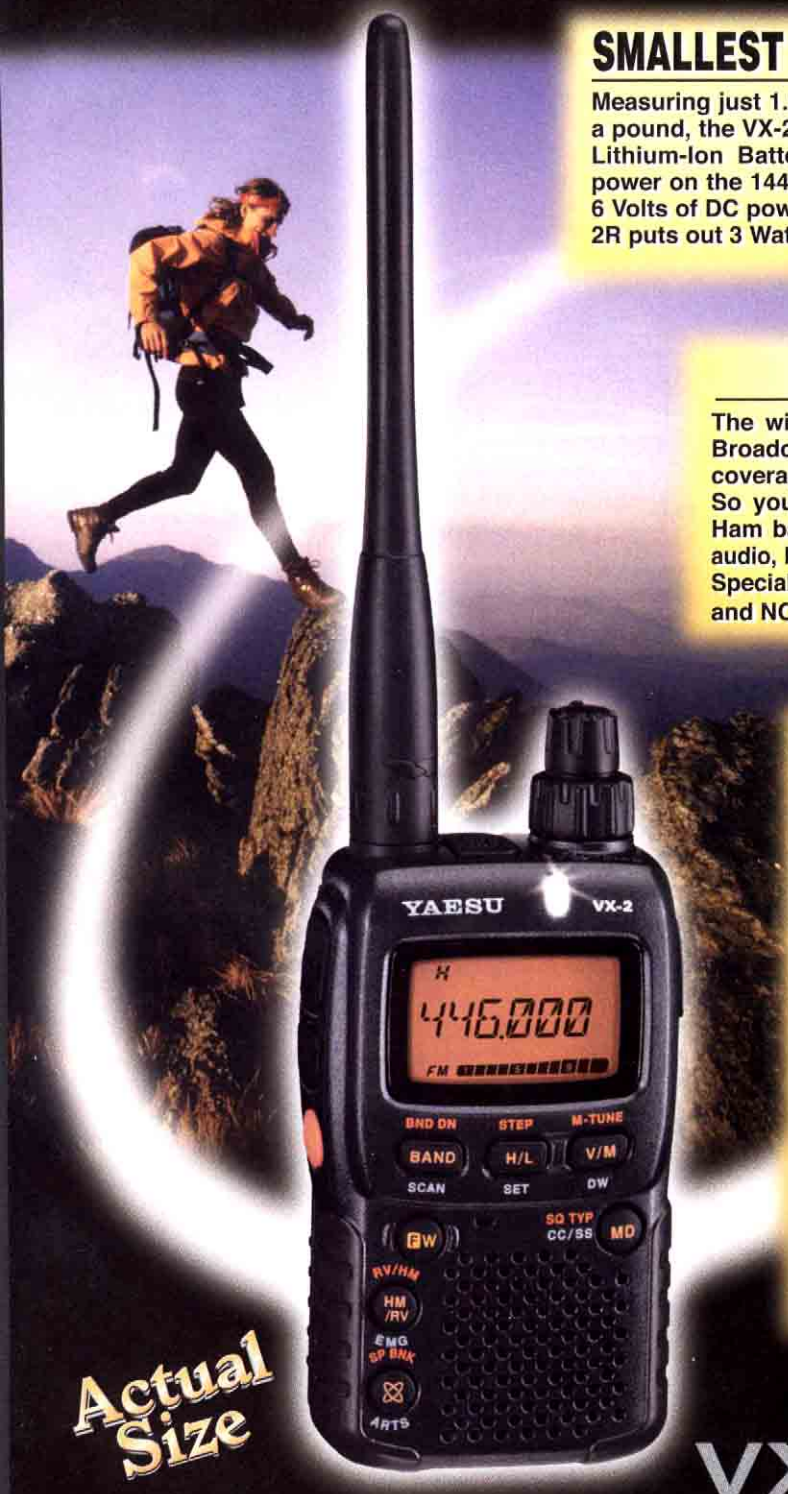
West Gulf Division (NTX, OK, STX, WTX)

North Texas: Roy Rabey, AD5KZ, 600 Morning Glory Ln, Bedford, TX 76021-2207 (214-507-4450); **ad5kz@arrl.org**
Oklahoma: John Thomason, WB5SYT, 1517 Oak Dr, Edmond, OK 73034-7408 (405-844-1800); **wb5syt@arrl.org**
South Texas: E. Ray Taylor, N5NAV, 688 Comal Ave, New Braunfels, TX 78130 (830-625-1683); **n5nav@arrl.org**
West Texas: John C. Dyer, AE5B, 9124 CR 301, Cisco, TX 76437-9525 (254-442-4936); **ae5b@arrl.org**

WORLD'S SMALLEST DUAL-BAND HT WITH WIDE-BAND RX

The world's smallest Dual-Band HT with up to 1.5 Watts* of output power is your high-tech gateway to the world, via VHF, UHF, Shortwave Broadcast, Marine and Aircraft bands, or WIRES™ Internet linking!

*1.5 W/144 MHz, 1 W/430 MHz



Actual Size

SMALLEST HT WITH HIGH OUTPUT POWER

Measuring just 1.9" x 3.2" x 0.9" and weighing less than 3/10ths of a pound, the VX-2R is supplied with a 1 Amp-hour (3.7 V) FNB-82LI Lithium-Ion Battery Pack, providing up to 1.5 Watts of output power on the 144 MHz band, and 1 Watt on 430 MHz. If you supply 6 Volts of DC power from the optional E-DC-21 DC Adapter, the VX-2R puts out 3 Watts on VHF, and 2 Watts on UHF!

WIDE BAND RECEIVE

The wide frequency coverage of the VX-2R includes the AM Broadcast band, continuous HF shortwave coverage, VHF/UHF coverage up to 729 MHz, plus 800-960 MHz (cellular blocked). So you won't miss any of the action, whether you're on the Ham bands or monitoring overseas news, FM broadcasts, TV audio, Marine or Air Band users, or Public Safety communications. Special memory banks allow quick recall of Marine, Shortwave, and NOAA Weather broadcasts (with "severe weather" alert).

HIGH PERFORMANCE

- WIRES™ Internet Linking Key and 9-Memory DTMF Autodialer
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- CTCSS/DCS Encode/Decode
- Automatic Repeater Shift
- Host of Convenient Scanning Features

New style High Capacity Compact Lithium-Ion Battery FNB-82LI (3.7 VDC 1 Ah)

Rugged Diecast Chassis

Supplied accessories:
FNB-82LI, Charger NC-85, Antenna, Belt Clip

*Simulated LCD.

VX-2R

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Dual Element Broadcast Microphone

The Heil CLASSIC contains the new Heil 'Studio One' wide range broadcast element and your choice of our famous HC-4 DX element, the HC-5 element or the Heil 'iC' ICOM element. A small element selector switch and our 'soft touch' PTT switch are on the back panel.

- Frequency Range is 50 Hz - 18 kHz
- Cardiod pattern without proximity effect
- Complete with YOUR call letters on the flag
- Removable base for inverted boom mounting
- An exact replica of a 1930 broadcast microphone (no plastic copy here, folks)

THE GOLDLINE
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The 'Goldline' dual element studio microphone, another innovative product from Bob Heil was created specifically for broadcast quality. Smooth articulate audio with a +4dB peak @ 2 kHz gives the Goldline excellent voice articulation along with its "big bottom" low end that is all so important for producing a well balanced studio quality transmitted signal.

*Features the Heil full range broadcast element and your choice of the HC-4 or the HC-5 Communications element
- 50 Hz - 16 kHz frequency response
- Shown with optional SM-1 shock mount

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THE PRO SET PLUS! Dual Mic Element Headset

Contains our HC-4 DX and the HC-5 rag chew elements. Also available with the new Heil 'iC' ICOM element. Highly efficient acoustically tuned speaker cavities. Strong ¼" stud speaker mounting swivels. Speaker Phase Reversal Switch allows you to change the sound field between the two speakers. An amazing feature - exclusive to Heil PRO SET PLUS! "There is NOTHING on the market like this new Competition Headset!"

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Unique new lightweight single headset system using the high Performance Heil 'iC' electret element.

- UP/DOWN and PTT in line switches
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- Left or Right boom position

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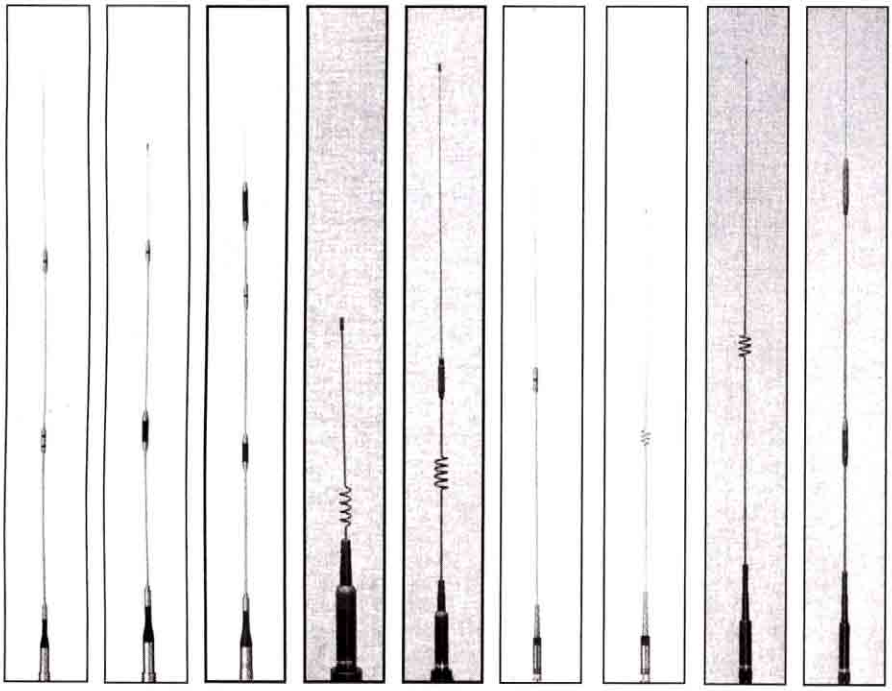
DIAMOND'S STATE-OF-THE-ART

VHF/UHF And HF/VHF Mobile Antennas– Maximum Performance Without Compromise

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



SG2000HD | SG7500A SG7500NMO | SG7900A | NR72BNMO | NR73BNMO | NR2C | NR770HA NR770HB | NR770HNMO NR770HBNMO | CR627B CR627BNMO

HV7A Mobile Antenna System

For New HF/VHF transceivers (Such as: IC706 series and FT100) NEW!

Optional Loading Coils

HVC7	40m
HVC14	20m
HVC18	17m
HVC21	15m

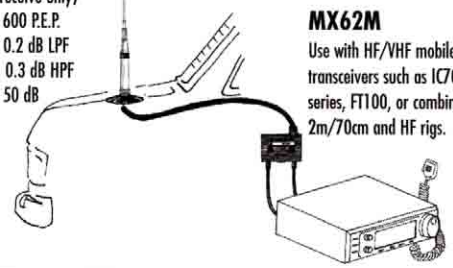
Recommended Antenna Mounts: K400C or K600M

MX62M Duplexer

Specifications:
HF/6m & 2m/70cm bands
1.6-56 MHz LPF
76–470 MHz HPF
(76–120 receive only)
Watts: 600 P.E.P.
Loss: 0.2 dB LPF
0.3 dB HPF
Isol.: 50 dB

The NEW HV7A has 5 band capability: 70cm, 2m, 6m, and 2 HF bands through use of loading coils. Foldover feature allows for easy access into low overhead buildings. Ideal for users of IC706 series and FT100 radios.

Bands Supplied:	10m/6m/2m/70cm
Opt. Loading Coils:	40m/20m/17m/15m
Power, P.E.P.:	HF 120w/VHF 200w
Mount Connection:	UHF
Length:	54"
SWR:	1.5:1 nominal



MX62M

Use with HF/VHF mobile transceivers such as IC706 series, FT100, or combine 2m/70cm and HF rigs.

SPECIAL FEATURES:

- Factory pre-tuned/no adjustment
- Highest Performance antennas
- NMO and UHF (PO) base styles
- 24 Kt gold plated connector pin
- No grounding required unless noted
- Fold-over feature on most models

FOLD-OVER

Patented One-Touch Fold-over Feature (Not available on NR72BNMO, NR73BNMO, & NR770SA.)

MODEL	BAND (MHz)	WATTS	CONN.	HT. IN.	ELEMENT PHASING
NR72BNMO*6	2m/70cm	100	NMO	13.8	1/4λ, 1/2λ
NR73BNMO	2m/70cm	100	NMO	33.5	1/2λ, 1-5/8λ
NR770HA7	2m/70cm	200	UHF	40.2	1/2λ, 2-5/8λ
NR770HNMO8	2m/70cm	200	NMO	38.2	1/2λ, 2-5/8λ
NR770RA	2m/70cm	200	UHF	38.6	1/2λ, 2-5/8λ
SG7000A*6	2m/70cm	100	UHF	18.5	1/4λ, 6/8λ
SG7500A	2m/70cm	150	UHF	40.6	1/2λ, 2-5/8λ
SG7500NMO	2m/70cm	150	NMO	41.0	1/2λ, 2-5/8λ
SG7900A*	2m/70cm	150	UHF	62.2	7/8λ, 3-5/8λ

* Not recommended for Magnet Mount
6 Grounding required.
7 NR770HB same specifications but in black finish.
8 NR770HBNMO same specifications but in black finish.
9 52-54MHz only

MODEL	BAND (MHz)	WATTS	CONN.	HT. IN.	ELEMENT PHASING
NR2C	2m	150	UHF	55.5	1/2λ+1/4λ
SG2000HD*	2m	250	UHF	62.6	1/2λ+3/8λ
SG6000NMO*6,9	6m	150	NMO	39	1/4λ
CR224A*6	2m/1-1/4m	150	UHF	68.5	7/8λ, 2-5/8λ
CR320A*6	2m/1-1/4m 70cm	200 100/200	UHF	37.4	1/4λ, 1/2λ 2-5/8λ
CR627B*6,9	6m/2m/	120	UHF	60	1/4λ, 1/2+1/4λ/
CR627BNMO*6,9	70cm	120	NMO	60	2-5/8λ

1/4λ rated in dBi.

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UP FRONT IN QST

DAVE HASSLER, K7CCC

Hamvention heaven: One well pampered visitor to Hamvention '03, Tom Marks, KE2QK, of the Cape May County (NJ) ARC, commented: "I don't know about the massage, but I have the sudden urge to go get a milk shake!" The little box at his feet could be a keyer…or a new type of paddle. There's more about what went on in Dayton during the third weekend in May in the article that begins on page 47 of this issue.

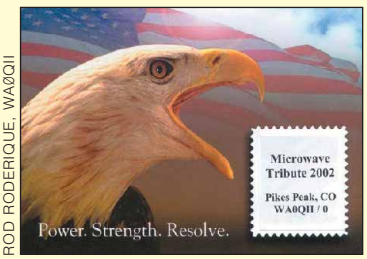
MIKE HOOVER, WB5AOC

A paddle would help: **Mike Hoover, WB5AOC, of Bryant, Arkansas, found Ham Creek next to US 59, just south of Henderson, Texas.**

HENRYK KOTOWSKI, SMØJHF

Henryk Kotowski, SV8/SMØJHF, spotted this friendly highway sign recently on the Greek island of Lesbos.

ROD RODERIQUE, WA0QII



On September 11, 2001, the NY2US/B Amateur Radio 10 GHz beacon atop the World Trade Center in New York was destroyed forever. As a tribute to the radio amateurs who perished in this disaster, the top of Pikes Peak, Colorado, was chosen to be symbolic for a *Microwave Tribute 2002*. On September 7, 2002, using compact 10 GHz microwave stations, Tim Ballinger, W0/GØRYR, and Rod Roderique, WAØQII/Ø, made SSB contacts between Pikes Peak (DM78) and five nearby grids (DM77/78/79/88/89). This VUCC accomplishment is dedicated to our fellow amateurs who are now QRT.

A QRP Adventure in OX-land

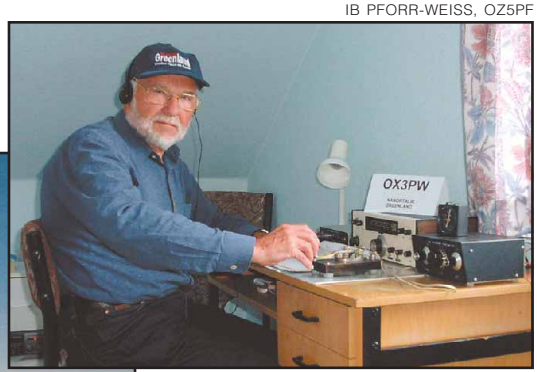
By Ib Pforr-Weiss, OZ5PF

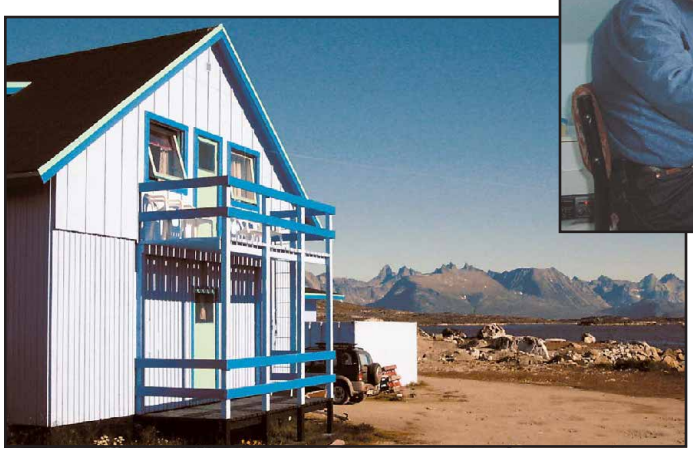
Last August, I (with portable QRP station in tow) visited the town of Nanortalik in southwest Greenland. My station consisted of an Argonaut 509 transceiver, a 12 V power supply, a manual ATU (pi-type), Morse key, mic and a roll of antenna wire. Total weight: about 6 kg. The owners of the Kap Farvel Hotel kindly gave me permission and help to set up an antenna. My room was on the first floor in the gable with an outside balcony. From the balcony and to a 5 m high pole I was able to stretch a 30 m long wire antenna, 5 m above the ground oriented east to west. With the window half open I could connect the antenna to the ATU. The ATU was further connected to the Argonaut with a short length of coax and grounded to the hotel's water heating system.

Since I had only limited time for ham radio, I used only 20 and 15 meters, but managed to make QSOs on CW and SSB with most of the European countries and several states in the USA. I received many fine reports. The Greenland Telecom authority had permitted me to use OX3PW, the call allocated to me back in 1953 when I served three years as radio operator on Frederiksdal Loranstation located in the Nanortalik area but closed down about 20 years ago.

This 10 day trip to Greenland was a very good experience, and to once again operate a ham station in OX-land was one of the highlights.

IB PFORR-WEISS, OZ5PF





Ib Pforr-Weiss, OZ5PF, an ARRL member from Kokkedal, Denmark, enjoyed revisiting Nanortalik, Greenland, last year, where he had operated in the early 1950s.

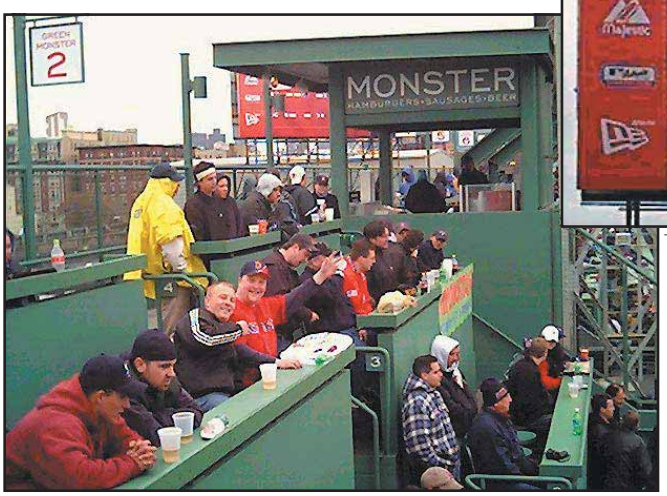
Hotel Kap Farvel with the balcony. The "radio room" was to the right of the balcony door.

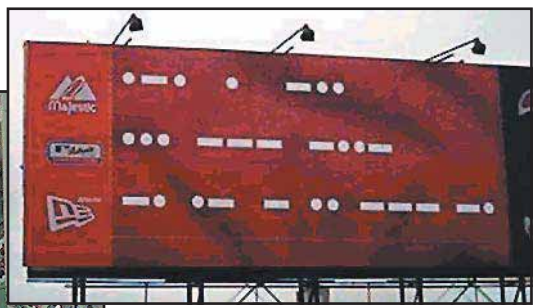
Dual-Purpose Get-Together at W5RRR

A group from the Johnson Space Center Amateur Radio Club is shown at a recent spring cleaning of JSC club station W5RRR. The awards were presented to the club by Carolynn Conley, KD5JSO, of the NASA Johnson Space Center International Space Station (ISS) Mission Integration and Operations Office. One award is an autographed picture of the ISS Expedition 1 Crew (ISS Expedition One Commander Bill Shepherd, KD5GSL, Soyuz Pilot Yuri Gidzenko and Flight Engineer Sergei Krikalev, U5MIR) with the citation, "To the JSC Amateur Radio Club with thanks from the ISS Expedition 1 Crew." A Special Flight Achievement Award was presented to the JSC ARC ISS Support Team from the Space and Life Sciences Directorate at JSC. It reads, "For your dedication to supporting communications between ISS crews, families and friends though operating, on your own personal time, the W5RRR amateur radio equipment."—*Ken Goodwin, K5RG*

KEN GOODWIN, K5RG

From left to right, back row: Carolyn Conley, KD5JSO; Kent Castle, W5OJ; Robert Eaton, KD5DYZ; Club President Leslie Eaton, KD5DYY; Larry Dietrich, WD8KUJ. In the front row: Vice President Matt Bordelon, KC5BTL, and Erich Bordelon.

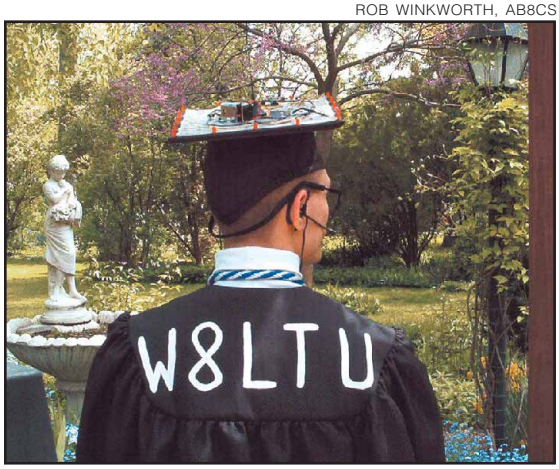




TOM ANTIL, N1XWA

Red Sox Nation: **In case there was any question about what they think of the Red Sox up in Boston, this billboard supplies a definitive answer! The photo was taken from the new seats atop the left field wall, also known as the Green Monster.**

ROB WINKWORTH, AB8CS



For his undergrad commencement, Rob Winkworth, AB8CS, turned his mortar board into a circuit board—with ATV! Rob is the founder of the Lawrence Tech Wireless Society (W8LTU), and gave the audience a grad's-eye view on a handheld LCD. He graduated Summa Cum Laude from the Southfield, Michigan school, and credits ham radio for keeping his engineering skills sharp.

No-Cost Coax Protector: When operating portable, I didn't always want to have to take my coax and antenna down. To keep the coax dry, I first get a 20 ounce cola bottle and cut off the lower section, using the label for a guide. I use a knife to cut the bottle and a pair of scissors to trim the rough cut. About 2 feet of nylon line lets me be flexible as to where I hang the antenna. I always burn the ends to stop the line from unraveling. I then make a slip knot for the coax end to slip it over the coax. Then I thread the string through the bottle and use the cap to secure the string. This keeps the coax dry and ready for use. It's cheap and easy, and the plastic bottle stays out of the landfill!
—*Michael Thigpen, AB4MT, Anderson, Alabama*

MICHAEL THIGPEN, AB4MT

AB4MT uses a soda bottle to keep his coax moisture-free while his portable antenna is deployed.

hy-gain HF VERTICALS...

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

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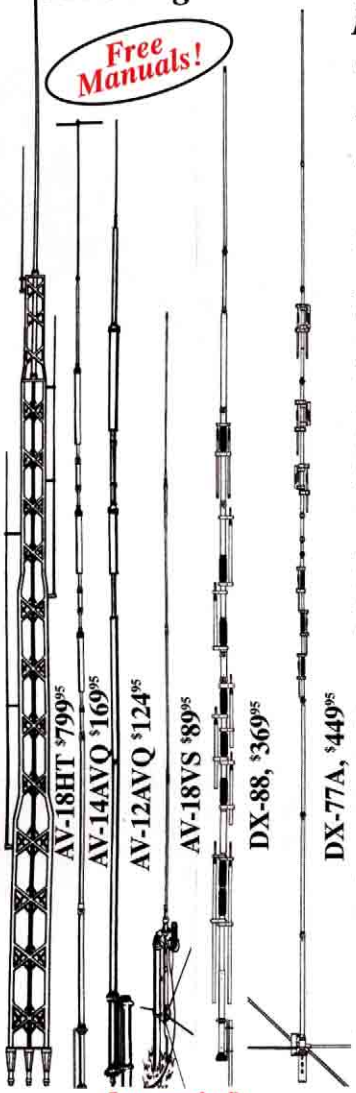

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All hy-gain multi-band vertical antennas are entirely self supporting -- no guys required.

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.

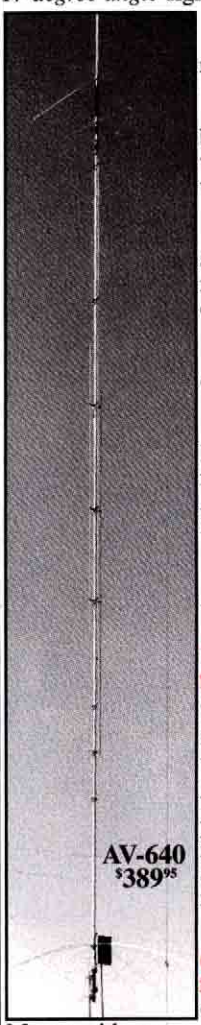
DX-88, $369.95. (10, 12, 15,17,20,30,40,80 Meters, 160 Meters optional). 25 ft., 18 lbs. All bands are *easily* tuned with the DX-88's *exclusive* adjustable capacitors. 80 and 40 Meters can even be tuned from the ground without having to lower the antenna. Super heavy-duty construction. DX-88 OPTIONS: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

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



No ground or radials needed
Effective counterpoise replaces radials and ground.

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*[R] insulated wire. Aircraft quality aluminum tubing, stainless steel hardware.

hy-gain[R] 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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Cord and stand sold separately.

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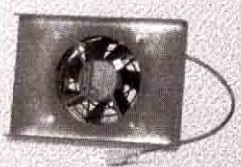
307 Speaker Series – External front-firing communications speakers, available in light grey (307G), black (307B), or charcoal grey (307C), are a terrific addition to any receiver or transceiver. Cabinet and large 4-inch speaker designed specifically for amateur radio use. *$98.*

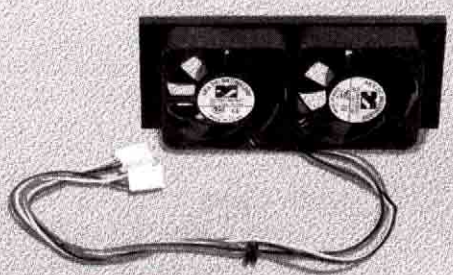
963 Power Supply – Hash-free switching design. 13.8 Vdc at 25 amps continuous, 30 amps peak. Small, lightweight (4 lbs!) and 90-264 VAC, 50/60 Hz input make 963 usable from just about anywhere. *$169.*

937 Power Supply – 13.8 Vdc at 11 amps for powering HF or VHF transceivers of up to 50 watts output. 115 VAC input. *$89.*

302 Series Tuning Knobs – Armchair tuning and direct frequency entry for your Jupiter (302J), Pegasus (302), RX-350 or Orion (302R). Function buttons allow control of some radio features. *$139.*



310 Fan Kit – NEW! Hole-free allen screw attachment to transceiver heat sink. 13.8 Vdc powered. Use with Orion, Jupiter, Pegasus, all Omnis, Corsairs, Tritons, Paragons. *$39.95.*



308 Fan Kit – Slide-on attachment to the Argonaut V transceiver. *$15.*

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DOWN WITH BPL

♦ I have sent the following comment to the FCC and I urge my fellow hams and ARRL members to let their feelings be known. We must protect our portion of the HF and VHF spectrum!

As an Amateur Radio operator for 40 years I am deeply disheartened to learn of the FCC's favorable attitude to the possible widespread use of BPL. Without discussing the technical aspects, let's suffice it to say it has been well documented how disruptive it is to HF and VHF communications. The amateur community is an irreplaceable resource of emergency communication. Countless times "hams" have been there to provide lifesaving communication during times of natural disasters—hurricanes, tornadoes, floods, earthquakes, etc—and during man-made disasters such as war and the 9/11 terrorist attacks.

I can't believe that the FCC would go against its own dictum and allow such emissions that would disrupt communications that are so vital to the safety and well being of our country. If BPL is allowed to go forward it would cause irreparable harm to American Amateur Radio. How could anyone even attempt to develop radio skills such as emergency nets, CW, digital and satellite communication if the radio spectrum is impenetrable due to this interference? Please continue to protect the airways, as the FCC has so admirably done in the past, and allow the amateur community to continue to flourish. Please, do not allow the implementation of BPL.—*Jim Costanzo, KI4VH, Tampa, Florida*

[*Editor's Note:* For more on BPL, see "Understanding the FCC's Broadband Over Power Line (BPL) *Notice of Inquiry*" on the ARRLWeb, **www.arrl.org/news/features/2003/06/19/2/**.]

PRESSING OUR CASE WITH CONGRESS

♦ They enter through security, uniforms pressed, badges shined, well groomed, all 250 of them. Once in the buildings of Congress they spread out. Each group of three or four has made appointments with various Members of Congress. At each meeting they press their case, "we need more funding for fire fighters."

Is this an effective approach? As a staff worker for a Member of Congress, I can tell you it is very effective. Over a period of three days these firemen and women meet with the staff and/or Congressman or Congresswoman in each of the 435 offices. It is obvious they are informed and committed enough about their needs to do something about it.

What about ham radio operators? Do we really care about our future? At this moment there are two very critical bills in Congress (in the US House they are HR 1478, which deals with covenants and HR 713, which protects our spectrum) that could be passed into law if ham operators would get busy, contact Representatives and Senators, and press for their support.

Again, as a Congressman's staff worker, I currently see very little effort being made in this regard by hams. Our office (Congressman Roscoe Bartlett, R-MD), for example, has received very few e-mails or phone calls from the Amateur Radio community.

The League and its officers are doing their best, but there is only so much that any one person can do. What I believe is needed is an organized, coordinated effort to alert Members of Congress to our needs. Can we get at least 100 hams into the halls of Congress, with handhelds and multimedia laptops to show the new ARRL CD, and with identifying logos, on a Wednesday and Thursday (when both Houses of Congress are in session)? I think such an effort would be extremely effective.—*Pudge Forrester, W4LTX, Hagerstown, Maryland*

NOT ALWAYS SILENT

♦ There appears to be much discussion lately about the recruitment of new members, particularly young people, into the Amateur Radio community. We talk about our mentors or "Elmers." I, like most, had an Elmer, too. The difference was that he didn't know that he brought me back into Amateur Radio.

My wife, Karen, is in the home health service and mainly assists the elderly. About 5 years ago, she began to care for an elderly gentleman who resided in Melbourne Beach, Florida. One day she mentioned to me that he was a ham radio operator and told me how she would help him get ready for his daily 8 AM "net." Shortly thereafter, I had the privilege of meeting him. He was a very modest person with remarkable credentials—a captain during WW II and a retired professor of physics.

During regular visits, we would casually discuss Amateur Radio but he never coaxed me into obtaining a license. At the time, he was 90 years of age and had been in Amateur Radio over 60 years.

About two years ago in July, he passed away in his home from heart complications at age 93. During those three years, Karen and I had become very attached to him and greatly felt the loss of a dear friend. There was some question as to what to do with all of his radio equipment. I remembered back as a kid in 1965 when I had obtained a non-renewable Novice class license and due to other circumstances let it expire without an upgrade. I remembered the fun I had making those 40 meter CW contacts on those cold Ohio winter nights and the good times my dad and I would have building those antennas. One day I knew I would get back into the hobby. Well, the time had come—I arranged with the family to acquire his boxes of radio equipment.

I found a coil of wire and strung it outside, connected it to his Yaesu FT-757 and listened. There was magic in the air. The radio adrenaline was flowing in my veins once again.

In November, I passed the Technician class exam and the code requirement. In December, I passed the General class exam. With a desire to continue, I passed the Amateur Extra class the following March. I am now KG4QBW working CW on 40, 20 and 15 meters and thoroughly enjoying it.

My Elmer and our dear friend was George M. Guilley, W8LKJ. His equipment has decals with his call sign labeled and these will definitely remain in honor of his contributions to Amateur Radio for so many years.

So many ideas have come to mind since I have become active once again. There is the desire to develop a vintage radio booth to display at hamfests or volunteering time to the local Boy Scout Troops to help obtain badges. I am also interested in teaching classes to help others pass their exams. I have a young nephew who is presently learning code and I have a feeling that he will be taking his Technician exam soon.

So, Mr Guilley, when you are looking down upon us, you can be rest assured that your key is not "silent."—*David Silvey, KG4QBW, Satellite Beach, Florida*

TIME TO CHANGE

♦ In recent issues, members have suggested dropping the word "amateur" because it does not convey a professional perception. I think this suggestion is appropriate for ARES because the connotations of the words "amateur" and "emergency" are almost contradictions. It's time to change ARES to "American Radio Emergency Services." And, while ARRL is at it, why not design a new ARES patch that recognizes the holder's EM-Comm certification level. Amateurs who are trained to be professional should be recognized as pros.—*Walt Heeney N8LJM, Stow, Ohio*

[*Editor's Note:* There will soon be a new patch recognizing those who have completed the ARRL Emergency Communications course. See **www.arrl.org/shop/** for availability.]

LEARNING THE ROPES

♦ Not being a General class operator as of yet, I listen a great deal to "learn-the-ropes" as they say. I've been told that by doing so will make me a better operator learning from the older, established and more experienced operators.

Well, I must say that over the past year I have learned a great many things good and bad. The most notable and the reason for this letter is the use of bad language and very off-color remarks made by operators on HF, VHF and UHF. It seems that these types of communication skills are becoming commonplace, which the amateur community and the FCC apparently do not mind.

To my knowledge, the Amateur Radio community is somewhat "self-regulating" in that other all hams are responsible in helping or assisting in the regulating of our hobby. Being a "newbie" to the hobby, I welcome help and assistance from anyone, no matter what the advice.

If we do not take control of *our* hobby, by the time things get out of hand, the FCC will most certainly take control and brother watch how *our* hobby changes hands.

As an amateur operator, it is my responsibility to maintain my station in accordance with the regulations set forth by the FCC and other agencies and most of all have fun. That is the real key to this whole thing, having fun and enjoying ourselves. If we must behave in this manner then meet eye to eye or pick up the telephone and have a blast. We must remember that the frequencies that we use are for all operators, regardless of race, creed, political affiliation and nationality. As one of these operators we give respect and expect the same in return. I know people that have not become hams and a number of hams that left the hobby due to their experiences on the ham bands which were not much different than heard on 11 meters.

By truly doing our part in creating a better hobby, it can only help the amateur community as a whole and continue our fine traditions.—*Glenn R. Breaux, KD5NVC, Lafayette, Louisiana*

SO MANY STATES, SO LITTLE TIME

♦ May I direct your attention to the April 2003 issue, page 39, Figure 1, wherein it states: "The grid squares shown for the United States are used by VHF enthusiasts to quickly determine locations of stations."

I would respectfully point out that the "grid squares shown" are for 48 of the United States, and not "for the United States." The United States consists of 50 states, as well as several commonwealths, territories and "unorganized territories." —*Ted Brattstrom, NH6YK, Volcano, Hawaii*

LET'S USE RADIO

♦ Re "FCC Cancels Amateur Service" [Correspondence, June 2003, p 24]:

Sam, N8VES, was on the mark until he told us to use *Echolink*! One of the reasons he is hearing fewer people on the radio is that many hams are using their PCs to talk to each other. Over 100,000 are already registered users of *Echolink*.

Certainly K1RFD's *Echolink* is extremely well written and refined software. In fact, Jonathan just received a Special Achievement recognition at the 2003 Hamvention for his popular creation.

It has many wonderful features that can link repeaters over a wide area for important bulletins and emergency use. However, some of its capabilities may be having a negative impact on the use of all of our point-to-point HF, VHF and UHF spectrum.

Loading up repeater time with PC chattering may make repeaters sound more busy, but what about the non-repeater segments of our VHF/UHF bands and 1.8-30 MHz? They are all wide open to the commercial interests.

If a Technician can use his 1-W handheld transceiver to easily talk across the world via *Echolink* through his local 2 meter repeater, what is his incentive to get a higher grade license? PC voice chat may have unwittingly taken away one of our greatest reasons for upgrading. Maybe *Echolink* registration should be restricted to Tech Plus and higher licensees—that would require a lower class licensee to at least have a radio to talk with other hams.

Remember...every hour talking via your PC is another hour of not using *your* radio!

If we want to see *all* of our radio spectrum protected, we should be encouraging the use of radios.—*Jay Kolinsky, NE2Q, Pound Ridge, New York* QST

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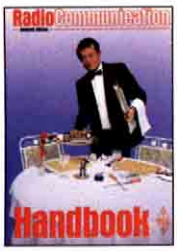

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One of the most comprehensive guides to the theory and practice of Amateur Radio communication. Find the latest technical innovations and techniques, from LF (including a new chapter for LowFERS!) to the GHz bands. For professionals and students alike. 820 pages.

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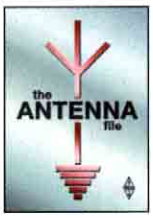

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The best work from the last ten years of RSGB's *RadCom* magazine. 50 HF antennas, 14 VHF/UHF/SHF, 3 on receiving, 6 articles on masts and supports, 9 on tuning and measuring, 4 on antenna construction, 5 on design and theory. Beams, wire antennas, verticals, loops, mobile whips and more. 288 pages.

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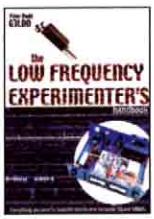

The Low Frequency Experimenter's Handbook

Invaluable reference and techniques for transmitting and receiving between 50 and 500 kHz. 112 pages.

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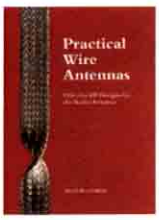

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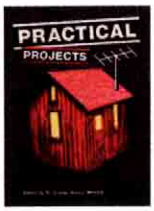

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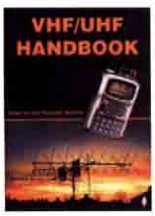

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The theory and practice of VHF/UHF operating and transmission lines. Background on antennas, EMC, propagation, receivers and transmitters, and construction details for many projects. Plus, specialized modes such as data and TV. 317 pages.

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With a variety of simple techniques, you can build high performance antennas. Create compact multi-band antennas, end-fed and center-fed antennas, rotary beams, loops, tuning units, VHF/UHF antennas, and more! 208 pages.

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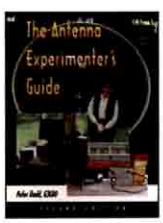
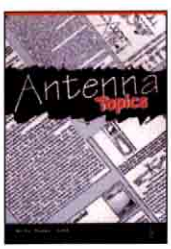


The Antenna Experimenter's Guide

Build and use simple RF equipment to measure antenna impedance, resonance and performance. General antenna construction methods, how to test theories, and using a computer to model antennas. 158 pages.

ARRL Order No. 6087—**$30**



Antenna Topics

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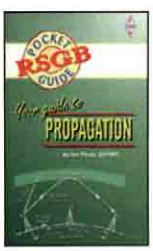

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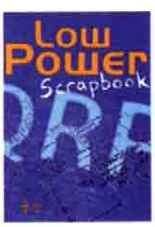

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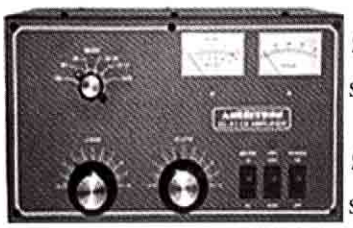

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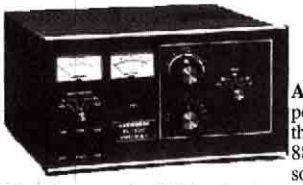

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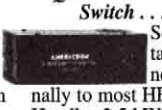

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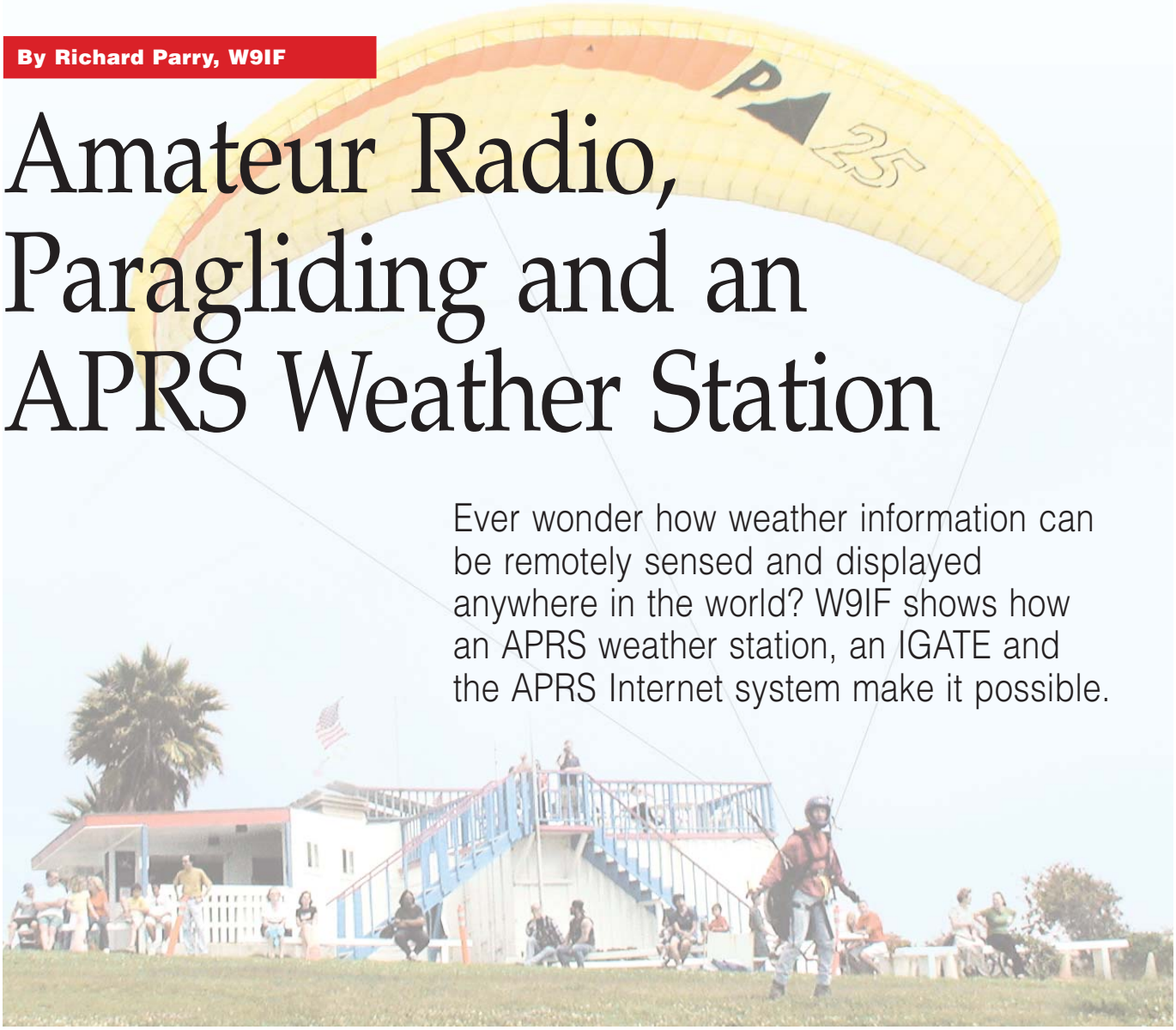
By Richard Parry, W9IF

Amateur Radio, Paragliding and an APRS Weather Station

Ever wonder how weather information can be remotely sensed and displayed anywhere in the world? W9IF shows how an APRS weather station, an IGATE and the APRS Internet system make it possible.



Amateur Radio is one of the best things that ever happened to me. While building transmitters, antennas, electronic keyers, radioteletype modems, APRS (Automatic Position Reporting System) trackers and a myriad of other projects, ham radio provided an outlet for my creative side and a wonderful learning environment. My high school days were spent installing invisible antennas on the roof of my apartment building in the Bronx, New York City and working DX on 20 meter CW. Those times bring back fond memories of my formative years. Amateur Radio also provided the spark that eventually led to my career as an engineer. More recently, it has allowed me to more fully enjoy the sport of paragliding.

When I tell friends I paraglide, they usually give me a funny look as they think of an "extreme" sport. I'll admit the sport is not for folks afraid of heights, but neither is it limited to the skateboarding generation. It is for anyone wishing to experience the thrill of non-powered flight. It doesn't take a great deal of experience or physical ability. In fact, most pilots take their first flight within a few days of beginning instruction. Paragliding and the sister sport, hang gliding, are referred to as "foot launched" sports. They literally allow anyone to soar like an eagle and reach for the clouds.

The Torrey Pines Gliderport in San Diego, California, where I fly, dates back to 1928. It is one of the premier soaring sites in the United States. National hero Charles Lindbergh flew there. The two-mile ridge, overlooking the Pacific Ocean, gives ample flight opportunity for paragliders, hang gliders, radio-controlled airplanes and full-size sailplanes. The tranquil sea breeze coming off the ocean allows flying with minimal expertise, which makes it a great place to learn. Inland soaring sites are also popular, but unpredictable weather conditions require more skill.

Paragliding allows you to enjoy a short flight along a ridge or a lengthy cross-country flight. Ridge soaring is possible when wind coming from the ocean hits the ridge and is directed upward. The upward movement of air creates lift for flight. With this lift, I have had many flights lasting more than an hour. If you are more adventurous, you can try cross-country paragliding where flights can last all day and cover distances of several hundred miles.

When my wife, Sharon, KC5PVL, and I began taking lessons, it was not uncommon to drive to the Gliderport only to learn that weather conditions would not support flight and we had wasted a trip. We often stayed for hours hoping that conditions would change but all too often they didn't. "Para-waiting" is the name affectionately

given to waiting for changing weather conditions. It is no more exciting than watching paint dry.

Like other outdoor sports, you are at the mercy of the weather. However, even when the sun is shining, the temperature is mild and the sky is clear, it doesn't mean you can fly. Flight requires lift. A powered airplane can generate lift anytime, using its engines to provide forward thrust. With sufficient speed, the uneven flow of air over and under the airplane wing results in lift and ultimately...flight. Paragliders do not have a power source, so they rely on Mother Nature for lift. Temperature, humidity, barometric pressure, terrain, wind speed and direction, and numerous other factors determine if flight is possible. Being able to determine those weather conditions while at home, via the Internet, would be a great asset, since it would tell us if flight would be possible. More importantly, it would allow me (and other pilots) to understand those weather conditions, which would ultimately make for safer flights.

APRS...The Perfect Solution

Weather conditions at my home, 15 miles from the gliderport, tell me nothing about conditions at the gliderport. In fact, weather conditions less than a mile inland from the ocean can be significantly different from conditions on the coast. Therefore, to determine if conditions are sufficient to support flight, we are interested in microclimate weather, which is the condition within a very small geographical area. Microclimate weather conditions can only be determined by a weather station at the site. Unfortunately, the infrastructure at the gliderport is very limited. There are no commercial ac power sources and phone lines are limited. For this reason, an APRS weather station is the perfect solution to provide communications from the gliderport to the local APRS network and, ultimately, to the Internet, where anyone in the world can monitor those conditions.

I am an APRS enthusiast and have installed several APRS mobile trackers, but installing an APRS weather station was breaking new ground for me. It was a learning experience with surprises and setbacks but, in the end, turned out to be a huge success.

The system described here has been operational for many months and has allowed hundreds of pilots to determine flying conditions remotely. The Web site is very popular; it typically gets 200 visits per day and sometimes as many as 400.

Weather Station Hardware

Many weather station systems are available that support APRS. If you want to build your own, the Tucson Amateur Packet Radio (TAPR) offers the T-238, a low cost APRS weather station developed by Will Beals, NØXGA, and Russ Chadwick, KBØTVJ (**www.tapr.org/tapr/html/Ft238.html**). For a compact low power APRS weather station, see µWeather (**www.rxcomm.net**), developed by KØRX. It is a single board weather station with temperature, pressure and humidity sensors located on a printed circuit board. It also has a real-time clock and generates 1200 baud AFSK weather formatted packets so a TNC is not needed; it connects directly to a radio. Commercial products are also available, such as those from Davis Instruments, RadioShack, Oregon Scientific and Peet Brothers. I selected the Peet Brothers Ultimeter 2000 (hereafter abbreviated U2K). It was picked because of its popularity and the availability of software (*Meteorologica* from Jonathan Bradshaw, N9OXE/M1EUY) that supports both the U2K and *Linu*x. However, that software is not used in the weather station discussed here. [*QST* reviewed the Ultimeter 2100, a similar, but enhanced, version of the 2000, in the January 2003 issue.—*Ed.*]

Purchasing a weather station can be like purchasing a camera. The number of options and "add-ons" is staggering. A rain gauge, sun shield and humidity sensor are a few of the more frequently purchased add-ons. Computer software for logging, displaying and analyzing weather data is also available. You can also purchase a remote modem that interfaces the weather station to a telephone line to allow the system to be remotely accessed by placing a phone call to the unit. Fortunately, for my paragliding weather station, all sensors I needed were included in the base configuration. The U2K comes with an anemometer to sense wind speed and direction and an outdoor temperature sensor. The supplied 40 foot cable connects the anemometer to the control head, and the temperature sensor comes with a 25 foot cable. Extension cables are available, but extending the length of the temperature sensor can result in small errors. A barometric and indoor temperature sensor is also included with the purchase of the weather station; both are located inside the display console, so no additional wiring is needed. Figure 1 provides a block diagram of the key components of the APRS weather station.

There wasn't much I could do about protecting the weather station's outdoor sensors from the harsh Pacific Ocean's salt air, but the electronics (TNC, hand-held transceiver and U2K) needed protection. I gave this a lot of thought and effort. I considered an outdoor sprinkler system enclosure or a weatherproof electrical box. Since the equipment would be inside a small shack, however, it wasn't mandatory that it be completely weatherproof. I decided on a dustproof and waterproof camera enclosure, the kind with thick foam that can be custom cut to safely hold and protect fragile camera equipment. My intent was to close the enclosure securely to keep salt air out. I would also add a desiccant to remove residual moisture. This was a great idea until I remembered the barometric sensor is located inside the U2K. Making the enclosure airtight would result in false pressure readings. I opted to leave the enclosure lid open slightly to allow the pressure inside and outside the enclosure to equalize.

Figure 2 shows the enclosure and the main components of the system, a weather station console, TNC and VHF transceiver. I removed the battery from the radio since

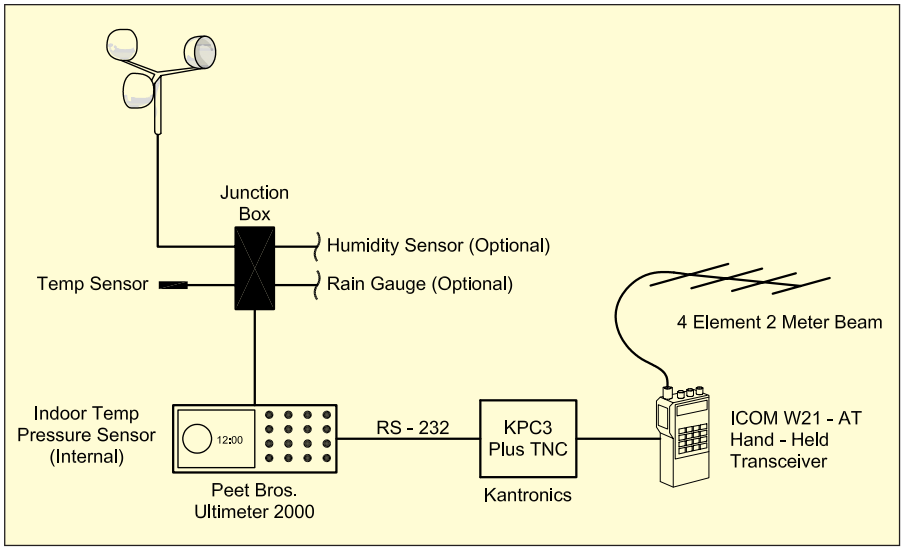


Figure 1—A block diagram of the W9IF-4 APRS weather station.

Figure 2—Top view of the weather station in its weatherproof enclosure. The Ultimeter 2000 (Peet Brothers) is in the upper left and a Kantronics KPC-3 Plus TNC is in the lower left. An ICOM IC-W21AT on the right is used for communication.

Figure 3—Bottom view of the APRS weather station. The terminal block provides for power distribution, while the junction box in bottom center interfaces the outdoor temperature sensor and anemometer.

it wasn't needed. I could have used an aluminum plate to fasten the equipment, but decided on simple cardboard, which was flexible and easy to work with.

Figure 3 shows the underside of the weather station equipment. A terminal block is used for 12 V dc power distribution. The weather station junction box provides a quick and easy method to connect the weather sensors.

The San Diego IGATE

The Torrey Pines Gliderport is located in San Diego, a large metropolitan area supported by an active APRS network. However, it is poorly located to support reliable communication. To the west is the Pacific Ocean; RF transmitted in that direction is of no use. To the east are mounds and small hills that attenuate RF signals to the main San Diego APRS network. Initial tests of the W9IF-4 APRS weather station confirmed my fears…most packets were not making it to the network and, therefore, not to an IGATE (Internet Gateway) for delivery to the APRS IS (APRS Internet System). Getting packets to an IGATE is critical. It provides the link to the **findu.com** database, developed by Steve Dimse, K4HG, where weather data is stored and eventually retrieved. Because APRS uses UI (Unnumbered Information) frames, if a packet is lost, it is lost forever; there are no re-transmissions. Every lost packet results in loss of data, so improving packet error rates was imperative in order for this project to be successful.

In some weather conditions, losing packets sporadically might be acceptable. However, when weather conditions change rapidly, every packet of data is valuable since it gives local residents advance notice that can be used to save lives and property. For this reason, APRS weather packets are transmitted at relatively frequent intervals of 5 minutes. Paragliding is unimportant compared to saving lives and property. Nevertheless, having frequent and reliable weather packets allows pilots to react quickly to take advantage of flying opportunities.

Losing packets was a major setback that could best be overcome by adding an APRS IGATE close to the weather-station. I was fortunate that my employer, Qualcomm, Inc is located just 3 miles from the gliderport and was willing to allow me to install the necessary equipment. I was also fortunate that Qualcomm has an amateur radio shack that I could use to house the equipment and connect to the Internet. I set up a dedicated *Linux* system running *aprsd* written by Dale Heatherington, WA4DSY. Once a packet travels the short distance to the IGATE, it is routed to the APRS IS.

Figure 4 shows a block diagram of the W9IF-7 IGATE system. Received packets are sent to the Internet where they are stored in the **findu.com**, MySQL database. When a user wishes to display weather conditions, he or she connects to the weather station Web page (**w9if.net/cgi-bin/torreywx/wx.pl**) and executes a CGI-Perl script, which connects to the **findu.com** database to retrieve the data. Once the data is received, it is analyzed and displayed.

After I installed the IGATE, packet error rates were improved, but still were high. Digging deeper, I discovered that the RF noise level was extremely high at the IGATE receiving station. This was due to the close proximity of the APRS antenna to other commercial antennas located on the roof of the Qualcomm building. Those commercial stations were overloading the front end of the receiver, causing severe intermodulation distortion. The solution was the installation of a 2 meter intermod band-pass filter. I installed a DCI-146-4H filter made by DCI Digital Communications (**www.dci.ca**) and one more problem was solved.

I was sure success was close at hand, but Murphy struck again. Packet error rates were improved after the installation of the intermod filter, but I was still losing almost half of the packets. I was beginning to run out of options. It occurred to me that increasing the transmit signal would help. But rather than increasing the power of the transmitter, I decided to reexamine the antenna system to increase the signal level.

I was using a simple magnetically mounted mobile antenna at the W9IF-4 weather station. It was a good first approximation, but it wasn't doing the job. I de-

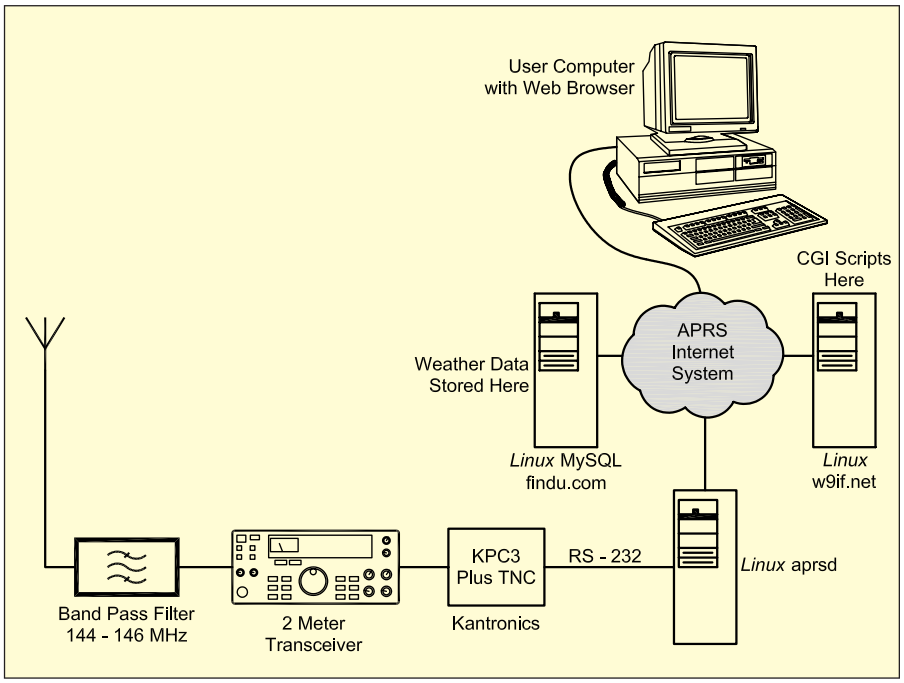


Figure 4—The APRS weather station IGATE block diagram. The *Linux* system runs *aprsd* software and forwards weather packets to the findu.com database. Weather data is displayed on a user's Web browser after retrieval from the database.

RICHARD PARRY, W9IF

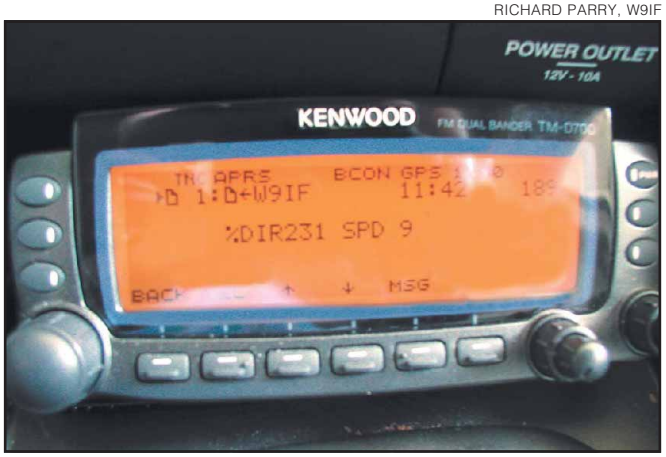


Figure 5—A Kenwood TM-D700A with voice synthesizer provides both visual and aural notification of weather conditions. The D700A speaks wind speed and direction without requiring driver visual interaction.

cided to change to a 4-element 2 meter Yagi antenna, which would give me gain and direct the RF to the IGATE, rather than sending most of it out over the Pacific Ocean, where it would be wasted. Finally…success! Packet error rates were acceptable…less than 5%.

Installation of a receiving node just 3 miles from the weather station had several advantages. First, since I had installed my own IGATE, I did not need to use the local APRS network to transmit packets to the APRS IS. This meant I could specify a very short APRS path from the weather station TNC, W9IF-4, to the IGATE TNC, W9IF-7. Using an efficient path is particularly important in an APRS weather station application, where packets are broadcast frequently (5-minute intervals). A shorter path means less traffic and therefore more bandwidth for other users.

The second advantage of the installation of the W9IF-7 IGATE is the increased coverage it provides to the metropolitan APRS network. It is configured as a RELAY only digipeater. The weather station, W9IF-4, can also be configured as a RELAY only digipeater, but its remoteness and relative proximity to the IGATE makes its use as a digipeater unnecessary.

WIDE-N digipeaters located on nearby mountaintops that provide wide area coverage are not needed. For this application, the goal is to transfer weather packets to the Internet, which is accomplished efficiently by the W9IF-7 IGATE. Broadcasting weather data by RF to the local network is of little, if any, benefit.

RICHARD PARRY, W9IF

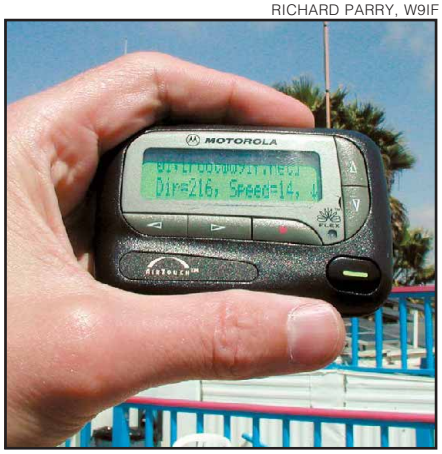


Figure 6—A commercial pager can be used to display weather conditions. Here, the display shows that the wind is from the SSW (216°) at 14 mph.

Automated Notification

Being able to ascertain weather conditions from anywhere via the Internet using a Web browser is a very powerful tool. But, being able to ascertain weather conditions while mobile would be even nicer. Once again, Amateur Radio provided the perfect solution. By sending an APRS message, I could obtain current weather conditions while in my car.

I programmed my *Linux* machine to connect to the **findu.com** database at 15-minute intervals to retrieve weather conditions. If wind direction and speed met predefined criteria, an APRS message was transmitted to my car.

While any TNC and display would provide this functionality, the Kenwood TM-D700A with an optional built-in voice synthesizer provided a safe, compact and elegant solution. Since the weather conditions were "spoken" by the D700A, I did not have to take my eyes off the road, so it was a particularly convenient and safe way to be notified.

Figure 5 shows the D700A with a typical weather display. The "%" percent symbol preceding the wind direction and wind speed displayed on the face of the D700A specifies that the text be spoken. DIR (wind direction) and SPD (wind speed) are abbreviations used to limit the length of the message and therefore conserve APRS network bandwidth.

The same technique used for sending APRS messages can be applied to notification to a commercial pager or cell phone. Figure 6 shows the results of an e-mail message sent to a pager that displays weather information when I am not connected to the Internet or mobile. A transceiver such as the Kenwood D7 with built-in TNC can provide similar functionality.

Aeronautical Mobile

Amateur Radio provides the means to determine weather conditions remotely and help pilots determine when conditions are likely to support flight. However, even when one is flying, Amateur Radio is a great asset. It allows pilots to communicate with each other.

The United States Hang Gliding Association (USHGA) is the governing body for hang gliding and paragliding in the US. It has been allocated 151.625, 151.995 and 151.925 MHz for communications use by the FCC.

A radio is more than a convenience when piloting; it is an important link between a student and an instructor. A radio is a requirement; it is vital to allow instructors to provide feedback and instruction to students. When a student graduates, the radio is no longer mandatory, but it is still useful for general communication.

As licensed Amateur Radio operators, my wife and I can operate in the amateur bands. Standard 2 meter simplex frequencies provide an effective means for air-to-air communication. Since we are always within sight of each other, a few mW is more than enough power for reliable communication. We can communicate with other hams via a repeater, but since flying safely is priority one, talking is limited to passing information that directly affects the flight.

Controlling the radio while aeronautical mobile is not an easy task since paragliding requires constant use of both hands. The audio portion of the human interface problem is solved with a small microphone located in the chin portion of the helmet and a speaker in the helmet near the pilot's ear. Figure 7 shows the general location of the equipment.

Controlling the PTT switch of the transceiver is a little more difficult. VOX (voice operated relay) control would appear to be a perfect solution. In practice, it doesn't work well, however. Since not everyone uses a radio, pilots often need to resort to traditional means of communication such as shouting or blowing a whistle to get another pilot's attention. These sounds would result in false trips of the VOX circuit. For this reason, VOX is not used. Control of the transceiver is accomplished using a switch mounted on a Velcro strap that wraps around a finger and using it to control the radio while holding the paraglider's break lines is easy and safe. Figure 8 provides a close-up of the finger PTT switch and connector for the microphone and earpiece.

SHARON PARRY, KC5PVL

Figure 7—The author ready for aeronautical mobile communication. Speaker and microphone are built into the helmet and a finger PTT switch controls the transceiver, leaving both hands free for flying. Safety is paramount while flying and special equipment is required and is designed toward that end.

RICHARD PARRY, W9IF

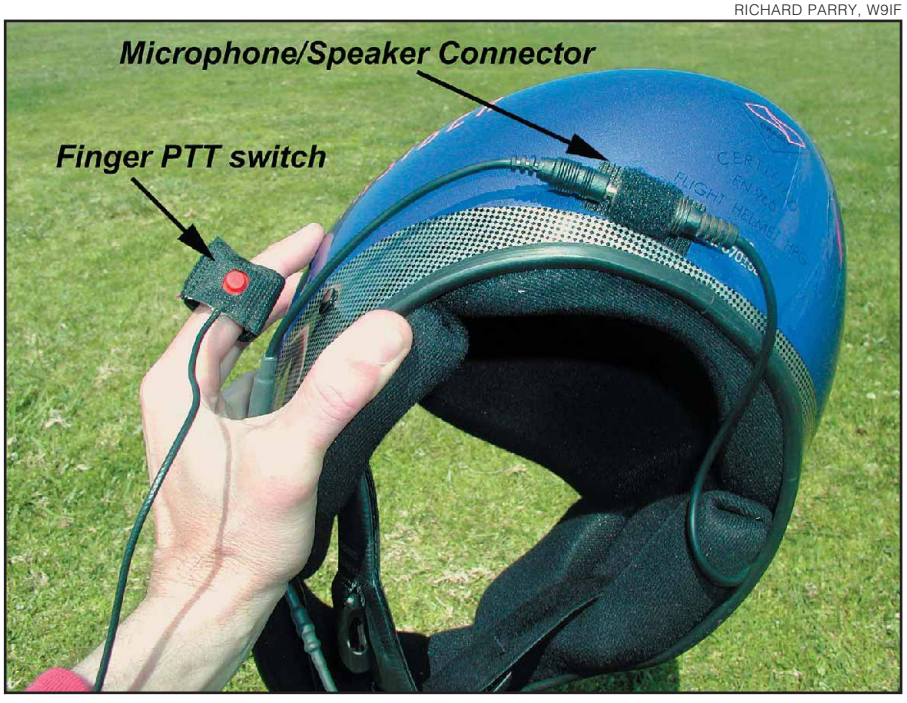


Figure 8—A view of the finger PTT switch and connector that interfaces the speaker and microphone inside the helmet.

Weather Station Caveats

Mark Twain quipped, "Everyone talks about the weather, but no one does anything about it." Unfortunately, our inability to do something about the weather is likely to continue. Predicting weather is hard enough to do without trying to control it.

Weather forecasting requires a sophisticated mathematical model with copiously accurate data to feed that model. Getting accurate data is a formidable task all by itself. One of the myriad problems with predicting the weather is measuring it. I originally took the simplistic view that all I had to do was install a weather station and it would tell me what I wanted to know. I discovered that measuring weather depends heavily on definitions. Two weather stations from different manufacturers can give different readings. In fact, the same weather station can give different readings based on the sampling mode it uses. For example, in the data logging mode, the U2K outputs wind speeds every second which represents instantaneous wind speed. In packet mode, it outputs average wind speed during a 5-minute period.

Other manufacturers use different sampling periods, resulting in still different values. There appears to be little standardization. In the US, for example, the

Resources

w9if.net The author's home page.
w9if.net/cgi-bin/torreywx/wx.pl The Torrey Pines Gliderport Weather Page, the basis for this article.
www.tapr.org/tapr/html/Ft238.html Web page for the TAPR low cost APRS weather station based on the Dallas Semiconductor 1-wire system.
www.rxcomm.net Web page for the µWeather weather station.
205.156.54.206/asos/obs.htm An overview of Automated Surface Observation systems.
205.156.54.206/oso/oso1/oso12/fmh1.htm The Federal Meteorological Handbook (FMH) Number 1 titled, *Surface Weather Observations and Reports*, dated December 1995 is the definitive US standard for the Aviation Routine Weather Report/Aviation Selected Special Weather Report (METAR/SPECI) code formats.
www.fiu.edu/orgs/w4ehw/onnhc-wind.html Weather Volunteer Observers Network at The National Hurricane Center. How to get accurate wind speeds.
www.flytorrey.com The Torrey Pines Gliderport home page.

SHARON PARRY, KC5PVL

Figure 9—Preparing to launch. The APRS weather station antenna and anemometer can be seen in the background.

standard sampling period for wind measurements is 2 minutes; in Europe it is 10 minutes. A full explanation of wind measurement is outside the scope of this article and I don't claim to have that expertise, but the salient point is that an understanding of how a measurement is taken is important to the understanding of that data.

Sensor placement is yet another variable that greatly affects the data. Weather can vary drastically between locations separated by less than a mile. It also varies with altitude. Measuring wind speed and direction at 1, 10 and 100 meters above ground level can give widely different measurements. For this reason, the National Weather Service (NWS) launches weather balloons daily to measure weather conditions at various altitudes.

A report from the American Society of Testing Materials (ASTM) defines standard techniques for measuring wind speed. It specifies that, "The anemometer and wind vane shall be located at a 10 meter (33 ft) height above level or gently sloping terrain with an open fetch [The distance along open land over which the wind blows.—*Ed.*] of at least 150 meters (500 ft) in all directions, with the largest fetch possible in the prevailing wind direction. Compromise is frequently recognized and acceptable for some sites. Obstacles in the vicinity should be at least ten times their own height distant from the wind sensors."

For most weather station installations, meeting this standard is difficult. Few amateur weather station volunteers have an isolated 30 foot tower. If they do, there is probably a Yagi or quad antenna sitting on top. More common and realistic are rooftop installations. Under these less than ideal conditions, wind flow may be influenced by a variety of factors—a sloping roof, vertical surfaces and structures (chimneys). Due mostly to the remoteness of the Torrey Pines Gliderport, I was able to come close to meeting ASTM requirements. Figure 9 shows the anemometer located on the roof of the gliderport headquarters, which is within 200 feet of the launch site, making it a near ideal location.

The important point of this discussion is that equipment and sensor placement affects the results. For this reason, it is suggested that this information be provided along with the wind data. See the Resources section for several sources that provide additional information on wind sensor placement.

Weather station configuration, weather station firmware, the Web interface and TNC configuration along with the KPC-3 Plus initialization commands can all be found on the ARRL Web page for this article: **www.arrl.org/files/qst-binaries/aprs_weather.zip**.

Finally...

When I started this project I felt it would be straightforward…a simple weekend exercise or, at worse, it would be up and running in a few weeks. It turned out to be more of an effort than I had intended, but that was mostly due to my ignorance of setting up a weather station and in not understanding its subtle complexities. Murphy's Laws also played some part in my setbacks. However, the results have been well worth the effort and the popularity of the Web site enforces that.

It is important to note that the Torrey Pines Gliderport APRS weather station builds on the work of many Amateur Radio operators. It would not be possible without the APRS protocol developed by Bob Bruninga, WB4APR. Nor would it be possible without the APRS Internet system and **findu.com** server developed by Steve Dimse, K4HG. The APRS IGATE software, *aprsd*, developed by Dale Heatherington, WA4DSY, was also a crucial component.

The APRS SIG mailing list sponsored by TAPR (Tucson Amateur Packet Radio) was an invaluable source of information and encouragement. Special thanks to David Norris, KG9AE, for his weather station expertise and his willingness to Elmer me on the subject. Thanks also to Mike Tortorella, W2IY, for listening to my problems and offering suggestions. To David and Gabe Jebb, my flying instructors, who supported my efforts. Thanks to my employer, Qualcomm, Inc for allowing installation of a San Diego DIGI and IGATE. And lastly to my wife, Sharon, KC5PVL, who introduced me to paragliding and will always be the wind beneath my wing.

R. Parry, W9IF, was first licensed in 1962 and has held an Amateur Extra class license for most of that time. Richard's formative years in ham radio were spent homebrewing equipment and operating 20 meter CW. Pursuit of a college education and the starting of a family resulted in an absence from ham radio, but he returned and became very active in designing, building, writing about and operating RTTY. He is the author of numerous Amateur Radio articles and he has published in QST, QEX, 73 *and the* ARRL/TAPR DCC Proceedings. *Richard holds a BSEE from the University of Illinois, an MBA from Northern Illinois University, an MSCS from North Central College and an FCC General Class Radiotelephone license. He is a software engineer at Qualcomm, Inc in San Diego, California, where he works on wireless telecommunication systems. Richard comes from an Amateur Radio family consisting of his father, WB2ILP, his wife, KC5PVL and his son, KK5SU. You can contact him at* **w9if@arrl.net**.

By Mike Loukides, W1JQ

A Dipole Curtain for 15 and 10 Meters

W1JQ tackles the construction of a version of one of the largest types of HF antennas. It's the main radiator at some of the most powerful international shortwave broadcast stations—the curtain array.

Looking at a shortwave broadcaster's Web site, I noticed that their antenna was a "dipole curtain." I wondered what a dipole curtain was as I'd always wanted an antenna that I could call a "curtain"… Sterba, Bobtail—whatever. I've had a lot of fun with my G5RV multiband dipole, but it's clearly not the antenna to use as the sunspot cycle declines.

At around 2 AM of a sleepless night, I decided that a dipole curtain must be an array of dipoles, fed in phase. Jim Peterson, K6EI, pointed me to a Web site (**www.tcibr.com/NewFiles/hfbroadants.html**) that showed I was correct. Dipole curtains have long been the "gold standard" of shortwave broadcast antennas. They are among the largest antennas I've ever seen. An array can have up to two dozen dipoles, stacked up to six high, with a design frequency as low as 5 MHz. A commercial dipole curtain looks like the backstop for a baseball field, designed for 100 foot-tall players. They can yield a gain of 20 dBi or more—as much gain as an EME antenna, on frequencies as low as 60 meters! These arrays typically use a nonresonant reflecting screen to give a unidirectional pattern. It's common to put a set of driven elements on either side of the reflector, so the pattern is switchable. Curtains with two or more stacks of dipoles are also slewable; that is, the pattern can be steered by changing the phasing between the stacks.

Could some of the world's largest antennas, with price tags in the millions of dollars, be adapted to amateur service? I didn't know, but there were many reasons to try. Dipole curtains are very

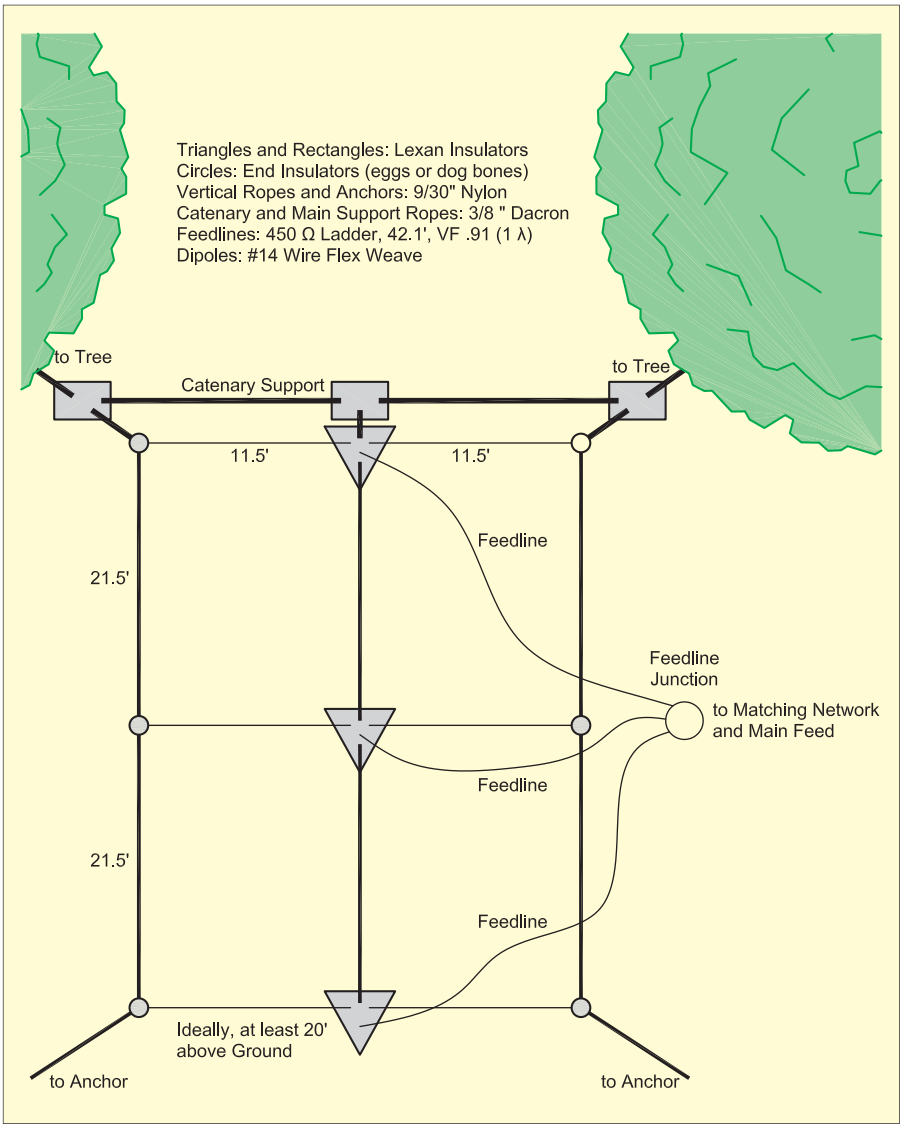


Figure 1—15-meter dipole curtain geometry.

broad; their properties don't change very much as you move across a band or even band to band. They have excellent low-angle radiation characteristics and they are ideal antennas for DX work. The optimum radiation angle for DX propagation is 10 to 20°,[1] and that's where curtains show their maximum gain. Additionally, they have a very broad beamwidth, particularly compared to antennas with equivalent gain. Although they deliver high gain, their radiation pattern allows them to cover a lot of territory without any rotation.

I decided to see whether I could trim the dipole curtain down to size and build an antenna that would fit into a suburban backyard. A few things go away immediately—the reflecting screen looks difficult to build and, at least for a first antenna, a single stack of dipoles is sufficient. With a design frequency in the 15 meter band, closer than ideal spacing and ground proximity lower than ideal, a stack of 3 or 4 dipoles can be made to fit easily in a backyard. Figure 1 shows the general idea of my dipole curtain. Its gain is competitive with a beam and its radiation characteristics are in some ways superior. It didn't cost much, it didn't require a tower (just some good trees) and it's even "stealthy." Dollar for dollar, I don't think it's possible to buy or build a more effective antenna for the upper HF bands. It's the only wire antenna I know about that has both high gain and broad beamwidth.

The Design

I started by stacking four 15 meter dipoles at 15 foot intervals, starting at 20 feet, with the top dipole at 65 feet. That height sounds arbitrary, but it represented the highest elevation I thought I could achieve. My trees are mature maples, close to 100 feet tall and I've never been able to use more than $^2/_3$ of a tree's height effectively. A minimum height of 20 feet was an educated guess; I thought it represented the point at which ground loss would outweigh the advantages of wider spacing.

The four-dipole design yielded decent gain, an excellent maximum radiation angle of about 12°, a nice broad beamwidth and very similar performance on 12 and 10 meters. I traded e-mail with Dean Straw, N6BV, who pointed out that I'd be better off if I cut the antenna back to two dipoles. With four dipoles that close together, coupling between the elements would significantly reduce the gain. I really did want those extra dipoles—so I tried putting one dipole back in (dipoles at 20, 41.5 and 63 feet). The third dipole didn't help 15 meters but it didn't hurt, either, and it was exactly what the antenna needed for 10 meter performance.

I spent lots of time tweaking the basic design shown in Figure 1, but my initial guess was fairly close to optimal, given my assumption that I could get the top dipole to 65 feet. If I made the spacing between dipoles larger, the bottom dipole was too low and performance suffered; if I made the spacing smaller, the elements were too close together and, again, performance suffered.

So, I stuck with dipoles at 20, 41.5 and 63 feet, cut for 21.25 MHz (23 feet total length). This array yields 11.38 dBi gain over real ground on 15 meters, and 13.34 dBi on 10 meters, according to *EZNEC*. The half-power beamwidth is 80° on both bands and the take-off angle is around 13°.

Now, how to feed it? For the two-dipole array, N6BV suggested equal lengths of 50 Ω coax to the dipoles and then a quarter wave matching section of parallel 75 Ω coax (with an effective impedance of 37.5 Ω). That would work reasonably well for the three-dipole array—except it wouldn't work on 10 meters. My strategy was to feed the dipoles with some number of half waves of transmission line on 15 meters. Regardless of the transmission line's impedance, its input impedance will equal the load impedance every half wave. That way, I had a workable feed system for 15 meters: the impedance at the junction of the transmission lines was about 25 Ω, and it could be matched to 50 Ω with a quarter-wave transformer. I played with different combinations of transmission line length and impedance to find something that would yield a reasonable match on 10 meters.

The winning combination turned out to be full-wavelength feeders of 450 Ω ladder line, which is 42.1 feet (according to the formula $\lambda = VF \times [984/f]$, where f is 21.25 MHz, and VF is the velocity factor; I assumed 0.91 for ladder line). The quarter-wave matching transformer is 9 feet long (assuming a VF of 0.78 for RG-11). *EZNEC* predicts a minimum SWR of about 1.3:1, and an SWR below 2:1 across the entire 15 meter band. On 10 meters, full-wave feeders conveniently yield a secondary resonance with a reasonably low SWR at 28.5 MHz—about 1.75:1, and below 3:1 between 28.125 and 29 MHz (Figure 2 shows the feed line construction). That's a higher minimum SWR than many hams are comfortable with, but it's really not a problem. Walt Maxwell's *Reflections*[2] argues that we shouldn't be scared away by high SWR or, for that matter, waste our time trying to tune our antenna systems for a perfect 1:1 match… that's what antenna tuners are for.

Still, I spent some time seeing if I could do better—and found some interesting red herrings. It turns out that, if you feed the top dipole or the bottom dipole with 300 Ω line, and the other two dipoles with 450 Ω line, the 10 meter SWR drops significantly. I discovered that this configuration had significantly less gain, however. A good SWR wasn't worth a few dB of signal strength. While I never analyzed why the 300 Ω line improved the SWR but reduced the gain, the answer is almost certainly that it upset the current distribution between the elements.[3] I tried other transmission line impedances, from 200 Ω up to 800 Ω, and none worked as well as 450 Ω.

So I stuck with full-wave feeders of 450 Ω line, and a quarter wave section of two lengths of RG-11U in parallel, all fed with 50 Ω coaxial cable. Since the SWR on the transmission line is on the high side, particularly on 10 meters, I chose to use high-quality low-loss cable. I settled on one of the many Belden 9913F7-equivalent (buriable, low-loss foam, RG-8-style) cables.[4] To ensure that the feed system could handle high power, I simulated all the feed lines using N6BV's *TLW* program, and satisfied myself that, when used on 15 and 10 meters, the antenna and feed system are capable of 1500 W—though it's getting close to the maximum voltage for RG-8 style foam coax. If you really want to run high power, you might be better off using "solid" RG-8, rather than foam.

If you're more adventurous, here are some other ideas for feeding the antenna. Perhaps the most obvious is using ladder line end-to-end. That's no doubt the best solution for those who have figured out how to route parallel line inside their house. A recent *QST* article[5] suggested another interesting possibity…a weatherproof, automatic antenna tuner mounted in the trees. Several vendors, most notably SGC and LDG, have tuners that will fill the bill. They are relatively expensive and I thought long and hard about whether to spend the money. I decided against it—but you might not.

Building It

This antenna proved to be the most complex piece of aerial engineering I've ever tried. Getting it up into the air without turning it into a tangled mass of wire and rope was a challenge.

I started by making center insulators from 6×6 inch squares of $^1/_4$ inch Lexan (from the McMaster-Carr Supply Company, another vendor I've come to love[6]) using a design suggested by Joe Wonoski, N1KHB. Figure 3 shows the basic design.

[1]Notes appear on page 38.

I cut each square diagonally (to be precise, Joe cut the squares diagonally for me), making two insulators from each piece. To prevent abrasion, I used a small rat-tail file to round off the edges of the holes through which the wires pass; I also sanded down the edges of the insulators slightly. When you've made an insulator, punch some holes in the "webbing" of the ladderline, and lace it to the insulator using black cable ties. The insulator thus serves as a strain relief. You could also use the WA1FFL Ladder-Locs for the same purpose.[7]

Once I had a piece of ladderline tied to an insulator (without the dipole), it was time to cut the feed line to 1 wavelength at 21.25 MHz. The antenna's behavior is fairly sensitive to getting the feed lines the right length, and the velocity factor of parallel transmission line can vary quite a bit, even within the same piece of cable. Rather than cut blindly, I borrowed N1KHB's MFJ Antenna Analyzer, which allowed me to measure a full wave precisely: cut the cable at about 45 feet, short it at the insulator end, tie the insulator up in the air (it doesn't have to be high), stretch the cable out so it was above ground, and trim the loose end for minimum impedance. Repeat until you have three insulators with roughly 42 foot long pieces of ladderline attached.

I became a complete convert to FlexWeave antenna wire (available from RadioWare[8] and other suppliers). That wire just doesn't want to tangle! You can tie knots in it as easily as in nylon rope.

I used standard egg insulators at the ends, though these turned out to be a poor choice given the antenna's geometry. If I build another curtain, I'll make triangular Lexan insulators for the ends (one hole for the wire, one hole for the upper support rope and one hole for the lower support rope). For pruning, I left some extra wire at the ends, tied back so as not to lengthen the dipole. I didn't try pretuning the dipoles with the MFJ Analyzer. Hoisting the dipoles to their eventual height purely for tuning was too much work, and at more convenient heights of 4 or 5 feet off the ground, the resonant frequency and impedance of a dipole is significantly different from what it will be in the air, making the value of "low-altitude" measurements questionable. *EZNEC* showed that the antenna wasn't particularly sensitive to the length of the dipoles—and the FlexWeave was so easy to work with that it was easy to measure the dipoles fairly precisely.

After reading some articles in *More Wire Antenna Classics,*[9] I decided to use a catenary rope at the top of the antenna. The catenary gives the antenna additional strength in windstorms and ice storms, both frequent in New England. The catenary—which is basically a "dipole" made out of rope, about 3 feet longer than the real dipoles—gave me a point from which I could support the center insulators, and allowed me to use more tension than I would have dared otherwise.

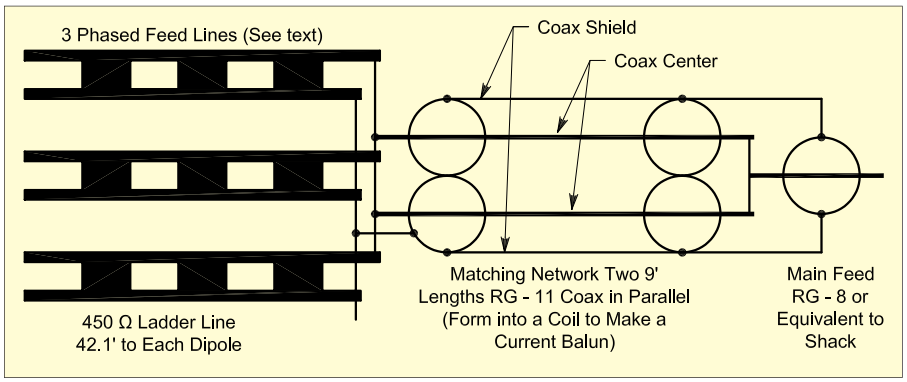


Figure 2—Transmission line schematic.

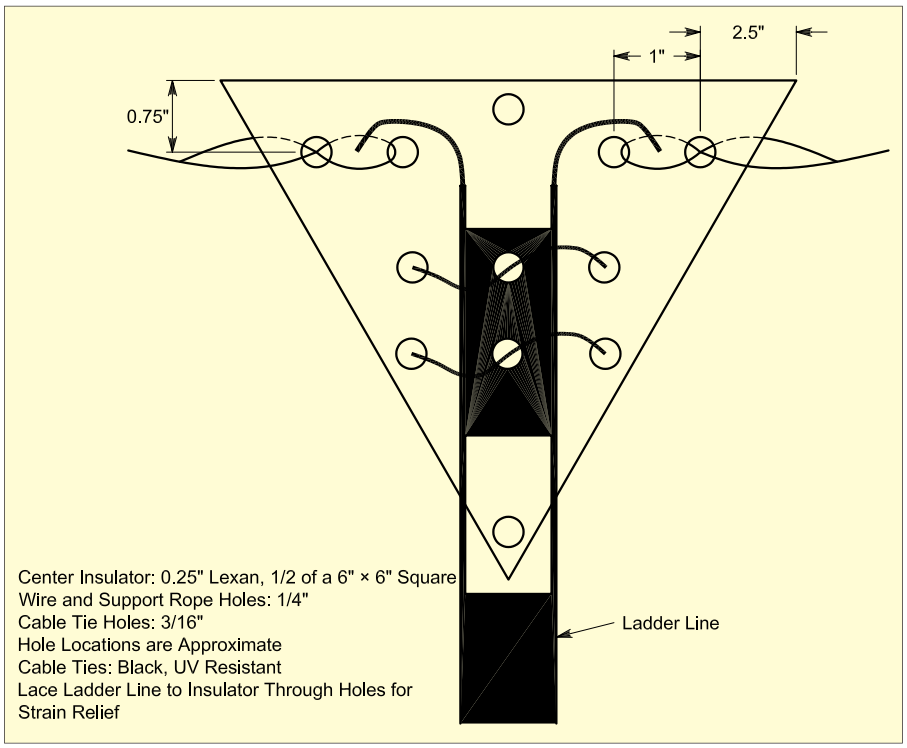


Figure 3—Center insulator.

The trickiest part of the antenna was the junction between the main feed line and the ladder lines to the elements, as shown in Figures 4A and 4B. I made a square of Lexan, on which I mounted two SO-239 coaxial sockets (for the matching section). I drilled holes that allowed me to lace the ladder line to the insulator, placing the three feed lines on top of each other. A few extra holes allowed me to attach ropes for suspending the junction in the air, and for hanging the matching section underneath; one hole allowed me to feed the right side of the three feed lines through to the bottom junction, where I attached them to the SO-239 bodies using spade lugs. I soldered the left side of the transmission lines to a stiff wire that ran between the center conductors of the two sockets.

There are three things to keep in mind when building the junction:

- The SO-239 connectors must be facing down, as you want the matching section and the main (coaxial) feed line to hang from the junction. Use epoxy to prevent water from getting into the sockets. I don't know whether water can get through an SO-239, a PL-259 and into your coax, but if you live in a cold climate, I guarantee you that water collecting in the "well" made by the SO-239 will break the junction apart. I used coax sealant liberally at all junctions. [Trust the fact that water *will* get into an unprotected PL-259 and SO-239 connector and even-

tually into the coax; these are not waterproof. Seal these connectors and their mating surfaces well.—*Ed.*]

• You must make sure the dipoles are all in phase. This is easy enough. Roll the ladder line for each dipole into a flat coil, stack the coils on top of each other and lace the lines to the junction, making sure that nothing has flipped over. Mark the same side (let's say the left side) of each center insulator. Then, at the junction, solder the ladder line to the SO-239 connectors. When you haul the antenna up, make sure the marked sides of the center insulator are all facing the same direction.

• Once you attach the feed lines to the junction, you have determined the array's stacking order. The top feed line goes to the top dipole, and so on. Label the dipoles so you don't spend lots of time tracing a tangle of cable and wire.

The matching section itself was simple. I used the Antenna Analyzer to cut two quarter-wave pieces of RG-11 cable. Cut pieces of cable that are roughly 10 feet long. Leave one end open, attach the analyzer to the other end and trim the other end for minimum impedance. To make things modular, I used PL-259s on both ends of each piece. At the antenna end, they mate with the SO-239s on the junction; on the other end, I used a "T" connector to attach them to the main feed line. Once you have the matching section built, wind the cables into as tight a coil as possible to form a current balun.

The final step, prior to hoisting the antenna in the air, was to pre-cut 23 foot lengths of rope to use between the elements. I used masking tape to mark 21 foot lengths, which made it easy to set the appropriate spacing between the elements.

Hanging It All

Now you're ready to hang the contraption in the air. The hardest part of the job was finding the right trees. After some hunting, I found a pair of large maples on the edge of the forest, separated by about 25 feet, with no major branches between them. With some careful archery and some friends who are better with a bow and arrow than I am, I managed to get ropes over branches at roughly the 65 foot level and far enough apart to spread the antenna adequately. And I was lucky; I was able to choose branches that "swung" the antenna a bit to the northeast, giving me a 60 degree heading I wanted.

Raising the antenna was routine—although there was plenty of potential for snarls. When the upper dipole got to the 40 foot level, it was time to start hauling the junction into the air. I was fortunate to find a convenient branch to support the junction just when I needed it; this was one detail I had tried hard not to think about. To allow the ladder lines to reach the individual dipoles and to keep the ladder lines from tangling, the junction should be 30 to 40 feet above ground and at least 20 feet away from the antenna. To avoid disturbing the antenna's radiation pattern, the junction should also be centered on the antenna.

Disaster struck when the south side of the antenna got stuck at the 45 foot level. The rope was high enough, but was going under a branch that prevented me from raising it further. You probably know the routine. Drop the antenna, shoot another arrow, pull another rope through the tree and start again. This time, I got stuck with the top of the antenna somewhere between 55 and 60 feet above ground…and there was nothing to be done. The obstruction was a long branch that was passing over the antenna, right in the middle. The an-

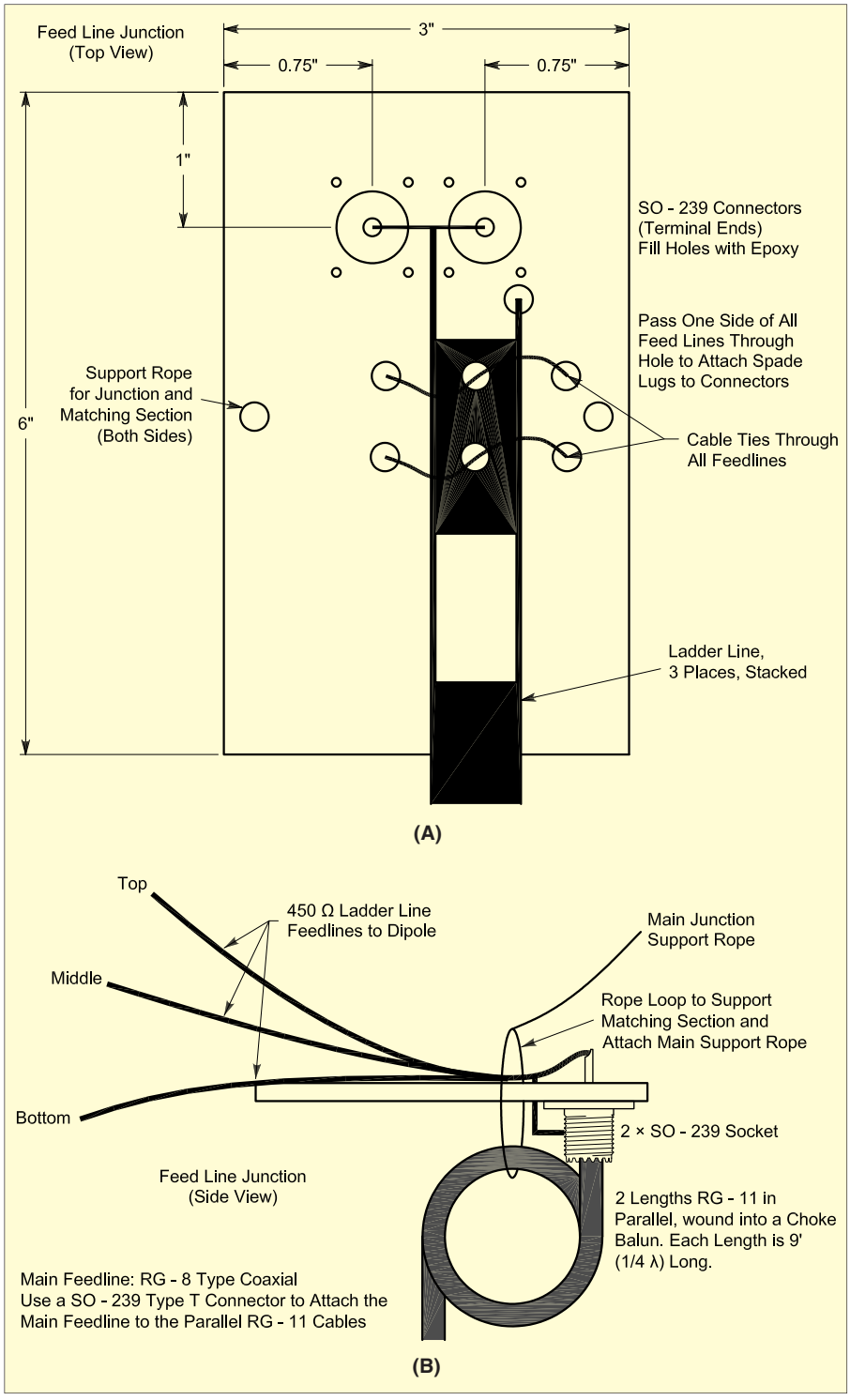


Figure 4A and 4B—Feed line junction, top view and side view.

tenna isn't as high as I had hoped it would be and I'm sure that ground loss is higher than I'd like, but the bottom element is still 12 or 14 feet off the ground, and that seems to be enough.

A number of problems I had expected just never materialized. I was worried that the weight of the transmission lines would pull the centers down and forward, giving me a stack of Vs skewed at an odd angle. In retrospect, elevating the feed line junction was critical to the antenna's geometrical integrity…the rope suspending the junction bore the weight of the transmission lines, not the dipoles themselves. It proved easier than I expected getting the feed line junction into the air without tangling the individual transmission lines.

Does It Work?

This is the part of the article where I'm supposed to write about how I worked YA and P5 on the first call, etc. I'm not going to do that. (Well…just a little.) As exciting as those stories sound, we all know that you can work DX running QRP into a dummy load if the conditions are right. And 100 W running into an antenna with 11-13 dBi of gain is not 1500 W feeding stacked, wide-spaced, monobanders. Antennas radiate; they don't work miracles.

What's the best way to evaluate an antenna? Ultimately, I go by what I hear. If I can hear stations, there's a good chance they can hear me. On 15 meters, signal strengths are literally 6 S-units better than with my G5RV—although I've already implied that the G5RV wasn't the best performer on 15. I worked ZK2TO under very poor conditions, when I couldn't even hear her on my other antenna. And I've gotten a couple of compliments for being one of the loudest signals on the band...something I'd never heard before. Comparing the curtain to an admittedly bad antenna doesn't prove a whole lot, but I'm satisfied that I accomplished what I wanted, which is rough parity with other stations running low power and a Yagi.

I've been reasonably satisfied with the G5RV on 10 meters, so the improvement isn't as striking, but the curtain is usually better by 2 S-units or more. Sometimes the improvement is as much as 4 S-units, sometimes less. On 10 meters, the G5RV has a gain of about 9 dBi, in the right direction. That more or less agrees with my observations. I see the smallest improvements (an S-unit or so) into the South Pacific, where the G5RV has one of its lobes.

On 15 and 10 meters, the SWR is satisfyingly close to what *EZNEC* predicted. The antenna, as I've built it, is a little long—but, given what I've said previously, you shouldn't be surprised that I haven't bothered to tune it. I'd rather spend time operating than minimizing my SWR. The SWR "in the shack" is still below 2:1 across the entire 15 meter band, and below 3:1 between 28 and 29 MHz.

I can't resist pushing my luck and trying my antennas on other bands. The curtain performs decently on 20 meters. The elements and element spacings are really too small to provide a lot of gain, but they're still good for 9 dBi, according to *EZNEC*. *EZNEC* also predicts a resonance in the 20 meter band, where the SWR is high (5:1 to 10:1 and in agreement with what I observe) but not unusable if you have a tuner. I wouldn't make this my only 20 meter antenna but it's something else to try when you're in the middle of a pileup or a contest. Its low radiation angle is a definite asset and it's been very effective. (I can't resist saying that I worked JY on my second call.) On 17 meters the antenna accepts power about as willingly as a rock. On 12 meters, the SWR is also very high, but the antenna delivers about 12 dBi of gain, so it's well worth trying; the only real question is how much additional loss you incur in the feed system due to the high SWR. Since I hadn't planned on either 12 or 20 meters, I feel like I got two extra bands "for free."

Without a real antenna range, about the only way to evaluate an antenna is subjective. So maybe that's the real bottom line. Do I still feel at a disadvantage compared to stations running equivalent power and a triband beam? The answer is an unequivocal "No!" Whether I'm in a pileup or a contest, I'm now competitive—and with far less expense than a beam, a tower and a rotator.

The Antennas I Didn't Build (But Might Have)

This article wouldn't be complete without mentioning some of the antennas that "got away"—my hope is that these will give you some ideas. So here goes:

- If you can figure out how to get 1500 square feet of chicken wire into the air, about 0.3 wavelengths behind the driven elements, please let me know! A non-resonant reflecting screen roughly 20% larger than the antenna in each direction should give you an additional 2.5 dB gain, or so.
- If you scale the design frequency from 15 meters to 17 meters, the "secondary resonance" obligingly moves from 10 to 12 meters, making a very nice antenna for the 12, 17 and 30 meter bands. (Don't forget to scale the transmission lines and elements heights, too.)
- Scaling the 3-element dipole curtain to 20 meters yields an antenna that's probably too big, unless you have really large trees in the right place. However, a 2×2 curtain looks like it might be practical—and, with an appropriate phasing network, it is slewable about 25 degrees off the center axis.
- Finally, if you have an aluminum farm with multiple towers, the curtain looks like an ideal fixed antenna to me. With optimal spacing and at a greater height, the antenna looks like a real winner, producing gains up to 14 dBi—even without a reflector.

But those antennas are for the future. For now, I'm satisfied with an excellent wire antenna for 10 and 15 meter DXing and contesting—the curtain array.

Notes

[1]*The ARRL Antenna Book*, 19th edition, chapter 23. Available from your local dealer or from the ARRL Bookstore, order no. 8047; tel 888-277-5289; **www.arrl.org/shop**.

[2]M. W. Maxwell, *Reflections II*, Worldradio Books, 2001. Available from the ARRL Bookstore, order no. REF2; tel 888-277-5289; **www.arrl.org/shop**.

[3]One would think that the best performance would come when the currents are equal on all elements. I set up an *EZNEC* model with this property, however, and this wasn't the case; equal currents yielded slightly less gain than my final design.

[4]Davis Bury-Flex (available from many vendors; I bought mine from RadioWare), Wireman CQ-102 or CQ-106; **www.radioware.com**; **www.thewireman.com**.

[5]S. Ford, WB8IMY, "One Stealthy Delta," *QST*, May 2002, pp 47-48.

[6]McMaster-Carr Supply Company, **www.mcmaster.com**. The 6×6 inch sample squares I used are PN8574K11. Half inch Lexan is also available in 12×12 inch squares (PN 8742K117) and only slightly more expensive.

[7]**www.thewireman.com**; **www.radio-ware.com**.

[8]**www.radio-ware.com**.

[9]R.Olsen, N6NR, "The NRY: A Simple, Effective Wire Antenna for 80 through 10 Meters," pp 3-26 to 3-28. This article appeared, as well, in *QST*, Mar 1993, pp 22-24. In addition to the catenary support, the "NRY" is also interesting because it's another stacked wire antenna–two 20 meter extended double Zepps, which is (if you think about it) essentially a 2×2 curtain. *More Wire Antenna Classics* is available from your local dealer or from the ARRL Bookstore, order no. 7709; tel 888-277-5289; **www.arrl.org/shop**.

Mike Loukides, W1JQ, was first licensed in 1969, at age 13. After a lapse of 15 years with renewal not possible, he retook the amateur exams and became a new Extra class ham in 2001. His recent attention to Amateur Radio revolves around the HF bands with a particular interest in wire antennas. Mike says they are among the few things in Amateur Radio he can build with his near nonexistent metalworking skills. He's written a software contest-logging program in Java and says he'd like to experiment with the satellite digital modes. Mike has a BSEE from Cornell and a PhD in English Literature from Stanford, and is a senior editor for a major computer book publisher. He can be contacted at 30 Hungry Hill Circle, Guilford, CT 06437 or at **mikel@oreilly.com**.

By Robert Sommer, N4UU

Optimum Radial Ground Systems

How many radials are needed for an optimal ground system? N4UU gives us that answer and more in his pursuit of the ideal ground system and the definition of what makes it so.

Suppose you have purchased some length of wire, L, which you will deploy in a radial ground system. You can cut that wire into a few long radials or many short radials. In general terms, you could cut the wire into n radials, each of length r = L/n. I will show that the ground loss can be minimized by using the proper value of n.

Let me define that value of n which provides the minimum ground loss as the *optimum* value of n and denote it by n_0. Using the analysis presented in a classic paper by G. Brown, et al, I have derived the following result:[1]

$$n_0 = 2.25\ (sf)^{1/4}\ L^{1/2} \qquad (1)$$

where
s = soil conductivity (S/m)
f = design frequency (MHz)
L = total wire length (feet)

For brevity, Brown's analysis is not repeated here, but all of the pertinent equations can be found in an excellent *QST* article by R. Severns, N6LF, which also provides an extensive bibliography.[2] All of the results presented below pertain to the ground loss within a radius of R = 1/2 wavelength from the antenna, with 1 kW fed to the antenna, including the ground system.

Total Wire Length

Figure 1 shows a family of curves of ground loss versus n for several values of L. The existence of a minimum loss, and hence, an optimum value of n for each value of L is evident. Values of n_0 calculated from Equation 1 accurately predict the values of n that minimize the ground loss. I have chosen R = 1/2 wavelength because it is consistent with Brown's paper and because most of the loss, particularly with short verticals, occurs within that radius.[3] If similar curves are computed for a larger value of R, the losses will be somewhat higher, but the minima will occur at *exactly* the same values of n. Therefore, choosing $n = n_0$ achieves the minimum ground loss for all values of R, not just for R = 1/2 wavelength.[4]

The circled data point in Figure 1 pertains to the case of 120 half-wave radials. I will touch upon this point later when discussing how large L must be in order to reduce the ground loss to a negligible level.

It is interesting to observe that the tip-to-tip spacing of adjacent radials in an optimized radial system is given by

$$d_0 = 1.24\ (sf)^{-1/2}\ \text{feet} \qquad (2)$$

which does not depend upon L.[5] Therefore, all optimized ground systems, large and small, are characterized by the same spacing between the tips of adjacent radials, and that spacing decreases as s or f is increased.

Soil Conductivity

Figure 2 shows three curves of ground loss versus n for different values of s.[6] These choices of s include the largest and smallest that are likely to be encountered

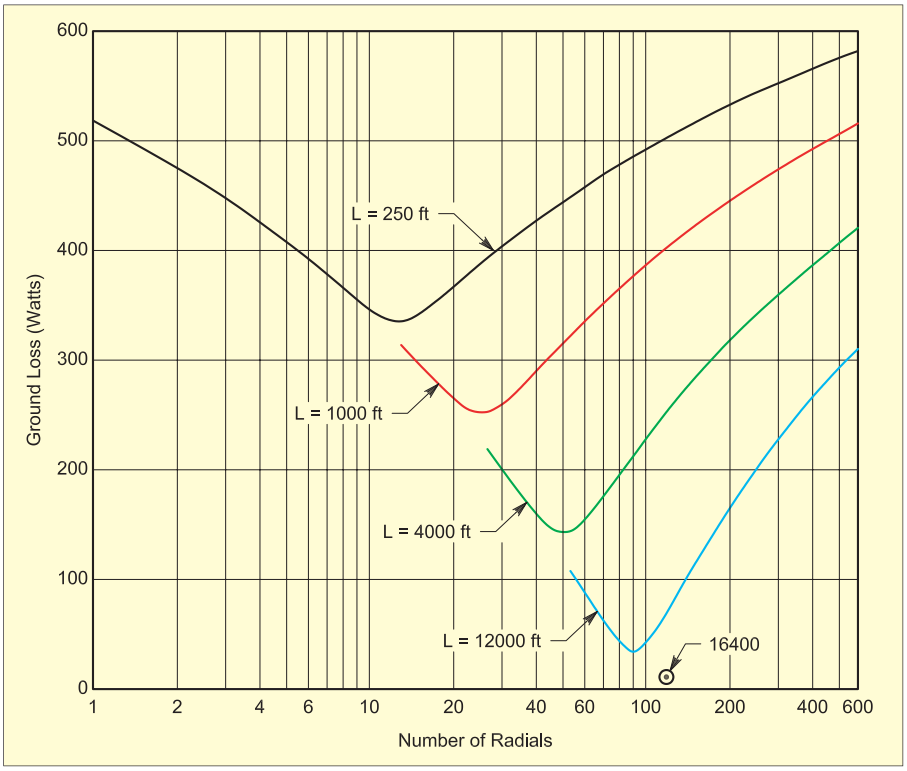


Figure 1—Ground loss versus number of radials for several total wire lengths with a 1/4 wavelength vertical operating at f=3.60 MHz over average soil (conductivity s=0.0045 S/m).

[1]Notes appear on page 43.

and an average value. Note that n_0 increases as s increases. This is because more closely spaced radials are needed to coax the ground current out of more highly conductive soil and into the radial system. Note that n_0 changes relatively little as s changes and consequently, it is not necessary to know the value of s with great accuracy.[7] When using Equation 1 to determine a good choice of n, it is better to err in the direction of a smaller rather than larger value of s. The dashed curve for seawater minimizes at n_0 = 247 radials each about 16 feet long. This is the epitome of a large number of short radials.

Design Frequency

Figure 3 shows three curves of ground loss versus n for different design frequencies. If a multiband system is contemplated, these results suggest that the radial system should be optimized for the lowest frequency band. Figure 4 shows similar results but with L = 14.64 wavelengths at each frequency. On this basis, the minimum ground loss is nearly the same for each frequency.

Vertical Antenna Height

Figure 5 shows three curves of ground loss versus n for three different vertical antenna heights. The chosen heights correspond to 1/16, 1/4 and 0.528 wavelengths, which range from the shortest to the tallest verticals likely to be of interest.[8] It is no surprise to observe greater ground loss with the short antenna.[9] But I was very surprised to find that n_0 changes very little; 52 radials are optimum with the short vertical and 48 radials are optimum with the tall vertical. With the quarter-wave vertical, 51 radials are optimum and Equation 1 predicts n_0 = 50.7, which is in excellent agreement. After checking numerous other cases with different values of s, f and L, I have found that n_0 does not change significantly over the range of vertical antenna heights that are of practical interest.

Radial Wire Thickness

Figure 6 shows three curves of ground loss versus n for radials consisting of 8, 14 and 20 gauge copper wire. Fourteen gauge wire is twice the diameter of 20 gauge wire and 8 gauge wire is twice the diameter of 14 gauge wire. Compared to 20 gauge wire, the same length of 8 gauge wire contains 16 times as much copper and yet the thicker wire reduces the ground loss very little. (Note the expanded ground loss scale used in this figure.) Therefore, use of thick wire is not a cost-effective means of reducing ground loss. It can be seen that n_0 changes very little when the radial wires range from 8

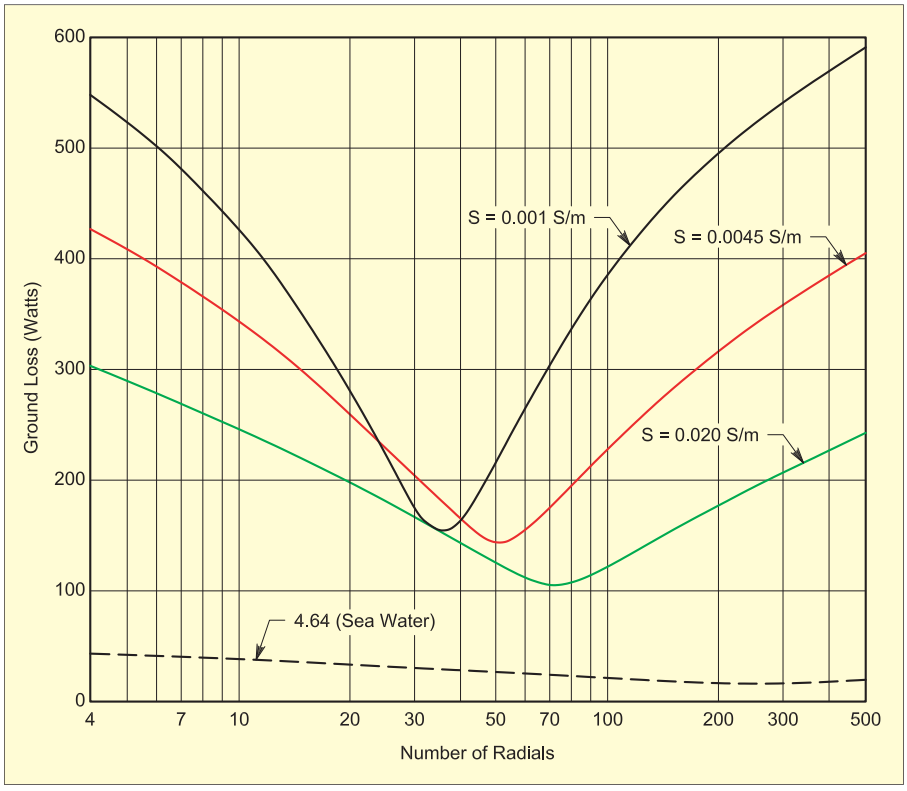


Figure 2—Ground loss versus number of radials for very good, average and very poor soil conductivities with a 1/4 wavelength vertical operating at f=3.60 MHz with total wire length L=4000 feet.

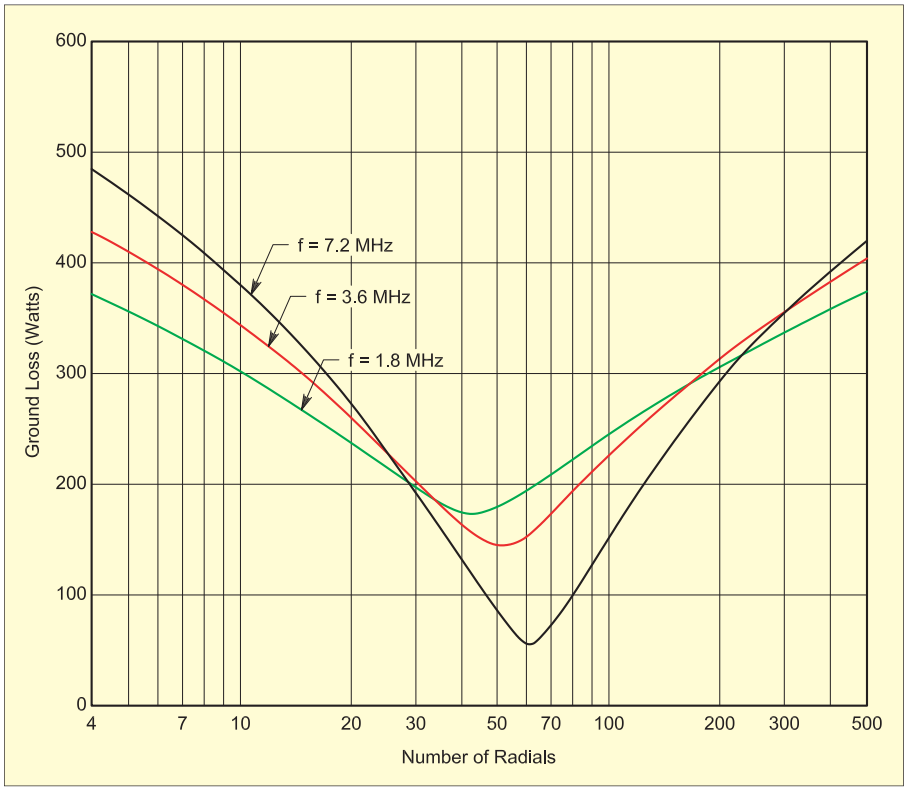


Figure 3—Ground loss versus number of radials for 160, 80 and 40 meter 1/4 wavelength verticals over average soil (conductivity s=0.0045 S/m) with total wire length L=4000 feet.

to 20 gauge. The curves shown here minimize at n_0 = 49, 51 and 52.

Accuracy of Equation 1

Brown's analysis is predicated on a base-loaded antenna, which consists of a thin vertical wire. Consequently, the current flowing in the antenna exhibits a sinusoidal distribution with the physical and electrical lengths being equal. My derivation of Equation 1 further assumes a quarter-wave vertical and radials made of #14 gauge wire. I have chosen the constant (2.25) in Equation 1; this provides the best accuracy throughout the 160 and 80 meter amateur radio bands for average soil conductivity. Although Equation 1 is a relatively simple solution to a complex problem, its accuracy is excellent. This can be verified by checking it against the graphical results presented earlier. Although the accuracy worsens in the 30 meter band, the greatest error (obtained with f =10.15 and s = 0.02) is still less than 5 percent. All of the graphical results show that if n deviates by five percent from its optimum value, the corresponding increase in ground loss is insignificant.

Many amateurs use some form of "loading" to achieve quarter-wave resonance and improved efficiency with a physically shortened vertical. Popular methods include the insertion of a loading coil at the midpoint of the vertical or configuring the antenna as a T or an inverted L. In such cases, the electrical length is 90° while the height can be significantly less than a quarter-wavelength. Recall that the results in Figure 5 showed that n_0 changes very little over a wide range of antenna heights and, correspondingly, over a wide variation of antenna current and ground current distributions. Owing to those findings, I feel confident that Equation 1 will also provide accurate estimates of n_0 for loaded antennas.

How Much Is Enough?

Brown concluded: "It is also found that a ground system consisting of 120 buried radial wires, each one-half wave long, is desirable." His recommendation, which requires L = 60 wavelengths of wire, was made for the AM broadcast band. Similar ground systems, particularly for 160 meters, are beyond the means of most amateurs. However, he conducted experiments at 3.000 MHz using wide ranges of n and r with antenna heights of 22, 44, 88 and 99°. The largest ground system he tested had 113 radials each 135 feet long (0.412 wavelength). The radials were made of 8 gauge copper wire and they were buried at a depth of 6 inches. Excellent agreement between measured and theoretical values of field strength and

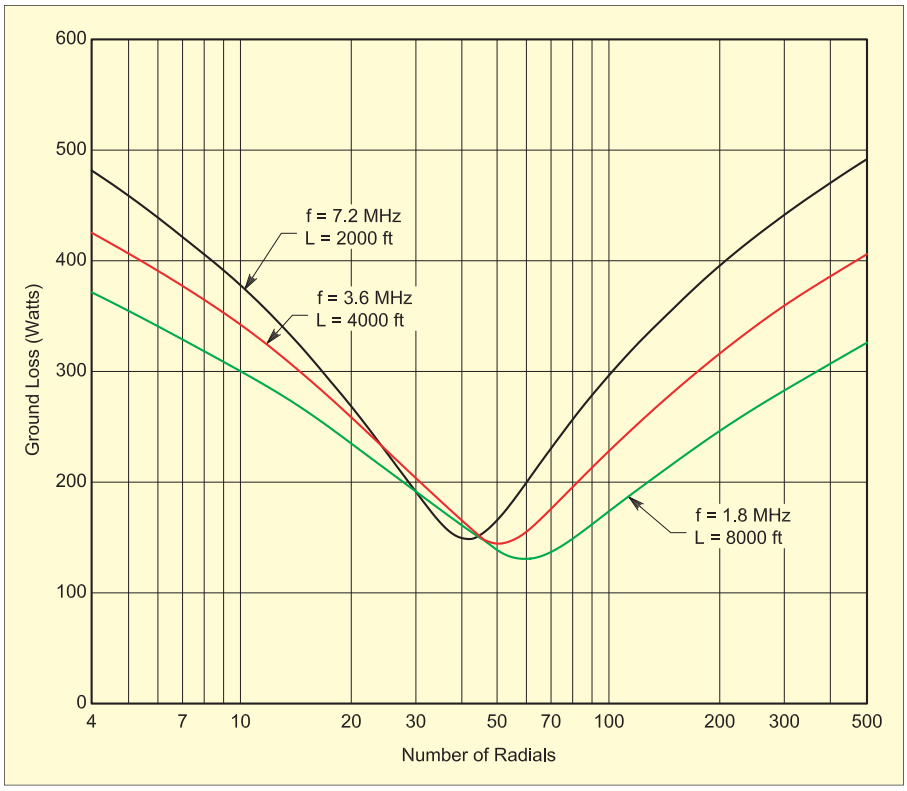


Figure 4—Ground loss versus number of radials for 160, 80 and 40 meter ¼ wavelength verticals over average soil (conductivity s=0.0045 S/m) and L=14.64 wavelengths in each case.

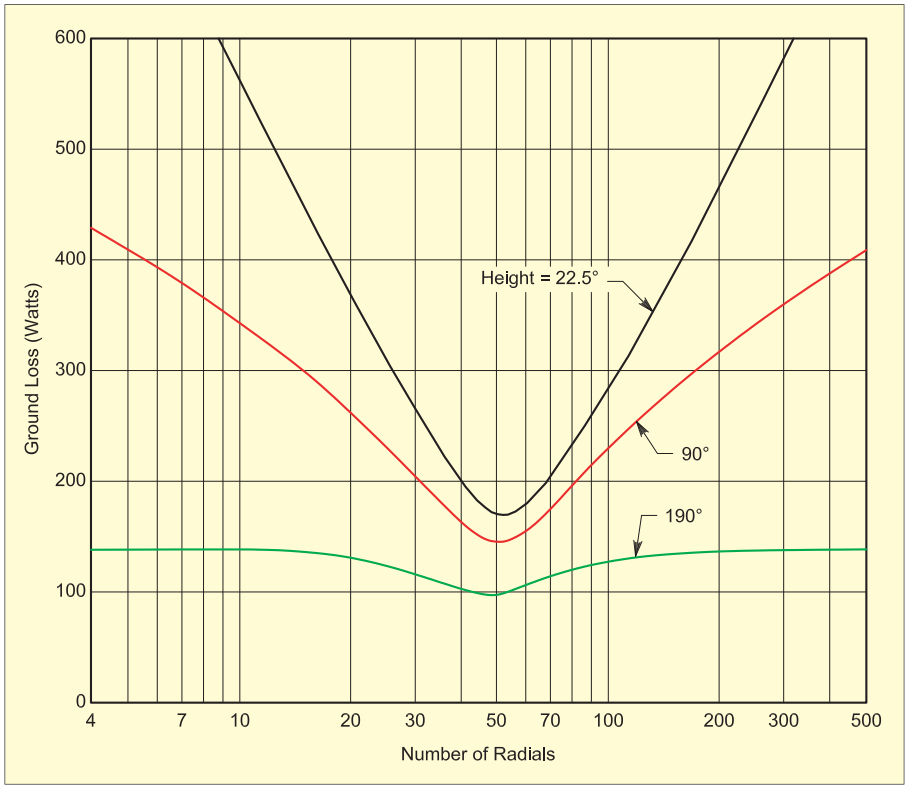


Figure 5—Ground loss versus number of radials for three vertical antenna heights operating at f=3.60 MHz over average soil (conductivity s=0.0045 S/m) with total wire length L=4000 feet.

base impedance were obtained with that ground system even though it contained 22 percent less than 60 wavelengths of wire.[10] It still reduced the ground loss to a negligible level.[11]

For Brown's recommended ground system with average soil conductivity, 8 gauge wire, a quarter-wave vertical, and a frequency of 930 kHz, the calculated ground loss is 48 W.[12] I determined the value of L and the corresponding values of n_0 and r_0 for optimized ground systems that provide the *same loss* with 14 gauge wire and several amateur band frequencies. Results of these calculations are given in Table 1 and I believe that they are very conservative; the values of L shown in the table are surely enough to reduce the ground loss to negligible levels.

If all other losses are small, a ground loss of 48 W leaves 952 W of radiated power, which is 0.21 dB below a kW. Similarly, a loss of 109 W reduces the radiated power by 0.5 dB. I repeated the previous calculations with a ground loss of 109 W and the results are given in Table 2. Whereas the values of L given in Table 1 are enough for commercial broadcasters, I think the values of L given in Table 2 represent a pragmatic determination of how much is enough for Amateur Radio operators. The law of diminishing returns weighs heavily against building radial systems larger than those shown in Table 2.

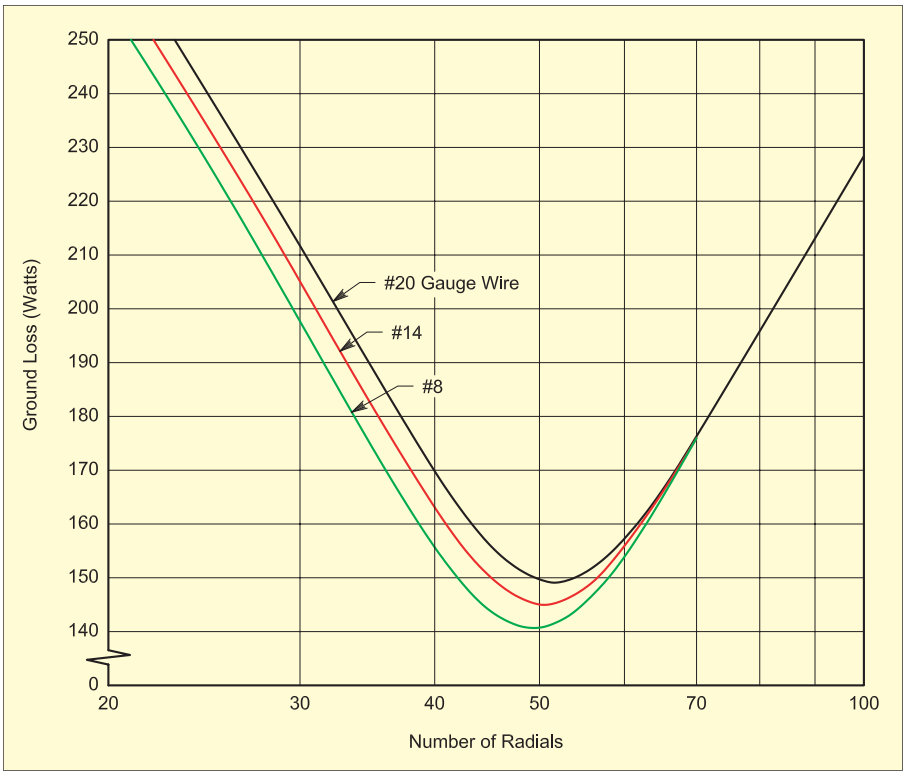


Figure 6—Ground loss versus number of radials for three different radial wire diameters with a 1/4 wavelength vertical operating at f=3.60 MHz over average soil (conductivity s=0.0045 S/m) with total wire length L=4000 feet.

Table 1
Optimized Ground Systems with Negligible Loss

F(MHz)	*n_0 (#)*	*L(Feet)*	*L(Wavelengths)*	*r_0 (Feet)*	*r_0 (Wavelengths)*
1.83	110	26,190	48.7	238.1	0.443
3.50	85	11,360	40.4	133.6	0.476
3.80	82	10,180	39.3	124.1	0.480
7.15	63	4,440	32.3	70.5	0.512
10.12	55	2,890	29.7	52.5	0.541
14.15	48	1,910	27.5	39.8	0.572

Table 2
Optimized Ground Systems with Low Loss

F(MHz)	*n_0 (#)*	*L(Feet)*	*L(Wavelengths)*	*r_0 (Feet)*	*r_0 (Wavelengths)*
1.83	73	11,570	21.5	158.5	0.295
3.50	63	6,290	22.4	99.8	0.355
3.80	62	5,780	22.3	93.2	0.360
7.15	50	2,850	20.7	57.0	0.414
10.12	44	1,870	19.2	42.5	0.437
14.15	38	1,220	17.6	32.1	0.462

Lowfers and Surfers

Low frequency experimenters can operate in the 160-190 kHz band with an antenna that does not exceed 15 meters (49 feet) in height. For this lowfer band and for the 136 kHz slice, excellent accuracy is provided by

$$n_0 = 2.52 (sf)^{1/4} L^{1/2} \quad (3)$$

This equation pertains to a 49 foot vertical, which is equivalent to a height of less than 0.01 wavelength at these frequencies. Corresponding values of n_0 with a quarter-wave vertical would be about 7 percent lower. For seawater with 4.64 S/m,

$$n_0 = 2.83 f^{1/4} L^{1/2} \quad (4)$$

can be used over the frequency range of 610 kHz to 19 MHz with an error of less than 5 percent.

Other Considerations

In addition to using the optimum number of radials, several other aspects should be considered to ensure their maximum effectiveness. Copper wire is the best choice and it can be bare or insulated. Radial wires should be equal in length, evenly spaced and run radially from the antenna without meandering. The wires can be laid on the surface of the soil or buried shallowly; deep burial reduces their effectiveness. Wire as thin as 20 gauge can be used at amateur power levels since the total current is divided among n radials. It just needs to be rugged enough to avoid breakage. Lastly, be aware that no benefit is obtained at radio frequencies by incorporating ground rods as part of the radial system.

Conclusions

My computer took over 100 hours to produce the totality of data used to prepare this article. Hence, it is no wonder that Brown, working with a slide rule in 1937, did not publish similar results. If you build an optimized radial ground system in accordance with the information in this article, you can take solace in knowing that your system provides the minimum possible ground loss in return

for the money and labor you put into it.

Appendix

Ground loss values presented in Figures 1-6 were obtained by numerical integration of dP from 0 to r with n radials present and from r to R without radials. [dP/dr is the incremental ground loss in W/m for a ring of soil at a given radius from the base.—*Ed.*] For each curve, n and r are constrained by the constant L = nr. Out of curiosity, I calculated the ratio of earth current to wire current at the radial boundary, r_0, for several optimized systems with quarter-wave verticals and found the current ratios were *precisely equal to one!* As outlined below, this observation led the way to deriving Equation 1, thereby circumventing the need to perform numerical integrations to determine n_0.

Assuming 14 gauge wire, Severns' Equation 2 can be expressed by:[13]

$$I_e/I_w = 3.61984L^2n^{-4}$$
$$[6.57041+\log (L/n^2)]\ sf \qquad (A\text{-}1)$$

after substituting r = L/n, simplifying the logarithmic term and combining the various constants.

Setting $I_e / I_w = 1$ results in $n = n_0$ so Equation A-1 can be recast into the form

$$n_0=k_1\ [k_2+\log\ (L/n_0^2)]^{1/4}\ (sf)^{1/4}\ L^{1/2} \qquad (A\text{-}2)$$

and since the logarithmic term varies slowly, Equation A-2 can be approximated by[14]

$$n_0 = k\ (sf)^{1/4}\ L^{1/2} \qquad (A\text{-}3)$$

Select desired numerical values s_1 and f_1 for which Equation A-3 will become exact and define the variable $z = n_0 /L^{1/2}$. Setting Equation A-1 equal to one, substituting the new variable, and rearranging terms, it can be shown that

$$z^4=(23.78382 -7.23968\log z)s_1f_1 \qquad (A\text{-}4)$$

A simple computer search can test different values of z to obtain a numerical solution; call it z_1. Then, calculate

$$k = z_1\ (\ s_1f_1\ )^{-1/4}$$

and substitution of the numerical value of k into equation A-3 yields Equation 1.

Determining an accurate value of k for Equation 3 is not as straightforward because the antenna height is such a small fraction of a wavelength. For this case, using an antenna height of 49 feet, a frequency of 175 kHz and average soil conductivity, the ground loss was calculated for different values of n using numerical integration (double precision was needed to obtain meaningful results in this case). The value of n that provided the minimum ground loss could then be accurately determined. Then, knowing n_0, s, f and L, Equation A-3 was used to determine the appropriate value of k for Equation 3.

Acknowledgments

I want to thank Carl D. Bethel, K4OD, and Rudy Severns, N6LF, for their useful comments and encouragement to write this article. I am also grateful to Mrs Lynette Coultrap for employing her word processing skills while preparing the manuscript.

Notes

[1]G.H. Brown, R.F. Lewis and J. Epstein, "Ground Systems as a Factor in Antenna Efficiency," *Proceedings of the IRE*, Vol 25, No. 6, Jun 1937, pp 753-787.

[2]R. Severns, N6LF, "Verticals, Ground Systems and Some History," *QST*, Jul 2000, pp 38-44.

[3]See Note 2, Figure 4.

[4]Provided $R > r_0 = L/n_0$, ie, any distance outside of the radials. If $R < r_0$, n = L/R minimizes the loss but this is a trivial case of little significance.

[5]See Note 2, Figure 8. Equation 2 exhibits less than 5 percent error in d_0, provided $n_0>6$.

[6]Brown chose 0.002 and 0.01 to characterize poor and good soil conductivity, respectively. For sake of discussion I chose their geometric mean, 0.004472, to represent average soil. Also, halving the poor soil value and doubling the good soil value results in 0.001 and 0.02, which I refer to as very poor and very good.

[7]Doubling s increases n_0 by 18.9 percent.

[8]Significant high angle radiation occurs with greater heights. Note that the total ground loss in this case will be significantly higher than the graph shows because much of the loss occurs at distances greater than a half-wave. But this does not change n_0 at all.

[9]See Note 2, Figures 3 and 5. Also note that a $^1/_{16}$-wave 80 meter vertical is only 17 feet tall.

[10]Theoretical values are based upon a perfectly conducting earth.

[11]See Note 1, Figures 25 and 30. With the 22° antenna, the measured field strength was 0.5 dB below the theo retical prediction. Since the radiation resistance is about 1.5 Ω, the current flowing in the antenna is very high. It is possible that a significant portion of the discrepancy is attributable to resistive loss in the antenna itself (2.5 inch galvanized iron pipe). At greater antenna heights, the differences between measurement and theory are smaller, typically 0.25 dB or less.

[12]930 kHz is the geometric center of the AM broadcast band. [Well, it was prior to 1995 when the AM broadcast band was 540-1600 kHz. Now, with that band being 540-1700 kHz, the geometric center is closer to 960 kHz (958 kHz).—*Ed.*]

[13]See Note 2, equation 2 but be aware that I_e / I_w is actually 10^4 times greater. That factor went missing somewhere while traveling from the author to the printer. Also, we are only concerned here with current magnitudes and not their phase.

[14]The quantities k, k_1 and k_2 are numerical constants.

Robert C. Sommer, N4UU, was first licensed as KN2BHE in 1952 and later held the call W4CRW. He received the Amateur Extra class license in 1968. Bob earned an MSEE degree from New York University in 1961 and has specialized in the theoretical aspects of digital communications. He has two patents and has authored 22 technical articles. Bob is a DXCC Honor Roll member, a Life Member of the ARRL and a Senior Member of the IEEE. As you may surmise, his Amateur Radio interests lie in DX and antennas. He can be contacted at 3806 Richard Ave, Fairfax, VA 22031 or at **sommern4uu@aol.com**.

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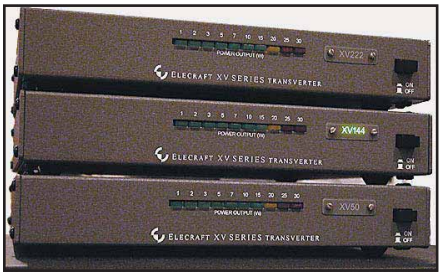

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By Rick Lindquist, N1RL, and Ed Hare, W1RFI

60 Meters: Frequently Asked Questions

Just the FAQs—what you need to know to enjoy our new 5 MHz allocation.

In May, a long-awaited FCC *Report and Order* (*R&O*) in ET Docket 02-98 granted US amateurs secondary access to five discrete channels in the vicinity of 5 MHz. The atypical amateur allocation becomes available to US amateurs at midnight (12 AM) local time on July 3, 2003. The limited spectrum and stringent operating requirements will mean amateurs will have to demonstrate their best behavior and operating skills if the Amateur Service ever hopes to get an actual band segment at 60 meters.

As ARRL CEO David Sumner, K1ZZ, put it in his July 2003 *QST* "It Seems to Us" editorial: "In terms of Amateur Radio spectrum, we usually say, 'Use it or lose it.' The watchword for 60-meter operators should be, '*Mis*use it and lose it.'" Sumner predicted that, over time, amateurs "will develop a record of disciplined, responsible use of the five channels in the public interest that will justify another look at these rather severe initial restrictions." The entire column can be found at **www.arrl.org/news/features/2003/07/01/1/**.

The FCC grant followed a period of experimental operation on 5 MHz under the WA2XSY Part 5 license granted to ARRL. The channelized scheme is similar to the 5-MHz experimental operation under way in the United Kingdom (**www.rsgb-hfc.org.uk/5mhz.htm**). The FCC granted amateurs access to channels centered on 5332, 5348, 5368, 5373 and 5405 kHz. The last channel is common to the UK amateur 5 MHz experimental band plan. Who will be the first to log a transatlantic QSO with the UK or a DX QSO with Hawaii or one of the US Pacific territories on 60 meters?

This new allocation presents some new twists in amateur HF operation as well as some unfamiliar technical demands. The channelized format was the result of a compromise between the National Telecommunications and Information Agency (NTIA), which administers spectrum occupied by government users—the band's primary occupants—and the FCC. The channels will be available to General and higher class licensees.

Amateurs may operate upper-sideband voice (emission 2K8J3E) at a maximum of 50 W effective radiated power (ERP) and an audio bandwidth not exceeding 2.8 kHz. The operating rules, which amount to fewer than 170 words, are spelled out in §97.303(s), Frequency sharing requirements [see the sidebar, "What the FCC Rules Say: §97.303(s)"].

The following frequently asked questions are based on actual inquiries from ARRL members regarding the new 5 MHz/60 meter allocation.

1) Why did the FCC give us channels instead of a band?

The NTIA, which administers spectrum regulated by the federal government, raised 11th-hour opposition to ARRL's request and the FCC's proposal that would have given amateurs a 150-kHz-wide band at 5 MHz (5250-5400 kHz). The NTIA's opposition, expressed after the period for comments already had expired, cited ongoing spectrum requirements of federal government licensees having homeland security responsibilities. Following some give and take between the FCC and the NTIA, the NTIA reviewed its assignments in the vicinity of 5 MHz and found five "lightly used" channels it felt it could share. Contrary to speculation, the channels are not a harbinger of a new trend in Amateur Radio allocations in general. This is a special case.

2) How can I be sure I'm within the specified channel allocation?

There are two concerns here. One is your suppressed carrier radio frequency and the other is your audio frequency bandwidth. There's apparently some confusion between the two as they involve using these new channels. The channels the FCC has allocated for the Amateur Service in its *R&O* are 5332, 5348, 5368, 5373 and 5405 kHz. These are *channel-center* frequencies, *not* the ones you'd tune your radio to. The NTIA has told the FCC that hams "must assure that their signal is transmitted on the channel-center frequency." This means the amateur signal must be centered within the 2.8-kHz-wide channel.

The FCC has provided scant guidance beyond suggesting—in a footnote that follows the NTIA's advice—that amateurs tune 1.5 kHz *below* the center-channel frequencies to be "on channel." Amateurs will need to be sure the tuning display readout reflects transmitted (ie, carrier) frequency (most do). Consult your transceiver's manual if you're not sure.

This chart from the NTIA suggests appropriate tuning frequencies for each center-channel frequency:

Channel Center	*Amateur Tuning Frequency*
5332 kHz	5330.5 kHz
5348 kHz	5346.5 kHz
5368 kHz	5366.5 kHz
5373 kHz	5371.5 kHz
5405 kHz (common US/UK)	5403.5 kHz

Following this chart will ensure that you are within the channel if your radio has a lower audio passband of 100 Hz or higher—which should apply to most commercial amateur transmitters/transceivers. The FCC expects your "occupied bandwidth" to be within the 2.8 kHz channel. This means—assuming a –1.5 kHz suppressed-carrier offset—you must keep your *audio* bandwidth between 100 Hz and 2900 Hz (2.9 kHz) to ensure that you do not go outside the 2.8 kHz channel. Most modern transceivers default to an SSB bandwidth in this range, but some are capable of bandwidths on SSB of 3.0 kHz or greater.

ARRL Laboratory Manager Ed Hare,

W1RFI, believes prudence calls for ensuring that your low-end ("bass") audio sharply attenuates below 200 Hz while your high-end ("treble") audio sharply attenuates above 2800 Hz. This yields an occupied bandwidth of 2.6 kHz, well within the channel limits. Hare explains that most transceivers roll off low-end audio at 100 to 200 Hz, so if the suppressed carrier is 100 Hz below the channel, the occupied bandwidth will fit neatly within the 2.8-kHz channel. You'd probably be well advised to keep your audio processor at a minimal setting if you use one at all.

Some newer transceivers permit users to "tailor" transmitted audio response to boost or roll off on the high and low ends. If yours does, rolling off the extreme low-frequency and high-frequency audio and following the tuning scheme suggested by the NTIA should keep you within the channel. Sometimes a simple choice of microphone element might be all that's needed.

Amateurs also need to take into consideration any third-order (or higher) intermodulation distortion (IMD) products. These can affect your overall transmitted bandwidth. Radios that exhibit poor or marginal IMD characteristics are the ones that cause "splatter" on the bands. ARRL tests and presents graphs of worst-case IMD in all MF/HF transceiver "Product Review" columns (**www.arrl.org/members-only/prodrev/**) in *QST*.

You might ask someone with a quality "band scope" or—far less common but more definitive—a spectrum analyzer, to measure your actual transmitted audio bandwidth.

A PSK31 software "waterfall" display can make a simple and handy tool to help determine your radio's transmitted AF response curve. Generating a PSK31 signal into a dummy load, set your PEP output at a convenient power level—say 10 W—in the center frequency of the waterfall display. Then note how far on either side of center you can transmit before your output power drops off significantly. The waterfall should display at least 3 kHz of spectrum. If you're able to measure your PEP accurately, you should be able to gauge your transmitter's audio passband by using a little math.

The FCC defines "bandwidth" in 97.3(a)(8): "The width of a frequency band outside of which the mean power of the transmitted signal is attenuated at least 26 dB below the mean power of the transmitted signal within the band."

Doug Smith, KF6DX, has posted some useful information, "How to Transmit Legally on the New 60-m Band" on his Douglas T. Smith Editorial Services Web site (**www.doug-smith.net/sixty.htm**). The Web page discusses bandwidth issues in greater detail.

The bottom line on audio bandwidth: Consult your transceiver's operating manual or manufacturer for information on its typical USB transmitted audio bandwidth. If you have any doubts about your transceiver's audio bandwidth or its ability to maintain your signal within a given channel, you should seriously consider *not operating* on this allocation until you can ascertain your radio's performance with a reasonable degree of certainty. ARRL will provide information on specific transceivers as it becomes available.

3) How can I be sure I don't exceed the power limit?

The FCC has said hams may run 50 W effective radiated power (ERP) on the five 60 meter channels. The new rules say, "For the purpose of computing ERP, the transmitter PEP (peak envelope power) will be multiplied by the antenna gain relative to a dipole or the equivalent calculation in decibels. A half-wave dipole antenna will be presumed to have a gain of 0 dBd." This means if you use a half-wave dipole (about 87 feet 3 inches for the "middle" channel according to the formula), set your transmitter's power output power for 50 W PEP (many transceivers' meters can be set to indicate peaks), and you should be in compliance. The FCC asks licensees using antennas other than half-wave dipoles to "maintain in their station records either manufacturer data on the antenna gain or calculations of the antenna gain." This is a new record-keeping requirement for amateurs.

The "best" antenna configurations will be those with a proven track record on the lower bands, keeping in mind that using a loop or an array of some kind will require you to "do the math" to ensure you are not radiating more than 50 W ERP *in any direction*. The math is fairly straightforward. You must reduce your power by the number of decibels your antenna gain exceeds 0 dBd (0 dB relative to a half-wave dipole). Conversely, you can increase your transmitter power if your antenna exhibits loss compared to a dipole. Be prepared to document these situations in your station records, however.

4) Why won't the FCC let us operate CW or PSK31? Narrowband modes like these seem ideal for the new channels.

True as that may be, the FCC followed the NTIA's lead in permitting only upper-sideband (USB) voice. In fact, 60 meters is the first generally available ham radio allocation that does not permit CW and the first below 20 meters where LSB is not the convention! The use of a common mode lets federal government users readily identify amateur stations as necessary.

5) But if USB is the only permissible emission, how can hams "tune up" on 5 MHz? That might mean putting out a carrier.

Good question! A dummy load would be the device of choice for "tuning up" on 5 MHz, especially since many users will be attempting to transmit on a channel that's already got some activity on it (you wouldn't "tune up" on the local repeater input, would you?). Amateurs on 60 meters also might want to gain skill at using receiver noise or other signals to adjust an antenna tuner before transmitting. Most automatic tuners do require briefly transmitting a small amount of carrier over the air. Not recommended but probably legal (as long as you're not interfering with other stations) would be the tried and true "whistling" or "hellllllooooo" methods.

6) Should I operate on 60 meters? If I do, what type of operating should I expect?

As ARRL CEO David Sumner, K1ZZ, put it in his editorial: "If we demonstrate that we can use [the 60 meter channels]

What the FCC Rules Say: §97.303(s)

An amateur station having an operator holding a General, Advanced or Amateur Extra class license may only transmit single sideband, suppressed-carrier (emission type 2K8J3E) upper sideband on the channels 5332 kHz,5348 kHz, 5358 kHz, 5373 kHz and 5405 kHz. Amateur operators shall ensure that their transmission occupies only the 2.8 kHz centered around each of these frequencies. Transmissions shall not exceed an effective radiated power (ERP) of 50 W PEP. For the purpose of computing ERP, the transmitter PEP will be multiplied with the antenna gain relative to a dipole or the equivalent calculation in decibels. A half-wave dipole antenna will be presumed to have a gain of 0 dBd. Licensees using other antennas must maintain in their station records either manufacturer data on the antenna gain or calculations of the antenna gain. No amateur station shall cause harmful interference tostations authorized in the mobile and fixed services; nor is any amateur station protected from interference due to the operation of any such station.

responsibly, cooperatively and in the public interest, there is no reason we cannot seek expanded access at an appropriate time. If your personal operating practices are inconsistent with that, please do yourself and everyone else a favor and confine your operating to the traditional bands."

We'd further suggest that if you've own an older transceiver or transmitter that's modifiable but has an analog dial and a tendency to drift that you also avoid trying to operate on these channels—especially given the technical guidelines.

To be sure, a lot of operators will test the waters once the new band opens, just to say they've been on there and maybe to collect a QSL card or two to prove it. But given the limited spectrum, it may not be the best allocation on which to start up an extended ragchewing session, indulge in long-winded transmissions or even to call CQ. ARRL anticipates that 5 MHz channelized operation will come to resemble repeater operation. Stations might be expected to break in to join a QSO in progress or grab a signal report and, rather than calling CQ, they'll just announce that they're "monitoring" a particular channel.

The 5 MHz channels also might provide the best propagation in the event of a disaster, when stations need to establish needed longer-range HF emergency communications links. As the FCC *R&O* states, "We believe that frequencies in the 5250-5400 kHz range may be useful for completing disaster communications links at times when the 3 [sic] and 7 MHz bands are not available due to ionospheric conditions, and [we] appreciate the desire of the amateur radio community to assist with disaster communications." Until now, emergency nets often have had to switch between 40 meters during the day and 75 meters at night. Of course, in the event of an emergency situation, amateurs should avoid channels carrying emergency-related traffic.

7) What is a domestic, secondary allocation?

Whether or not you consider the five channels a "band" or not, the FCC has stipulated that our 5 MHz channels constitute a domestic allocation; it is not available worldwide (that would have to be determined at a World Radiocommunication Conference, and 5 MHz was not on the agenda for WRC-03). We're considered secondary because other users—primarily federal government stations—are primary. The most important thing is that, as secondary users, amateurs must yield to—and refrain from interfering with—primary users at all times. Giving us specific channels was one way to minimize the probability that hams might run afoul of critical government users.

Internationally, the band 5250 to 5400 is allocated on a primary basis to the Fixed Service and on a secondary basis to the Mobile Service, except aeronautical mobile stations. In the US, the band's occupants include FCC Part 80 (Maritime) Part 87 (Aviation) and Part 90 (Private Land Mobile). Many specific government allocations are confidential.

8) What should I do if someone comes on the air and tells me to leave the frequency?

The short answer: Stop transmitting! Assume the request is legitimate, vacate the channel promptly and ask questions later (off the air). Such government stations conceivably could include, for example, a US Coast Guard vessel running low power into a small antenna. While it's unlikely that federal government stations ever would ask amateurs over the air to vacate a channel, it's better to play it safe, since it's their band, and we're secondary users.

9) How can I modify my transceiver to operate on these channels?

There's an ARRLWeb repository for the modification information manufacturers have made available to us at **www.arrl.org/tis/info/60-meter-mods.html**. For other modification techniques, ARRL hopes to be able to provide limited modification information as we're able to test modified radios to be sure the modification does not cause the radio to operate illegally or improperly. Modifying your radio also could void the manufacturer's warranty.

Most modifications will "open up" your transceiver and permit it to transmit throughout the HF spectrum. Some mods involve nothing more complicated than clipping a diode or wire. There is no certainty, however, that a modified rig will meet FCC requirements for harmonics and other spurious emissions on all frequencies, so hams must either thoroughly check the post-modification performance of their equipment or wait for mod information that the manufacturer has validated.

A listing of modification resources available via the Internet may be found on the AC6V Radio Modifications Web site (**www.ac6v.com/techref.htm#mods**). ARRL neither endorses nor warrants these or any similar modifications in any way. All licensees have the obligation to determine whether their equipment is operating properly on 5 MHz (and, for that matter, on other amateur allocations.)

10) But isn't it illegal to modify my ham gear?

In a word, no. While you might void the warranty, it's legal to modify, then use, your radio in the Amateur Service. It is illegal to use a modified radio *outside* Amateur Service allocations without the required license and FCC-certificated equipment.

11 Where can I find more information?

Several news stories about the 5 MHz grant have been posted on the ARRL Web site "news crawl" and have appeared in *The ARRL Letter* (**www.arrl.org/arrlletter**). The FCC *Report and Order* in ET Docket 02-98 is available on the FCC's Web site (**hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-03-105A1.doc**). ARRL Members may address specific technical questions to the ARRL Technical Information Service (TIS) via e-mail, **tis@arrl.org**. Nontechnical regulatory questions can go to **reginfo@arrl.org**. Finally, a 60 meter FAQ Web page can be found at **www.arrl.org/FandES/field/regulations/faq.htm#sixty**.

ARRL Regulatory Information Specialist John Hennessey, N1KB, and ARRL Assistant News Editor Dave Hassler, K7CCC, assisted with the preparation of this article.

Rick Lindquist, N1RL, is ARRL Senior News Editor. He can be reached at **n1rl@arrl.org**. *Ed Hare, W1RFI, is ARRL Lab Manager. He can be reached at* **w1rfi@arrl.org**.

NEW PRODUCTS

COAX FEED-THROUGH PANELS FROM QUICKSILVER RADIO PRODUCTS

◊ Quicksilver Radio Products introduces their PaneRelief coax feed-through panels. These panels are adjustable to fit openings from 19 to 32 inches, and require no tools to install. Designed for temporary or semi-permanent installations, the panels obviate the need to drill holes or frequently assemble and disassemble your station on a regular basis. The panels are available in three models: with two SO-239 connectors, two BNC connectors, or one of each (shown). Contact the company for custom configurations.

Price: $30. Order from Quicksilver Radio Products, 30 Tremont St, Meriden, CT 06450; **sales@qsradio.com**; **www.qsradio.com**.

By Dave Hassler, K7CCC

DAVE HASSLER, K7CCC

Hamvention '03: Friends, Forums and Frenetic Fun

A sodden Saturday helped keep attendance down, but didn't dampen spirits at the largest annual gathering of hams in North America

A rainy Saturday didn't detract from Hamvention, held May 16-18 in and around Hara Arena in Trotwood, Ohio. A total of 22,168 attendees—including guests and exhibitors—from all over North America and several other continents were present, the largest such gathering of hams in the United States. Attendance was down about 10 percent from last year, said Hamvention Production Manager Garry Matthews, KB8GOL. "Our biggest contributing factor to the drop was the near-constant rain on Saturday," he said. "We had a whole day washed out."

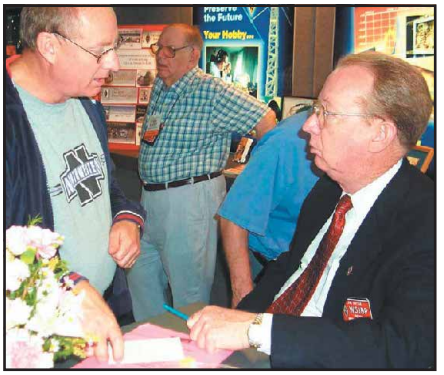
Even with attendance down from the recent peak of almost 29,000 for Hamvention 2000, many people continue to mark a weekend in May as red-letter days for a ham holiday. Sure, there is gear to peruse and forums to attend, but having the chance to share the Amateur Radio experience with fellow hams in person is what compels many to come back again and again.

Mike Sigelman, KØBUD, has been a Hamvention regular for several decades. He said that over the years he has gotten to know many hams who come to Hamvention either as exhibitors, speakers, club mem-

DAVE HASSLER, K7CCC

The Contesting Forum drew a flock of hams anxious to see how a possible change in their operating techniques might help improve future scores.

DAVE HASSLER, K7CCC

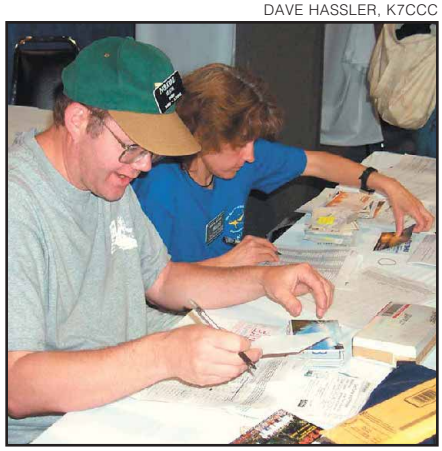


ARRL President Jim Haynie, W5JBP, was constantly engaged in discussion at the busy ARRL booth. Spectrum defense, youth education and the new 5 MHz channelized allocation were hot topics.

Dayton VE Sessions Net 136 New Tickets

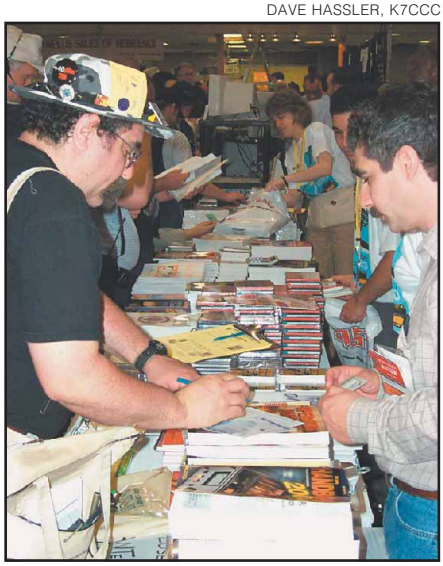
Hamvention always features a VE team set up to administer exams to prospective and upgrading hams. This year 298 license elements were given to 161 test takers, including 40 Morse code exams. In all, 175 test elements we passed, reported Terri Ruwe, AK8T. She said Hamvention attendees earned 136 new licenses through the various sessions: 82 Technician, 31 General and 23 Amateur Extra tickets. That total includes 17 non-US amateurs who earned a US Amateur Radio license.

DAVE HASSLER, K7CCC



Keith Kemper, N8KOL, and Ann Santos, WA1S, plow through stacks of QSL cards at the DXCC card checking table. Volunteers and ARRL staffers checked card packages from over 150 applicants. ARRL Membership Services Manager Wayne Mills, N7NG, estimated that about 16,000 cards were processed in just over two days' time.

DAVE HASSLER, K7CCC



ARRL Accounts Manager Joe Bottiglieri, AA1GW (right), and Circulation Manager Kathy Capodicasa, N1GZO, help members at the ARRL booth.

bers or just plain bargain hunters. "I enjoy knowing them all and that, to me, is why I enjoy hamfests: the people," he said.

The Brass Tacks

Amidst all the haggling over gear, chatting with old friends and gazing at eye-catching new products, the ARRL booth buzzed with activity all weekend. Members took advantage of their chance to meet with League officers, volunteers and ARRL Headquarters staff to ask questions, purchase books and supplies and offer comments. Many questions centered around three topics, said ARRL CEO David Sumner, K1ZZ: the new FCC 5 MHz allocation, the lack of youth in the ham community and broadband power line (BPL) communication.

ARRL Great Lakes Division Director Jim Weaver, K8JE, hosted the ARRL Forum on Saturday. At the gathering, ARRL President Jim Haynie, W5JBP, spelled out ARRL's current focus succinctly. "Job number one with us is spectrum," he stated. "We're going to do everything we possibly can to make sure there is a place to operate."

In addition to working for support for the Amateur Radio Spectrum Protection Act of 2003 in both the US House and Senate, Sumner noted the work the League has done on behalf of members—and all amateurs—preparing for the 2003 World Radiocommunication Conference in Geneva, Switzerland. He lauded the continuing ARRL Lab investigation on the potential impact of broadband over power line. BPL is a form of power line communication that, depending on the data rate of the transmission, can create S9-or-better noise over large parts of the HF spectrum.

Two other spectrum issues were on the minds of forum attendees: the possible realignment of 40 meters to give amateurs an exclusive worldwide 300 kHz band and the recent FCC decision to grant hams secondary use of five channels in the 60-meter band. The day before Hamvention opened, the FCC released a Report and Order stating that amateurs would receive the 2.8 kHz-wide, upper sideband phone-only channels, and would not receive an asked-for allocation at 136 kHz, among other items. Haynie weighed in on the 60 meter allocation by saying that hams should approach the use of the center-frequency channels with an attitude of good stewardship.

Several forum attendees asked about the proposed move of international broadcasters to frequencies above 7300 kHz. Sumner provided a summary of what the League and the International Amateur Radio Union (IARU) prepared for WRC-03. With 25 European countries proposing to move broadcasters in three stages over several years, and 15 countries in the Americas with a similar proposal, Sumner said he felt there was a good chance of allocating 300 kHz of spectrum at 7 MHz solely for amateur use, something that hasn't existed since 1938.

Haynie also tackled a number of questions and comments from the audience regarding the lack of youth in the Ama-

teur Radio community. He reported that the ARRL Amateur Radio Education and Technology Program now has 50 schools enrolled, providing curriculum and equipment at no cost to the schools, and reaching literally thousands of young people. Haynie also noted the great success in licensing new hams enjoyed in the United Kingdom with the new Foundation License. The Foundation License is similar in concept to the original US Novice ticket, but without a hard Morse requirement.

DAVE HASSLER, K7CCC

With rain pouring steadily onto the pavement outside Hara Arena on Saturday afternoon, hams jammed the aisles indoors to see vendors' wares.

Which Way to the Forum?

Hamvention hosted many forums, with the topics ranging from pedestrian HF operating to digital modes to contesting to youth to antennas to DX to public service to regulations to QRP to... well, you get the idea. One well-attended technical forum centered on high-speed multimedia information delivery over amateur frequencies in the 2.4 GHz range. On Sunday, The ARRL Amateur Radio Technology Task Forces presentation demonstrated how hams can assemble high speed digital networks using the IEEE 802.11b standard, detailing procedures for point-to-point, ad-hoc, infrastructure and access point networks. The Task Force pointed out that since September 11, 2001, Amateur Radio has taken on a heightened role in emergency communication on many levels, and amateurs involved with emergency communication should explore the new technology, which is allowable under Part 97 rules.

Friday, over 100 hams sat in on the Amateur Radio and the Law forum. ARRL General Counsel Chris Imlay, W3KD, Fred Hopengarten, K1VR, the author of *Antenna Zoning and You*, attorney Jim O'Connell, W9WU, and others answered audience questions mainly concerning antennas and towers. O'Connell assured the forum-goers that municipalities "haven't set out to destroy Amateur Radio...," but that it's important to get legal advice concerning adding a rider to a contract that will allow a reasonable antenna system. Imlay provided an update on The Amateur Radio Emergency Communications Consistency Act of 2003, designated HR 1478. The bill would require private land-use regulators—such as homeowners' associations—to reasonably accommodate Amateur Radio communication consistent with the PRB-1 limited federal preemption. PRB-1 now applies only to states and municipalities.

Getting the word out about important ham radio issues was the topic of the Public Relations forum Sunday morning. ARRL Public Relations Committee Chairman Jeff Reinhardt, AA6JR, served as moderator, and participating committee members included David Greer,

What's New? Quite a Bit!

At the top of the scores of new products announced at Hamvention '03, ICOM lifted the velvet curtain on the IC-7800. The promotional literature for the not-yet-in-production HF/6 transceiver notes that the rig will sport two separate receivers, four DSP units, 200 W of output power, built-in RTTY and PSK31 software, a keyboard connector and a 7-inch color TFT video screen. Estimated price? The initial retail price could be upwards of $9000.

At the TAPR Digital Forum, Gerald Youngblood, AC5OG, peered into the future of ham transceivers when he presented a completely software-defined radio that puts out 1 W of RF from three PC boards, dc to 60 MHz.

Ten-Tec showed off the new Titan III 417 amplifier. The amp runs a pair of 4CX800A tetrodes for 1500 W out when 60 W of drive is applied. In 100% duty cycle modes, expect 1000 W, with a bit less on 17 and 12 meters. The primary draws 20 A from a 240 V ac line.

Yaesu introduced a tiny handheld FM transceiver, the VX-2R, which weighs just 6 ounces and still puts out 1.5 W on 2 meters and 1 W on 70 cm with its 3.7 V battery and double that off an outboard 6 V source. The little rig sports a wide-band receiver and over 1000 memories. The company also debuted a mobile unit, the FT-8800R, that has independent two-channel capability, 50 W on 2 meters and 35 on 70 cm, and 800 memories for its wide-ranging receivers.

Kenwood announced an as-yet-unchristened HF/6 meter mobile rig capable of 200 W output on HF and making heavy use of DSP technology. Promotional literature from Kenwood states that the DSP will also do TX/RX audio equalization and perform speech processing.

Understanding the popularity of VHF, the folks at Elecraft showed off their new series of VHF transverters for 6, 2 and 1¼ meters. While designed to mate seamlessly with the company's K2 transceiver, the transverters will also work well with most modern transceivers capable of providing the appropriate amount of drive.

A gaggle of curious hams elbowed one another to get a good look at the IC-7800 mockup during the rig's unveiling. The HF/6 transceiver is rumored to sport a price tag of close to $9000.

N4KZ; Gary Pearce, KN4AQ; Gary Johnston, KI4LA; Rich Moseson, W2VU; Sherri Brower, W4STB, and Jim McDonald, KB9LEI. ARRL Media Relations Manager Jennifer Hagy, N1TDY, opened the program with a talk about ARRL's public relations program and her duties at League Headquarters. Then, after a PR-related quiz show played by the forum participants, a question and answer panel discussion followed. Attendees learned which photo formats media outlets prefer, how to get local coverage during a major disaster and how to get reporters to cover Amateur Radio events, among other topics.

At the DX forum May 17, ARRL Membership Services Manager Wayne Mills, N7NG, formally presented the long-awaited Logbook of the World program to the public. The secure server system allows contesters and DX award chasers to upload logs and get confirmed contacts good for ARRL operating awards such as DXCC and Worked All States. The system is not meant to replace paper QSL cards as "the final courtesy," but to aid in accuracy and speed of awards processing. He answered a number of questions about operating the current beta software, and noted that the source code for the client-side application has been released, so that logging software developers can integrate Logbook into their programs. Basic *Windows* and Linux versions already exist, and at least one Macintosh software developer has shown interest.

"And the Award Goes to..."

Hamvention '03's Amateur of the Year award winner Larry "Tree" Tyree, N6TR.

Although there was no formal banquet this year due to low paid attendance in recent years, Hamvention still honored notable hams striving to promote and enhance our wonderful hobby at a reception May 17. As announced in April, well-known contester Larry "Tree" Tyree, N6TR, of Boring, Oregon, received Hamvention's 2003 Amateur of the Year Award. Tyree is the creator, organizer and promoter of the successful Kid's Day, now administered by the ARRL. Tyree also developed the popular *TR-LOG* contest logging software. Jonathan Taylor, K1RFD, of Ridgefield, Connecticut, won the 2003 Special Achievement Award for developing the Internet-linking program *EchoLink* and the repeater-control program *EchoStation*. Dr Steve Dimse, K4HG, of Cudjoe Key, Florida was honored with the 2003 Technical Achievement Award. Dimse developed the global Automated Position Reporting System (APRS) Internet network. He also wrote the *FindU* APRS viewing software.

CQ Magazine took the opportunity afforded at Hamvention to announce its 2003 inductees into the *CQ* Amateur Radio Hall of Fame. At the third annual induction, 15 Amateur Radio operators were honored, including former ARRL General Manager Dick Baldwin, W1RU; Walter Cronkite, KB2GSD; Bob Denniston, VP2VI/WØDX (SK), and Shozo Hara, JA1AN. *CQ* also inducted Ken Keeler, N6RO, and Dan Street, K1TO, into the *CQ* Contest Hall of Fame.

Vice Admiral J. Scott Redd, KØDQ, Keynotes Donor's Reception

DEBRA JOHNSON

ARRL CEO David Sumner, K1ZZ; Donna Redd; Vice Admiral J. Scott Redd, KØDQ, and ARRL President Jim Haynie, W5JBP, at Thursday evening's Donor's Recognition Reception.

The second annual ARRL Donor's Recognition Reception afforded 52 ARRL donors and the assembled ARRL guests, Board members and family the opportunity to meet an architect of US naval policy and a fellow ham, Vice Admiral John Scott Redd, USN (ret), KØDQ. The event was held May 15 at the Wright-Patterson Air Force Base Officer's Club in Dayton.

After a warm welcome and Maxim Society presentation by League President Jim Haynie, W5JBP, ARRL CEO David Sumner, K1ZZ, introduced Redd. In 36 years of active duty, Redd commanded eight organizations, led the recommissioned Fifth Fleet, and held several senior policy positions at the Pentagon. His personal commendations include five Distinguished Service Medals and the Order of Bahrain. While commanding all US naval forces in the Central Command theater, he led seven different live operations, involving Iran, Iraq and the withdrawal of UN troops from Somalia.

No stranger to technology issues, Redd graduated from the US Naval Academy in 1966 as a Trident Scholar majoring in math and physics. He later won Fullbright and Burke scholarships for graduate study. A dedicated Amateur Radio contester, Redd has won one national and six world contesting titles.

"We were very lucky to have Vice Admiral Redd as our speaker," said ARRL Chief Development Officer Mary Hobart, K1MMH. "Scott captivated the guests with amazing stories of his service to our country. He also talked about his involvement in an education project, and how important the ARRL Education & Technology Program is to the future of Amateur Radio."

The reception recognized the contribution of 250 invited donors to the future of Amateur Radio. The gathering also honored the generosity of ARRL Vice President Kay Craigie, N3KN, and her husband Carter, N3AO, who were recognized for their lifetime support of ARRL with membership in the Maxim Society. The Maxim Society is made up of those who have made over $10,000 in lifetime contributions to ARRL programs. "Kay told the group about Carter's father and family, and how their example inspired the Craigies to give something back. Their extraordinary generosity is reflected in all areas of ARRL fund raising," Hobart said. "ARRL is pleased to have the opportunity to thank each of our major donors who have supported all of our efforts to support Amateur Radio so generously."

Considering his first trip to Hamvention a rousing success with the acquisition of sweep tube finals for his Swan Cygnet and jawing with other Hellschreiber enthusiasts, Dave Hassler, K7CCC, is the Assistant News Editor for QST *and the ARRL Web site. He can be reached by e-mail at* **k7ccc@arrl.org**, *or by telephone at 860-594-0240.*

By Jim McCobb, W1LLU/V31JR

V3: A First for Me

I'd been a ham for 43 years before it happened to me. The first time I ever sat on "the other end" of a DX pileup was just in February 2002, and like a lot of first-time experiences, this one remains vividly drawn in my mind.

My friend Walt Stinson, WØCP, has been on numerous DXpeditions and suggested in 2001 that I go with him sometime. Prior to that, going out on a DXpedition just didn't hit me as the most urgent thing to do in the world and I'd had no big opportunities to go. As I was approaching 60 years of age, Walt's suggestion intrigued me and I wanted to learn what being on the other end of the pileup would be like. And I wanted to confirm to myself that I could handle the challenge.

I started bugging him a bit about going along on a trip. Eventually, he suggested that we go to Belize for the 2002 ARRL DX Contest. Walt used the Internet to find a place for us to stay, and we signed on for a house on the Caribbean Sea in Placencia, Belize, for 12 days starting on February 27. Since Walt had done this numerous times before, he already had equipment housed in hard boxes; all I had to do was bring a few ham accessories and myself.

Belize required entry documents and we had in our possession a detailed list of all equipment, with serial numbers, manufacturer and weight. Walt's license renewal had been arranged in advance, as was my request for a new license, and I believe that these advance arrangements saved us time and possible aggravation upon arrival in Belize.

The tri-band Yagi used in the contest can be seen on top of the beach house in the background of the author's QSL card from the operation. An inverted L was also set up for use on 75 and 160-meter phone.

The Cheese Incident

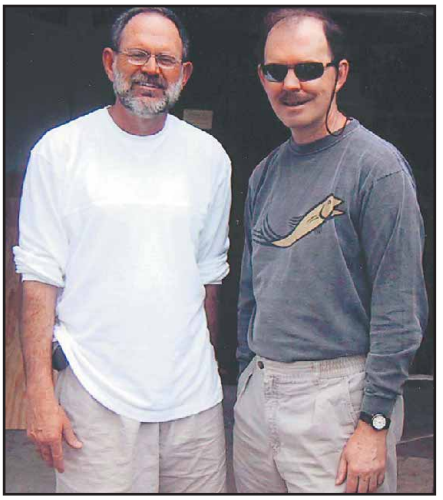
We flew to Belize City on February 26 and the next day I picked up my new license—V31JR—at the Telecommunications Office. We then boarded a puddle jumper to Placencia, about 75 miles south of Belize City and right at the edge of the sea. The house was about a mile from the airstrip and we got there in a pickup with a couple of helpers who brought most of the heavy stuff in for us. It was the middle of the day and hot. My body was still on "cold," however.

After lunch at a local hotel, we got some equipment set up inside. That evening we went back to the hotel for dinner, and although I didn't know it immediately, I was to be struck down by a seemingly innocent, yet potent, cheese. The next morning I felt like I was going to die as the cheese broke through the waning help of my Lactaid pills. For the lactose intolerant, an overdose of dairy products can cause a level of discomfort that cannot sufficiently be described by the mere written word. Suffice it to say, I was wiped out for two days, the Thursday and Friday before the contest.

Even though I was operating at less than 50 percent of my usual energy level, I got our Cushcraft R7 vertical up in relatively short order, positioned about 25 feet from the ocean. Then the real antenna raising had to start. Bob Fox, V31MD, lived close by and lent us a 20-foot piece of pipe for a mast for our 6-element tri-band beam, so we headed out to get the pipe and go shopping. There are a couple of

Some of the docks along a road into the village of Placencia on the south-central coast of Belize.

A study of the V3 operating position the morning after the contest. Stinson and McCobb planned their equipment list so the station would have two of everything, just in case.



Relaxed for a snapshot after the 48-hour contest, Walt Stinson, WØCP (left), and Jim McCobb, W1LLU, got a chance to do a little sightseeing, snorkeling and some limited travel...after they called their wives, of course!

grocery stores in Placencia Village, so we picked up what we could.

During our stay in Belize, we took most of our meals at the rental house. Our libations included plenty of soft drinks, water and beer. Almost every breakfast was comprised of fried egg and peanut butter sandwiches. I was to learn that Walt is a true connoisseur of the peanut butter and egg sandwich. For lunch and dinner, we had either hamburgers or peanut butter and jelly sandwiches. Occasionally, we had some fruit and there was a piece of cake here and there. And yes, we survived fine.

Becoming the DX

After picking up supplies, we got Bob's mast and walked it back about half a mile to the rental house. A Force 12 C3SS tri-bander was assembled and raised to about 30 feet off the ground, clearing the house and palm trees nicely. We installed a rope for turning the beam and Thursday evening we had our first QSOs. Friday morning, we put up an inverted L for 75 and 160 meters; one end was in a palm tree and the other went to a fiberglass telescoping mast. The five short elevated radials at the base were adorned with lots of orange tape, just in case any beach walkers came by.

Walt noticed that his voice was a bit raspy and therefore spent hours Friday afternoon setting up a voice keyer, just in case his voice gave out completely. But after all the work, it didn't play properly because stray RF was messing things up.

I was now set for my first experience operating on a DXpedition. It was overwhelming to be the DX, even with all the tips that Walt provided. Anyone who has occasionally complained that a DX operator is too slow, deaf or that he "just doesn't get it" should give it a try sometime. Especially for the first-time operator, it's daunting. During my initial stint at our Belize station, it seemed like a rumbling mountain was audibly building in the headphones. It was unbelievable.

The contest started late Friday afternoon. I was concerned about Walt's voice, but by Saturday morning the problem had disappeared. Being the novice, I volunteered to take the night shift on 40, 80 and 160 meters. During the middle of the night, I went out to move the clip lead on the inverted L to transform it from its 80-meter position to 160. I don't know if any humans saw me, but the entire dog population of the area was certainly in attendance—holding a big flashlight was like a homing beacon for them. Fortunately, none of them went on the attack, but they sure did make a lot of noise.

During the day I got some sleep, but by 2:30 PM, Walt was ready for a rest himself. Around 4 PM, I found out what real DX contest running was all about. I could hear the mountain building. I was at a rate of about 250 contacts per hour, the highest I have ever done. Entering data into the computer was now beyond my skill level and my brain, voice and hands were no longer in sync. But it just kept building. By 6 PM I tore off the headphones and told Walt I couldn't handle any more. I was concerned about my ability to hold onto this mountain of callers. It took Walt about two hours to work the mountain down, operating at rates approaching 400 contacts per hour. Right then, I thought that it must be the biggest pileup of all time.

By Sunday morning, after another all-nighter, I was beginning to wonder about my love affair with contesting. Compared to Saturday, Sunday was a piece of cake. We ended up with about 5200 QSOs in the contest, with another 2500 out-of-contest contacts made. The experience taught me a lot about working pileups and I learned what worked for the callers, as well, both with Morse and on phone. One thing we clearly noticed was that to get through to V3, it apparently helps to be in Italy. The Italians had an easy time getting through, closely followed by Japanese stations.

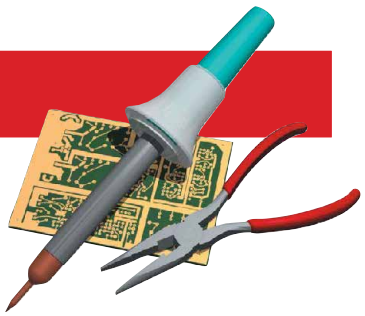
Relaxing and Reflecting

With the contest over, we moved on to more casual DXing, sightseeing and a few other things. But first on the agenda was to speak with our wives. We reached Walt's wife Mary Kay, NØUGX, on 20 meters, while my wife, Rosemarie, was listening in at home on my transceiver. Later, schedules were set up and phone patches were made through Colorado to my home near Boston.

Because of the limited road system we didn't get to see very much of Belize. We spent some time in Placencia, a fishing village, and Walt did some snorkeling. On March 10, we started dismantling the station and the next day the final antenna came down. The trip back was uneventful. Walt and I had a lot of fun on this great trip and, now initiated into the once-mysterious world of "being the DX," I found myself thinking about where I might go next.

All photos by the author.

Jim McCobb, W1LLU, has been a ham for over 44 years, first being licensed in 1959 as KN1LLU. After a stint in the US Air Force in the early 1960s, when he held the call KA8JM, McCobb graduated from Bentley College and embarked on a career in banking and financial consulting. He enjoys HF operating, primarily on SSB, and runs the gamut of contacts from ragchewing to contesting. He is a member of the Yankee Clipper Contest Club and a Life Member of ARRL. Since 1980, he has served as the League's treasurer. McCobb can be reached via e-mail at **w1llu@arrl.org**.



The Doctor is IN

Q Debbie, N1YYB, asks: I am plagued by interference from an unknown source. I suspect it's possible the noise is generated by something in our house but I'm not sure. Any suggestions on how to locate the noise source—or at least determine whether or not it's internal to our home?

A Certainly—and here is an easy approach. You'll need a battery-powered AM radio capable of hearing the interference and possibly a flashlight. Proceed as follows:

1. Go to the main breaker panel or fuse box in your home. Verify the presence of the noise with the battery-powered radio. Be sure to have your flashlight ready if electric lighting illuminates the panel or the area in which it is located.

Caution—you must take any and all precautions before proceeding to the next step if there is any possibility of physical contact with any live or hot circuit component within the breaker panel. Solicit professional help if you are uncertain or unsure of proper and safe operation. Do not, under any circumstances, remove the breaker panel sub-cover unless you are qualified to work on live ac mains-level circuitry. Even so, there should be no reason to work within the panel sub-cover unless you can confirm that a faulty or arcing breaker is the cause of the RFI (a rare occurrence). If that is confirmed, seek qualified help.

2. Set the main breaker to off. The noise will stop if its source is located within your house. If the noise continues, you can assume it is coming from a point external to your home.

Note that, if this is the case, the noise is originating from a source that is beyond your control. Radio Direction Finding techniques may then be used to isolate the noise to a particular residence or an area of your utility's power line system. This is obviously not a repair you can make yourself. In the case of power line noise, start by filing a complaint with your utility's customer service department. Never attempt to climb or bang on utility poles.

3. Assuming that the noise stops, return the main breaker to the on position.

4. Isolate the offending noise source to a particular circuit by turning off each circuit breaker, individually. Once you open the breaker associated with the offending source, the noise will disappear. Be sure to return all breakers to the normal on position once the circuit has been located.

5. Finally, isolate the noise to its actual source by unplugging each device on that circuit. You will have found the offending device when the noise again disappears. Don't forget potential RFI sources such as doorbell transformers and furnace controls. These devices are causal to common interference problems and can be overlooked by the novice RFI investigator. Good luck on your hunt!

Q Joe, N1KHB, asks: Doc, I'm looking to make some plastic insulators to support wire antennas at my QTH. I plan on buying a quantity of either Lexan or Plexiglas, but I haven't decided which. I've heard that Plexiglas is not as good as Lexan for projects involving exposure to the weather—can you give me some guidance?

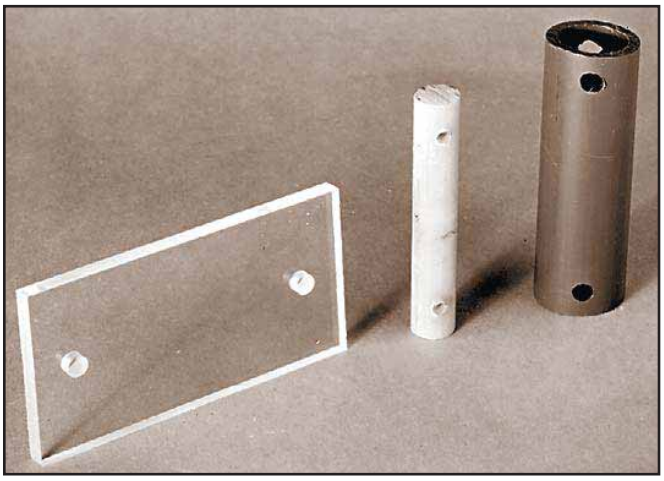


Figure 1—Here are some homemade antenna insulators made of acrylic and polycarbonate plastics. They are easily machined, have good weathering characteristics and are fairly strong.

A The Doctor doesn't claim to be a plastics expert, but I can advise you on a couple of points. I don't think UV or weather exposure is much of a problem with Plexiglas or Lucite (which are trade names for clear acrylic) or else it wouldn't be used for windows. Lexan (a trade name for polycarbonate), however, is much stronger than Plexiglas and will hold up to much more physical strain and abuse as would occur when it's used as an antenna insulator. For more information on the properties of plastics, the doctor suggests contacting a plastics distributor or manufacturer. You can locate several using the TIS Find Web page at **www.arrl.org/tis/tisfind.html**. Some antenna insulators made of these materials can be seen in Figure 1. The nice thing about them is that they're easily configurable to custom requirements that the commercial products might not be able meet.

Q Ed, K4SB, asks: What is the formula for an LC constant? I can't seem to locate it in my collection of books, but I know I've seen it before. It is a "dream" for calculating L and C values for a resonant network. One of the best applications for this is in matching an end-fed half-wave vertical. Since a 1/4 wave vertical with a feed point near the ground can suffer from ground losses, this technique allows the high current point to be moved up so as to reduce the losses greatly.

A It took The Doctor a while to dig this one up, but he discovered the answer in the 1970 *ARRL Handbook*. It's actually present, in rearranged form, in the current (2003) *Handbook*, p 6.35, equations 91 and 92. The formula is:

$L \times C = 25{,}330 / F^2$ (where F is in MHz)

That formula is easily derivable with a little math, however, so you don't have to clutter up your brain with a bunch of numbers or constants. Remember that, at resonance, the

capacitive reactance is equal to the inductive reactance in a series circuit. So,

$X_L = X_C$ or $2\pi fL = 1 / 2\pi fC$ and…multiplying both sides by $2\pi fC$,

$(2\pi)^2 f^2 LC = 1$, so $f^2 = 1 / (2\pi)^2 LC$. Now, take the square root of both sides,

$f = 1/2\pi\sqrt{LC}$ …and, presto, we've derived the formula for resonance in a series circuit.

Now, rearranging and squaring, $LC = 10^6 / (2\pi)^2 f^2$. We added the 10^6 term because we want our formula to reflect frequency (f) in MHz, not Hz. If you carry the mathematics through, you'll see that $LC = 10^6 / 39.478 f^2$ or…

$LC = 25330 / f^2$ and…there's our formula!

The Doctor recommends that you not memorize formulas, if possible.…Try to remember what they really mean and you should be able to derive them with little work. That way, you'll understand where they came from.

The Doctor would also note that a quarter-wave vertical can be raised above ground and, with the addition of a few radials (3 or 4) as a counterpoise, the same result that Ed describes will be achieved.

Q Wally Veal, N4ZNH, writes: I have a Kenwood TS-570D and recently purchased an Ameritron AL-811H amplifier. What I'm looking for is a wiring diagram for the remote connector from the rig to the amplifier. The amplifier relay jack calls for a shielded audio cable with a standard male phono plug to connect to the rig's normally open amplifier keying circuit. The keying circuit in the amp has positive 12 V dc open circuit and provides 100 mA of current when pulled to ground. The amp also has an internal snubber diode across the relay coil. The ALC circuit also uses a shielded audio cable with a standard male phono plug to connect the ALC jack on the amp to the negative-going ALC input jack on the rig. Any help in configuring the cable or…if you know of a source for such a cable, that would be greatly appreciated.

A According to page 61 of the Instruction Manual (you can download it from **www.kenwood.net/indexKenwood.cfm?do=SupportFileCategory**), you'll see that pin 2 of the remote connector goes to the ground/shield, pin 4 of that connector goes to amplifier relay and pin 6 goes to the amplifier ALC circuit. There is also a collection of connector diagrams available on the same Web site, including the microphone, remote and accessory connectors. That should get you going!

Q Richard, W4MUR, writes: I have encountered an antenna problem that has me totally buffaloed. The design is electrically a J-pole (15 meters), but the matching stub is run horizontally. The radiator consists of a half-wave vertical made of a 10 foot section of 1/2-inch electrical conduit with threaded nuts brazed to each end for mechanical and electrical coupling. To the top of this is screwed a 12 foot length of WW II surplus mast sections. The matching section consists of 11 feet of open wire feed line (12 gauge wire spaced 3 1/2 inches, fed with 50 Ω coax near the shorted end).

The antenna sits on top of a 14 foot fiberglass vaulting pole and sticks through a short section of ABS pipe bolted to the edge of the garage roof and is about 2 feet from the brick wall of the garage. Additionally, there is an 18 inch wide horizontal trellis of galvanized mesh attached to the wall at the 7 to 9 foot level for some vines in my yard. Near the bottom of the vertical radiator is a triangular metal vent.

In order to tune the antenna, I brought the base of the antenna away from the wall, lowering it to a convenient tuning height. The top part was still run through the ABS pipe. I was able to get a 1.1:1 SWR using an antenna analyzer.

Upon raising the antenna to vertical, the SWR increased and no matter where I connect the coax to the open wire, the best SWR I can get is 2:1. Simultaneously, the resonant frequency decreases from the lowered position to the vertical position. I tried coiling the coax to act as a choke balun and manipulating the antenna position so that it no longer touched the ABS support pipe. Raising the antenna incrementally to the vertical position, I observed increasing SWR as it became more vertical. Changing the position of the matching section to vertical had no effect. What's going on?

A I definitely recommend using a balun for this antenna for a permanent installation, although it is not likely the cause of your problem. Coiled coax would certainly suffice, but it *must* be wound in adjacent, neat turns in order to get the proper choking action (using some sort of coil form would be a good idea). *The ARRL Antenna Book*[1] suggests using 6 feet of coax wound in 8 turns as being the optimal configuration for a 15 meter choke balun (this applies to both RG-8 and RG-58 type coax).

Figure 2—A portable antenna analyzer is a useful device for determining antenna and transmission line characteristics. It generates its own signal, so transmitter RF isn't required.

What is the most likely cause of your grief is the metal vent at the peak of the garage roof. This piece of metal will act as the plate of a capacitor, with the antenna as the other plate—as if you had added a small capacitance hat at that point of the antenna. This, in itself, is not so much the problem, but rather, the different position of the antenna from where you tuned it to where it was finally mounted. The electrical position of this capacitance hat is changing with respect to the antenna and that is most likely changing the antenna's resonant frequency.

What I would suggest is to make note of where the resonant point is now (in the permanent mounting position). Don't worry about the actual SWR for the moment—just note where the impedance is pure resistive. The use of a portable RF antenna analyzer, similar to the one shown in Figure 2, is recommended. Then, lower the antenna, change the length of the radiator by several inches and raise it back up. Relocate the resonant point and note how much it's moved. This should give you a pretty good idea as to how you need to change the length of the radiator to get the exact resonance you desire, although it may require a couple of tries before you get it exactly where you want it.

Once you get the radiator where you want it, adjust the position of the feed point on the ladder line. Since the ladder line is not a radiating section (not significantly so, anyway) it should not be affected by the proximity of the wire mesh for the vines, especially if you are using a balun on the coax. The Doctor hopes that helps and good luck!

[1] *The ARRL Antenna Book*, 19th ed., is available from your local dealer or the ARRL Bookstore, order no. 8047. Tel (toll-free in the US) 888-277-5289 or (from elsewhere) 860-594-0355; **pubsales@arrl.org**; **www.arrl.org/shop**.

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

By Larry Coyle, K1QW

A "Clamped-Bandwidth" Gyrator Audio Filter

What's a gyrator? This little audio processor can improve the performance of a less-than-ideal receiver.

While waiting for enough cash to accumulate in my bank account to upgrade my ham equipment, I had to make do with a cheap, bottom-of-the-line receiver setup. Any of you who have been in that situation know the problems—noise, poor selectivity, etc. A few months ago, I decided to buckle down and put together an audio processor box. I wanted something that would plug in between the audio output jack from my receiver and my headphones and give me a little boost in performance.

In particular, I decided that I needed the following:

- a tunable band-pass filter
- a means of changing the balance between the left and right sides of the headphones (so I could compensate for a slight hearing loss in one ear)
- some additional gain

After a little more thought I came up with a few more nice-to-have features:

- a switch to reverse the phase between both sides of the headphones
- a constant or "clamped" bandwidth circuit that, once set, remains fixed, regardless of center frequency

This last feature would make the unit a lot more pleasant to use than the typical constant-Q band-pass filter, where the bandwidth gets wider as the center frequency is increased.

After perusing a few handbooks and asking around a bit, I decided that the heart of my little audio processor should be a variable band-pass filter based on a circuit called a *gyrator*. The gyrator is a useful circuit that doesn't seem to be as familiar as it should be, so I'll explain a little bit about it before jumping into the other details of the processor.

The Gyrator

A gyrator is a unique circuit that uses a couple of operational amplifiers, some resistors and a capacitor to mimic the properties of an inductor. A basic gyrator circuit is shown in Figure 1. The nice thing about a gyrator, aside from being small and inexpensive, is that the effective inductance can be quite large and can be varied over a wide range by simply changing the setting of a variable resistor. So, a gyrator inductor in parallel with a capacitor gives a fine imitation of a variable tuned circuit at audio frequencies, without the need for a huge iron-core inductor. More information on this useful circuit is available elsewhere.[1]

A gyrator with the circuit values shown in Figure 1 covers the inductance range of 600 mH to 27 H simply by rotating the 500 kΩ potentiometer (R1) over its full range. With a 0.01 µF capacitor in parallel, the circuit's resonant frequency can be varied from 300 Hz to 2000 Hz.

The Complete Circuit

Figure 2 shows the complete schematic for the audio processor. The gyrator inductor consists of op amps U1C and D, ca-

[1]P. Horowitz and W. Hill, *The Art of Electronics*, 2nd ed., Cambridge University Press, 1989, p 281.

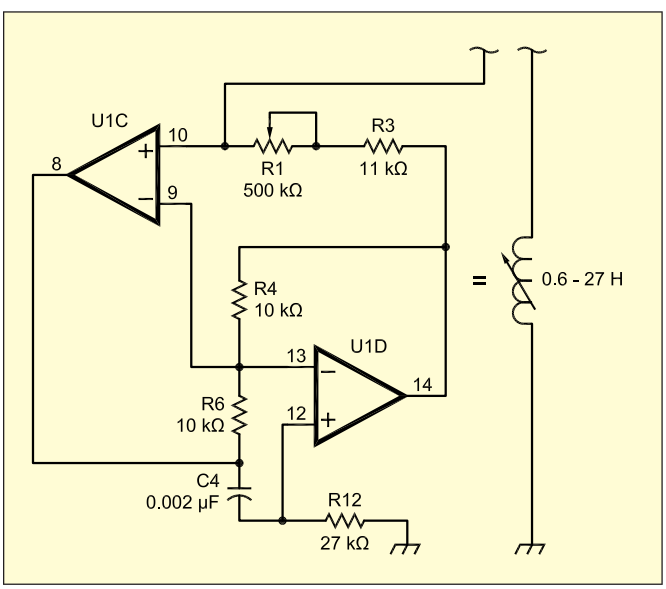
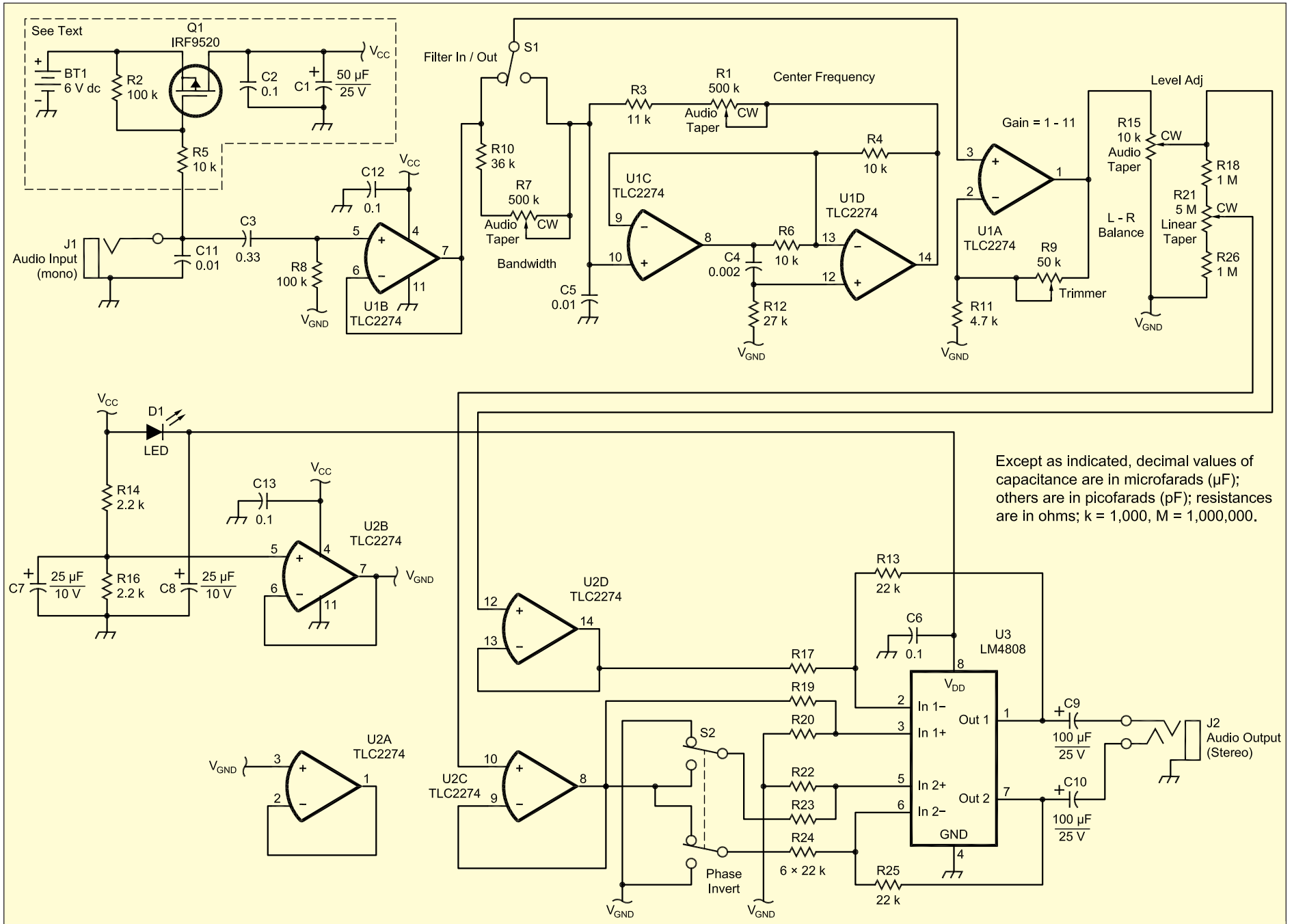


Figure 1—The basic gyrator circuit. This circuit looks like an inductor but minus the heavy iron. As the 500 kΩ pot is varied over its range, it mimics a 0.6 H-27 H variable inductor.



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.

Figure 2—Schematic diagram and parts list for the tunable-bandpass headphone amplifier. Parts are available from a number of sources, including Digi-Key Corp, 701 Brooks Ave South, Thief River Falls, MN 56701; tel 800-344-4539; www.digikey.com; Mouser Electronics, 1000 N Main St, Mansfield, TX 76063; tel 800-346-6873; www.mouser.com and Ocean State Electronics, PO Box 1458, 6 Industrial Dr, Westerly, RI 02891; tel 800-866-6626; www.oselectronics.com. Common resistors, capacitors and toggle switches are available at RadioShack; www.radioshack.com.

BT1—Battery, 4-AA in holder (6 V dc).
C1—50 µF, 25 V electrolytic capacitor.
C2, C6, C12, C13—0.1 µF, 50 V ceramic capacitor.
C3—0.33 µF, 50 V ceramic capacitor.
C4—0.002 µF, 50 V ceramic capacitor.
C5, C11—0.01 µF, 50 V ceramic capacitor.
C7, C8—25 µF, 10 V electrolytic capacitor.
C9, C10—100 µF, 25 V electrolytic capacitor.
D1—LED, red, panel-mount.
J1—1/4 inch, mono phone jack.
J2—1/4 inch, stereo phone jack.
Q1—IRF9520 MOSFET.
R1, R7—500 kΩ potentiometer, audio taper.
R2—100 kΩ, 1/4 W, 5%.
R3—11 kΩ, 1/4 W, 5%.
R4, R5, R6—10 kΩ, 1/4 W, 5%.
R8—100 kΩ, 1/4 W, 5%.
R9—50 kΩ, 10% trim potentiometer.
R10—36 kΩ, 1/4 W, 5%.
R11—4.7 kΩ, 1/4 W, 5%.
R12—27 kΩ, 1/4 W, 5%.
R13, R17, R19, R20, R22, R23, R24, R25—22 kΩ, 1/4 W, 5%.
R14, R16—2.2 kΩ, 1/4 W, 5%.
R15—10 kΩ potentiometer, audio taper.
R18, R26—1 MΩ, 1/4 W, 5%.
R21—5 MΩ potentiometer, linear taper.
S1—SPDT miniature toggle switch, panel mount.
S2—DPDT miniature toggle switch, panel mount.
S3—SPST miniature toggle switch, panel mount (optional power switch, see text).
U1, U2—IC, TLC2274CN quad op-amp, TI (Digi-Key 296-7129-5-ND).
U3—IC, LM4808M dual headphone amp (Digi-Key LM-4808M-ND).

pacitor C4 and resistors R1, R3, R4, R6 and R12. The 0.01 µF capacitor C6 resonates with the gyrator to form the equivalent of an LC tuned circuit. As R1 is varied over its range, the center frequency varies from 300 Hz to about 2060 Hz. R7 and R10 are in series with the tuned circuit and control the bandwidth, which can vary from 30 Hz to 420 Hz over the range of R7.

Note that with this arrangement, the circuit Q changes along with the resonant frequency, so that once the bandwidth is set by R7, it remains at that setting regardless of where the center frequency is set—one of my design goals.

Op amp section U1A acts as a buffer to prevent the level control, R15, from loading the filter and changing its electrical characteristics. I also included a gain-setting trimmer resistor, R9, in this stage, in case it became necessary to boost the receiver audio. R9 could be just a fixed resistor, if you don't need to fool much with the maximum gain.

Audio Output Stage

Following this buffer amplifier are the front panel level and balance controls. The outputs from these pots are buffered by op amp voltage followers and fed into the LM4808 dual audio amplifier, U3. Switch S2 reverses the phasing of one of the headphone channels and illustrates a very interesting phenomenon. In one position of S2, you will hear the sound in your headphones as two separate sources, one at each ear. With the phase reversed, the sound appears to come from somewhere inside your head.

Audio Input and Power Control

Audio is ac coupled from the input jack to a unity-gain buffer stage, U1B, to isolate the filter bandwidth control from the outside world. Across the input jack is a 0.01 µF capacitor to prevent local high-powered AM broadcast stations from getting into this circuit.

The whole circuit draws less than 11 mA and runs very nicely off four AA alkaline cells. To avoid wasting battery energy (and to save wiring in a power switch), I used a P-channel MOSFET, Q1, to switch power to the circuit. When the input cable is connected to the receiver audio output jack, R5 is pulled toward dc ground, turning on Q1 and applying power to the circuit. (If you decide to use this feature, you must be sure there's a dc path to ground through your receiver's audio output jack. Mine didn't have one, so I had to install a 10 kΩ resistor inside the receiver, across the jack. Alternatively, you could just wire in a power switch in place of Q1 and its associated components.) [An LM78L05 voltage regulator with two 1N916 diodes in series with the regulator's ground (center) pin (cathodes toward ground) will give 6.3 V dc at up to 100 mA from a 12-14 V dc station source. Place a 0.33 µF capacitor at the regulator input and a 0.1 µF capacitor at its output. Put the power switch before the regulator circuit.—*Ed.*]

Finally the LED, D1, serves a double purpose. It drops the supply voltage to IC U3 so as not to exceed the 5.5 V maximum supply voltage rating of the LM4808, and it also shows that power to the circuit is on. Because the current drawn by U3 varies with audio level, the LED blinks in time with the CW signals being received. I haven't yet found any practical use for this effect, but it does look cool. [It could be a good indicator of a CW signal centered within the preset passband, while tuning.—*Ed.*]

Construction

You can use any wiring technique you like for this project, as there is really nothing critical about parts layout or lead dressing. The 4 AA cells that power the unit mount inside the box, or an external 6 V dc or 12 V dc supply with regulator can be used, as described earlier.

Almost all parts are of the through-hole variety, one exception being the LM4808 output amplifier, which is available only in a surface mount package. A well-stocked junk box is a good start for most of the routine components, and ICs and pots are all readily available through the major parts suppliers.

Conclusion

This little box won't turn a third-rate receiver into a top of the line model, but it will help you dig out those CW stations from deeper in the pileups. It's easy to use, inexpensive to build, and when you crank the bandwidth down, it's a real joy to hear how the QRM just melts away!

Larry Coyle, K1QW, was first licensed in the late 1950s, while in high school. He operated CW and phone back then, using homebrew gear on 40 and 10 meters. Inactive for some time while pursuing an MSEE degree and a career, and raising a family, he reentered the amateur ranks after earning an Amateur Extra class license. Larry is looking forward to operating the HF CW bands again, whenever he can take time away from his EE consulting business. You can reach him at 100 Rolling Ln, Needham, MA 02492; **lmcoyle@attbi.com**.

MixW

Is it possible to discuss a multifaceted piece of software in a single *QST* page? *MixW Windows* is essentially one-stop shopping for Amateur Radio digital operating. It's difficult to do justice to the "Swiss Army Knife" of digital software in less than 800 words.

What *Can't* It Do?

Assuming you own a sound-card-equipped *Windows* PC and an appropriate sound-card interface, *MixW* gives you the ability to send and receive RTTY, CW, PSK31, Hellschreiber, MFSK16, FSK31, PSK63, Throb, MT63, SSTV, packet (HF and VHF) and AMTOR. You can also receive PACTOR-I and fax with *MixW*.

MixW will "talk" to your transceiver if it is CAT compatible, which many are these days. This means you can manipulate your rig from within *MixW*. With software such as *PCAnywhere*, you can even do this remotely. *MixW* can also interface with your antenna rotator.

MixW incorporates a sophisticated logging program that includes a "contest mode" with configurations for a number of popular digital contests. When you click on a call sign in the receive window, *MixW* enters the call into the log and displays the country information according to the prefix. *MixW* will export to ADIF and Cabrillo formats. And, yes, it prints QSLs and QSL labels.

As they say in the TV commercials, "Wait! There's more!" *MixW* will function as a "voice keyer" for contest operating. It can grab spots from your local DXcluster via packet radio or the Internet. *MixW* will even monitor and decode the NCDXF/IARU CW propagation beacons (your PC needs to have a very accurate clock for this function to work properly).

On the Air with *MixW*

After two months, I am still exploring the features of *MixW*, but what I've seen so far is impressive. With the selectable waterfall, spectrum and tuning displays, *MixW* is quite easy to operate, regardless of mode. Even digital modes as notoriously difficult to tune as HF packet and MFSK16 yielded quickly to *MixW*.

Speaking of MFSK16, one of the new aspects of this mode is the ability to send images at any time during a QSO. The practice is controversial among US amateurs because, depending on how you interpret Part 97, transmissions with image content may be illegal within the so-called CW/digital subbands (which is why traditional analog SSTV QSOs are conducted in the phone portions of the bands). I have already seen a number of these image-added MFSK16 QSOs taking place. *MixW* automates the process in a clever way. If you are copying text and the operator suddenly begins sending an image, *MixW* automatically opens a tiny window, displays the picture (see Figure 1) and then returns to the text mode.

PSK31 operation with *MixW* was a joy. You can "bookmark" stations in the tuning display and even scan for signals throughout the passband. The tuning indicator analyzes signal characteristics and provides RST reports on the fly (a handy feature).

MixW did a fine job copying RTTY. Its performance might fall a little short of the highly praised *MMTTY* software, but it is close. Visual modes such as SSTV and Hellschreiber worked very well. Hellschreiber was particularly fun with *MixW*. See Figure 2. As with all amateur software, I found that performance in the CW mode is most reliable with perfect fists and strong signals.

Conclusion

To experience *MixW* with minimal investment, download and test-drive the fully functional 15-day version. You can download it from Jim Jaffe, WA2VOS, at **www.nvbb.net/~jaffejim/MixWpage.htm**, or from the *MixW* site at **www.mixw.net**. The registered version will set you back $50, which is not bad at all for such a highly capable application.

System requirements: Pentium 166 or faster PC running Windows 98, ME, NT, 2000 *or* XP *with a 16-bit SoundBlaster-compatible sound card.*

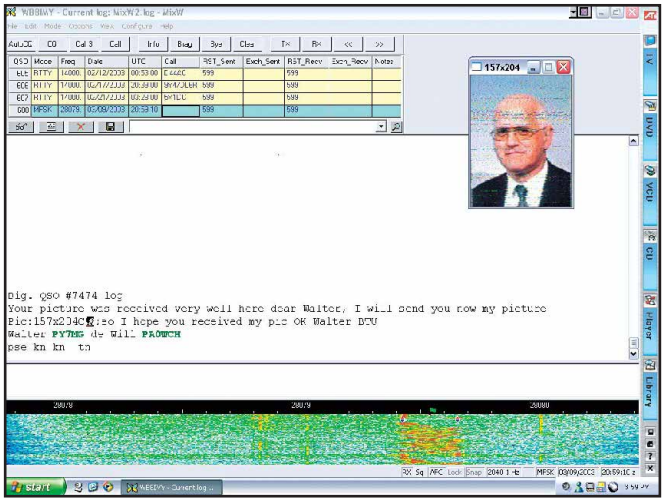


Figure 1—PA0WCH sends a picture of himself while making an MFSK16 contact with PY7MG.

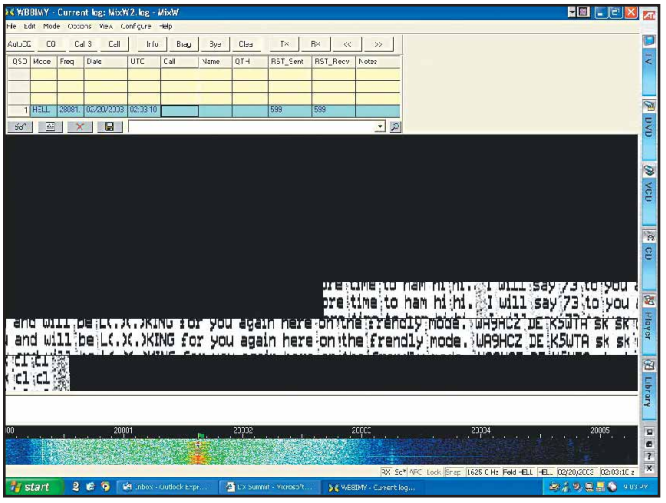


Figure 2—WA9HCZ and K5WTA enjoying a Hellschreiber QSO.

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

Experiment #7—Voltage Multipliers

Background

This is the second of a three-part series of experiments on power supply circuits. Last month we studied the rectifier. This month we take the rectifier one step further to create output voltages higher than that of the power source…even of the opposite polarity!

Terms to Learn

- *Commutation*—periodic switching that is synchronized to a clock signal or a time reference
- *Floating*—a voltage source is floating if neither of its output connections are connected to ground
- *Ripple*—the regular (ac) variation of rectifier output voltage at the frequency at which the output capacitor (filter) is charged
- *Surge Current*—the large inrush of current into discharged capacitors when voltage is first applied
- *Voltage Regulation*—the change in output voltage with load current (usually expressed as a percentage change in voltage for a given change in output current)

The Voltage Multiplier

There are many instances where an ac power source is available but a dc voltage is needed by a circuit that can't be obtained by using a simple rectifier. Sometimes, a circuit just needs a "dab" of higher voltage…and it's not worth the expense of using a higher-voltage transformer or adding another secondary winding to get it. For other applications, such as high-voltage supplies for amplifiers or other tube circuits, a full-voltage transformer may be too expensive (or too difficult to insulate for the high voltage needed). Voltage multiplier circuits are used to address both situations.

In the full-wave rectifiers of the previous experiment, we saw how diodes are used to route charging current into a storage capacitor. The diodes effectively double the frequency at which the capacitor can be charged. The doubling of the charge frequency also doubles the amount of current a rectifier can supply for a given voltage variation or ripple.

What if, instead of doubling the output current, there was a way to use the same diodes to double the output voltage? By arranging the diodes and capacitors properly, we can create a "bucket brigade" effect where the voltages of the capacitors can be added together.

Figure 1A shows the simplest voltage multiplier—a half-wave doubler—supplied from a source with an RMS voltage of V_{RMS} and whose peak voltage is 1.4 V_{RMS}. Starting with both capacitors discharged, a negative half-cycle from the voltage source charges C1 to 1.4 V_{RMS} through D1, as shown in Figure 1B. On the following half-cycle, in Figure 1C, the output capacitor C2 is charged through D2 but, like an acrobat

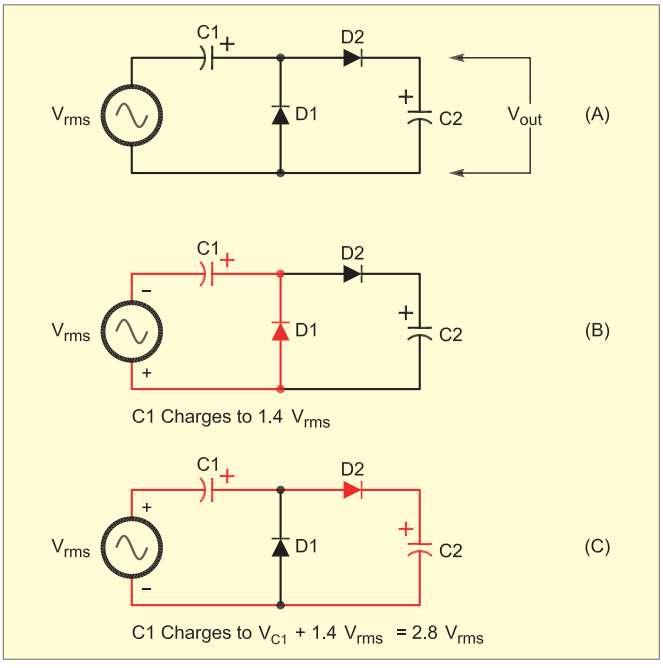


Figure 1—The half-wave voltage doubler circuit. Figures 1B and 1C show how the capacitors charge on alternating half-cycles. The voltages of C1 and C2 are added together as C2 is charged.

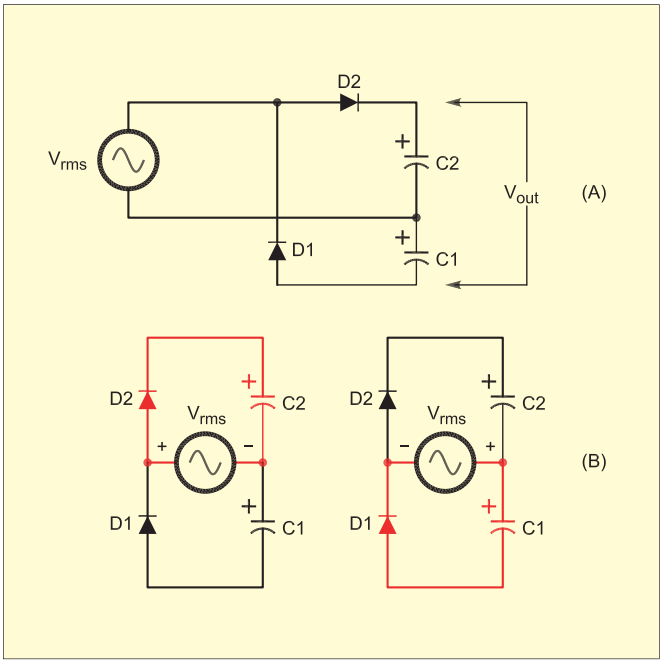


Figure 2—The full-wave voltage doubler. Figure 2A shows the usual schematic for the circuit. Figure 2B redraws the circuit for clarity and illustrates how the capacitors charge on alternate half-cycles.

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

springing onto another's shoulders, the voltage of C1 adds to the source voltage and C2 is charged to 2.8 V_{RMS}. Because one diode is always in the current path, the actual output voltage is less by one diode's forward voltage drop, V_f, of 0.7 V.

The half-wave doubler only charges the output capacitor once every other half-cycle, limiting the amount of current that can be drawn from the supply. Each diode and capacitor in the half-wave doubler must be rated to handle the full output voltage. These limitations can be a problem at high output voltages.

To increase the amount of output current and reduce the necessary ratings of individual components, the diodes and capacitors can be rearranged as shown in the full-wave doubler circuit of Figure 2. For the half-wave doubler, one side of the voltage source may be grounded, but for the full-wave doubler, the source must be floating.

Figure 2A shows the customary way of drawing the full-wave doubler circuit on a schematic, where the voltage source is usually a transformer secondary winding. However, it's a little easier to understand when redrawn as in Figure 2B. On alternate half-cycles, the source charges each capacitor to its peak voltage, 1.4 V_{RMS}. The output voltage is developed across C1 and C2 in series. This also means that the value of output capacitance that supplies current to the load is less than C1 or C2 by the equation:

$$C_{output} = (C1 \times C2) / (C1+C2)$$

In addition, one diode drop is subtracted from the charging voltage of each capacitor, so the actual output voltage will be 2.8 V_{RMS} – [2×0.7 V].

Note that when using these voltage multiplier circuits for powering actual equipment at higher power, it is necessary to limit the surge current into the capacitors when the supply is first powered up. The discharged capacitors look like short circuits to the transformer secondary and diodes and can blow a fuse or damage components on those first few cycles of charging. That is why, in *The ARRL Handbook*, the discussion of voltage multipliers includes surge-limiting resistors. In our experiments, the surge currents are quite small and can be ignored.

Testing a Pair of Voltage Multipliers

Let's start with the half-wave doubler. As with last month's experiment, use your function generator as the voltage source. Construct the circuit as shown in Figure 1 taking care to observe the polarities of the capacitors.

- Set the function generator to output a 1 kHz sine wave at 5 V_{RMS}. Use your voltmeter to measure the dc voltage across C1 and C2. With no load to drain charge from either capacitor, you should measure nearly 2.8 × 5 V = 14 V dc across both C1 and C2.
- Connect a 10 kΩ load resistor across C2 and re-measure the capacitor voltages. You will see the voltage across C1 drop to just below 1.4 × 5 V = 7 V dc while the voltage across C2 stays about one diode forward voltage drop (0.7 V) below 14 V dc. If you are using an oscilloscope you should see waveforms like those of Figure 3.
- You can experiment with the doubler by varying the load resistance or capacitance values. Less load resistance (a heavier load) or less capacitance will drop the output voltage dramatically as C2 is discharged more during each half-cycle. Vary the frequency of the source. Raising the source frequency also charges the capacitors more frequently, so for a given load resistance, this will increase output voltage.
- Make a voltage inverter by switching the polarity of the diodes and capacitors.
- Construct a full-wave doubler, as in Figure 2, using the same diodes and capacitors as for the half-wave doubler. You won't be able to use the oscilloscope unless the function generator output is floating, so rely on your voltmeter.
- With no load resistor connected, the output voltage will be close to 14 V dc, but with the 10 kΩ load, the output voltage will be lower than for the half-wave doubler because the effective output capacitance is less—C1 in series with C2—and there is an extra diode forward voltage drop. However, the *voltage regulation* of the full-wave doubler is better than the half-wave circuit because the output capacitors are charged more frequently, doubling the ripple frequency.
- If you add a 1 µF capacitor in parallel with both C1 and C2, the output voltage should increase.

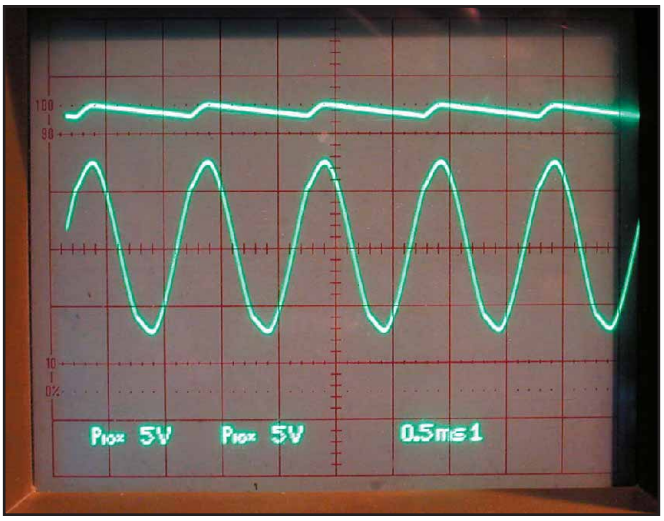


Figure 3—The photo shows the input sine wave to a half-wave voltage doubler and the output waveform across C2. Note that capacitor C2 is charged once every other half-cycle. Ground potential for both channels is at the center of the sine wave.

It should be obvious from your experiments that the voltage regulation of these voltage multiplier circuits is not outstanding. They should not be used where large variations in load current are to be expected. They are useful circuits, however, and can be used effectively where load currents are low and where "stiff" voltage regulation is not important.

Suggested Reading

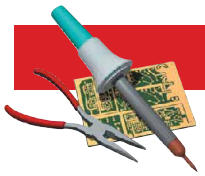
- Chapter 11 (rectifier circuits) of *The ARRL Handbook* has an excellent section on voltage multipliers, including triplers and quadruplers. A set of graphs is provided to aid in figuring how much capacitance is needed for given loads with a 60 Hz ac supply.
- And don't forget our Web site for this series is **www.arrl.org/tis/info/html/hands-on-radio/**.

Shopping List

- 2—1N4148 diodes (any silicon rectifier will do)
- 10 kΩ, 1/4 W resistor
- 4—1 µF and 2—10 µF capacitors, 25 V dc or higher

Next Month

So what do you do with all these power supplies? To get the best results from most circuits, it's necessary to power them with a smooth, constant voltage. Next month, we'll design and build a voltage regulator to do just that. QST



HINTS & KINKS

A PIC PROGRAMMER FOR ALL COMPUTERS

◊ I have an old autopatch and I wanted to add a CW IDer to it. The natural choice of methods for building this IDer is a PIC processor. *The 2001 ARRL Radio Amateur's Handbook* had just the ticket on pages 22.59 through 22.65. When I built the PIC programmer shown there and plugged it into the back of my laptop computer, it didn't work. Some research showed that the problem lay in the voltages on the RS-232 port. The specification for RS-232 communication ports includes 12-V minimum levels, and the PIC requires 12-14 V on the pin 4 ($\overline{\text{MCLR}}$) to assert the programming mode. Many computers do not meet the standard (my laptop only hit a little over 8 V). So, I needed a programmer that would be compatible with the original found in the *Handbook*, but work with any computer, including my laptop. So I set out to redesign the PIC programmer with these goals:

- Work with any computer.
- Work at the end of a serial cable.
- Support in circuit programming.
- Be easy to build (and cheap).

The downside of the new programmer is that it requires an external dc power supply of 15-25 V (+15 V is the +13-V regulator's minimum input requirement; +25 V is the +5-V regulator's maximum input rating). A couple of series connected 9-V batteries do the trick; the programmer consumes little current, so they should last a while. Remember to disconnect them when you're not using the programmer.

I have provided two methods of setting the program voltage. R10 and R9 provide about +12.7 V, sufficient to put the PIC in program mode, but 240-Ω resistors are rare. As an alternative, make R10 220 Ω with R11 1.5 kΩ and V1 a 1-kΩ trim pot available at RadioShack. This lets you use all standard part values and gives the added benefit of being able to precisely set the output voltage to +13 V.

Be careful with the +5-V supply. The TO-220 packaged 7805 has the input on pin 1, output on pin 3 with ground in the middle. The TO-92 is just the opposite: input on pin 3, output on pin 1. The pin numbers on the schematic are correct for the TO-92 package.

This programmer maintains computer control of the programming mode on the PIC as in the original design; this is the purpose of Q1-Q4. When TXD (P1-3) goes low the PIC is taken out of program mode and held in reset. When TXD goes high $\overline{\text{MCLR}}$ rises to +13 V. C1 and C2 make sure that RB6 and RB7 are held low while $\overline{\text{MCLR}}$ rises to its programming level.

I used a wire-wrap socket to hold the 16F84 for programming. This socket is above the level of the board, making it easier to remove PIC.

P3 supports in-circuit programming. For its use, the target project must include a similarly wired connector. The download package includes a diagram of my IDer project, which includes such a connector.

While hand wiring this project is quite acceptable, there is a PC-board pattern and parts placement diagram in the download package.[1]

You need two pieces of software to program PIC projects: a compiler translates your source code into machine code that the PIC understands. I use *MPLAB IDE,* which is available from the Microchip Technologies Web site (**www.microchip.com**). Follow the link to "Development Tools" and then look for the latest version of *MPLAB IDE*. You'll need a broadband Web connection: The current version is 6.20 and the complete system download is over 25 MB.

Next, you need a programmer. This uploads the machine language file to the PIC via the programmer. The one specified in the *Handbook* is called *PIX*, and I've included it in the download package. There are other choices and I tried some of them, but they didn't work on my laptop. *PIX* works great.

Now, you will also want a manual (125 pages) for the PIC so you can know what it all means and figure out how to make the PIC do what you want. You will find this at: **www.microchip.com/download/lit/pline/picmicro/families/16f8x/30430c.pdf**.

You may find this a bit daunting if you are not familiar with microprocessors and assembly language. There are countless tutorials available on the Internet, some right on the Microchip Technologies site. *The ARRL Handbook* gives some good places to go and books to buy too. Don't let the idea of programming scare you away from trying it.

By this time you have built your programmer, downloaded the software, and now you are ready to dive into it. I just want to give a couple of suggestions that will help you get started. First, how do you get *MPLAB* to work? I had the same question. I found the answer by looking in the help files of the program, of all places. Start up *MPLAB* and click on [HELP] [MPLAB IDE Help] [MPLAB IDE Project Tutorial] [How do I create and build an MPLAB IDE project?].

Carefully follow the instructions given there and you will be set. Remember the IDE environment that is *MPLAB* is quite robust and includes a great deal of wonderful tools to help you develop PIC programs. I do not pretend to have it all figured out. I just want to encourage you to keep playing, searching the help and stepping through the tutorials provided with the program. Microchip also has a downloadable reference guide that may help.

The next step is programming the PIC. I use the *PIX* program, as I stated before. It is a pretty straightforward program. To use it you first need to know what your serial port is: COM1, COM2, etc. You can find this by clicking [Start] [Settings] [Control Panel] [System] [Device Manager] [Ports].

You should see something labeled COM_. Once you know this, then you are ready to edit the configuration file for the programmer. Go to the directory where *PIX* is installed and find the PIX.CFG file. Open it using *Notepad*. Find the line "Port=LPT1" and put a semicolon right at the beginning of the line. Then, add a line that says, "Port=COM_", filling in the blank with the number from the device manager. Next, find the line that says, "Programmer=Shaer" and put a semicolon right at the beginning of that line. Now look for the line that says, ";Programmer=Ludi" and remove the semicolon at the beginning of the line. Save the file and start up *PIX*.

When the program starts, a dialogue box will come up that says something like, "No/Bad Hardware. Not True Continue." Select "Yes." The only thing that bothered me about this pro-

[1]You can download this package from the ARRLWeb at **www.arrl.org/files/qst-binaries/**. Look for 03HK08.ZIP.

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

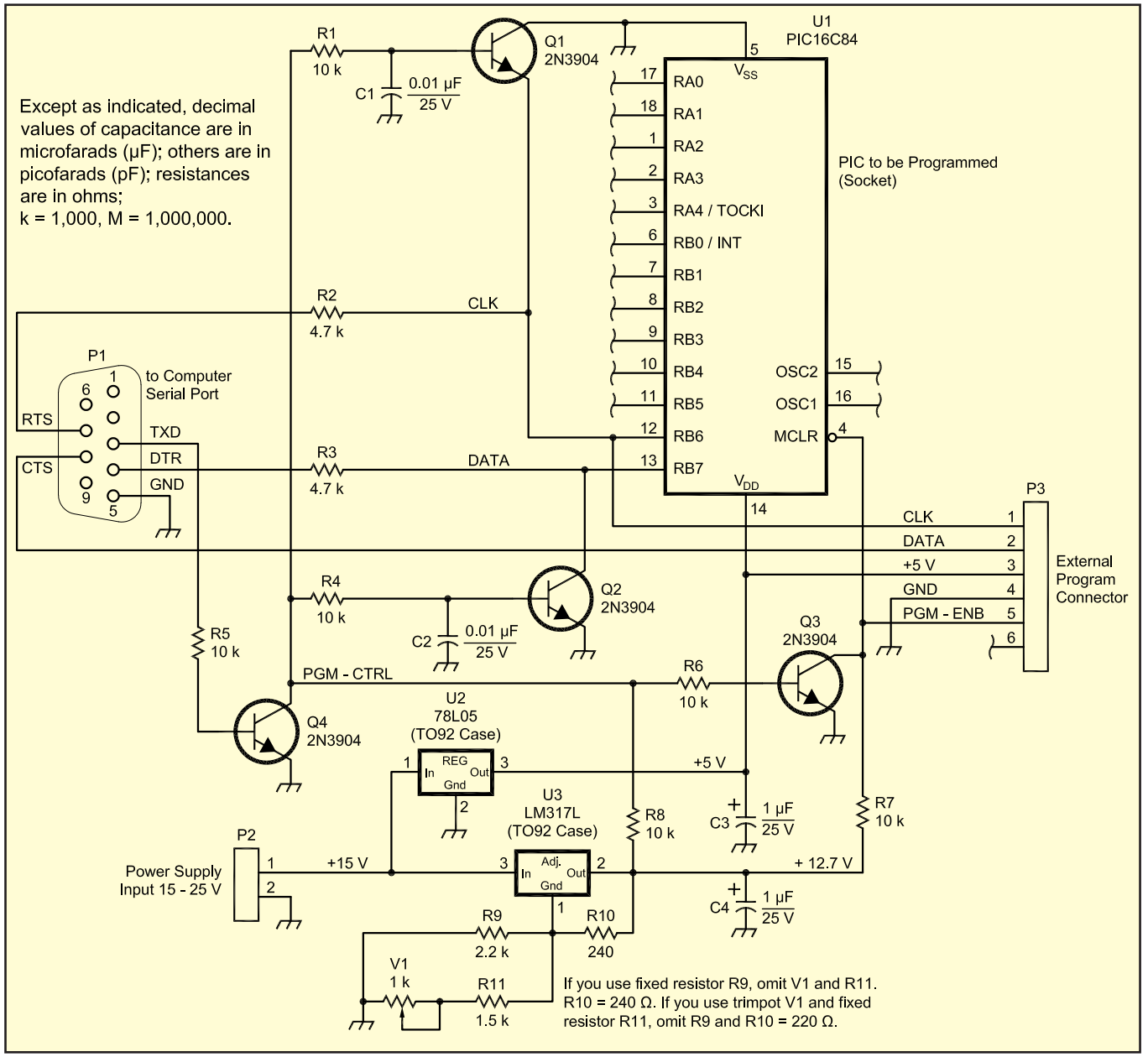


Figure 1—A schematic of WA2PUX's PIC programmer. Unless otherwise specified, use 1/4 W, 5%-tolerance carbon-composition or film resistors.

C1, C2—0.01 µF ceramic.
C3, C4—1.0 µF 25 V radial-lead electrolytic.
P1—DB9, female (right angle).
P2—2-pin header.
P3—6 pin header.
Q1-Q4—2N3904 or equivalent (NPN bipolar).
R1, R4-R8—10 kΩ resistors.
R2, R3—4.7 kΩ resistors.
R9—2.2 kΩ (see text).
R10—220 Ω or 240 Ω (see text).
U1—18-pin DIP wire-wrap socket (see text).
U2—78L05, 5-V, regulator (TO-92 case).
U3—LM317L variable-voltage, three-terminal regulator (TO-92 case).
V1—1 kΩ 15-turn trimpot.

gram when I started using it was the terminology. I see choices like "BLOW PIC" and "BLOW EEPROM." I had heard of and used terminology like "burning an EPROM," but never this. It turns out that this terminology is equivalent to the more amiable "Program PIC" and "Program EEPROM." So, don't let the terminology scare you. When you press F9 to "BLOW" the PIC, the processor is not going to blow up or fry.

Consider what sort of projects you may have around the shack or at home and look at the wide variety of PICs available. Above all, be adventurous and wade into the wonderful world of processor-based solutions. You will be amazed at how easy it can be once you get past the initial hurdle of learning something new.—*Ralph J. Gable, WA2PUX, 658 French Glen, Oregon, WI 53575-2723;* **wa2pux@arrl.net**

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

Yaesu FT-857 MF/HF/VHF/UHF Transceiver

Reviewed by Rich Arland, K7SZ
QST *Contributing Editor*

When I was asked to do a review of the new Yaesu FT-857 transceiver, I thought, "What timing!" I had been looking at both the FT-857 and its bigger brother, the FT-897, for several weeks, trying to decide which one to buy.

Out of the box, the first thing I had to tackle was mounting the front panel to the main portion of the radio. Thumbing through the manual I found, on page seven, exactly how to do that. The detachable front panel has become an industry standard with small, mobile transceivers. In order to remote the control head, you need to purchase the optional YSK-857 Separation Kit. It is very handy to be able to bury the main "box" of the radio under a seat or in the trunk in a mobile installation and have just the small front panel/control head mounted on the dash. It's a convenient, space-saving idea with the added benefit of being easily concealed when you leave the vehicle.

On the surface, the newest addition to the Yaesu HF portable transceiver line looks a lot like an FT-817 on steroids. That is where the similarities end (frequency/mode coverage and menu access not withstanding). The '857 offers a fully adjustable output from 5 to 100 W on 1.8 through 29.7 MHz, plus 6 meters. Power out on 2 meters is 50 W and power out on 70 centimeters is 20 W. The rig can operate on voice, CW or data modes. The package is about twice the size and three times the weight of the FT-817, so while it may be suited for a mobile or base station environment, it might be a little on the heavy side for the backpacker, when combined with the added weight of a battery, antenna and accessories.

Yaesu offers three filter options—the YF-122S, a 2.3 kHz SSB filter, the YF-122C 500-Hz CW filter, and the YF-122CN, a 300 Hz CW filter. The transceiver will accommodate two of these optional filters, and the installation instructions are outlined on page 120 of the manual. Filter call-up is accomplished by using the Multi Function (MF-n) menu.

The FT-857 is a nice compact package, measuring 2.0×6.1×9.2 inches (HWD) and weighing 4.6 pounds. The frequency agility of this rig is amazing. The receiver covers 100 kHz to 56 MHz, 76-108 MHz, 118-164 MHz and 420-470 MHz. The user can listen to international shortwave broadcasts, commercial AM and FM outlets, VHF aeronautical stations, public safety stations and nearly all the ham bands from 160 meters through 70 centimeters (only 222 MHz coverage is excluded).

The 128 page operating manual is quite well laid out, considering the complexity of the FT-857 and the multitude of menus needed to configure the radio to your particular operating style. The manual is chock full of pertinent information. It will take you a while to assimilate the entire manual, so plan on doing a lot of reading and subsequent "playing" with the radio.

The Learning Curve

Getting comfortable with the controls on the FT-857 requires a bit of a learning curve, especially if you are not used to working with smaller radios utilizing layered menus. A total of 14 buttons control most of the radio's features. The FT-857 uses multi-layered menus, accessed by the function (F) button. Since I had owned the FT-817 for over a year, the controls and menus on the FT-857 were almost intuitive.

Press and release the F button and you go into the multi-function display, a series of 17 menus controlled by the three MF buttons directly below the LCD display. These are adjustments and parameters for some of the most used features of the radio.

Bottom Line

The FT-857 offers 100 W in a very compact package. Think of it as the FT-897 for your car.

Many of these multi-function selections are merely toggles that switch specific features on and off. These are the settings you may want to change on the fly. Examples are CW/SSB filter selection, A/B VFO selection, split frequency operation, memory storage, speech processor on/off, keyer memory playback, preamp on/off, attenuator and noise blanker on/off, and CTCSS tone encode/decode. Various display options, such as Spectrum Scope Monitor enable, LCD display size and metering assignment (Power/SWR/ALC/S) are also selected through the multi-function keys.

Press and hold the F button to enter the menu system, which controls a wide variety of the performance aspects and operating characteristics of the FT-857. This is where you configure the radio to work the way you want it to. Menu items include RF power output selection, keyer setup, CW/Phone parameters, display color and brightness, mic gain, repeater shift, keyer speed, CW pitch and the like. There are 91 menu options available. Each of these is briefly explained in a matrix, which is a lifesaver when you are trying to remember all the nuances of this tiny radio.

The FT-857 is loaded with memories. The QMB (Quick Memory Bank) is used to quickly store a frequency you might want to recall in a hurry. You can load any frequency held in the QMB into one of the 200 regular memory slots at any time. While in QMB you can change frequencies, emulating the VFO mode, and you can also change the operating mode.

The main memory bank is composed of 200 memory slots that can be used to store your favorite operating frequencies and

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

Table 1
Yaesu FT-857, serial number 3C020019

Manufacturer's Claimed Specifications

Measured in the ARRL Lab

Frequency coverage: Receive, 0.1-56, 76-108, 118-164, 420-470 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, 50-54, 144-148, 430-450 MHz.

Receive[1] and transmit, as specified.

Power requirement: Receive, 1.0 A; transmit, 22 A (100 W output).

Receive, 0.6 A; transmit, 16 A. Tested at 13.8 V.

Modes of operation: SSB, CW, AM, FM.

As specified.

Receiver

Receiver Dynamic Testing

SSB/CW sensitivity, bandwidth not specified, 10 dB S/N: 1.8-30 MHz, <0.2 µV; 50-54 MHz, <0.13 µV; 144-148, 430-450 MHz, <0.13 µV.

Noise floor (MDS), 500 Hz filter:

	Preamp off	*Preamp on*
1.0 MHz	–127 dBm	–134 dBm
3.5 MHz	–130 dBm	–136 dBm
14 MHz	–132 dBm	–137 dBm
50 MHz	–136 dBm	–140 dBm
144 MHz	see note 2	–140 dBm
432 MHz	see note 2	–140 dBm

AM sensitivity, 10 dB S/N: 0.1-1.8 MHz, <32 µV; 1.8-30 MHz, <2 µV; 50-54 MHz, <1 µV; 144-148, 430-450 MHz, not specified.

10 dB (S+N)/N, 1-kHz tone, 30% modulation:

	Preamp off	*Preamp on*
1.0 MHz	1.9 µV	0.91 µV
3.8 MHz	1.6 µV	0.72 µV
50 MHz	0.97 µV	0.48 µV
120 MHz	see note 2	0.41 µV
144 MHz	see note 2	0.42 µV
432 MHz	see note 2	0.51 µV

FM sensitivity, 12 dB SINAD: 28-30 MHz, <0.5 µV; 50-54, 144-148, 430-450 MHz, <0.2 µV.

For 12 dB SINAD:

	Preamp off	*Preamp on*
29 MHz	0.51 µV	0.26 µV
52 MHz	0.35 µV	0.18 µV
146 MHz	see note 2	0.19 µV
440 MHz	see note 2	0.21 µV

Blocking dynamic range: Not specified.

Blocking dynamic range, 500 Hz filter:

Spacing	20 kHz	5 kHz
	Preamp off/on	*Preamp off/on*
3.5 MHz	109/106* dB	94*/90* dB
14 MHz	109*/105* dB	94*/88 dB
50 MHz	108*/102* dB	88*/86* dB
144 MHz	note 2/102* dB	note 2/83* dB
432 MHz	note 2/96* dB	note 2/79* 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
	Preamp off/on	*Preamp off/on*
3.5 MHz	88/88 dB	67/66 dB
14 MHz	87/86 dB	66/65 dB
50 MHz	88/85 dB	67/65 dB
144 MHz	note 2/83 dB	note 2/63 dB
432 MHz	note 2/84 dB	note 2/64 dB

Third-order intercept: Not specified.

Spacing	20 kHz	5 kHz
	Preamp off/on	*Preamp off/on*
3.5 MHz	+9.2/+1.7 dBm	–18/–25 dBm
14 MHz	+4.1/–5.4 dBm	–23/–31 dBm
50 MHz	+0.1/–7.1 dBm	–25/–33 dBm
144 MHz	note 2/–8.8 dBm	note 2/–37 dBm
432 MHz	note 2/–6.9 dBm	note 2/–34 dBm

Second-order intercept: Not specified.

Preamp off, +69 dBm; preamp on, +66 dBm.

modes along with CTCSS information. The regular memory storage area is where you would also load any special net/emergency frequencies, split frequencies for DX operation as well as any nonstandard repeater splits. Any frequency stored in one of the 200 memory slots can also be tagged alphanumerically to aid in identification.

The FT-857 incorporates the Smart Search feature from Yaesu's VHF/UHF mobiles. In this mode, the rig searches above your current operating frequency and locates any active frequencies, storing them in one of the 50 Smart Search memories. These memories are considered soft memories, because any stored information will be lost if you initiate a subsequent Smart Search or go into the VFO mode. The traveling ham can make great use of this feature to locate repeaters while driving.

I Can See Clearly Now

The FT-857 also incorporates a Spec-

FM adjacent channel rejection: Not specified.	20 kHz channel spacing, preamp on: 29 MHz, 65 dB; 52 MHz, 65 dB; 146 MHz, 65 dB; 440 MHz, 64 dB.
FM two-tone, third-order IMD dynamic range: Not specified.	20 kHz channel spacing, preamp on: 29 MHz, 64 dB; 52 MHz, 63 dB; 146 MHz, 61 dB; 440 MHz, 59 dB; 10 MHz channel spacing, preamp on: 52 MHz, 88 dB; 146 MHz, 87 dB; 440 MHz, 83 dB.
S-meter sensitivity: Not specified.	S9 signal at 14.2 MHz: preamp off, 17 μV; preamp on, 6.6 μV; 52 MHz, preamp off, 14 μV; preamp on, 5.3 μV; 146 MHz, preamp on, 4.0 μV; 432 MHz, preamp on, 2.6 μV.
Squelch sensitivity: SSB, 1.8-30 MHz, <2.5 μV; 50-54 MHz, <1 μV; 144-148, 420-450 MHz, <0.5 μV; FM, 28-30 MHz, <0.32 μV; 50-54, 144-148, 430-450 MHz, <0.16 μV.	At threshold, preamp on: SSB, 14 MHz, 1.7 μV; FM, 29 MHz, 0.15 μV; 52 MHz, 0.09 μV; 146 MHz, 0.1 μV; 440 MHz, 0.11 μV.
Receiver audio output: 2.5 W at 10% THD into 4 Ω.	4.0 W at 10% THD into 4 Ω.
IF/audio response: Not specified.	Range at –6 dB points (bandwidth): CW (500 Hz filter): 386-972 Hz (586 Hz) USB: 234-2864 Hz (2630 Hz) LSB: 286-2816 Hz (2530 Hz) AM: 140-2530 Hz (2390 Hz).
IF rejection: 60 dB; image rejection, 1.8-30, 50-54 MHz, 70 dB; 144-148, 430-450 MHz, 60 dB.	First IF rejection, 14 MHz, 124 dB; 50 MHz, 98 dB; 144 MHz, 118 dB; 432 MHz, 129 dB; image rejection, 14 MHz, 100 dB; 50 MHz, 86 dB; 144 MHz, 99 dB; 432 MHz, 72 dB.

Transmitter

Transmitter Dynamic Testing

Power output: HF and 50 MHz: SSB, CW, FM, 100 W, AM, 25 W (carrier); 144 MHz, SSB, CW, FM, 50 W, AM, 12.5 W (carrier); 430 MHz, SSB, CW, FM, 20 W, AM, 5 W (carrier).	HF and 50 MHz: CW, SSB, FM, typically 102 W high, 3 W low; AM, typically 20 W high, 1 W low; 144 MHz: CW, SSB, FM, typically 51 W high, 3.5 W low; AM, typically 12 W high, 1.5 W low; 430 MHz: CW, SSB, FM, typically 19 W high, 2 W low; AM, typically 5 W high, 1 W low.
Spurious-signal and harmonic suppression: ≥50 dB on HF; ≥60 dB on VHF and UHF.	HF, 53 dB; 50 MHz, 61 dB; 144 MHz, 62 dB; 430 MHz, 63 dB. Meets FCC requirements for spectral purity.
SSB carrier suppression: >40 dB.	53 dB.
Undesired sideband suppression: >50 dB.	56 dB.
Third-order intermodulation distortion (IMD) products: Not specified.	See Figures 1 and 2.
CW keyer speed range: Not specified.	4 to 59 WPM.
CW keying characteristics: Not specified.	See Figure 3.
Transmit-receive turn-around time (PTT release to 50% audio output): Not specified.	S9 signal, 12 ms.
Receive-transmit turnaround time (tx delay): Not specified.	SSB, 21 ms; FM, 15 ms. Unit is suitable for use on AMTOR.
Composite transmitted noise: Not specified.	See Figures 4 and 5.
Bit-error rate (BER), 9600-baud: Not specified.	146 MHz: Receiver: BER at 12 dB SINAD, 2.8×10^{-3}; BER at 16 dB SINAD, 1.4×10^{-4}; BER at –50 dBm, $<1.0\times10^{-5}$; transmitter: BER at 12 dB SINAD, 7.7×10^{-4}; BER at 12 dB SINAD + 30 dB, $<1.0\times10^{-5}$. 440 MHz: Receiver: BER at 12-dB SINAD, 3.3×10^{-3}; BER at 16 dB SINAD, 1.5×10^{-4}; BER at –50 dBm, $<1.0\times10^{-5}$; transmitter: BER at 12 dB SINAD, 8.3×10^{-4}; BER at 12 dB SINAD + 30 dB, $<1.0\times10^{-5}$.

Size (height, width, depth): 2.0×6.1×9.2 inches; weight, 4.6 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.
[1]Receive sensitivity is reduced below 350 kHz.
[2]IPO not available above 56 MHz.

trum Scope Monitor that actually allows you to "see" activity above and below your operating frequency, much like a spectrum analyzer. This feature is active in the VFO and memory modes. When activated, the Spectrum Scope Monitor displays relative signal strength (on the LCD) on frequencies immediately adjacent to your operating frequency in various frequency increments that are selected based upon the mode in use. This feature is nice for keeping track of action during contests and to pinpoint activity on a given band.

Several scanning options are available on the FT-857. In the VFO mode the transceiver will scan either above or below the VFO frequency (whichever you select), stopping on active frequencies. In the memory mode, the transceiver will scan through the memory channels and halt on an active frequency. In addition, you can program the rig to skip selected memory channels. In the Programmable Memory

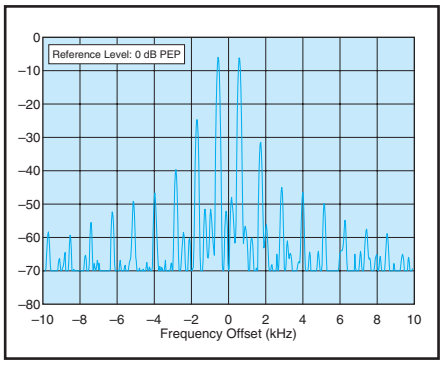


Figure 1—Worst-case spectral display of the FT-857 transmitter during two-tone intermodulation distortion (IMD) testing on MF and HF. The worst-case third-order product is approximately 25 dB below PEP output, and the worst-case fifth-order product is down approximately 40 dB. The transmitter was being operated at 100 W PEP output at 1.85 MHz.

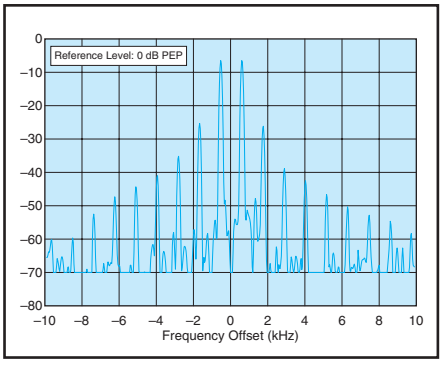


Figure 2—Worst-case spectral display of the FT-857 transmitter during two-tone intermodulation distortion (IMD) testing on VHF and UHF. The worst-case third-order product is approximately 25 dB below PEP output, and the worst-case fifth-order product is down approximately 35 dB. The transmitter was being operated at 100 W PEP output at 50.2 MHz.

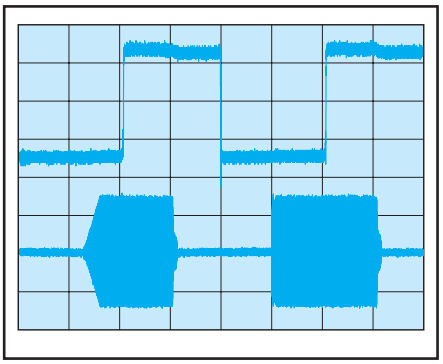


Figure 3—Worst-case CW keying waveform for the FT-857 showing the first two dits using external keying. Equivalent keying speed is approximately 60 wpm. The upper trace is the actual key closure; the lower trace is the RF envelope. Horizontal divisions are 10 ms. The transmitter was being operated at 100 W output at 14.2 MHz.

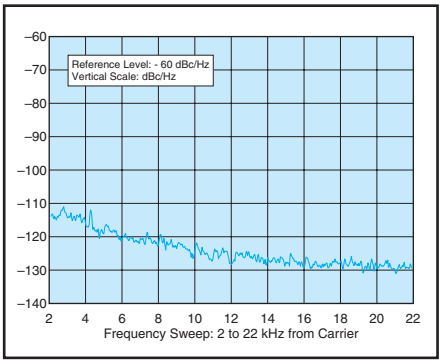


Figure 4—Worst-case spectral display of the FT-857 transmitter output during composite-noise testing on MF and HF. Power output is 100 W at 14.02 MHz. The carrier, off the left edge of the plot, is not shown. This plot shows composite transmitted noise 2 to 22 kHz from the carrier.

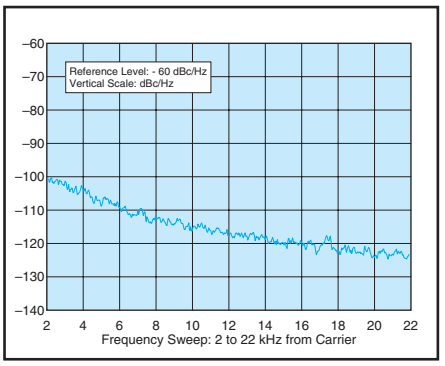


Figure 5—Worst-case spectral display of the FT-857 transmitter output during composite-noise testing on VHF and UHF. Power output is 20 W at 432.02 MHz. The carrier, off the left edge of the plot, is not shown. This plot shows composite transmitted noise 2 to 22 kHz from the carrier.

Scan mode the transceiver will scan between user prescribed limits. Finally, the FT-857 has a "Priority Channel" scan mode whereby the priority channel (memory channel M-001) is periodically checked with the transceiver in the VFO or Memory mode. Once activity on M-001 is detected, the transceiver will pause on the priority channel.

The CAT's Out of the Bag

Yaesu's CAT System provides a method of controlling various aspects of the FT-857 via your computer. By using third-party software packages like contest logging software, your computer can communicate with the FT-857 without any redundant operator intervention, making contesting a real pleasure. In order to use the CAT System, you'll need the optional CT-62 cable, which interfaces your computer's RS-232 port to the CAT/Linear jack on the rear apron of the FT-857. This optional cable performs level conversion for proper serial port to radio operation. Yaesu does not produce any CAT software, but there are several sources on the Internet.

On-Air Operations

Reading the manual, perusing the specifications and dissecting the Lab test results is fine, but this only tells part of the story. You can have a rig with outstanding specs, but if you are not comfortable using it, you're not going to be satisfied and you are not going to have any fun with the radio.

Thankfully, the FT-857 is a dream rig to use. One operational feature I really like is the ability to set the LCD screen color to change when you change bands, band segments and/or modes. This means you can select different colors for FM, SSB, DATA and AM, or color-code band segments like QRP calling frequencies, DX watering holes, and simplex or repeater sub-bands, making it a lot easier to navigate through the memory maze.

On-air testing with the FT-857 provided me with many hours of fun on the QRP bands, and some serious DXing, using higher power, on the low end of 20 meters. Our local ARES group is quite active, offering three weekly nets on two local repeaters. I used the '857 to check into several of these nets and to work some folks via local 2-meter and 70-centimeter repeaters. I received great audio reports on both SSB and FM using the factory default settings.

CW operation provided a couple of twists. The FT-857 does not feature full break-in (QSK) keying, or anything really close to it. The T/R switchover is adjustable from 3000 ms down to 30 ms, but even at that, the CW keying is not full break-in. In addition, the T/R relay (yes, the FT-857 uses a relay to switch between transmit and receive) chatters like mad at speed. So I adjusted the T/R changeover to around 300 ms, which delays the transmitter between characters at 15 WPM and higher. This seems to provide the best trade-off between a chattering relay and receiver recovery time.

One very nice feature is the TX/BUSY indicator, just to the left of the main tuning knob. This indicator glows green when the squelch is open, red during transmit and bright blue when the incoming signal is zero-beat with the IF passband in the CW mode (with the IF shift off). This makes easy work of getting exactly on the transmitting station's frequency. This is great for those of us who lack perfect pitch. In addition, when the radio is in the FM mode, this indicator will glow blue when you are receiving a signal with a CTCSS/DCS encoded tone that matches the one to which your trans-

ceiver is set. Nice touch!

The ability to load up to three "canned" messages for instant reply via a single press of one of the three Multi-Function buttons (Ply1, Ply2, Ply3 in multi-function menu MFo) is a great feature. You can thus configure the keyer as a contest keyer (although it won't handle serial numbers), reducing the number of boxes you have to drag along when operating portable or mobile.

CW DXing using the IF shift and Clarifier (RIT) controls on the FT-857 proved to be quite pleasant. The combination of these two features and the 500-Hz Collins mechanical filter enabled me to snag a couple of new countries in the middle of large pileups. Split operation is a breeze using the dual VFOs on the FT-857. The DX can run but they can't hide!

Receiver performance is similar to but slightly degraded from Yaesu's FT-897 model, reviewed in the May 2003 issue of *QST*. As a rule, dynamic range (blocking and third order IMD) were slightly worse. However, the third-order and second-order intercept points improved slightly from the '857's bulkier older brother. See Table 1 for the complete test results.

Quirks and Annoyances

No rig is perfect, and the FT-857 is no exception. Here are a few thoughts on how Yaesu could improve the package. A set of laminated plastic cards listing the 91 different menu system items and the 17 different multi-function options would be useful as a field guide. Having a set of small, readily available cheat sheets would make life a whole lot easier on the user and save valuable space and weight by not having to carry the entire manual around.

Then there is the dc power cord, which ought to be redesigned. Many manufacturers use no. 10 or 12 AWG red/black "zip cord" for dc power cabling. Yaesu decided to use separate red/black wires with a plug on one end and in-line fuse holders on the other. Unless you remove the fuse holders or lop off the plug that mates to the radio, there is no practical way to run this power cord inside a vehicle. Yaesu should use "zip cord" and provide the fuse holders for the user to install after the power cabling has been run in the vehicle.

Affordable and Portable

Would I buy this radio? In a heartbeat! The FT-857 is a very capable rig designed with the mobile/portable ham radio operator in mind. The folks at Yaesu have done their homework and given us a rig that offers outstanding performance with 100 W of RF in a very small package. Yaesu designers have taken up the challenge to improve on their tremendously successful FT-817 and the result is the FT-857. Well done, Yaesu!

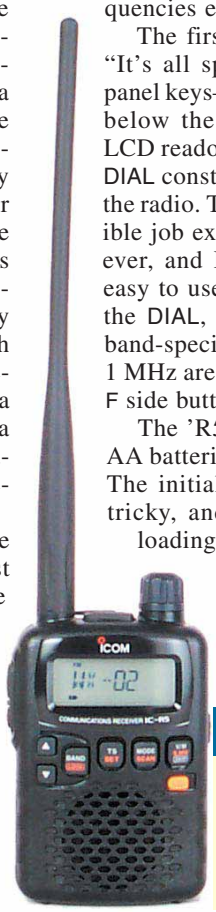
Manufacturer: Vertex Standard USA, 10900 Walker St, Cypress, CA 90630; tel 714-827-7600; **www.vxstdusa.com**. Price: $849.95.

ICOM IC-R5 Hand-held Receiver

Reviewed by Brennan Price, N4QX
Assistant Technical Editor

The past few years have seen the introduction of a number of hand-held receivers. Some have more features than others, and buyers have a wide range of options to choose from. A few of the more sophisticated models even have the ability to receive the most popular Amateur Radio HF operating modes, single sideband and CW. Some amateurs findcarrying a comprehensive hand-held receiver useful. While many transceivers have multiple watch functions and multiple VFOs, sometimes they are poor substitutes for a completely separate receiver. As a result, a number of amateur manufacturers have added hand-held receivers to their lines.

ICOM's latest offering is the IC-R5. About the size of its latest multiband hand-held receiver, the IC-T90A, the 'R5 is *not* among the CW and single-sideband capable models. Nevertheless, at its size and price, it is an impressive machine, scanning and sounding AM, narrowband FM and broadcast FM signals with speed and ease. From the AM broadcast band, through the shortwaves, and into the VHF and UHF amateur, aviation, and public service bands, the IC-R5 offers comprehensive coverage from 150 kHz to 1300 MHz, cellular frequencies excluded.



The first impression of the radio is, "It's all speaker." Merely seven front panel keys—all on top of the speaker and below the LCD and the 10-character LCD readout, two side panel keys, and a DIAL constitute the user's interface with the radio. The user's manual does a credible job explaining their function, however, and I found the limited controls easy to use. All tuning is done through the DIAL, with each click executing a band-specific tuning step. Large steps of 1 MHz are accomplished by holding the F side button while clicking the DIAL.

The 'R5 comes with two Ni-Cd size AA batteries and a plug-in wall charger. The initial charging routine is a little tricky, and not nearly as intuitive as loading the batteries and plugging in the charger. A quick read of the manual is advisable.

The BAND key toggles between 12 different frequency bands, each with a distinct and adjustable tuning step. The DIAL controls frequency selection, while the ▲ and ▼ keys control volume level from the 0.1-W speaker. A thousand standard memory channels are available and may be assigned to any of 18 memory banks. Twenty-five pairs of band edge memories can delineate frequently scanned band segments, such as the 145.1-145.5 MHz 2-meter repeater segment. Both manual tuning and scanning can be performed in VFO and memory modes. United States television audio frequencies and weather frequencies are preprogrammed and have special displays. Both the input and the output of an Amateur Radio repeater (or any other repeater) can be monitored through the receiver's duplex operation feature. Briefly, this is accomplished by setting the offset, enabling duplex mode, and pressing the SQL button to monitor the repeater input directly. The actual procedure for setting the offset and turning the duplex mode on is somewhat convoluted; there are eight steps of button pushing and DIAL turning between the setting of the output frequency and when the input frequency can be monitored at the touch of a button. Also of interest to amateurs is the 'R5's ability to detect and decode CTCSS tones and DCS codes.

Particularly useful is the manual's frequency table, which lists the audio frequencies for television channels in the United

Bottom Line

ICOM's IC-R5 is tiny, inexpensive and simple, and it's a nice station accessory for amateurs looking for these qualities.

Table 2
ICOM IC-R5, serial number 0601263

Manufacturer's Claimed Specifications	Measured in the ARRL Lab
Frequency coverage: Receive, 0.15-822; 851-867; 896-1310 MHz.	Receive, as specified.[1]
Modes of operation: FM, WFM, AM.	As specified.
Power requirements: 0.17 A (max audio), 6 V dc.	0.15 A (max volume, no signal), tested at 6.0 V dc.
Size (HWD): 3.4×2.3×1.1 inches; weight, 6.5 ounces.	
AM sensitivity (10 dB S/N): 0.5-5 MHz, 1.3 μV; 5-30 MHz, 0.71 μV; 118-136 MHz, 222-247 MHz, 0.56 μV; 247-330 MHz, 0.71 μV.	AM, test signal modulated 30% with a 1-kHz tone, 10 dB (S+N)/N: 1.0 MHz, 1.1 μV; 3.8 MHz, 0.58 μV; 53 MHz, 0.4 μV; 120 MHz, 0.46 μV; 146 MHz, 0.41 μV; 440 MHz, 0.6 μV;
FM narrow sensitivity (12 dB SINAD): 1.6-5 MHz, 0.32 μV; 5-118 MHz, 0.2 μV; 118-247 MHz, 0.18 μV; 247-330 MHz, 0.2 μV; 330-470 MHz, 0.18 μV; 470-1000 MHz, 0.28 μV; 1000-1310 MHz, 0.35 μV.	FM narrow, 12 dB SINAD: 29 MHz, 0.17 μV; 52 MHz, 0.14 μV; 146 MHz, 0.15 μV; 222 MHz, 0.14 μV; 440 MHz, 0.2 μV; 906 MHz, 0.23 μV; 1270 MHz, 0.28 μV.
FM wide sensitivity (12 dB SINAD): 76-108 MHz, 0.89 μV; 175-222 MHz, 0.71 μV; 470-770 MHz, 1.0 μV.	FM wide, 12 dB SINAD: 100 MHz, 0.84 μV.
FM adjacent channel rejection: Not specified.	20 kHz channel spacing: 29 MHz, 56 dB; 52 MHz, 57 dB; 146 MHz, 51 dB; 222 MHz, 49 dB; 440 MHz, 53 dB; 906 MHz, 57 dB; 1270 MHz, 49 dB.
FM two-tone, third-order IMD dynamic range: Not specified.	20 kHz channel spacing: 29 MHz, 48 dB; 52 MHz, 49 dB; 146 MHz, 47 dB; 222 MHz, 50 dB; 440 MHz, 47 dB; 906 MHz, 55 dB; 1270 MHz, 49 dB.* 10 MHz channel spacing: 52 MHz, 57 dB; 146 MHz, 69 dB; 440 MHz, 59 dB.
Squelch sensitivity (threshold): Not specified.	At threshold: FM, 29 MHz, 0.34 μV; 52 MHz, 0.38 μV; 146 MHz, 0.34 μV; 222 MHz, 0.38 μV; 440 MHz, 0.38 μV; 906 MHz, 0.8 μV; 1270 MHz, 1.1 μV.
Audio output: 0.1 W at 10% THD into 8 Ω.	0.125 W at 8% THD into 8 Ω[2]
IF/audio response: Not specified.	Range at –6 dB points (bandwidth): AM: 306-3562 Hz (3256 Hz).
Spurious and Image rejection: Not specified.	IF: 29 MHz, 75 dB; 52 MHz, 31 dB; 144 MHz, 71 dB; 222 MHz, 21 dB; 440 MHz, 53 dB; 906 MHz, 61 dB; 1270 MHz, 59 dB; Image: 29 MHz, 56 dB; 52 MHz, 53 dB; 146 MHz, 99 dB; 222 MHz, 43 dB, 440 MHz, 74 dB; 906 MHz, 33 dB; 1270 MHz, 9 dB.

Except as noted, all dynamic range measurements were taken using the ARRL Lab standard spacing of 20 kHz.
*Measurement was noise-limited at the value indicated.
[1]Sensitivity degrades slightly below 500 kHz.
[2]Volume control is stepped—the next higher step produced 14% THD.

States and other parts of the world. The 68 United States channels are programmed into a special band at the factory, but the table is a terrific ready-reference for travel abroad. The table also includes widely used frequencies in the Aviation, General Mobile, Family Radio, and Business Radio Services.

Programming and scanning is quite easy. In fact, the two can be combined through an automatic memory write function, which can store up to 200 active frequencies automatically as a band is scanned. This is useful when you visit a place without a frequency list or repeater directory handy. Programming a frequency into a standard memory channel is as simple as tuning the frequency in the VFO, pressing the S.MW button for one second, selecting the memory channel number, and pressing the S.MW button again. The receiver makes efficient use of the limited controls it has.

Listening to the 'R5 is pleasant. The prominent speaker cranks out 0.125 W at 8% THD into 8 Ω, according to ARRL Lab test results. The sensitivity measurements meet and in some cases exceed what one would expect from a handheld receiver in this price class, and the dynamic range measurements are about as expected. All VHF and UHF stations that I expected to hear from my location were indeed heard by the 'R5, and I was pleasantly surprised with its HF performance. See Table 2 for the ARRL Lab's measurements.

The 'R5 comes with a SMA-threaded rubber duck antenna. Of course, such an antenna is ideal for use at higher VHF and UHF frequencies. Only the strongest meduimwave and shortwave stations can be adequately detected by this antenna, but shortwave listeners know that a substantial external antenna is imperative for receivers—even hand-helds. Nevertheless, I received Hartford-area AM broadcasters and even transmissions from Radio Canada International's Sackville, New Brunswick, facility with no difficulty.

The IC-R5 is a solid offering, easily receiving strong broadcast signals and rapidly scanning standard or user-designated band segments. Its portability and price are attractive, and hams unwilling or not needing to spend the money for additional modes may find the 'R5 a useful accessory.

Manufacturer: ICOM America, 2380 116th Ave NE, Bellevue, WA 98004; tel 425-454-8155; fax 425-454-1509; **www.icomamerica.com**. Price: $199.95. QST

President Haynie Testifies Before Congressional Subcommittee

ARRL President Jim Haynie, W5JBP, testified June 11 on Capitol Hill on behalf of the Spectrum Protection Act of 2003, HR 713. The ARRL initiative would require the FCC to provide "equivalent replacement spectrum" to Amateur Radio if the FCC reallocates primary amateur frequencies, reduces any secondary amateur allocations, or makes additional allocations within such bands that would substantially reduce their utility to amateurs. Haynie was the last of 11 scheduled witnesses to speak during the Subcommittee on Telecommunications and the Internet hearing, "The Spectrum Needs of Our Nation's First Responders."

"We are indeed a first responder," Haynie said on behalf of the nation's some 680,000 Amateur Radio operators. Ham radio is more than "just having fun playing on the radio," he told the panel, a subcommittee of the House Energy and Commerce Committee chaired by Rep Billy Tauzin (R-LA). "It also produces capable, trained volunteer communicators in systems of emergency telecommunications that are impervious to disasters of all sorts," Haynie said. "These volunteers are ready to respond—and do respond immediately—when all other systems of communications fail, including public safety communications whey they're overloaded, destroyed or lack interoperability."

Among other examples, Haynie pointed out how Amateur Radio operators answered the call on September 11, 2001, in New York City, at the Pentagon and at the Western Pennsylvania crash site of the fourth hijacked airliner. Hams also assisted federal authorities in the debris search following the February 1 shuttle *Columbia* disaster, Haynie pointed out, and aided in the response to tornadoes in the Midwest and South earlier this year.

Haynie told the subcommittee that hams have lost more than 100 MHz of VHF and UHF spectrum over the past 15 years and that another nearly 360 MHz of VHF and UHF spectrum "has been substantially compromised." Haynie said hams have shared spectrum successfully with government users on VHF and UHF and have been able to "make do with less," but, he added, "that concept has reached a breaking point with our service." The 2.4 GHz band, once left largely to amateurs, in recent years has become "polluted" with wireless activity, Haynie told the panel.

DEREK RIKER, KB3JLF

President Haynie, center, addresses the June 11 session of the House Subcommittee on Telecommunications and the Internet.

"Interoperability" was the watchword during the daylong subcommittee hearing. Several witnesses testified that a lack of interoperability among public safety responders at disaster scenes—including the World Trade Center—prevented warning those in danger and resulted in a tragic loss of life.

Haynie was not alone in offering supportive words about Amateur Radio. HR 713 sponsor Michael Bilirakis (R-FL), quoted a paragraph from the submitted testimony of Norman Jacknis of the Westchester County, New York, Department of Information Technology. "In the first hours following the attack of September 11, 2001, the only way we could coordinate the sharing of firefighting, medical examiner, health, and information technology resources with New York City officials was through the highly trained, volunteer Amateur Radio (ham) operators," Jacknis said. "This irreplaceable resource must be protected from incursion by other interests."

One of the two amateur licensees in Congress, Rep Greg Walden, WB7OCE (R-OR)—a subcommittee member called for a halt to the "astonishing" erosion of amateur spectrum. "Time and again, if you find an emergency, you find a ham radio operator," Walden said.

FCC Office of Engineering and Technology Chief Edmond Thomas also cited the contribution of Amateur Radio operators to public safety. "The ham radio community has offered invaluable service to first responders during emergency situations," he said.

Sen Michael Crapo (R-ID) has introduced a Senate version of the Amateur Radio Spectrum Protection Act, S 537. It's now in the Senate the Commerce, Science and Transportation Committee, but no hearing on the measure has been set as of press time. The text of HR 713/S 537 is available via the Thomas Web site, **thomas.loc.gov/**.

Ham-Astronaut Thrills Hometown Youngsters

NASA ISS Science Officer Ed Lu, KC5WKJ, told youngsters at his hometown alma mater via ham radio this spring that zero gravity—or "zero G"—feels a bit like going over the top on a roller coaster. The May 27 Amateur Radio on the International Space Station (ARISS) contact with Klem Road South School in Webster, New York, was the first for a member of the two-ham ISS Expedition 7 crew and for Lu, who had attended the kindergarten through grade 5 school some three decades ago.

"If you've ever been on a roller coaster and you go over the top of the roller coaster you feel that feeling like you're kinda light—you're floating up on your feet," explained, who's also the flight engineer for the current crew. "It's almost exactly like that but a lot stronger." Weightlessness "feels great," but after some time in zero gravity, Lue added, describing his own post

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

NASA

Floating and relaxing: **Expedition 7 NASA ISS Science Officer and Flight Engineer Ed Lu, KC5WKJ, floats in the Destiny Laboratory of the International Space Station.**

space shuttle experience, "it feels like your legs weigh a ton."

Lu told the youngsters that while he was speaking to them from NA1SS, he was floating—and relaxing—about a foot above the floor and about to have lunch. "I like the food up here a lot," he remarked later. The ISS crew typically eats three meals a day, he said.

Lu answered about a dozen questions, although apparent signal dropout and noise plagued the last minute or two of the contact. With the ISS over Hawaii at the time, radio contact with NA1SS was established via Nancy Rocheleau, WH6PN, who arose before 3 AM to serve as control operator. An MCI teleconferencing circuit linked the school with WH6PN.

ARISS is an international program with participation by ARRL, AMSAT and NASA.

WA8SME IS NEW COORDINATOR OF ARRL'S "THE BIG PROJECT"

Mark Spencer, WA8SME, has joined the ARRL Headquarters staff as the new coordinator of the ARRL Amateur Radio Education and Technology program—also known as "The Big Project." He succeeds Jerry Hill, KH6HU, who has returned to Hawaii.

ARRL Education and Technology Program Coordinator Mark Spencer, WA8SME.

Spencer, whose first day on the job was June 5, said he's happy to have the chance to continue to work with both young people and Amateur Radio. "This office has the great opportunity to be a facilitator in integrating wireless technologies into the schools," he said. "Ham radio is a facet that can open doors in that area, and I think that ham radio can help make the curriculum relevant for kids."

A ham for 38 years, Spencer has taught math, science, computers and social science at the middle school, high school and community college levels, often integrating Amateur Radio into his lessons.

ARRL Field and Educational Services Manager Rosalie White, K1STO, said she's thrilled to have someone of Spencer's caliber on staff to guide the Education and Technology Program. White also noted that Hill, The Big Project's first coordinator, was instrumental in guiding 50 pilot schools into the program and oversaw its development beyond the initial plans into a viable program that already has touched the lives of nearly 1400 young people.

Prior to starting his teaching career in 1993, Spencer served 21 years in the US Air Force, retiring with the rank of Lt Colonel after a career that included work in reconnaissance and intelligence.

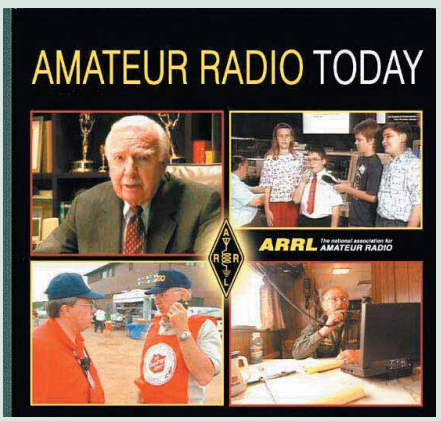
The Education and Technology Program emphasizes integration of technology, math, science, geography, language skills and social responsibility within a global society. It also provides a complete Amateur Radio station for schools accepted into the program.

The continued success of the ARRL Amateur Radio Education and Technology Program depends on individual and corporate contributions. To learn more, visit the ARRL Development Office secure Education and Technology Program donor Web site, **www.arrl.org/forms/development/donations/education/index.html**. For more information on The Big Project, visit the ARRL Amateur Radio Education and Technology Program Web site, **www.arrl.org/FandES/tbp**, or e-mail Spencer, **mspencer@arrl.org**.

INCUMBENTS RETURNED IN EIGHT ARRL SECTIONS

Incumbent section managers kept their offices for another two years in eight ARRL sections. Three sitting SMs hand-

Amateur Radio Today Sent to Members of Congress



A copy of the *Amateur Radio Today* CD-ROM video presentation went out earlier this year to all 535 members of the US Congress. The ARRL video tells Amateur Radio's public service story from a non-Amateur Radio perspective. Former CBS news anchorman Walter Cronkite, KB2GSD, narrates the six-minute presentation.

"After viewing the video, I am sure you will agree that hams are a valuable public safety resource, and continued threats to the spectrum they operate on is not in our national interest," say identical letters to their colleagues from US Rep Michael Bilirakis, a Florida Republican, and US senators Michael Crapo, an Idaho Republican, and Daniel Akaka, a Hawaii Democrat. The letters also seek additional cosponsors for The Amateur Radio Spectrum Protection Act of 2003. Bilirakis sponsored the House version of the measure, HR 713. Crapo sponsored the Senate version, S 537, and Akaka is an original cosponsor. The bills, an ARRL initiative, are on their third try in Congress.

Individuals may order a copy of the *Amateur Radio Today* CD-ROM from the ARRL on-line catalog or download it for free from the ARRL Web site, **www.arrl.org/ARToday/**. *Amateur Radio Today* also is available in VHS videotape format as well as in a subtitled (open-captioned) version.

FCC News

FCC PROPOSES ADDITIONAL 5-GHZ SPECTRUM FOR UNLICENSED USE

The FCC has proposed making another 255 MHz of 5-GHz spectrum available for unlicensed use at 5.470 to 5.725 GHz. Amateur Radio has a secondary allocation at 5.650 to 5.925 GHz, which it shares with government and nongovernment radars and—in part of the band—nongovernment fixed satellite uplinks. In a 28-page *Notice of Proposed Rulemaking* (*NPRM*) in ET Docket 03-122, the FCC suggested that the additional spectrum be made available for use by unlicensed National Information Infrastructure (U-NII) devices, including Radio Local Area Networks (RLANs), operating under Part 15 of the FCC's rules.

"Our action today furthers twin goals of the Spectrum Policy Task Force: promoting spectrum access and furthering development of unlicensed technologies," said FCC Chairman Michael Powell in a separate statement. "Once the backwater of baby monitors and cordless telephones, the unlicensed sector has developed into a hotbed of growth and innovation." The other four commissioners echoed Powell's enthusiasm in their own statements.

The FCC's action comes in response to a petition for rule making from the Wi-Fi Alliance—an industry coalition formerly known as the Wireless Ethernet Compatibility Alliance (WECA). If the FCC goes through with the proposal—and it appears likely that it will—Amateur Radio will be left with a 25-MHz segment at 5 GHz—5.825 to 5.850 GHz—that's not already earmarked for unlicensed services.

The ARRL has opposed previous WECA petitions for additional 5-GHz spectrum and plans to file comments on the latest *NPRM*.

Amateur Enforcement

♦ **FCC affirms hefty fine in interference case:** The FCC has affirmed a $12,000 fine against Technician-class Amateur Radio operator Scott E. Kamm, NØUGN. The FCC released a *Forfeiture Order* May 7 alleging willful and repeated interference, broadcasting of music and failing to identify with his call sign. The FCC's Kansas City office issued a *Notice of Apparent Liability for Forfeiture* (*NAL*) January 24, but, the FCC said, Kamm never responded.

Kamm's station was in Waterbury, Nebraska, at the time he was cited last fall, although the FCC already had granted his February 27, 2002, application to change his mailing address to Sioux City, Iowa.

Responding to complaints of continuing interference on the input of a 2-meter repeater, FCC agents monitored the machine's input frequency last December 9. They observed a very strong 146.31-MHz signal interfering with amateur communications already in progress "consisting of music, sound effects and unmodulated carriers" and no station ID.

The FCC twice tracked similar signals to Kamm's residence, inspected his station and found a transceiver capable of operating on 146.31 MHz, the FCC said. Kamm claimed no transmissions were made from his station.

During 2002, Kamm was the target of several letters and an FCC *Warning Notice* from Special Counsel Riley Hollingsworth. Last fall, the FCC's Wireless Telecommunications Bureau set aside Kamm's amateur license renewal based upon complaints about the operation of his station and questions regarding his qualifications to be a licensee. Kamm's amateur license expired last September 29, and his license renewal application, filed August 8, has reverted to pending status.

♦ **FCC alleges Michigan ham engaged in deliberate interference, threats:** The FCC alleges that a Michigan ham engaged in deliberate interference and broadcasting and threatened other amateurs, and it has sent Michael Guernsey Sr, ND8V, of Parchment a tape recording to back up those assertions. Since late 1998, Guernsey has been the recipient of seven letters from FCC Special Counsel Riley Hollingsworth, including two warning notices. In 2000, the FCC threatened to designate Guernsey's license for a revocation and suspension hearing. Guernsey subsequently agreed to a nine-month suspension of his HF privileges in 2001.

"The operation of your station over the last several years raises questions about your qualifications to remain a Commission licensee," Hollingsworth wrote Guernsey on April 7. The latest flap primarily involves complaints from other amateurs of deliberate interference on 20 meters. The recorded transmissions were made on March 26, 2003.

In his letter, Hollingsworth noted that some of the interference apparently sprang from on-the-air personal disputes or from what Guernsey perceived as deliberate interference to his transmissions. Even so, Hollingsworth said, Guernsey has apparently ignored the Commission's written and verbal warnings to not retaliate with similar behavior. Hollingsworth advised Guernsey that the alleged deliberate retaliatory threats and transmissions on top of other QSOs are contrary to FCC rules.

Hollingsworth said the FCC will use the information Guernsey submits to decide whether to designate his license for a suspension and revocation proceeding or to lift his voice privileges for the remainder of his license term, which ends in 2012.

Hollingsworth issued similar words of caution to George Zardecki, N9VTB, of Chicago, with whom, he says, Guernsey has squabbled on the air. While Hollingsworth indicated that he would review and take action regarding Zardecki's deliberate interference complaints, he advised Zardecki that "in several instances, your own conduct was as bad or worse than the party about whom you complained." He cautioned Zardecki against retaliatory interference, slander and name calling.

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ily won re-election in contested races after ballots were counted May 20 at ARRL Headquarters.

In the Maryland/District of Columbia Section, Tom Abernethy, W3TOM, turned away a challenge from Vic Curtis, WA3YUV, 826 to 266 votes. Abernethy has been MDC SM since July 2001.

In the San Joaquin Valley Section, Charles McConnell, W6DPD, topped challenger Thomas M. "Mike" Zane, N6ZW. The final vote tally was 304 to 251. McConnell became SJV SM in 2002 when he was appointed to succeed Don Costello, W7WN. McConnell previously served as SJV Section Communications Manager/SM from 1976 until 1989, when he became Pacific Division Vice Director. He served as Pacific Division Director from 1990 until 1993.

In New Hampshire, Al Shuman, N1FIK, defeated Russell J. Santos, K1TSV, 478 to 95. Shuman previously served as NH SM from 1992 until 1999. His current term began in 2001.

Sitting ARRL section managers in five other sections were unopposed for election or re-election and were declared elected. They are Dick Flanagan, W6OLD, Nevada; Bill Hudzik, W2UDT, Northern New Jersey; Bob Beaudet, W1YRC, Rhode Island; Mel Parkes, AC7CP, Utah, and John Dyer, AE5B, West Texas.

All new terms of office began July 1.

In Brief

● **Lee Kitchens, N5YBW, SK:** Lee Kitchens, N5YBW, of Ransom Canyon, Texas, died unexpectedly May 12. He was 73. An ARRL member, Kitchens served as ARRL West Texas Section Manager from July 2001 until October 2002. Kitchens also was a past president and foundation trustee of the organization Little People of America (LPA), **www.lpaonline.org**, a nonprofit organization that provides support and information to people of short stature and their families. He was LPA's vice president of membership at the time of his death. Kitchens also was a mayor of Ransom Canyon, where the city hall is located on Lee Kitchens Drive. He was a member of Lubbock County RACES/ARES and trustee of a local repeater. The family invites memorial donations to the LPA's newly established Lee Kitchens Memorial Fund, PO Box 65030, Lubbock, TX 79464-5030.—*Bill Ricker, N1VUX*

● **Gerald G. Schmitt, KK5YY, SK:** Jerry Schmitt, KK5YY (ex-KC5EGG), of Los Alamos, New Mexico, died unexpectedly May 23 after an apparent heart attack. He was 60. Schmitt was especially well-known within the AMSAT and APRS communities and was the designer and primary promoter of the portable Arrow antenna used for satellite work; he also had a hand in developing antennas for AO-40. "Jerry was a very good friend of AMSAT's," said AMSAT President Robin Haighton, VE3FRH. At Hamvention 2003 Schmitt assisted at the AMSAT booth and did a live ham satellite demonstration. "We're all going to miss him," Haighton added. An ARRL member, Schmitt served as a net control operator for the New Mexico Swapnet and took part in providing ham radio communication during the Cerro Grande fires in New Mexico. In 2001, Schmitt managed Earth-station duties during an Amateur Radio on the International Space Station school group contact from the New Mexico Museum of Natural History and Science in Albuquerque. Survivors include his wife, Barbara, KD5CGU.—*Brian Mileshosky, N5ZGT, provided some information for this report*

● **Frank Schwab, W8OK, SK:** Well-known top-flight contester and CW operator Frank Schwab, W8OK, of Dayton, Ohio, died May 30 after a lengthy illness. He was 77. In 1952 and then president of the Dayton Amateur Radio Association, Schwab was among the organizers of the first Hamvention. Schwab subsequently became known as the "father of Hamvention" or "Mr Hamvention." Schwab had attended every Hamvention but was hospitalized during the 2003 event. An ARRL Life Member, he also belonged to the Society of Wireless Pioneers and the Quarter Century Wireless Association, and he was a founding member of the Southwestern Ohio DX Association. A World War II Navy veteran radioman, Schwab was first licensed in 1946 as W8YCP and, owing in part to his considerable CW skill (he could copy 55 WPM), he soon rose to the top of the DXCC ranks and eventual membership in the CQ DX Hall of Fame. In addition to his wife, Carolyn, his survivors include four hams: daughter Joanne Hubbard, N8QMP, grandchildren Bobbie Anderson, KC7RWX, and Sarah Anderson, KC7MRO, and son-in-law Jack Hubbard, NI8N.—*information provided by Jack Hubbard, NI8N*

● **Vote on *QST* Cover Plaque award:** The winner of the *QST* Cover Plaque Award for May was Allen Baker, KG4JJH, for his article "The Black Widow—A Portable 15 Meter Beam." Congratulations, Allen! The winner of the *QST* Cover Plaque award—given to the author—or authors—of the best article in each issue—is determined by a vote of ARRL members. Voting takes place each month on the *QST* Cover Plaque Poll Web page, **www.arrl.org/members-only/qstvote.html**.

Media Hits

■ The book *Hello World: A Life in Ham Radio* was the focus of a lengthy article in *The New York Times*. The review gave high praise to authors Danny Gregory, KC2KGT, and Paul Sahre, KC2KHN, who conceived of the book and eventually got licensed after coming across the QSL card collection of the late Jerry Powell, W2OJW, at a flea market. The piece detailed Powell's colorful ham radio history, featured some of his QSL cards and shared the lure of Amateur Radio with non-ham readers.

■ National Public Radio in June featured an hour-long program on Amateur Radio during *The Connection*, which originates at WBUR, Boston. The main guest was Bob Hopkins, WB2UDC, who Elmered the authors of *Hello World: A Life in Ham Radio*. Show topics included working DX, ham radio and the space program, and emergency communication. Callers from around the country participated in the live program. The show can be accessed via *The Connection* archives, **www.theconnection.org**.

■ *The Star Press* of Muncie, Indiana, interviewed ARRL Public Relations Committee member Jim McDonald, KB9LEI, for a story on local license classes. McDonald explained the licensing process and many of the good reasons for becoming a ham radio operator. The paper also interviewed Josh Beeson, N9GQA.

SECTION MANAGER ELECTION NOTICE

To all ARRL members in the Alabama, Alaska, Delaware, East Bay, Kansas, Michigan, New Mexico, Santa Barbara, Tennessee and Western Massachusetts 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 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 September 5, 2003. Whenever more than one member is nominated in a single section, ballots will be mailed from Headquarters on or before October 1, 2003, to full members of record as of September 5, 2003 which is the closing date for nominations. Returns will be counted November 18, 2003. Section Managers elected as a result of the above procedure will take office January 1, 2004.

If only one valid petition is received from a section, that nominee shall be declared elected without opposition for a two-year term beginning January 1, 2004. 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*

Nominees Sought for ARRL Board of Directors

If you're a full ARRL member in one of the following five divisions and are interested in playing a part in the League's democratic organization, here's the opportunity. Nominations are open for the offices of director and vice director for the 2004-2006 term in the Central, Hudson, New England, Northwestern and Roanoke divisions.

ARRL Divisions

The policies of the League are established by 15 directors who are elected to the Board on a geographical basis to represent their divisions and constituents (see page 10 of any recent *QST* for a list of the divisions, directors and vice directors). These 15 directors serve for three-year terms, with five standing for election in each.

Just as in national or state politics, ARRL voters/members have the privilege and responsibility to decide that they like the actions of their incumbent representatives and support them actively for reelection or to decide that other representatives could do a better job, and to work for the election of those persons. Vice directors, who succeed to director in the event of a midterm vacancy and serve as director at any Board meeting the director is unable to attend, are elected at the same time.

Call for Nominations

Nominations are open for director and vice director in the five divisions mentioned above for the three-year term beginning January 1, 2004.

How to Nominate

1. *Obtain official nominating petition forms.* This package consists of a cover letter; a reprint of this election announcement; blank Official Nominating Petition forms and Candidate's Questionnaires for the offices of director and vice director; a copy of the ARRL Articles of Association and Bylaws; and an informational pamphlet for candidates.

Any full member residing in a division where there is an election may request an official nominating petition package. You don't need to be a candidate to request the forms. Your request for forms must be received by the Secretary *no later than noon Eastern Time on Friday, August 8, 2003.* There are separate forms for director and vice director nominations.

2. *Submit petition with statement of eligibility and willingness to serve.* Official forms bearing the *signatures of 10 full members of the division* and naming a full member of the division as a candidate for director or vice director, must be submitted, with a statement *signed by the candidate* attesting to his or her eligibility, willingness to run and willingness to assume the office if elected. These documents must be filed with the secretary *no later than noon Eastern Time on Friday, August 15, 2003*. Only original documents can be accepted; *no facsimiles of any kind are acceptable.* On Monday, August 18, 2003, the secretary will notify each candidate of the names and call signs of each other candidate for the same office. Candidates will then have until Friday, August 29, 2003, to submit 300-word statements and photographs, if they desire these to accompany the ballot, in accordance with instructions that will be supplied.

3. *Election Committee to certify eligibility.* In accordance with the Bylaws, an Election Committee, composed of three directors not subject to election this year, is responsible for the conduct of the election. This year, the Election Committee consists of Rick Roderick, K5UR (chair), Walt Stinson, WØCP, and Bernie Fuller, N3EFN.

The nominee must hold at least a Technician amateur license, be at least 21 years of age and have been licensed and a full member of the League for a continuous term of at least four years immediately preceding nomination. No person is eligible whose business connections are of such nature that he or she could gain financially through the shaping of the affairs of the League by the Board, or by the improper exploitation of his or her office for the furtherance of his or her own aims or those of his or her employer. The primary test of eligibility is the candidate's freedom from commercial or governmental connections of such nature that his or her influence in the affairs of the League could be used for his or her private benefit. The idea behind these rules is to ensure that candidates: (1) possess a lasting interest in Amateur Radio and the League, (2) have the legal capacity to make decisions for the ARRL and (3) are free from conflicts of interest.

Balloting Will Follow

If there is only one eligible candidate for an office, he or she will be declared elected by the Election Committee. Otherwise, ballots will be sent to all full members of the League in that division who are in good standing as of September 10, 2003. (You must be a licensed radio amateur to be a full member.) The ballots will be mailed not later than October 1, 2003 and, to be valid, must be received at HQ by noon Eastern Time on Friday, November 21, 2003. A group of nominators can name a candidate for director or vice director, or both, but there are no "slates," as such. Each candidate appears on the ballot in alphabetical order. If a person is nominated for both director and vice director, the nomination for director will stand and that for vice director will be void. A person nominated for both offices does have the option, however, of declining the higher nomination and running for vice director if he or she wishes. Because all the powers of the director are transferred to the vice director in the event of the director's death, resignation, recall, removal outside the division or inability to serve, careful selection of candidates for vice director is just as important as for director.

Absentee Ballots

All ARRL members licensed by the FCC, but temporarily residing outside the US, are eligible for full membership. Members overseas who arrange to be listed as full members in an appropriate division prior to September 10, 2003, will be able to vote this year where elections are being held. Members with overseas military addresses should take special note of this provision; in the absence of information received to the contrary, ballots will be sent to them based on their postal addresses. Even within the US, full members temporarily living outside the ARRL division they consider home may have voting privileges by notifying the Secretary prior to September 10, 2003, giving their current *QST* address and the reason that another division is considered home. If your home is in the Central, Hudson, New England, Northwestern or Roanoke divisions but your *QST* goes elsewhere, let the ARRL Secretary know as soon as possible, but no later than September 10, 2003, so you can receive a ballot from your home division.

The Incumbents

These people presently hold the offices of director and vice director, respectively, in the divisions conducting elections this year:

Central—George R. Isely, W9GIG and Howard S. Huntington, K9KM

Hudson—Frank Fallon, N2FF and Stephen A. Mendelsohn, W2ML

New England—Tom Frenaye, K1KI and Mike Raisbeck, K1TWF

Northwestern—Greg Milnes, W7OZ and Jim Fenstermaker, K9JF

Roanoke—Dennis Bodson, W4PWF and Rev. Leslie Shattuck, K4NK

For the Board of Directors:

May 23, 2003

David Sumner, K1ZZ
Secretary

Hams Help Battle Malibu Brush Fires

By Lawrence J. Sachartoff, N6MJE (with editorial input from Gene Berwager, KF6CTS, and Tom Fakehany, N6FDR)

N6MJE

Brush fires in the Santa Monica mountains above Malibu were spread by Santa Ana winds.

Malibu, California, with its long wide, white beaches, continual sunshine and casual ambiance, is one of Southern California's most famous beachside resorts. Located 23 miles north of where the famed Wilshire Boulevard meets the Ocean at Pacific Coast Highway, Malibu is beach rich, sinfully rich, with 27 miles of something-for-everyone coastline: broad, sun-baked beaches, hidden coves, tide pools, world class waves, and if you're lucky, Bay Watch Bodies. Malibu is nestled along the Santa Monica Mountains and is victim to natural disasters such as mudslides and brush fires. The Los Angeles area's brush fires are made worse by northeasterly winds locally called Santa Anas.

Santa Anas Bring Trouble

These Santa Anas, blowing from the desert, pick up heat from friction as they move through the many mountains and canyons ringing Los Angeles. By the time they hit the Los Angeles area, they can have velocities in excess of 50 miles per hour and cause temperatures to rise into the 80s or more in contrast with seasonal temperatures in the 50s to the 70s. A major side effect of Santa Anas is low humidity, which, when coupled with the high winds, causes a high fire danger.

Sunday night, January 5, 2003, was an especially windy "Santa Ana evening." With very high winds, power lines were falling down throughout the Los Angeles area. Around 11:30 PM, as the lines fell, their sparking caused a brush fire in Malibu, in the areas of Corral and Latigo Canyons. Before long, the Los Angeles County Fire and Sheriff's Departments were mobilized to perform their respective duties. At the Sheriff's Lost Hills Station, the Emergency Operations Center (EOC) was activated to coordinate traffic management and possible evacuations in the Malibu area. Amateur Radio in Los Angeles County plays a big part in these situations, and the Los Angeles County Disaster Communications Service, or DCS, a RACES-affiliated organization, was activated about midnight on Monday morning, January 6.

Ham Radio Activated

The Lost Hills Station's DCS unit, made up entirely of volunteers and known as DCS-22, is headed by Thomas Cagan, KB6NQW, District Communications Officer. Tom, a former Marine, was contacted by the Malibu Area DSC-22 supervisor, Los Angeles County Sheriff's Department Reserve (S/R) Captain Thomas Fakehany, N6FDR, and ordered to stage DCS-22's Mobile Command Post at the Malibu Civic Center near Pepperdine University. As the activation progressed, Cagan was joined by Gene Berwager, KF6CTS, DCS-22's Operations Officer; Dave Danner, K6AIX, DCS-22's Malibu Operations Officer and Marv Haffner, KD6OXW, DCS-22's Mobile Command Post Operations Officer. As the operation grew, the team provided interdepartmental communications on 2 meters between various agencies (LA County Fire and Sheriff Departments, Malibu City government and the California Highway Patrol), until they stood down about 9:30 AM.

Using DCS-22's pager notification system, S/R Captain Fakehany reactivated DCS-22, at the request of Lost Hills Station Commander Captain James Glazar, N6WMZ, at about 11:40 AM, for a new brushfire located in the Canyon. As the team mobilized, Lawrence Sachartoff, N6MJE, Assistant District Communications Officer, conferred with Fakehany and coordinated the initial response to Malibu of Cagan and Danner. Danner, arriving at the Malibu Civic Center, prepared DCS-22's Mobile Command Post for relocation to Zuma State Beach, where the interagency Command Post was being set up.

Interagency Coordination

Meanwhile, Sachartoff responded to the Lost Hills Sheriff's station and activated the DCS-22 Emergency Operations Center (EOC), acting as Net Control for 2 meter and 40 meter nets. Wearing a second hat as Operations Officer, Sachartoff coordinated staffing of the EOC, posting Wes Banbury, WB6ICC, and Wes's daughter Rynn Banbury, KA6AEO. With Rynn logging all the action and Wes coordinating standby responses from DCS-22 members and standby commitments on the Los Angeles Countywide 2 meter net from DCS members at other stations, DCS-22 staffed up for a major response, as the fire had grown to engulf over 1200 acres.

While Cagan and Danner staffed the Mobile Command Post at Zuma State Beach, Berwager and Haffner were en route to Malibu from their homes in the San Fernando Valley area of Los Angeles. As announcements were made on DCS-22's primary 2-meter frequency, others responded: Cas and Debbie Grys, respectively KF6CUE and KG6GCQ, were dispatched to Malibu High School, which was in use as an Evacuation Center and held many middle and high school students kept back at school due to the fire. Using 2 meter handheld transceivers, Cas and Debbie provided communications for American Red Cross staff, passing their traffic to DCS-22's Mobile Command Post for dissemination to other agencies. Bob Lavin, K6BOB, and Daryl Linkow, KE6IHA, took over the nets at the Mobile Command Post, coordinating traffic on the 2 meter and 40 meter radios. Lee Ford, KA6VIX, Malibu Assistant District Communications Officer, had secured food for the hungry opera-

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

tors who were working at the Mobile Command Post. John Lorentz, N6DNU, Dave Peteque, N6EPN, and Alan Carson, KE6QIW, also were involved with operations at the Mobile Command Post.

Back at the Sheriff's Station Emergency Operations Center, Naomi and Norm Goodkin, WB6OHW and K6YXH, staffed the 40 meter net and Instant Messenger console. Berwager assumed his usual role of Operations Officer, which was currently held by Sachartoff at the Lost Hills Station, and coordinated operations between all parties, eventually ordering the Mobile Command Post to move to the Sheriff and Fire Command Post at Trancas Canyon. Dan Halpert, WA6JQB, assumed the role as Net Control of the 2 meter net, while Wes Banbury continued as Net Control for the 40 meter net. Berwager was then sent to Malibu to open the Malibu Civic Center, which was to serve as an overall Area Command Post. Shortly thereafter, all DCS-22 personnel on the Malibu side were ordered to the Malibu Civic Center with the Mobile Command Post. James Sumner, WT6JS, assumed 2 meter Net Control at the Sheriff's Station Command Post until DCS-22 stood down at approximately 10 PM.

As DCS-22's first activation in over two years, operations went smoothly, owing to training exercises held throughout the year. With excellent coordination between the Amateur Radio operators of DCS-22 and the various public service agencies, radio traffic and situations were managed effectively and safely, with only three homes lost. All things considered, it was another great showing for the members of DCS-22, RACES and Amateur Radio!

TRIBUTE TO NICK ZORN, N4SS

It is with sadness that we note that Nick Zorn, N4SS, of Pace, Florida, became a Silent Key on February 27, 2003. Nick was a longtime leader in the ARRL's National Traffic System and Field Organization, and he was the first NTS Eastern Area Digital Coordinator.

Nick was first licensed in 1955 as K4BSS and was a Life Member of the ARRL. Jim Leist, KB5W, NTS Central Area Chairman, said, "He was already a dedicated and very capable traffic handler when the digital era 'erupted' and the new modes really got his attention. He was an accomplished CW operator long before he got involved with digital. It was particularly enjoyable to 'swap dits' and a few sea stories with him after nets when he was still active in the finger-talking mode." Nick had a career in the United States Navy, and he retired as a Commander, U.S. Navy, in 1975.

Northern Florida Section Traffic Manager Earl Leach, WX4J, said, "Nick set the example for NTS traffic handling. A former Northern Florida STM and TCC member, he was one of the founders of the NTS Digital system and as Eastern Area Digital Coordinator established an HF digital system with coverage in virtually all sections of the Eastern Area. He was always there to help us with problems, and above all, was our friend."

Marcia Ford, KW1U, Chair of the NTS Eastern Area, wrote about Nick's mentoring abilities. "I first met Nick in the 1980s when we worked the CW nets and TCC sked together," Marcia said. "I remember him as an A-1 operator who could send and receive with the best of them. As he became more involved with the NTS digital scene, he became a mentor to me and a source of encouragement. He was there to help in any way he could. I relied on him as a digital coordinator for his knowledge and calm spirit. He was a good leader."

George Neeson, VE3BDM, of Elizabethtown, Ontario, also acknowledged his friend, Nick: "I can no longer call N4SS when I have a problem, but he has passed the torch. I have been able to assist American amateurs to set up digital systems thanks to his teaching."

Field Organization Reports

Compiled by Linda Mullally, KB1HSV

Public Service Honor Roll
May 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.

675 W2MTA
640 N2CCN
510 W7TVA
488 AB2IZ
475 N2LTC
398 KC2DAA
380 W7ARC
352 N2YJZ
335 NC2F
310 KA2ZNZ
300 W2LC
292 K9JPS
281 N2OPJ
250 N9VE
242 NN2H
240 KB2RTZ KB2KOJ
235 W5ZX
230 KB2SNP
225 N5NAV
215 K2ABX
212 KA0DBK
210 KB2CCD
203 KA2GJV
200 KD1LE
185 W5OMG
176 N1IST
174 N6NKO
170 W5ARS
168 N3WAV
167 KB2ETO
165 WI2G
160 K7GXZ KG4OTL W3YVQ
157 KV4AN N2RTF
155 WA9ZTY N2HQL
151 KG4FXG
150 NJ5M
147 N2JRS
141 N2IK
140 KG4CHW KD4GR AD5KE N4TAB AG9G
136 WB2LEZ
135 KC0HOX NN7H W9RCW
132 KB3GFC
130 W7GB AG4DL AC5XK
128 W5RXU
127 KA2YKN
126 KG9B N7TOD W5IM
125 N8IO KC5OZT KK5GY K0IBS K4YVX K9LGU WB2UVB
123 N2JBA
120 N1LKJ W1GMF KW1U K4FQU
KA4FZI WA2YL AB4XK W6IVV W8YS W6QZ W3BBQ WA4DOX K4RLD W4EAT K4IWW WX4J N3RB W5JYJ WB0TAQ KK3F KB0DTI
119 KB5ILY
117 WA1QAA
115 W8IM KA2BCE
113 WA2GUP
112 AA4AT
110 K8AE K8GA N8FPN KC4ZHF K5UPN AF4NS N8NMA N5IKN WA5OUV W7QM N7YSS W7ZIW KE4JHJ W9BHL NR2F K2UL KL5T N2GJ N3SW KA5KLU W5GKH N7YSS WA1JVV AB0WR
108 W3ZQN
107 KB8NDS N0ZIZ
106 WD4LSS KB9KEG N5OUJ
105 K4BEH W7DPW K3CN KG4OQA WX4H W0WWR
104 N8ZJU W4AUN
103 NB4K N7EIE
102 WB5NIC
101 KA9RZL
100 WA8SSI K8VFS WA4EIC KE4UOF WA9VND KD4EFM K4SCL KB5TCH WN0Y W7GHT WD9F W7LG K3SS W9CBE N9MN KC2EOT WB2QIX WA2YBM K2BCL AF4QZ KA4UIV KB2KLH WB2GTG N2AKZ N7CM
99 WJ2F W7TC
97 N1TPU
N4VVX
96 W1ALE
95 KB0YTM
94 KA0O W2GUT K1TSV
93 KJ7SI K4DND W4CC AD5CA
92 WB4UHC
91 KO4OL AL7N
90 N8OD AA8PI WA8RCR WB4PAM W4WXA WB4GGS WB7VYH WD8DHC KA8WNO K1JPG KF4WIJ AA2SV W5RIP KG2D WB2IJH KE2SX AA3GV N3WK
89 AF2K W2CC NQ4U
88 K4WKT KE0XQ WB6UZX W0HXB WA2CUW W0HXB KE3FL
87 KB1HDO K6IUI W6JPH
KC3Y
86 W7VSE
85 KA9HRO
83 N8QVT K4FUM WB4BIK
82 N3KB
81 KD5SWI KC2IYC KK7TN AB0UY
80 KC8UTL WA8DHB KG4MLD AA4YW W2MTO KL7OR N3OR K3IN WA0LYK
76 N8DD KG4QIP
75 K8KHZ N8FXH
74 K2VX K4KAM
73 K5SFM KC7SGM
72 KB1CVH K4ZC AK6DV KC6SKK
71 AA4BN KD6YJB KC4YGB
70 W1PLW K4DZM WA2WMJ

The following stations qualified for PSHR points in previous months, but were not recognized in this column: (Apr) K8PJ 115, K4WWV 90, KA9HRO 80, N8IBR 66.

Section Traffic Manager Reports
May 2003

The following ARRL Section Traffic Managers reported: AL, AR, CO, DE, EB, EMA, EPA, EWA, GA, ID, IL, IN, KY, KS, LA, MI, NC, NFL, NLI, NNJ, NTX, NV, OH, OK, OR, ORG, SC, SD, SDG, SFL, SJV, SNJ, STX, TN, VA, WCF, WI, WNY, WPA, WV, WWA, WY.

Section Emergency Coordinator Reports
May 2003

The following ARRL Section Emergency Coordinators reported: AK, AR, ENY, EWA, IL, IN, KY, MDC, MN, MO, NC, NLI, NV, SFL, SNJ, STX, SV, WMA, WNY, WV.

Brass Pounders League
May 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*
W4ZJY	0	859	612	0	1471
W1GMF	0	452	692	24	1160
N2LTC	0	504	488	49	1041
WX4H	1	321	478	2	802
KK3F	20	366	346	20	752
KW1U	0	350	268	10	628
W6DOB	0	138	398	42	578
KC8LBZ	-	-	-	-	568
N1IQI	0	321	240	0	561
K2BCL	4	222	258	25	509
N8IO	138	177	171	15	501

BPL for 100 or more originations plus deliveries: K9JPS 436, W9RCW 188, K8PJ 180, K8GA 173, K9GU 171, W7TVA 129, N5IKN 123, AK6DV 101.

The following stations qualified for PSHR points in previous months, but were not recognized in this column: (Apr) K8PJ 710. (Mar) AK6DV 107.

The AH3D Johnston Atoll DXpedition

The Johnston Atoll lies approximately 1125 kilometers (700 miles) southwest of the Hawaiian Islands. The atoll consists of Johnston, Sand, North and East islands and small reef on the northwest side of the coral islands. All of the occupants of Johnston Atoll reside on Johnston Island, located at 16°45´ N and 169°32´ W. Johnston Island was originally 46 acres and was dredged in the mid '60s to about 600 acres.

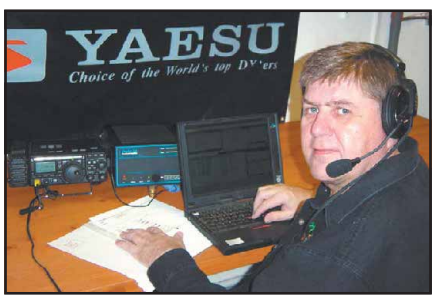
In 1796 Captain Joseph Pierpoint accidentally discovered the atoll as he grounded the American brig *Sally*. Captain Charles J. Johnston is credited for the discovery and naming of the island when the crew of the British HMS *Cornwallis* sighted the coral islands on December 14, 1807.

The island was later claimed by the US in 1858, for guano mining. In 1934 the island was turned over to the US Navy for defense purposes. After WW II the US Air Force took control of the atoll for disposing of chemical weapons. During the 1950s and '60s nuclear tests were performed. Up until late 2000 Johnston was a storage and disposal site for chemical weapons. Shortly afterward, non-US nationals were permitted on the island. The island is expected to be completely turned over to the US Fish and Wildlife Service (USFWS) by the end of this year.

In late 2002, Martti Laine, OH2BH, realized like many other DXers that Johnston Island was soon to be under the jurisdiction of the USFWS and once that happened it would be very difficult to get on the island without significant paperwork. Just before Christmas last year, Martti asked me if I would be interested in going to Johnston Island along with Pertti Simovaara, OH2PM. Martti wanted to use his US call sign, AH3D, from its proper DXCC entity before it would be impossible.

During the holidays, our team was completed and we began to communicate with Gary, KH6GMP, and John, K1ER/KH6, our Hawaiian liaisons. After contacting the island's administrators and gaining support through the local sponsor David, KH3AC, we were given the green light and obtained our entry papers just two days before leaving the US mainland. Our Finnish team members left their northern homeland on January 23. The two spent a couple of days on the US West Coast picking up some additional equipment including an FT-897 and FT-857 from Vertex Standard (Yaesu). Some other equipment was obtained from Glenn, K6NA, and Jim, W6YA.

We all met up at Los Angeles International Airport on Saturday January 25. From there we headed to Honolulu, where we would spend a day and a half making final preparations and meeting a few of the locals. On Monday afternoon, we flew via Aloha Airlines to the remote Johnston Island. It took about two hours. Once we landed, we were escorted to the airport terminal where the local police collected our entry permits and health records. We were also given a short history of the island and told exactly where we were not permitted. Failure to comply would result in jail time. After we cleared the local requirements our sponsor David picked us and our equipment up and delivered us to the club station.



Martti, OH2BH, smiles as he finally gets to use his AH3D call sign from its intended DXCC entity. Check out the ultra small Yaesu FT-897 and FinnFet FF1001.

Martti, Pertti and Dave on the shoreline. Nearby Sand Island was the location of a 600 foot Loran tower until not too long ago.

The first night we quickly set up an antenna for 30 meters and tapped into the existing Mosley multiband beam, which had some minor problems. Thankfully the next day we were able to secure use of the island's 100 foot crane in order to repair the coax feed line and attach a small rope to be used to turn the beam. We also were able to install multiple dipoles on an empty 90 foot telephone pole.

Our main goal was to work Europeans. First in order that they would have a chance to make that first QSO with KH3 and second on other bands and modes. We knew the openings to Europe would be short to this remote island and so, during the times the bands were not open to Europe we concentrated on the other parts of the world with a heavy emphasis on the low bands and some RTTY.

Our strategy was to:

1. Manage the pileups closely so that all levels from all areas of the world would have their opportunity.

2. Have the entire audience enjoy the show and have the feeling they would quickly make that first QSO so they did not have to worry too long and go on with life or wait for more bands and modes. No sweating and no pain.

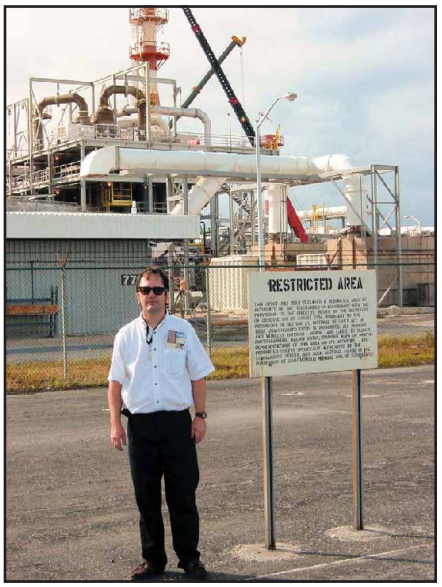
3. Get the maximum benefit from the practice of operating by numbers so that important, positive learning could be experienced at the DX end of the pileup.

Controlling the Pileups

Martti spent most of his time in the operating room of the local AM station, KJVR. This was the SSB station, which was used mostly on 20 meters to Europe along with SSB on 15, 40 and 80 meters. Martti

On 12 and 17 meters we used this four-element dual-bander by FinnFet Antenna.

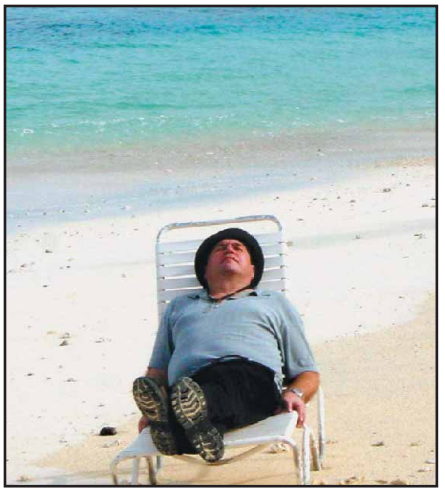
Bernie McClenny, W3UR ♦ 3025 Hobbs Rd, Glenwood, MD 21738-9728 ♦ w3ur@arrl.org



This is as close as your editor wanted to get to the chemical disposal plant.

Each day the AH3D team would get one hot meal at the local Coral Reef Café. There was plenty of good food and it was very reasonable too. Three and a half dollars would fill you up for another 18-21 hours of operating time!

Thankfully there was a 100 foot crane on the island, which Pertti, OH2PM, used to repair the Mosley multiband beam.



Martti takes a short nap and dreams "Where Do We Go Next?"

has often said, "The pileup behavior is a mirror of the DXpedition operator. There is no such thing as an unruly pileup alone, rather an unruly DXpeditioner that cannot control the crowds." Over the years, OH2BH has followed this philosophy throughout his DXpeditions. Although some may claim that the European pileups are unruly, it is what the DXpedition operator makes of it. Unclear operating procedures, failure to understand the multitudes from each country, loss of tempo and unfair geographical distribution of QSOs can quickly generate a messy pileup. During marginal propagation conditions and applying OH2BH's philosophy, more than 3000 Europeans found their way into the AH3D log.

The Relaxed Operating Mode

Pertti, OH2PM, operated almost all CW except for the last few hours of the operation. He also operated mostly during the night hours and slept during the day. "The best mode of the waiting pileup is the feeling that one's turn will come in due course and in an orderly fashion. It is called the DX relaxation mode," says Pertti. OH2PM operates almost exclusively CW and clearly observed many DXers do not come from the high speed CW contesting ranks. Most DXers are casual CW operators. Productivity and efficiency do not come from high rates but rather from a clear procedure that in the end results in a relaxed feeling by those hunting the DX. This avoids the "Did I work the DXpedition question." Sending at a well paced speed in a highly clear operating mode, specifically on the low bands, keeps everyone in a relaxed mood.

Working By Numbers

I operated on RTTY, SSB and CW on a variety of the bands. "Working by numbers can be a satisfying experience to all. This allows the weaker ones to surface in no time at all, rather than just working no-number Big Guns day-in and day-out." Some will claim that going by numbers should not be used. It is the ultimate challenge but can be done and it should be done. A good example is on the low bands following the sunrise across the US. Spending a well-defined period of time on each number allows the smaller stations to surface earlier in the DXpedition along with the Big Guns. What is the correct amount of time for each number? Only the experienced DXpeditioner will know, as it is a moving target and there are no textbook answers.

What did I Learn?

After seven days of operation and more than 28,000 QSOs it was time to leave Johnston Island. As with all past DXpeditions I learned several things. Martti reminded me that there are three main target areas of DXers: Europe, North American and Japan. I knew this but he told me that it's difficult to find a DXpedition location where you can easily work all three. There is always at least one area that is going to be difficult because of propagation. One of the things that make a DXpedition a success is being able to satisfy all three areas and in order to do that you're going to have to put an emphasis on the propagation-challenged area.

Just a few days before writing this article I received the following from Mike, K8IW, who just managed to work AH3D:

> My card from AH3D arrived this week. I was struck by your comment on the card about working by numbers and the weak ones popping up. That is in fact how I managed to work AH3D on 24 MHz SSB with my home made attic wire dipole (Alpha Delta Center Insulator) and 100 watts (Kenwood TS-570D). Whoever was on there at 20:22 on Feb. 1 worked stations in the 8th call area until he worked me. And I was the LAST station he worked before moving on to the 9th call area. And there is absolutely no doubt in my mind that I was the weakest station in the pack. I have always been a CW op and work SSB only when there is a good reason like a new one. I would have to say your philosophy got me in the log, an all-time new one for me.

Conclusion

This was my first DXpedition in the Pacific Ocean. I really enjoyed the sites, my DXpedition companions and the thrill of being on the other side of the pileup. Until the next DXpedition—see you in the pileups!—*Bernie, W3UR* QST

The Merry Merry Month of May

What a great month May was! Single- and double-hop E_s on 6 meters, a big 2-meter E_s opening in the US and perhaps the best European 2-meter E_s conditions in years. The European E_s openings are based on e-mail reports, Internet reports the DK5YA VHF Page and the GØNFA VUSHF Daily Newsletter and the Good DX DXrobot. Information about US 2-meter E_s comes from a large number of e-mail reoprts and Internet sites for the Good DX DXrobot and the DXWorld Propagation Logger.

Two-Meter Sporadic E in Europe

Europe usually has better E_s conditions than we do; in part because they are closer to the magnetic equator, but also because there is much more activity there to detect these usually fleeting openings. Two-meter E_s has been mighty scarce in the US in recent years. Perhaps these openings occur in cycles as Steve, K1FO, remarks on MoonNET: And perhaps our turn is coming again.

Major Openings

The 2-meter E_s season began in Europe on May 11 with two short openings eastward from Western Europe at 1005Z JO40-JM88 and 1420Z JO21-KN35 (YO). But the real deal was May 19 and 20. The May 19 opening extended (Figure 1) from just after 1530Z to 1930Z and was followed by FAI propagation from UT5JCW to Italy. The major activity involved Western Europe, DL, F, G, GW, ON and PA working into HA, LZ, S5, UB5, YO and YU. A secondary path opened from EA and EA6 to LZ, SV and OZ about an hour before the end of the opening.

The following day, May 20 (see Figure 2) began with a short opening between CT2HSO (IN61) to 9H1CG (JM75) around 1100Z. It reopened well around 1540Z with EA and CT working into DL, OE and OK. An hour later came a spectacular opening; a large number of stations in Central and Western Europe (DL, OK, HB9, OE) worked the Canary Islands EB8BTV (IL18qi) over distances greater than 3000 km. OK1TEH (JO70fd) appears to have the longest distance contact at 3567 km. There is an unresolved question of whether these were double-hop E_s or an E_s link to a tropo duct that may have existed between CT and EA8. The MUF exceeded 200 MHz based on contacts between F and CT less than 800 km apart. Of additional interest were African contacts made between F6FHP (IN94) and CT3HF (IM12); F8DBF (IN78) and 7XØAD (JM16). The opening finally came to an end over four hours later at 2000Z.

This Month

August*	No good or excellent EME conditions this month
August 2-3	ARRL August UHF Contest
August 13	Perseids meteor shower peaks at 0440 UTC
August 16-17	ARRL 10 GHz and Up Cumulative Contest
August 22-24	2003 Eastern VHF/UHF Convention

*Moon Data from W5LUU

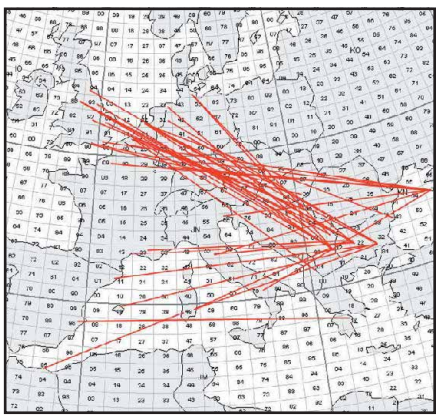


Figure 1—Paths for the 2-meter E_s opening of May 19 in Europe.

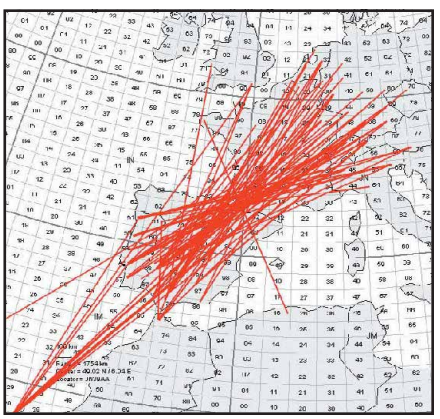


Figure 2—Paths for the 2-meter E_s opening of May 20 in Europe.

The largest European opening in terms of activity and extent occurred on May 25 from 1512Z to 1617Z and then 1738Z to 1907Z (see Figure 3). The first segment (in blue) featured contacts between UA6/UB5 and southern Italy/Sicily and later LZ/YO. Around 1600Z, the MUF once again exceeded 200 MHz. The latter segment (in red) was much more widespread with contacts from Western Europe to Eastern Europe (LZ, Z32, YO, HA, UB5 and SP) and from Italy into Scandinavia, LY and SP. All of Europe was involved with the exception of those unfortunate enough to be located beneath the E cloud around JO50,60/JN49,59. Again the MUF exceeded 200 MHz.

Minor openings

Aside from the May 11 opening, a short E_s opening was recorded around 0930Z on May 22. Another short one occurred on May 27 between 0712 and 0722Z from UA into SM. In association with the minor solar storm on May 29, EB1EHO (IN73) worked into Italy. On May 31 there was a 2+ hour E_s opening that was narrowly focused at the eastern end of the Mediterranean, where 4X worked LZ, YO, HA and 9A, and OD5 worked throughout LZ.

Two-Meter Sporadic E in the US

News of the European openings had long since reached the States and although 6 meter E_s conditions remained promising, nothing happened for quite some time. However, on May 25 our day finally came. At 2005Z K5CM (EM25) found WA2FGK (FN21) and we were off to the races until 2230Z. A representative map of these E_s contacts appears in Figure 4. There appeared to be three primary phases to this E_s opening. From the beginning, the major ionization cloud supported contacts between the Northeast and Oklahoma, Arkansas and Missouri; slightly later there were contacts between Minnesota and the Carolinas and Georgia. Toward the end of the opening, a western movement and narrowing of the cloud supported contacts from the Northeast to Nebraska and finally to western Illinois. The longest contact appeared to be 2128 km between NL7CO (EM04to) and VE2HOG (FN07gl). The shortest contact, 1117 km between W3EME (FM19qt) and N9LR (EN50du), indicates a midpoint MUF of around

Gene Zimmerman, W3ZZ ♦ 33 Brighton Dr, Gaithersburg, MD 20877 (tel 301-948-2594) ♦ w3zz@arrl.org

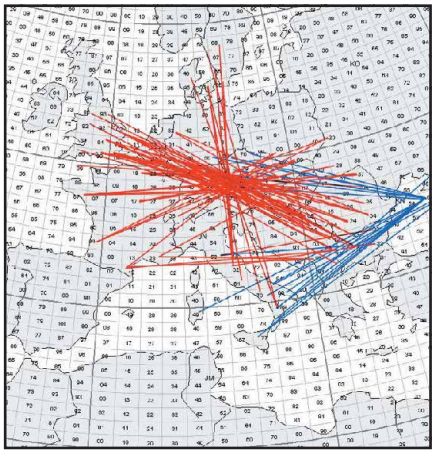


Figure 3—Paths for the 2-meter E_s opening of May 25 in Europe. The early opening is in blue; the later opening is in red.

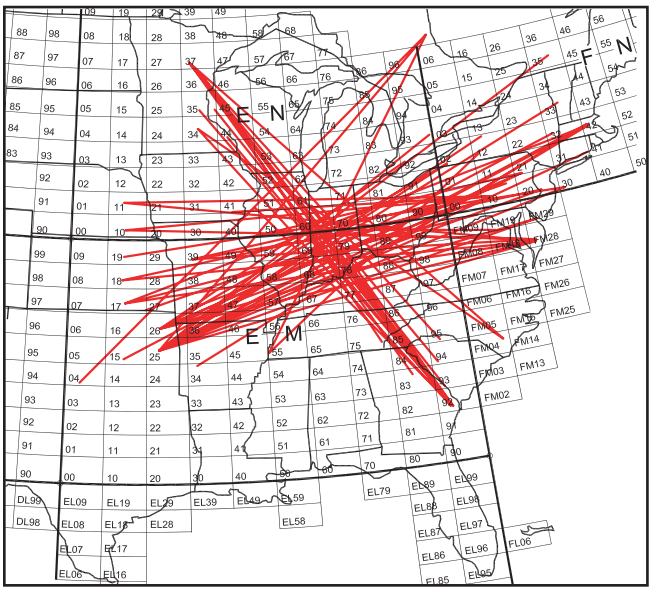


Figure 4—Paths for the 2-meter E_s opening of May 25 in the US.

184 MHz. Some impressive contact totals were reported: K5CM at 63 QSOs/24 grids; K5YY (EM26) at 56 QSOs/23 grids; KCØHFL (EM17) at 30 QSOs/15 grids.

Not to be outdone by the Europeans, we racked up two more E_s openings. Following the intense aurora on May 29-30, there was a reasonably rare E_s opening from 0400-0430Z between the Pacific Northwest (CN84 through CN89) to the central valleys and selected coastal grids in California (CM95, 98 and DM03, 05, 06, 07). Finally, later on May 30, K5CM saw a very short E_s opening to the Northwest working WA7GSK (DN13) at 1950Z.

Solar Storm of May 29

But there's more! Beginning on May 27, solar region #365 produced three X-class flares and an associated coronal-mass ejection (CME). This resulted in a severe magnetic storm beginning at 2000Z here in the US, ushering in 18 hours of wild activity—aurora on 6 meters through 70 cm, 6 and 2-meter E skip, north/south F2/TE DX as far south as Argentina and all night multiple-hop E_s throughout the US. The peak K index reached 8 on May 29 at 2100Z and May 30 at 0000Z and the May 30 A index reached 76. With such strong activity one might have expected the auroral oval to lock out the most northerly stations, but KØAWU (EN37), VE2JWH (FN35) and stations in the Minneapolis and Seattle/Vancouver areas were very much in evidence on the spotting networks.

Likewise although stations in the more southerly latitudes were worked, they did not appear in the numbers reminiscent of the great auroras of 1982, 1986 and 1989. The farthest south stations that I saw on AU were K4RX (EM70) on 6 meters, KU4WW (EM54) and W5RCI (EM44) on 2 meters and WB5LUA (EM13) on 222 MHz. Spectral spreading was relatively great and few if any SSB contacts were reported on 2 meters. Activity was reasonable on 222 MHz but apparently nonexistent for the most part on 432 MHz except for a single contact reported between K1JT and W3EP. There were, however, lots of 2-meter contacts between 1500 and 2000 km in distance and lots of high-volume contacts like K4QI (FM06) with 57 QSOs in 41 grids.

Auroral contacts on 222 MHz deserve special mention because this fascinating band suffers from inactivity in part because of the relative lack of commercial equipment. Several stations were actively involved on 222 MHz either by direct report or via the reflectors and packet clusters: WA8RJF (EN91), W9UD (EN41), KØAWU (EN13), NØLL (EM09) and KMØT (EN13). WA8RJF may have been the most active with contacts ranging from W4DEX (EM95) and AA4H (EM86) to the south and KMØT and KØAWU to the north and west. NØLL wins the prize for the southernmost station W5LUA (EM13qc) as well as AA4H and W5RCI (EM44). KØAWU chimed in with W9UD, KMØT, WA8RJF, N9LR (EN50) and K2YAZ (EN74). KMØT had 6 contacts in 6 grids and 4 states. My timing must have been off because I worked only two stations, but VE2JWH (EN35) was a new grid for me. The Northwest was represented by N7EPD (CN87) working W7MEM (DN17). For sure the 222 MHz Standings listed elsewhere in this column will need some updating after this event.

The straight auroral propagation began to diminish somewhat between 0000 and 0100Z. It was replaced at first by excellent conditions from many parts of the US to northern South America (YV, HK) on 6 meters and then around 0400Z with transcontinental double-hop E_s, which lasted on and off until well into the morning. Two unusual 6-meter contacts were reported on the propagation reflectors: K1SIX (FN43) into GM and K1TOL (FN44) into KL7, both ostensibly via auroral E. The two instances of 2 meter E_s that developed have already been described. All in all, it was a great month. I can hardly wait for June!

ON THE BANDS

Don't think that all this 2-meter E_s and storm activity was all there was in May. Europe and Africa on 6 meters, tropo along the Gulf Coast and in the Midwest interior and new digital activity attended the approach of summer. Reports of other propagation and other activities were received from K1TR, N3DB, W4KPA, W4XP, N7QF and G4UPS not otherwise mentioned.

Six Meter E_s

Continuing the promising start at the end of April, there was some kind of 6-meter E_s recorded essentially every day in May. Double-hop E_s was noted on several days particularly on the 19th by K6LMN (DM04) into the Carolinas and on the 24th by WA2BPE (FN12) into California. K6QXY (CM88) reports the first transpacific contact in May with ZL3HW on the third. Excellent DX conditions to the south were noted on May 11 and 24 with the likes of HR1RMG, TG9NX XQ3SIX, FM5WD and 9Y4AT reported by KB3HJA, N8CJK, KB8VAO and KE4WBO. Europeans began to appear after mid-month with W4GF (EM83) reporting EA and CT and K2OVS reporting EAs on May 20 and K6QXY reporting the first opening of the season to KL7 later that day. Perhaps the best DX day was May 24 with XEs near (XE2HWB in DL44 by NØJK EM17) and far (XE1MM EK09 by K7JA DM03), J75KG (by NW5E EL98) and a variety of Caribbeans—FG, FJ, FM, J3, CO, KP4—and FY in northern South America worked by K7BV/1. Dennis, K7BV/1, also reports D44TD on May 25 and his first JT6M digital contact with CN8LI. K1SIX and K2OVS completed JT44 contacts with

222-MHz Standings

Published 222-MHz standings include call-area leaders as of June 1. For a complete listing, check the Standings Boxes on the World Above 50 MHz Web pages at **www.arrl.org/qst/worldabove/**. To ensure that the Standings Boxes reflect current activity, submit reports at least every two years by e-mail to **standings@arrl.org**. Printed forms are available by sending a request with SASE to Standings, ARRL, 225 Main St, Newington, CT 06111.

Call Sign	State or Province	States Worked	DXCC	Grids	DX† (km)
W1JR*	NH	47	4	89	2050
K1TEO	CT	24	2	108	1720
W1AIM	VT	20	2	50	2021
K1LPS	VT	17	2	54	1472
KU2A	NH	15	2	35	1144
WA1ECF	MA	14	2	45	1294
AA1YN	NH	12	1	9	496
K1WVX	CT	10	1	13	973
WA1HOG	NH	7	1	9	291
K2AN	NY	24	2	62	1043
W3HHN	NY	22	2	29	1642
K1JT	NJ	18	2	47	1727
WA2ZFH	NY	12	2	20	519
W3ZZ	MD	36	2	101	1931
WA2FGK	PA	22	2	61	—
K4QI	NC	30	2	78	—
K4ZOO	VA	26	2	88	1690
AA4H	TN	26	2	74	1737
W4WTA	GA	23	1	57	1485
KU4WW	AL	19	1	30	1240
W4SW	VA	9	1	23	641
N4UFP	SC	8	1	13	—
K0VXM	FL	5	1	21	1757
W5LUA*	TX	50	—	—	—
K5UR	AR	42	2	199	—
W5RCI	MS	38	2	123	1930
K5SW	OK	31	2	123	2051
WB5AFY	TX	30	1	70	1238
W5ZN	AR	23	2	73	2250
W5UWB	TX	22	2	55	2197
AA5C	TX	16	2	70	1843
WD5AGO	OK	10	2	25	1975
K5LLL	TX	9	2	30	2089
N5QGH	TX	8	—	27	—
K5RHR	NM	7	1	28	577
AA5AM	TX	7	1	24	1100
NE0P	OK	2	1	4	101
W6TOD	CA	10	2	—	—
KC6ZWT	CA	6	1	22	1371
KR7O	CA	4	2	22	1638
N6RPM	CA	4	2	22	1431
W7RV	AZ	9	3	51	1740
K7HSJ	OR	3	1	11	624
K7XC	NV	2	1	7	619
W8PAT	OH	30	2	78	2057
N8KOL	OH	27	2	85	1510
K2YAZ	MI	21	2	72	2167
WB8XX	OH	21	2	41	1253
WB8TGY	MI	8	2	20	701
WB9SNR	IL	27	2	61	1745
KA9UVY	IL	24	1	51	1536
N9NJY	IL	23	2	68	1580
W9JN	WI	16	2	71	1981
N0AKC	WI	10	1	17	—
W9RPM	WI	8	2	15	850
N0LL	KS	23	2	95	1691
N0HJZ	MN	23	1	71	1530
KM0A	MO	23	—	70	1350
W0JRP	MO	22	1	72	1305
K0FF	MO	18	1	52	1174
K0RZ	CO	15	1	51	2040
K0VSV	IA	14	2	37	1120
N0UK	MN	13	2	61	1169
W0RT	KS	12	1	—	1455
K0SQ	MN	11	1	36	1074
KF0Q	MN	8	2	29	830
WA2HFI/0	MN	7	1	27	868
KR0I	MO	5	1	6	474
Canada					
VE3DSS	ON	22	2	—	—
VE2PIJ	PQ	8	2	22	694

*Includes EME contacts
†Terrestrial
—Not given

CT1DYX. K4XXX reports strong openings to HK and YV on May 31 following the aurora, but the close in Caribbean (WP4LNY) reports were limited to the southeastern US.

Tropospheric Ducting

The Gulf Coast and the middle of the country continued to enjoy good tropospheric conditions. The big day for Gulf Coast tropo was May 12. N1YZ (EM63) reports 2-meter contacts with the Carolinas and W4KPA's 5-W mobile FT-817 and 2-meter loop produced contacts from EM73 with K4QI (FM06) on 2 meters and 70 cm, K5QE (EM31) on 2 meters and W5CIA (EM40) on 70 cm. The 70-cm contacts were made with the 2-meter loop! NEØP (EM04) reports good conditions to Texas, Kansas, Missouri, Illinois and Iowa on 2 meters, while making contacts with Missouri and Illinois on 70 cm. KMØT (EN13) reports contacts on 144, 222, 432, 1296 and a heard report on 2304 from WB5AFY in EM04 on May 18. Mike also added six new grids on many of the microwave bands thanks to two separate rover efforts from NØDQS to EN05, 06, 15, 16, 20 and EM29. Signal strengths were quite weather dependent. A little haze was good, but high winds were bad. Meanwhile K7JA/6 and KH6BZF report an early appearance of the KH6HME beacon in the California Southland on the 20th. WH6DQ (BK29) even reports working into the Catalina (DM02) repeater with marginal signals on May 22. K6QXY north of San Francisco reports hearing the beacon on May 20-23.

EME and Digital

John, W5UWB, reports JT44 contacts with UA4AQL, ES6RR and SP2OFW. John is using a single 17-element M^2 antenna and 1500 W. Meanwhile Lance, W7GJ, sends an interesting e-mail from LA8AV describing his 6-meter contact with Lance using only 100 W and a rope Yagi.

HERE AND THERE

Perseids Meteor Shower

What is often the major meteor shower of the year, the Perseids, peaks at 0440Z on August 13. Based on observations since the last passage of its parent comet, P-Swift-Tuttle, in 1992, two other maxima are possible, one at 0240Z and one at 1440Z. Oil up your vocal chords and crank up your *WSJT* software!

ARRL 10 GHz and Up Cumulative Contest

Get out your tripods, folks, and head for your favorite hill. You can operate a total of 24 hours from 0600 local on Saturday August 16 to midnight local on Sunday August 17. The favorite liaison frequency is 144.260 in many places. Rules are at **www.arrl.org/contests/rules/2003/10GHzandup.pdf**.

ARRL August UHF Contest

This contest runs from 1800Z August 2 to 1800Z August 3. All bands from 222 MHz and upward will be used. Rules can be found at **www.arrl.org/contests/rules/2003/UHFContest.pdf**. This is a good time to check out your UHF and microwave equipment. If you participate please send in a log. It's the only real way to measure activity.

2003 Eastern VHF/UHF Convention

Sponsored by the Northeast Weak Signal Group, this convention will be held in Enfield, Connecticut, August 22-24. Technical sessions and band discussions on Saturday will be followed by a hamfest/flea market on Sunday. For further information see **www.newsvhf.com/**.

Florida Weak Signal Society Mail Reflector

The FWSS has set up a mail reflector at **flwsg@cycat.com**. To join send e-mail to that address with the word "subscribe" in the subject field. Follow the directions from the robot when it replies.

International Forum for Radio Amateurs

From well-known VHFer Oscar Morales, CO2OJ, comes word of this forum to be held in March 2004. The conference will host discussions of DX, VHF and emergency communications among other topics. The official call for the event is at the Federación de Radioaficianados de Cuba Web site **frc.co.cu**. All are welcome.

STRAYS

ARRL SEEKS AMATEUR RADIO PRESENTATION PROGRAMS

ARRL Field and Educational Services (F&ES) is seeking Amateur Radio presentation programs or slide shows that utilize Microsoft *PowerPoint* or similar computer-based slide-viewing software. F&ES also is interested in VHS and digital video programs to add to materials F&ES offers hams through the ARRL Video Series (**www.arrl.org/FandES/ead/materials/videos.html**). Topic choice can be any Amateur Radio topic of interest to hams or targeted for a non-ham community, including demonstrations and tutorials on various topics. The ARRL Web site's Multimedia Frequently Asked Questions page (**www.arrl.org/FandES/ead/materials/visuals.html**) has further information.

Submissions must contain *original material* and should not use music, video clips or copyrighted materials owned by others without appropriate permissions. Submissions should include a cover sheet describing the program, system requirements and file sizes and noting any use of materials used with the permission of others. CDs selected for distribution would be made available to clubs and interested individuals for the cost of duplicating, shipping and handling. Send presentation or slide show on disc, CD-ROM, VHS tape or DVD to Multimedia Project, c/o Mary Lau, N1VH, ARRL Field and Educational Services, 225 Main St, Newington, CT 06111. For further information, contact Mary Lau, N1VH, **mlau@arrl.org**.

The One Eyed Monster…or How Television Changed Ham Radio Transmitters Forever…

Our example is the Johnson Viking I. Introduced in 1949 with a kit price of only $209.50, Amateur Net—less tubes, crystals, key and mike—could also be purchased for $259.50, wired and tested.

It came in a classy looking cabinet with a modern, yet reliable and proven circuit. The tubes used were well-known at that time and readily available on the war-surplus market at reasonable prices. It had a 6AU6 crystal oscillator, 6AQ5 buffer/doubler and a Raytheon RK-4D32 final amplifier. The 4D32 was also chosen by Collins Radio as the final amplifier tube for their 32V series of transmitters. It was a popular and well-advertised tube of the time.

The modulator consisted of a 6AU6 speech amplifier, driving another 6AU6, which in turn drives transformer coupled class AB2 push-pull 807 modulators. If it was planned to use the Viking I as an exciter for a higher-powered amplifier later on, an additional 500-Ω audio output was possible from the modulation transformer to drive a larger modulator in the amplifier. This would encourage hams to buy the Viking I because it was expandable. The final tube would be link-coupled to the amplifier.

The power supply was very well designed with a pair of 5R4 high voltage rectifier tubes, a 5Z4 low voltage rectifier and a 6AL5 bias rectifier.

Provisions were made for VFO control, and Johnson would offer the model 122 VFO, also available in kit form or wired.

Fred Wahlquist, now AA2P, purchased the kit version early on after much reading and research. Fred figured the Viking I was well worth the money. He also purchased the VFO.

Fred said, "It didn't take me long to put it all together, once I got started."

Fred Wahlquist, AA2P, in the 1970s.

"My first antenna system was a clothesline that had a metal wire in its center," he continued, "and I used the metal water pipes in my home as the counterpoise. Nobody knew I had a ham radio. It really got out, too."

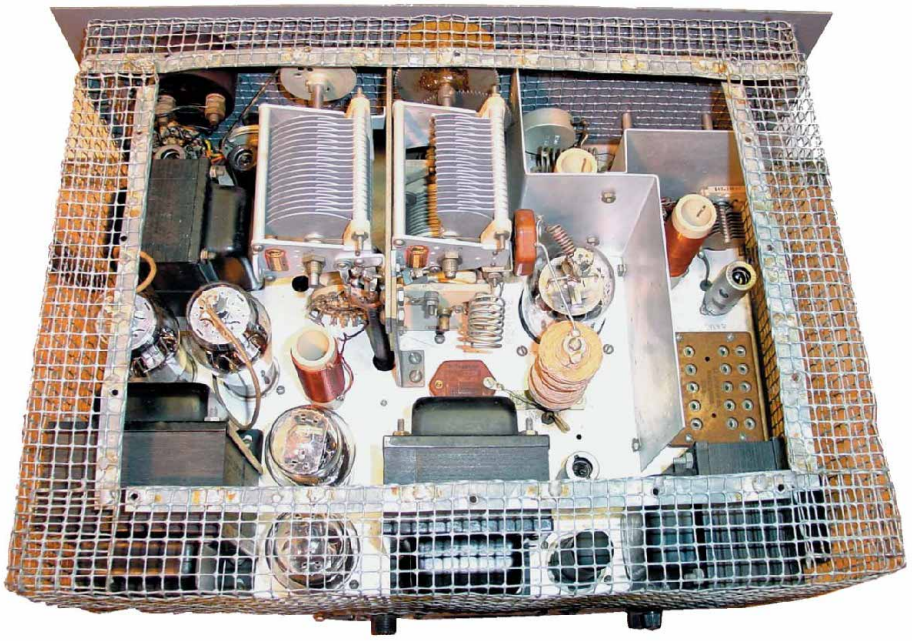
But being a good neighbor, Fred knew that their television sets might be having some interference. So when *QST* came out in June 1952 with a great article titled, "TVI-proofing the Viking I," by Phil Rand, W1DBM, he decided to improve his transmitter.

Rand also published a handbook called *Television Interference*. In the third edition he reprinted his *QST* article on the Viking I. (It's the one with the red cover and it's worth reading.)

Fred dove right in, taking apart his transmitter and painstakingly following the directions, step-by-step, until he completed the wiring changes and a replica of the shield in the article using rabbit cage wire. Like the one in the article, Fred had a "clean" transmitter, one he and his neighbors could live with. You can see the neat and orderly job he did in the shielding in the photo.

When I disassembled the Viking I to dust it off and prepare it to be photographed, I was impressed with Fred's

John Dilks, K2TQN ♦ 125 Warf Road, Egg Harbor Township, NJ 08234-8501 ♦ k2tqn@arrl.org



Viking I TVI shielding with the top cover removed.

construction of the original kit. It was neat and orderly, as good as you might expect from a "factory-wired" job. It really is picture perfect. Except for its age and obvious use, it is almost like new.

By now, you Johnson collectors have probably noticed the cabinet color doesn't look correct. It's not. Fred told me he really didn't like the Johnson maroon color, so he painted it his favorite color, Navy battleship grey. Fred's an ex-Navy radio operator, having served in World War II. So this new color looked great to him, and I kind of like it, too. It may get a new paint job some day, after I finish restoring the older components and test it on the air. If I do, it will be a fresh coat of battleship grey.

The TVI shielding will also remain as a testament to all those hams who really tried to keep peace in the neighborhood, and modified their beloved transmitters.

Other TVI'd Rigs

I have seen some once-beautiful radios hacked up by prior owners using copper window screen, soldering it to the cabinet and front panels. I've seen cabinets with screen and aluminum shielding riveted and sheet metal screwed through the sides, tops and bottoms. And I have seen entire shielded enclosures for the whole transmitter, with small doors that open for knob turning. These are the ones that are always the last to be sold at hamfests, sold cheaply and most likely to become parts rigs for other non-modified transmitters.

The Viking II and other Later Transmitters

In 1952 when the redesigned Viking II came out it was advertised to be "TVI suppressed" by using special shields and built-in filters.

Collins redesigned the later-version 32V series transmitters and cabinets. An internal aluminum shield was added around the RF deck, and it had a new cabinet without the larger openings found in the earlier models.

World Radio Labs started to add shielding on the Globe King 500A's and future 500 models.

From then on, as much of the engineering time went into designing the TVI-free part of transmitter as went into the rest of the circuits. The new single sideband transceivers allowed the manufacturers to overhaul their lines completely. The newer rigs were much better, we were told. But the big chassis and cabinets and new AM transmitters became part of the past. They became Boat Anchors.

From Phil Rand's 1996 *QST* Obituary

Philip S. Rand, W1DBM, died November 17, 1995, in Lebanon, New Hampshire, at age 89.... He was an electronic engineer for the Remington Rand Corporation in the late 1940s, when Amateur Radio faced a crisis in the form of interference to the early VHF television sets. Rand worked with the ARRL to develop TVI suppression techniques for channels 2 through 6.

ARRL's then Technical Editor George Grammer, W1DF, designed high-pass filters for the primitive TV sets, while Rand developed new methods of shielding for amateur transmitters.

Rand published articles in *QST* spanning 50 years, from "A Shack on Wheels" (1933) to "The Beeper, An Audible Frequency Readout for the Blind Amateur" (1983).

During the TVI days Rand lived in Redding Ridge, Connecticut, and worked closely with ARRL staff member Lew McCoy, W1ICP (now retired). McCoy remembers Rand displaying in his office a computer that used 12AT7 vacuum tubes—it was the famous UNIVAC. McCoy called Phil Rand "my tutor in TV interference"....

AUGUST OLD RADIO MEETS YOU'LL LIKE

Rhode Island—I won't be able to get to one of my favorite places on Saturday, August 2, but if you're in the New England area you can. It's the "Yankee Radio Tune Up" at the New England Museum of Wireless and Steam. They host an annual radio flea market at 8 AM, and a small auction at noon. You can find them at 1300 Frenchtown Rd, East Greenwich, RI 02818, tel 401-885-0545. It is located about 10 minutes south of Route 95 (it's easy country driving). They have a wonderful display of radios there; you'll want to bring a camera and stay all day. I promise you, you'll be glad you went. For more information and a Web link, see my Web page, **www.eht.com/oldradio/arrl/index.html**.

Virginia—On August 2 and 3, I will be in Berryville, Virginia with my mobile ham radio museum. It's the Shenandoah Valley Amateur Radio Club's 53rd Annual Winchester Hamfest and Computer Show Sunday, August 3, 2003 at the Clarke County Ruritan Fairgrounds in Berryville, Virginia. There will be some overnight camping the night before. Listen on AM for the new museum Collins station/exhibit around 3885 on Saturday night. The Museum's call is W3KY. Then come by on Sunday and see it live. It's a 75A1 receiver and a 32V3 transmitter that was made operational by collector Al Klase, N3FRQ. See my Web site for more information and a link to the Hamfest. Look for my hat at the hamfest and say hello.—*K2TQN* QST

OP-ED

The Trouble with Single Wideband

By Mike Lonneke, WØYR

Single sideband was first heard on the amateur bands in 1947. Since then, amateur "phone" signals started getting narrower in an effort to fit more signals into crowded bands.

In *Single Sideband for the Radio Amateur*, former ARRL General Manager John Huntoon wrote, "Sideband, through elimination of carrier heterodynes and reduction of channel width, has remarkably improved the communication capacity of our phone bands."

A *de facto* standard of about 2.7 kHz bandwidth for a good sounding SSB signal was soon adopted. If a SSB transmitter is properly adjusted, stations can fit in every 3 kHz up and down the bands.

Amateurs carried on until 1997 when SSB began to appear on the air carrying more bass response than most amateurs had ever heard on SSB. The signals were not overmodulated. The operators at first used restraint in their adjustments. Soon, excesses came into play. One amateur connected an expensive recording microphone to his rig. When it sounded flat, he used an audio control board and began boosting the bass, forcing the highs, compressing levels, gating the audio "chain" and even "de-S-ing" the audio. Soon, others followed suit and some signals spread from about 3 kHz in width to 6 kHz or more. The race was on to see how much bass could be piled onto a signal and how "bright," "natural" and "wet" an SSB signal could be made to sound. Various SSB exciters were tried until those that could be easily modified to transmit wideband, heavily processed audio were identified. A Web site was set up with instructions on how to do this.

These amateurs were engaging in a kind of signal mutilation and bandwidth occupation seldom heard since the AM days, except during SSB DX contests. On-air complaints came fast and furious. Frustration led to jamming and intentional QRM by offended amateurs and to heated exchanges. As the complaints increased, the signals became broader. Those complaining that they are unable to work within 3 kHz of these signals were invariably told the fault lies with their receiver. Amateurs within several kHz of these "audiophiles" are subjected to splatter buckshot, distortion products and irritating whines and whistles as they demonstrate just how inconsiderate an amateur can be on a crowded band. One amateur regularly occupies as much as 9 kHz of bandwidth and even has another set of distortion products from 12 to 14 kHz above his main transmitting frequency.

These Single Wideband types forget that their heavily processed audio easily overdrives every RF amplifier stage. Ehrlich, W2NJR, wrote in *Single Sideband for the Radio Amateur*, "If the linear final of an SSB rig is overdriven it not only can cause splatter, but also will put signals right back in the suppressed-sideband space from which the exciter is working so hard to eliminate them." Now we know why a signal, transmitting a maximum 3.5 kHz-wide human voice takes up as much as 9 kHz of spectrum.

Paul M. Segal, years ago, wrote *The Amateur's Code*. Segal's first tenet reads: "The Amateur is Considerate…. He never knowingly uses the air in such a way as to lessen the pleasure of others." Single Wideband is inconsiderate.

The FCC's Rules, Part 97.307(a) state that amateurs shall not "occupy more bandwidth than necessary for the information rate and emission type being transmitted, in accordance with good amateur practice." That is a subjective and debatable description, but no reasonable person would contend the FCC had in mind SSB signals occupying the tremendous bandwidths of SWB signals heard daily on our bands. The human voice can certainly be transmitted with better fidelity than we hear on our "Donald Duck" mode, but most amateurs contend that a crowded amateur band is not the place to do it.

Numerous complaints have been filed with the FCC's Enforcement Division. The FCC is investigating this complex situation. It is not helped by subjective definitions of "minimum bandwidth" and "good engineering practice" called for in the Part 97 Rules. The problem is not limited to the US; it is worldwide. The FCC will have to come up with an enforcement strategy that will hold up in court.

In February, I asked Riley Hollingsworth of the FCC's Enforcement Division to review a draft of this article. His reply by e-mail said, "Good article. It [Single Wideband] is not only inconsiderate as hell, but very rude and shortsighted. Such operation invites petitions for rulemaking to limit bandwidth. Apparently it never occurs to some very selfish people that the reckless exercise of rights sometimes leads to their limitation. You can quote me on any of this." On April 3, he repeated much the same message in Advisory Notice letters.

As Riley predicted, a Rulemaking proposal has been filed with the FCC to curtail wideband operation and to require amateurs to limit the bandwidth of their signal by law. It is a shame that amateurs have brought this on themselves. The trouble with Single Wideband is that it is "inconsiderate as hell."

QST Op-Ed Policy

The purpose of Op-Ed is to air member viewpoints that may or may not be consistent with current ARRL policy.

1) Contributions may be up to two-thirds of a *QST* page in length (approximately 900 words).

2) No payment will be made to contributors.

3) Any factual assertions must be supported by references, which do not necessarily have to be included in the body of the article to be published.

4) Articles containing statements that could be construed as libel or slander will not be accepted.

5) The subject matter chosen must be of general interest to radio amateurs, and must be discussed in a way that will be understandable to a significant portion of the membership.

6) With the exception that the article need not be consistent with League policy, the article will be subject to the usual editorial review prior to acceptance.

7) No guarantee can be made that an accepted article will be published by a certain date, or indeed, that it will be published at all; however, only articles that we intend to publish will be accepted, and any article we have decided against publishing will be returned promptly.

8) Send your contributions to ARRL Op-Ed, 225 Main St, Newington, CT 06111. QST

FEEDBACK

♦ In the Integrated Timer experiment in "Hands-On Radio" (Jun 2003 *QST*, page 59), the actions of the set and reset functions of the flip-flop are reversed. Correctly stated, when the set input (trigger comparator output) changes from low to high, Q goes low. When reset (threshold comparator output) changes from low to high, Q goes high.—*Dan Ferreira, N1BMA*

♦ In "The Protector" schematic (Jun 2003 *QST*, Figure 1, page 56), resistor R13 (10 kΩ) was omitted. It should be in series with pin 2 of U2A (LM358) after the junction of R11, R12 and C3.—*Arnaldo Drummond, PY5AQ*

Getting Organized: Hopeless?

Organization: That's the name of the game. According to my wife, I am one of the most disorganized people on the planet. I, of course, do not agree. She, on the other hand, can find anything, at any time, anywhere in the house! It's scary. I mean, *really* scary. She can even find things in my shack that I haven't seen in months! Not only that, she *knows* the manufacturer, model number and the frequency range of *every* piece of gear in my shack! I can't sneak a new piece of gear in without her noticing.

In an attempt to "get organized," I started assembling a station engineering manual. I really don't know why I hadn't done this earlier. At every Air Force Tech Control Facility I ever worked in we had a station engineering manual. Ditto in the broadcast industry. It makes sense, so maybe that's why I put it off for so long.

What's a SEM?

So exactly what is a "station engineering manual"? The SEM is *the* place you go for information about your station. All the schematics of each piece of gear along with interconnecting wiring diagrams, coaxial cabling, mic connector wiring, power distribution are contained within the SEM.

If you have a single QRP rig, one antenna, tuner, keyer, paddle set, power supply and headphones, you can probably get away without assembling a SEM. However, if you put all the information about the rig, and accessories together in one place, for all practical purposes you have a SEM by default. Problems arise when you add multiple rigs, antennas, mixed power sources (battery and ac mains supply), computer/digital radio interface equipment, etc. At this point, you need to make a conscious effort to pull all the loose ends together into one or two organized binders. This will allow you to have all the technical information regarding your entire station readily accessible. Then when something goes wrong it's a simple matter of pulling out the SEM and starting the troubleshooting process.

Okay, now that you've made the decision to amass all the technical info about your station, where do you begin? Logically, cataloging the transceiver (or transmitter/receiver) manuals would be the first place I'd start. Obtain a large three ring binder (or two) and several packages of dividers prior to starting. When you place the various manuals into the binder, separate the manuals with a divider. Each rig has a divider placed ahead of the actual manual (or schematic) labeled with the make and model of that particular rig. These are placed in alphabetical order starting from the front of the binder. If you tend to be really retentive you can also include the invoice/sales slip with each manual in case warranty work is needed at a future time. Don't forget to include any modifications to the radio gear, either by annotating the mod on the schematic or inserting a separate piece of paper listing the mod(s) done to the rig.

Accessories

Next would follow accessories: antennas, antenna/coaxial switches, audio preamps/equalizers, computer(s), packet/radio modems, headsets, keys/keyers, microphones, power supplies/power distribution equipment, rotors, et al.

Finally, a complete set of interconnectivity wiring diagrams should be included. This is where a trip to your local RadioShack store or commercial electrical supply house might prove enlightening. Obtain some wire labels. These can be the types that resemble tie wraps with a large tag that can be written on with pencil, or they can be the sequentially numbered tapes that simply go around the wire or cable. If you use the latter, be sure to annotate, when you draw your station interconnecting wiring diagrams, which numbers are on which cables. This greatly simplifies the task of mating up new equipment or replacing a piece of existing gear that has been removed for maintenance. Also, since these wire labels are normally printed on paper with an adhesive backing, it is a simple matter to take a colored highlighter and color code the labels to reflect coaxial cable, power cabling and audio cables. Don't forget to show these color codes on the interconnecting wiring diagrams. In short, use your imagination. Whatever method works for you, use it!

In my case, the sheer volume of technical data that I have compiled on my station cannot be displayed in one or two binders. Therefore, I have placed my SEM in a file drawer inside a filing cabinet using dividers. This certainly is not as easy to use as a binder, but at least I have the technical data within easy reach. This is a far cry from my earlier method of stuffing manuals and schematics in between books in the bookshelf!

If you have some creative ideas, please send them along and we'll see about getting them into the column. Remember: Once you start the SEM process, you must keep up with it to be sure all changes in the station are logged and the appropriate diagrams are updated to reflect these changes.

TWO GROUPS MERGE

I am really excited about the following news, provided to me by Joe Everhart, N2CX. As of June 4, 2003, the Northern California QRP Club (NorCal) and the New Jersey QRP Club have merged, forming the American QRP Club. This merger, months in the planning, has brought together two of the most successful QRP clubs in North America. Since 1994, NorCal has produced over 50 original projects in kit form. The NJ QRP Club has similarly produced 30 new designs and kits over the last eight years. Both clubs sponsor highly successful QRP weekends (Pacificon and Atlanticon) and both have extremely popular quarterly magazines (the NorCal *QRPp* and the NJ-QRP-C *QHB*).

The benefits to the QRP community are tremendous. First, the two clubs will pool their talent, efforts and parts-scrounging abilities to produce even more innovative, low cost useful kits for QRPers. Second, the American QRP club will sponsor and fund Atlanticon and Pacificon, but each club will be individually responsible for the planning and execution of these events. Currently in the planning stages is a national QRP convention. Finally, the two quarterly QRP journals will combine in a larger format (8.5 × 11 inches) with at least 72 pages, called *The Home-brewer*. Each year a CD-ROM with the entire previous year's newsletters, bonus material, software, tools and reference material will be offered for sale.

There will be a slight membership cost increase: $20 per year for the US and Canada and $30 for DX subscribers. The increase is needed to offset the larger format and associated printing and mailing costs. In reality, this is $10 per year cheaper than having to maintain two subscription/memberships in the separate organizations. Current members will continue to receive all the issues they have paid for, but they will be combined (in the case of a QRPer having dual membership in both organizations) and carried over into *The Homebrewer*. The reduction in duplication and redundancy will be another solid benefit to the QRP community.

If you want to join, send your yearly payment to the American QRP Club, c/o Paul Maciel, AK1P, 1749 Hudson Dr, San Jose, CA 95124. Be sure to check out their Web site at **www.njqrp.org/a-qrp** or check into the QRP-L mail reflector (**qrp-l@lehigh.edu**) for further information. QST

Rich Arland, K7SZ ♦ 25 Amherst Ave, Wilkes Barre, PA 18702 ♦ k7sz@arrl.org

RSGB Delegation Reports on Foundation License Success in UK

RICK LINDQUIST, N1RL

Knights of the round table: **(From left) ARRL CEO David Sumner, K1ZZ, RSGB President Bob Whelan, G3PJT, RSGB Commercial Manager Mark Allgar, M1MPA, and RSGB General Manager Peter Kirby, GØTWW, discuss issues of mutual interest.**

Great Britain's new Foundation license (**www.arrl.org/news/stories/2002/01/10/1/**) has reversed the slide in licensee numbers and reinvigorated Amateur Radio in the UK. That was the assessment of Radio Society of Great Britain (RSGB) (**www.rsgb.org**) President Bob Whelan, G3PJT, who headed an RSGB contingent that visited ARRL Headquarters April 29-30. "We had some pretty alarming statistics," Whelan told his audience of ARRL staff members. He said the RSGB realized that if nothing changed, the number of Amateur Radio exams given would drop to zero in five years, "and time was marching on." That trend, coupled with a rising median age in the Amateur Radio population in the UK and RSGB members' desire for a "practical, progressive" approach to licensing prompted the RSGB to rethink the licensing structure, Whelan said.

As a result, the RSGB conceived of and convinced the Radiocommunications Agency to approve the Foundation license as a "radically different" entry-level approach to Amateur Radio and the first step in a three-tiered licensing structure. The organization then spent about a year developing the licensing materials. Among other new requirements, Foundation applicants must demonstrate the ability to make an on-the-air contact. Since the RSGB considered HF access "essential" to newcomers, it devised a Morse assessment—rather than a proficiency examination—to qualify Foundation applicants.

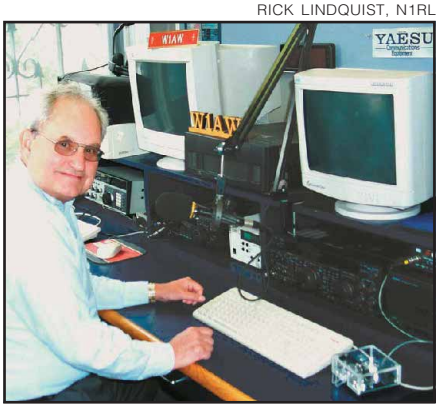
Since the license first became available January 1, 2002, Great Britain has seen the number of amateurs rise by 4000—approximately a quarter of them under age 21. "It was slightly unexpected," Whelan conceded. The RSGB had planned on an initial rush of 1000 candidates, but three months into the new program, the organization found itself inundated with 3000 applications. There are 50,000 amateur licensees in the UK. Foundation licensees sport M3-prefix call signs and have privileges on all bands from 136 kHz to 440 MHz—except 10 meters—with a 10 W power limit.

Foundation license classes often are offered through weekend sessions sponsored by local radio clubs, typically to a dozen applicants. In addition to the Morse assessment, which has no specific code speed requirement, applicants must pass a 20-question (soon to be 25-question) written examination. "It's had a dramatic impact on our clubs," Whelan said of the new license. There are approximately 650 ham radio clubs in the UK, and many had been experiencing declining membership. More information on the Foundation License is available on the RSGB Web site (**www.rsgb.org**). Click on "Foundation Licence Courses."

Whelan predicted that in the UK's current deregulatory climate, the RSGB would be picking up a greater share of the responsibility for Amateur Radio examination administration and licensing over the next few years. In addition to Whelan—who's been RSGB's president for two years—the delegation included RSGB General Manager Peter Kirby, GØTWW, and Commercial Manager Mark Allgar, M1MPA. While at ARRL Headquarters, the RSGB team also discussed with ARRL staff members preparations for World Radiocommunication Conference 2003, International Amateur Radio Union concerns, power line communications, sales and marketing issues and other topics of mutual interest.

Whelan also reported the RSGB's success with its new GB4FUN Amateur Radio van (**www.gb4fun.org.uk/**). The ham radio station on wheels visits schools and non-Amateur Radio public gatherings to publicize the hobby. The van has logged 370,000 visitors in the past year, Whelan said, calling the response at schools "absolutely amazing." QST

RICK LINDQUIST, N1RL



Special visitor to W1AW: **RSGB President Bob Whelan, G3PJT, checks out one of the visitor operating positions at Maxim Memorial Station W1AW.**

RICK LINDQUIST, N1RL

Giving "Ol' Betsy" a spin: **RSGB General Manager Peter Kirby, GØTWW, taps the key of "Ol' Betsy," the 1920s-vintage rotary spark gap transmitter that once belonged to ARRL cofounder Hiram Percy Maxim, W1AW.**

SILENT KEYS

It is with deep regret that we record the passing of these amateurs:

KA1AC, S. Stuart Gibbons, Topping, VA
KC1AX, Ralph C. Neary, Hancock, NH
WB1HBX, Paul H. Desveaux, Hampden, ME
AA1HT, Arthur F. Porter, Braintree, MA
W1KF, Ralph H. Vacca, Waltham, MA
WA1NWS, George E. Blantin, Newtown, CT
W1WAI, David S. Allen, Sudbury, MA
KA2CKR, Gary K. Bauer, Ontario, NY
W2CXY, Walter J. Morrison, Chatham, NJ
WB2DZF, Francis DiStefano, Rochester, NY
W2KME, Neal Hubach, Springfield, NJ
W2ORX, Richard P. Wells Sr, Stuart, FL
WB2ROC, Anthony E. Rossi, Fayetteville, AR
W2SUM, Peter Froloff, Wantagh, NY
K3ABG, Edward A. Nies Sr, Erie, PA
**W3AU, Edward E. Bissell Jr, Brooksville, FL
*WB3DBI, Larry Schwartz, Wylie, TX
W3GES, Ben Zarfos, Wrightsville, PA
WA3GWY, Richard L. Schatz, Sugarloaf, PA
KA3KUA, Harry Gardner, Hershey, PA
W3MAM, John Yuricek, Brackenridge, PA
W3SDV, R. B. Caldwell, Pittsburgh, PA
W3SWC, Ray Riniker, Lewes, DE
KA4CMP, Elna W. Lane, Lincoln, AL
W4EFL, Arthur J. Seltzer, Sun City Center, FL
K4FNK, Joseph S. Churan, Chapin, SC
*KG4GNO, Donald P. Goodman II, Midlothian, VA
WA4ICW, John W. Burwell, Saint Petersburg, FL
W4IQN, William Davidson, Birmingham, AL
W4ISS, Frank F. Simpson, Augusta, GA
*WA4LAF, James W. Chandler Jr, Huntsville, AL
WB4NCF, Vertie E. Norris, Gadsden, AL
*W4OMI, Walter M. Olson, Bartlett, TN
W4PGT, Merton W. Crichton, Winter Park, FL
KE4PRB, Roy J. Ulmer, Apopka, FL
W4RHD, Gene V. Mock, Fayetteville, AR
W4SSN, Chris J. Walker Jr, Savannah, GA
W4VQB, Robert Nedimyer, Titusville, FL
W4XJ, John W. Day, Knoxville, TN
KJ4YZ, John Clapper Jr, Matthews, NC
W5ARV, Will A. Shaw, Venus, TX
WA5BLI, Lee Huebert, Alamogordo, NM
N5CCK, Teddy L. Barton Sr, Oil City, LA
N5DGZ, Roxley E. Kent, Albuquerque, NM
KC5DZN, Frank J. Lukes, Mesa, AZ
KC5EQY, Chris Eul, Albuquerque, NM
KI5FD, Sherrell McCaskill, Maysville, OK
KE5JE, Elton D. Abbott, College Station, TX
W5NYM, Robert B. Swann, Dallas, TX
N5OKQ, Jerry Jennison, San Angelo, TX
N5SPN, Timothy L. Sullivan, Jackson, MS
W5SUL, William C. Plumb, Fort Worth, TX
N5YBW, Lee Kitchens, Ransom Canyon, TX
WA6ASO, Carl W. Baker, Ahwahnee, CA
KD6DN, Warren F. Maguire Sr, Fresno, CA
KB6GFB, Elgeva B. Hall, North Fork, CA
WA6IDO, Sheridan L. Harris, Visalia, CA
W6JIL, Marshall P. Kilrain, Shingletown, CA
W6OS, Edward G. Hall, Santa Rosa, CA
KB6PYD, Charles H. Jack, Watsonville, CA
*WA6TNY, Joan Upton, Estacada, OR
K6VX, Raymond D. Balch, Macdoel, CA
KI6WZ, Edgar L. Gelston, Twain Harte, CA
KA7ABE, Willard W. Fawver, Portland, OR
KB7AGR, Donald G. Perry, Tacoma, WA
W7BHI, Doris Emigh, Brewster, WA
W7CKF, Haydn W. Waddington, Portland, OR
KL7DE, Mike Downing, Casper, WY
KA7EGM, Clyde Hill, Bridgeport, WA
*N7FLE, Orland Upton, Estacada, OR
W7FVZ, Howard O. Kemper, Phoenix, AZ
AA7JA, John E. Van Such, Munds Park, AZ
W7KE, Clarence E. Filley, Hamilton, MT
W7KFH, Arnold W. Barnes, Spokane, WA
W7KIV, Charles R. Hilliker, Sun City West, AZ
KC7RDO, Stanley B. Manes, McMinnville, OR
WB7VOP, C. Walter Baty, Brookings, OR
WD8AQF, Denzel Leach, Grantsville, WV
K8ATX, Leslie G. Johnson, Bessemer, MI
W8BGI, A. H. Spaulding, Saint Petersburg, FL
N8FCK, Leonora Walters, Fenton, MI
KC8GJT, Ruth A. Miller, Fremont, OH
*K8JND, Everett M. Hawley III, Rives Junction, MI
W8OK, Frank Schwab, Dayton, OH
WA8RBA, Elaine C. Schoof, Perrysburg, OH
K8UOQ, Harry O. Smart, Farmington Hills, MI
W8VB, David C. Martin Jr, Sterling Heights, MI
KF8VL, Rex V. Cummings, Sumner, MI
WA8VRQ, Ray George, Wheeling, WV
K8VSH, Joseph Walters, Ironton, OH
KC8VVW, Dwight E. Boles, Uhrichsville, OH
WA8VWW, Richard D. Manley, Portsmouth, OH
*WB8WYW, Eugene Malaniak, Broadview Heights, OH
WB8YRU, Alexander J. Pribish, Leonard, MI
KA8ZAZ, Peter L. Van Duivendyk, Grand Rapids, MI
W9BI, James M. Molledahl, Melrose, WI
KA9CAI, Joseph D. Cassata, Naperville, IL
WD9ESN, William D. Jellings, Windsor, WI
WA9HQX, Opha W. Kelly, Anderson, IN
KA9IEZ, Arthur E. Lasater, Homewood, IL
W9IIB, Darwin W. Alverson, Port Edwards, WI
KB9OUG, Henry F. Pease, La Fayette, IL
W9SUF, George S. Halper, West Allis, WI
KA9UTT, Gene Cunningham, Shelbyville, IN
KF9VJ, Adrian Munnik, Sheboygan, WI
W9VLL, William C. Vosburg, Grafton, WI
WAØBUR, Paul E. Geiger, Kansas City, KS
KØBYC, Howard L. Findlay, Lenexa, KS
KFØDN, Conrad E. Gabrielson, Virginia, MN
NØGTZ, Donald J. Holman, Woodland Park, CO
KCØIZZ, Jerry L. Broadaway, Versailles, MO
WØJQ, George Weber, Delray Beach, FL
WAØKHN, Byron L. McMillan, Nokesville, VA
KAØLEC, Chester W. Burkhart, Park Rapids, MN
KFØQV, Robert D. Moody, Boulder, CO
KØRXK, Lola E. Hensley, Conifer, CO
KØSIN, Clifford J. Hanson, Minot, ND
VE3OKZ, Sidney V. Stadig, Linday, ON, Canada
VP9LL, E. M. Ware, Devonshire, Bermuda

*Life Member, ARRL
**Charter Life Member, ARRL

Note: Silent Key reports must confirm the death by one of the following means: a letter or note from a family member, a copy of a newspaper obituary notice, a copy of the death certificate, or a letter from the family lawyer or the executor. Please be sure to include the amateur's name, address and call sign. Allow several months for the listing to appear in this column.

Many hams remember a Silent Key with a memorial contribution to the ARRL Foundation or to ARRL's. 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

THE ARRL LEGACY CIRCLE

◊ The ARRL Legacy Circle is proud to recognize and thank ARRL members who have notified us that ARRL is included in their will or other estate plans. Recognition includes a Legacy Circle newsletter of gift planning information and updates on related tax issues. A planned gift of a bequest in your will, a trust, insurance policy or a gift of stock or other appreciated property can support the general operations of ARRL or a specific fund like the Defense of Frequencies Fund, the Education & Technology Fund, the Historic Preservation Fund or the W1AW Endowment. For information contact Mary M. Hobart, K1MMH by phone at 860-594-0397 or via email at **mhobart@arrl.org**.

I would like to get in touch with...

◊ former Sgt Donald "Skip" Gross (or someone who can put me in touch with him), whom I knew at Fort Lewis, Washington, in 1955. He was a ham, but I don't remember his call. We were stationed at the Sixth Army Communications School. In 1956 he was stationed on an island off the coast of Alaska.—*David Wiesen, K2VX, 11561 Rolling Green Ct, Unit 101, Reston, VA 20191*

THE W. SANDY LYNCH MEMORIAL AWARD

◊ The Tokyo International Amateur Radio Association (TIARA) is accepting nominations for the first W. Sandy Lynch Memorial Award, in memory of W7BX/7J1ABV who died earlier this year. This award will be presented each year to one licensed Amateur Radio operator in the world that TIARA deems to exemplify Sandy's dedication to the hobby and his personality. These traits include enthusiastic participation in a radio club, bridging international cultures, involvement in education or "Elmering," being active on-air, enthusiasm for new technology and fraternity.

Nominations may be submitted by any Amateur Radio operator or organization to TIARA by October 31. The recipient will be announced annually at the TIARA holiday party in Tokyo in December.

To make nominations or for further information, please e-mail **tiara@bosai.org** or send a letter to TIARA, PO Box 119, Akasaka, Minato-ku, Tokyo 107-8799, Japan. A memorial home page for Sandy Lynch is at **www.w7bx.org**.

FAMOUS HAMS

◊ I invite you visit my newly renovated Web sites listing Famous Hams (**www.nerc.com/~gjurrens/famous_hams.html**) and Astronaut/Cosmonaut hams (**www.nerc.com/~gjurrens/astrohams.html**). I'm adding new folks all the time, as well as links to articles about them. I'm always looking for submission suggestions, too, so if you know of interesting hams you feel should be added, please let me know. Feedback is always welcome.—*Gerry Jurrens, N2GJ, POB 147, Kingston, NJ 08528-9622;* **n2gj@amsat.org**

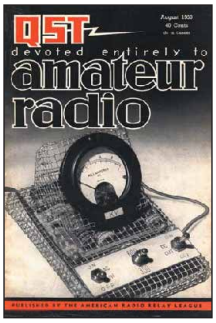
75, 50 AND 25 YEARS AGO

August 1928

♦ The cover photo shows the new acoustic wave filter, which provides "unparalleled selectivity." The editorial looks ahead to 1929, telling what changes lie ahead as a result of the Washington Conference of 1927. For example, the 40-meter band will be changed from 7,000-8,000 kHz to 7,000-7,300 kHz, and the 20-meter band from 14,000-16,000 kHz to only 14,000-14,400 kHz.

Ross Hull tells about "Overhauling the Transmitter for 1929" — an 11-page report. J. Walter Frates, 6CZR, reports on "Following the 'Southern Cross' to Brisbane." The Southern Cross is a large single-engine airplane with radio station, and hams listened to its Q.S.T. bulletins to help track its progress to Australia. The author closes with a look into "the not-far-distant future, when aerial fleets will be making transcontinental and transoceanic passenger and freight flights," crediting amateurs who helped with the present-day pioneering communication work. R. B. Bourne, 1ANA, describes "Acoustic Wave Filters and Audio Frequency Selectivity." A Strays reports that the Jenkins Laboratories, Washington, D.C., will begin a series of experimental television transmissions on July 2, on 6420 kHz, between 8 and 9 P.M. The report says that "If sufficient interest is shown, transmissions will be increased to twice or three times a week." The following article, by Harold Westman, presents "Some More about Amateur Television," including the scheduled transmission by WGY in Schenectady, N.Y. Tips are given on how to receive the picture transmissions using a mechanical scanning disc. Harold Westman tells how to get on "28,000 Kilocycles—And How!"

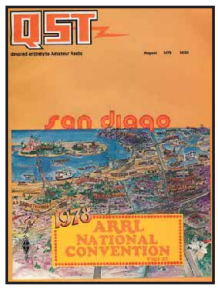
August 1953



♦ The cover photo shows how projects can be "breadboarded" using wire-mesh hardware cloth. The editorial describes how the ARRL QSL Bureau works, on its 20th anniversary.

Ed Tilton, W1HDQ, describes his "Low-Noise R.F. Amplifiers for 144 and 420 Mc." Richard Clay, W9JRO, discusses how to use "Negative Feed-back Modulation" to reduce distortion in 'phone transmitters. Don Mix, W1TS, presents "Eighty Watts on Six Bands," which describes a bandswitching rig using subassemblies. W. W. Deane, W5RET, tells about "A Four-Band Miniature 'Phone-C.W. Rig" that runs 13 watts input. "A Seafaring Kilowatt" tells about the new rig of Captain Kurt Carlsen, skipper of the *Flying Enterprise II*. Walter Roberts, W2CHO, presents Part III of "Magnetostrictive Devices and Mechanical Filters for Radio Frequencies." S. E. McCallum, W2ZBY, tells about "The 'Plain Ground-Plane' Antenna" that he built for 10 meters. George Thompson describes "The Multiband Antenna Coupler" that he built for use on six bands without coil changing. Milton Thomsen, W2CGN, reports on the "Quick-and-Easy Chassis" technique that is illustrated on the cover.

August 1978



♦ The cover cartoon shows the layout of San Diego, which will be the site of the 1978 ARRL National Convention. The editorial discusses complaints received from hams on "Those FCC Exams," where the FCC's lack of resources has caused exams to be less than optimal.

Dave Gray, WB8ZBA, describes "A 2-Meter Frequency Synthesizer" that uses an inexpensive chip developed for Citizens Band rigs. Eric Grabowski, WA8HEB, tells about "The Audiobox—An Amplifier with a Twist." Dana Atchley, W1CF, reports on "Updating Phased-Array Technology." E. W. Ljongquist, W4DWK/W1CQS, describes how to make your antennas less likely to come down, in "Antennas—Keeping Them Up." Stan Horzepa, WA1LOU, tells about some good amateur work, in "Amateur Radio Shines through the Blizzard Blitz of '78." In "International News," Bruce Johnson, WA6IDN, reports on "Amateur Radio in Pakistan." QST

Al Brogdon, W1AB ♦ Contributing Editor

W1AW Schedule

PACIFIC	MTN	CENT	EAST	MON	TUE	WED	THU	FRI
6 AM	7 AM	8 AM	9 AM		FAST CODE	SLOW CODE	FAST CODE	SLOW CODE
7 AM-1 PM	8 AM-2 PM	9 AM-3 PM	10 AM-4 PM	VISITING OPERATOR TIME (12 PM-1 PM CLOSED FOR LUNCH)				
1 PM	2 PM	3 PM	4 PM	FAST CODE	SLOW CODE	FAST CODE	SLOW CODE	FAST CODE
2 PM	3 PM	4 PM	5 PM	CODE BULLETIN				
3 PM	4 PM	5 PM	6 PM	TELEPRINTER BULLETIN				
4 PM	5 PM	6 PM	7 PM	SLOW CODE	FAST CODE	SLOW CODE	FAST CODE	SLOW CODE
5 PM	6 PM	7 PM	8 PM	CODE BULLETIN				
6 PM	7 PM	8 PM	9 PM	TELEPRINTER BULLETIN				
6:45 PM	7:45 PM	8:45 PM	9:45 PM	VOICE BULLETIN				
7 PM	8 PM	9 PM	10 PM	FAST CODE	SLOW CODE	FAST CODE	SLOW CODE	FAST CODE
8 PM	9 PM	10 PM	11 PM	CODE BULLETIN				

W1AW's schedule is at the same local time throughout the year. The schedule according to your local time will change if your local time does not have seasonal adjustments that are made at the same time as North American time changes between standard time and daylight time. From the first Sunday in April to the last Sunday in October, UTC = Eastern Time + 4 hours. For the rest of the year, UTC = Eastern Time + 5 hours.

♦ **Morse code transmissions:**
Frequencies are 1.818, 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

ALABAMA SECTION CONVENTION

August 16-17, Huntsville

The Alabama Section Convention ("Friendly Family Hamfest"), sponsored by the Huntsville Hamfest Assn, will be held at the Von Braun Center's South Hall, 700 Monroe SW; take I-565 to Huntsville until you reach the Memorial Parkway interchange (US 231/431), take Exit 19-A, remain in far right lane which will exit onto Clinton Ave, turn right onto Clinton, Center is three blocks on right, across from Hilton. Doors are open Saturday 9 AM to 4:30 PM, Sunday 9 AM to 2:30 PM. Features include giant dealer/manufacturer show (Don Tunstill, W4NO, 256-536-3904; **dtunstil@hiwaay.net**), huge flea market (Dave Givens, K5RSI, 256-883-2760; **K5RSI@DavidGivens.net**), exhibitors, vendors, wide selection of forums (Chuck Lewis, N4NM, 256-539-8950 or Johnny Winter, KR4F, 256-534-6785), DX card checking, DX banquet (Saturday, 6:45 PM, $25; 256-859-8920; **k4xh@aol.com**), VE sessions (10 AM sharp, both days; $10 test fee), Hospitality Rooms (Friday and Saturday nights at the Huntsville Hilton), convenient parking. Talk-in on 146.94, 145.33. Admission is $6, under 12 free. Tables are $30 (8-ft, includes 1 chair). Contact Scotty Neustadter, W4WW, 9710 Dortmund Dr SE, Huntsville, AL 35803; 256-880-8004; **w4ww@hamfest.org**; **www.hamfest.org**.

KANSAS STATE CONVENTION

August 17, Salina

The Kansas State Convention, sponsored by the Central Kansas ARC, will be held at the Salina Bicentennial Center Heritage Hall in Oakdale Park, 800 The Midway; from I-70 take the Ohio St Exit and turn S, at the 3rd stoplight (Greeley Ave) turn W (right), continue W on Greeley to the Bicentennial Center. Doors are open 8 AM to 4 PM. Features include large indoor air-conditioned flea market, vendors, full slate of interesting forums and meetings, DX card checking, VE sessions (promptly at 9 AM, walk-ins accepted), free parking, refreshments. Talk-in on 147.03, 443.9. Admission is $5. Tables are $15 ea (includes electricity). Contact Ron Tremblay, WAØPSF, 112 N Douglas Dr, Salina, KS 67401-3516; 785-827-8149; **rtremblay@cox.net**; **www.qsl.net/ckarc**.

NEW MEXICO STATE CONVENTION

August 22-23, Albuquerque

The New Mexico State Convention ("Duke City Hamfest"), sponsored by the New Mexico Hamvention/Duke City Hamfest Committee, will be held at the University of New Mexico Continuing Education and Conference Center, 1634 University Blvd NE; ½ mile S of I-40, just N of the intersection of Indian School Rd and University Blvd. Doors are open Friday 5-9 PM, Saturday 7 AM to 3 PM. Features include flea market, vendors, free tailgating, forums, Special Event Station, VE sessions (Saturday 7:30 AM; Pete DeWolf, 505-299-4128), self-contained RV parking ($10), banquet (Saturday 6 PM, $13.50; guest speaker), free parking. Talk-in on 145.33 (100 Hz), 444.0 (100 Hz). Admission is free. Tables are $12 (without power), $18 (with power). Contact Richie Allen, KC5NZR, Box 30394, Albuquerque, NM 87190; 505-242-0208; **kc5nzr@arrl.net**; **www.qsl.net/dchf**.

MISSOURI STATE CONVENTION

August 23, Columbia

The Missouri State Convention, sponsored by the Central Missouri Radio Association, will be held at the National Guard Armory, 5151 Roger Wilson Dr; 4½ miles N of I-70 on Hwy 63N to Prathersville Exit, follow signs. Doors are open 8 AM to 2 PM. Features include forum speakers on emergency communications, MARS meeting, VE sessions, awards card checking. Talk-in on 146.76. Admission is $5. Tables are $10 (includes 1 admission). Contact Dale Huffington, AEØS, 2709 Cimarron Dr, Columbia, MO 65203; 573-875-6170; **dale@tranquility.net**; **www.qsl.net/cmra**.

July 18-19
Oklahoma State, Oklahoma City*

July 18-20
Montana State, East Glacier*

July 25-27
Arizona State, Flagstaff*

August 1-2
West Gulf Division, Austin, TX*

August 3
Western New York Section, Williamsville*

August 9-10
Kentucky State, Lexington*

September 14
Alaska State, Anchorage

September 19-20
W9DXCC, Rolling Meadows, IL

September 19-21
Illinois State, Peoria

September 20
Arkansas State, Little Rock

September 27
Eastern Washington Section, Spokane

***See July *QST* for details.**

WEST VIRGINIA STATE CONVENTION

August 23-24, Weston

The West Virginia State Convention, sponsored by the West Virginia State Amateur Radio Council, will be held at the Jackson's Mill and Convention Center; I-79, Exit 99, W on US Rte 33 to 4th stoplight, N on US Rte 19 to Jackson's Mill Rd. Features include full days of events in a family setting, club activities, forums, educational programs, demonstrations, auction sale, VE sessions. Talk-in on 145.39. Admission is $3. Tables are $5. Contact Ann Rinehart, KA8ZGY, 1256 Ridge Dr, S Charleston, WV 25309; 304-768-9534; **ka8zgy@arrl.net**; **www.qsl.net/wvsarc**.

SOUTHWESTERN DIVISION CONVENTION

September 5-7, Long Beach, CA

The Southwestern Division Convention, sponsored by HAMCON and the Los Angeles Area Council of ARCs, will be held at the Hilton Long Beach, 701 W Ocean Blvd; Broadway off ramp of 710 Freeway, at Ocean Blvd and Golden Shore. Features include mega technical programs, exhibits galore, Grand Banquet, VE sessions, and much more. Talk-in on 145.52. Admission is $12 in advance (until Aug 1), $15 at the door; under 17 free with paying adult. Contact Jim Pitman, WA6MZV, 2902 Onrado St, Torrance, CA 90503-6033; 310-320-4707; **wa6mzv@att.net**.

MARYLAND-DC SECTION CONVENTION

September 6-7, West Friendship

The Maryland-DC Section Convention, co-sponsored by the Columbia ARA and the Foundation for Amateur Radio, will be held at the Howard County Fairgrounds, 2210 Fairgrounds Rd; I-70, Exit 80, Rte 32 S to Rte 144 W, right to Fairgrounds Rd. Doors are open 8 AM to 4 PM. Features include hamfest/electronics/computer show, large indoor/outdoor vendor space, tailgating, VE sessions, educational exhibits, SKYWARN classes. Talk-in on 147.135. Admission is $5 in advance (before Sep 1), $6 at the door. Tables are $35. Contact Ed Cabic, N2EC, Box 911, Columbia, MD 21044-0911; 410-992-7197; **n2ec@comcast.net** or **info@fall-fest.com**; **www.fall-fest.com**.

GREAT LAKES DIVISION CONVENTION

September 6-7, Findlay, OH

The Great Lakes Division Convention, sponsored by the Findlay Radio Club, will be held on Saturday (Sep 6 for Convention) at the Findlay Inn and Conference Center, 200 E Main Cross and on Sunday (Sep 7 for Hamfest) at the Hancock County Fairgrounds, 1017 E Sandusky St; State Rte 568, 1 mile E of Main St. Doors are open for convention on Saturday at noon; for hamfest flea market on Sunday at 7:30 AM, buildings are open 8 AM to 3 PM. Features include outdoor flea market ($5 per space), indoor vendors, latest equipment, computers and peripherals, forums, seminars (Saturday, beginning at 12:30 PM), awards program, banquet (Saturday eve, 6 PM; highlighted by ARRL President Jim Haynie, W5JBP), Wouff Hong ceremony (Saturday, 20 minutes after banquet concludes), overnight camping ($12, includes electric hookup), handicapped accessible, free parking (at Fishlock Ave entrance on Sep 7). Talk-in on 147.15, 444.15. Admission is $5 (Sunday hamfest only); $49.95 (Saturday convention, serves as pass to hamfest on Sunday; Jeanie Dalton, KB8QLC, 859-245-7703; **kb8qlc@arrl. net**). Tables are $19 (1st, includes admission), $14 (each additional). Bill Kelsey, N8ET, Box 587, Findlay, OH 45839; 419-423-4604 or 419-423-3402; **kanga@bright.net** or **hamfest@findlayradioclub.org**; **www.findlayradioclub.org**.

WESTERN PENNSYLVANIA SECTION CONVENTION

September 7, Butler

The Western Pennsylvania Section Convention, sponsored by the Butler County ARA, will be held at the Butler Farm Showgrounds, Rte 68; 3 miles SW of Butler. Features include huge flea market, new radio vendors, ample free parking. Talk-in on 147.36. Admission is $5. Tables are $15 (8-ft, indoor); outside space $5. Contact Kevin Berry, KF4RMA, 380 Three Degree Rd, Renfrew, PA 16053; 724-586-1182; **kf4rma@arrl.net**; **www.qsl.net/w3udx/**.

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.

Gail Iannone ♦ Convention Program Manager ♦ giannone@arrl.org

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 **August 1** to be listed in the **October** 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.)

Alabama (Huntsville)—Aug 16-17, Alabama Section Convention. See "Coming Conventions."

†Arkansas (Mena)—Sep 5-6; 7 AM to 4 PM. *Spr:* Queen Wilhelmina Hamfest Assn. Queen Wilhelmina State Park, 3877 Hwy 88 W; 13 miles W of Mena. Flea market, tailgating, dealers, Arkansas Repeater Council Meeting, ARRL forum, VE sessions, RV camping, Friday night BBQ, banquet (Saturday). *TI:* 146.79 (100 Hz), 146.46. *Adm:* Free. Tables: bring your own tables; space under tent $10, outside space $5. Charlotte Lee, KC5DOR, 415 Crosstrails Rd, De Queen, AR 71832; 870-642-7656; **clee1948@yahoo.com**; **www.qwha.org**.

†Arkansas (Wynne)—Aug 30, 8 AM to 2 PM. *Spr:* Cross County ARC. National Guard Armory, 305 E Helen Ave; off Hwy 1, behind shoe factory. *TI:* 147.375 (107.2 Hz). *Adm:* $5. Tables: $8 each or 2 for $15. Terry Busby, W5ARS, 115 Carwell Cir, Cherry Valley, AR 72324; 870-588-4800; **tgbusby@hotmail.com**; **www.qsl.net/crosscarc/hamfest.html**.

†California (Anderson)—Aug 9, 8 AM to 5 PM. *Sprs:* ARC of Anderson and Shasta Cascade ARS. Anderson River Park, Rupert Rd; from I-5 take Riverside Exit, go E to Airport Rd, turn right, take left onto Stingy Ln, go to Rupert Rd. Swapmeet, presentations, seminars, public demonstrations, VE sessions. *TI:* 146.64 (88.5 Hz). *Adm:* $5. Tables: $10. Jim Bremer, KK6MM, 2919 Inez St, Redding, CA 96002; 530-222-8001; **kk6mm@arrl.net**; **www.qsl.net/nc6sv**.

California (Long Beach)—Sep 5-7, Southwestern Division Convention. See "Coming Conventions."

†Colorado (Divide)—Aug 22-24. *Spr:* Mountain ARC. Golden Bell Resort, 380 County Rd 512; take US Hwy 24 to Divide, go N at traffic light on CR 5, go NW on CRs 51 and 512 to Golden Bell, follow signs for Campfest (approximately 4 miles from traffic light). Swapfest, tailgating ($5), VE sessions, camping. *TI:* 146.82. *Adm:* Free. Carol Wilson, KCØDTQ, 765 W County Rd, Woodland Park, CO 80863; 719-687-8758; **organist@firstchristiancos.org**; **www.qsl.net/nx0g/**.

†Colorado (Golden)—Aug 17; set up 7:30 AM; public 8:30 AM to 2 PM. *Spr:* Denver Radio Club. Jefferson County Fairgrounds, 15200 W 6th Ave; US 6/6th Ave E or W to Indiana St, S to 6th Ave Service Rd to Fairgrounds; or I-70 E to 6th Ave E, follow directions from 6th Ave; or I-70 W to Colfax Ave, left on Colfax, right at Indiana, follow directions from 6th Ave. Vendors, VE sessions. *TI:* 145.49, 448.625 (100 Hz). *Adm:* $5. Tables: advance $10, door $12. Bryan Steinberg, KCØCUA, 1011 S Foothill Dr, Lakewood, CO 80228; 303-987-9596; fax 303-987-2195; **kc0cua@arrl.net**; **www.qsl.net/w0tx/**.

†Florida (Fort Pierce)—Aug 16; set up 6:30 AM; public 8 AM to 2 PM. *Spr:* Fort Pierce ARC. Indian River Community College, 3209 Virginia Ave; I-95 or FL Turnpike to Fort Pierce/Okeechobee Rd Exit (Rte 70), go E approximately 3 miles to 37th St, turn right. All indoor air-conditioned hamfest, VE sessions. *TI:* 147.345 (107.2 Hz). *Adm:* $2. Tables: without electricity $5, with electricity $8 (first-come, first-served). Bill Sinbine, N4XEO, 17275 Hammock Ln, Ft Pierce, FL 34987; 772-461-7275; **n4xeo@arrl.net**; **www.qsl.net/w4akh**.

†Florida (Tampa)—Aug 23; set up 7 AM; public 8 AM to 1 PM. *Spr:* Tampa ARC. TARC Operations Center, 7801 N 22nd St; I-275 to Sligh Ave Exit, E on Sligh Ave to 22nd St, left (N) on 22nd St, go to end of road. Indoor swap tables, tailgating ($3 per space plus admission), VE sessions, free parking, refreshments. *TI:* 147.105 (103.5 Hz). *Adm:* $2, under 12 free. Tables: $15 (limited). Biff Craine, K4LAW, 13515 Greenleaf Dr, Tampa, FL 33613; 813-265-4812; **k4law@arrl.net**; **www.hamclub.org**.

Illinois (Carlinville)—Aug 2. Tim Jones, KA9VIV, 217-627-2355.

†Illinois (Danville)—Aug 24, 6 AM to Noon. *Spr:* Vermilion County ARA. VCARA Clubhouse, Harrison Park West Clubhouse Grounds; take Loagan St N at Main St to W Williams, turn left at 3-way stop onto W Williams, go W until you come to 1st road N, go right onto Woodbury Hill Rd, Clubhouse about ½ mile on right. Tailgate Fest (no inside setups), VE sessions. *TI:* 146.82. *Adm:* $5. Terry England, W9CAU, 105 Vance Ln, Danville, IL 61832; 217-446-4296; **w9cau@aol.com**.

Indiana (Angola)—Aug 3. Sharon Brown, WD9DSP, 260-475-5897.

†Indiana (Lafayette)—Aug 17; set up Saturday 3-6 PM, Sunday 6:30-8 AM; public 8 AM to 2 PM. *Spr:* Tippecanoe ARA. Tippecanoe County Fairgrounds, 1401 Teal Rd (SR 25); 60 miles NW of Indianapolis on I-65, between US 231 and US 52. Indoor/outdoor vendors, VE sessions (noon, Tippecanoe County Red Cross Building, 111 S 7th St), free parking. *TI:* 147.135 (88.5 Hz), 443.775 (88.5 Hz). *Adm:* $4, under 12 free. David Dull, WB9BRX, 49 Knoll Crest Ct, W Lafayette, IN 47906; 765-743-8305; **wb9brx@arrl.net**; **www.w9reg.org**.

†Indiana (Spencer)—Sep 6; set up 7 AM; public 8 AM to 2 PM. *Sprs:* Owen County ARA and Bloomington ARC. Owen County Fairgrounds; State Rd 46 (Morgan St) to East 5th St, turn S to Fairgrounds. Flea market, tailgating (free), forums, contests, VE sessions, refreshments. *TI:* 146.985. *Adm:* $3. Tables: $5. Carl Zager, KB9RVB, 1708 S High St, Bloomington, IN 47401; 812-339-4437; **kb9rvb@arrl.net**; **www.bloomingtonradio.org/hamfest**.

Kansas (Salina)—Aug 17, Kansas State Convention. See "Coming Conventions."

†Kentucky (Louisville)—Sep 6; set up Friday noon; public Saturday 8 AM to 3 PM. *Spr:* Greater Louisville Hamfest Assn. Bullitt County Fairgrounds (Shepherdsville), 20 miles S of Louisville on I-65; take Exit 112 onto Hwy 245, go E on Hwy 245 to Fairgrounds entrance on left. Hamfest/Computer Show, indoor flea market (Bill Bland, KC4OJ, 502-543-4956; **kc4oj@arrl.net**), outdoor tailgating (car $3, camper $5), major exhibitors (Stu Kratz, 502-423-0402; **wx4me@arrl.net**); commercial vendors ($30 per space with 2 tables and electricity; bring your own extension cords), ARRL forum (10 AM), VE sessions (10 AM to 1 PM, $12 fee; Gerald, KE4LIA, 502-935-6175), APRS demonstration, free overnight camping (Friday night), free parking, free hot dogs and drinks. *TI:* 146.7. *Adm:* advance $5, door $6; under 13 free. Tables: $16 (8-ft), $10 for indoor space only (no table). Joe Pollock, K4ULW, 502-935-7197; **k4ulw@aol.com**; **www.qsl.net/glha**.

Maryland (West Friendship)—Sep 6-7, Maryland-DC Section Convention. See "Coming Conventions."

†Massachusetts (Adams)—Aug 17, 8 AM to 2 PM. *Spr:* Northern Berkshire ARC. Adams Agricultural Fairgrounds, Old Columbia St; take Rte 8 into Adams, at ¼ mile S of North Adams town line turn W onto Butler St, turn left onto Old Columbia St. Tailgating, vendors, overnight camping, free parking, refreshments. *TI:* 146.91. *Adm:* $3, under 12 free. Tables: $10 (for non-NoBARC members), $5 (for NoBARC members). Alan Vigiard, K1SAV, 25 Upton St, Adams, MA 01220; 413-446-8742; **code.freak@verizon.net**; **www.nobarc.org/hamfest.htm**.

Massachusetts (Cambridge)—Aug 17. Nick Altenbernd, KA1MQX, 617-253-3776.

†Massachusetts (Swansea)—Jul 26, 10 AM. *Sprs:* Bristol County Repeater Assn and Fall River ARC. American Legion Post 303, 73 Ocean Grove Ave; Rte 195 to Ocean Grove Exit 4 to Rte 103 W, go up hill, take left at next intersection past flashing light (Credit Union on left), proceed approximately ¼ mile, take right onto Ocean Grove Ave, Hall is on right. Flea market, New England Clamboil/Chicken BBQ banquet lunch (noon, limited seating, tickets must be purchased in advance; Roland Daignault, N1JOY, 508-678-6331; **n1joy@arrl.net**), guest speaker, refreshments. *TI:* 145.15 (123 Hz). *Adm:* $2. Chris Smith, K1CJS, 73 Nashua St, Fall River, MA 02721-4149; 508-676-5759; **k1cjs@arrl.net**; **www.qsl.net/bcra/events.html**.

†Michigan (Grayling)—Sep 6; set up 6 AM; public 8 AM to noon. *Spr:* ARA of Hansen Hills. Hansen Hills Recreation Area, 7601 Old Lake Rd; take M-72 W out of Grayling to M-93, S on M-93 about 1 mile, left on Old Lake Rd, follow signs. Swap Shop, electronic and computer equipment, tailgating ($10 per space plus admission; weather permitting), VE sessions (11 AM, all license classes, must preregister for all exams, no walk-ins; George Brand, WA8SCO, 989-344-8607; **wa8sco@arrl.net**), ample parking, refreshments. *TI:* 145.13. *Adm:* $2. Tables: $5 (6-ft). Jon Schultz, N8YSS, 3729 E Branch Rd, Grayling, MI 49738; 989-348-4966 (home) or 989-348-1702 (work); **jschultz@i2k.net**; **www.arahh.org/swapshop.html**.

†Michigan (Jackson)—Aug 9; set up Friday 6-8 PM, Saturday 6-8 AM; public 8 AM to Noon. *Spr:* Cascades ARS. Northwest Elementary School, 3757 Lansing Ave; I-94 to US 127 N to Parnall Rd Exit, go E on Parnall Rd for 1 mile to Lansing Ave, go left (N) onto Lansing Ave, go 0.4 mile to school entrance on right. Trunk sales ($10), vendors, VE sessions, free parking, refreshments. *TI:* 146.88 (100 Hz). *Adm:* $5, under 12 free with paying adult. Tables: $10 (floor, without power) $15 (wall, with power); free admission if purchased in advance. Lee Van Alstine, KA8VMJ, 7145 Clinton Rd, Jackson, MI 49201; 517-787-7783; **ka8vmj@arrl.net**; or David Foster, W3IGT, 734-347-8738; **www.w8jxn.org**.

†Michigan (Lapeer)—Aug 24, 8 AM. *Spr:* Lapeer County ARA. Lapeer County Center Building, 425 County Center Dr; I-69 to Exit 155 N, take M24 N to second light, go right on McCormick Dr to Court St (just before tracks), turn left, go 3 blocks to County Center Dr. Ham Swap, vendors, VE sessions (8:30 AM, Lincoln Room), meetings (11 AM, Lincoln Room), free parking, refreshments. *TI:* 146.62 (100 Hz). *Adm:* $5. Tables: $10. Ken Kelch, AB8PM, 1302 Clark Rd, Lapeer, MI 48446; 810-245-3907; **ab8pm@arrl.net**; **www.w8lap.com**.

†Minnesota (Rush City)—Sep 7; set up noon to 1 PM; public 1 PM to 4 PM. *Spr:* East Central Minnesota ARC. Rush City High School; I-35, Rush City Exit 159, go 1 block E, then 1 block N to High School. Tailgating, ARES info, refreshments. *TI:* 145.33. *Adm:* buyers $3, sellers $5. Tables: $2. Larry Jilek, KAØMEN, 51835 Belle Isle Dr, Rush City, MN 55069; 320-358-4205; **lj@ecenet.com** or **info@ecmarc.org**; **www.ecmarc.org**.

†Minnesota (St Cloud)—Aug 23; set up 8 AM; public 9 AM to 2 PM. *Spr:* St Cloud ARC. National Guard Armory, 1710 8th St N and 16th Ave. Flea market, dealer displays, vendors, VE sessions (on site, sign in 11 AM to noon, testing

†ARRL Hamfest

Gail Iannone ♦ Convention Program Manager ♦ giannone@arrl.org

noon to 3 PM; preregistration requested but not required), refreshments. *TI:* 147.015, 146.94. *Adm:* $8. Tables: $10 (320-255-1410). Scott Hall, KAØDAQ, 3001 8th St N, St Cloud, MN 56303; 320-252-4498; **lscotth@aol.com**; **www.w0sv.org**.

Missouri (Columbia)—Aug 23, Missouri State Convention. See "Coming Conventions."

†Missouri (St Charles)—Aug 24, 7 AM to 1 PM. *Spr:* St Charles ARC. American Legion Hall, 2500 Raymond Dr; I-70, First Capital exit, N to W Clay, W to Droste, N to Raymond, turn left, hall on right. Flea market, seminars, VE sessions. *TI:* 146.67. *Adm:* advance $2, door $3. Tables: $15. Ray Martin, KØWC, 47 Jean Dr, Florissant, MO 63031-8417; 314-524-1521; **remsr@earthlink.net** or **k0wc@arrl.net**; **www.wb0hsi.org**.

†Montana (Missoula)—Aug 9, 8 AM to 5 PM. *Spr:* Hellgate ARC. Greenough Park, Greenough Dr; turn N on Van Buren from E Broadway or I-90, Mile Marker 105 to Cherry St, left to Van Buren, turn right, go 3 blocks to park. Swapmeet, VE sessions. *TI:* 147.04, 146.52. *Adm:* Free. Lewis Ball, AC7UZ, 6900 Butler Creek, Missoula, MT 59808; 406-549-1450; **ac7uz@blackfoot.net**; **riversdreams.com/k7vk/**.

†New Jersey (Mullica Hill)—Aug 17, 8 AM to 2 PM. *Spr:* Gloucester County ARC. 4-H Fairgrounds, Rte 77, 10 minutes from I-295 and NJ Turnpike; from Commadore Barry Bridge follow Rte 322 E to Rte 45, then follow Rte 45 S to Rte 77, continue S for another 1½ miles, Fairgrounds are on left. Ham Radio/Electronics/Computer Flea Market, dealer displays, tailgating ($5, plus admission), antique and vintage radios, VE sessions (9:30 AM), free parking, refreshments. *TI:* 147.18 (131.8 Hz). *Adm:* $5, nonham spouses and under 12 free. Tables: $10 (covered pavillion space, plus admission). Harry Bryant, AA2WN, Box 496, Pennsville, NJ 08070; 856-678-6091; **aa2wn @arrl.net**.

†New Jersey (Oakland)—Aug 16; sellers 6 AM; buyers 8 AM to Noon. *Spr:* Ramapo Mountain ARC. American Legion Hall, 65 Oak St, I-287 to Exit 58, take Rte 202 S, turn right onto Oak St, hamfest on left. Ham Radio/Computer Flea Market, vendors, tailgating ($10 per space), refreshments (kitchen opens at 7 AM). *TI:* 146.49, 146.52. *Adm:* $5, nonham spouses and kids free. Tables: $12 (inside). Bob Anderson, K2BJG, 69 Page Dr, Oakland, NJ 07436; 201-337-6945; fax 973-962-6210; **rmarc@qsl.net**; **www.qsl.net/rmarc**.

†New Mexico (Alamogordo)—Aug 30, 7 AM to 2 PM. *Spr:* Alamogordo ARC. Otero County Fairgrounds, 401 Fairgrounds Rd; N end of town, across from Shopping Mall. Forums (ARRL, MARS, Road Runner), VE sessions. *TI:* 146.8 (100 Hz). *Adm:* Free. Tables: $5. John Van Westen, KC5WPJ, Box 1191, Alamogordo, NM 88310; 505-434-2343; **kc5wpj@tularosa.net**.

New Mexico (Albuquerque)—Aug 22-23, New Mexico State Convention (Duke City Hamfest). See "Coming Conventions."

†New York (Ballston Spa)—Sep 6, 7 AM to 3 PM. *Spr:* Saratoga County RACES. Saratoga County Fairgrounds, Prospect Ave; I-87 to Exit 12, W on Rte 67 to Ballston Spa, follow hamfest signs. Commercial vendors, new and used equipment, tailgating ($5 per space, includes admission), foxhunt, VE sessions, free parking, refreshments. *TI:* 147.0, 147.24. *Adm:* $5. Tables: $5 (8-ft; reservations and pre-payment welcomed and encouraged; first-come, first-served basis). Darlene Lake, N2XQG, 314 Louden Rd, No 84, Saratoga Springs, NY 12866; 518-587-2385; **lake@capital.net**; **www.capital.net/~lake/**.

†New York (Bethpage)—Sep 7; set up 7:30 AM; public 8:30 AM to 1 PM. *Spr:* Long Island Mobile ARC. Briarcliff College, 1055 Stewart Ave. Long Island Expressway to Exit 44S to Exit 9 (Broadway), turn right onto Broadway, bear right onto Cherry Ave, turn right onto Stewart Ave. Hamfair and Electronics Show, flea market, vendors, dealers, tailgating ($15 per space, includes 1 admission; no advanced registration needed), equipment, computers, ARRL info, tune-up clinic, free parking, refreshments. *TI:* 146.85 (136.5 Hz). *Adm:* $6, nonham sweethearts and under 12 free when accompanied by paying adult. Tables: $15 (admits 1 person). Brian Gelber, WB2YMC, 46 Forest Dr, Plainview, NY 11803; 516-822-0673; **hamfest@limarc.org**; **www.limarc.org**.

†New York (Westmoreland)—Aug 16, 7 AM to 2 PM. *Spr:* Rome Radio Club. Westmoreland VFD Fireman Field, Station Hill Rd; NYS Thruway to Exit 32, after toll booth turn right at light, turn left onto Rte 233, turn left at next light, Fireman Field is one-tenth mile down on right. Flea market, vendors, Amateur Radio and computer products, free "Junk Box" area, refreshments. *TI:* 146.88. *Adm:* $5. Tables: $10 (plus admission). Tim Saladin, KC2HVS, Box 254, Oriskany, NY 13424; 315-768-1523; **kc2hvs@localnet.com; pages.prodigy.net/romeradioclub**.

†North Carolina (Shelby)—Aug 30-31; gates 6 AM, buildings 8 AM to 5 PM. *Spr:* Shelby ARC. Cleveland County Fairgrounds, on Hwy 74 Business E; I-85 S to US 74 (W to Shelby), to US 74 Business, ½ mile on right. Giant flea market, major manufacturers, new equipment dealers, daily forums, VE sessions, QSL card checking, refreshments. *TI:* 146.88. *Adm:* advance $5, door $6. John Ledford, W4JL, 9555 Knob View Dr, Vale, NC 28168; 704-462-4910; **w4jl@shelby.net**; **shelbyhamfest.org**.

Ohio (Findlay)—Sep 6-7, Great Lakes Division Convention. See "Coming Conventions."

Ohio (Friendship)—Aug 23. Kim Lozier, N8ZW, 740-456-1616.

†Ohio (Van Wert)—Jul 20, 8 AM to 3 PM. *Spr:* Van Wert ARC. Van Wert County Fairgrounds, US Rte 127 S; follow US Rtes 30, 224, or 127 to Van Wert, follow signs to Fairgrounds. Flea market, new and used radio and computer equipment, VE sessions. *TI:* 146.85. *Adm:* $5. Tables: $10. Jack Snyder, WD8MLV, 12949 OH/IN Stateline Rd, Ohio City, OH 45874; 419-495-2209; **wd8mlv@earthlink.net**; **www.w8fy.org**.

†Ohio (Warren)—Aug 17; 6 AM (flea market), 8 AM (inside sales). *Spr:* Warren ARA. Kent State University Trumbull Campus (Work Force Building), 4314 Mahoning Ave NW; at the intersection of Rtes 5 and 82 Bypass and Rte 45. Flea market ($5 per 10-ft outside space), computers and electronics, forums (antenna, Storm Chasers), CW Blast Contest, VE sessions (registration 9:30 AM, testing 10 AM; walk-ins, no need to preregister; Dennis Carraher, N8IVE, 330-924-4342; **n8ive@arrl.net**), handicapped accessible, refreshments. *TI:* 146.97. *Adm:* $5. Tables: $10 (for 2 inside 5-ft tables, plus admission). Renee McCaman, KB8SVF, 317 Raymond Ave NW, Warren, OH 44483; 330-847-8478; **mccaman@cboss.com**; **www.w8vtd.org/**.

Ontario (Ottawa/Carp)—Aug 30. Greg Danylchenko, VE3YTZ, 613-236-9291.

†Pennsylvania (Bartonsville)—Sep 6, 8 AM to 2 PM. *Sprs:* Eastern PA ARA and Pocono ARK. Monroe County Vo-Tech School, Vo-Tech Rd; Rte 611 N, right onto Bartonsville Ave, right onto Laurel Lake Rd, at fork in road turn right onto Vo-Tech Rd. Guest speakers, VE sessions. *TI:* 147.045 (131.8 Hz), 146.535. *Adm:* $5, children and spouses free. Tables: $15. Bill Connelly, W3MJ, RD 3, Box 3165, E Stroudsburg, PA 18301; 570-424-0845; **w3mj@ptd.net**.

Pennsylvania (Butler)—Sep 7, Western Pennsylvania Section Convention. See "Coming Conventions."

†Pennsylvania (Hanover/Pleasant Hill)—Aug 24; set up 6 AM; public 7 AM to Noon. *Spr:* Hanover Area Hamming Assn. Pleasant Hill Fire Company Carnival Grounds, on PA Rte 94, 2 miles N of MD/PA line. Tailgate Fest, vendors, refreshments. *TI:* 146.895. *Adm:* $3 per car load. Mike Garber, N3KTX, 494 Monarch's Dr, Westminster, MD 21157; 443-604-8133; **mgarb21157@mybluelight.com**; **www.qsl.net/haha**.

†Pennsylvania (New Kensington)—Aug 24, 8 AM to 1 PM. *Spr:* Skyview Radio Society. Skyview Club House, 2335 Turkey Ridge Rd; from the intersection of Rtes 380 and 366, take 366 W toward New Kensington, go approximately 1 mile, turn right onto Whitten Hollow Rd, go ½ mile to stop sign, turn right onto Turkey Ridge Rd, Clubhouse is on left at top of hill. Flea market ($5 per spot), VUCC/WAS card checking. *TI:* 146.64 (131.8 Hz). *Adm:* Free. Robert Livrone, N3WAV, 116 Arizona Dr, Lower Burrell, PA 15068; 724-339-9607; **n3wav@arrl.net**; **www.qsl.net/k3mjw/**.

Pennsylvania (Uniontown)—Aug 30. Carl Chuprinko, WA3HQK, 304-594-3779.

†Tennessee (Lebanon)—Aug 31, 7 AM to 3 PM. *Spr:* Short Mountain Repeater Club. Cedars of Lebanon State Park, US Hwy 231 S; 7 miles S of I-40. Exhibitors, vendors, refreshments. *TI:* 146.91. *Adm:* Free. Tables: Bring your own. Keith Harris, K4MHK, 2145 Honey Prong Rd, Hartsville, TN 37074; 615-478-8536 (days) or 615-633-4484 (eves); **keharris@nctc.com; www.qsl.net/smrc/index.htm**.

†Texas (Gainesville)—Aug 23, 7 AM. *Spr:* Cook County ARC. Gainesville Civic Center, 311 S Weaver St; from I-35 N or S exit California St, go E for 2 blocks, turn S onto Weaver St. Indoor/outdoor flea market, tailgating ($6, first-come, first-served), commercial vendors, VE sessions, RV parking adjacent to Civic Center ($15 with full hookup, 940-668-4530), free parking. *TI:* 147.34 (100 Hz), 442.775 (100 Hz). *Adm:* advance $5, door $6. Tables: advance $8, door $10 (electricity $5 additional). James Floyd, N5ZPU, Box 100, Gainesville, TX 76240; 940-668-7511; **jfloyd54 @swbell.net**.

†Vermont (Waterbury)—Sep 20, 8 AM to 2 PM. *Spr:* Central Vermont ARC. Waterbury Armory, Armory St; I-89 to Exit 10 S, take sharp left to Union St, take first left, Armory parking lot at end. Flea market, ham gear swap and sales, forums, demonstrations, operating HF and VHF stations, foxhunt, VE sessions (12:30 PM, all elements), RV camping (Duxbury, 802-244-7546; or Gold Brook, 802-253-7683), refreshments. *TI:* 146.625 (100 Hz). *Adm:* $6, under 12 free. Tables: $10. Tom Girardi, WA1YNU, 51 Maple Ave, Barre, VT 05641; 802-793-2959 or 802-476-3116; **wa1ynu@pshift.com**.

†Washington (Spanaway)—Aug 16; set up Friday 2-7:30 PM, Saturday 6-8:30 AM; public 9 AM to 3 PM. *Spr:* Radio Club of Tacoma. Bethel Junior High School, 22001 38th Ave E; from I-5 N or S take Exit 127 to SR 512 E to Hwy 7 (Parkland/Mt Rainier) southbound, go approximately 7 miles to 224th, take left turn, go 1 mile to 38th Ave E, go left, ¼ mile to school on right. Commercial displays, vendors, demonstrations, lectures, VE sessions (10 AM; Shirley Murphy, N7QHW, **sundancealso@harbornet.com**), free parking, self-contained RV parking, refreshments. *TI:* 147.38 (103.5 Hz), 147.5. *Adm:* $5, under 17 free with paying adult. Tables: $20 (non-commercial), $30 (commercial); includes 1 admission. Frank Palmer, AC7JY, 3817 169th St, Ct E, Tacoma, WA 98446; 253-539-7772; **ac7jy@sn.com**; **www. w7dk.org**.

West Virginia (Weston)—Aug 23-24, West Virginia State Convention. See "Coming Conventions."

†Wisconsin (Baraboo)—Aug 9; set up 5 AM; public 7 AM to Noon. *Spr:* Yellow Thunder ARC. Sauk County Fairgrounds, located on Hwy 33 (8th Ave), far E side of Baraboo. Circus City Swapfest, vendors, computers, electronics, tailgating, VE sessions, camping, free parking, refreshments. *TI:* 147.315 (123.0 Hz). *Adm:* advance $4, door $5. Tables: $5 (8-ft, with electricity; includes 1 admission ticket on advance sales only). Steve Schulze, N9UDO, 1120 City View Rd, Baraboo, WI 53913; 608-356-2313; **n9udo@arrl.net**; **www.qsl.net/ytarc/hamfest.htm**.

†Wisconsin (Eau Claire)—Sep 6, 8 AM to 2 PM. *Spr:* Eau Claire ARC. Exposition Center, I-94 and Hwy 93, Lorch Ave; I-94 (Exit 68) Hwy 93, go S 1/8 mile, then right on Lorch Ave to Expo Center. Dealers, free tailgating (with paid admission), VE sessions, free parking, refreshments, free coffee. *TI:* 146.91 (110.9 Hz). *Adm:* $5, under 17 free when accompanied by paying adult. Tables: $10. Jim Staatz, KG9RA, Box 1867, Eau Claire, WI 54702-1867; 715-838-9108; **kg9ra@ecarc.org**; **www.ecarc.org**.

CONTEST CORRAL

Feedback

In the 2002 ARRL 160-Meter Contest the entry of **VE7UF** was omitted. The score was 44,643 with 294 QSOs and 69 multipliers. It is first place in the Single Operator High Power category in the BC section.

W1AW Qualifying Runs are 10 PM EDT Monday, Aug 4, and 4 PM Thursday, Aug 21. The K6YR West Coast Qualifying Run will be at 9 PM PDT Wednesday, Aug 13 (10-40 WPM). Check the W1AW Schedule elsewhere in this issue 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

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.

July 26-27

Flight of the Bumblebees—CW—sponsored by the Adventure Radio Society, 1700Z-2100Z Jul 27. Bumblebees are low power portable stations that walk, bike, or boat to their sites and sign "/BB" after their calls. Frequencies (MHz): 7.040, 14.060, 21.060, 28.060. Exchange: RST, SPC, and Bumblebee Number or power (5 W maximum). Score: QSOs × number of different Bumblebees contacted ×3. For more information—**www.natworld.com/ars/pages/bumblebees/bb_rules.html**. Logs due 14 days after the contest via the ARS reporting Web site **www.natworld.com/ars/bb_log.html**.

Aug 2-3

ARRL UHF Contest, 1800Z Aug 2-1800Z Aug 3 (see Jul *QST*, p 105 or **www.arrl.org/contests/rules/2003/UHFContest.pdf**).

North American QSO Party—CW—sponsored by the *National Contest Journal*, 1800Z Aug 2-0600Z Aug 3 (see Jan *QST*, p 97 or **www.ncjweb.com**).

SARL HF DX Contest—SSB—sponsored by the Bloemfontein Radio Amateur Club 1330Z-1730Z Aug 3 (CW is Aug 31). Frequencies: 80-20 meters. Categories: SOAB, MS. Exchange: RS(T) + serial number. QSO Points: SSB—1 pt, CW—2 pts. Total score: QSO points + ZS call areas and South African countries (see Web site). For more information—**www.sarl.org.za/public/contests/contestrules.asp#HFCWPHONE**. Logs due 14 days after the contest to **admin@sarl.org.za** or PO Box 1721, Strubensvallei 1735, Republic of South Africa.

Ten-Ten International Summer Phone QSO Party—sponsored by Ten-Ten, International, 0000Z Aug 2-2400Z Aug 3, 10 meters only. Exchange: call, name, state and 10-10 number (if available). QSO Points: nonmembers—1 pt, members—2 pts. Total score: sum of QSO points. For more information—**www.ten-ten.org**. Logs due Aug 18 to Steve Rasmussen, NØWY, 312 N 6th St, Plattsmouth, NE 68048-1302.

European HF Championship—CW/SSB—sponsored by the Slovenian Contest Club, 1000Z-2159Z, Aug 2. EU to EU contacts only. Frequencies: 160-10 meters. Categories: SOAB only—CW, SSB, and Mixed Modes, HP and LP, and SWL. Exchange: RS(T) and last two digits of first year licensed. Score: QSOs × number of different years received, counted once per band. For more information—**lea.hamradio.si/~scc.** Logs due Aug 31 to **euhfc@hamradio.si** (Cabrillo format preferred) or Slovenia Contest Club, Saveljska 50, 1113 Ljubljana, Slovenia.

TARA "Grid Dip" Contest—PSK and RTTY—sponsored by Troy ARA from 0000Z-2400Z Aug 2. Frequencies: 80-6 meters, work stations once per band, work Rovers again from new locators. Categories: SOAB only—QRP (<5 W), LP (<20 W or RTTY <100 W), HP (100 W max or RTTY legal limit) Rover (50 W max or RTTY legal limit) operating from more than one grid locator, SWL. Exchange: Name and 4-digit grid locator. QSO Points: 1 pt/QSO. Total score: QSO points × grid locators counted once per band. For more information—**www.n2ty.org/seasons/tara_grid_rules.html**. Scores due Aug 23 via online submission form at **www.n2ty.org/seasons/tara_grid_score.html**; logs via e-mail to **grid-manager@n2ty.org**.

PanAmerican Lighthouse-Lightship Weekend—all modes—sponsored by the Amateur Radio Lighthouse Society from 0001Z Aug 2-2359Z Aug 3. Frequencies (MHz): CW—1.830, 3.530, 7.030, 14.030, 21.030, 28.030; SSB—1.970, 3.970, 7.270, 14.270, 21.370, 28.370. Exchange: ARLHS member or lighthouse number or year first licensed, name, and SPC. For more information—**arlhs.com/page3.html**. Logs due Aug 31 to Dave Ruch, NFØJ, PO Box 20696, Bloomington, MN 55420-0696.

Aug 9-10

Worked All Europe DX Contest—CW—sponsored by the Deutscher ARC, 0000Z Aug 9-2400Z Aug 10 (phone is Sep 13-14; RTTY is Nov 8-9). Frequencies: 80-10 meters according to Region 1 band plan. Categories: SOHP, SOLP, MS, SWL. Packet or spotting nets allowed (SO stations not using spotting assistance will be noted). SO operate 36 hrs max, up to three off periods of 1 hour min. Non-EU work EU only except RTTY, where everyone works everyone. Exchange: RS(T) and serial number. Score 1 pt/QSO and 1 pt/QTC. Final score is QSOs + QTCs × weighted multipliers. Multipliers: non-EU use WAE countries, EU use DXCC entities plus call districts in W, VE, VK, ZL, ZS, JA, PY and RA8/9/Ø. (RTTY use WAE + DXCC.) Mults on 80 m count ×4, on 40 m ×3, otherwise ×2. A QTC is a report sent from a non-EU station back to an EU station of QSOs that took place earlier in the contest. For RTTY only: QTCs can be exchanged between any stations on different continents. A QTC contains the time, call sign, and QSO number of the station being reported (e.g. 1307/DL1AA/346). A QSO may only be reported once and not back to the originating station. A maximum of 10 QTCs can be sent to a single station. The same station can be worked several times to complete this quota, but only the original QSO has QSO point value. Keep a list of QTCs sent. For example, QTC 3/7 would indicate that this is the third series of QTCs sent, and seven QSOs are reported. For more information—**www.waedc.de**. Logs due by Sep 15 (CW), Oct 15 (Phone) or Dec 15 (RTTY) to **waedc@darc.de** or to WAEDC Contest Manager, Bernhard Buettner DL6RAI, Schmidweg 17, 85609 Dornach, Germany.

Maryland-DC QSO Party—CW/Phone—sponsored by the Antietam Radio Association, 1600Z Aug 9-0400Z Aug 10 and 1600Z-2359Z Aug 10. Frequencies (MHz): CW—3.643, 7.035, 14.035, 21.035, 28.035, Phone—3.920, 7.230, 14.270, 21.370, 28.370, 50.150, 52.525, 144.15, 146.55, 146.58, 432.15, 446.000. Categories: Club, Mobile, Novice/Tech, QRP, and Standard. Work stations once per band/mode, portable/mobiles can be worked again in each county. Exchange: QTH and category. QSO Points: Club—10 pts, Mobile—5 pts, QRP or Novice/Tech—4 pts, CW or RTTY or ATV—3 pts, all others—1 pt. Highest single point value applies. Score: QSO points × MD counties + Baltimore City + DC. (MD-DC stations also count SPC.) For more information—**www.w3cwc.org/rules.html**. Logs due Sept 20 to **wa3eop@arrl.net** (ASCII format) or Antietam Radio Association, PO Box 52, Hagerstown, MD 21741-0052.

Aug 16-17

ARRL 10 GHz and Up Contest, 0800 local-2000 local Aug 16 and 0800 local-2000 local Aug 17 (see Jul *QST*, p 105 or **www.arrl.org/contests/rules/2003/10GHzandUp.pdf**).

North American QSO Party—SSB—sponsored by the *National Contest Journal*, 1800Z Aug 16-0600Z Aug 17 (see Jan *QST*, page 97 or **www.ncjweb.com**).

SARTG WW RTTY Contest, sponsored by the Scandinavian Amateur Radio Teleprinter Society, 0000Z-0800Z and 1600Z-2400Z Aug 16 and 0800Z-1600Z Aug 17. Frequencies: 80-10 meters. Categories: SOSB, SOAB, MS, SWL. Exchange: RST and Serial number. QSO Points: own country—5 pts, different country on same continent—10 pts, diff cont—15 pts. Score: QSO points × DXCC entities + W/VE/VK/JA call districts. For more information—**www.sartg.com**. Logs due Oct 10 to **sm7bhm@svessa.se** or to SARTG Contest Manager, Ewe Håkansson, SM7BHM, Pilspetsvägen 4, SE-291 66 Kristianstad, Sweden.

Keymen's Club of Japan Contest-CW—sponsored by the Keymen's Club of Japan, 1200Z Aug 16-1200Z Aug 17. Frequencies: 160-6 meters (JA allocations on 160 are 1.810-1.825, 1.908-1.912 MHz). Categories: SOAB, SOSB (JA only), SWL. Exchange: RST and JA prefecture/district or continent. QSO Points: 1 pt/QSO (JA count JA-JA-1 pt and JA-DX-5 pts). Score: QSO points × JA pref/dist from each band (JA also count continents). For more information—**www.jarl.com/kcj**. Logs due Sep 30 to **ja1dd@jarl.com** or Yasuo Taneda, JA1DD, 279-233 Mori, Sambu-town, Sambu-gun, Chiba 289-1214, Japan.

New Jersey QSO Party—CW/Phone—sponsored by Englewood ARA, 2000Z Aug 16-0700Z Aug 17 and 1300Z Aug 17-0200Z Aug 18. Frequencies (MHz): 1.810, 3.535, 7.035, 14.035, 21.100, 28.100, SSB—3.950, 7.235, 14.285, 21.355, 28.400, VHF/UHF 50-50.5 and 144-146 MHz. Exchange: QSO number and SPC or NJ county. QSO points: 3 pts/QSO. Score: QSO points × NJ counties. NJ stations use NJ counties + states (except NJ) + provinces, max 83. For more information—**www.qsl.net/w2rj**. Logs due Sep 13 to Englewood Amateur Radio Association, Inc, PO Box 528, Englewood, NJ 07631-0528.

SEANET Contest-CW/SSB/Digital—sponsored by the SEANET Convention, 1200Z Aug 16-1200Z Aug 17. Frequencies (MHz): CW—3.525, 7.025, 14.025, 21.025, 28.025, SSB—7.090, 14.320, 21.320, 28.320. Categories: SO, MS, AB, SB, Mixed and Single Mode combinations. Exchange: RS(T) and serial number. QSO Points: SEANET-SEANET—10 pts (5 pts if same country), SEANET-World—10 pts. Score: QSO points × DXCC entities for SEANET entrants, QSO points × SEANET entities for non-SEANET entrants, counted once per band and mode. For more information and list of SEANET countries—**www.seanet2003.com/contest.htm.** Logs due Oct 31 to **g3nom@rast.or.th** or Ray Gerrard, HSØZDZ, PO Box 69, Bangkok Airport PO, Bangkok 10212, Thailand.

Aug 23-24

Ohio QSO Party—CW/SSB—sponsored by the Mad River Radio Club, 1600Z Aug 23-0400Z Aug 24. Frequencies (MHz): CW—3.545, 7.045, 14.045, 21.045, 28.045; SSB—3.850, 7.225,

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

14.250, 21.300, 28.450. Categories: SO, MM and Mobile. Exchange: Serial number and Ohio county, state or province, DX stations send DX. QSO Points: CW—2 pts, SSB—1 pt. Score: QSO points × OH counties (OH station count states, provinces and OH counties) counted once per mode. For more information—**www.mrrc.net/oqp**. Logs due 30 days after the contest to **oqplogs@mrrc.net** or to Ohio QSO Party c/o Jim Stahl, K8MR, 30499 Jackson Rd, Chagrin Falls, OH 44022-1730.

NRRL 75th Anniversary Contest—CW/SSB—sponsored by the Norwegian Radio Relay League (NRRL) from 1200Z Aug 23-1200Z Aug 24. Frequencies: 80-10 meters, work stations in LA/JW/JX once per band and mode. Categories: SOAB (spotting networks allowed), MS. Exchange: serial number (LA stations also send county abbr). QSO Points: 3 pts/QSO. Total score: QSO Points × LA counties + JW/JX counted once per band and mode. Logs due Sep 15 to **la9hw@arrl.net** (ASCII text) or Jan Almedal, LA9HW, Odinsgt 7, NO-4631 Kristiansand, Norway.

TOEC WW Grid Contest—CW—sponsored by the Top of Europe Contesters (TOEC), 1200Z Aug 23-1200Z Aug 24. Frequencies: 160-10 meters. Categories: SO (no packet), -AB, -SB, Low Power (<100 W, AB only), MS (10 min band change rule), MM, Mobile (SOAB)—work mobiles from each grid field (i.e., JP, KO, EM). Exchange: RST + grid square, i.e., JP73 (log must show all grid fields activated). QSO Points: own continent—1 pt, other cont—3 pts, QSOs with mobiles—3 pts. Score: QSO points × two-letter grid fields. For more information—**www.qsl.net/toec/contest.htm**. Logs due 30 days after the contest to **TOEC.contest@pobox.com** or to TOEC, Box 178, SE-83122 Ostersund, Sweden.

SCC RTTY Championship, sponsored by the Slovenian Contest Club, 1200Z Aug 24-1159Z Aug 25. Frequencies: 80-10 meters. Categories: SOAB-HP, SOAB-LP, MS-HP, MS-LP. Exchange: RST and 4-digit year first licensed. QSO Points: own country—1 pt, different country same continent and between W, VE, VK, ZL, ZS, JA, PY call areas, LU provinces, and UA9/Ø oblasts—2 pts, different continent—3 pts. Score: QSO Points × different years from all bands. For more information—**lea.hamradio.si/~scc/rtty/htmlrules.htm**. Logs due Sep 15 to **rtty@hamradio.si** (Cabrillo format preferred) or on diskette to Slovenia Contest Club, Saveljska 50, 1113 Ljubljana, Slovenia.

CQC Summer QSO Party—CW/SSB—sponsored by the Colorado QRP Club, 1800Z-2359Z Aug 24. Frequencies (MHz): CW—1.825, 3.560, 3.710, 7.040, 7.110, 14.060, 21.060, 21.110, 28.060, 28.110 MHz, SSB—1.910, 3.985, 7.285, 14.285, 21.385, 28.385 MHz. Categories: SOSB, SOAB, Portable. Exchange: RS(T), SPC, first name and CQC number or power (5 W max). QSO Points: CW—CQC member 6 pts, nonmember 4 pts, SSB-CQC member 3 pts, nonmember 2 pts. Score: QSO points × SPC counted once per band × total different names. Add 1000 points to score for working WØCQC. For more information—**www.cqc.org/contests/summer03.htm**. Logs due 30 days after contest to **contest@cqc.org** (ASCII only) or to Colorado QRP Club, Box 371883, Denver, CO 80237-1883.

Hawaii QSO Party, CW/Phone/RTTY/PSK31, sponsored by the Koolau ARC, 0700Z Aug 23-2200Z Aug 24. Frequencies: 160-10 meters. Categories: SOAB and MS (single or mixed-mode), MM (mixed-mode only). Spotting nets and packet allowed in all classes. Exchange: RS(T) and SPC, maritime region (1-3), or HI county. QSO Points: 20-15-10 meters, Phone—1 pt, CW/Digital—2 pts; 40 meters, Phone—2 pts, CW/Digital 4 pts; 80 meters, Phone—4 pts, CW/Digital—8 pts; 160 meters, Phone 8 pts, CW/Digital 16 pts. Score is total points plus 150 pts for QSO with KH6J. For more information—**www.kark.us/HiQSOP/**. Logs due 30 days after contest to **ah6oz@hawaii.rr.com** or Hawaii QSO Party, PO Box 8960788, Wahiawa, HI 96786-0788.

Aug 30-31

YO-DX Contest-CW/SSB-sponsored by the Romanian Amateur Radio Federation (RARF), 1200Z Aug 30-1200Z Aug 31. Frequencies: 80-10 meters. Categories: SOAB, SOSB, MS. Exchange: RST and serial number, YO stations send county abbreviation. QSO Points: different country own continent—2 pts, different continent—4 pts, YO stations—8 pts. Score: QSO points × YO counties and DXCC entities counted once per band. For more information—**www.hamradio.ro/contests//yodx_eng.htm**. Logs due 10 days after the contest to **yodx_contest@romstar.com** or YO DX HF Contest, PO Box 22-50, 71100 Bucharest, Romania.

SARL HF DX Contest—CW—1330Z-1730Z Aug 31 (see Aug 2-3). QST

SPECIAL EVENTS

Wingdale, NY: Steve Jacobson Memorial ARA, N2SJ. 1600Z-2200Z **Jul 27**. 2nd Annual Steve Jacobson Memorial Station at Camp Ramah. General bands 28.450 14.250. Certificate. Bernie Umlas, N2NVU, 50 West 34th St, Apt 3A12, New York, NY 10001.

Grand Haven, MI: North Ottawa Amatuer Radio Club, W8CSO. 1600Z **Jul 31**-2000Z **Aug 1**. Celebrating the US Coast Guard Festival. 14.240 7.240. QSL. NOARC, Box 44, Ferrysburg, MI 49409.

Oshkosh, WI: Fox Cities Amateur Radio Club, W9ZL. 1400Z **Aug 1**-2100Z **Aug 3**. Experimental Aircraft Association Airventure & Fly-In Convention. 28.425 14.243 14.085 7.243. Certificate. Wayne Pennings, WD9FLJ, 913 N Mason, Appleton, WI 54914.

Canton, OH: Canton Amateur Radio Club, W8AL. 1200Z **Aug 1**-0300Z **Aug 4**. Annual Pro-Football Hall of Fame Festival 40th Anniversary. 28.365 21.365 14.265 7.265. Certificate. Donald E. Perry, WQ8J, 968 Culverne Ave NW, Massillon, OH 44647.

Barnegat Light, NJ: Old Barney ARC, N2OB. 1300Z-2300Z **Aug 2**. National Lighthouse Activity Weekend (Lighthouse USA-039). 14240 7240 146.835. QSL. Old Barney ARC, N2OB, PO Box 345, Tuckerton, NJ 08087.

Hawley, PA: Science Camp Watonka, KB3BUM. 1330Z-2130Z **Aug 2**. 6th Annual Special Events Station. 28.440 21.340 14.240 7.240. Certificate. Camp Watonka, PO Box 127, Hawley, PA 18428.

Mclouth, KS: BARCBADS Amateur Radio Club, KAØB. 1600Z-2300Z **Aug 2**. Annual Mclouth Threshing Bee and Tractor Pulling Contest. 7.250. Certificate. Gary Royer, PO Box 45, Mclouth, KS 66054.

Bristol, ME: Lincoln County Amateur Radio Club, K1LX. 1200Z **Aug 2**-2200Z **Aug 3**. Pan American Lighthouse Weekend/Pemaquid Point Lighthouse. 14.270. Certificate. John Peters, K2LOT, 154 Boothbay Rd, Edgecomb, ME 04556.

Burnett, WI: Rock River Radio Club, W9S. 1600Z **Aug 2**-2100Z **Aug 3**. The 35th Annual Dodge County Antique Power Show. 14.275 7.250. Certificate. Rock River Radio Club, W9TCH, PO Box 26, Juneau, WI 53039.

Mukilteo, WA: Boeing Employees Amateur Radio Society, W7FLY. 1600Z **Aug 2**-0100Z **Aug 3**. National Lighthouse Weekend. 28.370 14.270 7.270. Certificate. Fritz Von Hagel, 7717 143rd Ave NE, Lake Stevens, WA 98258.

St Augustine, FL: St Augustine Amateur Radio Society, N4AUG. 1400Z **Aug 2**-2200Z **Aug 3**. Activation of St Augustine Lighthouse, #789, for PALLW. 21.270 14.270. QSL. SAARS, PO Box 860084, St Augustine, FL 32086-0084. **www.saars.net**.

Port Colborne, ON Canada: Welland County ARC, VC3XXV. 1300Z **Aug 2**-1600Z **Aug 4**. Canal Days Marine Heritage Festival, 25th Anniversary. 28.350 21.250 14.250 7.250. QSL. Doug Frame, VE3JDF, 895 Lakeshore Rd E, Port Colborne, ON Canada, L3K 5V3.

Fort Payne, AL: DeKalb County Alabama Amateur Radio Club, W4GBR. 1800Z **Aug 2**-1800Z **Aug 10**. The World's L-o-n-g-e-s-t Yard Sale Special Event Station. 28.470 21.270 14.270 7.270. Certificate. W4GBR Special Event, 2113 Dogwood Blvd NE, Fort Payne, AL 35967. **www.dekalbamateurradio.com**.

Hamburg, NY: Southtowns Amateur Radio Society, WB2ELW. 1400-0200Z **Aug 7**-1400-0200Z **Aug 17**. 164th Erie County Fair. 21.320 14.320 14.070 7.230. Certificate. John Leitten, KA2RFT, 6120 McKinley Pky, Hamburg, NY 14075.

Valdosta, GA: Valdosta Amateur Radio Club, W4G. 0800Z **Aug 8**-1000Z **Aug 10**. Valdosta 1st Hamfest. 28.300 14.345 7.258 3.962. Certificate. Valadosta Hamfest, PO Box 3644, Valdosta, GA 31604.

Eau Claire, WI: Eau Claire Amateur Radio Club, W9EAU. 1400Z-2100Z **Aug 9**. W9EAU 50th Anniversity of the Eau Claire Amateur Radio Club. 21.390 14.290 7.290. QSL. ECARC, PO Box 1867, Eau Claire, WI 54702-1876.

Indianapolis, IN: Indianapolis Kids VHF Net, W9Z. 1300Z-1800Z **Aug 9**. Kids Only Special Event at Broad Ripple Hamfest. 28.400 21.350 14.260 7.250. Certificate. Steve Wendt, KB9RDS, 9559 Neptune Dr, Indianapolis, IN 46229.

Maryland Line, MD: Social Security Employees' ARC, W3SSA. 1300Z-2100Z **Aug 9**. Celebrating 68th anniversary of the Social Security Act. 28.375 21.375 14.275 7.275. Certificate. Greg Stec, 1624 Pickett Rd, Lutherville, MD 21093.

Jamestown, NY: Conewango Creek Special Events Group, K2LUC. 0000Z **Aug 9**-2359Z **Aug 10**. Lucille Ball Birthday Celebration. 146.94/R 28.450 14.260 7.260. QSL. CCSEG, c/o CCAFMA, Box 81, Jamestown, NY 14702. We hope to be on all bands, all modes.

Muskegon, MI: Muskegon Area Amateur Radio Council, W8ZHO. 1400Z **Aug 9**-2000Z **Aug 10**. Huntington Harborfest Tall Ships Challenge. 28.350 21.300 14.265 7.265. Certificate. MAARC, PO Box 691, Muskegon, MI 49443.

Pikes Peak, CO: Colorado VHF Group, KØYB. 1500Z-1800Z **Aug 10**. Colorado 14er Event... mountaintop radio operating. 147.42 28.350 21.330 14.260. QSL. Bob Witte, 21060 Capella Dr, Monument, CO 80132. **www.Colorado14erEvent.org**.

West Union, OH: DeForest ARC, K8GE. 1700Z-

Maty Weinberg, KB1EIB ♦ Special Events ♦ events@arrl.org

2130Z **Aug 10**. Ohio's Bicentennial Celebration, Adams County. 14.225 7.225. Certificate. DeForest Amateur Radio Club, PO Box 73, West Union, OH 45693-0073. **www.qsl.net/k8ge**.

Walton, NY: Delaware County 4H Amateurs, KC2JLL. 1200Z **Aug 11**-2400Z **Aug 16**. 117th Delaware County Fair. 28.350 21.335 14.235 7.261. QSL. Brendan Bellamy, 3 Bridge St, Delhi, NY 13753.

Hatboro, PA: Warminster Amateur Radio Club, K3DN. 2100Z **Aug 13**-2100Z **Aug 17**. 225th Anniversary of the Battle of Crooked Billet. 21.280 14.280 7.180 3.880. Certificate. Warminster Amateur Radio Club, Box 113, Warminster, PA 18974.

Sycamore, IL: Kishwaukee ARC, W9S. 1400Z **Aug 14**-2200Z **Aug 17**. Commemorating Steam Power on the Farm. 28.390 14.270 14.038 7.270. Certificate. Bob Yurs, PO Box 341, Sycamore, IL 60178.

Alliance, OH: Alliance Amateur Radio Club, W8LKY. 1600Z-2100Z **Aug 16**. Ohio Bicentennial and Carnation Days in the Park. 28.405 14.295 14.045 7.045. Certificate. AARC-W8LKY, PO Box 3344, Alliance, OH 44601.

Roanoke, VA: Roanoke Valley Amateur Radio Club, W4CA. 1400Z-2100Z **Aug 16**. Steam Powered Locomotives. 28.460 21.260 14.260 7.260. QSL. Ray Crampton, 1670 Catawba Rd, Troutville, VA 24175.

Wooster, OH: Wayne Amateur Radio Club, W8WOO. 1400Z-2359Z **Aug 16**. Wayne County's Celebration of Ohio's 200th Birthday. 28.450 21.350 14.250 7.250 CW up 50 from bottom of band. Certificate. Wayne Amateur Radio Club, PO Box 881, Wooster, OH 44691.

Buffalo, NY: Western NY DX Association, K2L. 1600Z **Aug 16**-1800Z **Aug 17**. Lighthouse Weekend Event. 21.020 14.020 7.020 3.520. QSL. Robert Nadolny, PO Box 73, Springbrook, NY 14140.

Burnt Island Lighthouse, ME: Yankee ARC, KA1RFD. 0001Z **Aug 16**-2359Z **Aug 17**. International Lighthouse/Lightship Weekend. 28.370 21.220 14.270 7.270. QSL. Rod Scribner, RR 4 Box 6770, Gardiner, ME 04345.

Eagle Harbor, MI: International Lighthouse/Lightship Weekend, K8E. 0001Z **Aug 16**-2359Z **Aug 17**. Lighthouse and range lights. 14.030 21.030 14.275 21.325. Certificate. QSL bureau, or direct to N8MR, 14071 Fairway, Livonia, MI 48154. **www.kc8nah.com/Interests/illw03.htm**.

Fire Island National Seashore, NY: Great South Bay ARC, W2GSB/LH. 1400Z **Aug 16**-1900Z **Aug 17**. International Lighthouse/Lightship Weekend. 28.460 21.320 14.260 7.260. QSL. W2GSB/LH, PO Box 1356, West Babylon, NY 11704.

Hudson River, New York City, NY: USS *Intrepid* Association and Bucks-Lehigh UHF Repeater Association, WA3KEY/2. 1600Z **Aug 16**-0100Z **Aug 17**. 60th Anniversary of the aircraft carrier USS *Intrepid* CV-11. 28.575 21.375 14.275 7.240. Certificate. Norman Drechsel, WA3KEY, PO Box 498, Quakertown, PA 18951. **www.wa3key.com/blura.html**.

Newport, OR: Oregon-Idaho DX Group, N7L. 0001Z **Aug 16**-2359Z **Aug 17**. International Lighthouse/Lightship Weekend from Yaquina Bay Lighthouse. 21.221 21.021 14.221 14.021. QSL. Vince Van Der Hyde, K7VV, Box 12941, Salem, OR 97309.

N Wildwood, NJ: East Coast Long Wire Association, KC2KAX. 0001Z **Aug 16**-2359Z **Aug 17**. Lighthouse-Lightship Weekend 2003. 28.465 21.256 14.256 7.256. Certificate. ECLWA, PO Box 318, Green Creek, NJ 08219.

Shetland Islands, Scotland UK: Amateur Radio Lighthouse Society, GB2ELH. 0001Z **Aug 16**-2359Z **Aug 17**. International Lighthouse and Lightship Weekend from Eshaness Lighthouse, Shetland, Scotland. CW 21.020 14.020; Phone 21.270 14.270. QSL. Lee Graves, WA7PBH, 4341 SE Satinleaf Pl, Stuart, FL 34997. **lighthouses.net.au/illw/2003.htm**.

St Augustine, FL: St Augustine Amateur Radio Society, N4AUG. 1400Z **Aug 16**-2200Z **Aug 17**. Activation of St Augustine Lighthouse, #789, for ILLW. 21.270 14.270. QSL. SAARS, PO Box 860084, St Augustine, FL 32086-0084. **www.saars.net**.

Southold, NY: Peconic ARC, W2AMC. 1300Z **Aug 16**-2000Z **Aug 17**. International Lighthouse/Lightship Weekend, Horton Point Lighthouse. 50.125 14.270 7.270. Certificate. Peconic ARC, PO Box 113, Peconic, NY 11958.

Sturgeon Point, MI: South Lyon Area Amateur Radio Club, N8SL. 0001Z **Aug 16**-2359Z **Aug 17**. International Lighthouse/Lightship Weekend at Sturgeon Point Light. 28.370 21.370 14.270 7.270. QSL. Tom Peasley, WB8IIA, 30960 Bramley Cir, New Hudson, MI 48165-9645.

Tuckerton, NJ: Old Barney ARC, W2T. 1300Z **Aug 16**-2100Z **Aug 17**. Lighthouse Activity from Tucker's Island Lighthouse USA-911. 146.835 14.240 14.030 7.240. QSL. Bob Schenck, N2OO, PO Box 345, Tuckerton, NJ 08087.

Vineland, NJ: Amateur Radio Lighthouse Society, W2L. 1300Z **Aug 16**-2000Z **Aug 17**. International Lighthouse/Lightship Weekend. Sat SSB 21.285 14.270; Sun CW 21.035 14.035; 40 m as necessary. QSL. John L. Sielke, 1353 Samuel Dr, Vineland, NJ 08360.

Tawas City, MI: Hazel Park Amateur Radio Club, K8S. 0000Z **Aug 16**-2359Z **Aug 18**. International Lighthouse and Lightship Weekend from Tawas Point Lighthouse (#USA 837). 28.370 21.370 14.270 7.270. Certificate. Gary Sklar, K8IKW, 7296 Green Farm Rd, West Bloomfield, MI 48322.

Sioux City, IA: Sooland Amateur Radio Association, KØTFT. 1800Z **Aug 17**-2359Z **Aug 20**. 100th Anniversary of the death of Sergeant Floyd. 146.52 21.360 14.260 7.260. Certificate. Jim Rhodes, KØXU, 429 E 26th St, South Sioux City, NE 68776.

Bay City, MI: Baysail, W8A. 0000Z **Aug 17**-2400Z **Aug 31**. 2003 Tall Ships Challenge from schooner *Appledore IV*. 28.370 21.370 14.270 7.270. Certificate. Mark Mowery, 1764 E Garrison Rd, Owosso, MI 48867.

Albuquerque, NM: Duke City Hamfest, N5M. 2300Z **Aug 22**-2100Z **Aug 23**. Duke City Hamfest and NM State ARRL Convention. 28.560 21.360 14.260 7.260. QSL. Tom Lea, W5LEA, 1009 Clancy Dr NE, Albuquerque, NM 87112.

Des Moines, IA: DMRAA, WØAK. 1300Z-2100Z **Aug 23**. Annual Dragon Boat Races. 28.370 21.370 14.260 7.260. QSL. Dan Miller, 1040 Rittenhouse St, Des Moines, IA 50315.

Pittsburgh, PA: South Hills Amateur Radio Club, KS3R. 1300Z-2300Z **Aug 23**. Celebrating club's 10th anniversary. 28.430 21.375 14.270 7.235. Certificate. South Hills ARC, 211 Gerrie Dr, Pittsburgh, PA 15241. **www.sharc.net**.

Shelbyville, IN: Blue River Valley Amateur Radio Society, W9JUQ. 1700Z-2100Z **Aug 23**. Bears of Blue River Festival. 14.250 7.250. Certificate. James Hilderbrand, KB9ZYC, 405 S Main St, Waldron, IN 46182.

Wausau, WI: Wisconsin Valley Radio Association, W9SM. 1600Z **Aug 23**-2100Z **Aug 24**. Return of the Pan-Am Games to Wausau's Whitewater Park. 28.460 21.360 14.260 7.260. QSL. Wisconsin Valley Radio Association, PO Box 363, Wausau, WI 54402-0363.

Paradise, AZ: Cochise Amateur Radio Association, K7RDG. 1800Z **Aug 30**-1600Z **Sep 1**. Annual Trek to ghost town of Paradise, AZ. 21.305 18.115 14.305 7.230. Certificate. Cochise ARA, PO Box 1856, Sierra Vista, AZ 85650.

Hanover, KS: Crown Amateur Radio Association, KØASA. 1400Z-2100Z **Aug 31**. Hollenberg Pony Express Station Festival. 18.085 14.245 14.040 7.125. Certificate. Crown Amateur Radio Association, 11551 West 176th Terr, Olathe, KS 66062.

Parsons, WV: Mountain State Transmitters, K8VNQ. 1400Z-2100Z **Aug 31**. Annual Tucker County Hick Festival. 14.270 14.050 7.235 7.050. Certificate. Mountain State Transmitters, PO Box 1492, Elkins, WV 26241.

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 **Oct** *QST* would have to be received by **Aug 1**. Submissions may be mailed (Attn: Maty Weinberg), faxed (860-594-0259) or e-mailed (**events@arrl.org**) to ARRL HQ. 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 April 10 to June 9, 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

1291	W1MAD
1292	NØXLR
1293	W8LHP
1294	VY2RU
1295	KG6GMT
1296	K9MU
1297	N8PAQ
1298	VP2MJD
1299	KE4P
1300	KV4T
1301	VE3WMD
1302	W2JEK
1303	N6HC
K3CWH	425
KF4LVF	225
K6LMN	375
KF6MXK	150
W7KNT	625
WO9S	350

144 MHz
100

617	N1KI
618	KR7O
619	WO9S

222 MHz
50

114	VE2JWH

432 MHz
50

303	VE2JWH

10 GHz
5

134	N2EZS
135	N2JMH
136	N2KXS

24 GHz
5

17	K2DH
18	K2EHF
19	WO2P

Satellite
100

126	WA2MIS
127	N9OI
N5AFV	450
K5OE	800
W6ZQ	400
K8TL	500
N9UUR	300

QST

DXCC Honor Roll

*Compiled by **Bill Moore, NC1L** • DXCC Manager*

The DXCC Honor Roll is earned by amateurs who submit confirmation for contacts reached within the top 10 of the overall number of entities on the DXCC List. There were 335 entities on the list for the period with 326 being required for the Honor Roll. The period for this list is from April 1, 2002 to March 31, 2003. The **boldface** number indicates total current DXCC credits. The number next to the call signs represents an individual's overall total.

MIXED

335 Top of Honor Roll
4X1FQ/374
4X4DK/386
4X6UO/341
9A2OM/342
9A5I/356
9A7C/341
9A7V/341
9A9A/344
AA1K/346
AA1V/348
AA4H/346
AA4S/358
AA4Z/358
AA7A/348
AB0X/348
AB8K/352
AF2C/345
AF4Y/342
AJ6V/346
AK1N/344
AL7R/341
CT1BH/363
CT1DRA/341
CT1RM/353
CT1ZW/354
CX4CR/355
DF2IS/341
DF3CB/342
DF7NM/343
DF9ZP/342
DF9ZW/341
DJ2BW/384
DJ2TI/353
DJ2YA/373
DJ3IW/343
DJ4PI/361
DJ4SO/349
DJ4XA/364
DJ5DA/369
DJ5JH/362
DJ6NI/359
DJ6RX/363
DJ6TK/361
DJ6VM/359
DJ7ZG/369
DJ8CG/342
DJ8FW/353
DJ8NK/357
DJ9KG/347
DJ9RQ/352
DJ9RR/344
DK1FW/358
DK2GZ/341
DK6ED/344
DK6IP/347
DK6NP/349
DK8NG/349
DK9KX/351
DL0WW/352
DL1BO/383
DL1EY/357
DL1PM/370
DL3NBL/341
DL3OH/365
DL3ZA/366
DL4MCF/341
DL6MI/341
DL7FT/369
DL7VEE/345
DL7WL/346
DL8YR/351
DU9RG/342
EA3NA/360
EA4DO/364
EA4DX/341
EA4GT/344
EA4KD/341
EA4MY/352
EA6NB/341
EA7DUD/341
EA8AKN/341
EA8ZS/341
ES1AR/378
ES1QD/342
F2VX/357
F3AT/380
F5II/363
F5KOK/346
F5VU/357
F6ANA/341
F6AOI/359
F6BEE/349
F6BKI/350
F6BWJ/348
F6DHB/346
F6DLM/346
F6DZO/342
F6DZU/346
F6ELE/341
F6EWK/346
F6EXV/346
F6HIZ/341
F9CZ/344
F9RM/377
G0DQS/341
G3GIQ/368
G3HCT/379
G3HTA/363
G3JAG/363
G3KMA/370
G3LQP/360
G3MXJ/360
G3NDC/350
G3NLY/367
G3OCA/340
G3RTE/347
G3RUV/357
G3UML/366
G3XTT/344
G4BUE/351
G4BWP/344
G4IUF/343
G4ZCG/341
GM3BQA/365
GM3ITN/375
GM3WIL/344
GW3CDP/347
HA0DU/352
HA6NF/341
HA8IE/341
HB0LL/359
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HB9AFI/353
HB9AQW/355
HB9AZO/345
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HB9MD/363
HB9PL/376
HB9RG/350
HL1XP/341
I0AMU/385
I0KDF/343
I0KRP/350
I0MWI/349
I0OLK/361
I0TCA/345
I2KMG/368
I2LPA/357
I2MOV/347
I2MQP/348
I2PEI/348
I2PJA/352
I2ZFD/365
I2ZGA/345
I2ZZZ/356
I4AVG/344
I4EAT/348
I4IZZ/340
I4MKN/361
I4WZT/341
I5ARS/372
I5CRL/349
I5ENL/343
I5FLN/359
I5ICY/342
I5IGQ/342
I5JHW/345
I5KKW/346
I5ZGQ/346
I6FLD/373
I6FYR/344
I8ACB/349
I8DVJ/341
I8IHG/344
I8KNT/348
I8LEL/353
IK0AZG/341
IK1GPG/341
IK2BLA/341
IK2DFZ/340
IK4BHO/341
IK4DCT/340
IK4EWN/341
IK4GME/341
IK4HLO/341
IK5CQV/341
IK6BOB/341
IK6GPZ/340
IK8CNT/341
IN3RZY/345
IN3TJV/348
IN3XAI/345
IT9GAI/364
IT9HLR/341
IT9SVJ/341
IT9UCS/346
IT9ZGY/382
JA0CRG/342
JA0DWY/349
JA0GRF/353
JA0GZZ/352
JA0HXV/343
JA0LXP/349
JA0SC/351
JA0UH/335
JA0UUA/341
JA1AAT/363
JA1ADN/374
JA1BFF/351
JA1BK/374
JA1BLC/365
JA1BN/373
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JA1EOD/362
JA1FHK/364
JA1FNA/355
JA1GRM/341
JA1GV/365
JA1HGY/359
JA1IFP/363
JA1IOA/346
JA1JAN/360
JA1JYZ/342
JA1KJK/338
JA1MOH/352
JA1PCY/351
JA1QWT/339
JA1RWI/349
JA1SJV/350
JA1SVP/350
JA1UQP/360
JA1VN/352
JA1WSK/353
JA1WSX/354
JA2ADY/343
JA2AH/360
JA2AHH/343
JA2AXB/348
JA2BAY/351
JA2BY/369
JA2CXH/349
JA2CYL/345
JA2DSY/357
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JA2JNA/344
JA2JRG/341
JA2JW/377
JA2KVD/351
JA2NDQ/351
JA2ODB/345
JA2QCX/344
JA2QPY/342
JA2TBS/342
JA2VPO/347
JA2WYN/342
JA2XW/367
JA3APL/362
JA3ART/360
JA3AUQ/351
JA3AZD/362
JA3BQE/358
JA3CSZ/348
JA3DY/375
JA3EMU/355
JA3FYC/353
JA3GM/356
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JA3NTE/352
JA3THL/355
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JA4DLP/355
JA4DND/352
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JA4ZA/368
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JA5IU/352
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JA6BEE/362
JA6BZA/340
JA6CBG/343
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JA6YG/362
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JE2URF/341
JE8BKW/341
JF1KKV/346
JF2MBF/341
JF2OWA/341
JH0BBE/342
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JH1GZE/353
JH1HGC/351
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JH8MXH/343
JI1FXS/339
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JI1PGO/343
JI1VVB/343
JI2EMF/341
JI2KXK/341
JJ2RCJ/342
JJ3AFV/341
JJ3PRT/350
JL3JTD/340
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JM1VRW/341
JN1MKU/341
JO1MOS/340
JP1IOF/341
JP1NWZ/342
JR1BLX/350
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JR1MLU/349
JR1TNE/353
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JR2KDN/341
JR3HZW/345
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JR4LNG/340
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K5OVC/360
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K5QY/343
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K6RN/375
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K6SQL/346
K6TA/369
K6TIM/343
K6TS/342
K6YRA/368
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K7AR/343
K7JS/341
K7LAY/349
K7LJ/345
K7NN/359
K7OM/345
K7OSE/354
K7PI/345
K7SP/350
K7UT/354
K7WJB/340
K7XB/355
K7ZBV/345
K8CX/348
K8DR/378
K8EJ/367
K8JK/345
K8LJG/354
K8MFO/365
K8NA/350
K8NW/347
K8PYD/359
K8RR/360
K8SL/340
K8YSE/341
K9AB/380
K9BWQ/354
K9ECE/376
K9MM/362
K9OW/351
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K9UWA/351
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K9IW/335
K9YY/328
KA8ZPE/332
KG9N/332
LA0CX/331
LX2PA/332
LZ2CC/335
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N4TO/333
NM3V/331
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JA3MNP/337
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330
N3UN/336

329
KB5GL/333
W8SEY/338
WX5L/333

328
AA5AU/333
JA3AUQ/334
N2TU/334
N5GGO/333
W2FXA/334
W5PJR/334

327
I5ICY/333
I5IGQ/333
K4FJ/333
NA0Y/331
OH2LU/333
W2JGR/333
W6ZX/333

326
DJ2BW/333
I4MKN/332
SM0AJU/332
WB4UBD/332

By **Gene Zimmerman, W3ZZ**

2003 January VHF Sweepstakes Results

A typical January weekend...

Each year in the dead of winter there is a stirring amongst the weak signal VHF operators. No matter that the Northern climes are frigidly cold and snow and sleet are falling everywhere. It's time to check out the station. Radios that have not been exercised since last fall are turned on and tested. On goes the rotator box. Do the antennas still turn? Do they still work? The beacons get a big workout here. Are the amplifiers still putting out the power they're supposed to? And what about the microwave gear? A few calls to the locals will test these.

Why all the checking under such inhospitable conditions? The ARRL January VHF Sweepstakes is coming! All the clubs are organizing and imploring their membership to participate. Even the rovers are getting ready. It takes a certain disregard of the physical environment to be a rover—and that goes doubly in the winter. The SS is always marked by a paradox—high activity in the face of lousy conditions. Activity is a combination of club organization and the chance for people like me who operate portable in the warmer months to use their home stations. Propagation is a matter of midwinter conditions.

This year brought the double whammy of extremely cold temperatures and a lot more snow than usual to the eastern two thirds of the nation. On the weekend itself, bitterly cold temperatures and, generally dry, windy conditions conducive to high noise levels even in normally quiet locations were the rule in many places but some places in the Rocky Mountains and on the West Coast were more hospitable. A typical January weekend—but one with some surprises as we will see.

2003 Overall

The number of logs submitted seems to have stabilized to some degree this year. Compared to last year the 797 logs submitted were down marginally but in the last three years the numbers have ranged from 797 to 818. This is still significantly more logs than any other ARRL VHF contest. The core categories remained at essentially the same levels with 441 low power stations and 190 high power stations. The main difference compared to 2002 appears to have been a drop in limited multioperator logs from 55 to 32 accompanied by a slight rise in rover entries from 71 to 81 in 2003.

Propagation

Remember September with its absolutely flat, unenhanced band conditions? Well, January started out the same way. Cold windy weather will do that. That is not to say that there wasn't a little bit of east/west tropo reported in the Pacific Northwest but by and large it was brute force, grind them out. Then around 2000Z on Sunday the minor sporadic E (E_s) season smiled on us with a strong opening extending from 100° longitude eastward to the Atlantic seaboard, north well into Canada and south to the Gulf Coast and Florida (see Figure 1). The major E cloud was over KY and the IN/OH border and originally supported contacts between the Northeast and WØ and W5 excluding essentially all of Texas and New Mexico. As one moved toward western New York and eastern Ohio, the path rotated north/south toward the Gulf and Florida. As the opening matured, this cloud narrowed and moved north first concentrating contacts into Nebraska and then shortening between W2/W3 and western IL. The orthogonal path was also open between Minneapolis and more northern MN and the NC/SC coast. The opening from down the FL peninsula appeared to be very spotty mostly into the upper Midwest and occasionally into New England. Mean-

Top Ten

Single Operator, Low Power	
K2DRH	160,395
WA3GFZ	120,530
N1DPM	108,288
K1UHF	81,888
W3KJ	67,728
WA8RJF	55,473
AF1T	54,439
K4TO	53,992
W1PM	53,738
N3FUJ	53,568

Single Operator, High Power	
K1TEO	444,096
AA2UK	374,262
WA2FGK	354,860
K2AXX	261,060
KMØT	259,675
K1RZ	240,470
WA3NUF	187,040
WB9Z	182,991
K1JT	167,808
K2SMN	166,800

QRP Portable	
KC7RAS	8,646
W9GKA	7,065
N8A (N8XA,op)	5,336
N6VMO	2,324
KQ6EE	2,240
N2IM	1,872
WD5AGO	1,680
KA1VEC (NM1K,op)	1,071
NØJK	780
WB2AMU	731

Limited Multioperator	
K8CC	116,494
N3JFM	94,930
W1QK	66,780
W4ZRZ	60,833
W2DTA	54,032
N8ZM	48,488
K2AA	42,976
KB1DFB	35,644
N1LDY	35,594
W1XM	24,684

Multioperator	
K3EAR	877,041
W2FU	810,266
N2PA	505,827
N3NGE	326,952
WØRSJ	265,766
WA3ZKR	78,431
W2QK	75,430
N8KOL	73,580
W2EA	65,436
K1MUJ	56,316

Rover	
N2JMH	525,249
K2TER	473,396
N6TEB/R	282,492
N9UM/R	269,712
KK7GU/R	232,260
N6DN/R	226,296
KF9US	211,830
N2OPW	210,078
W7DHC/R	149,124
WO2P/R	147,708

Affiliated Club Competition

	Score	*Entries*
Unlimited Category		
Mt Airy VHF Radio Club	3,127,678	61
Medium Category		
Rochester VHF Group	3,353,279	44
North East Weak Signal Group	1,357,754	33
Murgas ARC	1,232,206	4
Northern Lights Radio Society	833,508	26
Society of Midwest Contesters	741,447	12
Potomac Valley Radio Club	681,910	32
Pacific Northwest VHF Society	479,982	30
Badger Contesters	423,551	15
Yankee Clipper Contest Club	174,997	5
Western States Weak Signal	142,974	7
Mad River Radio Club	118,534	3
South Jersey Radio Assn	113,360	6
Crawford County ARC	101,598	18
North Texas Microwave Society	96,806	11
Contest Club Ontario	95,016	10
Bergen ARA	66,944	6
Six Meter Club of Chicago	41,677	13
Northern California Contest	40,974	3
Florida Contest Group	29,645	4
Hampden County Radio Assn	12,619	3
Tennessee Contest Group	10,216	4
Mobile Sixers Radio Club	1,524	6
Lawton Fort Sill ARC	919	4
Rochester (MN) ARC	824	7
Local Category		
Delaware Valley VHF Society	178,208	7
Roadrunners Microwave Group	123,215	3
Eastern Connecticut ARA	95,968	3
Eastern Panhandle ARC	77,507	6
Northern New York Contest	6,734	4
Meriden ARC	4,122	3

while a secondary cloud formed somewhere in the vicinity of the NY/New England border that allowed stations in MI and IN near the main cloud to work into northern New England and Canada. Canadians were also audible here in the mid-Atlantic later in the opening. By 2300 the opening was diminishing rapidly and by 2330Z it was all but over.

The National Scene

How much difference does a good E skip opening make in the placement of the top scores? Not as much as you might think. Once again living in the densely populated Northeast corridor is no guarantee of a winning performance. The low power single operator class (SOLP) remains by far the largest. Bob, K2DRH/9, leads the way for the third straight year, this time by a comfortable margin 40k over Paul, WA3GFZ, with former winner Fred, N1DPM, only 12k points further back. Bob's score of 160,395 is a new overall category mark. In the high power single operator (SOHP) category, Jeff, K1TEO, is the top scorer for the sixth time in a row, 70k points ahead of Bill, AA2UK, who returns to serious competition with Herb, K2LNS, operating WA2FGK a mere 20k points behind him. Twenty-four intrepid souls braved the winter weather in the Single Operator Portable (SOP) class, which gets an almost complete overhaul in 2003. Top honors go to the Northwestern Division and Ric, KC7RAS, closely followed by Kevin, W9GKA, and Ax, N8XA, operating as N8A.

The top spots in the multioperator competition had some new faces this year. Dave's crew at K8CC moves to the top spot in the Limited Multioperator (LM) class 22k points ahead of the quartet at N3JFM. The Murgas ARC longtime operators of K3YTL moved from FN11 down to FM19 to join with the South Mountain Contest Club, K3EAR, to take the Multioperator Class (MO) with a category record setting score of 877,041. Close on their heels less than 10% behind was Jeff, W2FU's group with N2PA moving into third place. Winter is not the most pleasant time to be a rover but the rigors of upstate New York didn't faze N2JMH/R, who had the top rover score for the third year running again closely followed by K2TER/R covering the same territory. N6TEB/R edged past N9UM/R for third place.

Regional Highlights

The regional scores produced some interesting results. Stations in the Northeast, Central and the northern part of the Midwest region were helped by the E_s opening. Detailed Division scores can be found in the Web report.

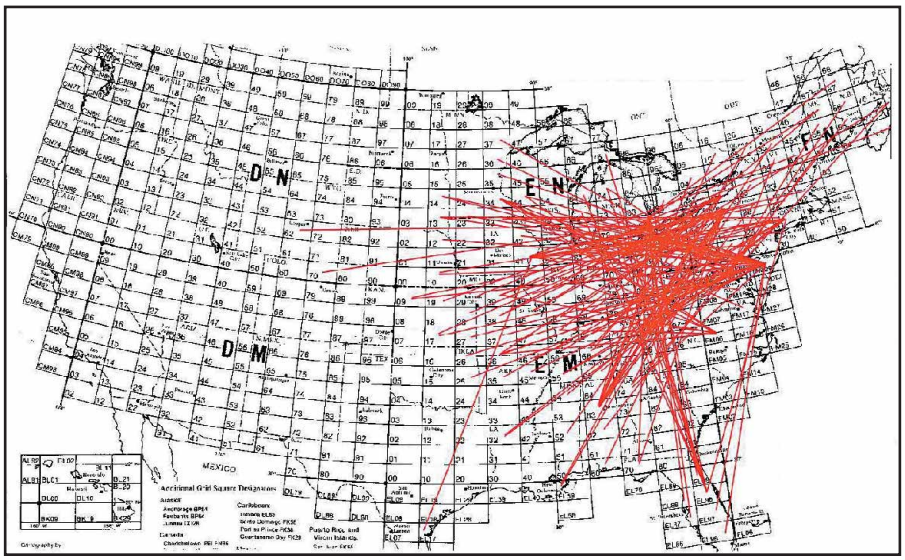
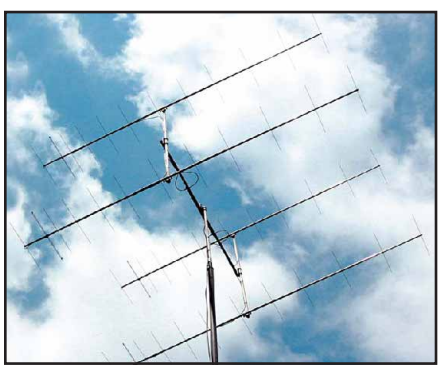


Figure 1—Sporadic E opening between 2000-2330Z in the Eastern and Midwestern US. Line intersections indicate reflection centers from the E cloud.

Northeast

Top performers came from all parts of the Northeast. In addition to the national top ten performers already mentioned, outstanding SOLP performances were turned in by Del, K1UHF, and Joe, W3KJ, and by SOHP operators Mark, K2AXX, and Dave, K1RZ. Close behind N2IM were well-known QRP operators Rusty, NM1K, at KA1VEC and Ken, WB2AMU. Longtime LM participants W1QK and K2BAR, operators at W2DTA, provided the competition for N3JFM. Many of the K3YTL operators journeyed down to the South Mountain Contest Club station K3EAR at the old K3MQH site and produced their first MO top national score. Close on their heels were Rochester's W2FU and N2PA. All the top rover performers were from western New York: N2JMH/R, K2TER/R, N2OPW/R, WO2P/R and N2KXS/R. So much for cold, icy weather!

K7BV/1 in front of his neat 6 meter station: an ICOM IC-756PROII and an ACOM 1 kW amplifier.



K3TV's 2 meter antenna system—four 12-element M² Yagis.

Southeast

Richard, K4RTS, Dan, K8GUN, and Steve, W4SHG, led the way in the SOLP class in the Southeast while Rus, K4QI, transplanted Buckeye Gary, KE8FD, and Tom, K2UOP, were the top SOHP entries. The group at W4ZRZ parlayed a solid E_s opening into the top LM score in the region and no. 4 high nationally. In the MO category AG4V easily outdistanced the abbreviated effort from W4RX. Bill, W3IY/R, was the top rover but with a score much smaller than usual.

Central

Tony, WA8RJF, and Dave, K4TO, followed K2DRH's nationally winning score in SOLP. HF contester Jerry, WB9Z, racked up the no. 8 SOHP score nationally with fine scores posted by Mark, K8MD, and Ken, W9GA. W9GKA and N8A (N8XA) were dominant players on the SOP scene. The multiops were well represented by LMs K8CC and N8ZM,

Regional Results

Within each Region, scores are listed in descending order by power categories. Scores list call sign, score and power (A = SO Low, B = SO High, Q = SO Portable, L = Limited Multiop, M = Multioperator, R = Rover).

Northeast Region (New England, Hudson and Atlantic Divisions; Maritime and Quebec Sections)			Southeast Region (Delta, Roanoke and Southeastern Divisions)			Central Region (Central and Great Lakes Divisions; Ontario Section)			Midwest Region (Dakota, Midwest, Rocky Mountain and West Gulf Divisions; Manitoba and Saskatchewan Sections)			West Coast Region (Pacific, Northwestern and Southwestern Divisions; Alberta, British Columbia and NWT/Yukon Sections)		
WA3GFZ	120,530	A	K4RTS	31,951	A	K2DRH	160,395	A	KØSHF	52,635	A	KC6TEU	31,430	A
N1DPM	108,288	A	K8GUN	25,560	A	WA8RJF	55,473	A	NØURW	38,533	A	VE7DXG	29,986	A
K1UHF	81,888	A	W4SHG	25,110	A	K4TO	53,992	A	KT8O	36,432	A	KC6ZWT	22,852	A
K1TEO	444,096	B	K4QI	105,260	B	WB9Z	182,991	B	KMØT	259,675	B	N7EPD	52,022	B
AA2UK	374,262	B	KE8FD	38,199	B	K8MD	87,763	B	WØGHZ	125,710	B	N6RMJ	33,698	B
WA2FGK	354,860	B	K2UOP	35,948	B	W9GA	84,095	B	WØZQ	90,272	B	W6KBX	31,044	B
N2IM	1,872	Q				W9GKA	7,065	Q	WD5AGO	1,680	Q	KC7RAS	8,646	Q
KA1VEC (NM1K,op)	1,071	Q				N8A (N8XA,op)	5,336	Q	NØJK	780	Q	N6VMO	2,324	Q
WB2AMU	731	Q							KØNR	608	Q	KQ6EE	2,240	Q
N3JFM	94,930	L	W4ZRZ	60,833	L	K8CC	116,494	L	WØJH	16,530	L	W7AV	4,480	L
W1QK	66,780	L	KD5HPT	5,152	L	N8ZM	48,488	L	AD5V	2,436	L	K6WAR	3,416	L
W2DTA	54,032	L	AI4CW	3,920	L	W9VW	12,474	L	WX5II	1,743	L	W7DK	2,185	L
K3EAR	877,041	M	AG4V	17,640	M	N8KOL	73,580	M	WØEEA	10,948	M	W6TE	49,612	M
W2FU	810,266	M	W4RX	7,584	M	W9RVG	51,282	M	KAØMR	9,548	M	KI7EL	3,058	M
N2PA	505,827	M							N5PYK	6,076	M			
N2JMH/R	525,249	R	W3IY/R	12,192	R	N9UM/R	269,712	R	NØDQS/R	94,686	R	N6TEB/R	282,492	R
K2TER/R	473,396	R	KB1EXM/R	3,952	R	KF9US/R	211,830	R	W9FZ/R	80,408	R	KK7GU/R	232,260	R
N2OPW/R	210,078	R	N4FLM/R	3,069	R	KØPG/R	53,805	R	W5DF/R	71,832	R	N6DN/R	226,296	R

numbers 1 and 6 nationally and N8KOL no. 8 nationally in the MO class. Big rover scores were turned in by Mark, N9UM, ex-KG9PF (no. 4 nationally), and by the return of an old rover hand Phil, KF9US.

Midwest

Lenny, KØSHF, was the top SOLP station this year in the Midwest with Dan, NØURW, edging Eric, KT8O, for the runner-up slot. Mike, KMØT, once again cracked the top five nationally in the SOHP class with fellow club members Gary, WØGHZ, and Jon, WØZQ, running next and Al, W5LUA, leading the pack to the south. Tommy, WD5AGO, piloted his SOP station to a no. 7 finish nationally. The multiops were represented by Limited Multi WØJH and a close MO race won by the crew at WØEEA over KAØMR. Gene, NØDQS, won a spirited rover competition over Bruce, W9FZ, and Dan, W5DF.

West Coast

A number of close races occurred on the West Coast. Ken, KC6TEU, edged out Gabor, VE7DXG, in the SOLP category with Norm, KC6ZWT, close behind. In the SOHP competition Eric, N7EPD, was almost 20k point ahead of a pack of four stations led by Pat, N6RMJ, Don, W6KBX, Jim, AF6O, and Bob, N7AU. KC7RAS was the top national SOP station followed by the no. 4 and 5 ranked scores of John, N6VMO, and Hon, KQ6EE. Among the multiops W7AV narrowly outdistanced K6WAR and W7DK while W6TE finish no. 12 nationally in spite of mediocre conditions and no sporadic E. The West Coast rovers turned in excellent scores. Dave, N6TEB/R took the category and a third place finish overall. Kenny, KK7GU/R, eked by Paul, N6DN/R, by less than 6k points to earn them the no. 5 and 6 places in the national competition. Also notable was Jim, W7DHC/R's no. 9 finish,

Expanded Results, Line Score Printouts Available

For complete contest results online, 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.

Affiliated Club Competition

January is prime time for the ARRL club competition. The Medium Category had the largest number of entries—24—with 6 entries in the Local Category and only one in the Unlimited Category. The Mt Airy VHF Radio Club—the Pack Rats—has been the top scorer in the Unlimited Category for decades and this year was no exception. Their secret of success is a large number of home stations with multiband capabilities and the ability to get them on the air in the contest. Almost nothing is left to chance and about two-thirds of their members actually submit logs. However, for the second straight year the Rochester VHF Group in the Medium Category had an even higher score by 225k points. The RVHFG combined two huge MO scores and five big rovers to make 2.8 of their 3.3+ million points to win the Medium Category. On the strength of their strong single operator stations, the Northeast Weak Signal Group moves into second place and the Murgas ARC with the top MO and the no. 3 SOHP entry moves into third. Northern Lights moves from sixth to fourth and YCCC replaces the Downey Contesters. Missing their big MO entry and with minimal participation from their two big rovers, the PVRC falls from second to sixth; and Western States (WSWSS) drops from sixth to tenth. Success depends on organization—helping each member get his/her station ready, convincing them to operate for as long as they can and then actually submitting the log. The VHF oriented clubs do all of these very well. Moving up to the top in the Local Club Competition is the Delaware Valley VHF Society. Runner-up in the category is the Roadrunners Microwave Group from south Texas.

Next Year

The next January VHF Sweepstakes will be held on January 17 and 18, 2004. Will the E-skip return? Will there be more snow, ice and bitterly cold temperatures or will some of the highest hilltops be open? Can K1TEO and K2DRH/9 remain top dogs in the single op fixed station categories? Speaking of dogs, will the tandem duo of ND3F and W3IY return to the fray to challenge N2JMH? Will some Midwestern or Far Western rover rise up and take them all? Will W2FU overcome the boys from South Mountain at K3EAR? Tune in, tune up and help your club fight for the prize. QST

2003 ARRL September VHF QSO Party Contest Announcement

Date: 1800 UTC September 13-0300 UTC September 16

How to participate: Any amateur station on any band above 50 MHz may be worked. The entry classes for Single Operator are high power, low power or portable. A Limited Multioperator station may use up to four bands (any four bands). A Multioperator Unlimited uses more than four bands. A Rover is a one or two person station that moves and operates from two or more grid squares. Any station may be worked once per band, regardless of mode. You may rework a rover station each time they move to a new grid square. Use of a spotting network makes your station a Multioperator entry. DX stations may only work W/VE stations for credit.

What to say: All stations give their call sign and four-digit grid locator (such as W1AW FN31). Information on how to determine your grid square is found on page 86 of the April 1994 issue of *QST* or online at **www.arrl.org/locate/gridinfo.html**.

Special interest: The September VHF QSO Party frequently has good tropospheric propagation, and every few years you will get a significant tropospheric event. Be sure to check for openings that can occur unexpectedly.

Quirks: The higher the concentration of amateurs in a region the larger pool of potential QSOs. A Single Operator Portable station operates from a single location away from home and must use a portable power supply, portable station and a maximum of 10 W PEP output. If you see a high solar flux index, check out activity on 50 MHz. Remember that a rover operator may also submit a separate Single Operator entry from their home station if they do not rove the full contest period.

Rule changes this year: The total transmitter output power for a high power entry in any category is either 1500 W PEP or the maximum allowable power level established by the national licensing authority of your country, whichever is lower.

Best reason to participate: This contest is a good way to build up totals for the ARRL VHF/UHF operating awards such as VUCC. A band opening on 50 MHz could also present the opportunities to find new states for an ARRL Worked All States award or add entities to a DXCC total. And if it is a pretty weekend, a rover can enjoy one last taste of summer. The Affiliated Club Competition in September is a good way to encourage newcomers to get on and participate in a VHF contest.

Relative challenge: More so than in June, the higher bands play a significant role in the September VHF QSO Party. It is also possible for someone to participate in this event with modest stations. You will get better results utilizing SSB or CW instead of FM. The more bands you are able to utilize the better your results.

Scoring: QSOs count one point each on 50 and 144 MHz, two points on 222 and 432 MHz, three points on 902 and 1296 MHz and four points each on 2.3 GHz and higher. On each band, every time you work a different grid square, you receive a multiplier. Your multiplier total is the sum of grids you worked per band. The final score is your QSO point total times your multiplier total. A rover gets one additional multiplier for each grid they activate during the contest.

How to report your score: You must send in your entry by October 15, 2003. E-mail Cabrillo format log to **SeptemberVHF@arrl.org** or send paper logs and complete summary sheet to September VHF QSO Party, ARRL, 225 Main St, Newington, CT 06111.

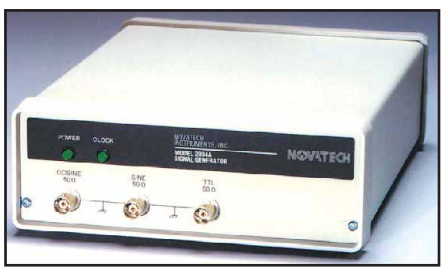
Complete Rules: The complete rules may be found at **www.arrl.org/contests/forms**. You will also find links to the General Rules for all ARRL Contests, General Rules for ARRL Contests on Bands above 50 MHz (VHF), and other forms and operating aids, log sheets for submitting your entry. If you don't have Web access, you can obtain the complete rules and forms by sending a self-addressed, stamped envelope with postage for 2 ounces to September VHF QSO Party Rules, ARRL, 225 Main St, Newington, CT 06111.

For more information: e-mail **contests@arrl.org** or phone 860-594-0232. QST

NEW PRODUCTS

NOVATECH 2904A FUNCTION GENERATOR

◊ Novatech Instruments announces its Model 2904A, a precision DDS function generator in a table top instrument case. The 2904A outputs sine, cosine, and TTL signals simultaneously. The sine and cosine output amplitudes are programmable with 12 bits of resolution for up to 24 dBm output power. The output frequency is programmable from 1 Hz to 10 MHz in 1-µHz steps. Programmable functions include frequency sweep, chirp, FSK and BPSK.



Price: $1295. Contact Novatech Instruments, PO Box 55997, Seattle, WA 98155-0997; tel 206-301-8986; **sales@novatech-instr.com**; **www.novatech-instr.com**.

HIGH-CURRENT SWITCHING POWER SUPPLIES FROM PETERSON ELECTRO-MUSICAL PRODUCTS

◊ Peterson Electro-Musical Products is distributing a line of fixed 13.8 V dc switching power supplies in 40, 60 and 80 A models. Units can be used in parallel for higher current ratings. Applications may include high power mobile amplifiers, whole station power sourcing for multiple radios or other high current needs. The supplies feature short circuit protection, thermal shutdown, and reverse polarity protection. A built-in cooling fan operates on demand, and the unit is UL listed. Mounting flanges are featured for wall mounting.

Prices: $165 (40 A), $215 (60 A), $270 (80 A). For more information, contact Peterson Electro-Musical Products, 11601 S Mayfield Ave, Alsip, IL 60803; tel 708-388-3311; **www.petersonemp.com/hamradio**.

DRF TECHNOLOGIES VOIP INTERFACE

◊ VA3TO and DRF Technologies (formerly iLINKca) announce the release of their latest VoIP Multimode interface. The interface is designed to work with the popular Echolink Internet linking software. Features include a hardware DTMF decoder, COS or VOX receiver sensing, a transmit time-out timer and five status LEDs.

The VoIP Multimode also doubles as a sound-card interface for modes such as PSK31, WSJT, SSTV and WEFAX.

The interface is housed in a low profile, painted aluminum chassis, and is available as a kit, as an assembled and tested board, or as a complete unit installed in the chassis.

Price: $45 for kit without chassis, $65 for assembled board without chassis, $80 for complete, enclosed unit. For more information, visit **www.ilinkca.com** or e-mail **va3to@rac.ca**.

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

OAKLAND, CA
2210 Livingston St., 94606
(510) 534-5757
(800) 854-6046
Mark, WI7YN, Mgr.
I-880 at 23rd Ave. ramp
oakland@hamradio.com

SAN DIEGO, CA
5375 Kearny Villa Rd., 92123
(858) 560-4900
(800) 854-6046
Tom, KM6K, Mgr.
Hwy. 163 & Claremont Mesa
sandiego@hamradio.com

SUNNYVALE, CA
510 Lawrence Exp. #102
94085
(408) 736-9496
(800) 854-6046
Howard, KE6PWH, Mgr.
So. from Hwy. 101
sunnyvale@hamradio.com

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- 5W @13.8V ext DC • USB, LSB, CW, AM, FM
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- 65w • Ruggedly Built
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- Direct Keypad Frequency Entry
- Bullet-proof Front End

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- Built-in CTCSS/DCS
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2M/440mHz Compact HT

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- Alpha numeric display
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Ultra compact HF, VHF, UHF

- 100w HF/6M, 50w 2M, 20w UHF
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2M/440 Mini Dualbander Transceiver

- 50w 2m, 40w 440mHz
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- All mode w/DSP
- HF/6M @ 100W, 2M @ 50W 440 MHz @ 20W
- CTCSS encode/decode w/tone scan
- Auto repeater • 107 alphnumeric memories

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IC-718 HF Transceiver

- 160-10M @ 100W
- 12V Operation
- Simple to Use
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- One Touch Band Switching
- Direct frequency input
- VOX Built-in
- 101 alphnumeric memories

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- 2M, & 70CM @ 5W
- V/V, U/U, V/U
- Independent controls for each band
- 200 alphnumeric memories
- Auto repeater
- CTCSS encode/decode w/tone scan
- IRLP compatible

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

$200 ICOM COUPON!

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IC-756PROII All Mode Transceiver

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- Enhanced 5 inch color TFT w/spectrum scope
- Selectable IF filter shapes for SSB & CW
- Enhanced Rx performance
- SSB/CW Syncronous tuning
- Multiple DSP controlled AGC loops
- Advanced CW functions
- 101 alphnumeric memories

$200 ICOM COUPON!

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IC-746PRO All Mode 160M-2M

- 10-2M @ 100W
- 32 bit IF-DSP+ 24 bit AD/DA converter
- Selectable IF filter shapes for SSB & CW
- 102 alphnumeric memories
- Enhanced Rx performance

LOW PRICE

IC-T7H 6W, Dual Band Transceiver

- 2M/70CM
- 70 alphnumeric memories
- 6W output
- CTCSS encode/decode w/tone scan
- Auto repeater
- Easy operation!
- Mil spec 810, C/D/E*[1]

IC-V8 2M Transceiver

LOW PRICE

- 5.5W output
- 107 alphnumeric memories
- Customizable keys
- Auto repeater
- PC Programmable
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- Drop-in trickle charger included

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

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IC-2720H Dual Band Mobile

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- DTMF Encode
- 212 memory channels
- Remote Mounting Kit Included

SOON!

IC-208H Dual Band Mobile

- 55 watts VHF (2M), 50 watts UHF (70CM)
- Wide Band RX**
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- Detachable remote head
- DMS w/linked banks

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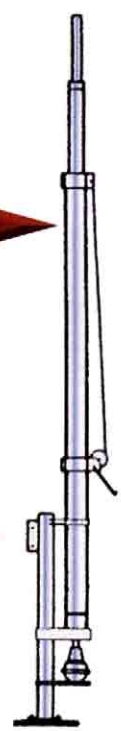

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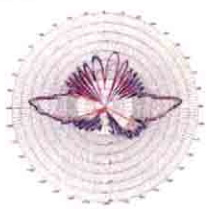
Length: 5ft 10inches
Conn: Integral N-Female



GP-24 elevation pattern

GP-24-3

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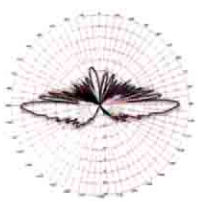

GP-24-3 elevation pattern

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Conn: N-male

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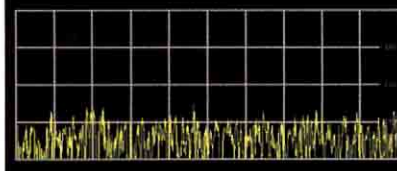

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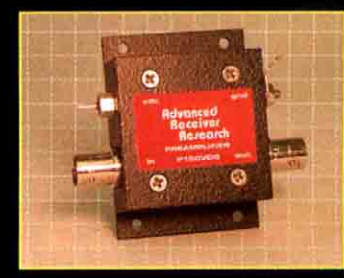

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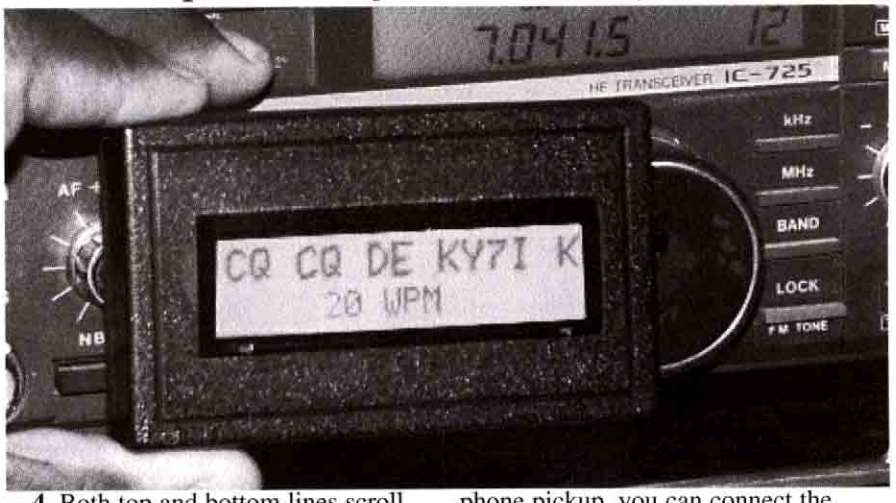

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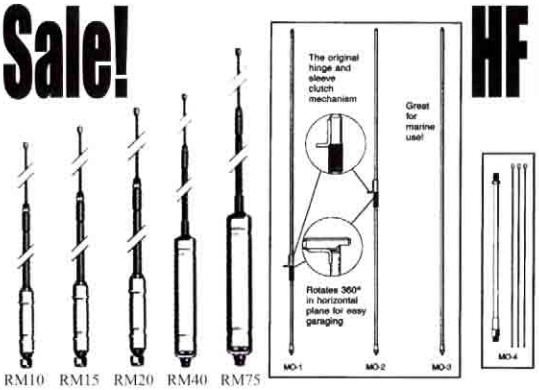

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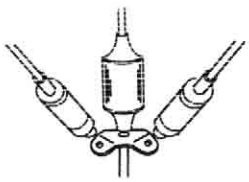

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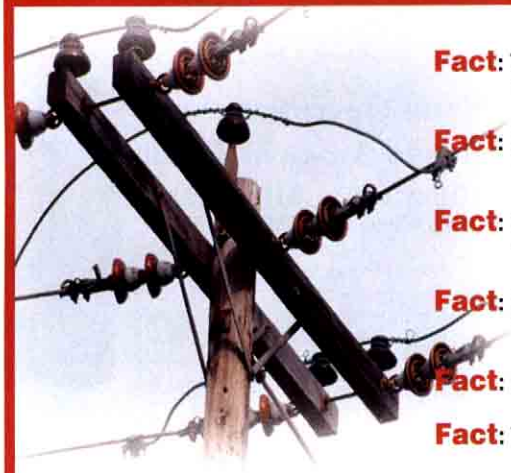
An Important Message for all hams! Please read!

There's a new serious interference threat to Amateur Radio Spectrum...



Fact: The FCC is considering possible rule changes to aid commercial interests that want to deliver high-speed Internet service using existing power lines.

Fact: Feeding Broadband over Power Lines (BPL) uses high-frequency RF from 2 to 80 MHz—a range that includes many popular ham bands.

Fact: Europe is already experiencing interference from BPL and Japan has rejected this technology due to interference potential.

Fact: Comments by FCC Commissioners praise BPL technology without considering radio amateurs' legitimate concerns.

Fact: ARRL must educate government officials quickly and effectively.

Fact: To do this, ARRL must conduct tests and take measurements from across the country to demonstrate our case—**an unanticipated expense.**

What can you do?

Add your voice and *your contribution today* to the 2003 Spectrum Defense Fund...even if you've already contributed this year.

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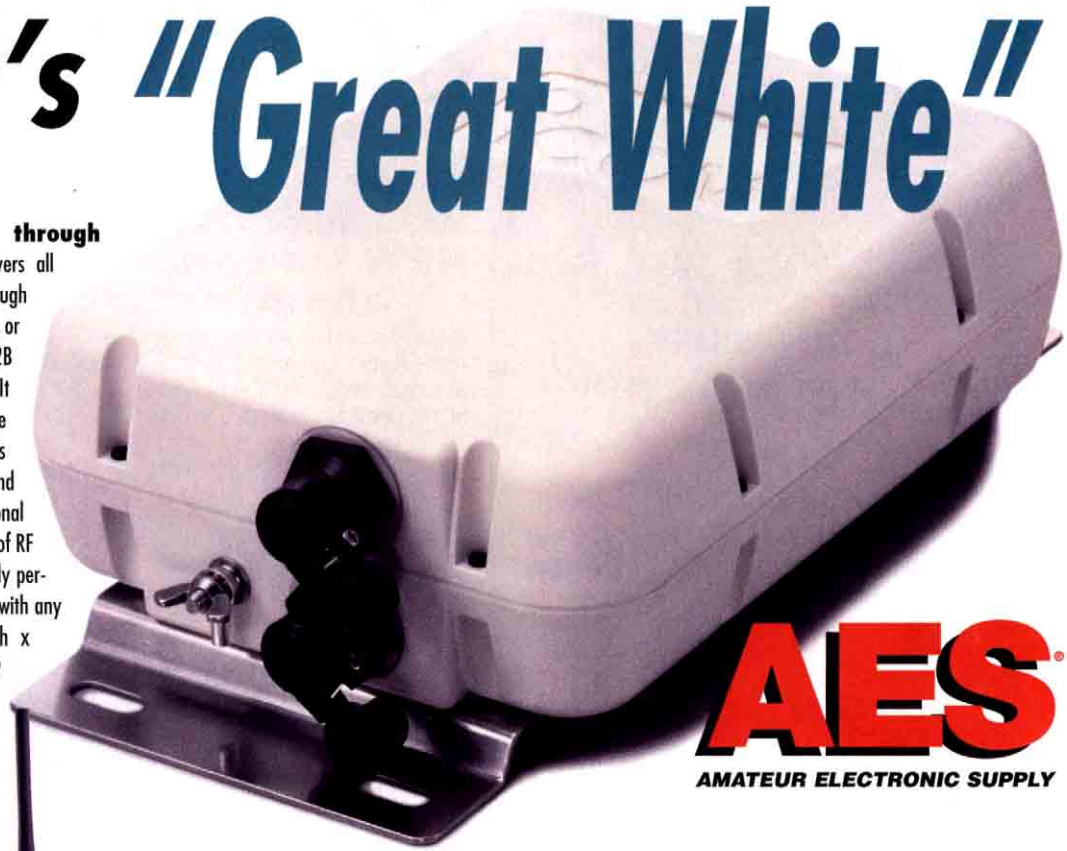

AH-4 Tune-up from HF through 50MHz band. The AH-4 covers all amateur bands from 3.5MHz through 54MHz with a 23-foot or longer wire, or 7-54MHz with the optional AH-2B antenna element (mobile only). It offers 45 memories and an average tune-up time of less than 2.5 seconds per band. Installation is simple and mobile use is possible with the optional AH-2B. The AH-4 emits only 300mW of RF output while tuning and automatically performs certain operations when used with any Icom transceiver. 6.78"w x 2.78"h x 9.06"d, 2 lbs, 10 oz **$259.99**

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IC-V8 Quality, simplicity, anywhere. (middle) 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..... **$129.95**

IC-T7H Powerful output and ample receive audio. (left) A 6W amp circuit provides superior transmit on both VHF and UHF when 13.5 V DC is supplied. In addition, a full 500mW of AF is output from the speaker – easy to copy in noisy environments. Separate CTCSS tone encoder and encoder/decoder are standard. Single push action makes it simple. This 2M/440MHz meets MIL SPEC. 2.25"w x 4.34"h x 1.06"d, 10 oz..... **$189.95**

IC-T90A Surprisingly compact, full featured. (right) The T90A 50/144/440MHz HT offers 5W with wideband receive. It features 555 alphanumeric memories with Icom's 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.. **$269.95**

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 backlit mic. 5.5"w x 1.56"h x 7.09"d, 2 lbs, 10 oz **$179.95**

IC-706MKIIG Base station features, mobile size. The 160-10M + 6M, 2M, 70cm Mark II G is constructed for stable, quality output with low IMD and spurious emissions. It features tone squelch, DSP, auto repeater, and 107 alphanumeric memories. 6.56"w x 2.28"h x 7.88"d, 5 lbs, 6 oz..... NOW! FREE RMK706 included **$799.95**

IC-746PRO 32-bit DSP takes you even higher. All-mode operation, 100W of power, 102 alphanumeric memories, and a multi-function LCD are impressive features of the HF/50/144MHz 746PRO. Its floating point DSP and 24-bit AD/DA converter make it a must-have. The 746PRO also offers a memory keyer, built-in antenna tuner, digital noise reduction and much more. 11.3"w x 4.7"h x 12.5"d, 19 lbs, 13 oz..... NOW! FREE PS-125 included © **$1399.95**

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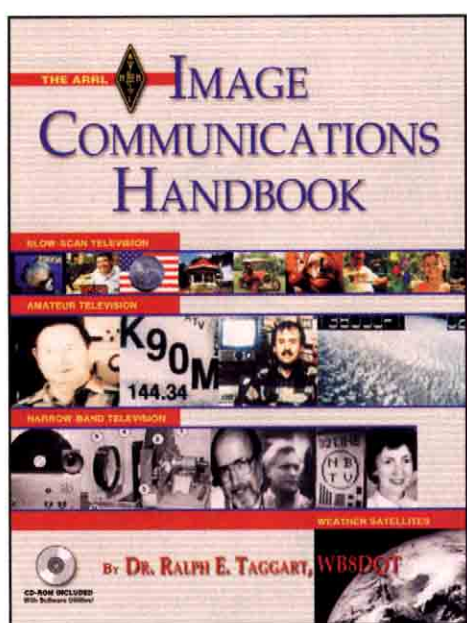

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TH-G71A Sharp Distinction: The brighter side of handy communications. (right) This FM dualbander (144/440MHz) boasts an illuminated keypad and LCD, high-performance antenna, and a stylish yet ergonomic design. The 5W G71A also offers convenience with 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**

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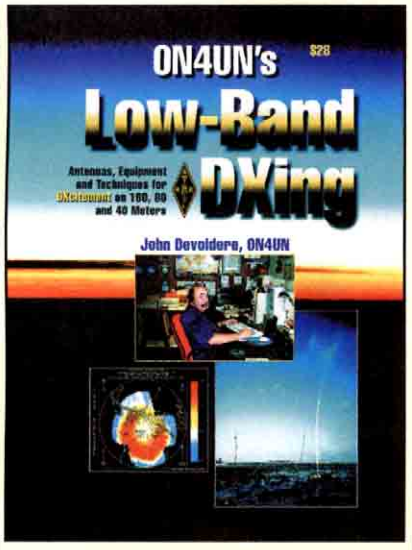

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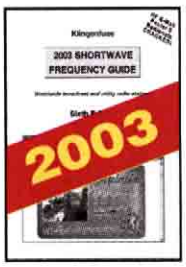

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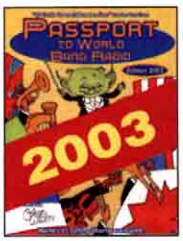

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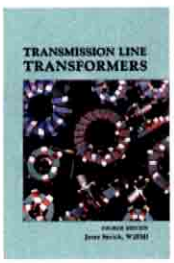

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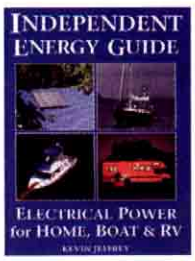

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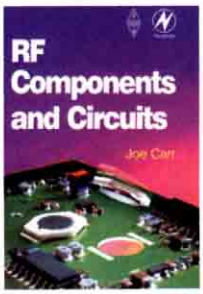

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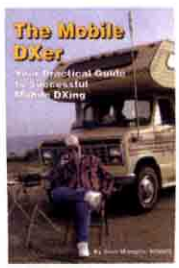

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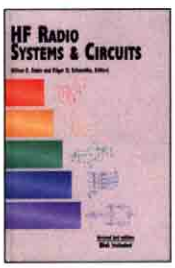

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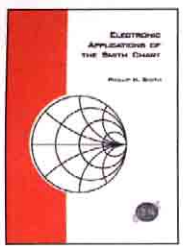

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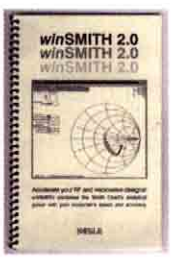

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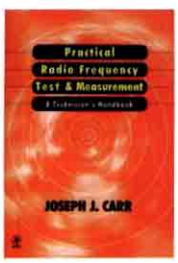

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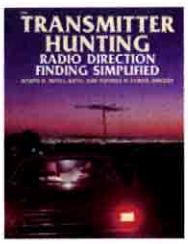

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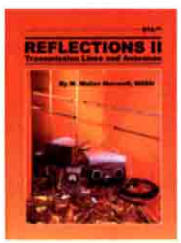

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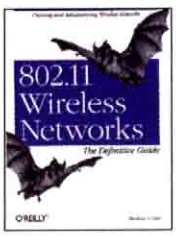

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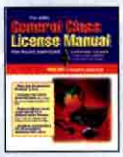

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2210G	5-10	130	20	14/0.8	Standard	346
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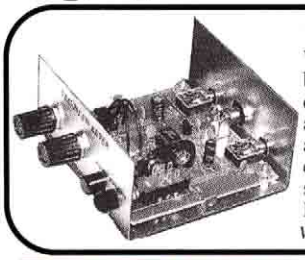

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20/30/40/80 Meter Receiver Kits give high performance! Covers entire band or tailor to cover desired portion. Copy CW/SSB/AM. NE602/ 612 mixer-oscillator, LM386 high gain audio amplifier. 1¾x4¾x 5¼ in. *Moderate skill level.* Order **VEC-1120K** (20 Meters),**VEC-1130K**(30 Meters),**VEC-1140K** (40 Meters), **VEC-1180K** (80 Meters), **$29.95 ea.**

20/30/40/80 Meter QRP CW transmitter Kits have variable crystal oscillator tuning, front panel switch selects 1 of 2 crystals. 1 crystal included. Transmit and Receive switch. Connect receiver. 1¾x4x3½ in. *Intermediate skill level.* Order **VEC-1220K** (20 Meters), **VEC-1230K** (30 Meters), **VEC-1240K** (40 Meters), **VEC-1280K** (80 Meters), **$29.95 ea.**

Tunable SSB/CW Audio Filter Kit has sharp *four* pole peak and notch filters. Zero in with frequency control & adjust bandwidth for best response. Tune frequency from 300-3000 Hz. Notch is an outstanding 50 dB. 1 Watt amplifier. Speaker/Phone jacks. 12 VDC at 300 mA. 1¾x4¾x5¼ in. *Intermediate skill level.* Order **VEC-841K, $34.95.**

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Super CW filter/amplifier Kit has powerful 1 watt audio amplifier to drive speaker. 8 poles active IC filtering uses cascaded low-Q stages. 3 bandwidths: 80,110, 180 Hz. Center frequency: 750 Hz. Up to 15 dB. Use 9-18VDC, 300 mA max. 1¾x4 x3½ in. *Simple skill level.* Order **VEC-821K, $29.95.**

Super SSB Audio Filter Kit improves readability with 8 poles, optimizes audio bandwidth, reduces SSB splatter, low, hi-pitched interference, hiss, static crashes, background noise. Use 9V battery. 1¾x4x 3½ in. *Simple skill level.* Order **VEC-830K, $19.95.**

144/220/440 MHz Low-Noise Preamp Kits soup up your antenna system. Helps pull in weak signals. Works wonders for scanner or ham-band receiver. Gives great low-noise performance and immunity from damaging electrostatic discharge. 1x1½ in. *Simple skill level.* Order **VEC-1402K** (144 MHz),**VEC-1422K** (220 MHz), **VEC-1444K** (440 MHz), **$17.95.**

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2/6/10 Meter FM Receiver Kits let you tune into the world of ham radio. Catch all the action! Each covers the entire FM sub-band and runs off your 9 volt battery. Plug in speaker or headphones for loud clear reception. 1¾x4x3½ in. *Intermediate skill level.* Order **VEC-1002K** (2 Meters), **VEC-1006K** (6 Meters), **VEC-1010K** (10 Meters), **$34.95 each.**

2 Meter Monitor Kit receives 144-148 MHz. Low noise, high gain RF preamp gives you excellent 0.1 uV sensitivity. Air variable tuning capacitor has 8:1 reduction. Dual conversion superhet provides selectivity and stability. Automatically eliminates squelch tails. Built-in speaker, squelch, tone, volume controls. 19¼ in. telescopic whip. 9V battery. 2x4¼x4 in. *Intermediate skill level.* Order **VEC-104K, $79.95.**

5 Watt 2 Meter FM transmitter Kit lets you transmit voice and data -- AFSK data (up to 1200 baud) and FSK data (up to 9600 baud). Jumper select reactance or direct FM modulators. Reliable Motorola NBFM transmitter IC and PA transistor. Crystal controlled (x8 frequency multiplication). -60 dBc spurs and harmonics. Use 12-14 VDC, 1.5 amps. 5-pin DIN microphone jack. 1¾x4¾x5¼ in. *Difficult skill level.* Order **VEC-1202K, $99.95.**

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New!

Great introduction to QRP, the hottest and fastest growing activities in ham radio. With this tiny *transceiver*, you'll discover what thousands of QRP enthusiasts already know -- you don't need a $1000 radio to get on the air and communicate worldwide. All it takes is some simple circuitry using less energy than a pen-light bulb! You get VXO frequency control, broad-banded transmitter circuitry, solid one Watt plus output, shaped keying, .3 uV sensitivity, direct conversion receiver. Includes crystal for popular QRP calling frequency. 1¾x4¾x5¼ in. *Intermediate skill level.* Order **VEC-1380K** (80 Meters), **VEC-1340K** (40 Meters), **VEC-1330K** (30 Meters), **VEC-1320K** (20 Meters) **$59.95 each.**

Super CW Audio Filter Kit gives you three bandwidths: 80, 110, 180 Hz. Eight poles gives super steep skirts with no ringing. Pull CW QSOs out of terrible QRM! Plugs into phone jack to drive phones. QRM down 60 dB one octave from center frequency (750 Hz) for 80 Hz bandwidth. Improves S/N ratio 15 dB. Use 9V battery. 1¾x4x 3½ in. *Simple skill level.* Order **VEC-820K, $19.95.**

AM Radio Transmitter Kit lets you set up your own AM station and broadcast crystal clear programming from your studio with *you* as the disc jockey or talk show host. Play music from CD player, tape deck or other source. Choose clear frequency from 530-1750 KHz. Standard line level or microphone input. Easy CD, tape deck or mike mixers connect. Audio level adjustment. 1¾x4x3½ inches. *Simple skill level.* Order **VEC-1290K, $29.95.**

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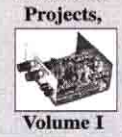

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MFJ tiny Travel Tuner

Tiny 4½x2¼x3 inch tuner handles full 150 Watts! Covers 80-10 Meters, has tuner bypass switch, tunes nearly anything!

MFJ brings you the *world's smallest* full power 150 Watt 80-10 Meter Antenna Tuner. Extra wide matching range lets you tune nearly any antenna.

It's no toy, its got guts! Built with real *air* variable capacitors (600 Volt, 322 pF) and *three* stacked powder iron toroids to handle real power -- not just QRP. Bypass switch lets you bypass tuner when you don't need it.

You can use nearly any transceiver at full power with nearly any coax fed or random wire antenna for portable, home or mobile operation.

It's perfect for compact rigs like Icom IC-706MKIIG, Yaesu FT-100D, Kenwood TS-50, QRP rigs and others with a built-in SWR meter.

Operate anywhere, anytime with a quick easy set-up! Tune out SWR on your mobile whip from inside your car. Operate in your apartment with a wall-to-wall antenna or from a motel room with a wire dropped from a window or from a mountain top with a wire over a tree limb. Great for DXpeditions or field day. Be prepared for emergencies.

MFJ-902 is so small and handy, you'll rely on it wherever you go! It's easy to pack away in your briefcase, suitcase, backpack, glove compartment or desk drawer. It's tiny enough to slide in your back hip pocket! 4½Wx2¼Hx3D in.

MFJ-902
$69.95

New!

MFJ All-Band G5RV Antenna

MFJ-1778
$39.95

Covers all bands, 160-10 M with antenna tuner. 102 feet long. Has super strong custom fiberglass center insulator that provides stress relief for 450 Ohm ladder line. Use horizontally or as a compact inverted vee or sloper. Use on 160 Meters as Marconi with tuner and ground. Handles full 1500 Watts. Add coax, rope and *you're on the air!*

MFJ G5RV Junior, covers 40-10 Meters

MFJ-1778M, $34.95. *Half-size* 52 foot long *G5RV Junior* covers 40-10 Meters with tuner, handles 1500 Watts.

MFJ Single Band Dipoles

Ultra high quality center fed dipoles will give you trouble-free operation for years. Custom injection-molded UV-resistant center insulator has built-in coax connector and hanging hole. Heavy duty 7-strand, 14-gauge hard copper antenna wire. Extremely strong solderless crimped construction. Authentic glazed ceramic end insulators. Use as horizontal or sloping dipole or inverted vee. Handles full 1500 Watts. Simply cut to length for your favorite frequency with cutting chart.

MFJ-1779A **$59.95** 265 ft., 160M
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MFJ-1779C **$29.95** 35 ft., 20-6M

Current Balun/Center Insulator

MFJ-918
$24.95

True *1:1 Current Balun/ Center Insulator* forces equal antenna currents in dipoles for superior performance. Reduces coax feedline radiation and field pattern distortion -- your signal goes where *you* want it. Reduces TVI, RFI and RF hot spots in your shack. *Don't build a dipole without one!* 50 hi-permeability ferrite beads on high quality RG-303 *Teflon*(R) coax and *Teflon*(R) coax connector handles full 1500 Watts 1.8-30 MHz. Stainless steel hardware with *direct* 14 gauge stranded copper wire connection to antenna. 5x1½ inches. Heavy duty weather housing.

Long 10/12 foot Telescoping Whips

MFJ-1954
$19.95
10 Feet

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12 Feet

10 foot extended, 19 inches collapsed, MFJ-1954, $19.95. 12 foot extended, 22.5 inches collapsed. MFJ-1956, $29.95. Standard 3/8 inch by 24 threaded stud for use with all standard mounts. Durable 1/2 inch diameter plated brass. Telescopes for full 1/4 wave operation 2 to 12/15 Meters. Cover 17, 20, 30, 40, 60, 80, 160 Meters with loading coil. Use two for multi-band dipoles. Replace screwdriver antenna whip for highly efficient *fixed* mobile operation.

MFJ RF Isolator

MFJ-915 *RF Isolator*
MFJ-915 **$29.95**

prevents unwanted RF from traveling on the outside of your coax shield into your transceiver. This unwanted stray RF can cause painful RF "bites" when you touch your microphone or volume control, cause your display or settings to go crazy, lock up your transceiver or turn off your power supply. In mobile installations, stray RF could cause your car to do funny things even blow your car computer. Clear up these problems, plug an MFJ-915 between your antenna and transceiver. *Don't operate without one!* 5x1½ inches. For 1.8 to 30 MHz.

Portable Collapsible Antenna Tri-Pod

MFJ-1918
$39.95

Holds 66 pounds of antenna steady. Black *steel* base forms strong braced equilateral triangle 40 inches on a side. Non-skid feet. One inch diameter steel mast extends height to six feet. Strong base and mast locks. Easily add antenna mount or mast extension for greater heights. Collapses to 38 inches by 4 inch diameter. 6¾ pounds.

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Protect your expensive HF/VHF/UHF transceiver from static electricity and lightning induced surges with an ultra-fast gas discharge tube. Plug between transceiver and antenna coax, attach ground.

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69¢ each
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Authentic *glazed ceramic* antenna insulator. Extra-strong -- will not break with long antennas and will not arc over or melt even under full legal power. Molded ridges give extra-long high voltage path to prevent high-voltage breakdown. Smooth wire holes prevent wire damage. Use as center or end insulator for dipoles, doublets, G5RVs, guy

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Durable four foot *copper bonded* steel earth ground rod is a tough 3/8 in. diameter that will last and last. Sharp pointed end makes it easy to drive into the ground. Use it to tie your equipment to a single earth ground to help bleed off static and RFI and prevent RF hot spots. Use several to form a good RF ground for random, long wire and vertical antennas.

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Operate 10 bands: 75/80, 40, 30, 20, 17, 15, 12, 10, 6 and 2 Meters with one antenna Separate full size radiators . . . End loading . . . Elevated top feed . . . Low Radiation Angle . . . Very wide bandwidth . . . Highest performance no ground vertical ever . . .

Operate 10 bands -- 75/80, 40, 30, 20, 17, 15, 12, 10, 6 and 2 Meters with this MFJ-1798 vertical antenna and get *full size performance* with no ground or radials!

Full size performance gives high efficiency for more power radiated. Results? Stronger signals and more Q-5 QSOs.

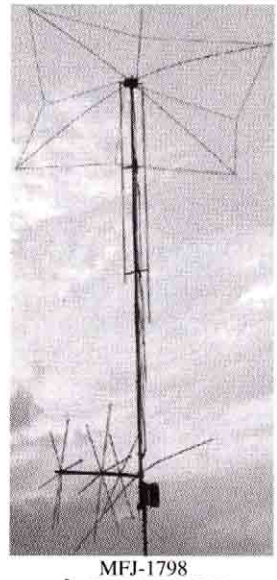
Full size performance also gives you exceptionally wide bandwidths so you can use more of your hard earned frequencies.

Full size performance is achieved using separate full size radiators for 2-20 Meters and highly efficient end loading for 30, 40, 75/80 Meters.

Get very low radiation angle for exciting DX, automatic bandswitching, omni-directional coverage, low SWR. Handles 1500 Watts PEP SSB.

MFJ's unique *Elevated Top Feed*™ elevates the feedpoint *all the way to the top* of the antenna. It puts the maximum radiation point high up in the clear where it does the most good -- your signal gets out even if you're ground mounted.

It's easy to tune because adjusting one band has minimum effect on the resonant frequencies of other bands.



MFJ-1798
$289.95
Ship Code F

Self-supporting and just 20 feet tall, the MFJ-1798 mounts easily from ground level to tower top -- small lots, backyards, apartments, condos, roofs, tower mounts.

Separate Full Size Radiators

Separate *full size* quarter wave radiators are used on 20, 17, 15, 12, 10 and 2 Meters. On 6 Meters, the 17 Meter radiator becomes a 3/4 wave radiator.

The active radiator works as a stub to decouple everything beyond it. *In phase* antenna current flows in all parallel radiators.

This forms a very large equivalent radiator and gives you incredible bandwidths.

Radiator stubs provide automatic bandswitching -- absolutely *no loss* due to loading coils or traps.

End Loading

On 30, 40, 75/80 Meters, end loading -- the most efficient form of loading -- gives you highly efficient performance, excellent bandwidth, low angle radiation and automatic bandswitching.

MFJ's unique *Frequency Adaptive L-Network*™ provides automatic impedance matching for lowest SWR on these low bands.

Tuning to your favorite part of these bands is simple and is done at the *bottom* of the antenna.

No Ground or Radials Needed

You don't need a ground or radials because an effective counterpoise that's 12 feet across gives you *excellent* ground isolation.

You can mount it from ground level to roof top and get awesome performance.

No Feedline Radiation to Waste Power

The feedline is decoupled and isolated from the antenna with MFJ's exclusive *AirCore*™ high power current balun. It's wound with *Teflon*® coax and can't saturate, no matter how high your power.

Built to Last

Incredibly strong solid fiberglass rod and large diameter 6061 T-6 aircraft strength aluminum tubing is in the main structure.

Efficient high-Q coils are wound on tough *low loss* fiberglass forms using highly weather resistant *Teflon*® covered wire.

MFJ's Super High-Q Loop™ Antennas

MFJ-1786
$379.95
Ship Code F

MFJ's *tiny* 36 inch diameter loop antenna lets you operate 10 through 30 MHz *continuously* -- including the WARC bands!

Ideal for limited space -- apartments, small lots, motor homes, attics, or mobile homes.

Enjoy both DX and local contacts mounted vertically. Get both low angle radiation for excellent DX and high angle radiation for local, close-in contacts. Handles 150 watts.

Super easy-to-use! Only MFJ's super remote control has *Auto Band Selection*™. It auto-tunes to desired band, then beeps to let you know. No control cable is needed.

Fast/slow tune buttons and built-in two range Cross-Needle SWR/Wattmeter lets you quickly tune to your exact frequency.

All welded construction, no mechanical joints, welded butterfly capacitor with no rotating contacts, large 1.050 inch diameter round radiator -- not a lossy thin flat-strip -- *gives you highest possible efficiency.*

Each plate in MFJ's tuning capacitor is welded for low loss and polished to prevent high voltage arcing, welded to the radiator, has nylon bearing, anti-backlash mechanism, limit switches, continuous no-step DC motor -- gives smooth precision tuning.

Heavy duty thick ABS plastic housing has ultraviolet inhibitor protection.

NEW! **MFJ-1788, $429.95.** Same as MFJ-1786 but covers 40 Meters-15 Meters continuous. Includes super remote control.

MFJ-1782, $339.95. Like MFJ-1786 but control has only fast/slow tune buttons.

MFJ-1780, $249.95. *Box Fan* Portable Loop is about the same size (2x2 foot) as a box fan, complete with handle. Covers 14-30 MHz. Control has fast/slow tunes.

MFJ Portable Antenna

MFJ-1621 **$89.95** Ship Code A

MFJ-1621 lets you operate in most any electrically free area -- apartment, campsite, hotel, the beach, etc. DXCC, WAZ, WAC, WAS have been won with MFJ-1621! Work 40, 30, 20, 17, 15, 12 and 10 Meters with a telescopic whip that extends to 54 inches. Mounted on a sturdy 6x3x6 inch cabinet. Built-in antenna tuner, field strength meter, and 50 feet of RG-58 coax cable. Handles 200 Watts.

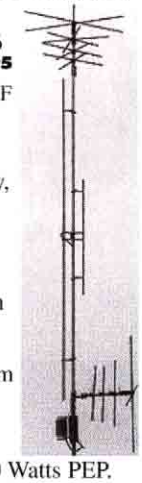
MFJ's G5RV Antenna

MFJ-1778, Ship Code A **$39.95**

Covers all bands, 160-10 Meters with antenna tuner. 102 feet long, shorter than 80 Meter dipole. Use as inverted vee or sloper to be more compact. Use on 160 Meters as Marconi with tuner and ground. Handles full legal limit power. Add coax feedline and some rope or other nonconductor and you're *on the air!*

MFJ halfwave vertical

6 bands: 40, 20, 15, 10, 6, 2 Meters . . . No radials or ground needed



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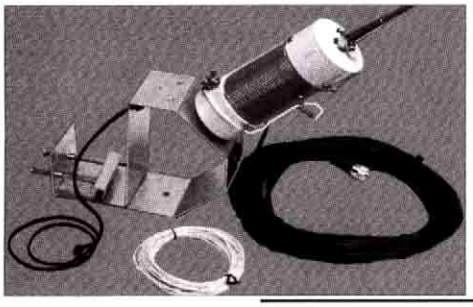

MFJ-1622
$99.95
New!

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.

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!*

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for Antenna Restricted Areas

40, 20, 15, 10 Meters, Automatic Band Switching

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Highly efficient end-loading. Entire length radiates.

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HF mini-Bugcatcher

Highly efficient 40 - 6 Meter base-loaded 5½ foot Bugcatcher mobile antenna . . . Use light duty mounts

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.

MFJ-1624 **$79.95** *New!*

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.

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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.

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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!

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Super easy-to-use! Remote control autotunes to desired band, then beeps. No control cable needed. Handles 150 watts.

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Adjust your antenna tuner for a perfect 1:1 match without creating QRM.

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More MFJ SWR Analyzers™

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MFJ-989C *Legal Limit* Antenna Tuner

MFJ uses super heavy duty components to make the world's finest legal limit tuner

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You can match dipoles, verticals, inverted vees, random wires, beams, mobile whips, shortwave -- nearly any antenna. Use coax, random wire or balanced lines.

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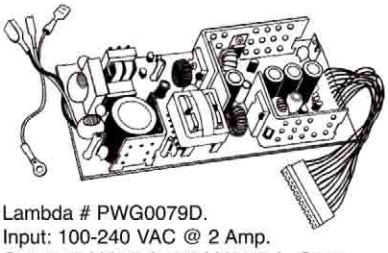

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September Issue	Deadline: July 18, 2003	Ships Mid August 2003
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SAVE BIG ON ANTENNAS, TOWERS & CABLE

TELESCOPING ALUMINUM TUBING

DRAWN 6063-T832

.375	$.70/ft	1.375" ..	$1.75/ft
.500"	$.80/ft	1.500" ..	$1.95/ft
.625"	$.90/ft	1.625" ..	$2.25/ft
.750"	$1.00/ft	1.750" ..	$2.50/ft
.875"	$1.10/ft	1.875" ..	$2.75/ft
1.000"	$1.20/ft	2.000" ..	$3.00/ft
1.125"	$1.35/ft	2.125" ..	$3.50/ft

In 6' or 12' lengths, 6' lengths ship UPS. Call for 3/16"& 1/4" rod, bar stock, and extruded tubing.

CUSHCRAFT ANTENNAS

13B2/A148-10S	$149/85
A270-6S/A270-10S	$79/99
A3S/A4S	$449/539
A50-3S/5S/6S	$95/169/259
A627013S	$189
AR2/ARX2B	$49/69
AR270/AR270B	$85/99
R6000/R8	$319/449
X7/X740	$679/289
XM240	$719

Please call for more Cushcraft items

FORCE 12–MULTIBAND

C3	10/12/15/17/20m, 7 el	$599
C3E	10/12/15/17/20m, 8 el	$649
C3S	10/12/15/17/20m, 6 el	$539
C3SS	10/12/15/17/20m, 6 el	$559
C4	10/12/15/17/20/40m, 8 el	$759
C4S	10/12/15/17/20/40m, 7 el	$679
C4SXL	10/12/15/17/20/40m, 8 el	$979
C4XL	10/12/15/17/20/40m, 9 el	$1119
C19XR	10/15/20m, 11 el	$959
C31XR	10/15/20m, 14 el	$1299

Please call for more Force 12 items

TRYLON "TITAN" TOWERS

SELF-SUPPORTING STEEL TOWERS

T200-64	64', 15 square feet	$1099
T200-72	72', 15 square feet	$1299
T200-80	80', 15 square feet	$1499
T200-88	88', 15 square feet	$1769
T200-96	96', 15 square feet	$2049
T300-88	88', 22 square feet	$1989
T400-80	80', 34 square feet	$1899
T500-72	72', 45 square feet	$1799
T600-64	64', 60 square feet	$1699

Many more Trylon towers in stock!

BENCHER / BUTTERNUT

Skyhawk, Triband Beam	$1129
HF2V, 2 Band Vertical	$239
HF5B, 5 Band Minibeam	$349
HF6VX, 6 Band Vertical	$329
HF9VX, 9 Band Vertical	$349
A1712, 12/17m Kit	$54
CPK, Counterpoise Kit	$129
RMKII, Roof Mount Kit	$159
STRII, Roof Radial Kit	$125
TBR160S, 160m Kit	$119

More Bencher/Butternut–call

M2 VHF/UHF ANTENNAS

144–148 MHz

2M4/2M7/2M9	$95/115/125
2M12/2M5WL	$159/209
2M5-440XP, 2m/70cm	$169

420–450 MHz

440-70-5W/420-50-11	$135/93
432-9WL/432-13WL	$175/229
440-18/440-21ATV	$125/145

Satellite Antennas

2MCP14/2MCP22	$175/229
436CP30/436CP42UG	$229/269

ROHN TOWER

25G/45G/55G	$89/189/239
25AG2/3/4	$109/109/139
45AG2/4	$209/225
AS25G/AS455G	$39/89
BPC25G/45G/55G	$75/99/110
BPL25G/45G/55G	$85/109/125
GA25GD/45/55	$68/89/115
GAR30/GAS604	$35/24
SB25G/45/55	$39/89/109
TB3/TB4	$85/99

Please call for more Rohn prices

US TOWER

MA40/MA550	$849/1399
MA770/MA850	$2359/3649
TMM433SS/HD	$1139/1379
TMM541SS	$1499
TX438/TX455	$979/1579
TX472/TX489	$2459/4579
HDX538/HDX555	$1269/2269
HDX572MDPL	$5899

Please call for help selecting a US Tower for your needs. Shipped factory direct to save you money!

COMET ANTENNAS

GP15, 6m/2m/70cm Vertical	$149
GP6, 2m/70cm Vertical	$139
GP9, 2m/70cm Vertical	$179
B10NMO, 2m/70cm Mobile	$36
SBB224NMO, 2m/220/70cm	$69
SBB2NMO, 2m/70cm Mobile	$39
SBB5NMO, 2m/70cm Mobile	$55
SBB7NMO, 2m/70cm Mobile	$75
Z750, 2m/70cm Mobile	$55
Z780, 2m/70cm Mobile	$69

Much more Comet in stock–call

M2 ANTENNAS

50–54 MHz

6M5X/6M7	$209/299
6M7JHV/6M9KHW	$259/469

HO LOOPS

6M/2M/222/432	$95/45/45/45

HF ANTENNAS

10/15M4DX, 4 Element	$389/439
20M4DX, 4 Element 20m	529
KT36XA, Triband Beam	$1249

More M2 models in stock–please call

GLEN MARTIN ENGINEERING

Hazer Elevators for 25G

H2, Aluminum Hazer, 12 sq ft	$359
H3, Aluminum Hazer, 8 sq ft	$269
H4, HD Steel Hazer, 16 sq ft	$339

Aluminum Roof Towers

RT424, 4 Foot, 6 sq ft	$159
RT832, 8 Foot, 8 sq ft	$239
RT936, 9 Foot, 18 sq ft	$389
RT1832, 17 Foot, 12 sq ft	$519
RT2632, 26 Foot, 9 sq ft	$869

UNIVERSAL ALUMINUM TOWERS

4-40'/50'/60'	$539/769/1089
7-50'/60'/70'	$979/1429/1869
9-40'/50'/60'	$759/1089/1529
12-30'/40'	$579/899
15-40'/50'	$1019/1449
23-30'/40'	$899/1339
35-30'/40'	$1019/1569

Bold in part number indicates windload capacity. Please call for other Universal models. Shipped factory direct to save you money!

DIAMOND ANTENNAS

D130J/DPGH62	$79/139
F22A/F23A	$89/119
NR72BNMO/NR73BNMO	$39/54
NR770HBNMO/NR770RA	$55/49
X200A/X3200A	$129/210
X500HNA/X700HNA	$229/369
X510MA/X510NA	$189/189
X50A/V2000A	$99/149
CR627B/SG2000HD	$99/79
SG7500NMO/SG7900A	$75/112

More Diamond antennas in stock

MFJ

259B, Antenna Analyzer	$219
269, Antenna Analyzer	$299
941E, 300W Antenna Tuner	$109
945E, 300W Antenna Tuner	$99
949E, 300W Antenna Tuner	$139
969, 300W Antenna Tuner	$169
986, 3KW Antenna Tuner	$289
989C, 3KW Antenna Tuner	$309
1798, 80–2m Vertical	$249
1796, 40/20/15/10/6/2m Vert.	$189

Big MFJ inventory–please call

COAX CABLE

RG-213/U, (#8267 Equiv.)	$.36/ft
8X-MINI, Mini RG-8 Foam	$.19/ft
RG-213/U Jumpers	Please Call
RG-8X Jumpers	Please Call

Please call for more coax/connectors

TIMES MICROWAVE LMR® COAX

LMR-400	$.59/ft
LMR-400 Ultraflex	$.89/ft
LMR-600	$1.19/ft
LMR600 Ultraflex	$1.95/ft

TOWER HARDWARE

3/8"EE / EJ Turnbuckle	$11/12
1/2"x9"EE / EJ Turnbuckle	$16/17
1/2"x12"EE / EJ Turnbuckle	$18/19
3/16" / 1/4" Preformed Grips	$5/6

Please call for more hardware items

HIGH CARBON STEEL MASTS

5 FT x .12" / 5 FT x .18"	$35/59
10 FT x .18" / 11 FT x .12"	$129/80
16 FT x .12" / 16 FT x .18"	$119/179
20 FT x .25	$315
22 FT x .12" / 21 FT x .18"	$149/235

GAP ANTENNAS

Challenger DX	$289
Challenger Counterpoise	$29
Challenger Guy Kit	$19
Eagle DX	$299
Eagle Guy Kit	$29
Titan DX	$329
Titan Guy Kit	$29
Voyager DX	$409
Voyager Counterpoise	$49
Voyager Guy Kit	$45
Quick Tilt Ground Mount	$75

LAKEVIEW HAMSTICKS

9106 ... 6m	9115 ... 15m	9130 ... 30m
9110 ... 10m	9117 ... 17m	9140 ... 40m
9112 ... 12m	9120 ... 20m	9175 ... 75m

All handle 600W, 7' approximate length, 2:1 typical VSWR ... $24.95

HUSTLER ANTENNAS

4BTV/5BTV/6BTV	$129/169/199
G6-270R, 2m/70cm Vertical	$169
G6-144B/G7-144	$109/179

Hustler Resonators in stock–call

ANTENNA ROTATORS

M2 OR-2800PDC	$1249
Yaesu G-450A	$249
Yaesu G-800SA/DXA	$329/409
Yaesu G-1000DXA	$499
Yaesu G-2800SDX	$1089
Yaesu G-550/G-5500	$299/599

ROTATOR CABLE

R62 (6, #18)	$.32/ft.
R81/82	$.25/.39
R84	$.85/ft

PHILYSTRAN GUY CABLE

HPTG1200I	$.45/ft
HPTG2100I	$.59/ft
PLP2738 Big Grip (2100)	$6.00
HPTG4000I	$.89/ft
PLP2739 Big Grip (4000)	$8.50
HPTG6700I	$1.29/ft
PLP2755 Big Grip (6700)	$12.00
HPTG11200	$1.89/ft
PLP2758 Big Grip (11200)	$18.00

Please call for more info or help selecting the Phillystran size you need.

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HUGE ICOM DEALS ★ HUGE YAESU DEALS

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 trasceiver 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.

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The exciting YAESU FT-8800R Dual Band Mobile is the rig you've asked for, and it's available now! With a powerful 50 Watts of 2-meter power output (70 cm: 35 W), wide receive coverage, 800+ memory channels with 10 memory groups, independent two-channel operation (V/V, U/U, V/U), optional remote-head mounting kit, and cross-band repeater capability, the FT-8800R is packed with the features you demand, at a price you'll enjoy. And its superb ergonomics and creative firmware design make the FT-8800R the easiest Dual Bander to operate while driving!

144/430MHz DUAL BAND

ACTUAL SIZE
*Simulated LCD display

FT-8800R

144/430 MHz FM DUAL BAND TRANSCEIVER

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TM-V7A
2 meters & 440 MHz

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Kenwood is proud to be the only company chosen as a participant in both the INTERNATIONAL SPACE STATION (ISS) and MIR space programs. The TM-V7A received awards from the Russian Space Agency for its flawless performance aboard MIR. The KENWOOD TM-D700A 144/440MHz FM Dual Bander is scheduled to join the International Space Station in orbit later this year. But is it any wonder? This world class voice and data communicator has technologies which are perfect for any mission, whether on planet earth or in outer space. This all goes to show that operating a Kenwood Amateur Radio is out of this world.

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