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Ham Radio Above 50 MHz

March 1999

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- Mission Impossible? Getting Kids into Ham Radio
- SATERN: Radio Club with a Difference

On the Cover: Ward Wheaton, WB7VVD, and Harold Sibert, KC7AED, operate a red laser station in Phoenix, Arizona. Details on page 70.

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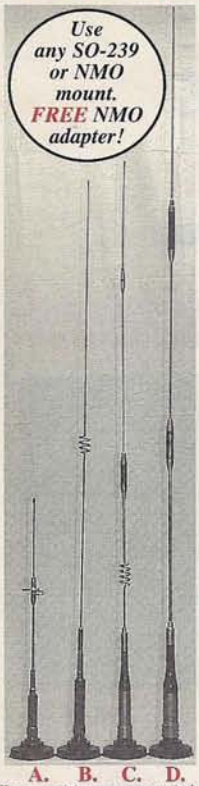

Shown on mini mag mounts, not included.

Each MFJ RuffRider™ mobile antenna comes with MFJ's unique 90 degree "fold-over" feature -- lets you pull into your garage without knocking your antenna over!

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Phased radiators flattens the radiation pattern and concentrates your power to give you *super gain.*

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Rigid, heavy duty solid metal base reduces SWR flutter due to wind vibration. Two Allen set screws securely fastens radiator.

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MFJ mounts are recommended.

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MFJ's *No Matter What*™ Warranty

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144/440 MHz Antenna Tuner with *built-in SWR/Wattmeter*
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MFJ *RuffRider*™ super heavy duty Antenna Mounts

Trunk/Hatchback *Lip* Mount

MFJ-345 **$34.95** add s/h

MFJ's *RuffRider*™ super heavy duty solid steel Trunk/Hatchback *Lip* Mount mounts to any lip on your vehicle.

Extra-wide *four* inch lip and large reinforcing tabs on each side safely distributes the load over your vehicle's lip.

Two large set screws on each end of the mounting lip locks your mount in place. A scratch-proof rubber guard protects your vehicle's finish.

Secures large VHF, UHF and medium size HF antennas even at highway speeds.

Mounts on lips at any angle. Two axis of rotation lets you position your antenna vertically, horizontally or at any desired angle. Serrated swivel joints locks securely in place with huge 3/8 inch set screw.

Has SO-239 base mount. Use adapter for NMO. Includes low loss coax with PL-259 connector, Allen wrenches and protection caps for SO-239 and locking screw, One year MFJ *No Matter What*™ limited warranty.

MFJ-345 Lip Mount is shown mounted vertically to a mini-van's angled hatchback lip. Note extra-wide mount with reinforcing tab at right -- safely secures heavy antennas. Swivel mount is adjusted so antenna is near vertical away from mini-van to clear luggage rack.

Mirror/Luggage *Pipe Clamp* Mount

MFJ-340 **$34.95** add s/h

MFJ's *RuffRider*™ Mirror/Luggage *Pipe Clamp* Mount mounts on support rod of mirror, luggage rack or spare tire carrier of your truck, van, RV or SUV. Mounts on any horizontal, vertical or angled rod or pipe up to 5/8 inches in diameter.

Secures VHF, UHF and medium size HF antennas even at highway speeds.

Two axis of rotation lets you position your antenna to any desired angle. Serrated swivel joints locks securely in place with huge 3/8 inch set screw.

Convenient *Thumb and Finger* turn knob makes fold-over operation quick and easy. Locks in twelve positions.

Fold down your antenna at night when pulling into your garage and quickly put it back up to its operating position in the morning.

Has SO-239 base mount. Use adapter for NMO. Includes low loss coax with PL-259 connector, Allen wrenches and protection caps for SO-239 base mount and locking screw, MFJ's famous One year *No Matter What*™ limited warranty.

MFJ-340 Pipe Clamp Mount is shown clamped solidly to vertical mirror support rod on a pickup truck. Antenna is slightly swiveled to the left and positioned about 30 degrees from vertical to clear cab of the pickup truck.

MFJ's *MaxStrength*™ Hi-Flux Antenna Magnet Mounts

MFJ's *MaxStrength*™ high-flux magnet mounts give you maximum pull strength -- your antenna stays on top of your vehicle at highway speeds.

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MFJ-333 BS/BM, $14.95. Light to medium duty magnet mount. Low profile 3.5 inch diameter black base weighs 1½ lbs. For small to medium size antennas.

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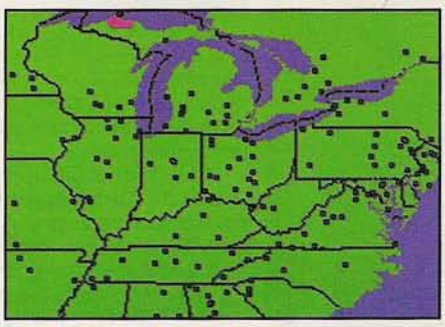

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Next Month: "CQ VHF Review: Kenwood TH-D7A and VC-H1" by Gordon West, WB6NOA

The Road Ahead

The road of ham radio growth has been bumpy lately—and we just hit a big pothole—there were fewer licensed hams in the U.S. at the end of 1998 than there were at the end of 1997. How do we turn things around?

This month's editorial is a shared soapbox, a brainstorming session of sorts, on ways to approach declining ham radio growth. Ideas and suggestions from members of the Internet VHF reflector are included, and the "brainstorming session" extends beyond "Line of Sight" (to coin a phrase)—with additional points of view in our "Op-Ed" and "Beginner's Corner" columns, and some concrete suggestions in KC7GCL's article, "Mission Impossible? Getting Young People Interested in Ham Radio." I invite you to read it all, and then to share your ideas with us. But please—constructive, positive suggestions only.

—W2VU

"The human voice is the most powerful communication tool there is, and that is where ham radio shines above computers."
—Caitlin Martin, KU4QD

"The road" has been a vitally important part of our society in the 20th century. Before the age of fast cars and superhighways, the vast majority of Americans spent most of their lives close to where they grew up. Travel was slow, generally uncomfortable, and expensive. All that has changed, of course. In the second half of the century, we became the most mobile society in history. It's unusual today for any of us to stay in one house, one job, one marriage for a lifetime. "The road" is ingrained in our culture, from Robert Frost's "The Road Not Taken" to "The Long and Winding Road" taken by the Beatles; from "Route 66" on TV in the 60s to the 30-plus year voyages of the Starship Enterprise (think about it... they're *always* on the road).

But there are those for whom the superhighway does not beckon. There are those for whom the trip is at least as rewarding as the destination. These are the people who made Charles Kuralt's "On the Road" series on the CBS Evening News so popular, the people who enjoyed William Least Heat Moon's book, *Blue Highways*, about the America you find when you travel the back roads of our nation, the highways often colored blue on road maps. Both Kuralt and Moon went *off* the main roads, avoiding the interstates and reporting on the wonderful and fascinating *people* they met along the way.

Hams tend to be in this latter group: knowing *how* something works is at least as important as knowing *that* it works, whether it's a radio, a computer, or the ionosphere. How many hams do you know who buy a new radio, and immediately open up the case to take a look inside? Do they think they're going to find something broken? No, they just want to see how it's put together. I remember that, when my boss and I both got digital cellular phones at about the same time last year, we immediately called each other—even though both of us were standing in his office—and then spent the next 10 minutes talking about possible reasons for the half-second delay we encountered (best we could figure was that at least one half of the call was going through a satellite link, with a 46,000-mile trip to slow things down; and since we're using two different providers, there might have been two satellite hops involved!). The trip was what mattered here, not the destination. If we only wanted to talk to each other, we would have kept the phones turned off. But no, making it work—and trying to figure out why it worked the way it did—that's what was important to us as hams.

Who You (Get to) Know

The other part of the *Blue Highways* mindset that also applies to many hams is that the most important part of the trip isn't where you go, or how you get there, but *who you meet* along the way and what you learn from them. Yes, ham radio is a technical hobby, but, first and foremost, it is a *people* hobby. We use our radios to communicate with other people, plain and simple. The point was made quite eloquently in an Internet posting by Caitlin Martin, KU4QD, calling on the ARRL to try to reverse the slide in licensing numbers with an ad campaign depicting ham radio "not as a technical hobby (where we have to compete with computers), but as a people hobby."

The human voice is the most powerful communication tool there is, and that is where ham radio shines above computers. Public service work (read: helping people out) can also be a good thing to promote....We also need to show that ham radio need not be expensive. I just talked to someone on my little Alinco HT, which sells for all of $78 new. Finally, we need to show that this isn't an old man's hobby or a good 'ol boys club. I am a 38-year-old

By Rich Moseson, W2VU, Editor (w2vu@cq-vhf.com)

woman, and I really think other people like me can find this hobby to be a pleasure (OK, it's also not a bad way to meet guys).

Many people responded to Caity's ideas with suggestions of their own. Among the most interesting was a reply from Oscar Morales, Jr., CO2OJ, in Cuba, where ham radio is growing steadily. Oscar's remarks are reprinted in this month's "Op-Ed" column.

Dan Evans, N9RLA, pointed out that getting new people into ham radio is only part of the problem...

Once these hams are licensed, how do we keep them active? I think the biggest problem we have right now is not necessarily low numbers, but the hams we have are inactive. We need to put more focus on keeping people involved and active. How do we keep those million+ hams (worldwide) on the air? I know, in my area, there are dozens of licensed hams. But you rarely hear more than three or four on a regular basis (and that's including 2-meter FM).

I make a point of encouraging all the hams in my area to get on and give me a contact in the contests. Most of them are devout non-contesters but will get on to "give me a point." I've even heard a few stick around and work a few more people. I consider those "successes." I think we need to spend more time trying to keep the hams we have on the air.

"The Hams We Have"

I think Dan has hit on a very important point. If you look at the U.S. licensing statistics for 1998, the first year in more than two decades that the total number of licensees has gone *down*, you'll see increases among Technician and Extra class licensees, but decreases in the number of Advanced, General, Tech-Plus, and Novice class hams. The increase in the ranks of Extras (+917) was hardly enough to offset the drops in the number of Advanced (-2,142), General (-2,742) and Tech Plus (-1,508) class hams. And that's to say nothing of the 6,447 Novices who disappeared from the license rolls during 1998. Fortunately, there were 10,832 new Technicians licensed during the year, so the overall net decrease was only 1,090, or 2/10 of 1%.

As Dan points out, it seems our biggest problem right now is not bringing new people into ham radio (although we could be doing a lot better at that; there were 20,000 new Techs in 1997 versus 11,000 in '98), but in keeping the people we already have. Even after factoring out the upgrades to Extra, we had nearly 12,000 hams in 1998 who let their licenses expire. Why are all these "hams we have" letting their licenses expire without renewing them? Why aren't they on the air? How have they lost the spark of interest and excitement? And, most importantly, what can the rest of us do to bring them back, and to stanch the flow of inactive hams into "license-lapsedom"?

Ed Bruns, W3EKT, offered one possible explanation:

Over the last 15 years, I have seen an increase in the number of new hams who are around 40...they spend whatever it takes for instant gratification, 20-, 30-, 50-thousand dollars. Every time they upgraded they got a new set of call letters. They go from Novice to Extra in five years, get tired of it, sellout and buy a boat, or plane, or whatever roadster catches their fancy. Midlife crisis? I don't know."

Ed said he couldn't offer any solutions to the problem, but, once again, we have some good ideas from the other side of the Florida Straits—Arnie Coro, CO2KK, offered the following suggestions from Havana:

I think that VHF/UHF and microwaves are going to play a very important role in the future of the hobby, especially if we all are able to promote the use of the spectrum segments assigned to our hobby. What's happening on 50 MHz is a good example of what can be achieved when people are *motivated* and try to learn more about propagation....

Now, how do you *motivate* people? Well, here is how I have done it many times: send a piece of equipment to an amateur that you know may use it. Let's say I send a 50-MHz receiving converter to a station in CO6 land (one of Cuba's central provinces). Two weeks later, he comes back to me on 40 meters, saying that he has heard nothing. Then it is time to explain to him a lot of things about 6-meter DX. Maybe a week or a month later, he will be looking for me on the national traffic net, asking for a circuit diagram for a transverter...he heard Argentina, Brazil, Mexico, Belize, and Canada on 6 meters! Then phase three...you do have to use a lot of time and patience to "Elmer" your "student" in proper VHF construction practices and techniques.

What's missing, Rich? In my humble opinion, I think that what is missing is devoting more time to share with other amateurs both your operating and technical know how (if you happen to be a "techie"). More activity does the job—more promotion, as Oscar said in his posting (*now this month's "Op-Ed"—ed.*), more relating to the local community...all those things will not only bring in more amateurs, but will also make those who already have a license more active!

Let's see what happens when the new generation of amateur satellites is really active! Or what about the International Space Station? Once a large crew is on board, we may see some nice QSOs going on all the time. But...don't forget that everything starts when you sit down at your station, flip the switch, and start operating.

"I think the biggest problem we have right now is not necessarily low numbers, but the hams we have are inactive. We need to put more focus on keeping people involved and active."—Dan Evans, N9RLA

Arnie's ideas are excellent and well-stated, but hardly new. This is not the first time we've called on hams in these pages to put more time and effort into "Elmering"—sharing our knowledge—and less into complaining and criticizing. In his "Beginner's Corner" column this month, Pete O'Dell, WB2D, says we need to do a better job of "selling" ham radio (a message very similar to KU4QD's above), and CO2OJ says in his "Op-Ed" piece that our recruitment problems would be solved if every ham was to bring just one new person into the hobby every five years. Arnie ups the ante: we not only have to bring in new hams, but help them get active and get the most out of ham radio. Otherwise, when their licenses expire 10 years down the road, they'll be among those "non-renewal" statistics.

Oscar talks about our collective responsibility for the welfare of ham radio. But, as Arnie points out by example, there's also a matter of individual responsibility. It's too easy to let someone else do it, or let the ARRL do it. The real challenge—and best chance for success—comes in doing it ourselves, and taking a share of that collective responsibility to keep ham radio healthy as we travel down the road into the 21st century. ■

Help Wanted

If you're involved with a project or activity that you think would be of interest to your fellow *CQ VHF* readers, we'd like to hear from you. Article submissions are welcome, as are "Op-Ed" opinion pieces if you have a point of view you'd like to share about a VHF-related topic. You can contact us by mail at 25 Newbridge Rd., Hicksville, NY 11801 (send an SASE for writers' guidelines), by e-mail to <cq-vhf@cq-vhf.com>, or via our World Wide Web page, <http://www.cq-vhf.com>. We look forward to hearing from you.

VHF News

FCC Crackdown Continues

The FCC's newfound fervor in citing alleged rules violations by amateurs appears to be more than a flash in the pan, as reports of FCC "pink slips" continue to crop up all over the country. For years, the ARRL and other ham organizations have been complaining about lack of FCC enforcement in the amateur bands. It now seems that two key actions late last year have turned things around: the transfer of amateur enforcement responsibilities from the Wireless Telecommunications Bureau (WTB) to the Compliance and Information Bureau (CIB) and the appointment of Riley Hollingsworth, K4ZDH, to coordinate amateur enforcement efforts.

The crackdown also appears to be part of a wider enforcement effort by the FCC, including actions against pirate radio stations and warnings to commercial tower owners that marking and lighting rules must be strictly observed. That last item may affect hams. "Newsline" reports that the FCC has re-emphasized the fact that *all users* of a commercial radio tower are responsible for its proper maintenance. So if your repeater antenna is on a commercial tower that's not properly marked or lit, the tower owner *plus all users* could face FCC fines.

SUNSAT May Be in Orbit

By the time you read this, if all has gone according to plan, South Africa's SUNSAT satellite will be in orbit. Launch was scheduled for January 14, just after this issue's deadline, from Vandenberg Air Force Base in California, on a Delta II booster. SUNSAT was to share a ride into space with the U.S. Air Force's ARGOS (Advanced Research and Global Observation Satellite) and Denmark's Orsted satellite, which will be studying the Earth's magnetic and electrical fields.

SUNSAT was built by students at the University of Stellenbosch in South Africa, working closely with AMSAT-ZS. Its amateur payload includes a 2-meter FM "parrot" repeater on 145.825 MHz, which will record uplinked signals and retransmit them on the same frequency, a 1200-baud standard packet mailbox, and a 9600-baud packet mailbox. Watch for details and updates on the *CQ VHF* Web site at <http://www.cq-vhf.com>.

SEDSAT/PANSAT Get OSCAR Numbers

Two amateur satellites launched late last year are now official members of the "OSCAR" family. SEDSAT, built by students at the University of Alabama at Huntsville, has been named SEDSAT-OSCAR-33 (SO-33), and the Naval Postgraduate School's PANSAT satellite is now PANSAT-OSCAR-34 (PO-34). SO-33 is still having significant power problems and is not yet available for amateur use. PO-34 is continuing to be prepared for general use.

Software Glitches Plague Several Satellites

Three amateur satellites have been having unexplained software problems recently, according to the "SpaceNews" newsletter. On December 21, the operating software on UO-22 crashed after about a year and a half of flawless operation and had to be shut down until new software could be uploaded. Then, the transmitter on KO-23 "tripped" for unknown reasons, shutting down that satellite until controllers could get it reset. Finally, software uploads and other command communications to the TO-31 satellite have been slowed down by user traffic, prompting control operator Chris Jackson, G7UPN, to warn that it might be necessary to close down the satellite's BBS during software loading and other command activities.

Space Station(s') Ham Stations

Gear for the initial ham station aboard the International Space Station was due to be delivered to the Kennedy Space Center in Florida on January 20, where it will be integrated into the overall equipment package slated for launch into orbit later this year or early next year. According to the *ARRL Letter*, the "Phase 1" ham station consists of two FM handhelds—one each for 2 meters and 70 centimeters—set up for voice and packet operation, plus power supplies, cables, and accessories. This will serve as a temporary ham station until equipment for a permanent and more complex setup is launched in three or four years.

Meanwhile, cosmonauts aboard the Russian Mir space station are continuing to send and receive slow-scan TV (SSTV) signals, and it appears that they're planning to keep the SSTV station on 2 meters, instead of shifting to the 70-centimeter frequency coordinated for SSTV by the International Amateur Radio Union. The original announcement indicated that the cosmonauts would QSY to 70 centimeters after a few days of testing on 2 meters. Now, "SpaceNews" and "Newsline" report that the crew will operate SSTV on weekends on 145.985 MHz, while maintaining normal packet operations on that frequency during the week.

ARRL Merges Field Services, Education Departments

The ARRL has consolidated its Field Services Department and its Educational Activities Department into a single department of Field and Educational Services. The Field Services Department had provided headquarters support for ARRL volunteers around the country (the Field Organization), while Educational Activities worked with ham instructors and professional educators, was the main contact point for prospective hams, and coordinated ARRL involvement in the SAREX (Space Amateur Radio EXperiment) and ARISS (Amateur Radio on the International Space Station) programs. According to the League, Rosalie White, WA1STO, will oversee the day-to-day operation of the combined department and will continue to be the primary staff contact on space matters.

"Emma's Challenge"

Young hams in the United Kingdom are responding to a challenge issued by the UK's 1998 Young Amateur of the Year, Emma Constantine, 2E1BVJ. "Emma's Challenge" involves building a

Compiled by the CQ VHF Staff

portable 3-watt, 6-meter FM transceiver for less than £50 (roughly equivalent to doing the same thing here for under $100). Young hams have until the end of 1999 to submit their entries. A report in "Newsline" says various sponsors have come on board to support the challenge, including the UK's Radiocommunications Agency (the British equivalent of the FCC). For more information, write to *RadCom* magazine, c/o the Radio Society of Great Britain (RSGB), e-mail address: <radcom@rsgb.org.uk>.

Hey, everybody! How about making this an international challenge? Any takers among our under-18 hams? Any prize sponsors in the industry? We'll take on the challenge of sponsoring and promoting the event here in the U.S. and assembling a panel of judges to review the entries. Let's see if our young hams can match wits, and soldering irons, with their counterparts across the pond. Watch for more next month.—ed.

Nominate Young Hams for Recognition

Nominations are open for the two major awards recognizing the accomplishments of young hams in the U.S. Newsline's "Young Ham of the Year" award (co-sponsored by *CQ* magazine) is accepting nominations until May 31 to recognize hams under age 18 who have provided outstanding service to the nation, their communities, or the state of the art in communications through their ham radio activities. Official nominating forms may be requested by mail with an SASE (self-addressed stamped envelope) to: 1999 Young Ham of the Year Award, c/o Newsline, 28197 Robin Ave., Santa Clarita, CA 91350; or may be downloaded from the Newsline Web site at <http://www.arnewsline.org>.

The ARRL's Hiram Percy Maxim award goes to a ham under age 21 "whose accomplishments and contributions are of the most exemplary nature within the framework of amateur radio activities." Nominations must be sent to your ARRL Section Manager, who must have them in time to forward them to ARRL Headquarters by March 31.

Scholarships Available

While we're on the topic of young hams, both the Dayton Amateur Radio Association (DARA) and the Foundation for Amateur Radio (FAR) are offering a variety of scholarships for the 1999–2000 academic year. DARA's scholarships—up to $2,000 each—are open to any ham graduating high school in 1999 and planning to attend an accredited post-secondary school. For details and an application, send an SASE to DARA Scholarships, 45 Cinnamon Court, Springboro, OH 45066. Application deadline is June 15.

FAR administers 66 separate scholarships ranging from $500 to $2,500. Applications are open to any hams planning to pursue a full-time course of post-secondary study and who have been accepted by, or are enrolled in, an accredited university, college, or technical school. For more information and an application, write to FAR Scholarships, PO Box 831, Riverdale, MD 20738. Requests must be postmarked before April 30.

Follow That Football!

In a reprise of the very first demonstration of APRS (Automatic Position Reporting System) nearly a decade ago, ham radio and APRS once again accompanied the football for the annual Army-Navy game on its trip from the U.S. Naval Academy in Annapolis, Maryland, to the stadium in Philadelphia, Pennsylvania.

This time, however, "Newsline" reports, the system included a linked GPS (Global Positioning System) receiver for exact location data and a Kenwood VC-H1 SSTV camera, mounted in the football van, which provided live shots of the runners who accompanied the ball on its journey. Both the tracking data and the pictures were viewable on the World Wide Web, which didn't exist when APRS first tracked the Navy football from Annapolis to Philly.

VYO New Prefix for Nunavut

Canada's new territory of Nunavut is getting its own ham radio prefix. According to the Radio Amateurs of Canada, hams in Nunavut will have a VY0 prefix, effective April 1, 1999. Nunavut used to be part of the Northwest Territories, the remainder of which will continue to use the VE8 prefix. So when the aurora comes rolling in and you hear a VY0 callsign, you'll know it's from Nunavut!

CQ VHF Ham Radio Above 50 MHz

EDITORIAL STAFF

Richard S. Moseson, W2VU, Editor
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Bernadette Schimmel, Editorial Assistant

CONTRIBUTING STAFF

Gordon West, WB6NOA, Sr. Contributing Editor

Kent Britain, WA5VJB, Microwaves and Antennas
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Dave Ingram, K4TWJ, How It Works/Project Corner
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CQ Communications, Inc.
25 Newbridge Road
Hicksville, NY 11801 USA.

Offices: 25 Newbridge Road, Hicksville, New York 11801. Telephone: (516) 681-2922. FAX (516) 681-2926. E-mail: CQVHF@aol.com; 72127.745@compuserve.com; cqcomm@delphi.com; WWW:<http://members.aol.com/cqvhf/>. CQ VHF (ISSN 1085-0708) is published monthly by CQ Communications Inc. Periodical postage paid at Hicksville, NY 11801 and additional offices. Subscription prices (all in U.S. dollars): Domestic—one year $24.95, two years $45.95; Canada/Mexico—one year $34.95, two years $65.95; Foreign Air Post—one year $44.95, two years $85.95.

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Letters

Your Spot to Speak Out

CQ VHF *welcomes comments and suggestions from readers. We'll print a representative sampling each month, and we reserve the right to edit letters for length or style. All letters must be signed and show a return mailing address or valid e-mail address. Writers' names will be withheld from publication upon request. Address letters to: Letters,* CQ VHF, *25 Newbridge Rd., Hicksville, NY 11801; or via e-mail to <letters@cq-vhf.com>. Please specify that it is a letter for* CQ VHF *magazine.*

"I Carry a Badge..."

Dear *CQ VHF*:

I just finished reading Peter O'Dell's article "Ooooops..." in the January issue of *CQ VHF* magazine! Outstanding article! We sure have our share of Ham Radio Police in San Diego, California! Brings back some fine memories of juvenile conduct, messing with the self-appointed police of the radio waves by really pushing Part 97! But we stayed within the rules, and they went crazy! This is supposed to be a hobby, and some people take things too seriously! 73,

Alex Groza, WB6DTR
Santee, California

Lost in the Ozone

The following was sent to CQ VHF *author David Dunham, WA1CUH:*

David—I read your article on ozone layer propagation in the January 1999 issue of *CQ VHF* and have some comments on the mechanism you propose. An electromagnetic wave traveling in a medium will be attenuated exponentially if its frequency corresponds to a resonant frequency of the medium, such as the electron plasma frequency or a molecular energy level transition. The energy will not be reradiated coherently (thus not acting like a repeater) but randomly and isotropically. I also find it unlikely that there are any energy levels in ozone corresponding to a frequency in the 144-MHz range; molecular spectra in general occur in the infrared and above.

You might find Chapter 7 of Jackson's *Classical Electrodynamics* a useful reference. I would be happy to discuss these ideas further.

Sincerely,

Paul Schoessow, KB9SAT
Downers Grove, Illinois

Paul—David wanted to take a look at the book to which you referred him before responding directly, so I'll answer with a couple of questions of my own. Assuming that what you say is true, then how do we account for any sort of radio signal refraction? If I understand my physics correctly (and I'm certainly no expert in physics), then if some sort of energy—say electromagnetic energy at radio frequencies—excites a molecule to a higher energy state, then when that molecule reverts to its normal energy state, it releases any additional energy it had absorbed, either as heat or electromagnetic radiation. This must happen because energy can neither be created nor destroyed, only altered in form. In other words, if signals at HF and VHF frequencies can be reflected coherently off of the E- *and* F- *layers of the ionosphere, then why shouldn't the same process permit them to be refracted coherently from the ozone layer?*

Anchors Aweigh!

Dear *CQ VHF*:

I keep hearing how expensive amateur radio is. Readers interested in a fun and economical project should consider 6-meter AM. "boatanchors" ('60s and '70s vintage radios) can be found costing anywhere from nothing to $100. Get a couple friends, search out some equipment, hang a dipole or build a vertical and have a ball! See you on 50.400 MHz AM.

Mike Wagner, K8SWL

Where Have All the Elmers Gone?

Dear *CQ VHF*:

I would like to thank and congratulate you on your commitment to the "Beginner's Corner," and the "Basics" column. As a long time newsstand purchaser of both *CQ* and *CQ VHF*, and a ham wannabe, these columns give me hope that I will one day build the confidence to "go it alone," since there's no such thing as an "Elmer" anymore. The OMs' condescension rains hard on the newcomer, and I've been a newcomer for 25 years. How much code proficiency was required to come up with the wireless mic, the pager, or the cellular phone? (We all know where they were invented.) How much code proficiency was required to come up with e-mail? (*We* know where packet was invented.) What's so sacred about HF phone? Presumably, a novice could create untold amounts of interference at propagation distances. How much code proficiency dose it take to interfere with your neighbor's TV on VHF or UHF?

Where have all the Elmers gone?

As a lover of off-shore boats, a ham radio license is essential, but Morse code is no longer required on the high seas. "Public service, Communication, Investigation, and Technical Education?" All I can do is keep buying your magazine. What's a newcomer-(ham wannabe) to do?

Stewart G. White
(via e-mail)

Stewart—It sounds like you've had an unpleasant encounter with one or two of our closed-minded brethren. But we're not all like that. Is there more than one radio club where you live? More than one repeater? More than one group of people giving license courses and exams? If so, perhaps you'd do well to check out some of the alternatives—you might find a new group of friends. Meanwhile, you've pointed out a host of good reasons to get your Technician license: the communications advances you describe indeed got their start on the VHF ham bands. And no, there's nothing sacred about HF phone. So what's stopping you from getting your Tech license and beginning to enjoy all that Ham Radio Above 50 MHz has to offer? Go for it! That's what a ham wannabe can do!

Product Update

MFJ VOX Speaker/Microphone

For mobile hams and emergency operators or anyone who wants hands-free operation, the MFJ-298I speaker/mic features an electronic adjustable VOX control and is compatible with most ICOM, Yaesu, RadioShack, Alinco, and ADI handheld transceivers with two prong plug-ins. In the VOX position, you just talk and the MFJ-298I automatically keys your HT; a "TRANSMIT" red LED lights up while your VOX is enabled. The VOX mic picks up your voice, but not background sound. Two condenser microphones are installed for feedback prevention. Sensitivity is adjustable by rotating the trimmer switch which accommodates loud or soft voices. With the VOX speaker/microphone in the appropriate position (attached to your front pocket or lapel) the sensitive microphone easily picks up your normal speaking voice. The VOX has an ON/OFF switch. Transmission is voice activated in the ON position; in the OFF position, you can use the MFJ-298I as a regular speaker/microphone and transmission is activated only by pushing the PTT switch. It uses two "AA" batteries for VOX operations; batteries are saved when the VOX is in the OFF position.

A durable plastic speaker mic fits comfortably in the palm of your hand and it includes a free external earphone which can be connected to the earphone jack for total hands-free operation or for monitoring the frequency. The MFJ-298I features a 360 degree rotating lapel clip; 54 inches of stretchable, retractable cord from speaker to plug; heavy duty molded plastic at the bend points to protect your speaker/microphone for years of dependable use.

The MFJ VOX Speaker/Microphone costs $39.95 and comes with MFJ's No Matter What™ one-year limited warranty.

To order or for your nearest dealer, call (800) 647-1800; Fax: (601) 323-6551; E-mail: <mfj@mfjenterprises.com>; or check out dealer/ordering information at: <http://www.mfjenterprises.com>.

Circle 100 on reader service card

ADI's "Virtual Valuemobile"

Owners of PC-programmable ADI AT-600 dual-band transceivers and PROG-600 PC programming kits can now take their radios "on tour," by downloading custom radio data files for cities all across the U.S. directly from ADI's Web page. Not only will you be able to painlessly program your handheld with all of the local repeaters, but whenever you travel, you'll be able to load files for your destination as well as any stops along the way.

To use these files, you must have an ADI AT-600 dual-band handheld and the PROG-600 programming software for Windows. Each file contains a list of local repeaters and popular out-of-band receive-only frequencies for an individual area. These files were compiled from input from ADI users and dealers and are not intended to be a comprehensive list of all of the repeaters in a given area. Instead, they are meant as a starting point for finding activity on 2 meters and 70 centimeters. Each file contains a mix of high-level and local FM repeaters.

Data files are available for a host of cities in the U.S., including Anchorage, Atlanta, Austin, Boston, Buffalo, Chicago, Dayton, Denver, Detroit, Fresno, Hartford, Honolulu, Houston, Huntsville, Kansas City, Las Vegas, Los Angeles, Miami, Milwaukee, New York, Oklahoma City, Portland, Richmond, San Francisco, Seattle, Tampa, and Tempe. More cities are planned, so if your favorite area doesn't appear on the list, just drop a note to ADI at: <premier@adi-radio.com> with the city/cities you'd like to see added.

To download these data files at no charge, visit the Premier/ADI Web page at <http://www.adi-radio.com/radios/software/rdfs/index.html>.

Circle 101 on reader service card

Orion NEC4WIN95 v2.0

Orion Microsystems of Montreal has released version 2.0 of its NEC4WIN95 antenna simulation software. The program runs on Windows 95, 98, or NT. Antennas are defined in either spreadsheet format or ASCII files, and both antennas and patterns are displayed in 3D and can be freely rotated using only the mouse. The program includes a long list of additional useful features.

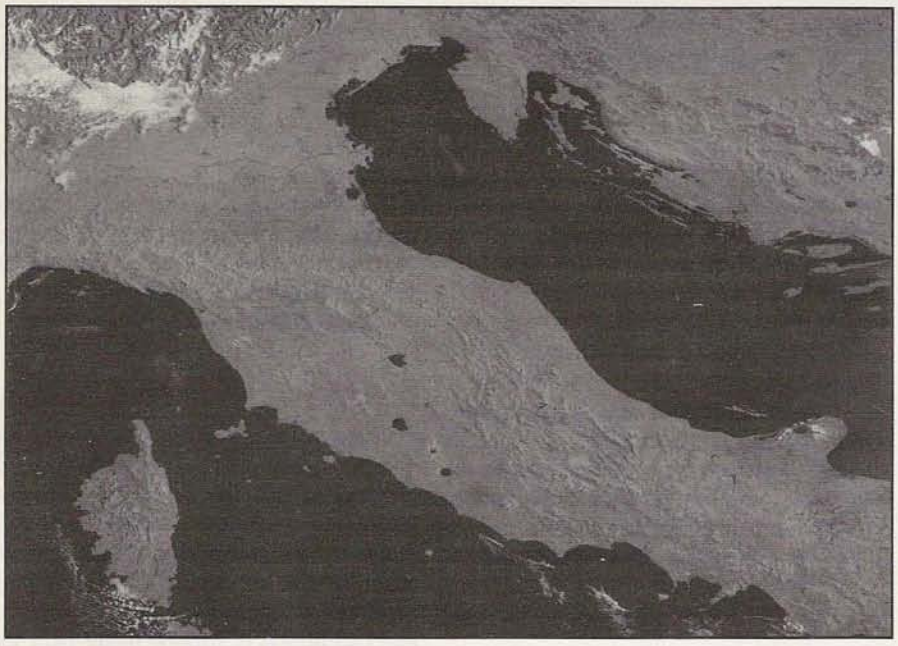
A 30-day evaluation version is available and may be downloaded from Orion's Web sites, at <http://www.orionmicro.com> and <http://www.cam.org/~mboukri>. NEC4WIN95 is $60 U.S. when ordered directly; $70 for Internet credit card orders. For more information, contact Madjid Boukri, VE2GMI, at Orion Microsystems, 197 Joncaire, Ile Bizard, QC H9C 2P7 CANADA; Phone: (514) 626-5002; E-mail: <mboukri@orionmicro.com>.

Circle 102 on reader service card

Hi-Res Weather Satellite Software

HRPT for Windows 95/98/NT—produced in England by Timestep and sold in North America by Spectrum International—is a powerful new system for resolving the high-resolution (1.1-km) digital images from the NOAA 12, 14, and 15 weather satellites. As its name suggests, it is completely Windows 95, 98, and NT compatible.

The HRPT package provides automated operation for unattended reception of images from the three satellites. The software includes all of the features in the now-discontinued DOS version, including routines for processing, displaying, and storing the data, plus new features that take advantage of the Windows 95 operating system. Element updates are easily available by automatic Internet connection.



HRPT (High Resolution Picture Transmission) is a digital data format transmitted by the NOAA polar orbiting satellites in the 1700-MHz weather satellite band. Since the signals are relatively weak, a high-gain dish antenna is needed. Because high gain results in a narrow beamwidth, the antenna must track the satellite, in real time, as it crosses the sky. This is done with a classic Az/El (azimuth and elevation) tracking system similar to that used for tracking amateur satellites.

Timestep also produces hardware and software for receiving standard analog APT (Automatic Picture Transmission) signals from all polar orbiting satellites, and from Meteosat, GOES and other geostationary satellites. Spectrum sells entire systems for receiving weather satellites (expect to spend between $3,500 and $4,000 to start from scratch), including the Timestep software.

For additional information, contact Timestep at P.O. Box 2001, Newmarket, CB8 8XB, ENGLAND; Phone: +44 (0) 1440 820040; Fax: +44 (0) 1440 820181, Internet: <http://www.Time-step.com>; E-mail: <sales@Time-step.com>. In North or South America or the Far East, contact Spectrum International, Inc., P.O. Box 1804, Concord, MA 01742 USA; Phone: (978) 263-2145; Fax: (978) 263-7008; E-mail: <spectrum@ma.ultranet.com>.

Circle 103 on reader service card

That Warm Glow Is Back

Easton, Pennsylvania-based Triton Services is manufacturing 3-500Z and 4-400A/C tubes to original Eimac specifications, marking the return of RF amplifier tube manufacturing to the U.S. According to the *ARRL Letter*, Triton purchased Eimac's Glass Tube Division a few years ago, including the original manufacturing equipment and technology, and has now gotten the tubes back into production.

The new Triton tubes are available exclusively through D&C Electronics, 3089 Deltona Blvd., Spring Hill, FL 34606; Phone: (800) 881-2374; Fax: (352) 683-9595; E-mail: <tube@gate.net>; World Wide Web: <http://www.dandcelectronics.com>.

Circle 104 on reader service card

Four New Books (and One CD) from Prompt Publications

Prompt Publications, an imprint of Howard W. Sams, has introduced several new publications of interest to hams.

Simplifying Digital Signal Processing, by Rajesh J. Shah, breaks down the process of digital communications into its simplest forms, building in a logical progression from the basic mathematical theories to practical concepts, with plenty of charts, figures, and tables to ensure the subject is fully understood. Included in the discussions are signals, transforms, digital-to-analog and analog-to-digital converters, system components, signal processing, systems, filters, and DSP applications. This book will occupy a prominent position on the reference shelf of anyone interested in digital processing or who wants to fully understand the subject from the ground up. List price is $29.95.

The *Components Identifier & Source Book, Second Edition*, by Victor Meeldijk, is a vital tool for anyone who wants to make the process of identifying and locating components easier and faster. According to the publisher, no other book on the market lists as many manufacturers of such diverse electronic components. The source book was written to assist technicians and system designers in identifying components from prefixes and logos; find sources for various types of microcircuits and other components; aid in cross reference of component types to manufacturers; provide cross reference of trade names, abbreviations, and part number prefixes to the manufacturer; provide listings of the worldwide manufacturing and sales office addresses; and list manufacturers who provide replacement devices and vendors who specialize in stocking and locating discontinued devices. The *Components Identifier & Source Book, Second Edition* sells for $34.95.

Newly revised and updated, *Semiconductor Cross Reference CD-ROM* is a comprehensive guide to replacement data for engineers, technicians, students, and those who work with semiconductors. With more than 490,000 part numbers, type numbers, and other identifying numbers listed, technicians will have no problem locating the replacement or substitution information. The *Semiconductor Cross Reference CD-ROM* covers all major types of semiconductors, including bipolar transistors, FETs, diodes, rectifiers, ICs, thermal devices, SCRs, LEDs, and modules. It also features replacements for NTE, ECG, RadioShack, and TCE, making this CD-ROM four cross-references in one. This reference includes an up-to-date listing of all original equipment manufacturers, making it easy to find all necessary parts.

Designed to be simple to use and understand, the CD-ROM gives users the advantage of a very speedy search. It also features a cross-reference of similar type numbers that have the same semiconductor replacements, something the paper version does not contain. The CD-ROM will run on PC platforms using Windows® 95, 98, or Windows NT. List price is $29.95.

Electronic Circuit Guidebook, Volume 5: Digital Circuits, by Joseph J. Carr,

K4IPV, is about the basics of digital electronics and the fundamental circuits that make up not only computers, but all digital products. It joins other titles in the *Electronic Circuit Guidebook* series in providing you with encapsulated practical information about specific areas of electronics technology. The *Guidebook* looks at logic gates, digital codes, clocked and unclocked flip-flops, practical and arithmetic circuits, number systems, display and decoder devices, data converters, microcontrollers, registers, and counters. List price is $29.95.

Telephone Projects for Electronics Experimenters, by Carl J. Bergquist, will furnish you with the fundamentals and basic history of telephone technology and some hands-on projects for your enjoyment. Telephony is a remarkable technology that has grown to be an indispensable part of our culture. The telephone lines represent an "electronic interstate" system that allows communication in a variety of ways. Since deregulation of the industry, the market has been flooded with an assortment of devices, supplying hobbyists with a fresh arena for ideas. Some of the projects and topics include 16-channel DTMF controller, hands-free headset telephone, a build-it-yourself telephone lab, electronic bell, 300-baud modem, testing telephone equipment, automatic tape controller switch, long-distance call restrictor, designing your own special devices. List price is $29.95.

For more information on these books, or to request a catalog, contact Prompt Publications, 2647 Waterfront Parkway East Drive, Indianapolis, IN 46214-2041; Phone: (800) 428-7267 or (317) 298-5400; Fax: (317) 298-5604; E-mail: <rwhite@hwsams.com>.

ADI Sponsors New Ham Radio Testing Web Site

A Web site designed to help you pass your ham radio theory exams has been set up by Premier Communications, maker of ADI and Pryme amateur gear and accessories. Called "HamTest.com," the new Web site lets you study entire question pools and even take live, simulated exams online so you'll know when you're ready for the real thing. And when you are, a simple mouse click will connect you to the ARRL site that lists upcoming exam sessions all over the U.S. In addition, the site provides an interactive user forum and an "Elmer's Chat Room," where you can look for help from experienced hams if you're having trouble understanding something. A Java-capable browser (such as Netscape 4.0 or Internet Explorer 4.0) is required for some functions, such as the live testing and the chat rooms. Study material can be accessed by any Web browser.

"We believe that the Internet represents a very valuable tool in the recruitment and training of new amateur radio operators," says Premier/ADI's Ken Collier, KO6UX. "And we are very pleased to be able to further the cause of ham radio in this way."

The ham test Web site is at <http://www.hamtest.com>. Questions may be e-mailed to <elmer@hamtest.com>.

The USA Takes on the World Foxhunting Championships

Ham radio and world-class athletics! You might think they have nothing in common—unless you have experienced ARDF—Amateur Radio Direction Finding.

By Joe Moell, KØOV*
(homingin@aol.com)

Why would nearly 250 people from all walks of life come from 32 countries to an eastern European forest? Why would they run and walk through the countryside with strange-looking antennas and beeping receivers? Answer: To find wily radio "foxes" and win medals doing it!

Most hams have heard of the sport of hidden-transmitter hunting, which goes by such nicknames as *foxhunting* and *T-hunting*. In North America, foxhunts usually involve a drive through town and country in a vehicle full of radio direction finding (RDF) gear. But elsewhere in the world, especially in Eastern Europe, Scandinavia, and the Far East, there are no cars in a foxhunt. It's an athletic event in a big park or forest. Sometimes it's called *radio-orienteering* because the participants use a map and compass along with RDF gear to search for five "controls" (foxes) and mark their cards with an "orienteering punch" at each fox. Other names for this on-foot sport are *fox-teering*, *foxtailing*, and *Amateur Radio Direction Finding* (ARDF).

Here in the U.S., rules for mobile transmitter hunts depend on local preferences. Some boundaries are large, others are small. Some are scored by time, others by mileage, and so on. On the other hand, radio-orienteering rules have been standardized by the International Amateur Radio Union (IARU), which makes it possible to hold championships at the national, regional, and world levels. ARDF Working Groups of the IARU have put on such events since 1980. Participating countries hold national championships every year, when possible. IARU Region 1 (Europe/Africa) and Region 3 (Asia/Oceania) championships usually take place in odd-numbered years, and there's a World Championship meet in even-numbered years.

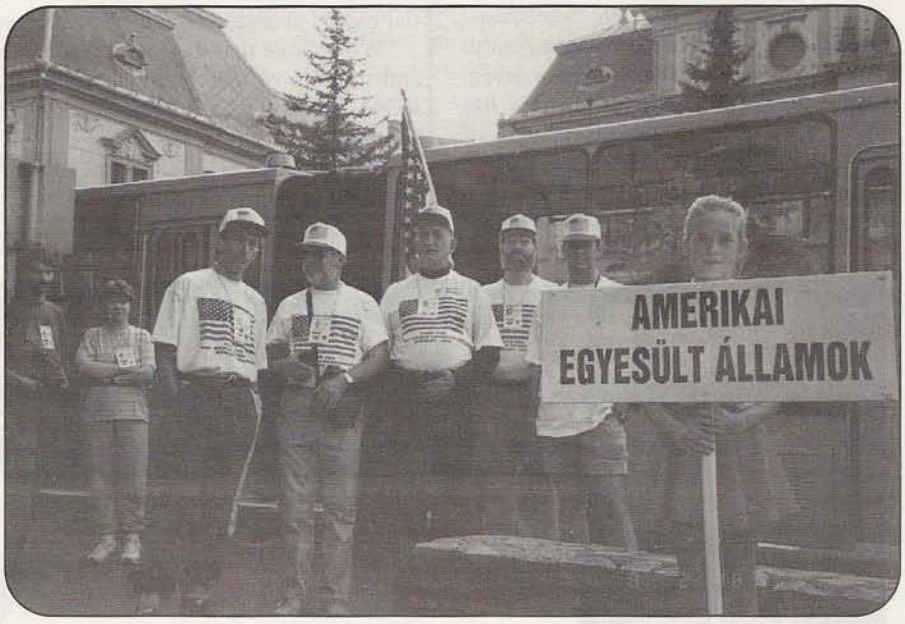


Photo A. Team USA lines up behind its national placard, ready to march through the streets. Left to right are Gyuri Nagy, HA3PA; Marvin Johnston. KE6HTS; Dennis Schwendtner, WB6OBB; Dale Hunt, WB6BYU, and Jack Loflin, KC7CGK. (Photo by Barbara Johnston, KE6OTF)

The USA Joins the Fun

Unlike the other two IARU regions, Region 2 (North and South America) does not yet have an ARDF Working Group. Prior to 1998, North American hams had observed the ARDF World Championships, but had never entered the fray. Interest in the sport has been growing here, though, and there were

**Joe Moell, KØOV, is a professional engineer with over 30 years of experience designing RF circuits and systems for broadcast, communications, and radar. He has hunted hidden transmitters for over 20 years and has written over 120 articles on RDF. Joe is also the ARRL National ARDF Coordinator.*

Photo B. At the opening ceremonies, there was marching, music, folk dancing, speeches from dignitaries, and plenty of security. (KE6OTF Photo)

radio-orienteering competitions at California hamfests during 1995 and 1996. The Friendship Amateur Radio Society (FARS) had put on ARDF events in Oregon (1991) and British Columbia (1993) with hams from Russia, Japan, Canada, and the U.S. on the course. And, in 1996, Kevin Kelly, N6QAB, traveled to Townsville, Australia, to represent the U.S. in the IARU Region 3 Championships.

This growth in foxtailing interest, plus some gentle prodding by IARU ARDF leaders in Europe and Asia, is finally beginning to be recognized by the national societies of Region 2. In 1997, Radio Amateurs of Canada appointed Perry Creighton, VE7WWP, as national ARDF Coordinator, the first in the Americas. Perry is no stranger to the sport, having put on the 1993 Friendship Radiosport Games foxhunt in his home city of Victoria, British Columbia.

The ARRL followed suit in February, 1998, by appointing me as the USA's first national ARDF Coordinator. One of my first goals was to have the U.S. compete in the ARDF World Championships for the first time. The 1998 event would be in Hungary, and I would be unable to go because of other commitments. Fortunately, Dale Hunt, WB6BYU, of Yamhill, Oregon, stepped forward and agreed to lead the team. Dale's first foray into the world of ARDF occurred a year earlier, when he went to Japan for the 1997 Friendship Radiosport Games. At that event, he finished first among all entrants from North America.

Other members of the U.S. delegation were: Jack Loflin, KC7CGK; Marvin Johnston, KE6HTS; Barbara Johnston, KE6OTF; Dennis Schwendtner, WB6OBB; and Gyuri Nagy, HA3PA.

Jack, KC7CGK, who is 17 years old and lives seven miles from WB6BYU, had attended the 1997 Friendship Radiosport Games ARDF competition in Japan, where he won the gold medal in his division. His other direction finding activities include tracking aircraft Emergency Locator Transmitters with the Civil Air Patrol.

KE6HTS, KE6OTF, and WB6OBB all live in Santa Barbara, California. Marvin is an avid transmitter hunter, both mobile and on foot. He has participated in two formal ARDF competitions in the Los Angeles area, winning first place in his division at one of them. His wife, Barb, accompanied him as observer and photographer. Dennis is a piano tuner who has been on mobile transmitter hunting teams for many years. He would like to compete in the World Championships when and if the IARU rules are changed to accommodate disabled participants (he is blind). Meanwhile, he served as the official USA Team Trainer.

HA3PA is a native of Hungary who has won medals in prior ARDF World Championships. Because of his Resident Alien status in the U.S., he was able to compete on our team. Gyuri generously provided additional 80-meter ARDF receiver/antenna sets for use during the Championships. This was welcome, as our equipment-building efforts have so far been primarily for 2 meters.

Team USA's first problem was getting to Hungary. Because there is no formal ARDF organization in the U.S. to raise funds, each person had to arrange and pay for transportation and entry fees. Thanks to some behind-the-scenes work by ARRL Executive Vice President David Sumner, K1ZZ, and others, a grant was obtained from the Colvin Foundation to help defray these costs.

Welcome to Hungary!

What's it like to attend a World Championship foxhunt? Well, it's much

Table 1.

A. Individual Medals

	OM	JR	YL	OT	VT
Gold	Czech	Hungary	Ukraine	Hungary	Russia
Silver	Russia	Czech	Ukraine	Ukraine	Ukraine
Bronze	Ukraine	Czech	Hungary	Russia	Russia

B. Team Medals

	OM	JR	YL	OT	VT
Gold	Czech	Czech	Ukraine	Russia	Russia
Silver	Russia	Russia	Russia	Hungary	Germany
Bronze	Ukraine	Ukraine	Czech	Ukraine	Ukraine

Table 1. In the 2-meter competition on September 3, there were 64 Seniors (OMs), 45 Juniors (JRs), 47 Women (YLs), 60 Old Timers (OTs) and 28 Veterans (VTs). These were the winning countries, listed (A) individually and (B) by team.

like the Olympics, with world-class athletes doing their best, individuals and national teams vying for medals, lots of pomp and ceremony, and a bit of haggling over rules and procedures. The site was in Nyiregyhaza, a major city on the eastern side of Hungary, about 150 miles from Budapest. Housing was provided at dormitories of Bessenyei Gyorgy Teachers Institute.

"The dorm was pretty nice, though the bathrooms were on the 'iffy' side," reported KC7CGK. "There were pairs of double rooms, split in the middle with a bathroom. Since there was only one person occupying each half, there was plenty of room. There also was a gym, swimming pool, and tennis courts."

"The city was like any other European city," Jack continued, "It seemed like anything you wanted was available. But if you went out of town a little ways, you could find horse-drawn carts and houses with mud floors and walls."

Americans visiting Hungary is unusual enough, but Americans at a Hungarian radiosports event was unprecedented. KC7CGK observed, "It was interesting going from a country where foxhunting is merely a weekend hobby for just a few hams, to a country where it is viewed as we regard soccer. I was impressed."

The Championships opened in grand style with a ceremony in the town plaza. Thousands watched as athletes marched through the streets and the mayor and City Parliament members welcomed them. Then there was folk dancing, baton twirling, and other entertainment.

"We found some young girls with signs identifying the countries," KE6HTS said. "We figured USA would be near the end of the line, but instead we were first since our sign read 'Amerikai.' Each team carried its national flag on a staff. At the last minute, we found we did not have a staff for the Stars and Stripes, so we used Dennis' white cane! It was quite an experience, walking at the front of such a procession and being observed and photographed by all the townspeople."

"The State Department had been giving warnings about traveling and making it known that you're an American," WB6BYU recalled. "And we ended up marching through the streets with big flags on our chests! But we felt safe. They had doubled or tripled their security just because we were going to be there."

Jack said it was difficult to find people out on the streets who spoke English. However, the ceremonial speeches were all translated into English and it was the official language of the Championships. Dale reported that most of the attendees at the Team Leader meetings were able to speak English well.

Photo C. Team Captain Dale Hunt, WB6BYU, sprints down the finish corridor at the end of the 2-meter event. (KE6OTF Photo)

Ham Versus Ham

"The words 'Ninth ARDF World Championships' really began to take on some meaning when we saw the various teams assembling for the competition," said KE6HTS. "It was rather impressive knowing we were in the company of the best ARDF people in the world. It was also quite a humbling experience."

ARDF championships have two competitions, held two days apart. One has 2-meter transmitters, the other is on the 80-meter band. At 0700 on the day after opening, buses began to take competitors to the 2-meter site. Marvin, KE6HTS, recounts the experience:

At this point, none of us knew where the competition would take place. An hour later, we arrived. The whole area was roped in, and once inside, no competitor was allowed to leave. Our RDF equipment was put into a special area on racks, and could only be retrieved when we were called to the starting box.

Ten minutes before assigned start time, competitors received an orienteering map. There was a small triangle marked for the start and small concentric circles at the finish line. Additionally, they received the card to punch at each transmitter. Five minutes before assigned start time, competitors were called into the start area where they checked equipment, studied maps, and made ready to begin. There were two starting corridors, one to the left for Women and Seniors and one straight ahead for Juniors, Old Timers, and Veterans.

Almost everyone started out at a run, or at least all those who stood a chance of winning! Since start times were five minutes apart and only one competitor from each division could start at one time, it would be about five hours before everyone had begun. The assigned starting times were drawn from a hat during one of the many meetings that the Team Captains attended. The time limit for this heat was 130 minutes.

At my assigned starting time, I jogged out of the starting corridor, turned on my equipment, and started taking bearings. As I went along, my bearing to fox #1 was almost due east, fox #2 was northeast, #3 was pretty much north, and #4 was west-northwest. Judging from signal strengths, #4 seemed to be the one to find first, so I headed along the road and turned east at the first junction. Shortly thereafter, I lost where I was on the map. I was pretty sure that the proper order to find the transmitters was 4, 3, 2, 1 and finish. Since I didn't know where I was, I just started following the bearings. Fox #4 turned out to be just on the other side of some brush along a trail. My elapsed time at this point was 40 minutes.

The terrain was relatively flat, with areas ranging from open fields to fairly dense brush, difficult to run through quickly. There were both harvested and unharvested cornfields, areas where trees had been planted in rows, and some places with freshly plowed dirt that was very difficult for running. The orienteering map showed the details on most of this—for those who could read and understand it! I headed directly towards #3. This caused slow progress since I didn't know how I could go around difficult terrain. After crossing rela-

Table 2.

A. Individual Medals

	OM	JR	YL	OT	VT
Gold	Czech	Czech	Belarus	Russia	Ukraine
Silver	Germany	Russia	Ukraine	Russia	Hungary
Bronze	Ukraine	Romania	Czech	Lithuania	Czech

B. Team Medals

	OM	JR	YL	OT	VT
Gold	Russia	Czech	Ukraine	Russia	Russia
Silver	Czech	Russia	Hungary	Ukraine	Ukraine
Bronze	Ukraine	Slovakia	Slovakia	Hungary	Germany

Table 2. In the 80-meter competition on September 5, there were 59 Seniors, 43 Juniors, 47 Women, 65 Old Timers, and 28 Veterans. These were the winning countries, listed (A) individually and (B) by team.

Photo D. Marvin Johnston, KE6HTS, got the judge at 80-meter fox #4 to snap a photo of him punching his card. Note the prominent orange and white orienteering flag that helps hunters spot the foxes.

tively clear areas to some denser forest and traveling another 400 meters or so, I found #3 with an elapsed time of a little over an hour.

With #2 now having a bearing of east-southeast, I headed in that direction. I found myself traversing a freshly-tilled grove of trees that made walking, let alone running, very tiring. As I then crossed a clear field, I kept thinking the transmitter was only 100 meters or so away. About 300 meters later, I finally got to it with an elapsed time of just over an hour and a half.

At this point, I was getting pretty tired from fighting the terrain. I had a clear bearing to #1 as well as to the finish, but time was getting tight. I knew I could find #1, but I wasn't sure if I could then make it back to the finish in time, given how tired I was becoming. So I decided to make sure I got to the finish without being disqualified. It turned out to be a good choice. Even if I had found #1 and made it in time, it would only have made a difference of one place in the standings.

Meanwhile, officials were keeping a close watch on all the competitors. "At each transmitter, there were two referees linked to the finish area with 440-MHz radios," KC7CGK reported. "As you got to each transmitter, they took down your number and checked who was just before you and just after you. If, for example, I had come in just behind competitor number 34 at all 4 foxes, they would be suspicious. At the finish, there was a board with everyone's name and the time they found each fox, updated in near real time."

Winning times on the 2-meter course for the five divisions ranged from 45 to 75 minutes. Gyuri did it in just under 70 minutes. All Team USA members got back with at least nine minutes to spare, and, except for the one Marvin missed, all Team USA members found all foxes. As Dale crossed the finish line, he spread his arms out and yelled with excitement, just as a photographer snapped him. That photo showed up the next day on the sports page of the local newspaper.

Competitors, But Elmers Too

Despite the fact that this gathering would determine who were truly the world's best radio-orienteers, the contestants were willing and eager to share their knowledge of this sport and their tricks of the trade, as Marvin soon discovered. "After dinner, Jack and I were invited by Tcherman Gouliev, UA3BL, to his room , where he explained the best use of equipment, strategy, and how to train for ARDF events. Tcherman is the Russian team

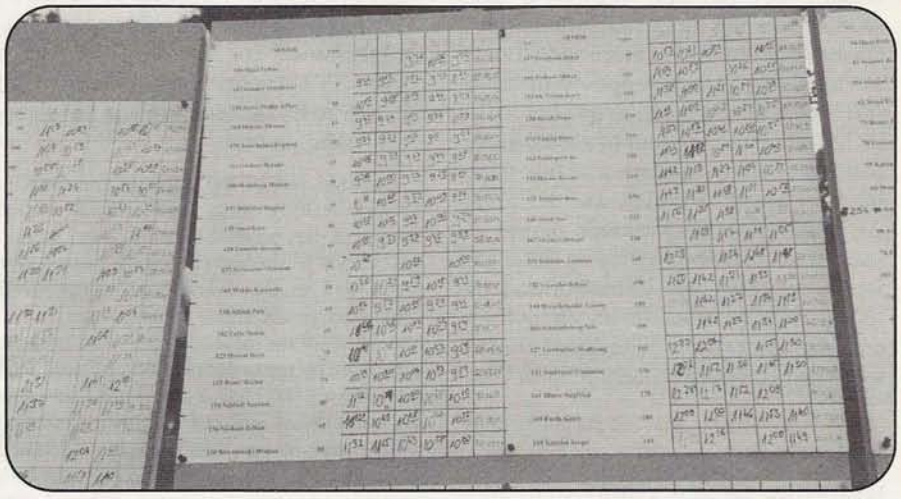


Photo E. Competitors' clock times at each fox were relayed by jury members at the foxes to the finish area, where they were posted for all to see. (Photo by Marvin Johnston, KE6HTS)

Rules, Rules, Rules

Championship foxhunting is governed by a 12-page IARU document titled, "Rules for Championships in Amateur Radio Direction Finding." Though it is explicit and specific, there still were details to be worked out, which kept Team Captain WB6BYU busy attending many meetings.

On a championship course, there are five low-power (0.25 to 1.5 watt) foxes, automatically transmitting in numerical order on the same frequency for exactly one minute each. A homing fox at the finish line beacons continuously on a separate frequency to aid competitors who get lost. Two-meter foxes use AM with tone modulation; 80-meter foxes send keyed CW. The goal is to find all required foxes and get to the finish line before the others in your division. Staying on the course beyond the maximum time results in disqualification.

Each target transmitter has a distinctive identification, sent continuously throughout its transmission. Fox #1 sends "MOE" plus callsign. Fox #2 sends "MOI," fox #3 sends "MOS" and so forth. Even without knowing Morse Code, it's easy to distinguish the individual foxes by counting dits.

Foxhunt organizers have learned that starting all the hunters at once would result in a big "follow the leader" game. Instead, they are started at regular intervals of one to five minutes, depending on the number of hunters at the event. Each is individually clocked by a team of timekeepers. Start time is marked on the hunter's scoring card and compared to time of arrival at the finish line.

Each country entering a championship match may field one or more teams of three to five contestants each. Team score is a function of the best three individual scores. Team members are not allowed to help one another, and course marshals are alert for violations. Gold, silver, and bronze medals are awarded to both top team and top individual entrants.

Under IARU rules, all competitors use the same venue and track the same transmitters, but there are separate divisions for Seniors (males ages 18 to 39), Juniors (boys under 18), Women (any age—nobody asks!), Old Timers (males 40 to 54), and Veterans (males 55 and over). Only Seniors are required to find all five foxes. Others need find only four of them; the designated four are different for each division. Transmitters must be at least 400 meters apart, with a total course distance of about 8 kilometers. All must be at least 750 meters from the start, at least 500 meters from the finish, and at least 500 meters from other foxes.

leader and Chief of the Moscow Radio Club. Since he had previously won six gold medals, we were honored that he would take time to share his experiences." UA3BL and WB6BYU then worked into the night realigning Dale's 80-meter set to give it more sensitivity.

The next day was supposed to be for rest before the 80-meter event, but it also included a five-hour tour of a local museum, followed by a program of folk dancing and music. HA3PA and KE6HTS decided to skip the afternoon part to get some last-minute practice in 80-meter foxtailing, using Gyuri's transmitters and receivers. "Gyuri was an excellent trainer," Marvin recalled. "The three hours we spent turned out to be very helpful."

The 80-Meter Hunt

The next morning, all competitors boarded the buses to a different location for the 80-meter heat. "Dale turned out to have a starting time of 0:00 (first group), while I had 0:40," said KE6HTS. "Gyuri felt really happy that he received a starting time of 3:05, since that would put him almost last out of the gate. Many trails of previous competitors would be visible, giving him hints about transmitter locations."

Marvin's practice the day before paid off, and he had a better time on 80 meters than he did on two.

I started out of the corridor for the Old Timers, heading north. As soon as I reached the end of the corridor, I turned on my receiver and got a bearing on fox #1 almost due north. As I ran that way, I got bearings on #2 somewhat to the right, #3 about northwest, and #4 about northeast, before I had to make a decision on the order in which I would seek the transmitters. I had a pretty good idea that #4 was closest and ran toward a road that would take me in that direction. Heading down the road, I knew I was close, by the both bearings and signal strength. When I saw another good competitor entering the road from the field, I headed that way and followed the tracks on the ground. When #4 went on [each of the "foxes" took turns transmitting, in one-minute bursts. See "Rules, Rules, Rules," for details], I was only a few hundred feet from the location and found it without difficulty. With an elapsed time of about 25 minutes, there was one down and three to go.

Heading back to the road, I had already decided that the order I would get the other transmitters would be 3, 2, and 1. So I headed back west. When I found a trail in the direction of #3, I took it. It turned out to be the correct decision and I found the transmitter about 10 minutes later. Finding a road that seemed to lead towards #2, I alternated between walking and running. Transmitter 2 turned out to be at the end of that road.

With only about 70 elapsed minutes, I headed up to find #1. Although I had plotted its direction from the start, the line I had drawn was not dark enough on the map and I missed it. The result was taking the wrong course to #4, which ended up costing me about 15 minutes. After finding it, I was off to the finish line about 1,200 meters north. Alternating between running and walking, I followed both the map and the DF bearings. It is not acceptable to walk the corridors, so I huffed and puffed along for several hundred meters until I passed the finish line.

Marvin's and Dale's early start times gave them the opportunity to track Gyuri's progress throughout the course and to watch many other competitors as they finished. "It was interesting because some teams had runners who carried their national flag alongside team members as they arrived at the finish line," Marvin remarked.

Looking Back

Most ARDFers say that foxtailing on 80 meters is easier than on 2 meters. Eighty-meter RDF equipment is smaller and lighter, and there are fewer signal reflections on 3.5 MHz to confuse the hunters. Winning times for the various divisions were two to 16 minutes better than for the same division on 2 meters. UA3BL, who had helped Dale optimize his receiver, won the gold in his division.

All members of Team USA had a better day and found every fox. Gyuri cut almost 15 minutes off his 2-meter time and finished 17th among the 65 Senior division competitors in this second heat. Jack did over 20 minutes better. "He beat the whole Japanese Junior team," Dale said proudly.

KC7CGK explained:

I was more organized. The course was in the shape of an arrow pointing up, the start point in the bottom left corner and the finish at the tip top. I ran north about five minutes

until the road ended and by that time I knew that there was a transmitter to the west, one straight ahead, and the other two were to the right. I went to the left one first, and then headed east and got the two on the right, then came back to the center, got the last one, and headed to the finish. I don't think I did better RDF, it's just that I kept running a little longer. I didn't know what to expect the first day and I think I let myself slack off. The second time I really pushed myself.

When Is The Next One?

"This was a great ham event!" That's how Team Captain WB6BYU summarized the championships. "The people were quite friendly, and were glad finally to have representatives from Region 2. For a relatively inexperienced team, we did well." Marvin added, "They said that, for the first time, it was truly a world championship."

Congratulations to Team USA members for their fine performances, and my personal thanks to all of them for eagerly telling their stories for *CQ VHF* readers. All of them are looking forward to future ARDF competitions and they want many more hams to join in. It's not difficult, but it requires a bit of skill that's easily obtained with practice. It's a great way for all ages to exercise, especially young people. Why not get your local Scout troops involved? Remember—hunters use receivers only, so you don't need a ham license to be a foxhunter.

An ideal time to hold your club's first ARDF event would be the second annual *CQ VHF* National Foxhunting Weekend on April 17–18, 1999. Then get a team together to compete at the first IARU Region 2 ARDF Championships, to be held in conjunction with the 1999 Friendship Radiosport Games this August. Watch for announcements on the Web and here in *CQ VHF* magazine. Happy hunting! ■

Resources

For more information about putting on mobile T-hunts and international-style foxhunts, see the National Foxhunting Weekend announcement article in the April, 1998, issue of *CQ VHF*.

International-style foxtailing was featured in the October, 1996, issue of *CQ VHF*. See "World-Class Fox Hunting Comes to America" by KØOV on page 16. This article includes ideas for putting on such events in your town.

Elementary radio direction finding techniques are discussed in the "Basics" section of the January, 1998, issue of *CQ VHF*, page 81.

Back issues of *CQ VHF* are available for $4 each (postage included) to U.S. addresses. Contact *CQ VHF* magazine, 25 Newbridge Rd., Hicksville, NY 11801; Phone: (516) 681-2922; Fax: (516) 681-2926; E-mail: <backissues@cq-vhf.com>; Internet: <http://www.cq-vhf.com>.

Technical information about VHF RDF methods is in the "Repeaters, Satellites, EME and Direction Finding" chapter of *The ARRL Handbook*. The *Handbook* is available in most ham radio stores or may be ordered directly from ARRL, 225 Main St., Newington, CT 06111; Phone (orders only): (888) 277-5289 or (860) 594-0355; Fax: (860) 594-0303; Internet: <http://www.arrl.org>.

The most comprehensive book for hams on this subject is *Transmitter Hunting—Radio Direction Finding Simplified*, by KØOV and WB6UZZ (TAB/McGraw-Hill #2701). It has 323 pages and 235 illustrations of RDF techniques, projects, and equipment reviews. Check your local bookstore or contact Tab Books, Division of McGraw-Hill, Inc., Blue Ridge Summit, PA 17294-0850; Phone: (717) 794-2191; Fax: (717) 794-2103.

The first ARDF stop for Internet surfers should be the author's Web site: <http://members.aol.com/homingin/>. (Don't omit the forward slash at the end.) At this URL, you'll find 20 articles on hidden transmitter hunting, a bibliography of 125 more articles, information on 20 RDF equipment suppliers, and over 110 RDF-related Web links and local foxhunting e-mail contacts. On the "Championship Foxhunting News" page, you'll see announcements and invitations to upcoming ARDF events. Also check the "Equipment for ARDF" and "Foxhunting for Scouts" pages at this site.

CQ VHF Spring Activity Weekends March 19–21, April 23–25, May 21–23, 1999

It's springtime...and it's time to take advantage of some of the wonderful VHF-plus propagation that comes our way along with the warmer weather.

By Gordon Beattie, W2TTT*
(w2ttt@worldnet.att.net)

Each year, many of us think about operating those great summer openings and contests while relaxing at home, hilltopping, or roving in parks and in the countryside. But first we all need to check out our gear, shake out the winter cobwebs, and get our skills back up to snuff! We also need to introduce new operators to the fun of VHF contesting—and even use the fun and excitement of a contest to generate interest among prospective hams.

CQ VHF Activity Weekends

To meet these objectives, *CQ VHF* magazine is pleased to announce a series of operating activities called the "*CQ VHF* Activity Weekends." Initially, we have scheduled a spring activity weekend series. If there's sufficient interest and activity, additional events at different times of year may be announced in the future.

To encourage activity throughout each weekend, each activity has been sliced into six-hour periods, starting at 6:00 p.m. (local time) Friday, and running until midnight local time on Sunday. Period 1 runs from 6:00 p.m. to midnight

Gordon Beattie, W2TTT, is active in many areas of VHF and will be sifting through the logs for the upcoming CQ VHF *activity weekends.*

Sample Log Entry Summary

CQ VHF Spring 1999 Weak Signal Weekend—Period 1
Callsign: W2TTT
Call District or DXCC Country: W2
Grid: FN30

Band	Contacts	Points	Grids
144	10	10	10
432	5	10	5
Total 1	15	20	15

Period Total (20x15) = 300 points

CQ VHF Spring 1999 Weak Signal Weekend—Period 4
Callsign: W2TTT
Call District or DXCC Country: W2
Grid: FN30

Band	Contacts	Points	Grids
144	8	8	6
432	7	14	3
Total 4	15	22	9

Period Total (22x9) = 198 points

CQ VHF Spring 1999 Weak Signal Weekend—Overall Score
Callsign: W2TTT
Call District or DXCC Country: W2
Grid: FN30

Band	Contacts	Points	Grids
144	18	18	16
432	12	24	8
Total	29	42	24

Final Score (42x24) = 1008 points

"To encourage activity throughout each weekend, each activity has been sliced into six-hour periods, starting at 6:00 p.m. (local time) Friday, and running until midnight local time on Sunday."

Friday; Period 2 runs from midnight to 6:00 a.m. Saturday; and so on until the end of Period 9 at midnight Sunday. You may work any or all of these periods, but you'll be competing only with stations operating a like number of periods during each contest. This lets you have a life and still be a contender.

All amateur bands above 30 MHz may be used. A station may be worked once per band *during each period* for a total of up to nine times per band each weekend. Rovers may re-work stations during the same six-hour period if they've moved to a new grid square. Scoring for each six-hour period is the same as is used in the ARRL VHF Sweepstakes and QSO Parties (this will make it easier for those using computer logging programs that automatically calculate your score; simply start a new log for each six-hour period).

Scoring is simple. Just add up the contact points *from each period* and multiply by the sum of the grids *from each period* (see scoring example), for your period total. Your final score is determined by multiplying the total number of contact points from each period by the total number of grids worked in each period (the example will make this make sense). So if you're short of time and want some of the fun, you can get into the activity for one or more periods and expect to find hungry folks ready to work you! Here are the specifics:

The FM Activity Weekend, March 19–21

"The FM Activity Weekend" is for operators of FM equipment. This event encourages both new and experienced operators to get on the air and make contacts on any VHF+ band between 6 p.m. local time on Friday, March 19, 1999, and 12:00 midnight local time on Sunday, March 21, 1999. Repeaters and 146.52 MHz simplex may *not* be used for logged contacts, except that satellite contacts (e.g., OSCAR-27) *are* permitted. Only frequencies commonly used in a locality for FM simplex may be used during the activity. Use of frequencies adjacent to repeater inputs or outputs that causes interference to a repeater is not permitted. Crossband contacts are prohibited, except for satellite contacts.

The Weak Signal Weekend, April 23–25

"The Weak Signal Weekend" is for operators of SSB, CW, and other digital mode equipment using no more bandwidth than is used by an SSB signal. This event encourages operators to get on the air and make contacts on any VHF-plus band between 6 p.m. local time on Friday, April 23, 1999, and 12:00 midnight local time on Sunday, April 25, 1999. No repeaters or translators may be used for logged contacts. Crossband contacts are prohibited.

The Specialty Modes Weekend, May 21–23

"The Specialty Modes Weekend" is for operators of video, RTTY, AMTOR, Packet, and other digital equipment. This event encourages operators to get on the air and make contacts on any VHF-plus band between 6 p.m. local time on Friday, May 21, 1999, and 12:00 midnight local time on Sunday, May 23, 1999. Repeaters, packet networks, or translators *may* be used for logged contacts in this event. However, all contacts must be with live operators, not with automated equipment, and all must be made in "real time" (an exchange of BBS messages does not count). Crossband contacts are permitted.

Entry Categories

There are five station categories:

Single Operator QRP—Fixed Station, 10W or less
Single Operator QRO—Fixed Station, above 10W
Multi-Operator QRP—Fixed Station, 10W or less
Multi-Operator QRO—Fixed Station, above 10W
Rover Stations—Travel to different operating locations

Exchange and Contact Logging

Each logged contact will consist of an exchange of callsigns and grid squares.

"Each logged contact will consist of an exchange of callsigns and grid squares."

Each log entry will include the UTC date, UTC time, band, mode, callsign, and grid square. (Note: Even though the activity period is based on local time, the logging will be UTC.) *You must start a new log for every six-hour period, beginning at 6 p.m. Friday.*

Scoring

Each six-hour period is scored separately. Within each period, score each contact as follows:

1 point for each contact below 200 MHz
2 points for each contact between 200 and 500 MHz
3 points for each contact between 500 and 1300 MHz
4 points for each contact above 1300 MHz

Note: This mirrors the standard values used for ARRL VHF Sweepstakes and QSO Parties and is automatically logged with these scores by all popular logging programs.

In the case of permitted cross-band contacts, base your contact points on the band on which you are transmitting (so an ATV contact on a repeater with a 1270-MHz input and a 421-MHz output would count for three points).

Next, list the number of grids worked on each band during that period and add them up. If you work 10 grids on 144 MHz and 5 grids on 432 MHz during one period, you'll have a total of 15 grids for that period. Multiply the number of contact points times the number of grids worked in each period to arrive at your total score for that period.

After the contest, add together the total number of contact points from each six-hour period, and add up the total number of grids worked in each period. Now multiply the grand total of contact points by the grand total of grids to arrive at your overall final score. Each log submitted must include separate logs and summaries for each six-hour period as well as an overall score summary sheet.

Miscellaneous Rules

Single operator and Rover stations are encouraged to stimulate activity on the bands by any reasonable means, including the use of repeaters, packet clusters, the Internet, e-mail, telephones, and smoke signals to coordinate contacts.

All stations, including single operator stations, are encouraged to stimulate interest in amateur radio by allowing non-amateurs to participate as operators and/or loggers (provided a licensed control operator is present at all times).

QRP stations may not have more than 10 watts of power going from the transmitter into the feedline.

Rovers must start their six-hour periods using the local time of their starting location, and must operate from a minimum of two locations during each weekend. Scoring for Rovers is the same as for other categories, except that Rovers may rework stations during the same six-hour period if they have moved to a new grid square.

Participant Recognition

Each weekend is a separate operating activity and the results of each will be listed separately in *CQ VHF*.

Scores for each weekend will be organized by U.S./Canadian call district and DXCC country and will be listed by station category and number of periods worked. If there is significant interest, high scores for single bands and/or single six-hour period may also be listed.

Presentation of plaques, certificates, etc., will be at the discretion of *CQ VHF* and will be determined on the basis of participation. Initial plans are to award a plaque to the top overall scorer in each station category for each activity weekend. Plaque sponsorships are solicited. Decisions of *CQ VHF* and the contest administrator are final.

Disqualification

If you lie, cheat, and/or steal, and we catch you, you're disqualified and subject to the non-publication of your entries for the next year. Remember: this is for fun, not profit!

Log Submissions

Logs may be submitted electronically (recommended) or on paper, along with photos and/or soapbox comments. Constructive suggestions for improving and/or expanding this event are welcome. Electronic logs may be e-mailed to **weekend@cq-vhf.com**; or may be mailed on 3-1/2-inch IBM-formatted diskette, along with a paper copy. Paper logs and diskettes may be mailed to *CQ VHF* Activity Weekends, 25 Newbridge Rd., Hicksville, NY 11801. Logs must be postmarked no later than 30 days after the final day of the activity for which they are submitted (FM: April 21; Weak-Signal: May 25; Specialty: June 23). *CQ VHF* is not responsible for logs lost in the mail or in e-mail, or whose late delivery makes it impossible to include them in the overall scoring.

Give It a Try!

Give one or more of these weekends a try and have some fun. Don't forget to get some other operators or prospective operators involved in this wonderful aspect of our hobby. There's nothing like a grinding operating activity to test out your gear, sharpen your general operating skills, and better prepare you for emergency and public service communications operations. One last thought: have some fun! ■

A Ham Radio Growth Formula—From Cuba

The number of licensed hams in the U.S. dropped last year for the first time in over two decades. But not too far away, in Cuba, ham radio is growing at a healthy pace. And CO2OJ thinks he knows why. Perhaps we can learn from their success.

Ham radio is dying, according to lots of articles in different magazines, and even the IARU (International Amateur Radio Union) and most of the national federations are very concerned. The subject was discussed at the IARU Region II Meeting last October in Venezuela, and it is a fact that in most of the countries represented, the number of licensed hams drops from year to year.

But in Cuba, we have almost doubled the number of licensed hams in less than 10 years and we continue growing. For example, during recent national exams for ham licenses held in Habana City (with a licensed ham population of 600), more than 50 newcomers took and passed the exams!

In some provinces, the growth has been so great that the government has run out of two-letter suffixes for the individuals' callsigns, and the Radio Administration recently modified the ham radio rules to allow three-letter suffix callsigns to be assigned to individual stations.

So why is ham radio growing in Cuba when it's shrinking in other parts? In my opinion, there are three main reasons: information (marketing the hobby), participation (fighting for a place in the life of the community), and collective responsibility (every ham has to feel that this is also his task).

In recent years, we have worked hard with young people, organizing activities in the schools and we have a radio club in almost all the universities in the country. I agree that computers are capturing most of the young people's attention, but we try to show them how they can put together the radio and the computer in real life. Most of our newcomers are young people connected in some way with computers. I remember that Bill Gates said that now the name of the game was not computation, it was communication!

Next, we have increased the participation of hams in the life of the community. We try not only to be useful during the hurricane emergencies, but also during elections, sporting events, and any other activity that allows people to get to know us.

Appliance Operators Need Not Apply

Some might say that, in Cuba, we don't have as many cellular telephones and other communication facilities as in other countries and that's why so many people here want to be ham radio operators. And that may be true. But it is also true that all those newcomers cannot go to RadioShack and buy a radio—they have to build their own rig or modify some commercial equipment if they really want to be on the bands, and that is *supposed* to be a very discouraging fact. Not here.

I know that cellular phones, the Internet, and many other commercial communication systems may have cost ham radio all those people who, in the past, entered to the hobby just to use a handheld as a personal telephone with their wives. But...you know, in the end, maybe that's not so bad.

But beyond them, in the schools, on the farms, and in the cities, there are a lot of people who would love to be hams, if only we can get to know them and touch their hearts. Nothing, not cellular phones, not the Internet, will ever be better than chatting with somebody in China, making a meteor scatter contact, or being the center of a pile up. You may be sure that there are many other "crazy persons" out there; we only have to find them.

Whose Problem Is It?

All this could be seen as only the problem of each country's national ham federation, and, to a certain extent, that is correct. But it's also *our* problem. *We* are the ones who will suffer if ham radio goes away. But *we* are also the key to solving the problem. *We* are more than a million hams all over the world, and if each one of us finds and wins a newcomer for the hobby at least once every five years, that number may grow very large indeed! ■

The opinions expressed in this column are those of the author and do not necessarily reflect the views of CQ VHF *or its publisher, CQ Communications, Inc.*

If you have an opinion on this issue or another matter of importance to the VHF ham community, we'd like to hear from you. Well-reasoned, well-written commentaries will be considered for our Op-Ed page. If we publish your Op-Ed article, we'll give you a complimentary one-year subscription (or extension of your current subscription) to CQ VHF. *Submissions not accepted for the Op-Ed page may also be considered for Letters to the Editor.* CQ VHF *reserves the right to edit all submissions for length and style.*

By Oscar Morales, Jr., CO2OJ* (infocom.etecsa.cu)

**Oscar Morales, Jr., CO2OJ, is a very active and well-known Cuban VHFer. This article was originally posted on the Internet VHF reflector.*

New CQ VHF Web Site, E-Mail Addresses

Come visit us at our new home on the World Wide Web, sign our Guestbook, order online, and make a note of our new, easier-to-remember e-mail addresses...@cq-vhf.com.

By Rich Moseson, W2VU*
(w2vu@cq-vhf.com)

Well, folks, we've finally done it...made that giant virtual leap deeper into cyberspace with our own domain name and a brand new Web site maintained by someone who actually knows what he's doing! Once everything is operational (we're hoping it will be by the time you read this), you'll not only be able to check out the latest issue of *CQ VHF* before it hits the newsstands, or check in on the latest VHF news, but you'll also be able to place orders, enter new subscriptions or renewals, directly online through a secure server to protect your privacy. Our new domain name is **cq-vhf.com**, and our new Web address (URL) is **<http://www.cq-vhf.com>**.

A Face-Lift

The first thing our new Webmaster, Doug Bailey (ABØIE at this writing, but eagerly awaiting the arrival of a vanity callsign), did was give our site a facelift, with prettier graphics, nicer design, and much faster page-loading. Then he added a guestbook (please sign in and say hi) and a search engine to let you find the keyword of your choice on any file within the site. We've also posted our 1998 annual index, so finding articles in back issues should be easier than ever. We'll be working on greatly expanded links, both to our advertisers and our readers, as well as VHF-related organizations all over the world. If you have a VHF-related link you'd like to see on our site—and

**Rich Moseson, W2VU, is Editor of* CQ VHF *magazine.*

Table 1. Who's Who @cq-vhf.com

Please use the following e-mail addresses to contact us and members of our staff:

Departments:	
General inquiries	cq-vhf@cq-vhf.com
Letters to the editor	letters@cq-vhf.com
Q&A	q&a@cq-vhf.com
Reader Feedback	feedback@cq-vhf.com
Op-Ed	op-ed@cq-vhf.com
Product Update	products@cq-vhf.com
VHF Hamlink	hamlink@cq-vhf.com
Subscription questions	circulation@cq-vhf.com
Back issue requests	backissue@cq-vhf.com
Change of address	change@cq-vhf.com
Staff & Columnists	
Dick Ross, K2MGA, Publisher	k2mga@cq-vhf.com
Rich Moseson, W2VU, Editor	w2vu@cq-vhf.com; editor@cq-vhf.com
Gordon West, WB6NOA, Sr. Contrib. Ed.	wb6noa@cq-vhf.com
Arnie Sposato, N2IQO, Advertising Manager	ads@cq-vhf.com
Doug Bailey, ABØIE, Webmaster	webmaster@cq-vhf.com
Kent Britain, WA5VJB (Antennas/Microwaves)	wa5vjb@cq-vhf.com
Ken Ernandes, N2WWD (Satellites)	n2wwd @cq-vhf.com
Dave Ingram, K4TWJ (How It Works)	k4twj@cq-vhf.com
Bob Josuweit, WA3PZO (Public Service)	wa3pzo@cq-vhf.com
Ed Manuel, N5EM (Amateur TV)	atv@cq-vhf.com; n5em@cq-vhf.com
Tim Marek, K7XC (Weak Signal)	k7xc@cq-vhf.com
Larry Mulvehill, WB2ZPI, Staff Photographer	wb2zpi@cq-vhf.com; photog@cq-vhf.com
Ken Neubeck, WB2AMU (6 Meters)	wb2amu@cq-vhf.com
Pete O'Dell, WB2D (Beginners)	wb2d@cq-vhf.com
Don Rotolo, N2IRZ (Digital Modes)	n2irz@cq-vhf.com

Table 1. New e-mail addresses of CQ VHF *departments, staff members, and columnists.*

you'd like to put a link to us on your site—please drop Doug a line at <webmaster@cq-vhf.com>.

New E-Mail Addresses

One of the cool things about having your own domain name is that you can make up your own e-mail addresses—and in our case, it means that everyone connected with the magazine can have similar, easy-to-remember e-mail addresses. So, if you want to send me a note, for example, you can just address it to <w2vu@cq-vhf.com>, or even to <editor@cq-vhf.com>, and it'll get to me. See Table 1 for a complete list of who's who (so far) @cq-vhf.com.

Online Ordering

We've had ongoing requests for online ordering, but haven't been able to provide you with a secure environment for doing so...until now. Our new Web site includes a secure server for online ordering, and Doug will soon be building us an "online store," where you'll be able to shop with confidence for all sorts of CQ products, including books, videos, calendars, and, of course, our magazines. And speaking of magazines in the plural, we've set up domains for each of CQ's six magazines, and you'll be seeing their Web sites online soon as well (*CQ* and *Popular Communications* are already online). See Table 2 for the Web sites of our sister magazines.

Table 2. CQ Communications Magazine Web Sites

**CQ Amateur Radio*	www.cq-amateur-radio.com
CQ Contest	www.cq-contest.com
**CQ VHF*	www.cq-vhf.com
Communications Quarterly	www.comm-quarterly.com
Electronic Servicing and Technology	www.electronic-servicing.com
**Popular Communications*	www.popcomm.com

*Table 2. New Internet domain names for all CQ Communications, Inc. magazines. To access our Web sites, type <**http://**> (without the brackets), followed by the address below (starting with **www**). Not all of these sites are online yet, but we're working on them. Those with a "*" are online at press time in mid-January).*

Come and Visit

So get out your "boogie board" and surf on over to our new Web site, <http://www.cq-vhf.com>, look around, sign the guestbook, and give us your ideas on how to make it even better. ■

Announcing

Six Club Announces 1999 Contests

If you like 6 meters and you're looking for action on the band, you might want to check out these three new contests from the Six Club.

The Six Club, an organization focusing on promoting 6-meter activity, is sponsoring three contests this year: two short-duration "sprint" events and one full-weekend activity. Additional contest information is available online at the Six Club's Web site, <http://6mt.com/contest.htm>, or by mail from: Six Club, P.O. Box 307, Hatfield, AR 71945. These are also the addresses for submitting logs. Here are the details:

1st sprint, April 24–25

The 1st sprint will be held on the fourth Saturday of April, for five hours, from 2300 UTC on Saturday until 0400 UTC on Sunday.

Each QSO with your own country is worth one point, and two points are scored for every contact made outside of your country. Hawaii and Alaska are considered separate countries. Multiply total QSO points by the total number of grids worked. All entries must be received by May 22, 1999, either by e-mail or "snail mail," to the addresses above.

Awards will be given out to 1st, 2nd, 3rd, and 4th place winners in each country. Six Club members and nonmembers are equally eligible for awards.

Full Weekend, May 21–24

This is the Six Club's major 6-meter contest, held on the fourth weekend in May. The contest begins at 2300 UTC Friday night and ends at 0300 UTC Monday. Scoring rules are the same as for the April sprint. All entries must be received by June 21, 1999, either by e-mail or snail mail to the addresses above.

Awards will be given out to the top three winners in each country and each ARRL section. Six Club members and nonmembers are equally eligible for awards.

2nd Sprint, July 17–18

The second Six Club sprint will be held on the third Saturday in July, for five hours, beginning at 2300 UTC Saturday and ending at 0400 UTC Sunday. Scoring rules are the same as for the April sprint. All entries must be received by August 21, 1999, either by e-mail or snail mail to the addresses above.

Awards will be given out to the top four winners in each country. Six Club members and nonmembers are equally eligible for awards. ■

CQ VHF Ham Radio Above 50 MHz

Reader Survey—March, 1999

We'd like to know more about you...about who you are and where you live, about the kind(s) of work you do, and about your ham radio interests and activities. Why? To help us serve you better.

Each month, we'll ask a few different questions, and ask you to indicate your answers by circling certain numbers on the Reader Service Card and returning it to us (we've already paid the postage).

And, as a bit of an incentive, we'll pick one respondent every month and give that person a complimentary one-year subscription (or subscription extension) to CQ VHF. This month, we'd like to ask about your education, your job, and your basic VHF interests:

A. Tell us about yourself:	**Circle Reader Service #**
1. Please indicate the nature of your employment:	
If you have or are a (choose one only, please)...	
Full-time job	1
Part-time job	2
Full-time parent/homemaker	3
Full-time student	4
Part-time student	5
Disabled, not working	6
Unemployed	7
Retired	8
B. Tell us about your ham radio interests/activities:	
1. Have you upgraded your ham license in the past two years?	
If your answer is...	
Yes	9
No	10
Licensed less than 2 years	11
Extra class more than 2 years	12
Not currently licensed	13
2. Please indicate VHF modes you operate:	
If you have ever operated...	
Amateur TV (ATV)	14
Contests (VHF)	15
FM simplex	16
Fox-hunting (hidden transmitter hunts)	17
Packet (including APRS)	18
Repeaters	19
Satellites	20
SSB/CW (weak-signal)	21
Other	22
None of the above	23
3. Please indicate what groups you belong to:	
Circle all that apply...	
AMSAT (Amateur Satellite Corporation)	24
ARES (Amateur Radio Emergency Service)	25
ARRL (American Radio Relay League)	26
CAP (Civil Air Patrol)	27
Local Radio Club	28
MARS (Military Affiliate Radio System)	29
NTS (National Traffic System)	30
Packet club	31
RACES (Radio Amateur Civil Emergency Service)	32
Skywarn	33
Weak-Signal Club	34

Thank you for your responses. We'll have more questions for you next month.

What You've Told Us...

Responses to our December survey about *non-radio* hobbies show that, as a group, you're active and involved in a variety of activities, many of which could and do make use of ham radio. In fact, 81% of you say that you're involved in one or more hobbies in which ham radio could play a role.

Tops among the hobbies we listed were camping (45%) and hiking (41%). Next was "other" at 39%—please tell us about some of those "other" hobbies in which ham radio can play a role. Others with participation above 25% included bicycling (36%), boating and computer experimentation (28% each), and hunting (26%). The 10–25% range was occupied by (alphabetically) amateur astronomy, amateur radio astronomy, flying, motorcycling, radio/control modeling, and RVing.

Nearly three-quarters of you (74%) use or have used ham radio in connection with one or more of these hobbies and another 14% might in the future. And 16% of you said you became a ham because of amateur radio's usefulness to a different hobby, while another 30% of you know someone else who did.

Link that 44% figure with a whopping 78% of you who feel ham radio could be better-promoted to these other hobbies, and we have a golden opportunity for highly effective recruiting. Specific ideas are invited.

This month's winner of a free one-year subscription is John Frasso of Havana, FL. As always, thank you for your responses.

Q & A

Questions and Answers About Ham Radio Above 50 MHz

The following question was directed to author Blake Kilburn, KI6US:

Q: I have a question concerning your "Build a 2-Meter Quagi" article in November's CQ VHF. How far is it from the outside end of the "H" section of PVC-tubing to the "DR1" director-rod? I am having trouble judging where to drill my first hole, based on the diagram on pg. 68, Figure 1.

Also, I would like to know if I could use brass-rod in place of the copper-coated steel rod. I have done other projects with the copper-coated steel rods in the past and had rusting problems. If you think the brass-rod will throw the project off, I could paint the thing with non-conductive spray-paint. Other than that, I just wanted to say thanks for the great project info. Can't wait to try the thing out. I have had some fun building a "Stacked Co-Linear 1/2-Wave J-Pole," but wish to experiment with this interesting looking beam. 73,

Steve Merrill, KB1DIG
Dover, New Hampshire

A: Blake has been in the hospital and hasn't been able to respond directly. I can't give you an answer about any effects that brass might have if used instead of the copper-coated steel rods, although my guess would be that, as long as they're the same diameter, there shouldn't be too great a difference.

As for the distance from the driven element to the first director, you can't figure it out from the diagram because it's not provided. Sorry about that, it slipped past us. You and another reader were the first to catch it. He and I talked about it on the phone and, extrapolating from the table in the ARRL Antenna Book for 147 MHz, we determined that the most likely distance is 15 1/2 inches. The other "missing" number is the distance from DR4 to the end of the PVC pipe. The overall length of PVC tube "H" is 72 inches (taken from the Table). The distance to the end from DR4 is whatever's left after you've measured and drilled the holes for all the elements. Hope this is helpful. I did mail your note to Blake, and hopefully he'll be able to respond directly to you soon.

The following question was sent to "Antennas etc." columnist Kent Britain, WA5VJB:

Q: Kent, I have a question about the driven element in your designs that have been given so far. I have all the past issues and have not found an answer anywhere. On the J driven element, you give the length of the long side but not the short side. I have looked at the tables and have not seen anything about this. Could you send the lengths for the short side to me so that I can build some of these? Thanks for any help.

Raymond Hartley, KE4TSY
Winston-Salem, North Carolina

WA5VJB replies:

A: There is no long side or short side. If I show the driven element as 12 inches long, tip to tip, then your finished Yagi will have the center of the driven element in the center of the boom. Allowing for the wood, you have 5 3/4 inches of driven element sticking out of each side.

W2VU adds: Kent, I think Raymond is asking about the length of the J-stub. If so, Raymond, the basic formula is that the "long" side of a J-pole is 1/2 wavelength long, and the stub, or short side, is 1/4-wavelength. If you look at the diagrams in all of Kent's "Cheap Yagi" articles so far, you'll see either an overall dimension for the driven element (in which case, you subtract the width of the boom, then divide by two and add back the boom width), or a breakout of element-length/boom-width/element-length (in which case you take one element length plus the boomwidth).

To keep you from having to go digging back to each issue since last August, see the Table for a rundown of the J-stub lengths, by resonant frequency.

Do YOU have a question about any aspect of "Ham Radio Above 50 MHz"? We'll do our best to give you a clear, concise answer—or if it's not a question that has just one easy answer, we'll invite readers to offer their solutions. Send your questions to: "Q & A," *CQ VHF* magazine, 25 Newbridge Rd., Hicksville, NY 11801; via e-mail to <q&a@cq-vhf.com> or via our Web page at <http://www.cq-vhf.com>. Be sure to specify that it's a question for "Q & A."

Table.

Frequency (MHz)	144	222	421	432/435	446	902/903	1296
Element Length	19"	12"	6.25"	6.25"	5.75"	2.6"	1.75"
Boom Width	.75"	.75"	.5"	.5"	.5"	.5"	.5"
Total stub Length	19.75"	12.75"	6.75"	6.75"	6.25"	3.1"	2.25"

Lasers to the Limit—Part 1 What's What in "Laserland"

If you thought "DC-to-light" was only an expression, think again. The author and some fellow hams are challenging the frontiers of laser communication, moving beyond the "common" red wavelengths to green and even blue, using Argon ion lasers.

By Eric Stroud, KB2TCQ*
(joe@mousehole.com)

Laser communication is a frontier more hams should explore, partly because of the wide variety of surplus laser equipment that can be found for nearly every budget. And amateur radio operators are given a lot of freedom to safely experiment with lasers, as there are currently no frequency limitations. Part 1 of this article will take a look at what's available in laser communication today, and, in Part 2, we'll focus on Argon Ion lasers for activity above 550 THz (that's Terahertz; 1 THz = 1,000,000 MHz!).

Visible Laser Activity

There's certainly activity in the 441- to 474-THz region, largely due to the availability of laser pointers, HeNe (helium-neon) tubes, and laser diodes, all of which operate in the visible red region (632 to 680 nanometers, or nm; see Table for a comparison of frequencies, wavelengths, and colors in the light spectrum). Quite a bit of amateur radio experimentation has been conducted in this region, and numerous articles have been written about construction, modulation, and receiver design using visible red lasers. That's why I decided to move away from visible red and toward even higher frequencies, into the range of green and blue light, above 550 THz.

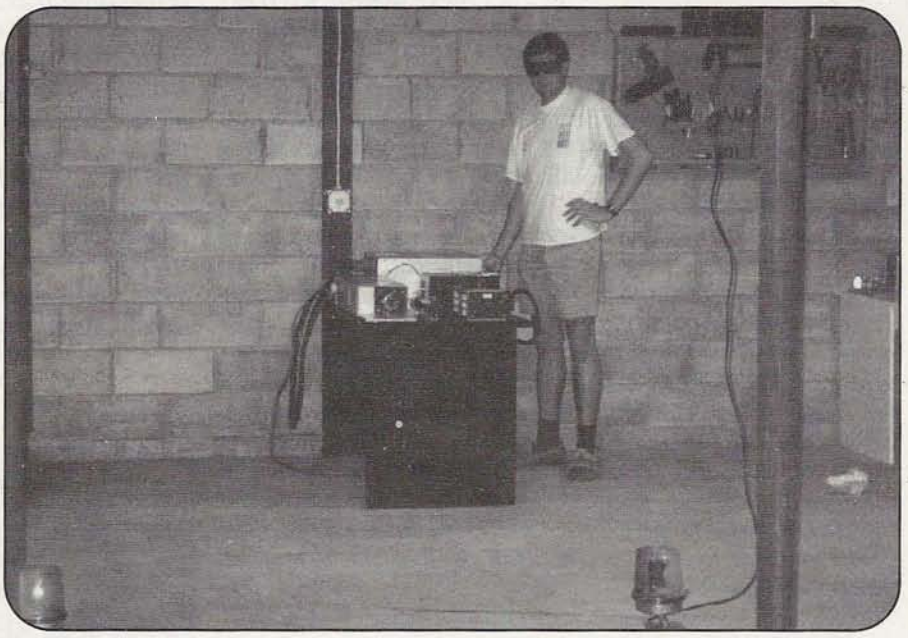


Photo A. The author in his basement laser lab. Note his special laser goggles and the warning lights in the foreground. Safety must always be your prime consideration in working with lasers. Depending on where you live, there may also be legal requirements for permits, etc. (Photos courtesy of the author)

Recently, some friends and I formed a small group to push the frequency envelope for free space communications (free space refers to a signal in the atmosphere, as opposed to a fiber optic cable or something similar). The group is based in northern New Jersey and currently consists of five amateurs/laserists. A lot of design work is done at my own laser lab (see Photo A). I've purchased a number of surplus lasers to do serious free space work with the group, and we've concentrated on frequencies above 550 THz. As a group, we've amassed a number of laser units, including a dye laser, argon lasers, a CO_2 laser, and colored HeNe lasers. Many of these were purchased over the Internet, while a few good finds were made at local hamfests. We've also home-brewed some units and we'll

Eric Stroud, KB2TCQ, has been a ham for four years and enjoys contesting and weak-signal work on VHF, UHF, microwave, and laser frequencies. He lives with his wife, Jean, in Oak Ridge, New Jersey.

Laser Basics

It wasn't too long ago that lasers were the stuff of science fiction, portrayed principally as light-beam weapons. Today, lasers have become part of our everyday lives—from CD players to supermarket checkout scanners—and "weapons" of modern medicine. But as familiar as they may be to us in use, many of us really don't understand exactly what they are or how they work.

The word "laser" is actually an acronym for *Light Amplification by Stimulated Emission of Radiation*. And the full name really helps explain what it does and how it does it. Power applied to the *lasing medium*—which can be a gas, a liquid, a semiconductor or a solid—inside something called an *optical resonator* stimulates the atoms and moves them to a higher energy level. If you read WA1CUH's basic explanation of quantum mechanics in our January issue ("Ozone Layer Propagation—Pondering the Possibilities," page 32), you'll remember that, when atoms move to a higher energy level, they *release* energy. These atoms release energy at light frequencies.

But what makes a laser different from a light bulb is that all of the light produced by each element in the lasing medium is at exactly the same frequency (color), and that the beam of light is *coherent*; that is, all of the light waves are moving in unison, rather than being of varying frequencies and phases. This *coherent* light beam can be very powerful and may be used for anything from communications to surgery to missile guidance.

"As a group, we've amassed a number of laser units, including a dye laser, argon lasers, a CO_2 laser, and colored HeNe lasers. Many of these were purchased over the Internet, while a few good finds were made at local hamfests."

attempt to construct an excimer (see below) laser this year. Fun stuff!

The group has already broken into the petohertz region (1 PHz = 1000 THz), in the ultraviolet range, and we're planning on exploring this part of the spectrum sometime in 1999.

Equipment for 550 THz and Above

If you've experimented with laser pointers and red HeNe lasers, and you're looking for more, you probably want something that can produce frequencies above 550 THz. How do you get there?

Five types of lasers offer the means of producing wavelengths in the 550-THz and above region: helium-cadmium (HeCd), diode-pumped solid state (DPSS), argon (Ar), excimer, and dye. Without going too deeply into the design and chemistry of these lasers, a brief overview follows.

Argon Ion Lasers for 563 to 655 THz

Argon ion lasers produce a bright blue-green emission. These are probably what you think of when a laser comes to mind and are what I'd recommend for getting started in 550-plus THz laser communication. Their applications include light shows, medical research and treatments, and manufacturing. Argon ion lasers can range in power from 20 milliwatts to 20 watts, and are typically easy to find on the surplus market. They produce a number of distinct emission lines between 334 nm (nanometers) and 1090 nm, depending on plasma current (plasma, in this case, refers to a gas that's been ionized to the point that it can conduct electricity. Plasma current is the flow of electrons within the plasma), with 488 and 514.5 nm being the most prominent. These two lines give the beam its bright green-blue color. This is useful because you're actually "transmitting" many different coherent THz signals all at once!

Small-frame argon ion lasers (20 mW to 1 W) are usually air cooled and can run off of 110 VAC, but they need around 5 amps of current. A popular model in this category is the American 60X argon ion laser *head*, or transmitter (Photo B), which is rated for 150 mW. Surplus units will put out between 75 and 100 mW, which will give you a visible beam at night. Along with your laser, be sure to get the proper power supply, as it's very difficult to construct one from scratch. A very popular and compatible power supply for the American 60X head is the Omnichrome 150 (see Photo C). The combination of 110-VAC operation and small size makes this package a great portable setup for about $1,100.

Mid and large frame argon lasers, ranging from 1 watt up to around 20 watts, need water cooling and, usually,

Photo B. The business end of an argon laser. This is an American 60-X 150 milliwatt laser head (transmitter), one of the more popular argon lasers available on the surplus market.

Table.

Laser Type	Emission Line (nm)	Frequency (THz)	Observed Color
Krypton Chloride (KrCl) Excimer	122	2459.02	UV-C (Ultraviolet)
Argon Fluoride (ArF) Excimer	193	1554.40	UV-C
Krypton Fluoride (KrF) Excimer	248	1209.68	UV-C
Xenon Chloride (XeCl) Excimer	308	974.03	UV-B
Helium Cadmium (HeCd)	325	923.08	UV-B
Nitrogen (N2)	337	890.21	UV-A
Xenon Fluoride (XeF) Excimer	351	854.70	UV-A
Border of visible region			
Helium Cadmium (HeCd)	441	680.27	Violet (Threshold of Purple Visibility)
Krypton (Kr)	476	630.25	Blue
Argon (Ar)	488	614.75	Blue
Copper (Cu) Vapor	510	588.24	Green
Argon	514	583.66	Green
Krypton	528	568.18	Green
Frequency Doubled Nd:YAG	532	563.91	Green
Helium Neon (HeNe)	543	552.49	Green
Krypton	568	528.17	Yellow
Copper (Cu) Vapor	570	526.32	Yellow
Helium Neon (HeNe)	594	505.05	Yellow
Helium Neon (HeNe)	610	491.80	Orange
Gold (Au) Vapor	627	478.47	Red
Helium Neon (HeNe)	633	473.93	Red
Krypton	647	463.68	Red
Ruby (CrAlO3)	694	432.28	Red (Threshold of Red Visibility)
Border of visible region			
Gallium Arsenide (GaAs)	840	357.14	NIR (Near Infrared)
Neodymium (Nd)-YAG	1064	281.95	NIR
Helium Neon (HeNe)	1150	260.87	NIR
Neodymium (Nd)-YAG	1330	225.56	NIR
Erbium	1504	199.47	NIR
Hydrogen Fluoride (HF)	2700	111.11	NIR
Helium Neon (HeNe)	3390	88.50	NIR
Carbon Dioxide (CO2)	9600	31.25	FIR (Far Infrared)
Carbon Dioxide (CO2)	10600	28.30	FIR

Table. Comparative chart of various types of lasers, their characteristic emission lines (wavelengths) in nanometers (nm), frequencies in terahertz (THz), and observed color (in the visible region).

three-phase 220 VAC. For portability, if running water is not available, an additional chiller unit will be needed, and this adds to cost, space, and weight. These lasers are considerably larger than the air-cooled argons, and will require, at minimum, 20 amps at single-phase 220 VAC. These are typically Class IV lasers and present considerable danger. (Lasers are classified according to their power output; from Class I, the weakest, to Class IV, the most powerful. Part 2 of this article will include a more detailed description of each class of lasers.) These beams are visible in air and you should have a CDRH (Center for Devices and Radiological Health) variance for free-space work (see "Resources").

A nice model to get is the Lexel 88 3-watt argon ion laser. It uses 25 amps at single phase 220 VAC (it can plug into a household clothes dryer outlet) and is water cooled, but does not take up a huge amount of space. Surplus units will produce 1.5 to 2.0 watts. The power supply and head together weigh about 140 pounds. Surplus Lexel 88s can be found for around $2,500 (a Lexel 88 and its power supply are visible in Photo C).

Helium-Cadmium (HeCd) Lasers

These ion lasers can produce two distinct emission lines: 325 nm (UV-B) and 442 nm (Violet). This will put you on 923

Keep in Mind...

Here are some things to keep in mind when shopping for lasers:

1) Any visible wavelength laser's beam will be visible to the human eye when there's enough scattering material in the air, such as water droplets, dust, etc.

2) Visible wavelength Class IIIB laser beams (more on laser classifications in Part 2; Class III and IV are the most powerful) become "more" visible to the eye, to the point that the beam remains fairly visible when viewed 90 degrees from the normal. Again, the more scattering material, the more pronounced the beam is.

3) Visible Class IV wavelength lasers are definitely visible from any viewing angle, which is why they're used for indoor and outdoor light shows.

4) Gas lasers possess much better beam characteristics than do diode lasers. The more tightly focused the beam, the farther it will travel in coherent form. This characteristic is called *divergence* and is measured in *milliradians*, or *mRad*. One milliradian (1 mRad) is equal to 0.0572958 degrees. For DX work, you want to look for a laser with a divergence as close as possible to 1 mRad, so that your beam reaches the receiver with minimal "spreading" (*in RF terms, think of a Yagi with a narrow beamwidth—ed.*). You can test your laser's divergence by observing the beam's diameter at a target within one foot, and then at a target at around 25 feet, and then at 50 feet. The beam diameter should be a *little* larger at 25 and 50 feet.

5) The wattage rating for a laser should not be compared to a wattage rating of a household light bulb, because they're calculated in completely different ways. Also remember that a laser concentrates its output into a very small area, while a light bulb is intended to illuminate as large an area as possible.

6) *Class IV lasers burn!* They burn the skin, and can cut paper, wood, plastic, and even metal. These lasers require the highest levels of safety. *Never use your hands or body to block a Class IV laser beam.*

THz and 678 THz, respectively. HeCd lasers in the surplus market are rare and generally have power outputs below 30 mW. Like the argon lasers, they use their own special power supplies, so be sure to purchase the current power supply for your laser head. Their moderate size makes them suitable for portable operation. They're considerably higher in price than a helium neon laser system, and you can expect to pay about $700 or more for a surplus 5-milliwatt HeCd system. Good surplus HeCd systems to look for are the Omnichrome 456 or Omnichrome 439-5, with power supplies.

Diode-Pumped Solid State (DPSS) Lasers

These ultra compact solid state lasers represent the most current technology and operate at 564 THz. Within them, a high power 1064-nm infrared laser beam is frequency-doubled to 532 nm by a potassium-titanyl-phosphate (KTP) crystal. The result is a very bright green emission, close to the wavelength to which the human eye is most sensitive (the eye is essentially a high-gain antenna for light. Just as a radio antenna has a resonant frequency at which it works best, the eye has the greatest "gain" at about 532 nm). These units represent the most compact and portable laser systems for use above 550 THz, and the technology is already in use in laser pointer pens. But they are costly. DPSS pens are in the area of $300, and 10- to 20-mW units cost around $1,000. Because it's a semiconductor laser, the beam is not as tightly collimated (focused) as a gas laser, and this becomes very noticeable within the first two miles of free space.

There are kits sold for constructing your own DPSS, but they require great skill. High-power IR laser diodes are extremely static sensitive, and extreme precision is needed for aligning the diode,

"Class IV lasers burn! They burn the skin, and can cut paper, wood, plastic, and even metal. These lasers require the highest levels of safety. Never use your hands or body to block a Class IV laser beam."

Photo C. Two lasers and their associated power supplies. At the front left is the American 60X laser seen close up in Photo B. Its power supply is in the front center. At the far right is the 220-volt power supply for the Lexel Model 88 3-watt argon ion laser, seen at the rear of the table.

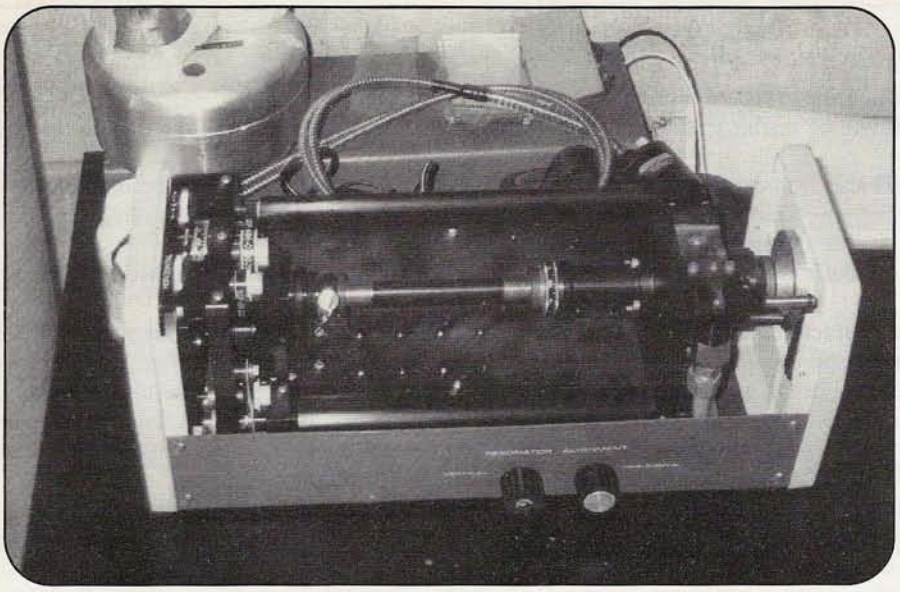


Photo D. A different sort of laser. This is a Spectraphysics 370 dye laser head. Unlike gas lasers, which produce beams at one or more specific frequencies, this one uses a different laser beam or other powerful light source to excite special laser dye, which produces a beam of colored light. This unit can be tuned to produce an emission for many different frequencies.

KTP crystal, couplers, and other crystals to get a quality beam. And you won't even save a whole lot of money, as kits are still in the $1,000 price range.

Excimer Lasers

Excimer lasers produce high intensity ultraviolet beams in the frequency range of 854 THz to 2.5 PHz. Excimer lasers are very rare on the "affordable" surplus market. When they do surface, partially functional units will command $1,000. And they require you to handle dangerous halogen gases, such as fluorine or chlorine. In my mind, it's not really worth the trouble of pursuing the laser, gases, and parts, because the money is better spent on the other lasers mentioned. (On the other hand, as noted earlier, building an excimer laser is our group's next project!)

Dye Lasers

A dye laser uses a powerful beam from a nitrogen laser, an argon laser, or a powerful flashlamp to excite a *laser dye*, which then emits a powerful beam of colored light. In this case, the laser dye is the *lasing medium*. This is really an option for those experimenters who already have nitrogen or argon lasers, or are familiar with strobe lamps. One can experiment with dozens of different laser dyes to produce many different visible and UV wavelengths. Some dye lasers are tunable, such as the Spectraphysics 370 (Photo D). This unit will allow you to tune the frequency of the light. Most of the dyes are toxic and costly, but one gram of laser dye will last you for years. You'll also need a small circulating pump (little cost). You can find some dye laser heads with optics starting around $300. Surplus Spectraphysics 370s are around $400. Laser dyes range from $50/gram and up.

Next Up: On the Air

That about covers the marketplace for affordable lasers. So start shopping (see "Keep in Mind..." for some tips on what to look for), and we'll get you on the air in Part 2. When we return, we'll talk about the stations that our laser group in New Jersey has put together, the places from which we've operated, and the surprising distances we've been able to cover. Will you be able to beat our distance records?

A closing word of caution: Lasers can be very dangerous. We want you to have fun and learn—but not cause injury or other damage. Unless you're working with someone who has laser experience, do not use any of the equipment we've described here until you read Part 2's discussions of laser safety. ■

Resources

For more information...

One of the most comprehensive online sources for laser info is Sam's laser FAQ Page: <http://www.intermarket.net/~don/lasersam.html>.

The Center for Devices and Radiological Health (CDRH) is a branch of the U.S. Food and Drug Administration. CDRH permits are required for certain outdoor laser activity. More information can be found at their Web site, <http://www.fda.gov/cdrh>. Or you may write to Center for Devices and Radiological Health, Rockville, MD 20850.

Equipment

Unless you find some rare gems at hamfests, the Internet is the place to do your shopping for laser equipment. See what these vendors have to offer or request their catalogs:

Anderson Lasers, 2883 W. Royalton Rd., Broadview Heights, OH 44141; Phone: (440) 237-6629; E-mail: anderr@netcom.com; Web: <http://www.andersonlasers.com/>.

Laser Resale, 54 Balcom Rd., Sudbury, MA 01776; Phone: (978) 443-8484; Fax: (978) 443-7620; E-mail: LaseResale@aol.com; Web: <http://www.laserresale.com>.

Laser Surplus Sales, 6110 E. Mockingbird Ln., Suite 102-774, Dallas, TX 75214; Phone/Fax: (214) 824-LASER (5273); E-mail: info@lasersurplus.com; Web: <http://www.lasersurplus.com>.

Laser Surplus, Inc., 759 Laurel Rd., Clinton, TN 37716-5454; Phone: (423) 457-5082; E-mail: lasersur@ix.netcom.com; Web: <http://www.lasersur.com>.

Midwest Laser Products, P.O. Box 262, Frankfort, IL 60423; Phone: (815) 464-0085; Fax: (815) 464-0767; E-mail: mlp@midwest-laser.com; Web: <http://www.midwest-laser.com>.

Handhelds You've Never Heard of... Until Now

The brand names may be new to you, but the companies behind them are well known in the ham market. And if you're interested in operating beyond 2 meters and 440, this will be a good place to look.

By Gordon West, WB6NOA*
(WB6NOA@cq-vhf.com)

Two new brand names have appeared on the VHF/UHF handheld market in recent months, but they're not really as new as you might think. Pryme (pronounced PRIME, not PREMEE or PRY ME!) is a new line of ham HTs from ADI/Premier, already an established name in the VHF-FM marketplace (their best-seller to date is the ADI AT-600 dual-band handheld). And Rexon is the brand name of HTs marketed by Maha Communications, best known for its line of nickel metal hydride (NiMH) batteries and chargers and power amplifiers. We're going to take a look at each company's newest offerings, starting (alphabetically) with ADI, um, Pryme.

Pryme PR-52 (6 Meters) and PR-222 (222 MHz)

ADI's newest handhelds are *definitely* not from the same mold as their present line, such as the AT-600, either in design or frequency coverage. The PR-52 covers the 6-meter band, and the PR-222 covers the 1.25-meter (222-MHz) band—and each handheld has 40 channels of memory and 5 watts output on a nickel cadmium (NiCd) battery.

The new style ADI Pryme HT (see Photo A) reminds me of the popular Alinco DJ-F1 series. It's short and stocky with a perfectly flat bottom, allowing it to stand up easily on a table top without tipping over (Photo B). The battery covers the entire back part of the handheld, so the belt clip actually goes on the back of the battery itself.

Both the Pryme 6-meter and 222-MHz HTs are heavyweights and have a nice feel. They're identical except for frequency coverage, so everything here applies to both units. When you turn the equipment on, you can't help noticing the relatively small LCD display with a very white background and very black numbers (Photo C). Not green on yellow, not light gray and dark gray, but jet black numbers on an almost pure white LCD background. But it's a small LCD display, so it's time to drag out those magnifiers when you need to try to figure out what the outside border of icons is telling you. The LCD back-light can be turned on constantly for nighttime use, or in momentary mode.

Amazing Audio

Audio output was amazing—loud enough to easily hear a call when wearing the equipment on your belt. On the top of the unit is a dual-color LED that glows green with channel activity, and turns red on transmit. There's no squelch knob, but rather an automatic squelch circuit with squelch override on the bottom of the PTT (push-to-talk) membrane pad. A single knob on the top controls volume and turns the power on and off. The top also has plugs for a speaker-microphone and for trickle-charging the battery pack while it's still attached to the radio. ADI supplies the small charger, too. The battery can also be fast-charged by contacts on the rear, as well as a fast-charge receptacle on the pack.

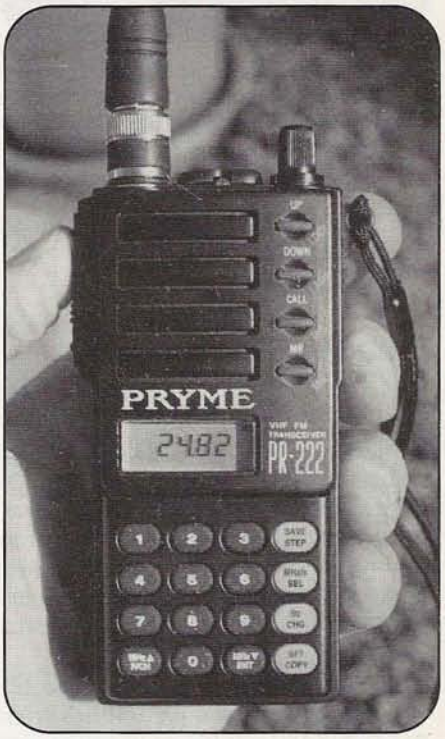


Photo A. The Pryme PR-222 handheld from ADI/Premier is one of the few 222-MHz HTs on the market today, and its twin, the PR-52, is likewise among a very small number of 6-meter HTs. (Photos by the author)

The antenna jack is a BNC connector, so it's a snap to get the adapter to run this equipment mobile. But if you do run it mobile, don't get long-winded on high power. The supplied battery pack puts out 600 milliamp-hours at 12 volts, and the unit begins to get warm after a solid minute of transmitting. Power output should be adjusted from 5 watts down to

**Gordon West, WB6NOA, is Senior Contributing Editor of* CQ VHF.

Photo B. The PR-222 (and the PR-52) feature flat bottoms so you can stand them on a table without fear that they'll fall over. The battery pack takes up the entire back of the radio.

1 or 2 watts for prolonged transmit times. There's an LCD bar that will show you your power level.

Frequency Coverage

The Pryme PR-52 covers the 6-meter band, on FM only, with transmit capabilities from 50 to 54 MHz (avoid the SSB and AM areas below 50.500 MHz). On receive, the little PR-52 goes all the way down to 40 MHz, letting you listen to low-band state police and highway patrol, low-band fire, baby monitors and the like at 46 MHz and 49 MHz, and even the Red Cross channel at 42 MHz.

The PR-222 transmits from 222 to 225 MHz, with reception capabilities from 216 to 228 MHz. With modification, you could even use this equipment to work our data band allocations from 219 to 220 MHz (*operations in this band segment* must *be coordinated through the ARRL to prevent interference to other services*). Remember, 220 to 222 MHz is now off limits to hams—we lost these 2 MHz to the land-mobile industry because there wasn't enough documented use of the lower portion of our "220" band.

Study That Manual

Both units come with a 20-page instruction manual, along with a one-page, ADI-written, "get-on-the-air-quickly" instruction sheet. Both the sheet and the manual are detailed enough to get you on the air in the VFO mode, but you'll need to do some rereading when it's time to program in repeaters with CTCSS and then store them in any one of the 40 memory channels. While the programming is straight-forward, the method is unique to Pryme and is *not* the way you may have learned from programming ICOM, Kenwood, Yaesu, or Alinco equipment.

For instance, CTCSS comes on as soon as you dial in any tone other than "000." You need to access the **Function** button (above the PTT membrane), get into the select mode, and move around to understand that there's both CTCSS encode and decode.

To change the duplex shift of a repeater, you press the **CHG** key, and then try to make out a microscopic plus or minus sign showing in the top of the display. But for CTCSS encode, the only time the "T" might appear is when you're actually transmitting, so you can't tell that you've got it properly programmed just by looking at the display on receive!

When it's time to go to memory write, you first enter the memory mode by pressing the **MR** key. Next select the memory channel you would like to edit (using the up and down keys), and then press **Function** and **MR**. Now enter the channel data again, and then press **Function** and **MR** (again) to save it to memory.

Both the 6-meter and 222-MHz Pryme single-band handhelds program identically, down to the last keystroke, other than the specific frequency you are punching in. Once you get the hang of multiple select key pushes—up to eight times to cycle through the menu—programming by the book will get you through all 40 channels. It's a little awkward, but after a couple of hours, you'll end up with 40 channels of simplex, repeater duplex, full repeater decode, paging, scanning, DTMF paging, battery save, and even the capabilities of hiding your frequencies by changing over the channel display to only a channel number.

The memories could then be cloned to another Pryme set using an optional cloning cable; or, if you're into computer lists of frequencies, there's even a PC programming mode, with the purchase of the optional PC software/cable kit.

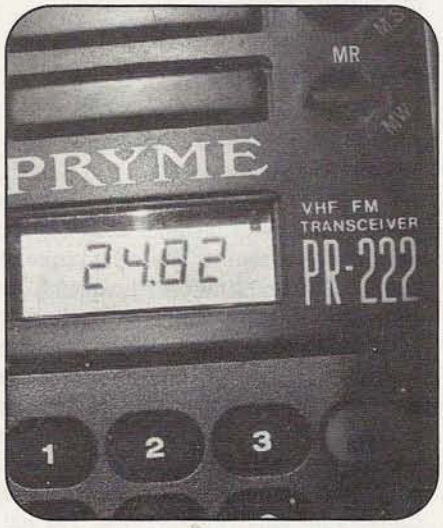


Photo C. The LCD display on the Pryme HTs is friendly to the eye, with flat black numbers on a nearly pure white background.

On the Air

Once the equipment is up and running with your stored 40 channels, you'll enjoy crystal-clear contacts with a handheld that won't fall over when you put it back down on the table, and that feels hefty enough to give old-timers that "real radio" feel. I would strongly recommend taller aftermarket rubber duck antennas and, when operating mobile, running the equipment on medium power in case you get long-winded and don't have your hand on the handheld to see how warm it's getting. That's one precaution with any external speaker/microphone. Since the radio is now sitting on the front seat, you don't get a chance to ensure that it's not getting overheated on high power.

I made plenty of contacts on several Southern California 222-MHz linked systems and everyone liked the sound of the PR-222's audio. On 6 meters, the little rubber duck won't cut it for much repeater operation unless you are within a couple of miles of the machine. An external antenna does the trick nicely. Also, real tall aftermarket 6-meter antennas will help, too. Pricing is in the mid-$200s for each handheld.

Maha's Rexon HTs

Chances are you'll recognize the name Maha from the small white and green boxes at ham stores and conventions that hold their NiMH battery packs. While there is still a big debate in the ham community about NiCd versus NiMH, if you follow the entire battery scene in land-

Dealers: Listen Up!

A few years ago, one of the biggest complaints about full-featured, dual-band handhelds was their complexity. The word "intuitive" creeps into the picture, meaning that programming a memory channel should be a natural progression of what is on the screen and what goes into that memory channel. But not so with the REXON 501—even after several read-throughs of the book, it takes some additional keystrokes to program an entire repeater "package," in layers, into a memory channel.

This full-featured REXON from Maha requires those granny glasses to see the micro-little icons showing plus and minus and tone. And, if you're not looking carefully, when you try to pump everything into one repeater channel with a single keystroke, something goes away and you don't even know it until the repeater just won't. Very frustrating!

This points out the importance of a dealer really wanting to get behind this equipment, having chip sets already pre-programmed for repeaters in the area, and saving the newcomer from the frustration of trying to get everything into the memory for the first time correctly.

Photo D. Maha—the battery folks—is importing Rexon handhelds for the ham market. This single-band RL-112 is for 2 meters, and there's a matching version, the RL-412, for 70 centimeters.

mobile handheld radios, it looks like NiMH is indeed here to stay.

Now, Maha has entered the handheld world as well, begging the question: Does the world need another? Regardless, Maha now offers four VHF and UHF handheld transceivers: two for 2 meters, one for 440, and one dual-bander. They carry the "sub-name" of Rexon, and one of the units reminds me of what I used to see a year or so ago from Midland.

Rexon RL-112/412

The RL-112 is a 2-meter VHF handheld and the RL-412 is a matching UHF version (see Photo D). Each has 20 memory channels that can take simplex, repeater duplex, or "odd split" transmit for each channel. There is also one programmable call channel.

I tested both and found the equipment worked well as advertised. But on the 112/412 transceivers, don't plan to start running them out of the box without poring over the small-print, 58-page instruction manual. Actually, I think the instruction manual was purposely printed extremely small in order to train your eyes to be able to see the *extra*-small indicators that you can *almost* make out on the LCD display. Important indicators like +/- repeater shift, tone, and the flashing memory icon are barely visible to the middle-aged eye. If you're over 50 (which I am), you will definitely need cheaters (glasses) to read both the instruction book and the actual LCD display on both the VHF and UHF models.

But the equipment *does* work beautifully. The keypad lights up, as well as the display, and the top two knobs control volume and channel-changing. Rexon does something unique with the squelch: it gives you a small squelch knob that's recessed below the two big knobs so it won't get accidentally shifted, and, like all other handhelds, it has a squelch override with a monitor button.

On the top is a small LED that glows green with channel activity, and red on transmit. Maha *does* include CTCSS decode, which allows you to mute the

speaker so only those signals that carry the exact tone of your choice blast through. But if the channel is occupied, you'll see the silent LED glowing green.

Turn It On

Audio output was relatively loud. I'm happy to see this because it means you can wear this equipment on your belt and still be able to hear any calls that should come through.

Both the VHF RL-112 and the UHF RL-412 provide everything as advertised, and, as long as you spend some time getting the 20 channels programmed into memory, you'll be all set for easy operation without the book. But 20 channels isn't much, so if you live in an area that has a ton of repeaters, you may wish to consider their step-up model, the RL-115 (see below). You get what you pay for with the RL-112 and RL-412 from Maha.

When calling around to the local ham stores, I found the RL-112 selling for around $135, and one store had them on a special at around $99. But keep in mind that this is the smaller, low-power, battery pack, so add about $20 if you want to go with the 5-watt, 12-volt Maha battery system.

Rexon RL-115

This appears to be a newer-technology single-band handheld, because the LCD display is nice and big and you can read all the little subcharacters relatively well (Photo E). The 115 also has that new-technology handheld "feel": wide and flat, bigger, back-lit, oval keys, a bigger speaker, and a battery system that slips up and inside the bottom of the HT. I liked the "feel" of the 115 much better than the 112.

The 115 offers 72 memory channels which can hold independent TX/RX (transmit/receive) frequencies, oddball shifts, two pairs of programmable subband limits for scanning, selectable scan skip, scan resume, priority monitoring, and instant recall of the call channel. CTCSS encode *and decode* are included, but it took a few minutes to figure out how to dial up the exact tone frequency. To get to the sub-functions, you don't hold a function button, but rather push the keypad "D" button once, and then the #2 "test" key to get to CTCSS tone select. I'm not sure why that's considered "test," but that's how the sub-functions work on this radio.

Photo E. The Rexon RL-115 is a single-band 2-meter HT with what appears to be newer technology than the RL-112 (and the LCD display is definitely easier to read).

"There are three levels of transmitter output, and I was able to get 5 watts out when using a 9.6-volt battery pack," comments Julian Frost, N3JF, one of several hams who tried out the radio. "But at 5 watts," he notes, "the unit gets very hot after just a few minutes of transmitting."

Once I figured out how to get into the function mode, the 115 was a lot easier than the 112 to run without reading the book. I liked the automatic repeater shift, but found a glitch in how to get the shift to turn on. I would first enter a frequency via the keypad, but then needed to turn the dial up or down one click in order to kick the shift into automatic. But since I was going to load everything into memory, no big deal.

The 115 has all of the bells and whistles you could ever want: DTMF autodial memories, paging and code squelch, priority monitoring, memory skip scanning, masking memories, simple memory storage, and all of the advanced features you'd expect from a modern handheld, including automatic battery saver, automatic power off, seven 3-digit code memories for storing ID codes—you name it. If you enjoy playing radio, I'd recommend this one over the less-expensive 112.

The Rexon RL-115 was seen selling for around $175, and this puts it right in there with the least expensive, full-featured, mega-memory 2-meter handhelds.

Rexon Dual-Band RL-501

This is a traditional dual-band, full-function handheld (Photo F) with twin displays of both the 2-meter and 440 bands, simultaneous reception on both bands, and simultaneous transmit on one/receive on the other (enabling this HT to work as a cross-band repeater).

Maha Communications is the exclusive U.S. distributor for the Rexon Technology Corporation handhelds and brings the dual-band RL-501 into our country with the optional RMY 100Z memory chip already installed. This chip provides 100 memory channels for VHF and 100 additional memory channels for UHF. This chip is factory installed and may be transferred to another unit by disassembling the battery receiver rails and getting to the chip that slides in and out of a little socket deep inside the bottom of the transceiver.

I could see an enterprising ham radio dealer initially setting up a master unit with 200 channels of local memory, then cloning a second unit's empty chip with

Photo F. Rexon's RL-501 is a full-featured dual-band handheld for 2 meters and 70 centimeters, at a price below what you'd pay "the big boys" for similar "bells and whistles."

these channels, and then repeating the process until the dealer has a box full of pre-programmed chips to insert in any new or used Rexon RL-501. About 10 years ago, Standard Radio Products had this same removable-chip memory feature, but found that everyone wanted the most memory possible, and didn't want to go to the expense or trouble of taking the unit apart, pulling out a 40-channel memory chip and installing one with three or four times the capability. So Maha now includes it in the base price.

Maha also includes the CTCSS decode board. It's already installed, and it not only does tone decode, but also offers all of those trick paging features found in most high-end HTs.

Everything But the Kitchen Sink

"With our 501, we include everything," comments William Chueh, KF6PXU, son of Maha Communications President Charles Chueh, KF6PXW. "We wanted everything in this unit to play straight out of the box, so this is why our Maha dual-band handheld offers all of the normally optional accessories as included features."

And the Maha, um, Rexon dual-bander has plenty of features, after you figure out how to turn it on. The on/off button is a little dimple on the top right corner of the radio. If you don't read the manual to figure out where to push, the unit won't turn on. The on/off button is located next to the twin volume and squelch controls and right beside the channel-changing knob.

"It would be nice if the knobs had a rubber coating on them, rather than just the plastic," commented reviewer Julian Frost, N3JF. "It would be a small refinement that would give the operation of the rotating controls a smoother feeling."

Watch Those Typos!

The instruction manual is written fairly well, but typos here and there and the extra small print detract from all of the great information that the manual contains in infinite detail. I really liked the "advice" paragraphs after many of the procedures and notes—it's sort of a review of what was just said, and, in principle, how to make this particular procedure work for someone just getting started with ham radio.

The instruction manual talks about switching the receiver from FM to AM. I was hoping that this would then tune in AM air frequencies, but I couldn't get the receiver to tune below 130.000 MHz. Most of the good AM air traffic is below 130 MHz, so there may be some additional inside mod to enable lower frequency reception. The highest the VHF side goes is 174.990 MHz—plenty high.

On UHF, I was surprised to find reception from 400 MHz all the way through 469.990 MHz. The VCO was a little shaky down at the bottom end, but I was able to hear a very low signal from a 406-MHz simulator test set.

Running with the Big Boys?

When it comes to menu items and features, the RL-501 is right up there with the "big boys"—but no alphanumerics and the actual size of the LCD display is nowhere near what we now get from those big boys.

It's tough for anyone to really compete with all of the excellent handheld products from Kenwood, Yaesu, and ICOM. But competition continues to play an important role as ham manufacturers try to outdo each other, and this little REXON dual-bander from Maha is certainly worthy of consideration if you can't afford a dual-bander with similar features from the big three. Chances are you'll probably see this equipment sell in the $260 range, but it's a dandy little dual-band HT for the money.

Finally, if you get a chance to see Maha at a ham show, spend some time talking with William Chueh, Charles' son. He's just a teenager, but he communicates as if he's been at the corporate level for the past 40 years. This young man is going to go big time in the radio industry. ■

Resources

For more information about Pryme radio products from ADI, contact ADI Premier Communications, 480 Apollo St., #E, Brea, CA 92821; Phone: (714) 257-0300; Fax: (714) 257-0600; Orders only: (800) 666-2654; Web: <http://www.adi-radio.com>.

Rexon handhelds are available in the U.S. from Maha Communications & Electronics, 2841-B Saturn St., Brea, CA 92821; Phone: (800) 376-9992; Fax: (714) 985-9221; Web: <http://www.maha-comm.com>.

Mission Impossible?—Getting Young People Interested In Ham Radio

Is it really as difficult as so many of us think it is to get young people interested in ham radio? KC7GCL says no...and offers some concrete suggestions for introducing new people to our hobby.

By Neil Dabb, KC7GCL*
(neild@cc.usu.edu)

Teenagers are interested in TV, food, clothes, and loud music. School is the place were they congregate to discuss the injustices imposed on them by the older generation, the newest fads in music and clothing, and the most recent episode of their favorite TV show. Teachers will attest to the fact that if they show a spark of interest in anything, it was either a mistake, or the child is ill and should be sent home immediately.

Sound familiar? Chances are your parents said the same things about you when you were at that stage of life, and you turned out fine (anyone who is a ham radio operator *must* be OK). So how does that creature who empties the fridge in 30 seconds flat and has a phone growing out of its head become a ham?

First, you need to realize that not everyone wants to become an amateur radio operator (much as we would like to think otherwise). If the only reason you become a ham is because a parent or significant other pushes you into it, chances are you won't remain active and will eventually let your license lapse. On the other hand, there are many young (and even not so young) people out there who would jump at the chance to become a ham, once that spark of interest is struck. Anyone can get a license because there are really very few handicaps that will prevent a person from becoming a ham.

Photo A. Getting young people, such as the author's daughter, Hollie, on the air is an excellent way to spark their interest in ham radio. Hollie is not licensed, but her sister Julie is KC7RPP. (Photos by Melanie Dabb)

So how do you get a teenager interested in something besides TV, pizza, and members of the opposite sex?

Generally Speaking

We're talking teenagers here (Photo A), but that doesn't mean that younger children won't be interested, and they generally have a lot fewer distractions than the teenagers do. Most of the ideas we'll cover here will also be good for younger children, and for girls as well as boys. While the number of girls getting into the hobby has grown over the past few years, it is far from 50-50.

The keys to getting and keeping young (and even not so young) people interested—in just about anything—are to make it fun, and to let them get their hands on

Neil Dabb, KC7GCL, lives in Logan, Utah, with his wife and five children. He is an industrial trainer and a freelance writer. Originally licensed while in high school, Neil let his Novice license lapse, then returned to ham radio in 1995.

Photo B. Camping and scouting are both good ways to get young people interested in ham radio. The author's son, Kelly, seen here, is studying for his ham license.

the equipment. My current assignment is taking a hands-on science program (Junior Engineering State, through Utah State University) to elementary schools throughout the intermountain states. The students are excited because they're having fun, and they get to do the experiments themselves—they get to play with the toys. (Unfortunately, we haven't yet been able to work ham radio into the program, but I haven't given up.) One of the new people in our office was shocked at how excited my partner and I were when a box of toys for our program came in. I've seen very few hams who weren't just as excited about getting and using a new rig.

I got my novice license in high school because my electronics teacher (Arol Maughn, WA7FMW) had the "toys" for us to play with. My license lapsed because, after I graduated, the toys to play with were no longer available. But I came back. If you get someone having fun and get them playing with the toys, they're hooked for life.

Scouting and Camps

Scouting offers a great many opportunities for getting young people involved with ham radio. Probably the biggest, or at least the best known, is the *Jamboree on the Air*, or JOTA. The first Jamboree on the Air was held back in 1958, and has been an annual event since, giving Boy Scouts, Girl Scouts, and their leaders the opportunity to learn more about amateur radio and make friends around the world. JOTA is held on the third weekend in October, each year, starting at 12:01 a.m. Saturday (local time) and ending at 11:59 p.m. Sunday.

Once scouts realize that they can participate in an activity with other scouts around the world, without leaving their immediate area, they'll approach local ham operators and clubs for assistance in this area, right? Maybe, but there are no guarantees. In any event, *this should not be the case*! As amateur radio operators anxious to get young people interested in *our* hobby, *we* should be out beating the bushes for both Boy Scout and Girl Scout groups that would like to participate in this worldwide event.

The Boy Scouts' radio merit badge has been around for many years, and it's one of the harder merit badges to get. The Girl Scouts are in the process of introducing a badge for radio. JOTA is an excellent opportunity for hams to help these scouts get their badges, as well as for getting them hooked on ham radio.

Camping provides another good opportunity, not only to get young people involved but also to try out your emergency gear and see if you could get on the air in a pinch. If a scout leader is also a ham (or is it, if a ham is also a scout leader?), he or she can generate a lot of interest just by bringing along the radio when the scouts are out on a hiking or camping trip (not to mention that it's a good safety net if someone needs help). I learned how effective this can be in getting people interested when I went on a father and son campout and saw how interested one of the leaders was in what I was doing with the radio. In addition, my son is now working on getting his license (see Photo B).

There are many other activities, such as bike races and hikes, which can provide common ground for both youth groups and amateur radio operators. An example here in Utah is a yearly activity called "Peak to Peak" in which scouts go

Photo C. Cedar Ridge Middle School in Utah, where Travis Roberts, KK7OV, was in charge of a club to introduce students to the hobby.

to the tops of the mountain peaks and try to signal each other using mirrors. You can imagine how much easier this is when the hams are there to help. Again, find out who is in charge of your local scout group (or other youth group) and offer to help.

In addition, there are some summer camps that have amateur radio clubs as part of their curricula. A good example is the Shohola Amateur Radio Club. Camp Shohola is a traditional boys camp located in the mountains of Northeastern Pennsylvania (see "Resources" for the Camp Shohola Web page and other examples). There are also many radio clubs that hold special event expeditions to famous places or hard-to-get grid squares. If you're in a public place, be sure to bring along someone who can explain ham radio in plain English. Contacting these special stations is also a fun activity. A quick search of the ARRL Web page, <http://www.arrl.org>, under special events, will give you a good start.

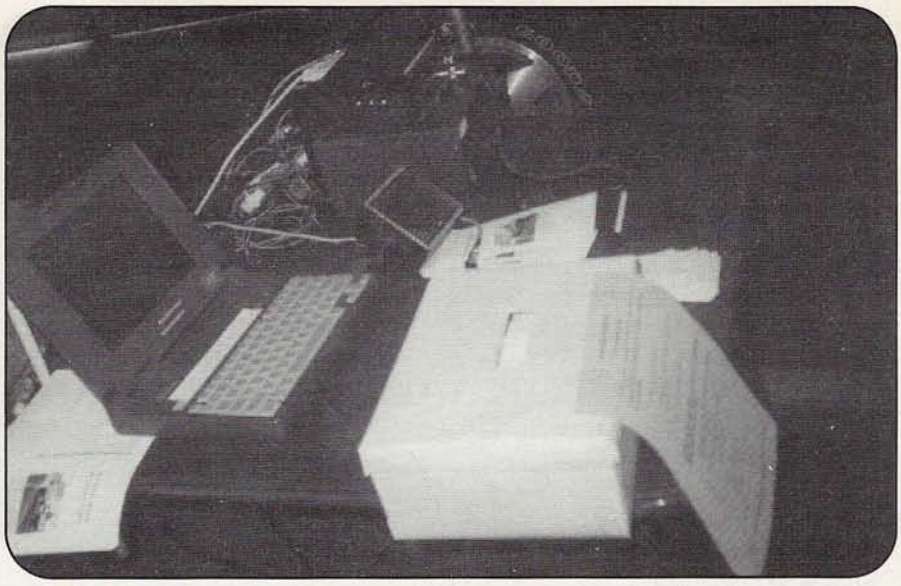


Photo D. The Bridgerland Amateur Radio Club (BARC) sponsored a booth at Logan, Utah's "night out against crime." There are many opportunities such as this that allow ham clubs to get some good publicity and introduce ham radio to the public.

CB and Science Fairs

An editorial by Rich Moseson in last June's *CQ VHF* ("Battling Band Bigotry") reminded me about some of the things that got me interested in electronics, and eventually in ham radio. My father was a TV repairman for a while, and, during that time, I learned that those funny wires on the roof were antennas and that the little transistor radio I saved my allowance for had an antenna as well. I soon learned that if I placed the radio just right, and listened after the sun went down, I could hear music from a long way away.

It was several more years before I took the electronics class I spoke of earlier, but the spark of interest and experimentation had to start somewhere. It's a lot easier to get someone who's already interested in radio to get their ham ticket than trying to start cold. So talk to your friends who spend their time on 11 meters (CB), and with those scanner and shortwave enthusiasts—especially the young ones. Let them get their hands on some ham equipment (with your supervision, of course) and discover what they're missing.

Another area that can showcase radio-related subjects to young people is science fairs. The subjects can be widely varied, whether it's a radio telescope (like the project done by my daughter, Julie, KC7RPP) or a remote-control (read that as radio-control) car or plane. The lure of 10 to 20 new channels to use for R/C projects may be irresistible. Even something as simple as finding a better antenna for a favorite music station can be the spark that ignites a teenager's interest in ham radio.

School Radio Clubs

Of course, there are also school radio clubs at many levels. Many have ham shacks, nets, and a even Web sites (see "Resources" for some examples). Some are run by teachers who are hams, while others are run by local hams as a means of introducing students to radio and getting them interested in the hobby.

Travis Roberts, KK7OV, told me about the Cedar Ridge Middle School club (Photo C) with which he worked this past year. He and the kids spent six weeks talking about ham radio, including HF, packet, the Internet, and Morse code software. The general premise was to take the time to get students interested.

Since school clubs are usually sponsored either by faculty members or the local PTA, those are the people to contact. Chances are that if there is a faculty member who is a ham, he or she will already have something set up (shame on them if they don't). If there's no one on the faculty who's interested (talk particularly with the science teachers), contact your local PTA president and ask for the name of the person on their board who can help you get the club set up. With their help, it shouldn't be too hard to organize a club at your local elementary, middle, or high school.

NASA is also involved in getting young people involved in amateur radio, through its SAREX program. SAREX stands for Space Amateur Radio EXperiment and is a cooperative effort between NASA, AMSAT, and the ARRL in which ham radio operators work with students to set up live question-and-answer sessions with astronauts in orbit. More than 200 schools have participated in this program to date (see the SAREX Web site in "Resources" for more information and application forms for your local school). Unfortunately the number of SAREX flights in the near future will be limited due to construction of the International Space Station, but, on the other hand, once the space station is complete, there'll be a permanent ham station in space for amateurs to contact.

On-Air Activities

There are several ham activities that lead naturally to getting young people (and the not so young) interested in amateur radio. Field Day is a prime example. The ARRL gives bonus points for setting up in a public area and sharing the radio art. It's been my observation that young people are fascinated with the equipment. Then, if they can make a contact or two, they're hooked—and since young people

"Advertising, such as hats, shirts, and license plates, can let people know we're hams and get them asking questions. As long as we're willing to answer them, the spark of interest may be ignited, and they may become hams."

are often attracted to any public event, chances are you'll have many opportunities to show off the hobby.

In addition, whenever we provide communications for public events, such as races, parades, and neighborhood watches, we're giving the public a taste of what ham radio is all about. Demonstrations for local groups can also get others interested. Another activity that anyone can participate in is hidden-transmitter hunts, or foxhunting (see KØOV's articles, elsewhere in this issue and in the April, 1998, *CQ VHF*). Again, offer the activity to local scout and youth groups and see what happens.

Keep On Keepin' On

The biggest thing is to keep doing what we are already doing. My son's best friend was riding with me while I was taking a load of equipment up to a girls' camp. I was in regular communication with my daughter, who was in another vehicle, and before long my son's friend was asking questions. I answered them and told him what he needed to do to get his own license. When we got back to my home, I showed him some books and he spent the rest of the afternoon reading. He moved to California recently, and is still excited about getting his license so he and my son can stay in contact with each other (and now his father is interested as well).

Advertising, such as hats, shirts, and license plates, can let people know we're hams and get them asking questions. As long as we're willing to answer them, the spark of interest may be ignited, and they may become hams. No, family and peer pressure to get a license don't always work. But that doesn't mean we shouldn't keep trying.

Everyone keeps complaining that the hobby of amateur radio is dying and that we must get the young people involved or the hobby will fade into oblivion. However, the sunspot cycle is turning our way and the fascination factor in radio is still there making the time right for this project. It's up to each of us to make the most of it.

This is your mission, should you decide to accept it, and the opportunity will be gone before you know it. Good luck! ■

Resources

Here are just a few examples of Web sites that can give you ideas or information for introducing young people to amateur radio. Searching the World Wide Web will yield more than enough information to get you started.

John Hanson School Radio Club	<http://www.mikeadams.clara.net/page3.htm>
Carl Hayden HS	<http://www.hayden.edu/~ham/>
Yale ARC	<http://www.yale.edu/w1yu/index.html>
Camp Watonka ARC	<http://www.watonka.com/hmepage.htm>
Camp Shohola ARC	<http://www.shohola.com/hamradio.html>
Radio Active Camping and Contesting Club	<http://www.startext.net/homes/jspencer/racc.htm>
Society of Amateur Radio Astronomers	<http://www.bambi.net/sara.html>
SAREX	<http://www.gsfc.nasa.gov/sarex>
Handi-Hams	<http://www.mtn.org/handiham/index.html>
Jamboree on the Air	<http://www.bsa.scouting.org/international/jota.html>
Motorcycling Amateur Radio Club	<http://www.calgary.shaw.wave.ca/~dpushie/marc/>

SATERN—
The Radio Club with a Difference

When disaster strikes, The Salvation Army is often among the first responders, and ham radio—through SATERN, the Salvation Army Team Emergency Radio Network—is an important part of the Army's emergency response.

By Ann S. Shaver, WH2E*
(ashaver@hawaiiancondos.com)

Imagine yourself—and your trusty HT—in the crowd of people greeting the President of the United States when he climbs out of Air Force One to inspect flood damage. Imagine that because of your radio skills, you are among a select group of volunteers helping Midwesterners rebuild their lives after tornadoes have ripped through their community. Picture yourself, chosen because of your technical aptitude, flying to Japan to drive a mini-field kitchen through the narrow streets of Kobe to help feed people following an earthquake.

These are some of the actual experiences SATERN volunteers John Stiles, WØOSP, Terry Thurn, KCØSVW, and Bill Shillington, W9ZCL (Photo A) can tell you about.

No, It's Not a Planet

SATERN, the Salvation Army Team Emergency Radio Network, was formally organized about 10 years ago by Salvation Army Major Patrick McPherson, WW9E, Art Evans, KA9KLZ, and a few others who recognized the valuable contribution amateur radio operators could and did make in supporting The Salvation Army's emergency disaster responses.

*Ann S. Shaver, WH2E, was first licensed in 1990. She is active in many aspects of amateur radio, including VE testing and public-service events. She enjoys participating in Special Event Stations, either as an operator or as part of the crowd.

Photo A. Bill Shillington, W9ZCL, tells a SATERN seminar about his flight to Kobe, Japan, to help The Salvation Army deliver a canteen (mobile response unit) to an earthquake-stricken area. (Photo courtesy WW9E)

Over the past decade, SATERN members have responded to a variety of natural and manmade disasters throughout North America and the Caribbean. With 20- and 40-meter HF nets, local VHF nets, packet nets, plus extensive use of the Internet and e-mail, SATERN now has an international presence as well.

According to SATERN officials, the group combines all the best features of a service-oriented radio club and realizes all the potential of amateur radio. This grandiose statement was more than amply demonstrated at the fourth annual SATERN Emergency Disaster Services Seminar last October at Camp Wonderland, in Kenosha, Wisconsin. Then, it was put into action in the various weather disasters which quickly followed the close of the seminar.

"These weekends are so great," Rich Jurgaitis, KA9GQF (Photo B), pointed out. "They are an opportunity to see old friends from all over, meet new people, share our experiences and sharpen our operating skills." He neglected to mention that the wooded setting is particularly magnificent in autumn and that the food at Camp Wonderland is always delicious and plentiful. Last year, there were about 190 registered participants from Canada, New York, Oregon, California, Hawaii, and points in between.

"It Was So Horrible..."

The seminar featured first-hand reports of responses to actual disasters. Kevin Philipps, Director of the Cook County (Illinois) Sheriff's Department Emergency Management Agency and Edmund Donoghue, M.D., Chief Medical Examiner for Cook County, shocked the audience with their accounts of the devastating, deadly heat wave that eventually claimed more than 700 lives in Chicago

Photo B. Rich Jurgaitis, KA9GQF, speaks at last fall's SATERN Emergency Disaster Services Seminar in Kenosha, Wisconsin. (Photo courtesy of the author)

in the summer of 1995. SATERN members not only provided typical communication services for responders, but also actually went room to room, checking on the welfare of vulnerable elderly people.

"It was so horrible," remembered Della Garcia Bracey, SATERN's dedicated administrative assistant. "We'd go into a room, give a person some cool water. Everything would seem OK. Then we'd go back minutes later and that person was dead. It really was unbelievable."

Tornadoes were the subject of another session. William Coleman, Disaster Services Director of The Salvation Army's Northern Division, and ham Terry Thurn, KCØSVW, discussed an actual response to the numerous tornadoes that cut a path of devastation in central Minnesota last May. The farming community of St. Peter was essentially wiped off the map and, within hours, The Salvation Army and its volunteers were on the scene to provide food, shelter, and emotional support for the victims. Following their vivid talk, Tom Mefferd, Director of the DuPage County (Illinois) Office of Emergency Management, discussed the meteorological phenomena producing these deadly windstorms, as well as recent technological advances in emergency weather preparedness. Ironically, moments after he mentioned radio and paging systems to alert people of impending dangerous weather conditions, dozens of beepers sounded throughout the audience—the National Weather Service had just issued a bulletin for southeastern Wisconsin!

The Role of Ham Radio

Over the weekend, workshops addressed various aspects of amateur radio

Photo C. Mike Duce, N9IWZ (left), and Pat Duce, WZ9H (right), conduct an emergency communications workshop at last fall's SATERN Emergency Disaster Services Seminar. (Photo courtesy of the author)

as it relates to emergency operations. Bill Downie, N9JRB, discussed maintenance, operation, and certification of emergency generators. Bill Davidson, KA9SWW, and Rich Jurgaitis, KA9GQF, demonstrated ways to get emergency power and tricks for constructing mobile antennas. Bill Shillington gave such a successful introduction to amateur radio theory that Mort Williams and Dick Anderson passed their Novice written exams at the VE testing session that followed! Mike Duce, N9IWZ, SATERN VHF Net Manager, and Pat Duce, WZ9H (Photo C), conducted an emergency communications exercise based largely on their experiences in actual emergency responses.

Other workshops dealt with subjects somewhat tangential to amateur radio operators, but central to a typical SATERN operation. Dee Shillington, WB9WVY, a food-services professional, discussed safe food-handling techniques. Robert Myers, Jr., N3YDL, Disaster Services Director for The Salvation Army's Western Pennsylvania Division, explained the Incident Command System and how it is useful in actual emergencies. (*The Incident Command System, or ICS, is becoming a major cornerstone of emergency response nationwide. To learn more about it, see this month's "In the Public Interest" column.—ed.*)

Beyond the Workshop

The learning—and the fellowship—continued past the formal close of the seminar. Before taking Jerry Jennison, N5OKQ, to the airport for his flight back to San Angelo, Texas, Harry Gilling, W9IB, made a detour to his shack to demonstrate APRS (Automatic Position Reporting System) and a means of accessing VHF repeaters through the Internet.

Harry selected a repeater in Houston, thinking Jerry would enjoy hearing some Texas talk. Did he ever! The subject on the repeater was the local club's response to the latest round of flooding to hit southern Texas. This was of particular interest to Jerry, who is a past president of Texas VOAD (Volunteer Organizations Assisting in Disasters). Not surprisingly, through the many facets of amateur radio and SATERN, Jerry was being drawn into emergency response on what should have been a quiet Sunday afternoon!

As it happened, Jerry had addressed the seminar just a few hours earlier regarding the recent flooding in Del Rio, Texas. He illustrated the different groups involved in disaster response by literally donning some of the different hats he had worn: amateur radio club, VOAD, county official, Skywarn weather spotter, even American Red Cross.

Communications and More

This is not so unusual for SATERN members. In fact, to alleviate human misery, SATERN volunteers *expect* to do a range of things that are not strictly related to their stated role as communicators. Typically, SATERN members work closely with a canteen (a Salvation Army mobile unit that can provide anything from snacks to full meals at disaster sites). The SATERN volunteers help equip the vehicle for communications—UHF/VHF, cellular phone or business-band radio, perhaps even CB or HF. Because of their familiarity with emergency power, SATERN volunteers often assist the canteen crew with generator operations. In an actual response, SATERN volunteers, trained in safe food-handling procedures, may also help with preparing sandwiches, distributing coffee and donuts, or whatever else needs to be done during slack communication periods.

Similarly, SATERN volunteers are often assigned to "shadow" principal officials responding to disasters. Sometimes the principal and the shadow communicator know each other from previous contacts, but even if they have never met, The Salvation Army representa-

SATERN and The Salvation Army

SATERN is a non-denominational organization of hams who are ready to assist The Salvation Army in times of need. The official SATERN Statement of Purpose explains that "The Salvation Army has by inclination and tradition strived to provide service at the point of greatest need in time of disaster." The Salvation Army, founded in 1865, is an international religious and charitable movement organized and operated on a quasi-military pattern and is a branch of the Christian church. On the other hand, SATERN members represent a variety of faiths and creeds; they are united in a desire to "mitigate the trauma and impede the potential of widespread tragedy that is implicit in disaster," as the SATERN Statement continues.

SATERN units vary greatly from location to location. The Chicago group, for example holds regular nets on area VHF repeaters. Some Chicago SATERN members are assigned to specific Canteens (Salvation Army mobile units that respond to disaster sites). In addition to responding to natural disasters, the Canteen may also respond to fires, flooded streets, and the like to provide sustenance and support to firefighters and other emergency personnel. The SATERN unit in Minot, North Dakota, works very closely with the county's RACES (Radio Amateur Civil Emergency Service) organization. In Oklahoma City, on the other hand, there is no RACES organization, but SATERN works smoothly and efficiently with ARES (the ARRL's Amateur Radio Emergency Service).

Most SATERN groups are closely associated with a Salvation Army Corps (church). In Southern California, the Banning Corps asked a group of hams to set up an emergency amateur radio network for Riverside and San Bernardino Counties. The group initially concentrated on establishing a radio network among four area Corps.

SATERN stalwart Quent Nelson, WA4BZY, is just one of the many who are expanding traditional SATERN operations to include the Internet. In the shaping the response to Hurricane Mitch, Nelson, McPherson, and a few other key volunteers agreed that the HF nets would deal only with informational, tactical, and logistical information. Health-and-welfare inquiries, on the other hand, would be routed to the Internet and answered by e-mail or local phone calls.

If you have an amateur radio license and a desire to help people in need, you are qualified to join SATERN. There are no requirements regarding religious affiliation, license class, or equipment. Although SATERN coordinators are, of course, interested in the operating capabilities of new members, they are also interested in knowing what other talents and abilities volunteers have to offer. As mentioned in the accompanying article, SATERN members typically do a variety of things in addition to assisting in communications.

tive usually has immediate confidence in the volunteer. He or she knows that SATERN members are both personally committed to the goals of the Army and have sharpened their technical and operating skills through drills and simulations and seminars. Although Pat Duce, SATERN National Training Officer, emphasizes that the SATERN shadow does not make command decisions for the disaster-services professional, the working relationship generally goes far beyond simply relaying messages.

"Alumni of our previous seminars have provided great assistance to The Salvation Army in a number of major disasters over the last few years," explained Major McPherson. "These learning weekends give us the opportunity to plan, review, [and] prepare...in a way that certainly positively impacts our mission and commitment to those affected by disasters. Additionally, the conference gives us the opportunity to review the dynamic of Salvation Army assistance in recent catastrophes and to provide information that each of us can take back and use in our home environments to enhance the work that God has called us to do."

A Brutal Test

In a particularly dramatic response to a major catastrophe—the Oklahoma City bombing—SATERN members faced a brutal test of their preparedness. Extensively drilled and trained by Frank McCollom, N5FM, the SATERN coordinator for the division, members were ready and able to provide backup VHF and UHF communications for a wide range of rescue workers. Cellular systems were so overloaded as to be totally useless for several critical days. The training paid off as SATERN volunteers exploited their knowledge of alternative means of communication and served as efficient, effective shadows for Salvation Army officers and other principals on the scene.

Indeed, Major David Dalberg, National Disaster Services Coordinator for The Salvation Army, emphasized the value of a trained cadre of volunteers. He tells of his experiences in North Dakota following massive floods (of a magnitude said to occur just twice in a millennium) when he was less than delighted that amateur John Stiles, WØOSP, was assigned to be his shadow. He quickly realized, however, that John's familiarity with some of the other responders headquartered at the Grand Forks Air Force Base was an asset. As it turned out, their two personalities complemented each other, and John often manipulated situations to put the normally low-profile Major Dalberg and The Salvation Army literally out front. Thanks to John's savvy aggressiveness, the Major was in the official receiving line to welcome President Clinton—and John was right behind! Throughout his talk, Major Dalberg repeated how much he had come to appreciate the support of all the SATERN volunteers for the full range of talent they bring as volunteers.

Making a Positive Difference

SATERN is clearly a way that amateur radio operators can make a positive difference. What's more, SATERN clearly makes a positive difference in the lives of its members. If you'd like to be part of this exciting effort, check with your local

Oops...

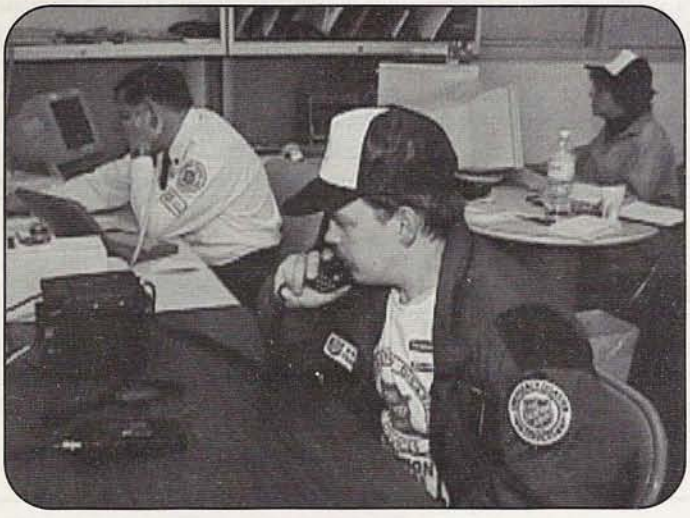
We mixed up our ones and zeros in January's "Digital Data Link" column on TCP/IP, and alert reader Bill Wageman, K5MAT, brought the error to our attention:

"The binary equivalent of 44.64.220.8 should be 00101100 01000000 11011100 00001000. The first decimal digit is the equivalent of 26, the second is 32 and the third is 110. The 26 is not just a shift of the binary digits, but the second and third are shifted right by one."

Now, Bill, do we get a 0? Or a 1? Or just an old-fashioned "F"?

SATERN's Hams in Action

The Salvation Army Team Emergency Radio Network provides communications and other services during disasters, emergencies, and public service events. Here are a few photos of SATERN's hams in action, courtesy of Salvation Army Major Patrick McPherson, WW9E:



Bill Feist, WB8BZH (background), runs the SATERN emergency network coordinating Salvation Army response vehicles during floods in Grand Forks, North Dakota.

Salvation Army Major Pat McPherson, WW9E, at the scene of a 26-day fire in East Chicago, Indiana. SATERN hams used 2-meter voice and packet to provide communications support for Salvation Army operations and shelters.

SATERN National Training Officer Mike Duce, N9IWZ, operates the SATERN Net Control Station during a Multiple Sclerosis walk in Highland Park, Illinois.

Pat Duce, WZ9H, handles the Net Control position during the General's Congress in Merrillville, Indiana. SATERN volunteers provided crowd control and safety assistance for some 4,000 participants.

amateur radio club or Salvation Army Corps to see if there's a SATERN group in your community. There are over 25 already established throughout the U.S. and Canada.

If there isn't a functioning SATERN group near you, contact Major Pat McPherson, WW9E, at 5040 North Pulaski Road, Chicago, Illinois 60630-2788 or send an e-mail to <ww9e@aol.com>. You'll receive more information on SATERN in general, any information specifically relevant to your area, and an application.

If you have HF equipment, listen for the 20-meter net, Monday through Friday, 1500 Z, 14.265 MHz. As long as the net is not actively involved in a disaster response, feel free to ask Net Director Harry Gilling or any of the daily net-control or relay stations for further information on becoming part of this outstanding organization. (At this writing, the net was just preparing to resume to normal operations after a 19-day stint of running as long as 12 hours at a time to pass critical traffic dealing with the aftermath of Hurricane Mitch.) Join the team —see what a difference you and your radio can make! ■

Training...in the Public Interest

Making yourself available to help in an emergency is only half the formula for public service success. Knowing what to do is the other half.

You walk into the local emergency management office and say, "Here I am. I'm a ham radio operator and I'll provide emergency communications for you." You might get a variety of responses, but the one request you'll probably get is to describe your background in emergency response. Just how well do you understand disaster operations?

No one expects you to know everything there is to know when you make that initial contact, but you'll be off to a good start if you can say that your group, whether it's ARES/RACES or some other public service communications unit, has a well-defined training program that its members go through to participate in disaster communications.

This month, we'll introduce you to some common training programs that will enhance your response to an emergency. Many of these are presented in *modules*, which permit flexibility in organization and scheduling.

Will you be prepared to assist when a disaster hits your community? No place is immune, and ham radio can be a valuable resource only if amateurs are ready—and trained—to help. (Photo courtesy National Weather Service, Mt. Holly, NJ)

Training Modules

Training modules can be set up according to the information covered, where the training takes place, the skill level desired or achieved, or the organization presenting the training. For example, the American Red Cross offers an abundance of courses addressing its work, as do the Federal Emergency Management Agency (FEMA), Search and Rescue (SAR) organizations, and the National Weather Service (NWS), among others.

Training can take place within the comfort of your home, by reading a book and taking an open-book exam, or you can learn on the air, or attend a more formal class at an agency or through your club. The key point with any training program is an understanding of the services you're going to provide and the expectations of the customers or served agencies with which you are working.

Where Do I Start?

There is a mixed discussion as to what material to cover first with the ham who's a newcomer to emergency communications. Some would say to start out by introducing who's in charge, who activates the hams, and what type of information they'll be asked to send. Others suggest that you first need to know what constitutes a disaster, and the difference between a disaster and a communications emergency.

If we take the second approach, a good start would be to attend the American Red Cross course, **Introduction to Disasters**. This is a three-hour course, focused on fundamental information about disasters, community response, and the role of the Red Cross Disaster Services.

In addition, the American Radio Relay League (ARRL) offers a videotape entitled, *At Any Moment*. This video is primarily directed at non-hams, but can also serve as an introductory tape to public service communications.

If you want to study on your own, FEMA's *Emergency Management Institute (EMI)* offers a series of home study courses. The EMI Independent Study program consists of self-paced courses designed for both the general public and for people who have emergency management responsibilities. There are no prerequisites or enrollment fees for these

By Bob Josuweit, WA3PZO (wa3pzo@cq-vhf.com)

ARES, Skywarn, and RACES are among the most popular organizations for hams interested in emergency and disaster communications, and all provide excellent training programs for their members. See text for details.

courses. The general public courses are available on EMI's Web site (see "Resources" for all Web site information). Each independent study course includes lessons with practice exercises and a final examination. Those who score 75 percent or better are issued a certificate of completion by EMI. The average course completion time is 10-12 hours. It's possible to earn academic credit and military points for completion of these courses. Here are some of their offerings:

Emergency Program Manager: An Orientation to the Position (IS-1)—This independent study course provides an introduction to Comprehensive Emergency Management (CEM) and the Integrated Emergency Management System (IEMS). It includes an in-depth look at the four phases of comprehensive emergency management: mitigation, preparedness, response, and recovery. The text is accompanied by illustrations, diagrams, and figures. In most units, there are worksheets, exercises, and tasks to complete.

Emergency Preparedness, USA (IS-2)—This course contains information about natural and technological hazards. Participants are led through the development of personal emergency preparedness plans and are encouraged to become involved in the local emergency preparedness network. The text is accompanied by illustrations, maps, charts, and diagrams.

Basic Incident Command System (IS-195)—The Incident Command System (ICS) is recognized as an effective system for managing emergencies. Several states have adopted ICS as their standard for emergency management and others are considering adopting it. As ICS gains wider use, there's a need to provide training for those who aren't first responders (i.e., law enforcement, fire, or emergency medical services personnel), but who may be called upon to function in an ICS environment; for example, hams. This Basic ICS course begins to meet that need. The course has been developed as self-instruction but can also be delivered in a classroom by an instructor. The course includes a large number of scenarios, examples, and opportunities for students to apply what they've learned.

"...you'll be off to a good start if you can say that your group, whether it's ARES/RACES or some other public service communications unit, has a well-defined training program that its members go through to participate in disaster communications."

What Can Your Group Offer?

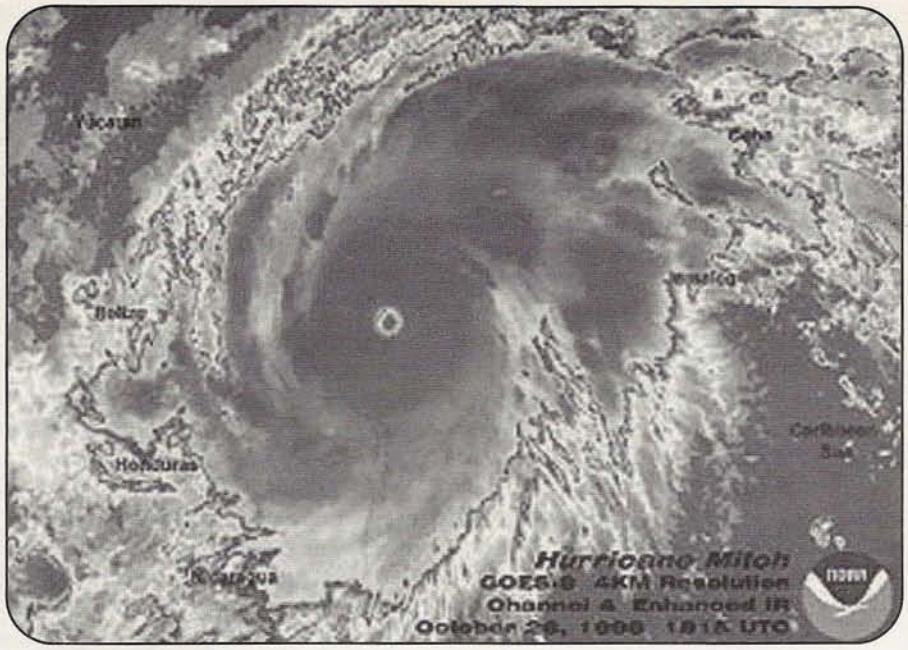
It's always important to know what services your group is capable of offering. It may be voice communications, digital modes such as packet, ATV (amateur television), or satellite operations. The key is not to overextend your group or its capabilities.

Training in activation and call-up procedures is extremely important. You have to know who's requesting communication support and then how to respond. Here's a great spot to review the ICS (see above). During the activation, you'll want to know what reports are wanted and any record-keeping that's required. Some groups respond with at least two different nets. One handles staffing assignments and the other handles the actual emergency.

For many pre-planned responses, you can determine ahead of time what type of communications will be required. From some spots, you may be able to operate from your car. Others may require a base station setup and still others will use an HT only. By knowing what equipment will be needed, you can allocate your resources more efficiently.

Another important training area is the proper operation of equipment. If you have a club station, or use equipment at the Emergency Operations Center, each operator should be trained on the use of the equipment. Instead of leaving the instruction book by the radio, you may want to write some specific procedures for operating the radios or other equipment (a real emergency isn't the time to start learning how the radio works!).

Finally, you'll want to cover operating procedures, whether you'll be using tactical communications or formal message traffic. The ARRL offers basic training in formal message-handling, and the Washington State Net (WSN) provides a detailed Web page with everything you'd want to know about traffic handling. Don Felgenhauer, K7BFL, has compiled an extensive list of traffic training tools, including basic procedures, forms, lists, and other operating aids. The WSN is a



Not all storms are as powerful as Hurricane Mitch, but they can require communications support. Effective response requires effective training. (NOAA satellite image)

CW net and they also discuss the use of CW on VHF. The information and links provided are good for the newcomer as well as the experienced traffic handler.

Other Specialized Courses

Here are some additional specialized courses which should be of interest:

The American Red Cross offers two courses which will help you understand the work they do at a disaster site. Taking these courses will make it easier to interface with them. **Damage Assessment** prepares people to obtain and report damage assessment information on homes and provide operational support on disaster operations. **Shelter Operations Workshop** instructs students in each critical phase of a shelter's operation and in how to manage shelter operations as a team in order to meet the needs of people displaced by a disaster.

For those who live near a nuclear power plant, FEMA offers a home study course entitled **Radiological Emergency Management (IS 3).** This independent study course contains information on a variety of radiological topics, including Fundamental Principles of Radiation; Nuclear Threat and Protective Measures; Nuclear Power Plants; Radiological Transportation Accidents; and Other Radiological Hazards. This course is available in computer-based training, textbook format, or online.

"Even if the hams in your group already have a well-established training program, you may still need to introduce amateur radio to government officials."

Skywarn Training

Many hams are interested in providing severe weather information to their local National Weather Service office. If you'd like to have a meteorologist come out to your group, contact your local weather forecasting office. A training seminar using either slides or videotape will teach you how to identify severe weather and then report it to the local forecasters. You also have the option to study on your own, using an online severe weather spotter guide provided by the National Weather Service on its Web site. If you're not sure of the definition of a wall cloud or other cloud formation check out *A Comprehensive Glossary of Weather Terms for Storm Spotters*. Finally, to learn how a Skywarn Program is put together, you can review the Mid-South SKYWARN Emergency Network Operations Manual posted online by the National Weather Service Forecast Office in Memphis, Tennessee.

Training Government Officials

Having a fully trained and ready-to-respond group of hams won't do anyone any good if the local government officials in charge of emergency management don't know who you are or what you can do. And this brings us back to the beginning of this month's column, in which you walk in the door of your local Office of Emergency Management and say, "Hi, I'm a ham. I'm here to help."

Even if the hams in your group already have a well-established training program, you may still need to introduce amateur radio to government officials. The ARRL video tape, *At Any Moment* (mentioned earlier), is one possibility. Another, suggested by the California Office of Emergency Services, is a FEMA course which begins to do the work for you. This is a pre-designed, professionally assembled course with materials that allow you to introduce amateur radio to the governmental agencies you serve. Best of all, it's free.

The **Amateur Radio Resources** course is part of FEMA's **Workshop in**

Emergency Management series. It was designed in 1994 to educate state and local government emergency management officials about amateur radio resources in provide emergency communications. Specifically, the workshop provides information and guidance on the Radio Amateur Civil Emergency Service (RACES) programs, since RACES is administered by FEMA.

The course objectives are to provide:

1. A familiarity with the various amateur radio resources that are available to help provide emergency communications and understand their similarities and differences.

2. An understanding of the types of emergency communications that can be provided by the various amateur radio resources.

3. An understanding of what RACES is and what its benefits are. Become motivated to use amateur radio resources and establish a RACES organization.

4. A knowledge of how to establish and fund a RACES organization and how to develop RACES plans.

5. An understanding of the various types of communications (equipment, technologies, and modes) used by amateur radio resources.

6. A knowledge of legal and regulatory issues.

The model course is presented in six units over four to five hours. An instructor guide, including course outline, instructor notes, and overhead transparency masters, can be obtained along with a student manual, which includes detailed course information along with a copy of Part 97 of the FCC Rules and a model RACES plan. Also available is a five-minute video titled, "Ready to Respond," and a 35-millimeter slide series. See "Resources" for ordering information.

Roll Your Own!

Another idea is to design your own training materials. With the advent of digital cameras and scanners, what better way of showing off your own group than to create a PowerPoint, Freelance, or other presentation and carry it with you to a meeting with the EMA director?

In Arizona, the Mesa Emergency Group, known as MEG, is a group of amateur radio operators which works closely with city officials in Mesa, a suburb of Phoenix. MEG has put together a 15-level training program for its members, starting with basic on-air operating experience and moving up through several levels of emergency communications simulations and leadership exercises. A full rundown of their program is available on the MEG Web site.

The Pikes Peak Amateur Radio Emergency Service (ARES) group in Colorado offers a training session to its members and has made it available to the world on the group's Web site. The material includes handouts on frequencies used, the group's mission statement, leaders, traffic forms, a personal equipment check list, and standardized maps. In addition, there are discussions on the overall purpose of ARES and how the local county/district fits into the state plan. Information is also provided on which agencies the local ARES group serves.

The Payoff

Joe MacPherson, VE1CH, commented on responding to the Swiss Air crash (see "In the Public Interest," December, 1998, *CQ VHF*) that

> ...it quickly became evident that the extensive training program implemented just over a year ago paid big dividends. People knew what they had to do, where they had to go, and what they needed to bring. The emergency net was activated without fuss, and voice procedures were crisp and professional. Many very favorable reports were received from senior officials, both at the scene and elsewhere.

The time to start training is now.

A final thought: This is at best an overview of information available to begin training for the world of amateur radio emergency communications. As trained communicators we have a lot to offer to our community. Do you have a successful training program in place? Let's hear about it. Is the current training information meeting your needs? We'd like to hear about your participation in public service and emergency events. Send them to wa3pzo@cq-vhf.com. ■

Resources

For more information on ARES, the Amateur Radio Emergency Service, contact the American Radio Relay League (ARRL) Field Services Dept. at 225 Main St., Newington, CT 06111; Phone (860) 594-0200; Fax: (860) 594-0259; Internet: <http://www.arrl.org>.

FEMA Home Study courses are available on the World Wide Web at: <http://www.fema.gov/EMI/ishome.htm>.

To order FEMA's **Amateur Radio Resources** course, call FEMA Publications at (800) 480-2520 (voice) or (301) 497-6378 (fax) or write: FEMA Publications, P.O. Box 2012, Jessup, MD 20794-6378. Materials include: Amateur Radio Resource Instructor Guide IG 250.6; Student Manual SM 250.6; "Ready to Respond" videotape VT 250.6; and Amateur Radio Resource 35-mm Slides TS 250.6.

The Mesa (Arizona) Emergency Group's training program can be found online at <http://www.primenet.com/~keithr/meg.html>.

To contact your local forecast office of the National Weather Service, look in the phone book under federal government listings; you may find listings under any one or more of the following: U.S. Department of Commerce, National Oceanic and Atmospheric Administration (NOAA), or National Weather Service (NWS). In addition, a severe weather spotter guide is provided online by NWS at <http://www.nssl.noaa.gov/~nws/spotterguide.html>.

A Comprehensive Glossary of Weather Terms for Storm Spotters may be found at <http://www.nssl.noaa.gov/~nws/branick2.html>.

And the Mid-South SKYWARN Emergency Network Operations Manual is on the Web at <http://www.srh.noaa.gov/ftproot/meg/html/skywarn_manual.html>.

Pike's Peak ARES Group training materials are available at: <http://www.qsl.net/n7lv/dist14.htm>.

The Washington State Net's training program can be found at <http://www.iea.com/~donf/tfctools.html>.

If you can't find what you are looking for at these sites, check out the *Amateur Radio Education Alliance* site at <http://www.area-ham.org>. There are many links to training topics of interest to amateurs.

Keeping Track of the Space Shuttle

You can monitor the Space Shuttle's orbital progress on your computer if you have current Keplerian data. This article gives you various ways you can ensure your Keplerian elements are up to date.

The Space Shuttle is unique among satellites since its orbit can change frequently during missions. If you don't keep up with the orbital changes, you'll get errors in your tracking predictions. Accurate predictions can mean the difference between success and failure in attempting a Space Amateur Radio Experiment (SAREX) contact.

This article gives you easy ways to keep your Shuttle *Keplerian elements* current, ensuring that your tracking program will give accurate positions. Keplerian elements, if you're not familiar with them, are a set of numbers which mathematically describe a satellite's orbit, allowing tracking programs to calculate a satellite's position, velocity, and direction of travel at any specified time, and to predict when a certain satellite will be "in view" from your location.

Why the Shuttle's Orbit Changes

Unlike most satellites, the Space Shuttle changes its orbit many times over the course of a mission. While most satellites rarely, if ever, fire thrusters to change their orbit, the Space Shuttle may do this daily—or even more frequently during the rendezvous phase of an International Space Station (ISS) construction mission. The Shuttle's orbit also changes from satellite deployments, wastewater dumps, and other "energy transfers."

When these sudden orbital changes occur, the Keplerian elements computed before the velocity shift no longer accurately represent the Shuttle's orbit. The ability of these Keplerian elements to accurately predict the Shuttle's position will degrade with time; larger velocity shifts will result in quicker prediction degradation than will smaller velocity shifts. If you want to accurately track the Shuttle, you need a new set of Keplerian elements that represent the orbit after the velocity shift occurred.

NASA Orbital Data

Most of the orbital data we use for tracking satellites is computed by the North American Aerospace Defense Command (NORAD) and released publicly by NASA's Goddard Space Flight Center (GSFC). NORAD updates Keplerian elements from radar and other tracking data in a computer program called a *least-squares differential correction* (DC). To update the Keplerian elements, NORAD needs at least 45 minutes of tracking data.

NASA tracks the Shuttle's orbit very accurately over the course of a mission. The NASA Mission Operations Computer (MOC) maintains the mathematical description of the Shuttle's orbit by continuously updating the position and velocity vectors. The MOC's orbital update program, called an *extended Kalman Filter*, works similarly to NORAD's DC program. The advantage of the Kalman Filter is that it operates continuously and immediately incorporates the Shuttle's velocity shifts. The disadvantage is that most satellite tracking software expects the Keplerian elements (that NORAD computes), rather than position and velocity vectors (that the MOC computes). An easy-to-use conversion program was needed.

NORAD Orbital Format

The Keplerian *Two-Line Elements (TLEs)* are the orbital format produced by NORAD and released by NASA GSFC Orbital Information Group (OIG); see "Resources" for their Web page information. The TLEs are a cryptic-looking format containing two lines of information (and the satellite's name added above by NASA). The TLE was developed as a compact way to send orbital data during the early Cold War when information was sent to radar sites over very slow Teletype circuits. Figure 1 is an example of a TLE set for the ISS.

Satellite tracking software readily converts the NORAD TLEs to position and

```
ISS
1 25544U 98067A   98340.46616806  .00010619  00000-0  13662-3 0   866
2 25544  51.5953  86.0440 0009022 264.3730  95.6280 15.59633823  2546
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Figure 1. Sample "TLE," or Two-Line Element, set of Keplerian elements (orbital data) for the International Space Station. The numbers make little sense to the casual viewer, but are understood by most satellite tracking programs.

By Ken Ernandes, N2WWD (n2wwd@cq-vhf.com)

Looking Ahead in CQ VHF Ham Radio Above 50 MHz

Here are some of the articles that we're working on for upcoming issues of *CQ VHF*:

- "Lasers to the Limit—Part 2" by Eric Stroud, KB2TCQ
- "Make Your HT Talk Forever," by Ken Collier, KO6UX
- "Understanding the Computer in Your Ham Shack," by Lew Ozimek, N2OZ

Plus...

- "Hollywood Ham Watch," by Bill Tracy, KE6EJQ
- "Build Your Own Battery Pack," by Dennis Wilkison, KE6UZQ
- *CQ VHF* Reviews:
  M² "HO" Loop Antennas, by Gordon West, WB6NOA
  ICOM IC-746, by Rich Moseson, W2VU

If you'd like to write for *CQ VHF*, you may download our writers' guidelines from the *CQ VHF* World Wide Web site at <http://www.cq-vhf.com> or FTP to <ftp://members.aol.com/cqvhf/General> and look for the file, "writguid.txt." Or, you may send a written request along with an SASE (self-addressed stamped envelope) to *CQ VHF* Writers' Guidelines, 25 Newbridge Rd., Hicksville, NY 11801.

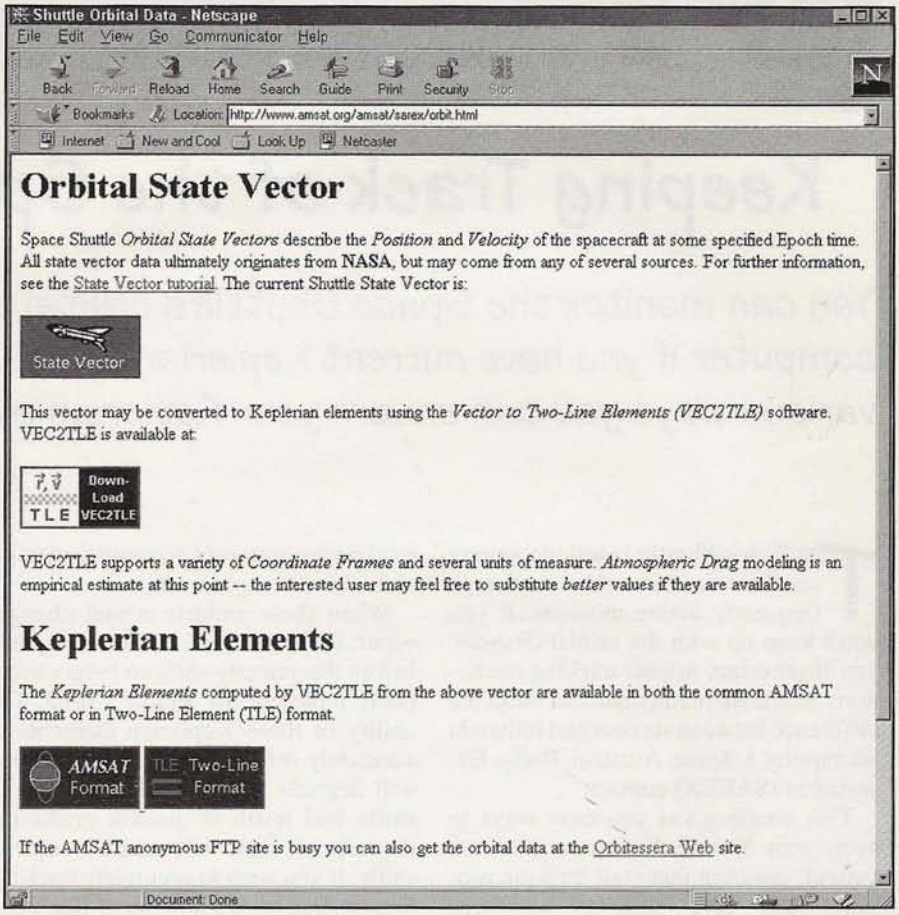


Figure 2. AMSAT's Shuttle Orbital Data Web page. It's regularly updated during shuttle missions and offers several choices of how to format current orbital data.

velocity vectors. You should therefore be able to reverse the process and convert NASA's Shuttle position and velocity vectors to Keplerian elements. This was the reason for creating my *Vector to Two-Line Elements* (*VEC2TLE*) software. Using VEC2TLE, you can compute a Keplerian TLE (and/or the more-descriptive *AMSAT Keplerian elements*) from a Space Shuttle position and velocity vector (i.e., state vector). What this means is that, following a Shuttle orbit change, you can update your Keplerian elements as soon as you can get an updated NASA state vector. With a one-time setup, you can have VEC2TLE do this rather automatically—it really doesn't take a "rocket scientist."

Data Sources—WWW and E-mail

Amateur satellite tracking software such as STSPLUS is sophisticated enough that some NASA agencies use it in place of expensive custom tracking programs. Ironically, this created a need within NASA for accurate Keplerian TLEs (since the state vectors aren't useful to STSPLUS). NASA found that VEC2TLE produced the accurate results needed to make STSPLUS a useful tool to them.

Since the same position and velocity state vector produces a unique set of Keplerian elements, it follows logically that we can save a lot of people considerable effort if a small group were to perform this task and make the Keplerian data available to those who are interested. NASA Marshall Space Flight Center also realized this and agreed to sponsor the Space Transportation System Two-Line Element (STSTLE) Internet mailing list. By subscribing to the STSTLE list, NASA agencies (and anybody else who is interested) automatically get e-mail messages with orbital updates.

To ensure that the Keplerian data is accurate enough at all times, my colleagues David Cottle, STSPLUS author Dave Ransom, and I typically produce four orbital updates per day to the STS-TLE mailing list. These updates are more frequent than is desired by the average amateur, but we need to satisfy the needs of the NASA sponsors. We therefore also post the same orbital updates to the AMSAT Web page and to our personal Web pages (again, see "Resources" for Web page access information). The Web pages let you choose when and how often to get orbital updates. Figure 2 is a screen capture of the AMSAT Shuttle Orbital Data Web page.

Subscribing to STSTLE

You can subscribe to the STSTLE list by sending an e-mail message to: **listproc @spacelink.nasa.gov**. The text in the e-mail message should be: **subscribe STSTLE** (followed by your first and last names). The orbital updates will be sent to the e-mail address from which you sent the request message. The NASA mailing list manager requires your name for reference purposes and to ensure that the STSTLE messages are not automatically re-mailed to another list.

The STSTLE messages and the Web sites have the Shuttle orbital information in three formats: Keplerian TLEs, AMSAT Keplerian elements, and the underlying NASA state vector formatted for direct read by VEC2TLE. You can choose whether to manually copy the Keplerian data into a text file on your computer or have VEC2TLE do it for you.

When manually copying the data, you need to be able to recognize the appropriate format in the STSTLE messages. (The AMSAT Shuttle Orbital Data Web page has the three formats already separated for you.) Once you've copied the Keplerian data in the desired format, you need to paste it into the text file used by your satellite tracking software. You need to be familiar with how your tracking software updates Keplerian elements in order to do this.

VEC2TLE allows you to automatically replace the old Keplerian elements with the new ones. You can do this with a one-time setup telling VEC2TLE which file(s) to update with the new TLEs and/or AMSAT Keplerian elements. VEC2TLE will search through the STS-TLE message, find the NASA state vector, and update your Keplerian element file(s). The VEC2TLE user instructions have detailed procedures on setting VEC2TLE for automatic updates as well as information on how to actually make the update when you get new orbital data.

Summary

The Space Shuttle's orbit changes often over the course of a mission. If you want to accurately track the Shuttle, whether for a SAREX contact or just for enjoyment, you need to update your Keplerian elements as the orbit changes. You can keep your Keplerian elements current by subscribing to the STSTLE e-mail list or by downloading orbital updates as needed from the AMSAT or other Web pages. You can then either manually copy and paste the Keplerian data into your tracking program or have VEC2TLE automatically update your Keplerian elements. Either way, the resources are available for you to keep track of the Shuttle during a mission. ■

Resources

The following Web pages offer more information on satellite tracking and Keplerian elements:

AMSAT Shuttle Orbital Data:
<http://www.amsat.org/amsat/sarex/orbit.html>;
NASA GSFC OIG Web Page:
<http://oig1.gsfc.nasa.gov/>;
David Cottle's Web Page:
<http://www.oze-mail.com.au/~dcottle/>;
Dave Ransom's Web Page:
<http://www.dransom.com/>;
Orbitessera Web Page:
<http://www.mindspring.com/~n2wwd>

Articles about the VEC2TLE program include:

"Vector to Two-Line Elements (VEC2TLE) Orbit Computation Software," Ken Ernandes N2WWD, *The AMSAT Journal*, Volume 17, No. 2, March/April 1994;

"VEC2TLE Version 9648—New and Improved," Ken Ernandes N2WWD, *The AMSAT Journal*, Volume 20 No. 5, September/October 1997.

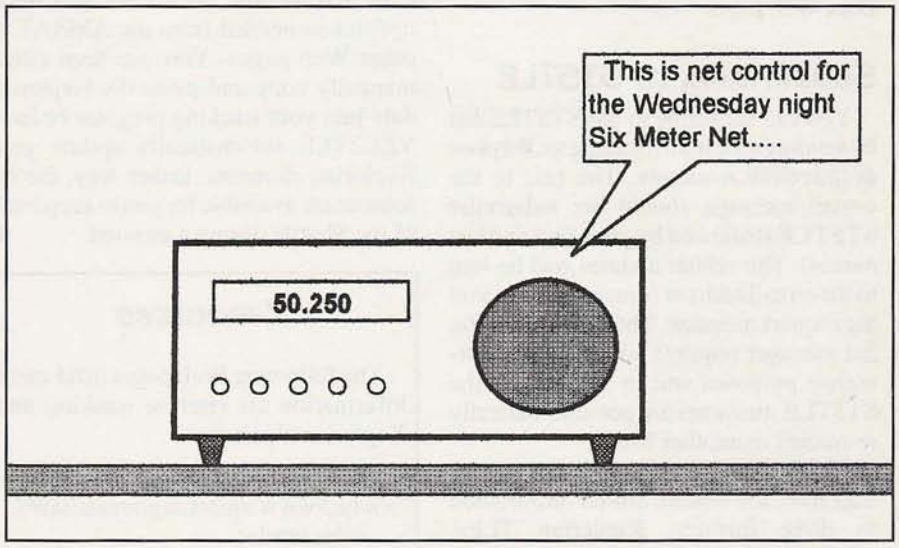
Back issues of *The AMSAT Journal* are available from AMSAT, P.O. Box 27, Washington, DC 20044; Phone: (301) 589-6062; Fax: (301) 608-3410; Internet: <http://www.amsat.org>.

The War Against Silence

Activity on the Magic Band is either feast or famine, says WB2AMU—and that needs to change if we're going to protect 6 meters for amateur radio.

Whether or not Magic Band operators know it, there's a war of sorts taking place on 6 meters. The conflict is basically whether hams are able to generate consistent activity on a band that's normally quiet for great lengths of time. When a major opening takes place, the whole spectrum appears to be jammed; when there's no propagation, it's dead quiet...to the point where one wonders if the receiver's working. It almost seems as if there is no middle ground, just the two extremes: bedlam or complete silence. There's no such thing as moderation on the Magic Band.

This battle is being waged throughout the U.S. and Canada. One of the weapons against silence during periods of no propagation is the use of *6-meter nets*. Through regular nets and activity nights, the band maintains some activity even during "quiet" times. A short list of some of these nets that I've bumped into are listed in the Table. I'll dedicate a future column to listing more nets if enough people write back to me with additional net information.



Six-meter nets are one of the weapons against the pervasive silence of the band.

"When a major opening takes place, the whole spectrum appears to be jammed; when there's no propagation, [six] is dead quiet...to the point where one wonders if the receiver is working."

"Weather Nets"

I remember when I first got on six in the early 1990s, when everything was

Table.

Net Name & Location	Day(s)	Time (Local)	Freq. (MHz)	Net Control
Southern California Six-Meter Net	Tu	8:00 p.m. PT	50.150	AA6DD
Johnson County (Kansas) Six-Meter Net	W	8:00 p.m. CT	50.175	KØLLS
Memphis (Tennessee) Six-Meter Net	Su	7:30 p.m. CT	50.135	Various
Yankee SSB Six-Meter Net (New England)	Su	9:30 a.m. ET	50.275	K1MUC
Wisconsin Six-Meter Net	Su, M, Tu, Th	9:00 p.m. CT	50.160	W9MUP/ WB9JWT

Table. Selected 6-meter nets. Please update us on activity in your part of the world. Send updates via e-mail to WB2AMU@cq-vhf.com, or by regular mail c/o CQ VHF.

By Ken Neubeck, WB2AMU (wb2amu@cq-vhf.com)

new and different to me. I used to hear this local ham on Long Island about 15 miles away who ran a net every Saturday morning called the Six-Meter Weather Net. He would go down a list of about 20 callsigns of hams located around the Northeast who would check in and report the weather in their area. After a year or so, it got to the point of where only one or two hams would check in and, eventually, I didn't hear the net control operator anymore. Thus ended the net. However, he had the right idea by making noise on the band and it's good to encourage hams to get on the band at least once a week, particularly during the doldrums, such as the late winter months.

Activity Bounces

It appears that after a major contest, such as Field Day or one of the regular ARRL VHF contests, the band gets a bit of bounce with some activity continuing for a few more days. It seems that once people are exposed to the potential of the Magic Band, they get more interested. We need more mobile stations to use the Magic Band on a regular basis, perhaps on the drive home from work or during lunchtime. It's criminal that there are long periods of silence on the Magic Band, considering that many of us know the great things about this band, both in terms of skip activity and line-of-sight capabilities. We should all make an attempt to keep the band active during the non-skip times. Think about having a regular sked on the Magic Band one day a week with a friend or two to make some noise!

Perhaps there will be no danger of losing the 6-meter band because of non-use by hams the way the 11-meter band was lost to the Citizen Band service, or the way 220 to 222 MHz was lost to commercial land-mobile services. The real danger is that as a band sees less use, myths develop about why it isn't "a good band." This situation should be avoided on 6 meters because it's a unique band with a lot of value to ham radio. So get on, get active, and make noise—talk to people even if they're not far away. Besides, what better way is there to spot a band opening than to suddenly hear a QSO from far away? ■

Do *you* have a 6-meter adventure to share? If so, we'd love to hear about it. Just contact us by mail or e-mail.

Reader FEEDBACK!

From a "Propagation Practitioner"

The following letter was sent to CQ VHF *author Lew Ozimek, N2OZ, regarding his two-part article, "The Magic of Radio Wave Propagation," in the November and December, 1998, issues:*

Dear Lew:

As an avid 6-meter operator since 1977, I found your article a wonderful complement to my own "on-air" experiences over the last few solar cycles. During the last two decades, I have read many technical and non-technical articles on VHF propagation that have been both informative and interesting (and incidentally, I have used much of this gleaned information in speeches at various local radio conferences). I found your two-part article one of the most comprehensive and clear essays that described all of the VHF-associated phenomena.

Now that I have sufficiently inflated your ego, I'd like to add a few points that I believe were either understated or only partially correct. I hesitated to write to you but then felt that since you had written such a clear and informative article, I thought that you would be receptive to some information based upon my "on-air" experience of thousands and thousands of hours listening and contacting people on 6 meters.

In the December part of article, page 29, paragraph 4: The Sporadic-*E* season does include August, since over the last five-to-eight years, I have participated not only in ordinary single-hop openings, but also in strong "double-hop" openings to the West Coast and to Europe as late as the third week of August. Secondly, this past mid-August, I had over a dozen QSOs with California and Washington stations as late as 1:00 in the morning here in Maine. The signals were weak and often times "right in the noise," but at other times they were fairly loud—but only the high power stations seemed to be getting through (and these were not aurora openings as the K index was 1 or 2 at the time).

Page 29, paragraph 6 & 7: Regarding FAI (Field Aligned Irregularities), my recollection is that these signals are not that weak. And after a gigantic double-hop "E" event, no fluttery signals are heard, but only signals that are hollow and off direct path (sounds like some form of back-scatter and not like aurora at all!).

Page 32, paragraph 1: On auroral-*E*, I notice that I can very often hear stations at distances of 1,200 miles but then I can also hear, either at the same time or later on (sometimes minutes later), stations at distances of 2,500 to 3,000 miles. It generally happens, with the onset of auroral-*E*, that the stations at the mid-point of 1,200 miles begin to fade away, to be later replaced by incredibly strong signals from stations in the 2,500- to 3,000-mile range. These auroral-*E* signals have pure notes, excellent audio fidelity, and absolutely *no* growl. This situation almost always occurs after the "growly" aurora weakens to signals to my south (such as W3s and W4s).

I always monitor the northern latitude beacons such as VE3UBL/b and especially VE4VHF/b, along with KØGUF/b,VE8WD/b, VE8BY/b, VE6ARC/b, and VE6EMU/b, to find out if auroral-*E* is present. There are times when I hear VE8BY/b, VE4VHF/b, and KØGUV/b on auroral growl and then they quickly shift to pure notes on auroral-*E*. When I hear these auroral-*E* signals, they can either be on direct path or some reflection on skewed angle. There have been many instances over the last two years when I have heard VE4VHF/b on aurora with my antenna directly to the Northwest, the beacon's signal becomes pure auroral-*E*, without a trace of an auroral growl.

Hope these comments help in adding more information from the point of view of a "practitioner." 73,

Lefty Clement, K1TOL
Lewiston, Maine

Earth-shaking ATV, Plus...

Imagine looking over the shoulder of a scientist as he or she watches a seismograph recording an earthquake in progress. Hams in Houston can do it right now—via amateur TV! Details and more in this month's "In Focus."

One unique aspect of ATV in comparison to other modes of amateur radio communication is that it lets us *show* other amateurs our interests, not just tell them about them. And each ATVer also brings his or her own interests and ideas to amateur video communication—one of the things that can make ATV so fascinating.

We've seen ATV used for video coverage of public service events. One of the most famous of these is the Rose Bowl Parade; another is the Houston Marathon each January (look for a report in the next column). But, in addition to these big events, each of us has hobbies and interests outside of ATV and amateur radio. I'd like to feature one of these hobbies this month, along with the ways that two hams are using ATV in connection with their "outside" hobby.

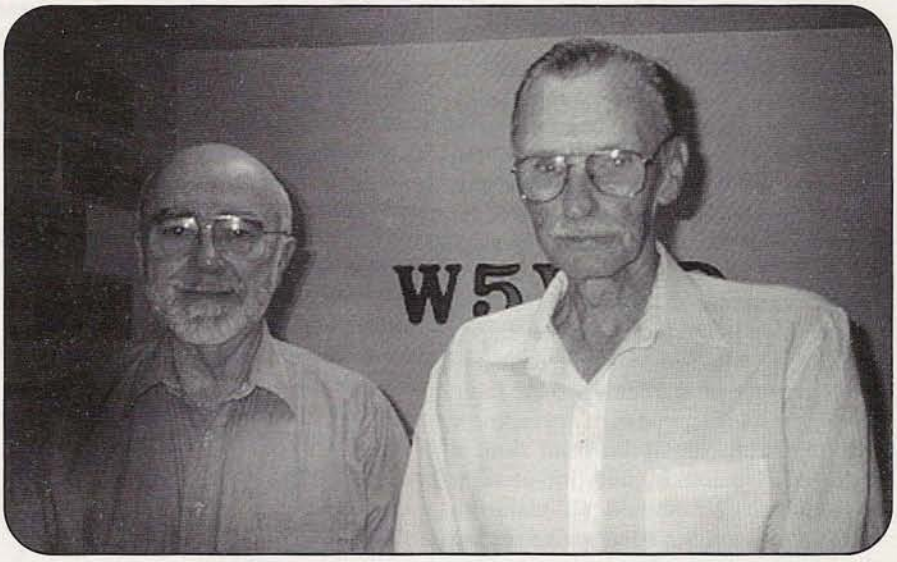


Photo A. Frank Cooper, W5VID (left), and John Coles, W5AUH, share their amateur seismology hobby via ATV with Houston-area hams—letting those hams be among the first people anywhere to know when an earthquake is taking place.

Shake, Rattle, and Roll

In Houston, there are two amateurs who've used ATV as a means of sharing their hobby with the rest of the ATV community. They are Frank Cooper, W5DID, and John Coles, W5AUH (Photo A), and their hobby is *amateur seismology*, the detection of earthquakes using homemade equipment. Their goal is to identify the location and magnitude of the earthquake, then put that information on the Internet for others to observe and verify.

W5DID (Photo B) was the first ATVer to bring us into this world of low-frequency detectors and chart recorders. Frank has often been among the first to recognize and identify earthquakes from all over the world. He frequently puts his ATV station on the air to show an earthquake in progress, letting ATVers in Houston see these events as they are happening. It's an awesome experience to see a large earthquake in progress and know that it's happening as we watch, with only other seismologists around the world knowing about it (in addition, of course, to any people in the affected area).

Frank has been working on his seismological equipment since 1969 and has built several different pieces of his equipment, including detectors and recorders. His introduction of seismology to the local ATV community got another amateur interested. After seeing Frank's work on the air, John, W5AUH, built his own seismograph, even improving on the design (Photo C). He, too, has televised earthquakes over the W5PZP ATV repeater in Houston. You can see information about their work on Frank Cooper's Web page at <http://freeweb.pdq.net/fxc/>.

Who Represents ATV?

Every ham knows that amateur radio doesn't exist in a vacuum. We're regulated by the FCC; we abide by international treaties; we share our bands with each other, utilizing band plans and gentlemen's agreements; and we've created other organizations, known as frequency coordinators, to bring order from potential chaos.

Organizations are a necessity, even in amateur radio. ATV is no different. We

By Ed Manuel, N5EM (atv@cq-vhf.com)

Photo B. W5VID's combination amateur radio/amateur seismology station. Note the seismograph readings on the computer monitor.

exist only as long as we have frequencies on which to practice our specialty. We all know that amateur radio is constantly under attack from outside commercial interests that want our bands, but many don't know that we occasionally come under attack from amateur organizations that would attempt to prevent ATV from using the bands available under current FCC regulations.

Photo C. W5AUH's homebrew earthquake monitoring station. Both he and W5VID have transmitted charts of ground vibration via ATV while an earthquake is in progress somewhere in the world.

One organization dedicated exclusively to the promotion and protection of ATV is *Amateur Television of North America* (*ATNA*). This organization was founded at the 1998 Dayton Hamvention and is trying to be the central focus that ties together all the small ATV clubs and operators in North America. The mission of ATNA is to:

- Protect ATV interests and frequencies;
- Use video transmission methods to support public service;
- Plan for the amateur radio adoption of new technology;
- Advance the state of the art of video and video transmission methods;
- Work with National Frequency Coordinators Council (NFCC) as the official coordinating body for Fast Scan ATV in North America; and
- Associate in an equal role with other like-minded societies.

ATNA can provide a much-needed voice for the ATV community at large in the U.S. The major activities of ATNA during its first year of operation have been to set up the organization, sponsor all the Dayton ATV activities, start a user mailing list at <http://www.qth.net/> and a digital ATV (known as DHTV) mailing list at <http://www.egroups.com/list/dhtv>. I'll talk some more about the DHTV list in a moment.

ATNA has also been represented at several hamfests around the country by officers and area representatives. They are trying to properly present the concerns and issues of ATVers across the country, including the increasing pressure on our spectrum, the encroachment of linking systems and repeaters, and helping to get ATV represented in all VHF contesting in a way that makes ATV a feasible contesting mode.

What ATNA needs to be an even more effective force for ATVers in the U.S. is participation, including representatives from each call area to help promote ATV interests. If your call area is not listed on the Web page at <http://www.qsl.net/atna>, please consider volunteering and send an e-mail to the names at the bottom of the page. (I would like to take this opportunity to personally thank John Hayes, W3HMS, and the officers and volunteers of ATNA for the work that they have started in providing representation for the entire ATV community. I encourage you to support them.)

Digital ATV Is Heating Up!

Since I last wrote about some possibilities in Digital Ham TV (DHTV), several reports of experimentation have been received. As long as there are efforts to make digital ATV a reality, I'll report on the work and keep you informed. One of the best developments is the previously mentioned e-mail re-mailer for DHTV. Check out the Web address for information about reading and posting messages to this list.

For those of you who may not have yet experienced an e-mail list, it is *the* method of sharing information in the information age. By "subscribing" to the list, you become a recipient of any e-mail message that is sent to the list. Anytime a message is e-mailed to the list, it is re-mailed to every subscriber, all in a matter of minutes. It lets people share ideas and information on a near real-time basis with like-minded experimenters anywhere in the world.

There are e-mail re-mailers (also called "reflectors") for virtually any subject the mind can conceive of. Some have only a handful of subscribers while others have literally hundreds of thousands. There are several good e-mail re-mailers for the ATV community. One place to find out about them is at the Houston Amateur

Photo D. NASA's shuttle-based "Sprint" AERcam—a sphere containing two TV cameras that floats in space outside the space shuttle (with control from inside) during spacewalks. It sends back video with a low-power radio signal. Will you be the first to successfully monitor these transmissions on Earth? (Courtesy NASA)

Television Society's Web site located at <http://www.stevens.com/HATS/>.

Some work with DHTV this month comes from Les Rayburn, KT4OZ, and Tom Askew, KB5IHI. They've been experimenting with video transmission using IBM Wireless LAN PCMCIA cards operating on 2.4 GHz. In their tests, Les and Tom used two laptop computers and wireless LAN (local area network) cards, transmitting Real Media data streams approximately 800 feet and resulting in actual ATV QSOs. Quoting from their test report,

> At 28.8 kbps encoding, it was...possible to have two-way (full duplex) QSOs, but at 56 kbps encoding the stream broke often. The Wireless LAN cards have a rated bandwidth of 512kbps but much of this is taken up by the protocol functions. One-way QSOs were possible at virtually any encoding speed, and high quality video (P5) was exchanged out to our maximum distance.

Not bad for a couple of laptops and a pair of $30 LAN cards. These LAN cards use spread spectrum and are Part 15 devices (they don't require a license when used without modification). Since Les and Tom plan to modify these cards with the addition of amplifiers and external antennas, they've decided to participate under the Special Temporary Authorization (STA) of the Tuscon Amateur Packet Radio organization (TAPR) that allows the use of the frequency-hopping method employed by the wireless LAN cards in the amateur bands. After having initial success using the Real Media streams, Les and Tom have transmitted MPEG1 streams at distances of up to three miles using the unmodified Part 15 devices. These streams have included pictures, callsigns, and voice in each test.

So, DHTV experimentation is alive and well in the U.S. Other amateurs are participating in the experimentation and discussion, including Clint Turner, KA7OEI, in Salt Lake City, Utah, and Woody Winstead, KJ4SO, in Raleigh, North Carolina. If this interests you, subscribe to the DHTV re-mailer and start learning about the future of ATV.

I don't want to leave you with the impression that DHTV is something going on only in the U.S. Quite the contrary—digital ATV experimentation in Europe is several years ahead of us. As early as 1996, the Austrian ATV organization had proposed MPEG1-based digital ATV as the new standard for the 70-centimeter band. This was to try to reduce the constant pressure on spectrum-intensive modes like ATV in countries where the total 70-centimeter band is considerably smaller than what we enjoy in most of the U.S. If you would like to read this proposal, you can find it on the Internet at <http://www.amrad.org/DigitalTV.html>. It's a very enlightening concept.

And Now for a Challenge!

I have to admit it. I'm a big fan of the Space Shuttle program and the International Space Station. I suspect most ATVers are. I probably spend entirely too much time surfing the manned spaceflight Web site (<http://station.nasa.gov/index-m.html>) maintained by NASA. But you can find such exciting things if you pay attention.

One of these finds is the *Autonomous Extra Vehicular Activity Robotic Camera*, or *AERcam* "Sprint" (Photo D). Developed by NASA to provide additional support to EVAs (spacewalks) by astronauts, it's a sphere, approximately 20 inches in diameter and looking very much like a soccer ball. In it are housed two television cameras, a wireless TV transmitter, a control receiver and a reaction control flight system. The AERcam flies free outside the orbiter and is maneuvered by a control operator inside the shuttle. It is intended to accompany astronauts as they work outside, assembling components of the International Space Station, providing additional video images from better vantage points than the cameras mounted in the shuttle could provide. Additionally, since it can be flown in various attitudes, the Sprint provides an excellent tool for doing inspections of hard-to-see areas.

The video output of the AERcam is on 2250 MHz and is an FM signal. The signal is designed for a range of 100 feet and runs a whopping 250 milliwatts. The only wrinkle is that the two cameras inside the AERcam are apparently wired as a stereo image for better viewing over the link. This is one aspect of the arrangement I haven't yet been able to get better information about. You can read more about the AERcam at <http://38.201.67.70/station/assembly/sprint/>.

Imagine being able to watch FM television signals direct from orbit during the years-long construction of the International Space Station. It will take some effort, to be sure. You'll need a low noise preamp and a decent dish antenna. I'll leave the details to some of our more technically oriented readers. You'll probably want a computer to handle automated antenna tracking, but satellite enthusiasts have been doing this for over a decade. And there are several possibilities for receiving equipment. Consider the Wavecom Jr. that has been so popular with the 2.4-GHz ATV community. These devices can be moved in frequency by changing the pre-programmed microprocessor. If you're interested in this approach, Brian Miles, WB7UBB, has offered to make replacement PIC microprocessors with different frequencies than come with the standard Wavecom. Contact Brian for more information at 12015 N 34th St., Phoenix, AZ 85028; or via e-mail to <wb7ubb@home.net>.

So there you have it—QRP TV DX from space. Who'll be the first to receive video from the AERcam "Sprint" and retransmit it on ATV? You can bet that I'll be working on something to receive these tiny signals from orbit.

Let's Hear from You

Don't forget—this column is a forum for sharing your ATV activities with the rest of the ATV community. Send your ideas, experiments, and happenings to atv@cq-vhf.com. And who knows? You might even see your own name and callsign in print! ■

Understanding Signal Levels, Frequencies, and Modes—Part 3

Now that we've explored the basics of amplitude (signal levels) and frequency, we'll conclude our series by showing you how these concepts are applied in the various types of modulation (modes) we commonly use on the radio.

Our previous two months' columns highlighting amplitude, frequency, and electronic measurements filled available space before we could include a related introduction to modes of communication. Consequently that topic, an easy experiment in comparing FM and AM, plus a fun quick-brew crystal radio project are in the limelight this month. The overall result promises to be a winner. Yes, indeed, as you surely will agree, it's this endless variety of special studies and pursuits that keeps amateur radio exciting year after year, generation after generation. Enjoy the ride...err...experience!

Photo A. The Vectronics Crystal Radio Kit as received and ready for assembly.

CW, AM, and SSB Simplified

Now, continuing on from last month, let's firm up our ground floor studies in amateur radio basics with an easy-to-understand explanation of such modern communications modes as CW, AM, SSB and FM. In addition to setting the stage for more advanced technical discussions in future columns, a group of mode-related questions is included on all classes of license exams. Learning "how it works" will thus prove beneficial in a number of ways.

The oldest, most basic, and easiest to understand mode in use today is *Continuous Wave*, or CW (illustrated as "A" in Figure 1). Here, a transmitter's signal is keyed on/off at a Morse code rate of between five and 40 or 50 words per minute (wpm) and intelligence is conveyed in the form of dots and dashes. Morse may be old, but it still "gets through" and covers a particular path with the least amount of power (compared to analog voice modes). It also represents a proud personal skill, just like playing a musical instrument. When pursued with a new and "just-right-for-you" pump key, bug, or paddle, CW can also prove delightful to operate. Since a radio signal is simply keyed on/off, the bandwidth of a CW signal is quite narrow—typically 250 Hz.

Also easy to understand is *Amplitude Modulation*, or AM ("B" in Figure 1). Here, the output level of a transmitter's signal or key-down carrier is varied from minimum (zero) to full power (100%) output, according to applied speech or audio. This continuous fluctuation in output power causes additional audio-related signals called *sidebands* to appear above and below the carrier signal's frequency. Differences between the carrier's frequency and frequencies of energy in the sidebands correspond to audio tones within speech. AM amateur radio transmitters are not crystal filter-restricted in bandwidth as are SSB (single side-

By Dave Ingram, K4TWJ

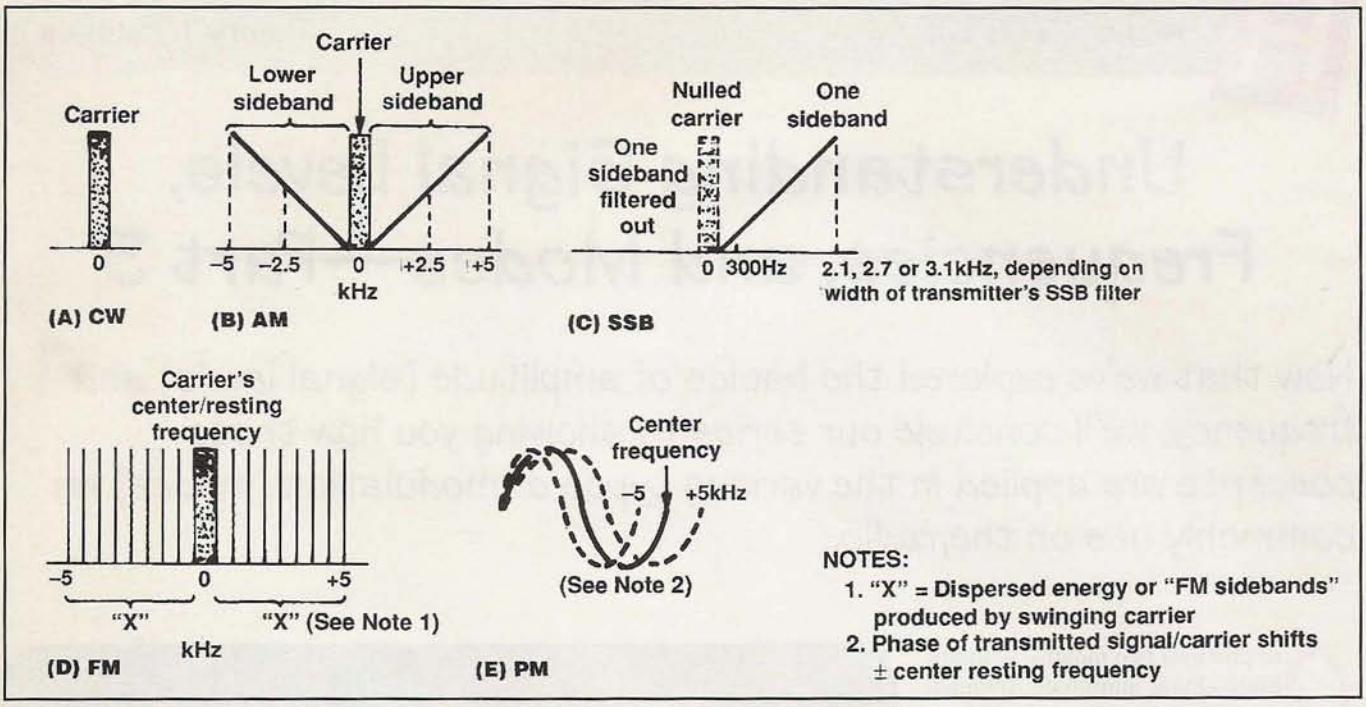


Figure 1. Simplified outline of popular modes used for communication. Discussion of each in text.

band) transmitters, so their on-the-air signals are usually 10 kHz wide and their sound is rich and full.

An SSB signal is similar to an AM signal, except that its carrier is nulled, or balanced out and one sideband is filtered out (Figure 1C). Since only one sideband is transmitted, receiving stations use their rig's internal *BFO* (*beat frequency oscillator*) to reinsert or synthesize a carrier to heterodyne, or mix with, the single transmitted sideband. If the receiver is set slightly lower or higher than the original carrier's frequency, either bassy or high-pitched speech results (sound familiar?). A transceiver's SSB filter is usually 2.5 or 2.7 kHz wide, so SSB occupies more band room than a CW signal, but less than an AM signal.

Frequency and Phase Modulation

FM, or *frequency modulated*, signals are particularly interesting as they're produced by varying the *frequency* of a transmitter's key-down or full-carrier signal at an audio rate. As a result of swinging the carrier above and below its center resting/unmodulated frequency, dispersed energy produces a number of instantaneously appearing sidebands (Figure 1D). The rate at which an FM signal swings above and below its center frequency is determined by the modulating tone(s), and the level or amplitude of the modulating tone(s) determines the amount of frequency swing.

Read that last sentence again. It contains enough "invisible information" to fill a separate month's column. Really! Low-pitched tones produce slow frequency swings. High pitched tones produce rapid frequency swings. Low volume sounds produce below average frequency swings or deviation. Since a receiver's bandwidth is preset, what would you say happens when deviation does not swing over the full range? You guessed it: the passband's unused range fills with band noise and you experience noisy reception. On the other hand, what

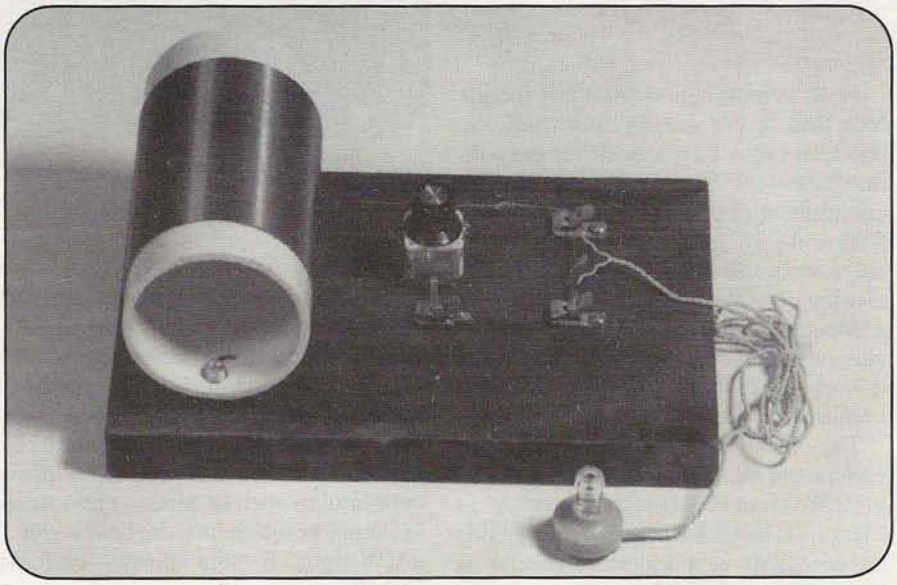


Photo B. Vectronics kit fully assembled and ready for action. It's a true "free play radio," as batteries or external power are not required for operation, and does a good job of pulling in distant clear channel stations at night.

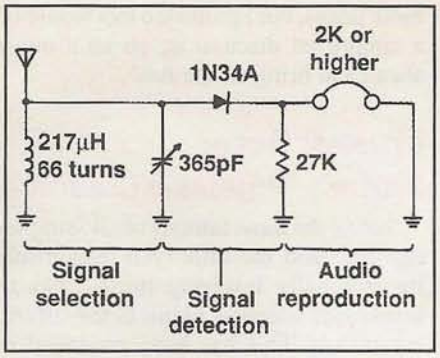


Figure 2. Circuit diagram of the Vectronics' Crystal Radio kit. Thanks to a well-documented instruction manual and inclusion of all parts, item goes together very smoothly. (Reprinted with permission)

Photo C. The Crystal Set Society has a bimonthly newsletter, books galore, and is a gold mine of circuits and information on crystal radios of all types.

do you think happens if the signal *overdeviates*, or swings beyond the limits of the receiver's bandwidth? That's right. Parts of the signal outside the passband will be clipped off by the receiver and the signal will sound choppy and distorted.

Generally speaking, there are two widths of FM signals in common use today: 200-kHz WBFM (wideband FM) used in commercial FM broadcasting (88 to 108 MHz) and 10- to 15-kHz NBFM (narrowband FM) used in amateur radio and other communications services. WBFM's audio range or width of 20 to 20,000 Hz is ideal for music, whereas NBFM's audio range or width of 20 to 5,000 Hz is quite adequate for voice (see "AM versus FM—You Be the Judge").

A popular variation of FM is *phase modulation*, or *PM*. If you look carefully at the specifications for your "FM" transceiver, you may be surprised to see that the method of modulation is actually listed as PM or phase modulation. Basically, PM is produced by capacitively or inductively shifting the phase of a transmitter's carrier ahead of or behind its reference points (see Figure 1E). Regular FM detectors interpret the results of a shifting-in-phase signal as changing in frequency, and so detect it as conventional FM. Using PM allows manufacturers to get the same basic results of true FM modulation with less complicated (and therefore less expensive) circuitry. Interesting, eh?

Pulling Voices from the Air

Described in plain language, a radio transmitter generates and emits a specific-frequency signal that's modulated in some manner by intelligence (*in this context,* intelligence *means any message or data that is to be transmitted, regardless of whether it meets the more traditional definition of the term—ed.*). In order to receive that signal, we must select its frequency, demodulate its information, and reproduce its intelligence. Selection and reproduction will be illustrated further as we proceed and discuss crystal sets. Right now, let's consider detection requirements for each mode.

AM has its own carrier or reference signal for heterodyning with sideband frequencies; thus it is the easiest mode to demodulate. A simple crystal diode serves this purpose in fine style. (Quick review: in a superheterodyne receiver, the received signal frequency is mixed, or heterodyned, with a set frequency produced by the receiver's IF, or intermediate frequency, oscillator. Additional signals are generated at two new frequencies: the sum and the difference of the received signal's frequency and the IF. One of these new signals is filtered out and the other is amplified and sent to the audio section of the receiver and ultimately to the speaker.)

AM versus FM—You Be the Judge

Commercial (wideband) FM has the ability to convey the full "Hi-Fi" range of audio sounds from 20 to 20,000 Hz while commercial AM is limited to 5,000 Hz. Can you actually hear that difference in audio quality? Try this quick 'n easy experiment in your own auto and decide for yourself.

First, if you can, select a local station simulcasting one or more programs of identical content on both the FM and AM broadcast bands. Adjust your car radio's balance/fader controls so all sounds emanate from only one speaker (thus eliminating any misjudgments due to stereo effects). Now, while listening to both music and speech, punch the radio's AM/FM button to switch between stations and compare audio quality. AM may seem to exhibit the same fidelity as FM, but remember it doesn't even contain tones above 5,000 Hz. So, assuming use of speech-only, what are FM's main advantages over AM? First, it's much less susceptible to noise and static (a whole column topic by itself; for now, just take my word for it). Second, a hefty modulator circuit is not required for FM as it is for AM. In other words, FM yields rich audio without rich expense. And that's why it's so commonly used today for voice communication, even when the fidelity of a wideband signal is not required.

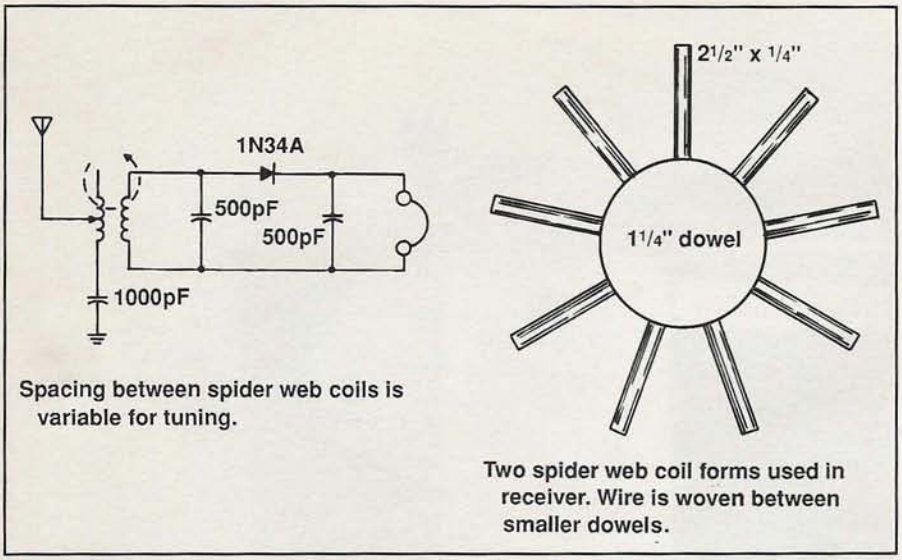


Figure 3. Circuit diagram of Spider Web coil-type crystal set discussed in a previous "Crystal Set Society Newsletter." Figure courtesy Rebecca A. Hewes and the Crystal Set Society.

A CW signal consists of little more than a carrier signal that is switched on/off according to Morse code. Consequently a second signal separated by approximately 700 to 1000 Hz from the desired signal's frequency must be heterodyned or "beat" with the CW signal to reproduce an audible tone. This signal may be generated internally by a receiver's BFO or externally by a small transistor oscillator circuit. An SSB signal consists of only one sideband, so a BFO or external signal must also beat with it to produce audio.

Since FM changes in frequency rather than amplitude, some form of *frequency-discriminating* arrangement must be used to retrieve transmitted audio. Modern FM detectors or demodulators have become rather fancy, but their general concept of operation involves using dual tuned circuits, with one resonant above and one resonant below a center-reference frequency. Diodes in each circuit conduct and pass small voltages comparable to the swing or modulating frequency. Phase-modulated (PM) signals are detected in the same way. I could continue several more pages, but I promised this would be a simplified discussion, so let's move ahead and bring on the fun!

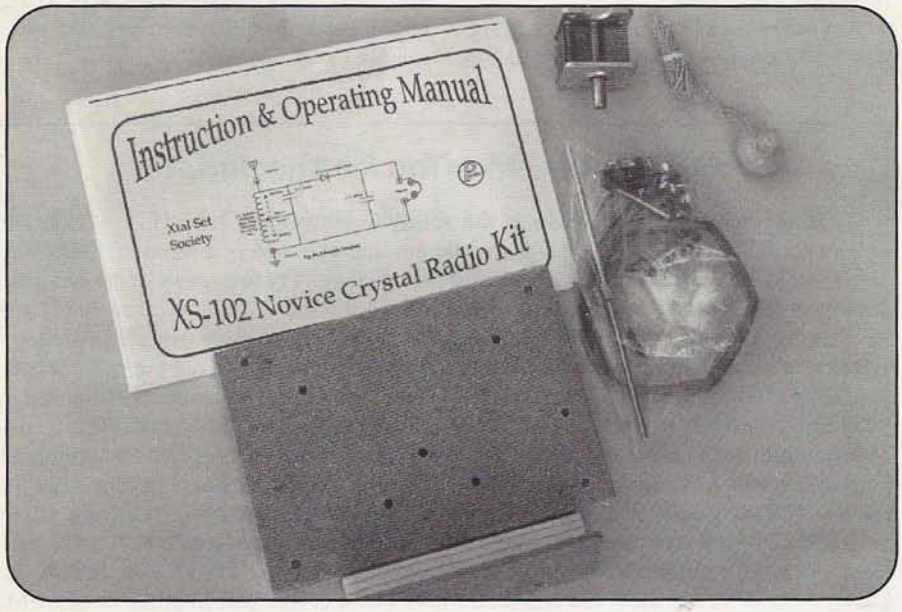


Photo D. The Crystal Set Society also carries several varieties of crystal radio kits like the set shown here, plus hard-to-find components like miniature open-air tuning capacitors and high-impedance crystal earphones, such as those in the upper right of this photo.

Crystal Sets: Radio's Timeless Classics

Surely the most famous of all "simple-ceivers," and the little tyke responsible for originally inspiring many folks to investigate amateur radio, is the classic crystal set. This has been produced in hundreds of varieties, ranging from open-air and wood-framed types to novelty versions like Philmore's eternally popular "Rocket Radio" of the 1950s (where, oh where have those heartthrobs gone?). Home-assembled crystal sets have also been stuffed into everything from Fire Chief Matchboxes to Sucrets tins. In addition to their appeal as good "confidence-building first projects" for new and prospective amateurs, crystal sets vividly demonstrate the basic requirements of any receiver: *signal selection, detection*, and *audio reproduction*. These steps are performed by a tuned circuit, a galena rock or germanium crystal detector, and earphone(s).

Most crystal sets are built to cover the AM broadcast band (550 to 1650 kHz), but their coil(s) can be tapped or changed in size to tune shortwave and even low VHF ham bands like 6 and (maybe with patient dinking) 2 meters. Copying local airport traffic on the 120-MHz AM air band, plus slope detecting (copying FM with an AM detector tuned slightly off-frequency) nearby stations and repeaters on 6 meters are additional possibilities worthy of pursuit.

So what's stopping you from building a crystal set right now? Hesitant to assume the challenge of hunting parts? Want "one-stop mail-order shopping"? Read on!

The Vectronics Crystal Quick-Kit

Crystal sets may not be as plentiful today as they were in the past, but diligent hunting can uncover some neat and impressive kits. One of the newest, most complete, and readily available kits today is the Vectronics Crystal Radio Kit, shown in Photos A (before assembly) and B (after assembly); the set's circuit diagram is shown in Figure 2. This kit comes with all the kibbles and bits, including wire for the coil and antenna and a high-impedance crystal earphone. I would say

"[Phase modulation] is produced by capacitively or inductively shifting the phase of a transmitter's carrier ahead of or behind its reference points....Regular FM detectors interpret the results of a shifting-in-phase signal as changing in frequency, and so detect it as conventional FM."

typical assembly time is a casual afternoon, allowing time to wind the coil, string up an antenna, and explain radio to a curious assistant or young relative.

Once the little gem is perking, you might connect a jumper lead to its coil's top or bottom and use it to tap-select various windings for higher frequency or shortwave reception. Remember to scrape off the enamel insulation from the turns at tap points. Jumping or shorting out all but eight or 10 coil turns should let you hit the 49-, 41-, and 31-meter shortwave broadcast bands, and the 40- and 30-meter ham bands. You can use an HF transceiver or communications receiver to determine the frequency range of your crystal set (find the matching signals). This process will be slow, but that is half the fun.

Want more ideas? Use a signal generator or grid dip meter for a BFO, and the set can tune in CW and/or SSB signals. Reduce coil turns or substitute a small coil, like 10 or 12 turns of wire wound on a Popsicle stick, and you may receive 6 meters or the 119-MHz aircraft band. Gosh, this could turn into a big-time radio adventure! (See "Resources" for ordering information.)

The Crystal Set Society

Homebrewing crystal sets is akin to eating potato chips—it's difficult to stop with just one. But why stop? Each affectionately built crystal radio is a conversation item and a piece of history you can hold in your hand—a gem you'll be proud to own and display for many years hence. All you need to start building an authentic replica from yesteryear is a circuit diagram, well-detailed description, and maybe a photo—and the perfect source of that guiding information is the Crystal Set Society (again, see "Resources").

The Crystal Set Society was started in 1991 by Phil Anderson, WØXI, president of Kantronics. In the beginning, the Society's newsletter was mostly theory. But at the request of members, the newsletter's focus changed to projects like sets with Spider Web coils, foxhole or "razor blade" radios, shortwave receivers with Galena detectors, and even sets with FM detectors similar to the classic Foster Sealey. Today, the Crystal Set Society is headed up by Phil's daughter, Rebecca A. Hewes. It has close to 1,000 members, a captivating bi-monthly newsletter loaded with neat crystal set ideas, a terrific bookstore with back issues of the newsletter, crystal radio books, hard-to-find parts, and even crystal set kits (photos C and D). Just looking through the last two newsletters kindles irresistible enthusiasm for building crystal sets. They describe a loop antenna receiver, details on winding Spider Web coils, and much more. Some of the circuit diagrams simply beg to be shared (Figure 3). Want to add some extra fun and enjoyment in your amateur radio world? Check out the Crystal Set Society.

Wrap Up

Once again we're down to the wire and must sign off, but stay tuned for more hot topics in the months ahead. Next in the spotlight is microphones, and we have views and details of some real gems to share with you. Still using a generic mic with your rig? Check out next month's column for guidance on customizing that mic to fit your voice and improving your on-the-air image. 73 and may the force of good signals be with you!

—Dave, K4TWJ

Resources

Vectronics Crystal Radio kits (Model VEC-121K) retail for $19.95 and are available from amateur radio dealers nationwide or may be ordered directly from Vectronics, 1007 Highway 25 South, Starkville, MS 39759; Phone: (800) 363-2922; Fax: (601) 323-6551; Web: <http://www.vectronics.com>.

The Crystal Set Society may be reached at P.O. Box 3026, St. Louis, MO 63130; Phone: (800) 927-1771. Membership/newsletter subscriptions are $10.95 a year, $12 Canadian, or $17 DX. Inquiries should be addressed to Rebecca A. Hewes at the above address.

Microwave Propagation

If you think that the microwave bands are only good for line-of-sight communications, well, you haven't been reading this magazine very closely...

"In regard to the limited range of propagation of these microwaves, the last word has not yet been said. It has already been shown that they can travel round a portion of the earth's curvature, to distances greater than had been expected."—Guglielmo Marconi, 1932

In 1932, during this same speech inaugurating the Dover-to-Calais ITT microwave link, Marconi reminded the audience that, at the time of his 1901 Transoceanic tests, mathematicians had calculated the maximum range of electric waves to be 165 miles.

Ask just about any of your friends on 75 meters or one of the repeaters, and they'll tell you that microwaves are line of sight. "If you can't see them, you can't work them," they'll tell you with complete confidence. Yet you keep hearing me talk about 100-mile contacts any time of the day or night, and even occasional 1,000-mile QSOs, on microwaves. What gives?

Inside Microwave Propagation

There is a variety of factors that allow microwaves to travel beyond the horizon. The first factor is the density profile of the atmosphere itself. The air is denser near the ground and gets thinner as we go higher. In my simplified drawing in Figure 1, you can see that the air itself is like a prism, continuously bending radio waves back towards the Earth. And a prism bends or refracts smaller waves more than longer waves. So the atmosphere naturally bends microwaves better than UHF, and UHF bends better than VHF, etc.

From a band opening point of view, this means 10 GHz opens first, then the opening works its way *down* to UHF, and finally to VHF. So when you hear that nice tropo opening on 2 meters, the microwave bands have already been open for some time. This top-down opening has been confirmed by many propagation studies and by radar operators.

Density Altitude

If you've ever worked with the equations predicting repeater or television coverage, you've used the "4/3 Earth's curvature" formula. This formula says that if true line of sight is 15 miles, then use 4/3 x 15 miles, or 20 miles, as your normal range. This 4/3 formula allows for the natural bending of the radio waves in the atmosphere (see Figure 2).

So is coverage better than 4/3 ever possible? Certainly! The density of the prism is changing all the time. The denser the prism, the better the atmosphere bends radio waves, and the father your signals go. For those of you who are pilots, this is called your *density altitude*. So, those cool, damp mornings with a high barometric pressure, when you can take off with four passengers, luggage, and a full load of fuel, are also the mornings when the microwave bands are open.

So what are we looking for? Key factors are barometric pressure much higher than normal and a high humidity. The air's density increases when it is carrying a lot of water, and the signals travel as far as the high pressure area extends. With slow-moving high-pressure areas, microwave openings of thousands of miles (especially over water) are relatively common.

Atmospheric Scatter

Scatter propagation takes advantage of turbulence in our atmosphere. Take a look

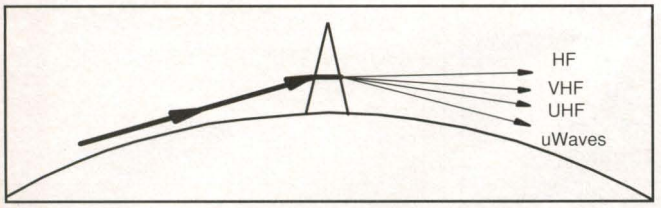


Figure 1. Density Profile of the Atmosphere. The air is denser near the ground and gets thinner as you go up. The air itself is like a prism, continuously bending radio waves back towards the Earth. Since a prism bends smaller waves more than longer waves, it is most efficient at microwave frequencies.

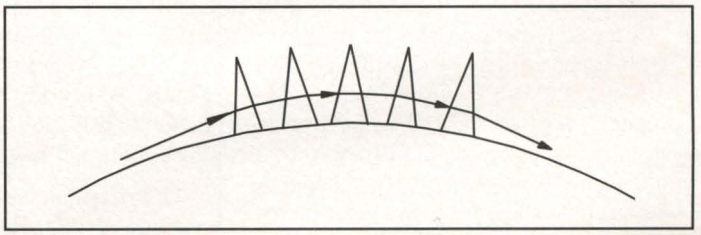


Figure 2. Refraction Effects of the Atmosphere. Without any atmospheric enhancements, the radio horizon is normally considered to be 4/3 of the visual horizon, so a 15-mile visual "line-of-sight" path provides a 20-mile radio path.

By Kent Britain, WA5VJB (Wa5vjb@cq-vhf.com)

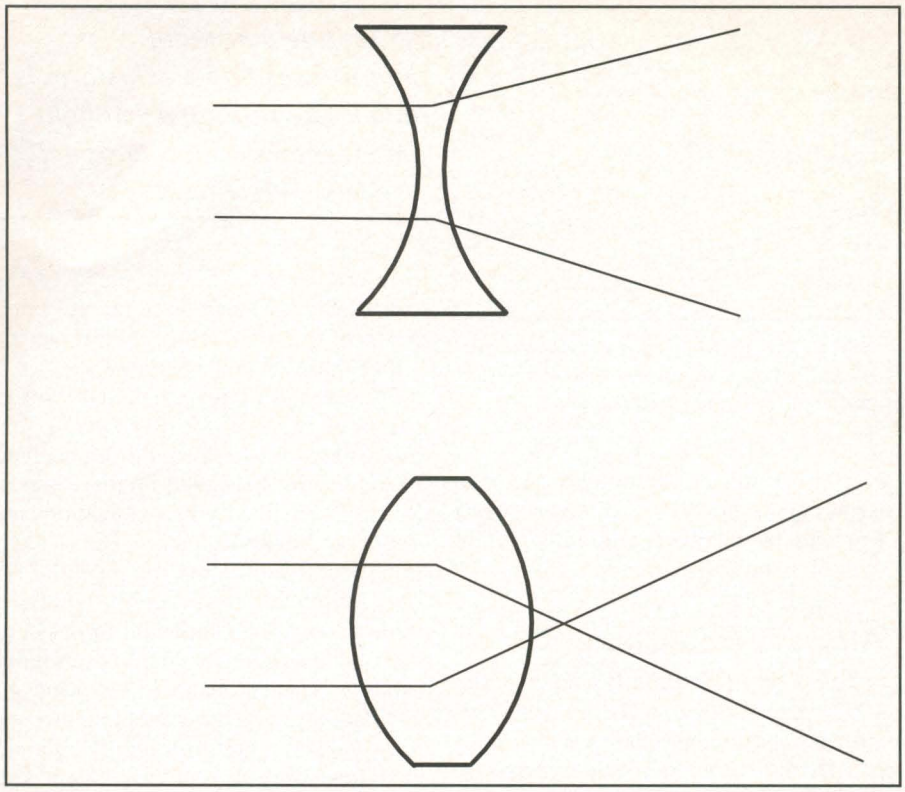


Figure 3. Convex and Concave Optical Lenses. If you shine a light up onto either a convex or concave optical lens that's horizontal above you, some of the light will be scattered up and some will be scattered down...and it doesn't really matter which shape the lens is.

at Figure 3, which shows you what happens to light when it passes through convex and concave optical lenses. Note how each different type of lens bends the light waves differently, but, in each case, some goes up and some goes down.

Now let's put these same types of lenses in the atmosphere (see Figure 4), where they will be like a bubble of air that is either more or less dense than the surrounding atmosphere. It doesn't matter if that bubble's density is greater or less than what surrounds it, as long as it's different. In either case, a portion of the energy is deflected back toward the ground. Clouds themselves do not reflect radio waves, but clouds are common where there are density changes in the atmosphere. Again, it doesn't make much difference whether this bubble of air is warmer than the surrounding air, or cooler, or wetter, or drier. As long as it causes a density change in the atmosphere, a portion of the radio waves hitting this pocket will be directed back to the ground.

"With slow-moving high-pressure areas, microwave openings of thousands of miles (especially over water) are relatively common."

Rain Scatter

Another atmospheric phenomenon that reflects microwave signals is water, or, more specifically, raindrops. These little dielectric blobs are just about the same size as half-wave dipoles on our 5.7-GHz and 10-GHz amateur bands. Shooting a beam of microwaves into a rainstorm is much like shining a spotlight into a snowstorm. The signal reflects everywhere! (see Figure 5). I remember W5UGO de-scribing a 5.7-GHz QSO with K5PJR on an Oklahoma summer day with his three-foot dish pointed straight up into a thunderstorm.

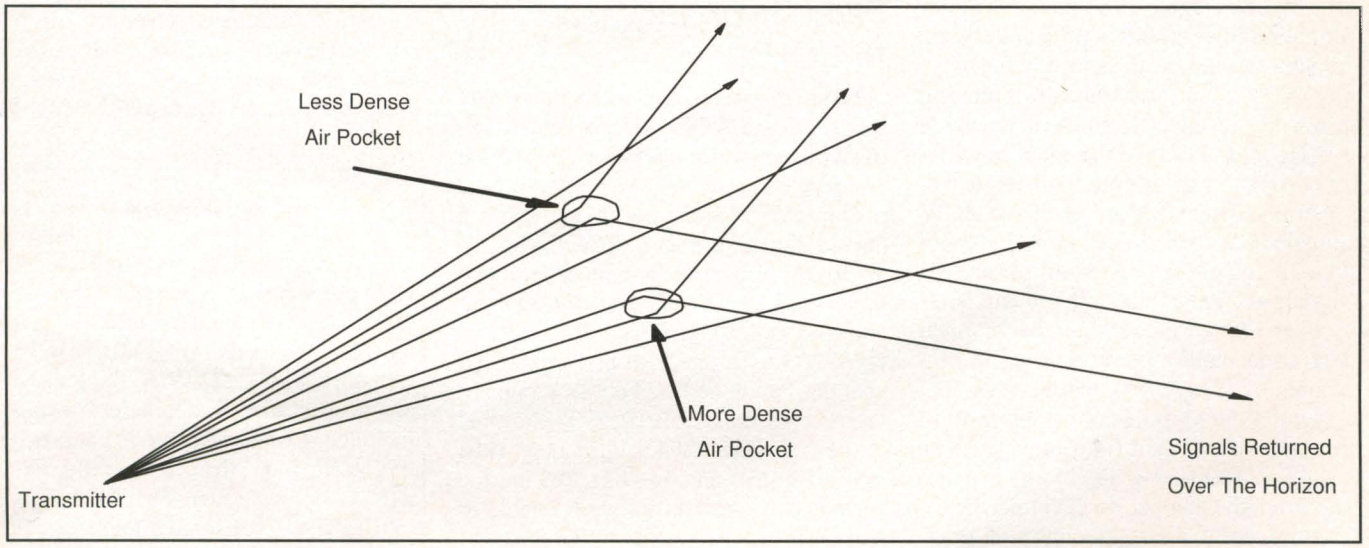


Figure 4. Atmospheric Scattering. Think of a concave or convex lens at radio frequencies. Any change in the density of the atmosphere—it doesn't matter if it's higher or lower—will result in scattering of signals at microwave frequencies.

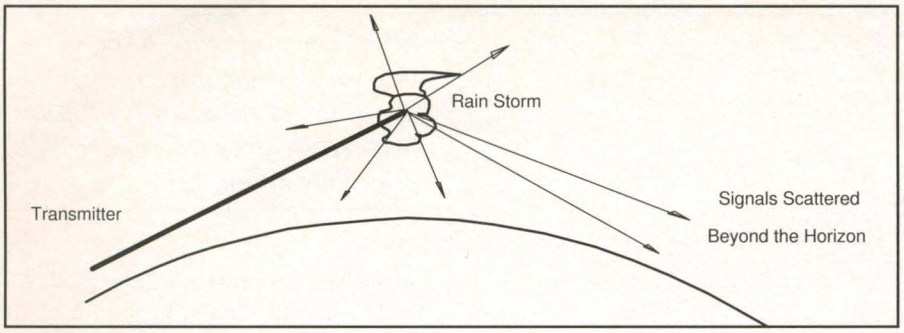


Figure 5. Rain Scatter of Microwave Signals. Raindrops look like half-wave dipoles to a signal at 5.7 or 10 GHz. Transmitting into a rainstorm will result in significant scattering—and much farther than "line-of-sight" distances—at microwave frequencies.

His signal went up several thousand feet, scattered off the raindrops, and went all over Oklahoma.

My introduction to 10-GHz "rain scatter" was from G3WDG/W5. Charlie had set up a small station 40 miles away, and we had been playing with signals for a day or so. When a Texas rainstorm hit (I always loved his quote, "It doesn't rain like this in England!"), he called me up and we went to 10 GHz. Normally, the beamwidth of my 18-inch dish is only 5 or 6 degrees. If I turn the dish any more than that, the signal goes away. But with all the rain scattering the signal, his direct signal was 2 S-units weaker. Only now I could rotate the dish *30 degrees* in either direction and still hear his CW!

Doppler Shift

There is another effect to sending CW signals through a rainstorm. When 10-GHz signals bounce off of moving objects, the signal now has a Doppler shift (an apparent shift in frequency based on your frequency, the speed of the moving object, and whether it's moving toward you or away from you). So what's the Doppler shift of billions of swirling raindrops? Yeah, billions of different frequencies. The net result of this is a CW signal about 5 kHz wide that sounds a lot like keying a compressed air hose. SSB signals get spread out and you can barely hear your own call come back, much less understand a conversation. So rain scatter is mainly a CW mode.

Rain scatter has become a big sport in Europe. After a rain front moves across England, and is over the North Sea and the English Channel, British microwave stations point their antennas southeast. Word gets out to the European stations on the continent and hundreds of German microwave stations point back to the Northwest. Result: 200-to-400-mile rain scatter QSOs are quite common between England and Germany while it's raining over Holland and Belgium.

Aircraft Scatter

I did a paper on aircraft scatter for the 1992 Central States VHF Society *Proceedings*. Bouncing signals off of aircraft is a far more complex subject than you might first think, but, in general, you need big antennas and lots of power.

As an example, for a 200-mile QSO on 10 GHz with a 747 halfway in between, you would need 10-watt stations, 18-inch dishes, and GaAsFET front ends. In the practical ham world, it's just another of the dozens of objects out there reflecting a small part of your signal. Work 'em first, figure it out later!

New North American Records on 120 and 144 GHz

From out west, we have news that KF6KVG and WØEOM have been working with their millimeter gear again (these amateur bands have a wavelength of 2 millimeters). They both use Hughes harmonic mixers and 9-inch dishes. WØEOM uses two antennas and two mixers, with one optimized for transmit and the other optimized for receive. KF6KVG uses one dish and mixer, but changes the diode bias between transmit and receive. On October 2, 1998, they had a one-way QSO of 4.9 kilometers (just under 3 miles) on 144 GHz, beyond the current U.S. record, but were unable to complete a two-way QSO due to KF6KVG's lower power.

They modified their equipment for 120 GHz, and on November 16, Will and Bob completed a 5.3-kilometer (3.18-mile) QSO for a new U.S. record. Look for them to be revisiting 144 GHz soon.

"Shooting a beam of microwaves into a rainstorm is much like shining a spotlight into a snowstorm. The signal reflects everywhere!"

For those of you who may scoff at a 5.3-km record, I just challenge you to see how far you can get with a few microwatts of RF. Also, the atmosphere itself absorbs the signals on these bands. So QSOs are like trying to communicate with searchlights in the fog. But as technology marches along, the potential for our millimeter wavelength bands is tremendous. The bandwidth to run hundreds of TV channels, hundreds of thousands of repeater channels, thousands of T-1 data lines, or most anything else we may want, is a *big* resource. We should encourage and support those hams who are experimenting there or, better yet, join in the activity.

Microwave Update 1999

The North Texas Microwave Society will be hosting this year's Microwave Update Conference. Al Ward, W5LUA, and I will be the hosts. This annual conference on amateur microwave operation, construction, and techniques will be held October 22 and 23 at the Harvey House hotel and conference facilities in Plano, Texas. I will be organizing one of our world-famous electronics surplus tours on October 21st. I hope many of you will be able to attend and I'll be passing along more details as we get closer. ■

Resources

For additional information on 10-GHz propagation in particular, see "10 GHz—A Good Band for a Rainy Day," by Tom Williams, WA1MBA, in the February, 1997, *CQ VHF*. Back issues are $4 each to U.S. addresses, postage included. Contact *CQ VHF* magazine, 25 Newbridge Rd., Hicksville, NY 11801; Phone: (516) 681-2922; Fax: (516) 681-2926; E-mail: <backissues@cq-vhf.com>; Internet: <http://www.cq-vhf.com>.

Would You Buy a Used Hobby from This Guy?

Ham radio needs a good image makeover, says WB2D, along with some good salesmen who know what the "customer" is looking for.

What got you thinking that you might want to become a ham? What sold you on ham radio? How did you move from not knowing that it existed as a hobby to joining its ranks? Simple questions?

Most of us can't answer "simple" questions like these off the top of our heads. We have to stop and let our minds drift back in time (well, at least, I do). Then, somehow, when you go back into that memory and relive it, you can start to see the steps you went through. For most people, I suspect, the decision to become a ham pretty much follows the decision-making process (usually referred to as a "strategy") used to make a major purchase. Everybody's individual strategy is different, to some extent. Some people have better strategies and typically make better decisions. But there's probably an overall model into which most buying decisions fall.

"Selling" Ham Radio

Most sales models talk about a five-step process: attention, interest, conviction, desire, and decision, or words to that effect. Most of the time, we move through these stages or states of consciousness without much awareness of what we're experiencing. We just know that we're being drawn in a particular direction. It just seems the "natural" thing to do. If it doesn't seem "natural," we usually talk about high-pressure sales tactics. After the fact, we tend to invent all sorts of rationalizations of why we made the decision that we did. In reality, though, a salesman, or an advertising campaign, or the words of a friend, or random circumstances moved us through the stages of our decision-making process.

A good salesman is like a magician who gets the audience to focus on the right hand while the left moves things around and makes the "magic" happen. The good salesman is focused on doing things that "naturally" move you through these stages. There's an old saw that it's the "sizzle that sells the steak." Logic is a wonderful tool, but it's pretty much useless in the sales process, except in the conviction stage, and even there it's of very limited value. The decision to buy is almost always made on an emotional basis, and then "reasons" are accumulated to rationalize the purchase. By the way, this is not rocket science: these laws of selling have been pretty well recognized and documented since the 1920s and '30s.

"For most people, I suspect, the decision to become a ham pretty much follows the decision-making process (usually referred to as a 'strategy') used to make a major purchase."

What We're Up Against

One of the first things I do in the morning is walk the dogs. A couple of days ago, I went out with the dogs before 8 a.m. and headed for the beach (it's a dirty job, but somebody has to do it). As I was walking along, I saw something that made me

By Peter O'Dell, WB2D (wb2d@cq-vhf.com)

On the Cover

They're baaaaack!!! Ward Wheaton, WB7VVD, and Harold Sibert, KC7AED, who graced the cover of our very first issue, are back again...this time working on the Phoenix Area Microwave Association's "Laser Project." Ward and Harold hold the red (Helium-Neon, or HeNe) laser distance record of 119.6 miles—using 5-milliwatt HeNe lasers—and hope to stretch it even farther when they can find the right mountaintops. According to Harold (who now holds the *CQ VHF* record for number of times on the cover, at three, including last July), laser communication was a logical next step up the frequency ladder. "Ward got me interested," he told us. "We started a contest group and were playing around with microwaves and wanted to get on all bands—and it just sort of blossomed from there." You can keep updated on the group's efforts to set new laser distance records on Harold's Web site at <http://www.primenet.com/~hsibert>.

Now, red laser frequencies may seem pretty high to most of us, but not to Eric Stroud, KB2TCQ, and his northern New Jersey laser group. For them, red is boring. So they've climbed even higher—above 550 THz (that's Terahertz, or 1 million MHz)—and are using argon-ion lasers and a variety of others to produce signals up into the violet range (the highest frequencies of visible light), and are working on ultraviolet. To discover what they're up to, read Part 1 of Eric's article, "Lasers to the Limit," elsewhere in this issue.

And keep in mind that there's no limit to the fun and variety that's available to every licensed ham on 50 MHz and above...even if it's waaay above. (Cover photo by Larry Mulvehill, WB2ZPI)

"The decision to buy is almost always made on an emotional basis, and then 'reasons' are accumulated to rationalize the purchase."

realize why ham radio is declining. There was a middle-aged guy out in his front yard talking to someone on his cellphone. Let's just say that he was not particularly fit, and it didn't sound like he was the most sophisticated guy in the world. But, he certainly seemed to be enjoying his conversation. After the dogs and I assured ourselves that the ocean was functioning normally and that the day could proceed without interruption, we headed back. The guy was still on the phone. No wonder ham radio is declining.

When I got back to the house, I sat down to breakfast and was reading the newspaper. An article written by a mother caught my attention. It seems that this lady's son is a computer whiz and spends a lot of time on the Internet. Part of it is for research, but a lot of his time is spent in various on-line chat rooms. So, the mother, wanting to know just what her son was up to, began hanging out in the chat rooms. One of the first things she noticed was a style of communication that mixed a nearly incomprehensible slang with goofy spellings and upper and lower case letters mIxeD toGeTheR iN a ranDOm FaSHion.

She started asking the various participants why they were doing this. Some of them ignored her, and some of them insulted her, but a few answered. Why? It is "creative" and cool. It is fun to communicate in a way that excludes people who are out of your circle. In other words, this was a way to lock out adults. Not because the kids wanted to do something illegal or immoral or fattening. No, just to have an identity of their own. There was an excitement to it.

Then, I thought back to those ancient days when I was in high school. A bunch of us used Morse code to communicate during really boring classes. If I recall correctly, it was a visual process with the dits and dahs formed by how long the index finger touched the desktop. It was fun, it was exciting, and we had found a way to exclude the teachers—except for Mr. Holt. We didn't know he had been a radio man in the Navy and could run circles around all of us with Morse code. I had no idea what was up when he asked four of us to stay after class one day. After all the other students left, he gave us some pointers on how to send insults and curses using Morse. I sure was surprised to find out that the United States Navy had abbreviations for all those words!

What Sold Me

I thought back to how I became interested in ham radio. It all started with a few comments that the science teacher made about communications and electronics. That was the first time I'd ever heard of the hobby. One of my friends who was active in the Boy Scouts started talking about getting a Radio Merit Badge. And then one of us discovered *Popular Electronics* magazine. Each month, there was another fascinating collection of news about electronic equipment, advances in technology, and predictions about what the future held. And there were these great stories about two high school kids who did all these neat things with electronics and ham radio. When the new issue arrived each month, the rest of the world dissolved and disappeared until the whole magazine was completely devoured.

Somewhere very early on, I began to fantasize that I, too, was doing all of these neat things with electronics and ham radio. Each month, the fantasies became stronger and more vivid. Maybe it was something I could do when I grew up, but I felt that there was no way that I could ever get to be a ham in the little rural town where I lived.

Next, my dad bought me a three-tube shortwave radio kit. I put it together, and it worked! (I should say it worked *in spite* of the fact that I put it together!) Suddenly, I was a world traveler. Turn the dial and listen to time signals from CHU or WWV. Turn the dial and hear some exotic language. Move on to the next frequency and find a woman speaking English with a very slight, but very distinct accent. Radio Moscow! Ooooh. I wonder if I am breaking the law just listening to her? Well, even if I'm not breaking the law, it most be immoral or unpatriotic or something. And the next day you go to class and talk to your friends in hushed tones. Shallow breathing and dilated pupils. The internal camera zooms in rapidly. It was all very exciting, clandestine—fitting for a James Bond movie (we'd have to wait a few years for "Dr. No").

Then, one day someone came to out school with the news that the local recre-

"Then, one day someone came to school with the news that the local recreation department was sponsoring a Novice ham radio class...fantasy had just crossed that thin red line into reality. I signed the sales contract right next to the big, black X."

ation department was sponsoring a Novice ham radio class. I didn't even know there were any hams who lived in town. Heck, a ham must be a special person, and I was sure that there was no one *that* special in our town. But fantasy had just crossed that thin red line into reality. I signed the sales contract right next to the big, black X.

A New Generation

Later on, I watched a whole new generation of hams come in out of the cold. It was 2-meter FM that brought them in the door. There was something so cool about walking around with a portable radio that you could use to call your friends. If an autopatch was available, you could even make phone calls—as long as you didn't violate the FCC rules about not ordering a pizza. Apparently, the FDA had determined that a pizza ordered over an autopatch was toxic, so the FCC outlawed the practice. The exact details escape me now, but it was something like that. But you could call your wife and tell her you were going to be late for dinner. And she might casually mention that a pizza would be good. And you might agree that it would be good and that you expected to drive right past the pizza parlor at about 7:30. Somehow, when you stopped at the pizza parlor at 7:30, there was a pie waiting with your name on it—one guaranteed not to be toxic in any form since it had not been contaminated by the autopatch syndrome. (*By the way, it is now legal to order a pizza by autopatch, as long as you don't own the pizza shop or work there.—ed.*)

Once the ham was hooked, something strange happened. A frequent topic of conversation on the repeater was some rare DX worked that morning or the night before. And the process started anew.

"It was no longer enough to listen to Radio Moscow. Now, it was time to talk to Vlad and Igor and exchange QSLs with them. Another signature by the big X: another closed sale."

Attracted by the 2-meter FM handheld, the new ham got caught up in DX fever. Then came the inevitable upgrades, rigs, amplifiers, towers, and beam antennas. It was no longer enough to listen to Radio Moscow. Now, it was time to *talk* to Vlad and Igor and exchange QSLs with them. Another signature by the big X: another closed sale.

Where Has All the Sizzle Gone?

What about today? Just walk into any store and count the number of people who have cellphones strapped to a belt, sticking out of a purse or glued to their ear. Compare the number who do to the ones that don't. Around here, it is about one to one, but that may not be accurate because some of the phones may be out of sight. Why are they suddenly so popular? Well, there's no getting around the convenience. And with the digital PCS revolution under way, competition in the industry has forced the rates so low that virtually anyone with a full-time job can afford a phone and a few hours usage each month. That pretty well shoots down the 2-meter FM sizzle.

What about DX? Log onto Yahoo or one of the other search engines, enter a topic, and you'll probably get somewhere between 35 and 500,000 hits. Flip through the listings, and you will find a foreign page or two in a matter of seconds. Click on the URL, and you'll be connected with a computer in Sydney or Moscow or Bora Bora. Guess what? The page probably has an e-mail address attached to it, so you can communicate one on one with someone on the other side of the world. Let's see, a computer and a phone line versus a transceiver, amplifier, tower, and beam, not to mention the ongoing battles with zoning committees, landlords, and condo commandos. That pretty well takes care of the DX sizzle, as I see it.

Let's not forget the chat rooms on the AOL, CompuServe, and the Internet in general. And then there are the forums, special interest groups, news groups, and so on. So much for camaraderie. How do you keep in touch with friends half-way around the world? E-mail is hard to beat.

Where Are We Going?

It all sounds pretty pessimistic, doesn't it? I don't think so. I just think that the "Powers That Be" in this hobby have been asking the wrong questions. Mostly, the questions have to do with admission standards. "Oh, dear. Would little Johnny get a ham license if it weren't so hard?"

Right now, we're in the midst of a major effort to lower the admission standards. I think it's pointless to do so. Don't get me wrong, the standards may need changing. But lowering them or even eliminating them, I believe, will have almost no effect on the growth of this hobby. In the long run, it may even have an opposite effect; that is, it may hasten its shrinkage. People like a challenge.

I don't think that the problem lies in admission standards that are too rigid or too rough or too out of date. When I was a teenager, we would have walked halfway across Texas to get a ham license because we were excited about it. There was something magical about it. There was something mysterious about it. There was something exotic about it. It caught our imaginations. Later on, a whole new crew came aboard when the 2-meter FM craze caught their imagination. Once the imagination is ignited, a prospective ham will walk over hot coals to get a ticket. Without the imagination, he won't walk across the street.

I don't have an answer, because the magic of 40 years ago is gone. Unfortunately, it's the magic that I understand, and it's the magic that the "Powers That Be" understand. But that magic is gone and won't come back.

However, there are new people out there coming into the hobby everyday. *You* are the ones who have the answer to this problem, because something moved *you* to become a ham. What turned you on? What ignited your imagination?

Please figure it out and let us old fogies know what it is. We don't need lower standards—we need a salesman who knows what the heck is going on in his prospect's mind. ■

Note: The opinions expressed in this column are those of the author and do not necessarily represent those of CQ VHF *magazine or its publisher, CQ Communications, Inc.*

Hamfest Calendar

The following hamfests are scheduled for March, 1999:

March 5–6, Hamfest '99, Jackson County Fairgrounds, **Pascagoula, MS**. Talk-in: 144.510/145.10. For more information, contact Charles "Kim" Kimmerly, N5XGI, at (228) 826-5811. (exams)

March 6, 1999 Kerbela Hamfest, Kerbela Temple, **Knoxville, TN**. Talk-in 144.83/145.43 or 146.52 simplex. For more information, contact Kerbela Amateur Radio Service, Kerbela Temple A.A.O.N.M.S., 315 Mimosa, S.E., Knoxville, Tennessee 37901.

March 6–7, 3rd Annual Hamfest Under The Sun, Fred K. Marchman Technical Educational Center, **New Port Richie, FL**. Talk-in: 146.670 or 145.330. For more information, contact Rick, KF4GXS, at (813) 842-2127, e-mail <richar@gte.net>.

March 7, SEWFARS Swapfest, Waukesha County Expo Center, **Waukesha, WI**. Talk-in: 146.82 PL 127.3. For more information, contact (414) 835-7035. (exams)

March 7, MTARA Hamfest & Flea Market, Westfield South Middle School, **Westfield, MA**. For more information, contact Jim Allen, N1RUT, at (413) 536-5182, e-mail: <jim.allen@the-spa.com> or Web site: <www.mtara.org>. (exams)

March 13, Annual Hamfest & Swapfest, Red River Valley Fairgrounds, **West Fargo, ND**. Talk-in: 14676-. For more information, call Mark Kerkvliet at (701) 282-4716. (exams)

March 13, Hamcom '99, Englewood, Florida, Tringali Community Center, **Englewood, FL**. Talk-in: 146.700. For more information, contact George, KA4JKY, 13591 Martha Ave., Port Charlotte, FL 33981, (941) 697-3445 or <gshreve@ewol.com>.

March 13, 18th Annual Mike and Key ARC Electronic Show & Flearmarket, Pavilion Exhibition Hall, Western Washington Fairgrounds, **Puyallup, WA**. Talk-in: 146.82/22 (pl 103.5). For more information, call (253) 631-3756 (eves and weekends); e-mail: <mwdink@eskimo.com>. (exams)

March 13, Hamfest, West Orange High School, **West Orange, NJ**. Talk-in: 146.15+1.0 85.4T, 224.480-1.6 No Tone, 447.875-5.0 156.7T, 146.520 Simplex. For more information, call Jim Howe, N2TDI, and Liz Howe, N2WGH (973) 402-6066. (exams)

March 13, Hamfest, Cave City Convention Center, **Cave City, KY**. Talk-in: 146.94. For more information, contact Larry Brumett, KN4IV, 108 Withers Dr., Glasgow, KY 42141, (502) 651-2363, or e-mail: <lbrumett@glasgow-ky.com>.

March 13, Swapmeet, American Legion Post, **Linda, CA**. For more information, contact Clara, KC6JPP, at (530) 742-2674, or Ron, W6KJ, at (530) 674-8533.

March 13, Hamfest, Scottsdale Community College, **Scottsdale, AZ**. Talk-in: 147.18, 440.00. For more information, contact Roger Cahoon, KB7ZWI, 8501 E. Edward, Scottsdale, AZ 85250, (602) 948-1824, or (602) 943-3548 (fax).

March 14, 39th Annual Hamfest, Sterling High School Field-house, **Sterling, IL**. Talk-in: 146.25/146.85 W9MEP repeater. For more information, contact Llyod Sherman, KB9APW, Sterling Rock Falls Amateur Radio Society, P.O. Box 521, Sterling, IL 61081-0521, call (815) 336-2434, or send e-mail to <lsherman@essexl.com>.

March 14, Hamfest & Computer Show, Indiana State Fairgrounds, East Pavilion Building, **Indianapolis, IN**. For more information, Send SASE to Indiana Hamfest, P.O. Box 1, Monrovia, IN 46157 or contact Dennis Bauerfiend, WB9ZNZ, at (317) 996-3782; e-mail <dbauerfiend@cleveland.dfas.mil>.

March 20, 23rd Free Hamfest, Martin County Fairgrounds, **Stuart, FL.** For more information, contact MCARA, P.O. Box 1901, Stuart, FL 34995.

March 20, 38th Annual Michigan Crossroads Hamfest, Marshall High School, **Marshall, MI**. Talk-in: 146.66 or 146.52. For more information, send SASE to SMARS, P.O. Box 934, Battle Creek, MI 49016, or call Wes Chaney, N8BDM (616) 979-3433.

March 20–21, St. Patrick's Day Hamfest, Midland County Exhibit Building, **Midland, TX**. For more information, contact Midland Amateur Radio Club, P.O. Box 4401, Midland, TX 79704, or call Larry Nix, N5TQU, by e-mail: <oilman@lx.net>; hamfest flyer and registration form at <http://www.lx.net/edge>. (exams)

March 21, Annual Winter "WECAFEST," Yonkers Raceway, **Yonkers, NY**. Talk-in: WECA repeater 147.66/06 with a PL of 114.8(Za). For more information, contact Tom Raffaelli, WB2NHC, (914) 741-6606 or the WECA Web site at: <www.weca.org>. (exams)

March 21, Flemarket/Hamfest, Southington High School, **Southington, CT**. For information, send SASE to SARA Hamfest, c/o Chet Bacon KA1LH, 138 1/2 Summit St., Plantsville, CT 06479-1125, (860) 628-9346; E-mail: <hcbacon@connix.com>; Web: <http://ww.connix.com/~hcbacon/sara.html>. (exams)

Operating Notes

For Late February, March, and April, 1999:

February	
28	Very Good EME conditions
March	
6–7	IARU Region 1 (Europe/Africa) VHF Contest
6–7	DUBUS (European) EME Contest, 144/1296 MHz
19–21	**CQ VHF Spring Activity Weekend (FM)** (see "Announcements" this issue)
28	Good EME Conditions
April	
17–18	**CQ VHF National Foxhunting Weekend** (rules in next month's issue)
23–25	**CQ VHF Spring Activity Weekend (SSB/CW)** (see "Announcements" this issue)
25	Good EME Conditions

Note: The ARRL Spring Sprints have been cancelled.

EME data courtesy W5LUU. More contest info is available on the CQ VHF *Web page at:* <http:/www.cq-vhf.com/navhfcon.htm>.

March 21, Hamfest & Computer Show, Charleston Civic Center, **Charleston, West Virginia**. Talk-in: W8CHF 145.35. For more information, contact Charleston Area Hamfest, P.O. Box 916, St. Albans, WV 25177, or call Jimmie Hewlett, WD8MKS, at (304) 768-1142, or e-mail: <crwhamfest @juno.com>.

March 21, Hamfest, Jefferson County Fairgrounds Activity Center, **Jefferson, Wisconsin**. Talk-in: 145.49. For more information, send SASE to TCARC, W9MQB, 711 East Street, Ft. Atkinson, WI 53538; or call (920) 563-6502 (eves); E-mail: <tricountyarc@globaldialog.com>. (exams)

March 21, 44th Annual Hamfest/Computer Fair, Lucas County Recreation Center, **Maumee, OH**. For more information, send SASE to Paul Hanslik, N8XDB, TMRA, P.O. Box 273, Toledo, OH 43697, (419) 243-3836.

March 21, Hamcomp '99, Tall Cedars of Lebanon Picnic Grove, **Hamilton Twp, NJ**. Talk-in: 146.67(-). For more information, call (609) 882-2240, or <www.slac.com/w2zq>; Hamcomp '99, DVRA, P.O. Box 7024, West Trenton, NJ 08628.

March 27, 16th Annual Hamfest, Bartholomew County 4H Fairgrounds, Community Building, **Columbus, OH**. Talk-in: 146.790/146.190. For more information, contact Marion Winterberg, WD9HTN, 11941 W. Sawmill Rd., Columbus, IN 47201-8000; or call (812) 342-4670;<winterbe@hsonline.net>.

March 27, Fleamarket, Pomfret Community School, **Pomfret, CT**. Talk-in: 147.225, PL 156.7 (K1MUJ). For more information, contact Paul Rollinson, KB1CNW, 182 Wright's Crossing Rd., Pomfet, CT 06259, call (860) 928-2456; e-mail: <paulrollinson@worldnet.att.net>.

March 27, Annual Michigan City Hamfest & Computer Fleamarket, Michigan City High School, **Michigan City, IN**. For more information, contact Ron Stahoviak, N9TPC, 5802 N. 400 W., Michigan City, IN 46360, or call (219) 325-9089.

March 27, Ham Radio Auction, Waterford Senior Center, **Waterford, CT**. Talk-in: 146.730(-). For more information, contact Tony, AA1JN, at (860) 859-0162 or see the Rason Web page: <www.ims.uconn.edu/~radon>.

March 28, 21st Annual Hamfest, Madison High School, **Madison, OH**. Talk-in: LCARA 147.21 repeater. For more information, call Roxanne at (440) 256-0320. (exams)

March 28, Free Tailgate, LARA Clubhouse, **Leesburg, FL**. Talk-in: 147.255+. For more information, contact Paul Branch, K3NON (352) 343-8729; e-mail: <w8hfk@aol.com>.

Update

"Origins of VHF FM and Repeaters" (February, 1999, *CQ VHF*) author Van Field, W2OQI, informs us that he has a sizable collection of early commercial FM radios, such as those seen in his article, and would like to hear from any collectors interested in adding to their own collections. His radios include those made by Motorola, GE, RCA, and Link. If you're interested, you may contact Van by e-mail at <wreck_and_rescue @juno.com> or by phone at (516) 878-1591.

Reports from All Over

It's been pretty quiet on the bands (except in Australia), but here's a look at what people were able to work in late December and early January, courtesy of WB2AMU, the Internet VHF reflector, and other contributors.

The month of December usually sees a minor peak in sporadic-*E* (*Es*) activity on 6 meters in the northern hemisphere, centered around the winter solstice. This year, it seemed, there wasn't as much action as usual, or maybe it was just back to normal after a few really hot winters! Here are some reports:

From Ken Neubeck, WB2AMU:

Some 6-meter activity was observed near the end of December with a brief opening between the Northeast and Florida during the evening of December 29th. A strong opening that lasted over two hours was observed on the next day on the 30th between the Northeast and the Midwest, beginning at around 2100 Z. Stations worked by WB2AMU (FN30) included K9CUN (EM69), KBØPE (EM48), N9NI (EM69), KB9IFH (EM59), K4BI (EM74), N9BJG (EM57), KCØAMK (EM39), and K4IQJ (EM72). Many of the stations commented that this opening was the strongest that they had heard during the winter season, as the band had been pretty quiet for the past two months.

Fuz Tanner, W4IO, also did well on the evening of December 30th with contacts made as far north as VE3YK (FN04) and VE3AJY (FN03) and several others in upstate New York and in New England. The band also opened into the Midwest for him later in the evening, with South Dakota and Colorado coming in. Like many others this year, Fuz was able to work PY5CC (GG54) via TEP [Trans Equatorial Propagation] on December 22 at 0030 Z.

Ed, WP4O, reports working some very interesting DX from Puerto Rico in Grid FK65. On 12/31 at 2332 Z, he finished working LU3EMK via TEP when PYØFF (Grid HI36) called him. When Ed swung his beam towards him, signals were very good. Based on the time, this appears possibly to be a double-hop *Es* opening. With 6 meters, it appears that anything can happen at any time via any mode, so it pays to make some noise!

On January 3, there was major meteor shower activity during the Quadrantids, with many stations heard or worked on 6 meters throughout the day in the Eastern U.S. and Canada. The MS [meteor scatter] activity was so strong that stations, such as WB2OTK (EM84) in South Carolina, were heard for over 15 minutes at 1700 Z, almost resembling a weak *Es* opening. VE9AA (FN65), N8WMU (EN63), KJ9I (EN53), W4MRI (EM86) were some of the many stations that were heard from this location (FN30). Much of the activity was around 50.125 with some stations going to 50.130 and 50.150.

"With 6 meters, it appears that anything can happen at any time via any mode, so it pays to make some noise!"
—Ken Neubeck, WB2AMU

From Mick, W1JJM, FN41:

Worked PY5CC at 2330 Z on 12/30/98. Sigs were 5x5 with TE flutter. (*Clearly, this is an example of the "mix 'n match" propagation described last month by WB2AMU; most likely a combination of sporadic-E and TEP.—ed.*)

From Terry Glass, NØYXE, Leawood, Kansas (EM28):

Six meters opened up on 12/30/98 at 2140 UTC when I worked KA3SDP in Pittsburgh, Pennsylvania. Altogether, I made 13 QSOs in six east coast states, as follows:

12/30: 2140 KA3SDP PA; 2142 KB2ZUP NY; 2148 W6XR NY; 2153 K1TEO CT; 2156 N3XJX PA; 2203 N2MCI NY; 2215 KC2DLD NJ; 2237 K1NK NJ; 2255 W3EKT MD; 2331 N3QCM MD.

12/31 (UTC): 0003 K4WWA VA; 0005 WD4NES VA; 0008 K4AU VA.

From Peter Heins, N6ZE:

N6ZE/mobile easily worked W1LP/MM (DL27) from deep in Malibu Canyon (DM04), 400 feet above sea level (ASL) and LAX Airport (DM03) (100 feet ASL), approx. 0400 Z 31 DEC 98; running TM-255 barefoot with one KB6KQ mini loop. Summer-like tropo conditions have once again occurred during the La Niña winter.

From Larry Hogue, W6OMF:

12/31: Nice signals into CM98 from DN26, W7HAH, Shep; and DN70, KØGU.

From Dave Batcho, N5JHV DM62:

Last evening (Jan 2 Z), I managed to work three VK2s (Australia) between 0155 Z and 0210 Z. This occurred after a prolonged (four+ hours), intense, opening to the west coast of XE (Mexico). I'm not sure whether the *E*-cloud spread enough to catch the Pacific TE, or the TE finally got good enough to hit the *E*-cloud.

Signals from VK were quite weak; VK2DN on CW, and VK2FLI and VK2ZHE on SSB. I don't know grids, working condx, etc. about these stations. I understand that WD5K also worked VK2DN, but I've heard no other reports. About 10 minutes prior to the first contact, the 46.240 VK video just popped up outta nowhere. I believe this xmtr is located in QF35, right in the heart of VK2-land. 46.172 up in QG53 (VK4-land) was not heard. All sigs were on the direct path.

As pointed out by VE9AA, the most incredible thing about this opening is that it took place almost precisely 365 days later from a very similar opening, on Jan 2, 1998, between 0030 Z and 0130 Z. In that opening, the propagation did not quite get to me, but several south Texas stations worked ZL and VK. Similarly, that opening took place right after/during a strong opening to the XE west coast (I have a print-out of the OH2BUA spots from that period).

Interesting stuff, and, once again, this a prime time of the year to be looking for *E*-TEP hookups.

Better Luck Down South

Dave's report leads us down to the southern hemisphere, where it's summertime, so it's their major *Es* season on six. WB2AMU passed along the following report of activity Down Under, put together by Jack Haden, VK2GJH, and posted on the UK Six Metre Group

(UKSMG) Web site's announcements page. It was relayed to Ken by Dave Ripton, K2SIX. Tnx to all.

Six Meters...Alive & Kicking
By Jack Haden, VK2GJH

The weekend of Saturday the 12th and Sunday the 13th of December was a 6-meter DXers paradise as the band came really alive. Many (Australian) east coast DXers worked KH6, FK8, ZL, and VK9N for new ones, while the lucky ZLs

(New Zealand) had a path to Mexico and Costa Rica, which was envied by excited VKs.

From the VK2GJH log: Sat 12th Dec 1998: At 2230 Z NZ TV video on 45.240/250/260 MHz was rising rapidly with the peak at 0000 Z with signals well in to the red on the S meter. ZL3SIX beacon observed strength five at 0013 Z, I worked ZL3NW minutes later with a 5X5 exchanged. ZLs reported contacts with TI5KD in Costa Rica and hearing the Mexico beacon around 0120 Z plus an HR6 was also heard.

0209 Z VK7RST beacon on 52 MHz 559 report, 0226 Z ZL4LV worked with 5X7 exchanged. VK4ABW heard at 0228 Z 5X6 calling CQDX. It was also reported that the ZLs had a solid path to JA (Japan) for a period of time but the JAs were not heard at all in Sydney. A feeding frenzy commenced at 0325 Z when the KH6HI and KH6HME beacons started to come through from Hawaii. The frustrations were answered at 0337 Z when Ted, NH6YK, was worked by VK1, VK2, VK3, VK4, VK7, and VK9N. Ted took the pileup to 50.120 MHz, where he stayed for nearly two hours working VK. One resident 6-meter aficionado in Sydney, who likes telling others what to do and when to do it, was chastised by a few for trying to pump the contact dry with Ted whilst others were waiting to work him. Practice what you preach?

Ted was later joined by Ken, KH7R, and KH6WU, who both enjoyed solid attention from DX-starved VKs, for many of whom Hawaii was a new one. Prominent Sydney DXer Bob Lear, VK2DN, commented it had been a number of years since Hawaii was so strong in Sydney on six.

Jim. VK9NS stirred a hornet's nest at 0355 Z with a 5X9 signal on 50.110 MHz SSB from Norfolk Island. As a small pileup started, Jim beamed to Hawaii and proceeded to work KH6 to the dismay of some VKs who needed him for a new one on six! Such is life. I tried to ring 3D2CM, T2ØAA, and C21RK to alert them, but no answer at any of the three residences. What a pity.

New Caledonia attracted many with FK8CA pounding away on CW on 50.095 MHz with a solid 599 signal at times. Again, many worked him for a new country or new mode. The band switched around at 0435 Z, with the VK4BRG beacon rumbling through like a steam train on 50.077 MHz, followed by a good strength five from beacon VK7RST. At 0447 Z, Brian, VK7RR, was five-nine plus in Sydney on 50.130 MHz, working a VK4. By 0500 Z, the KH6 beacons has disappeared but the VK4s were still coming in. Around this time, VK7 bowed out gracefully too. Local DX was about with VK2APG in Kiama, worked 5X9 both ways, ZL TV on 45 MHz still powering in but starting to wobble with fade just around the corner. UHF DX was great with WIN and PRIME TV in Wollongong being viewed clearly on the indoor antenna in Sydney for the first time in many years! The 45-MHz ZL TV was still coming through around the strength nine mark at 1245z when I switched off the IC-736 and went to bed. Let's hope we have a repeat of this tomorrow....

"Last evening (Jan 2 Z), I managed to work three VK2s (Australia) between 0155 Z and 0210 Z....I'm not sure whether the E-cloud spread enough to catch the Pacific TE, or the TE finally got good enough to hit the E-cloud."—Dave Batcho, N5JHV

Sun 13th December: ZL TV on 45 MHz was peaking 10 dB over all morning, VK7RAE beacon was a 559 report at 0116 Z indicated things were on the move, and they were, but sadly not to be a repeat of yesterday's star performance. VK7RST beacon on 52 MHz broke through at 0137 Z, heralding a rising MUF to the delight of many. A quick CQ on 50.110 MHz was rewarded with a strong signal from VK5AYD, clearly indicating the path was indeed different from yesterday, as no VK5s had been worked in Sydney. Brian, VK7RR, came through at 0145 Z with a good 5X9 from Hobart. A quick check of 52 MHz found VK5VF beacon pounding through 579 report on 52.450 MHz at 0152 Z. Back to 50 MHz and a good solid contact with John, VK5PO, on 50.150 MHz. John was after the Pacific so I kept the contact very short for him.

Both VK7 beacons were 599 at 0208 Z and a quick contact was made with Joe, VK7RG, on 50.125 MHz who was 5X9 plus at the time. ZL TV on 45 MHz had all but gone by 0215 Z making it very clear the band was changing direction, unlike yesterday's solid ZL path. A quick CQ netted Paul, VK2YVG, in Broken Hill who was 5X5. Paul was after the Pacific like everyone else. The VK7RAE beacon was plus plus on the meter at 0225 Z.

A frenzy broke out at 0249 Z with VK7JG and VK7GUN working Ted, NH6YK, in Hawaii, but the reports exchanged were poor compared to yesterday. Ted was barely audible in Sydney as he worked the two Tasmanian stations, much to the dismay of many who missed out Saturday and were on today just to work the KH6 gang.

At 0325 Z Jim, VK9NS, powered in to Sydney 5X9 and was soon chastised by a VK1 to move off the call frequency for the DX! Jim responded that he "was the DX" Again, a few VKs worked Jim for a new one, which was appreciated as usual. Despite the failure of the KH6 opening, Jim filled a void and made the afternoon worthwhile for many sweating at the radio in the summer heat.

Queensland made an appearance at 0342 Z with VK4KK pounding away on CW with a 419 report. At 0345 Z, VK7AB nudged the meter to 5X6, peaking nine, whilst talking to VK2BGL in Sydney. By 0410 Z, the VK7 beacons had all but disappeared and the void was replaced by the appearance of the VK8RAS beacon in Alice Springs on 50.046 MHz, 529 report. No VK8s were heard or worked by me, many called them, though, due to the beacon coming through, VK7JG heralded the last of the VK7s with a 5X8 signal whilst working VK1MP on 50.120 MHz at 0423 Z. By 0515z, it was all over bar the shouting, so to speak, and 50 MHz returned to its usual quiet self!

Many new voices are being heard on 6 meters, attributed to the likes of the HF plus 6-meter rigs being sold today. Quite a number of those I worked were running the new Yaesu FT-847 or FT-920, with many others running ICOM, Kenwood, or Alinco HF/VHF combination rigs. These new transceivers are definitely drawing new blood to six meters and, with propagation on the up and up, I am sure their owners will not be disappointed with 6 meters and the exotic DX on offer.

73's and see you on six! de Jack VK2GJH. Jack VK2GJH—Wednesday, December 16, 1998 at 17:08:50 (GMT) From the UKSMG Web Page Announcements.

Keep Those Reports Coming

Thanks to all for posting, gathering, and relaying these exciting activity reports. Until Tim is back with us on a regular basis, please post your reports to <cq-vhf@cq-vhf.com>, in addition to Tim and your other regular posting addresses. And if you can pass along collected reports, as we had this month from WB2AMU and VK2GJH, we'll be doubly appreciative.

Don't forget the new *CQ VHF* Activity Weekends (see announcement in this issue). We particularly encourage experienced contesters to operate in this month's FM Activity Weekend, to help set the tone for those who may be unfamiliar with contesting procedures. In addition, you might pick up some new operators among those participants who are new to contesting and "catch the bug" during this FM-only event.

73 and good DX. ■

Higher Speeds, Tidbits from Here and There

Want to get your packet messages moving faster than a snail? You'll have to broaden your horizons first...and look at what's available in Europe. Plus, we'll update you on the big APRS frequency switch and some goings-on at TAPR (and we'll even tell you what those stand for, if you don't already know).

I hear a lot of complaints that the packet network "isn't fast enough." My usual response is, "fast enough for what?" For DX spots or regular BBS work, 1200 baud is plenty. For stuff like what we featured in last month's column—Web pages served up over the network—even 9600 baud seems a little slow. Packet needs to get an order of magnitude faster if we expect to do anything cool with it. Think about it: How much more fun would packet be if it were actually *faster* than what the phone company offers? Not all that far-fetched, either.

High-Speed Modems

The first part of a faster RF data link is the *modem*. As I've written before, the standard G3RUH FSK modem we all know and love (especially if we love 9600-baud, either on the ground or by satellite) will easily scale up to 64 kB, fitting quite easily within a 200-kHz channel. There are several variants currently available commercially, generally at prices under $100. After my article a few months ago on this modem, I learned that the text of the original paper by James R. Miller, G3RUH, describing his FSK modem design, can be found on the AMSAT Web site at <http://www.amsat.org/amsat/articles/g3ruh/g3ruh-index.html>. Worth a visit.

One interesting variant is the *Enhanced Parallel Port* (EPP) version. Parallel port modems, in which most of the TNC functions are done in software, are nothing new. BayCom has sold a few variants for some years now, but they're limited to 9600 baud. In an article in a German club publication (ADACOM), Juergen Hasch, DG1SCR, describes a new implementation using an *FPGA* (*Field Programmable Gate Array*) chip. This modem will easily run at 76k8 (another way of writing 76,800 bits per second), and, because the TNC is in software (a PC/FlexNet driver already exists), it's not at all expensive. Complete construction details are included in the article, and I'm in the process of getting permission to reprint a translated version.

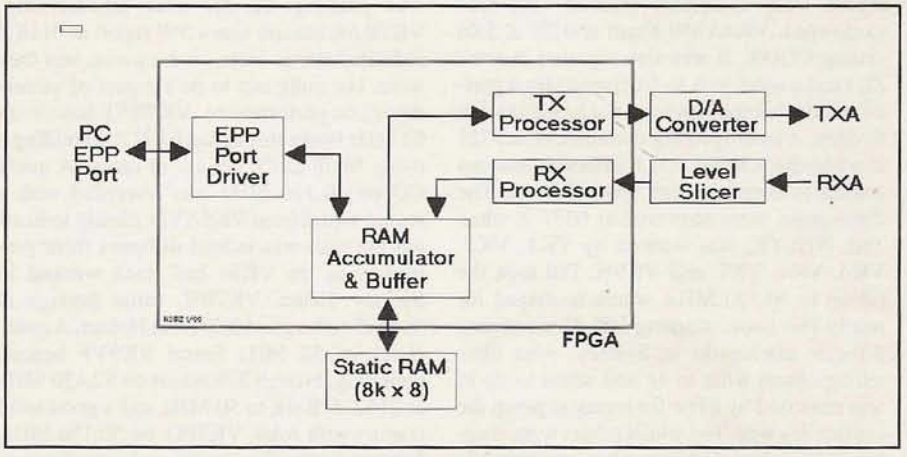


Figure 1. Block diagram of DG1SCR's EPP Modem for 76,800 (76k8) baud. Packet modems for computers load the processor significantly with Input/Output timing. This innovative (and fast) design reduces processor load by using a large RAM buffer, allowing more flexible timing; and an FPGA (see text) to decode packets.

Figure 1 shows a simplified block diagram of the modem, with only the D/A (digital-to-analog) converter, level slicer, and static RAM not implemented within the single FPGA. The important feature is the RAM buffer and large (8 kilobyte) static RAM. The major load on the host computer is Input/Output—it takes a lot of time to keep up with a real-time data stream. To reduce this load, the static RAM chip is used to store all the incoming and outgoing data until the PC or radio channel can handle it. For receiving, the FPGA chip handles all the decoding, feeding only complete error-free frames to the PC. For transmitting, the RAM allows the PC to feed in data at its own pace, without having to deal with the radio channel conditions.

By Don Rotolo, N2IRZ (n2irz@cq-vhf.com)

The TAPR Spread Spectrum Radio

Tucson Amateur Packet Radio (TAPR) has announced that a team led by Bob Stricklin, N5BRG, Bill Reed, WDØETZ, and Tom McDermott, N5EG, is developing the *TAPR Frequency Hopping Spread Spectrum radio*. At last report, the prototype radio was transmitting, although not yet hopping. The group spent about $15,000 on the project last year—on things like pc board prototypes, development software, parts, and other odds and ends that a project of this magnitude requires—and anticipate spending another $15,000 to $30,000 on it in 1999. Thus far, though, TAPR has received a little less than $2,000 toward its overall goal.

TAPR will be sending out a fund raising letter in the next few months to help fund all or part of the costs of this development project. Members are being asked to donate to this worthy cause, and I'm asking the readership of *CQ VHF* to also consider supporting this valuable project. Please take a serious moment to consider this request and help bring this unique project closer to completion. If you have contact with a local or regional packet organization, contact them about supporting this project as well.

Donations above $25 will receive a handsome certificate acknowledging their contribution to the TAPR FHSS Project, while those donating $250 or more will receive a plaque to let everyone know of their efforts on behalf of this project. All donations are needed and welcome, no matter how large or small. Even if you simply become a member of TAPR—well worth the $20—you can be sure it's appreciated and helpful. Thank you for your consideration.

Contact TAPR at 8987-309 E Tanque Verde Rd #337, Tucson AZ 85749-9399; Phone: (940) 383-0000; Fax: (940) 566-2544. Internet: <http://www.tapr.org>. Visa and MasterCard are accepted.

—N2IRZ

If you don't read German, have a look at the *Proceedings* of the 17th ARRL/TAPR Digital Communications Conference (1998). Here, Thomas Sailer, HB9JNX/AE4WA, and Johannes Kniep, DG3RBU, describe a different implementation of essentially the same modem, but where the HDLC (High-level Data Link Control) decoding and other functions are performed in software instead of hardware. The CPU loading is considerably higher—up to 25% of the processor time on a P-100—but the reduced cost of the modem is a valid tradeoff, especially considering that computers are much more powerful today. (Personally, I use an old 8088-based computer to run FlexNet, which forces me to use an external TNC).

A similar development, on which Juergen's EPP modem above is based, is the *YAM* (*Yet Another 9k6 Modem*) from Nico Palermo, IV3NWV. This modem, which has become quite popular, also uses the parallel port and an FPGA, but it's limited to 1k2 and 9k6 operation.

Domestically, the WA4DSY/GRAPES 56-kB modem has been around for quite some time. I have little experience with it, since it's a true RF modem, offering a 30-MHz RF output. You must use a transverter to scale the output frequency to the desired band, and that means you need power amplifiers, sequencers, and all that other stuff. You also need a little bit of technical know-how, and a larger bit of money—all that hardware doesn't come cheap. But, there is an advantage here: the wideband radio is included.

Radios for High-Speed Packet

Until recently, wideband radios, for data rates above 38k4, were hard to find, and they were really expensive when a source was discovered. There are a very few commercial offerings (there isn't much wideband commercial spectrum below 1 GHz), but they cost thousands of dollars and are tuned to commercial segments where amateur radio is not welcome. In the past few years, some (unlicensed) Part 15 spread spectrum radios, claiming RF data rates in excess of 200 kB, became available for under $1,000. The problem here, however, is that the type of spread spectrum used in these radios is not allowed under Part 97 rules, so hams must operate them under Part 15, with its low power limits and poor antennas.

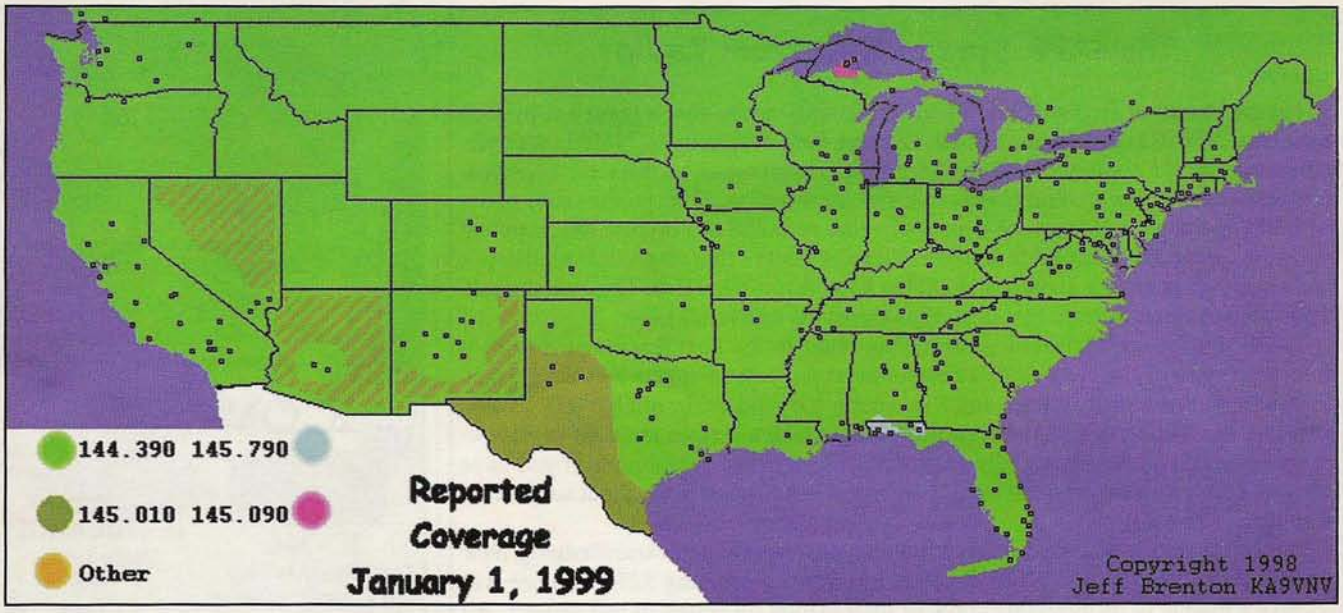


Figure 2. This map shows the reported APRS frequencies in the continental U.S. as of January 1, 1999. Nearly the entire country is on 144.390, effectively eliminating the potential QRM to manned space operations on 145.800. Southwestern Texas is on 145.01, to leverage the local packet network for APRS use; a small part of Michigan's upper peninsula is on 145.09, for the same reason; and a small part of the Florida panhandle returned to 145.79 due to some technical issues. This map, and the data collection behind it, are the fruits of the labors of Jeff Brenton, KA9VNV, and it is reproduced here with permission.

Tucson Amateur Packet Radio (TAPR) has been granted a Special Temporary Authority (STA) by the FCC to experiment on the air with spread spectrum. Visit the TAPR Web site (see "Resources") for details on what they've learned about operating these Part 15 SS radios under Part 97. It appears that the FCC rules will be changed in the near future, opening these devices up to amateur use. Unfortunately, the average user will still find these radios expensive, difficult to use, low-powered, and somewhat limited in certain terrain.

That doesn't mean spread spectrum is a bad idea—I believe that it's an integral part of the future of data communications—it's just that a more conventional radio would be more useful. (By the way, see "The TAPR Spread Spectrum Radio" for information about helping TAPR with their spread spectrum project).

Once again, I found something in the German literature which is extremely interesting: A fully developed 76k8 transceiver for the 70-centimeter band. It offers 2 watts output, the possibility of altering the frequency (it's PLL-tuned), and is available as a kit. I saw a prototype of the radio in 1997, and, in the meantime, it's been improved and updated. Designed by Alexander Kurpiers, DL8AAU, and Martin Liebeck, DL2ZBN, it seems to be the alternative that everyone has been waiting for. I have already begun saving up some money to buy two of the kits (what good is only one?), and I hope to get them on the air this summer.

Looking Across the Pond

Just a brief pause here to consider that much of what I end up writing about, especially the new and exciting stuff, comes from Germany. I wonder what it would take to get American college students so interested in radio? I fully understand that things available in Germany are still difficult to get in North America — take that radio kit above, for example. Even if you buy one (or two), suffer the exchange rate, pay for the transportation and customs duty, you still have only a kit, and the instructions are in German!

Still, we Americans tend to have a rather isolationist view of things, amateur radio included. We should try to look to other places and see what they've done to leverage our resources. When is the last time you read a ham magazine or book from England? (They are in English, you know). Try the Web, almost all hams speak, or at least write, English. The recent cooperation between TAPR and PRUG (the Packet Radio Users Group of Japan) is an excellent step in this direction.

But back to the subject at hand. I would love to publish the information about the 76k8 radio, but I'm afraid that nobody would build it. The few dozen with enough experience to build it don't have the interest, and the other dozen brave enough to try building it might never get it to work. But, being a glutton for punishment, I probably will, in some form or another. I suppose the ideal situation for us would be for someone to offer it wired and tested, but FCC approvals are expensive, so this is unlikely.

So, what do we do in the meantime? As always, the RF side is the limiting factor in packet. Modems are a dime a dozen, but radios that can exceed 19k2 are rare. TAPR's spread spectrum radio project might be one of the answers, but that alone won't fix everything. I think that the only thing that even has a *chance* of fixing everything is for you, dear reader, to *get involved*, and *make something happen*. Yes, you can, unless you never try.

APRS QSY Update

I often cruise the Web, looking for column material. (I also cruise the packet network, for the same reason, but, for some reason, there isn't as much there). Recently I saw a link to the Web page of Jeff Brenton, KA9VNV, with his detailed information collected on the APRS QSY, and it seems that, as of this writing, nearly all of North America has switched over

to the new APRS frequency of 144.390 MHz. The few isolated holdouts are on other frequencies due to local or technical issues, and the very few who must operate on 145.79 will probably not cause much QRM to space operations. Have a look at Figure 2, or visit Jeff's Web site for the latest version.

It's interesting to note that, despite the controversy I inadvertently caused by announcing the QSY as a virtually "done deal" (before it was), the whole process took only about a year. It's somewhat amusing to note that even the most vehement of objectors, whose flames I endured after that article, are now on 144.39. Honestly, I still have a hard time seeing the logic of not changing frequency, but that's a problem I'll have to work upon.

Goings-on at TAPR

As I mentioned above, TAPR is in the middle of designing a *Frequency Hopping Spread Spectrum* (*FHSS*) radio. The group is expending quite a bit of effort on the design, with some of the finest talent in the industry, and the result will most certainly be of the highest commercial quality standards. I'm looking forward to being able to buy a pair of these radios, which will make network links at better-than-ISDN rates a trivial matter.

Tom McDermott, N5EG, presented a status report on the project at the 1998 Digital Communications Conference (DCC). If you want to hear the presentation (as a RealAudio file), as well as view the overhead slides, visit <http://www.tapr.org/dcc>. It seems that they have most of the CPU and operating system work done, and are well on their way with the RF board.

TAPR's newest book is the *Spread Spectrum Update*, a collection of articles on spread spectrum. The book, with an introduction by N5EG, covers a range of issues including introductory info, regulatory, TAPR related, technical, and theory. I haven't read it yet, but if it's anything like Tom's last book for TAPR, *Wireless Digital Communications*, you'll get a lot out of it.

Tidbits

I've continued to play with my laser data project, but I've been busy at my real job, so there hasn't been much progress. Did you know that an ordinary LED can be used as a photodetector, if the light frequency (color) is fairly close? That's where I'm headed at this point. As expected, simple on-off keying of the transmitting laser tends to let a lot of noise into the system. The laser pointer I'm using cannot be modulated above about 11 kHz, so modulating the data atop a frequency carrier doesn't appear possible, at least at 9k6. I understand that other visible lasers have a much higher frequency response, which I'm looking into, but I think I'll approach the noise issue with better optical filtering.

Given the effort so far, I could have dug a trench for wires out to the shed, but that's no fun (*for details on Don's laser-to-the-shed project, see his December, 1998, column—ed.*).

Now that there's equipment out there, I have to start taking care of it. Next month, we'll take a closer look at the details of setting up a remote site. Little things like temperature control, lighting, and power distribution are in store for you. Perhaps we can revisit FlexNet briefly, to discuss computers, weather, and emergency power for those times when computers and weather are at odds with each other. Can you really convert your computer to run off 12 volts DC? We'll see. Until then, spring is just around the corner, so now is the time for you to design or build something and get it onto the network. ■

Resources

Detailed information on the APRS QSY, including recent maps of the current situation, is available on the Web page of Jeff Brenton, KA9VNV: <http://www.dididahdahdidit.com/APRSFreq.htm>. Also have a look at the TAPR Web page (see below)

For details on the YAM, visit the Web page of Nico Palermo, IV3NWV, at <http://www.microlet.com/yam>

To view the DCC paper by Thomas Sailer, HB9JNX and Johannes Kniep, DG3RBU, which appears in the 17th ARRL/TAPR DCC *Proceedings* (available from TAPR), visit <http://www.ife.ee.ethz.ch/~sailer/ham/epp_dcc98/epp.html>.

Updated information on TAPR's spread spectrum experiments and its under-development frequency-hopping spread spectrum radio, are available on the TAPR Web site at <http:// www.tapr.org>.

Basics

Packet Radio

Putting your computer on the air with "packet radio" is easy and fun. Here are the basics of what you'll need and how to make contacts. Watch for other articles in *CQ VHF* with more detailed information.

Equipment Needs

- A personal computer or data terminal (sometimes called a "dumb" terminal).
- A ham transceiver, generally a 2-meter (144 MHz) or 70-centimeter (440 MHz) FM rig, mobile or handheld, and an antenna.
- A Terminal Node Controller (TNC). This is the translation and housekeeping device that wraps up your information "packets" to be sent on the radio and unwraps the packets your radio receives. The TNC is connected to your computer's RS-232 (serial) port and to your radio's mic and speaker jacks.
- Cables to connect the equipment together. A standard serial cable will usually work for the computer-to-TNC connection (make sure the cable matches the connectors on both units). But you may have to make your own TNC-to-radio cable, since mic connectors vary greatly from rig to rig. Check the manuals for both the radio and the TNC, then match up the following:

TNC		RIG
Data Out	<==>	Audio In
Data In	<==>	Audio Out or Speaker Jack
Switching	<==>	Push-to-Talk (PTT)
Ground	<==>	Ground or shield **

*(** You may need to wire together the ground or shield terminals for the PTT line and the Audio In line on the mic connector.)*

Getting Ready

Once everything is wired up, you're ready to get started. Your TNC will turn on in the "command" mode. This means that anything you type in will be read as an instruction to the TNC and won't be sent out on the air. The first command you should type in is **MY (space) <your callsign>**, then press **<ENTER>**. This assures that your callsign is attached to every packet you send out. Next, type **MRPT ON** and press **<ENTER>**. This command means "monitor repeater" and will allow you to see (on your screen) the callsigns of not only the sending and receiving stations, but also of any relaying stations.

Now, begin by listening. Tune around for the distinctive "BRAAAP" sound of packet signals. You're most likely to find some on 145.01, 145.03, 145.05, 145.07, and 145.09 MHz. Adjust your receive volume until you begin to see packets (bits of messages) appear on your screen.

Each packet starts with a string of callsigns. The call of the sending station is first, then any relay stations, and, finally, the destination station. The callsign with a star (*) next to it is the one you're actually hearing and is probably close enough for a direct contact. If it's a callsign with a dash and a number after it, or if it's an ID that doesn't look like a callsign, then it's probably a network relay station (also called a "node") and not a real person at a keyboard.

On the Air

Contacting someone on packet is called "connecting." You can connect with people either directly or through a network of relay stations. To make a direct connection, just type **C**, a space, the call of the person you want to contact, and then press **<ENTER>**. If the link is made, your TNC will print **"*** CONNECTED TO <CALLSIGN>"** on your screen. At that point, your TNC automatically switches from the "command" mode to the "converse" mode, and everything you type will be sent directly to that person until you disconnect. To disconnect when you're done, return to the Command mode (see your TNC manual for details) and type **D <ENTER>**. You will soon get a **"***DISCONNECTED"** message.

Connecting through a network requires extra steps, but this is where the real fun of packet begins. The most popular type of packet network is called "TheNet." You enter by connecting to a local "node." Sometimes, nodes have "aliases" in addition to callsigns. For example, the WA2JVM-2 node in West Orange, New Jersey, is also known as "WORANG." You'd connect by typing **C WORANG <ENTER>** and waiting for a connected message. You can then connect to anyone else logged onto the node (by repeating the connect sequence) or you can connect to another node (if you type **NODES <ENTER>**, the node will send you a list of places it can connect you to), or to several nodes, and so on from there.

Once you're connected to WORANG, you can connect to a New York City node with direct satellite links to London and Los Angeles! (Who says you can't talk far on packet?) When you get to the node you want, you can connect to another station or tell the node to call CQ for you. When you're done, type **B** (for "bye") alone on a line and press **<ENTER>**. You may have to repeat that for each node in the chain you've built, until you get a ***DISCONNECTED** message from your starting node.

There's a whole different set of commands once you log into a packet bulletin board (PBBS) or a DX "Cluster." If you get confused, you can often get help by typing **/h <ENTER>** or **/? <ENTER>** Once you get the basics down, you'll be able to discover all of the fun that packet offers. ■

CTCSS Tone Frequencies

The following is a listing of the 42 standard CTCSS (Continuous Tone-Coded Squelch System) tone frequencies, along with the Motorola PL® designators often used to describe them. Many repeaters require that you transmit a CTCSS tone along with your signal in order to have your signal retransmitted by the repeater. CTCSS is usually used to minimize interference to and from other repeaters, not to restrict access.

Frequency (Hz)	"P/L" Designator		
67.0	XZ	131.8	3B
69.3	WZ	136.5	4Z
71.9	XA	141.3	4A
74.4	WA	146.2	4B
77.0	XB	151.4	5Z
79.7	WB	156.7	5A
82.5	YZ	162.2	5B
85.4	YA	167.9	6Z
88.5	YB	173.8	6A
91.5	ZZ	179.9	6B
94.8	ZA	186.2	7Z
97.4	ZB	192.8	7A
100.0	1Z	203.5	M1
103.5	1A	206.5	8Z
107.2	1B	210.7	M2
110.9	2Z	218.1	M3
114.8	2A	225.7	M4
118.8	2B	229.1	9Z
123.0	3Z	233.6	M5
127.3	3A	241.8	M6
		250.3	M7
		254.1	ØZ

CQ VHF Hamlink

CQ VHF "Hamlink" offers *free listings* of clubs, licensing classes, and exam sessions! *Plus,* for $1/month or $10/year, we also offer listings of **ham-related** *personal* Web sites (*commercial* **ham-related** Web listings are $5/month or $50/year).

Web site listings must be accompanied by payment in full in check or money order in U.S. dollars and mailed to *CQ VHF "Weblink,"* Attn: Bernadette Schimmel, 25 Newbridge Road, Hicksville, NY 11801. Credit card orders are accepted by mail, phone (516) 681-2922, or fax (516) 681-2926. Club, class, and exam listings may be submitted to *CQ VHF* "Clublink," or by e-mail to <CQVHF@aol.com>. Be sure to say what it is in the subject line (e.g., Club Listing).

Club Listings

CA, El Cajon, Amateur Radio Club: Meets 2nd Thursday of each month at 7 p.m. La Mesa Church of Christ, 5150 Jackson Dr., La Mesa, CA. Visitors welcome. Repeater: 147.420 (output) 146.475 (input) 107.2 PL. Nets: WAMO/YL/Young persons (<16); E-mail: <KF6ILA@hotmail.com>; Web: <http://www.eylar.com/arcec/>.

CA, Fortuna, Redwood Amateur Radio Club: Meets 1st Tuesday of every month at 7 p.m., CDF building, 118 Fortuna Blvd., Fortuna, CA. Repeater at 147.090+.6. Info e-mail: <KE6JQW@aol.com>.

CA, Fullerton Radio Club Inc: Meets 3rd Wednesday of every month at Fullerton Senior Center at 340 W. Commonwealth Ave., Fullerton, CA at 7:30 p.m. PST. Tuesday night net repeater 147.975, 8 p.m. PST. Visitors welcome. For more information visit Web site at: <http://ourworld.compuserve.com/homepages/kc6yhm>, or call Mike Cramer, KC6YHM, (714) 996-4510.

CA, Santa Barbara Amateur Radio Club: Meets 3rd Friday of month September–May at 7:30 p.m., County Schools Auditorium, 4400 Cathedral Oaks Rd., Santa Barbara. For more information about SBARC, see club Web site: <http://www.sbarc.org>; or call (805) 569-5700.

CA, South Orange Amateur Radio Association (SOARA): Meets 3rd Monday, Monthly, 7:30 p.m., Norman P. Murray Community Center, Mission Viejo, CA. Visitors welcome. Primary Repeater: 147.645(-). For information write: SOARA at P.O. Box 2545, Mission Viejo, CA 92690, call (949) 249-1373, or e-mail: <soara@cahaba.com>.

CA, Ventura County Amateur Radio Club: Meets 2nd Friday of each month at 7:30 p.m., Oxnard Public Library, 251 S. "A" Street, Oxnard. For more information about VCARC, see club Web site: <http://www.fishnet.net/~k6mep>, or call (805) 642-5770.

CO, Bicycle Mobile Hams of America: National non-profit club of bicyclists who use VHF radios for emergencies, lost riders, route information, chatting, etc. 450 members in 46 states, 6 countries. Annual Forum at HamVention. Net: 14.253, 1st & 3rd Sundays, 2000 UTC. E-mail: <hartleyal@aol.com>. For info, sample newsletter, send SASE to BMHA, Box 4009-CV, Boulder, CO 80306-4009.

FL, Clearwater Amateur Radio Society: Meets 7:30 p.m. 2nd Tuesday of each month, Clearwater Red Cross, 624 Court St. Linked repeaters: 146.97 (103.5), 224.94, 444.15 (103.5) and 444.575 (131.8) Club net: Wednesday at 8 p.m. Web: <www.fgcarc.org/cars>; E-mail: <k2sec@amsat.org>. Paul E. Knupke, Jr., KR4YL <pk@ij.net>.

FL, Englewood Amateur Radio Society: Meets 3rd Friday of each month at 7:30 p.m., Room 400 of Englewood United Methodist Church, 700 East Dearborn St., Englewood. Two-meter net at 7:30 p.m. all other Fridays (146.700). For more information about EARS, visit Web site at: <http://www.flnet.com/~crosby/ears>, or call Jack, W4JS, at (941) 475-1929.

FL, Highlands County Amateur Radio Club: Meetings held 3rd Monday of each month, 7 p.m. Agri-Civic Center Conference Room 3, South US 27, Sebring, FL. Visitors are welcome. Repeaters at 147.045 +.6, 442.350 +5.0, with packet on 144.970. Web page: <http://www.strato.net/~hamradio>; E-mail: <hamradio@strato.net>.

FL, Major Armstrong FM Association: Meetings held 2nd Saturday of each month, 12 noon, Pizza Hut of Lantana, 6170 South Congress Ave., Lantana, FL. Visitors welcome. Info e-mail: <WA4AW@juno.com>.

KY, Mammoth Cave Amateur Radio Club: Meetings held 3rd Tuesday of each month, 7 p.m. at "Doc Cady Memorial Club Room" in the lower level of th Glasgow City Hall, East Public Square, Glasgow, KY. Visitors always welcome. ARRL exams given at 9 a.m. on 2nd Saturday of each "even" month (e.g., Feb, Apr, Jun). Club repeaters are 146.940- and 444.925+. A net is held every night at 8 p.m. local time on 146.940. Contact Bill Wilkinson, KE4KRN Publicity Committee at: <bwilkinson@glasgow-ky.com> for information. Visit our Web site: <http://www.scrtc.blue.net/mcarc/>.

MB, Canada, Winnipeg Amateur Radio Emergency Service Inc. (WARES): Callsigns VE4YWG (Public Service Communications), VE4EOC (City Emergency Operations Centre). Meetings 3rd Tuesday of month, 1930h Sir Wm Stephenson Library, 765 Keewatin St. Membership open to all licensed amateurs at least 18 years of age living in or near Winnipeg and interested in emergency amateur communications. E-mail Jeff Dovyak, VE4MBQ, Emergency Coordinator at: <ve4mbq@ve4umr.ampr.org>; Web site: <http://www.geocities.com/CapeCanaveral/Hanger/1632/wares.html>.

MO, Morely: Tri-County Amateur Radio Club, (TRICO): Callsign KBØZAW. Meetings 2nd Tuesday of every month at 7 p.m. at Scott County Emergency Management Agency in Morely, Missouri. Membership open to all licensed hams and their family members. Visitors are encouraged and welcome. ARRL exams given with prior requests. The club repeater, 146.730-. Net held every Thursday at 8 p.m. local time, on 146.730-, and every Sunday at 9 a.m. on 3.905. Contact Clay Adams at <kc5pin@ldd.net> for info. Web site: <http://www.geocities.com/capecanaveral/hall/2819>.

NC, Charlotte: 2-meter SSB net, 144.220 USB, Wednesday nites @ 9:30 p.m. est/edt. Net control stations are Wilton/WB4PCS & Bill/W4GRW both are in Charlotte area of EM95. This net is now 5 weeks old & we have been averaging 20 check-ins each week (purpose is to increase activity on 2-meter SSB & promote fellowship).

NY, Binghamton Amateur Radio Association, Inc. (BARA): Meetings 3rd Wednesday of each month 7:30 p.m., Unitarian Universalist Church, 183 Riverside Drive, Binghamton. Visitors welcome. Club Station with HF/VHF operating positions, Club Repeater W2OW 147.390 MHz output/147.990 MHz input, PL 100 Hz, Autopatch. See our Web site at: <http://binghamton.edu/bara> or write BARA, P.O. Box 853, Binghamton, NY 13902.

NY, Brooklyn, Kings County Repeater Association (KCRA): Meets 3rd Tuesday of the month (except July & August), 7:30 p.m. at Fort Hamilton Army Base, Building 213, Brooklyn, NY. Visitors welcome. Call Don, W2DON, at (718) 248-0752 for more information. Club repeater (WA2ZWP) 146.430, up 1 MHz, PL 136.5. Web: <http://www.qsl.net/kcra>. VE exam sessions 4th Tuesday of the month (except July, Aug. & Dec.), 7 p.m. Pre-registration a must. Call Harvey, KB2EA, at (718) 948-2290 to register.

OH, Cleveland Area, Cuyahoga Amateur Radio Society: Meets 3rd Wednesday of every month except December at 8 p.m. at Busch Funeral Home community room, 7501 Ridge Rd., Parma, Ohio. June, July, and August, "Picnic Meetings" are held at the Cuyahoga County Metropolitan Park. Repeaters are on 146.82(-), 443.825 & 444.75 (+), 53.83 & 53.01 (+), plus digipeater at 145.07, and club simplex frequency of 146.475 MHz. For more info, contact club president, Tom Wayne, WB8N, at (440) 232-4193 or at <wb8n@en.com>.

OH, Lawrence County, Amateur Radio Emergency Service: Meets 3rd Monday of every month at 7 p.m., EMA/911 building, 515 Park Ave., Ironton, OH. Net every Thursday night 9:30 p.m. local time on repeater 146.715. Info e-mail: <wn8f@wwd.net>, or visit web site at: <http://www.wwd.net/user/syrinix/ares.html>.

OK, Tulsa: American Airlines Amateur Radio Club. Repeaters 145.345, 147.000+, 147.000-, 449.875, autopatches on 147.00 and 145.345. Club meetings held last Saturday of the month at 9 a.m. local time at Lil Abners Restaurant, Catoosa, OK. W5YI VE testing for all amateur radio classes held immediately following meeting. For more info on VE testing, club activities, and map on how to find Lil Abners Restaurant, see club Web page: <http://www.webzone.net/n5jk/aaarc.htm>.

PA, Foothills Amateur Radio Club (FARC), Greensburg: Meetings 2nd Tuesday of month at Red Cross Building, Plymouth Ave., South Greensburg, at 7:00 p.m. EST. Two-meter repeater on 147.18 (+600, PL 131.8). Contact N3SRJ, 907 Arlington Ave., Jeannette, PA 15644, e-mail: <n3srj@bellatlantic.net>; Web: <http://www.geocities.com/Heartland/Acres/7896>.

PA, Lambda Amateur Radio Club (LARC), Philadelphia: Since 1975, the only open and visible public service-oriented ham club for gay and lesbian hams. Monthly newsletter, HF skeds, Internet listserv and IRC, hamfest meetings, chapters, DXpeditions. Lambda Amateur Radio Club (ALRC), P.O. Box 56069, Philadelphia, PA 19130-6069; E-mail: <lambda-arc@geocities.com>.

PA, Monessen Amateur Radio Club: Meetings 3rd Monday of month at Mon Valley Community Health Center, Monessen, PA, 4th floor at 7:30 p.m. Everyone welcome. Repeaters on 147.27+, 443.8+, 224.58+. Net on Tuesday at 8 p.m. on 147.27+. For more info, contact Allan, N3UML, P.O. Box 26, Sycamore, PA 15364, (724) 852-6449 evenings.

PA, Philadelphia: The Holmesburg ARC meets last Thursday of each month at the NE Philadelphia Naval ASO at 8 p.m. Repeater - 146.685. General interest, classes. For more info: <www.harcnet.org>; <WA3PZO@harcnet.org>.

PA, Skyview Radio Society, New Kensington: Business meeting 1st Tuesday, social meeting 3rd Tuesday of month at SRS clubhouse, 2335 Turkey Ridge Road, Upper Burrell Twp. at 8:00 EST; 2-meter repeater 146.64 MHz (-600, PL 131.8). UHF repeater 444.3 (+5 MHz). Net Thursday at 9:00 on 146.64. Contact N3WAV, 116 Arizona Dr., Lower Burrell, PA 15068. E-mail: <n3wav@aol.com>.

UT, Rocky Mountain Radio Association (RMRA): Offers Utah, Wasatch Front, unique UHF to 6, UHF to 2, and UHF to HF remote gateways. Net Thursday at 9 p.m. on 447.900 PL 114.8 UHF/6-meter gateway open 24 hours on 448.700 PL 114.8. Visit the RMRA Web site: <www.inconnect.com/~rmra>; or e-mail: <rmra@inconnect.com> for more information.

WV (Bluefield) East River Amateur Radio Club (ERARC): Meets 1st Monday of every month at Ryan's Steakhouse, 7 p.m., in the Bluefield, VA, WalMart shopping plaza. See our Web page at <www.inetone.net/erarc/> for information on VE EXAMS, weekly breakfast meeting, club info, and weekly ARES net. Info: <w4vt@sera.org> or call KD4ZUA at (540) 326-3419.

WV, Charleston, Kanawha Amateur Radio Club (KARC): Meetings held first Friday of each month at 7 p.m. at the South Charleston City Hall Annex, 4th Avenue and D street in South Charleston. Weekly Sunday net at 8:30 p.m. on 145.35 W8GK Club repeater. Mail to: KARC, P.O. Box 1694, Charleston, WV 25326. For information, contact Jim Damron, N8TMW, Publicty Director, at: <103347.610@compuserve.com>.

WV, Plateau Amateur Radio Association, Inc. (PARA), Oak Hill, WV: Meetings held the first Tuesday of every month, 7:30 p.m. in the basement of the New River Pawn Shop, 328 Main Street, Oak Hill, WV. Mailing address is PARA, P.O. Box 96, Fayetteville, WV 25840. Repeaters are 146.790-; 147.075- and 443.300+. For more information, contact Juddie Burgess, KC8CON, Secretary, at <kc8con@usa.net>.

Exam Sessions

CA, Cypress: ARRL amateur radio license test sessions start at 9 a.m., every 2nd Saturday of odd months. We test all levels, Novice through Extra, reservations not required. The address is 10824 Hope St., Cypress, CA (nearest cross streets are Katella and Valley View). For information, contact Harrision Spain, AC6TI, via e-mail: <spain@ugsolutions.com>; Phone: (714) 952-6114; Web: <http://www.serve.com/n6ehm/testing.html>.

FL, Clearwater: Examinations held 2nd Monday of each month, (except December) at 7 p.m. at the Salvation Army at 1625 North Belcher Rd. For more information, contact John Townsley, AE4GB, at (727) 376-6705, e-mail: <ae4gb@gte.net>, or Mike Branda, K4HN, e-mail: <k4hn@amsat.org>. Paul E. Knupke, Jr., KR4YL <pk@ij.net>.

FL, Englewood: ARRL exams held 3rd Saturday of each month, 9:30 a.m., Englewood Chamber of Commerce building, 601 South Indiana Ave., Englewood. Two-day advance reservation required. For info and reservations, call Jack, W4JS, at (941) 475-1929.

FL, Highlands County: Examinations held 4th Monday of each month, 7 p.m. Agri-Civic Center Conference Room 1, South US 27, Sebring, FL. Walk-ins are welcome. Web page: <http://www.strato.net/~hamradio>; E-mail: <hamradio@strato.net>.

FL, West Palm Beach: Exams held 1st Saturday of each month, 9 a.m. VA Medical Center, 7305 North Military Trail, West Palm Beach. Walk-ins welcome. For info, contact Steve, W2QX, at (561) 585-8504; or e-mail: <WA4AW@juno.com>.

NC, Wilmington: Azalea Coast Amateur Radio Club will hold a VE testing session the 2nd Saturday of even numbered months at UNCW Morton Hall at 10 a.m. All persons wishing to take the amateur radio tests, please arrive before 10 a.m. Test candidates only. For further information call (910) 791-1566.

OH, Cincinnati: OH-KY-IN Amateur Radio Society will offer ham radio classes in the Cincinnati, OH area, scheduled to begin on Thursday evening, February 25th at 7 p.m. Ham radio classes are now being formed for all levels of licenses, Novice through Extra, including No-Code. Classes will be held every Thursday evening for 10 weeks at the Salem Presbyterian Church located at the corner of Mozart and Higbee in Wester Hills (behind the White Castle Restaurant at Harrison and Boudinot). At conclusion of the 10-week course, participants will be given an FCC license examination on Saturday, May 8th, at the same location. All morse code classes are free! The course is open to persons of any age, and no prior experience is necessary. For more information, contact Carol Hugentober, K8DHK, at (513) 661-5323 or Bruce Vanselow, N8FWA, at (513) 251-1555. E-mail inquiries to: <n8fwa@juno.com>.

OH, Cleveland Area: Cuyahoga Amateur Radio Club holds exam sessions on 2nd Sunday of each odd-numbered month (except May), at the Olde Independence Town Hall, 6652 Brecksville Rd. (Rte 21), Independence, OH. Sessions start at 9 a.m. Fee is $6.95 and a valid ID and copy of your FCC license is required (if you are already licensed). For more info, contact Gary Dewey, NI8Z, at (216) 642-1399 or at <gdewey@en.com>.

PA, Monessen Amateur Radio Club: Test session 1st Sat. of even months (Feb, Apr, Jun, etc.) 10 a.m. at New Eagle Boro Bldg. Main St., New Eagle, PA. Walk-ins welcome but pre-registration preferred. For more info contact Allan, N3UML, (724) 852-6449, P.O. Box 26, Sycamore, PA 15364.

PA, Parkway Philadelphia: The Philmont Mobile Radio Club sponsors exams on 1st non-holiday Thursday of each month at Franklin Institute, 20th and Ben Franklin Pkwy, Philadelphia, PA. Walk-ins welcome. Exams start at 6:30 p.m. For more info contact, Dusty Rhoades, ND3Q, at (215) 879-0505.

Personal Web Site Listings

Jim Bridge, KQ6BS, URL: <http://www.qsl.net/kq6bs>. Specialty: weak signal.

"The Radio Picture Archive," URL: <http://www.e-etc.com/rpa> (corrected). Speciality collection of pictures of radios.

Commercial Web Site Listings

Byers Chassis Kits: Aluminum chassis and cabinets kits, VHF & UHF antennas and parts. Catalog: Callbook address. E-mail: <k3iwk@herd.net>; <http://herd.net/byerschassiskits>.

CCT®, Inc.: Antennas—High Efficiency Unique Designs HF to UHF. Computer Systems, Sub-Systems, CPU & Motherboard Upgrades, Components. High Voltage Capacitors, Parts. CCT® Radio: <http://www.cctnetwork.com>.

Communications Specialists, Inc.: Manufacturers of Tone Signaling Equipment including CTCSS encoders and decoders, Morse Station IDers, Repeater Tone Panels and much more. Please see our ad in this issue; <http://www.com-spec.com>.

MS-Windows Software: RAC Callbook CD-ROM, Ultimeter Weather Stations and more, info <n2ckh@cybercomm.net>; Web: <www.QTH.com/n2ckh.bytewise.org>

Teletec: Manufactures 6, 2, 1 1/4 meter and 70 cm Linear Amplifiers as well as Receive Preamplifiers; <http://www.Teletec-usa.com>.

Woodhouse Communication: Antennas and publications for weather satellite imaging: <www.view2earth.com>.

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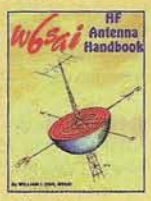

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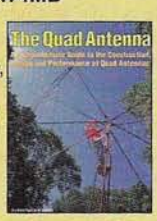

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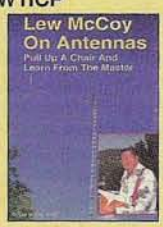

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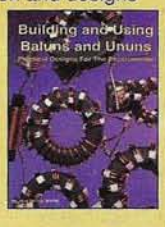

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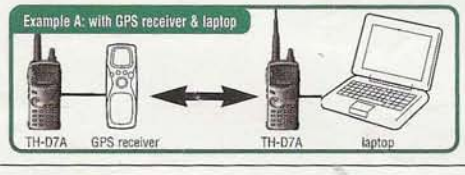

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