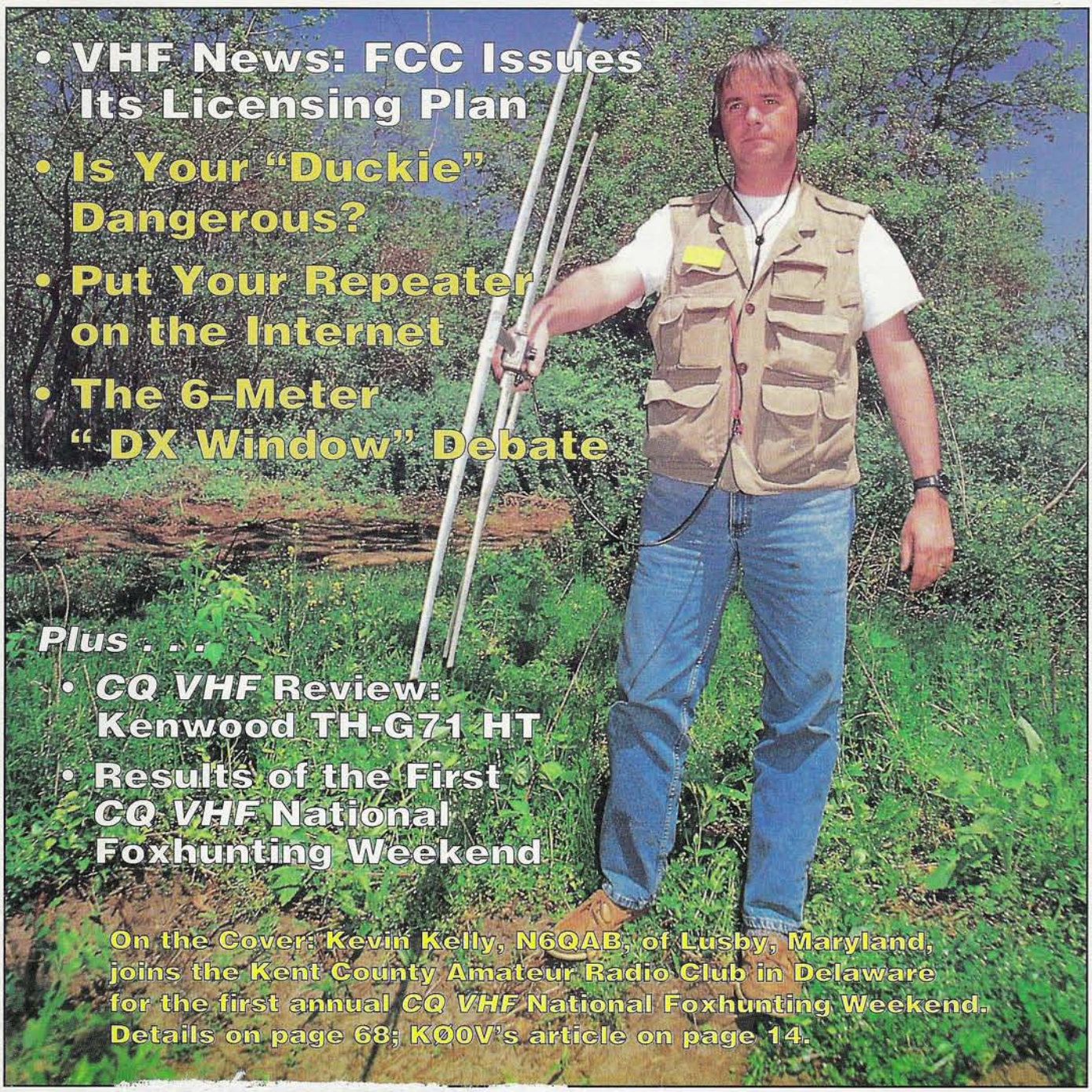
ICD 08237

CQ VHF Ham Radio Above 50 MHz

October 1998



- VHF News: FCC Issues Its Licensing Plan
- Is Your "Duckie" Dangerous?
- Put Your Repeater on the Internet
- The 6-Meter "DX Window" Debate

Plus . . .

- *CQ VHF* Review: Kenwood TH-G71 HT
- Results of the First *CQ VHF* National Foxhunting Weekend

On the Cover: Kevin Kelly, N6QAB, of Lusby, Maryland, joins the Kent County Amateur Radio Club in Delaware for the first annual *CQ VHF* National Foxhunting Weekend. Details on page 68; KØOV's article on page 14.

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B-5016-G
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Power Curve -- typical B-5016-G output power								
Watts Out	*130*	*135*	*140*	*145*	*150*	*155*	*160*	*165*
Watts In	*20*	*25*	*30*	*35*	*40*	*45*	*50*	*55*

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100 Watts for 2 Meter HTs

B-310-G
$199
Suggested Retail
MIRAGE RUGGED!

Power Curve -- typical B-310-G output power							
Watts Out	*25*	*50*	*75*	*95*	*100*	*100+*	*100+*
Watts In	*¼*	*½*	*1*	*2*	*4*	*6*	*8*

- ***100 Watts out with all handhelds up to 8 watts***
- ***All modes: FM, SSB, CW***
- ***Great for ICOM IC-706***
- ***15 dB low noise GaAsFET preamp***
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***Boost** your 2 Meter handheld to 100 Watts!* Ultra-compact all mode B-310-G amp is perfect for *all* handhelds up to 8 watts and multimode SSB/CW FM 2 Meter rigs. *Great for ICOM IC-706!*

35 Watts for 2 Meter HTs

B-34-G
$89.95
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Power Curve -- typical B-34-G output power								
Watts Out	*18*	*30*	*33*	*35+*	*35+*	*35+*	*35+*	*35+*
Watts In	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*

- ***35 Watts Output on 2 Meters***
- ***All modes: FM, SSB, CW***
- ***18 dB GaAsFET preamp***
- ***Reverse polarity protection***
- ***Includes mobile bracket***
- ***Auto RF sense T/R switch***
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- ***Works with handhelds up to 8 watts***
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MIRAGE RUGGED!

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BD-35
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Suggested Retail

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Power Curve -- typical BD-35 output power							
Watts Out (2Meters)	*30*	*40*	*45*	*45+*	*45+*	*45+*	*45+*
Watts Out (440 MHz)	*16*	*26*	*32*	*35+*	*35+*	*35+*	*35+*
Watts In	*1*	*2*	*3*	*4*	*5*	*6*	*7*

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- ***Auto Band Selection*** • ***Auto T/R switch***
- ***Full Duplex Operation*** • ***5x1¾x5 inches***
- ***FREE mobile bracket*** • ***"On Air" LEDs***
- ***Single Connector for dual band radios and antennas***
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- ***Works with all FM handhelds to 7 watts***
- ***One year MIRAGE warranty***

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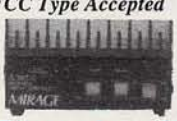
6 Meter Amplifier (50-54 MHz)

FCC Type Accepted



The A-1015-G, $389, is the *world's most popular* all mode FM/SSB/CW 6 Meter amplifier. 150 watts out for 10 in. For 1 to 15 watt transceivers.

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220-225	KP-1/220	KP-2/220
430-450	KP-1/440	KP-2/440

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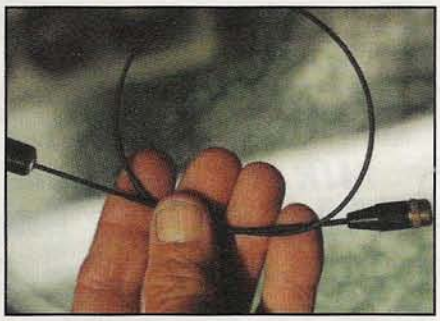
Volume 3, Number 10—October, 1998



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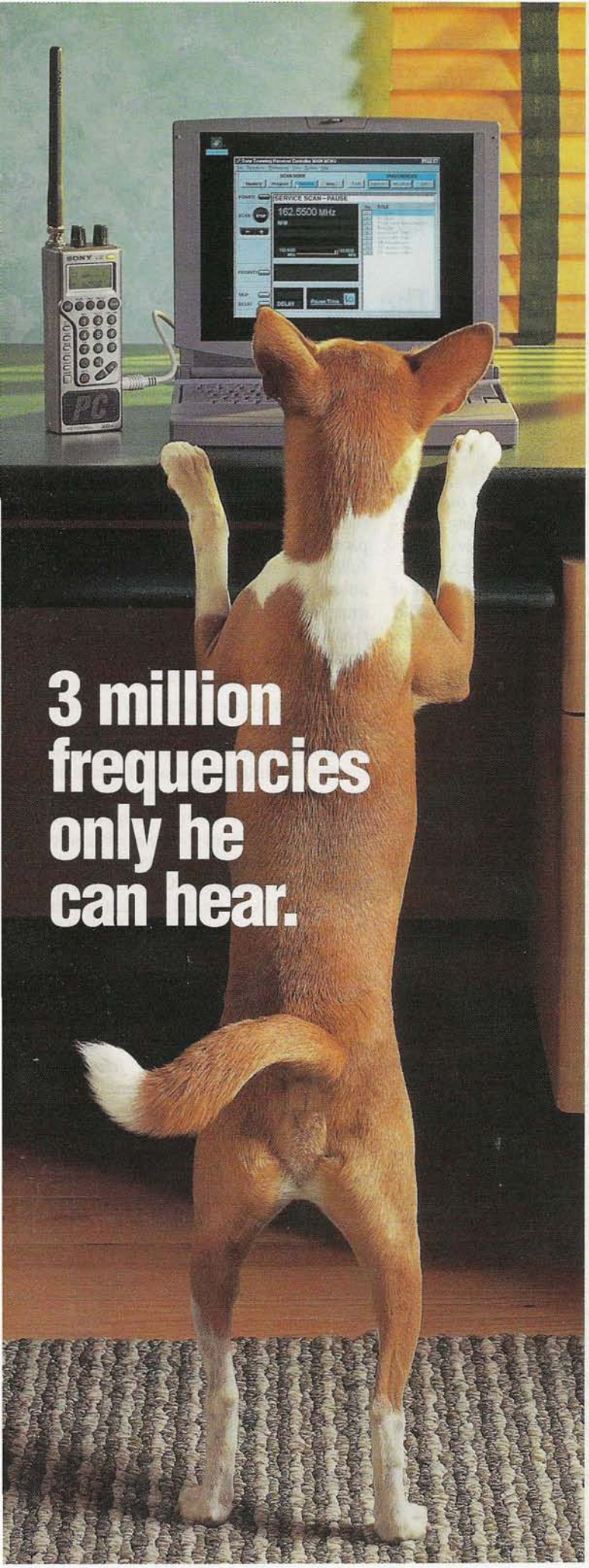
Next Month: Analysis of the FCC's License Restructuring Proposal



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Will License Restructuring Work?

That all depends on what you want it to do. The ARRL's plan for license restructuring probably won't bring much new blood into ham radio, but it could get the blood moving again in some old, inactive hams.

NEWS FLASH!

At press time, the FCC issued its own long-awaited license restructuring proposal. See "VHF News" on page 7 for details.

Section 97.1 of the FCC Rules, the "basis and purpose" of the Amateur Radio Service, sets out a "vision statement" for ham radio. It is our guiding vision, one on which we have all essentially agreed, and one which has served us well throughout our history. Very briefly, with some paraphrasing, here's what we're all about:

We want an amateur radio service that can and will...

...provide trained operators and equipment—especially in emergencies—to operate a non-commercial, volunteer communications service;

...provide technical leadership and innovation in the arena of wireless telecommunication;

...be a valuable educational tool, both in terms of teaching technical skills and communication skills;

...provide our country with a pool of trained communicators, technicians, and electronics experts in times of need; and

...promote goodwill and friendship among individuals of all nationalities, in a way that is unique to amateur radio.

Key Questions

Now, the key questions that must be asked anytime anyone proposes a major change in how we do things are these: *Will this proposal help promote our guiding vision? How? Will something different achieve the same goal more effectively?* So let's take a look at the ARRL's license restructuring proposal in light of those principles (if you're not familiar with the ARRL proposal, see "The ARRL Licensing Proposal").

Will reducing the number of license classes and reducing the code speed requirement help...

...provide more well-trained and well-equipped emergency communicators? Maybe. It will provide greater flexibility to our current corps of emergency communicators, but there's nothing here that really will attract new people to this aspect of amateur radio. We currently have a very large group of well-trained, well-equipped highly dedicated emergency communicators among the ranks of Technician licensees. In emergencies, however, they are limited to operating on VHF and UHF, when circumstances may dictate that HF will provide a better path. Easing the code requirement for access to significant HF privileges may help many of these hams become even better emergency communicators.

...provide technical leadership and innovation in the arena of wireless telecommunication? Well, not really. Most of the technical innovation going on today in the world of wireless telecommunication is going on at VHF and above. The proposed changes will have no effect on VHF/UHF/microwave privileges or licensing requirements.

...be a valuable educational tool, both in terms of teaching technical skills and communication skills? Again, not really. Although a tougher technical exam for higher license classes (to compensate for reduced code speed requirements) will promote greater technical skills. The folks who write our exams should take advantage of this opportunity to include more questions relating to communication skills, since poor operating practices appears to be more of a problem today than poor technical practices.

...provide our country with a pool of trained communicators, technicians, and electronics experts in times of need? Only insofar as it might draw significant numbers of new people into amateur radio. But there is no change proposed for today's entry-level license of choice (except for a poorly chosen new name that's too reminiscent of Class D CB); and the alternative means of entry—the Novice license—would be eliminated. This proposal is certain to promote upgrading, but I don't see how it will attract people who are not already attracted to either the Technician or the Novice class license.

...promote goodwill and friendship among individuals of all nationalities, in a way that is unique to amateur radio? Clearly, yes. Giving more hams greater access to the HF frequencies that regularly support international communications will give more of us the opportunity to meet and make friends with hams in other countries.

Will This Promote Our Guiding Vision?

So will changing the license structure advance the basis and purpose of amateur radio? Yes, a little bit. Some areas might be helped somewhat, but the over-

By Rich Moseson, W2VU, Editor (<cqvhf@aol.com>)

all benefits are not clearly in focus from this perspective.

Will changing the license structure advance the League's stated goal of bringing more people into amateur radio? Not likely. Again, there are no changes proposed in the requirements or privileges of the entry-level license, except to eliminate one possible path of entry.

So what's to be gained? Plenty. We've just been asking the wrong questions. First, there are the intangibles: By reducing the degree of reliance on a single communication mode (CW) as a litmus test for a broad range of operating privileges, we will be bringing ham radio a step closer to the many other radio services in many other countries (and in our own) which have decided that there is no longer a compelling need to require Morse proficiency as a condition of licensure. We will begin breaking down the wall that separates "traditional" (HF) ham radio from "newbie" (VHF) ham radio, and we will come a step closer to restoring a sense of unity within our hobby—a sense of diversity rather than division—and the beginning of the end of the debate over who is and isn't a "real ham."

Second, license restructuring could promote increased activity and upgrading. And, as I'll explain in a minute, this is the crux of our problem in ham radio today.

Is the League's Proposal Good for Ham Radio?

On the surface, I have no problem with the ARRL proposal. Personally, I might have gone just a little farther, merging the Advanced and Extra class licenses in a three-tier system, and dropping the top code speed to 10 wpm instead of the rather ridiculous (and obvious compromise) one-wpm reduction from the current 13. I also think, as we proposed in this space over a year ago, that we need a special category of not-quite-a-license—a basic amateur permit—to allow teachers, therapists, etc., to operate ham stations in schools and medical facilities under the *general* supervision of a licensed amateur; and upgrades based on demonstrated activity in addition to a formal exam.

But basically, the ARRL proposal is sound—and the sound you hear is that of the League and the FCC collectively admitting that, after 30 years, the experiment called "incentive licensing" didn't work. This proposal heads toward the way ham licensing used to be, before the days of incentive licensing, and before a whole raft of other changes, all designed to stimulate additional interest in amateur radio. But it all leaves me with a nagging feeling that the League is not really focused on the real problem.

The ARRL Licensing Proposal

For the record, in case you slept through last month's issue and the past two months' worth of on-air and online discussions, the ARRL Board of Directors—faced with the certainty that the FCC was about to propose its own license restructuring plan—finally agreed on a proposal after nearly three years of wrangling over it. The League's proposal is to rename the license classes Class A, B, C, and D, and structure them as follows:

Class D would be the equivalent of the current Technician license (same requirements and same privileges);

Class C, with a 5 word-per-minute code requirement and the equivalent of the current General Class theory exam, would carry current General class privileges, including expanded HF voice frequencies made up of what would become the former Novice bands (current Novices and Tech Pluses would be "grandfathered" into Class C);

Class B, would be nearly identical to the current Advanced class, except for a 12-wpm code requirement instead of 13; and

Class A, would carry the current Extra class privileges and theory requirements, but would require no additional code exam, so the top code test speed would become 12 wpm.

Are We Solving the Right Problem?

A look at ham history shows us that we've been tinkering with the licensing system for decades, and it leads me to ask this question: Could it be, after decades and decades of licensing experiments aimed at increasing interest in amateur radio, that it isn't really the licensing structure that's keeping people from joining the hobby? Could there be some other limiting factor? One which isn't going to be overcome by any number of licensing schemes? Overall, every effort to boost the number of licensees has succeeded—from the creation of the Novice and Technician licenses in the 1950s to incentive licensing in the '60s, Novice Enhancement in the '80s, and the code-free Tech in the '90s. We have more licensed hams today than ever before, and the numbers have essentially doubled in the past 20 years. So what's the problem?

The problem is that only around half of these hams are active, by current guesstimates (no one's done a survey recently of a representative sampling of the entire FCC database). And the numbers of hams who have been upgrading, joining organizations, buying magazines, etc.—signs of active involvement in the amateur community—have not risen at nearly the same rate as the number of licensees. As I see it right now, the major problem we need to address isn't how to get more people licensed, it's how to get more of the people who are already licensed active on the air and in the ham community.

The League's license restructuring proposal is a good step in that direction. No, it won't help boost the overall numbers very much, but it should provide encouragement for hams who have been inactive to dust off their radios, put up some antennas, and try out their newly gained privileges. Hopefully, they'll rediscover the fun you can have on the radio, the ham "bug" will bite again, and we'll see a long-term increase in the number of active hams.

More Steps Needed

License restructuring is only one step on the road to reaching out to inactive hams. This is a game we all can play, without relying on the FCC or the ARRL. Do you know any inactive hams? Do you know why they're inactive? Is it cost of equipment? Tell them about the HTs out there today in the under-$200 range. Is it lack of DX? Tell them about the new sunspot cycle plus a whole world of fun on VHF! Is it discouragement caused by hams with rotten attitudes about newcomers? Prove to them that those hams are in the minority—be a friend, loan out a radio, help put up an antenna, demonstrate something new and different, loan out a copy of this magazine.

If each of us can help get one inactive ham on the air and involved in the ham community, we'll have come a long way

toward revitalizing the amateur service and doing away with the perception that, despite its record number of licensees, ham radio is a hobby in decline. Be part of the solution.

The 6-Meter DX Window

Moving on to a completely different topic, whether or not ham radio overall is in decline, the 6-meter band is enjoying perhaps its greatest popularity surge ever. It's due to a combination of HF rigs that include 6 meters, widespread penetration of cable TV resulting in less TV interference, the opening up of 6 meters for the first time in many European countries, and really hot propagation in the past couple of years (or maybe the propagation's always been hot, but until now, there haven't been enough people on the band to appreciate it). And with the coming of really long-distance F_2 propagation along with the rising sunspot cycle (maybe even as you're reading this), the trend is likely to continue.

But there's a downside to all this growth: When F_2 opens 6 meters for intercontinental DX contacts, the lower end of the band will be wall-to-wall with signals. But not everyone is looking to work DX, and not everyone will be able to hear the DX when it's there (for example, stations in the Midwest may not be aware of an opening from the east coast to Europe). Those who have been through previous sunspot cycles say the higher activity levels on the band will spell certain chaos if we try to contain most DXing activity to the current 25-kHz "DX window," from 50.100 to 50.125 MHz, and if we continue to have the domestic SSB calling frequency on 50.125.

Following up on a proposal first made two years ago, the Central States VHF Society in July voted to recommend an expanded DX window, from 50.100 to 50.150 MHz, and a new domestic SSB calling frequency at 50.200 MHz. You'll find more background and arguments on both sides of this question elsewhere in this issue, in an article titled "The Six-Meter DX Window: Why, Where, and How Big?"

What's Our Position?

I've been asked by many people to take an editorial position on the proposal in addition to presenting both sides of the issue. OK, here it is: The Central States proposal represents a good compromise

"As I see it right now, the major problem we need to address isn't how to get more people licensed, it's how to get more of the people who are already licensed active on the air and in the ham community."

between the interests of the big-gun 6-meter DX community, which wants more space for when the band opens and less interference from domestic QSOs; and those of the "typical" 6-meter operator, who's as interested in capturing a new grid domestically as he is in working a "real" DX station.

In his half of the debate article, Ken Neubeck, WB2AMU, argues that the 100-kHz "DX window" originally proposed is too wide, and that it would become "dead space" during the eight to nine years of each 11-year sunspot cycle when 6 meters *isn't* open for long-range DX. He's right. A 50-kHz "window" is much more reasonable (even Ken says he's willing to live with it, even though he continues to feel that no change is really needed).

On the matter of the calling frequency, I'm persuaded by the arguments made at the Central States conference by 6-meter veteran Chip Angle, N6CA. When 6 meters opens, activity starts out on the calling frequency and spreads out from there. If the calling frequency is at the top edge of the DX window, then domestic QSOs may only spread up in frequency. If you listen to 2-meter SSB during a contest or band opening, you'll notice that activity spreads out both above and below the 144.200-MHz calling frequency.

Moving the 6-meter domestic calling frequency away from the edge of the DX window will provide the opportunity to do the same on six as well, and will provide greater encouragement for people to move off the calling frequency when the band is open (for those who aren't familiar with the calling frequency concept, the idea is to use that frequency as a starting point—to listen, to call CQ, and to start a contact. Once you've made contact, you should move off the calling frequency to hold your QSO).

Chip also argued that having the domestic calling frequency on top of the DX window means that, say, a strong station in the Midwest working sporadic-*E* to the east coast on the calling frequency

(Continued on page 82)

CQ VHF Ham Radio Above 50 MHz

EDITORIAL STAFF

Richard S. Moseson, W2VU, Editor
Edith Lennon, N2ZRW, Managing Editor
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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Tim Marek, K7XC, Weak Signal
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Hal Keith, Illustrator
Larry Mulvehill, WB2ZPI, Staff Photographer
Joe Veras, N4QB, Special Projects Photographer

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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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FCC Restructuring Plan: Four License Classes, Tech-Plus Hams May Lose HF Privileges on Renewal

The FCC ended months of anticipation in August by issuing its own, incomplete, proposal for amateur license restructuring, after being upstaged by the ARRL, which put forth a four-license-class, nobody-loses-privileges proposal at its board meeting in July.

The FCC document—which looks like a rush job and contains many apparent errors—makes no proposal at all regarding code speed requirements and *could take away HF privileges from current Tech-Plus licensees* who don't upgrade before their licenses come up for renewal.

The FCC's basic licensing proposal is to do away with the Novice and Technician-Plus license classes, leaving only the Technician, General, Advanced, and Extra class licenses. Under the terms of the Notice of Proposed Rule Making, no new Novice licenses would be issued, but current Novices would be able to renew their licenses indefinitely. The Commission would also stop issuing Tech-Plus licenses, which are earned by Technicians who pass the five-word-per-minute Novice code exam, and which grant a combination of Novice HF privileges and Technician class VHF privileges. Unlike the Novice part of the plan, though, holders of Tech-Plus licenses would have to upgrade to General by passing the element 3(B) written exam, or possibly *lose their HF privileges* when they renew their licenses ("Application for renewal of a Technician Plus Class...license will be processed as an application for renewal of a Technician Class...license," according to the NPRM).

Mixed Messages on Code Speed

In addition, the FCC makes no proposal regarding code speed requirements, instead asking the amateur community for input. However, the NPRM proposes changing the rule, which currently states that code exams must be sent "at no less than the prescribed speed" for the element being given, to read "at no less than 5 wpm..." suggesting, perhaps, that the Commission is thinking about a single five-word-per-minute code requirement for all HF license classes. Another hint in this direction lies in the fact that the NPRM requests comments from hams on dealing with alleged abuses of disability waivers for higher-speed code elements, but in the specifics of the proposed rules changes, simply eliminates the provision for these waivers altogether—if there are no higher code speeds, there's no need for waiver rules.

On the other hand, if the NPRM is approved as currently written, there will no longer be a five-wpm code test—element 1(a) is deleted—and Technicians wanting even the most basic HF privileges will have to pass a 13-wpm code test.

The NPRM also seeks input from hams on what to do with the current HF Novice subbands, and whether to give existing Novices CW privileges on the entire 80-, 40-, 15-, and 10-meter bands, with a 200-watt power limitation (the existing 200-watt limit for non-Novices operating in the Novice bands would be lifted).

Haste Makes Waste?

Among the apparent errors (we *hope* they're errors) are the elimination of RTTY/Data privileges in the 20- and 15-meter Extra CW subbands...and the removal of phone privileges from the 20- and 15-meter Extra *phone* subbands; plus the apparent removal of 10-meter phone privileges for current Tech-Plus licensees. In addition, there's a provision that an expired Technician license issued before February 14, 1991 (when the Tech code requirement was dropped), would provide permanent credit for Element 1(A), the five-wpm code exam—but there's no similar provision for an expired Novice license (beyond the two-year grace period). Plus, an expired Tech license from before 1987 provides permanent credit for the Element 3(B) written exam, but there is no such consideration given for expired licenses of any other class, once the grace period is over.

Finally, there's the rather bizarre proposal that would limit Novices to transmitting only "messages sent by hand" using CW. This would appear to prohibit Novices from using keyboards and memory keyers.

Beyond License Restructuring

The FCC licensing proposal is part of a broader NPRM "to eliminate unnecessary and duplicative rules, as well as to streamline our licensing process." And it proposes several additional changes, most of which are not discussed in the NPRM itself, but are included only in the 19-page appendix setting forth the specific rules changes proposed. Among these additional changes are the inclusion in the rules of the band-by-band power limits above which RF safety evaluations must be conducted; the phasing-out of special RACES (Radio Amateur Civil Emergency Service) station licenses; and giving Advanced class Volunteer Examiners (VEs) authority to give General class code tests.

Finally, the Commission did provide an extended comment period to make sure that every ham has the opportunity to read about these proposals and to file comments. Comment deadline on the NPRM (WT Docket 98-143) is December 1, 1998, with reply comments due by January 15, 1999. We have posted a link to the full text of the NPRM on the *CQ VHF* Web site. (*If what you've read here seems somewhat confusing and contradictory in spots, that's because the NPRM itself is somewhat confusing and contradictory. Our sense is that the FCC's intent is to help, not hinder, amateur growth, and in its haste to issue an NPRM, it did an incomplete job of crossing the "t"s and dotting the "i"s on the specific details. We will more fully analyze and comment on the FCC proposal in next month's issue.—ed.*)

(VHF News Continued on page 82)

Compiled by the CQ VHF Staff

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 <CQVHF @aol.com>; <cqcomm@delphi.com> or <72127.745@compuserve.com>. Please specify that it is a letter for* CQ VHF *magazine.*

The ARRL Licensing Proposal

Dear *CQ VHF*:

The July 24, 1998 ARRL proposed simplified license structure seems to be missing something! Instead of a simple Novice license to permit operation by newcomers, *especially kids*, on 10-meter phone, CW, and digital, the new structure would require a "Class C" license, the equivalent of the present General class, with code requirements reduced to 5 wpm. *This effectively bars newcomers from 10 meters, the most popular HF band in ham radio.* Ten meters will be at its best for the next four years, until 2002, providing worldwide contacts with low power and small, simple antennas—the ideal prescription to rejuvenate a stagnating hobby.

Let's keep the Novice entry level just like it is, and call it "Class F," for "Future of the Hobby." Let the Novices operate CW on any "Class C" CW band, and phone on the whole 10-meter phone band. What will be "Class E," then? Why, the Tech Plus, of course. This is an individual who passes both "Class D" (Technician) & "Class F" (Novice). (Perhaps "D" and "E" should be interchanged, to keep the upgrade progression correctly lettered).

So then will we have too many classes? The FCC can't handle it? Time for the government to trade in those old FCC computers (or give them to the schools) and join the 21st Century. Let's keep the exciting 10-meter band open to attract newcomers, especially kids. They are the future of ham radio and American technology!

73,

John Abbott, K6YB
Newhall, California

(The writer is author/publisher of *Ride the Airwaves with ALFA & ZULU*, a Novice/Technician license manual intended for children.)

Editor's Note: For additional comments, pro and con, on the ARRL licensing proposal, see this month's "Line of Sight" and "Op Ed" columns. A summary of the proposal is included in "Line of Sight."

Watch Your Language!

Dear *CQ VHF*:

I just finished reading the article in the August issue about Senator Barry Goldwater, "The Senator From Amateur Radio," by Rich Moseson, W2VU. I'll admit, I didn't realize to what extent the senator devoted his life and time to the hobby of ham radio. The article did him justice and he received the praise he deserved. He will be missed by many.

Amid the paragraphs of fond memories and touching testimonies, some comments were printed from Gabe Romero, K7NOK. One in particular, near the end of his recollections was very disturbing to me and, I would dare to say, all God-fearing readers of your magazine. It's sad to think that Mr. Romero and you, Mr. Moseson, would think the readers of this article would care to know that he took the Lord's name in vain. Do you think that impressed anyone?

I assume the article was to show how personable the senator was and it did include many glowing remarks. And not to take away from the senator, oh no, I won't judge a man's life by one comment, we all sin. But, do we want to have our sins printed for all to read after we die? I don't. I don't think the senator would have, and I don't believe you would either, Mr. Moseson.

As the editor of this magazine, you could have protected his good name and his family's embarrassment by not printing the remark. It would not have taken anything away from the article at all. The lead-in to that paragraph says, "Final memory:" I surely hope not. Shame on you, *CQ VHF*.

Rick Yuhas, KT4DU
Cropwell, Alabama

Rick—We're sorry you were offended by Senator Goldwater's language. Among the many things for which Barry was well-known was his "salty" language. This was a part of the man's personality. To have "sanitized" his quote would have been—to my mind—dishonest and disrespectful to the Senator. And I'm sorry, I disagree with you, I think that leaving it out would have detracted from the article.

"Right on Target"

Dear *CQ VHF*:

I decided to sit down a drop a quick line or two about the June editorial ("Battling Band Bigotry"), and sum it up in a couple of words or less: *right on target!*

I have noticed the situations that you described in the editorial and have not really paid any mind to the "big picture" until I came to the United Kingdom. Here in the UK, I have found several magazines that contain *all* modes of the "radio" hobby. This included scanner, CB, HF, VHF, ATV, as well as others—with no radio hobbyist bickering whatsoever going on. Just like Europe! Isn't that wonderful?!

Unfortunately, this is not the case in the U.S. The commercial communications sector appear to be quite aware of "what is going on" in the hobby, as evident by the several attempts to obtain as many amateur frequencies as possible from the FCC.

Somewhere I have heard or read the phrase, "united we stand, divided we fall." Too bad not everyone in our hobby realizes this, because by the time they wake up to reality, we may not have any bands or modes left to fuss about.

I enjoy *CQ VHF* very much each month! Keep up the excellent work!

Cheers!

Bob Aldridge, KF4DVG/M1CQW

FULL-FEATURED!

RadioShack's 45-watt 2-meter FM mobile Amateur Radio transceiver

Now Only $249.99

NEW LOW PRICE! was $299.99 in our 1998 Catalog

RadioShack's HTX-242 brings you top-notch performance and an array of handy features. Automatic Memory Store finds active frequencies and stores them in memory—including correct repeater offsets—great for new Hams and travel. The tracking-type receiver front end quashes intermod interference and true FM transmit provides excellent voice quality. You get 40-channel memory, built-in subaudible tone encoder **and decoder**, 10 DTMF memories and group calling. HTX-242 includes a detailed manual *written by U.S. Hams* to get you up and talking fast. It's backed by a 1-year limited warranty and a service plan is available.

At your fingertips: Selectable 45/10-watt transmit power. Multifunction scanning. Memory scan skip. Priority channel. Dual VFOs. Extended receive 136-174MHz. Transmit range extendable to 142.5-149.5MHz for CAP/MARS operation. Programmable frequency step. 1⅝×5⁹⁄₁₆×6³⁄₁₆".

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CIRCLE 141 ON READER SERVICE CARD

Product Update

MFJ-554 Code Practice Oscillator for Classrooms

MFJ's new Code Practice Oscillator, the MFJ-554, was specially designed for demanding classroom use and abuse, and its clear tones actually enhance learning Morse code. It produces a true pure sinewave, not a harsh sounding squarewave. You get low distortion code: typically less than .2% total harmonic distortion (THD) from its BTL (Bridge-Tied-Load) amplifier. The MFJ-554 delivers 1 watt into its internal three-inch speaker or you can plug in an external speaker for more volume.

Key clicks are especially annoying in classrooms because they tend to bounce around the room, magnifying the distraction. The MFJ-554 removes all traces of harsh clicks so you can concentrate on learning the code without distraction. Five milliseconds of symmetrical rise and fall time shapes the keyed oscillator waveform to remove key clicks—an MFJ exclusive.

MFJ-554 has a volume control and adjustable tone control from 400 to 1000 Hz; an on/off switch, power-on LED, 1/4-inch key jack, 3.5-millimeter external speaker jack, and coaxial DC power input jack. Requires 12 VDC. Rugged all metal enclosure measures a compact 1 1/2 x 4 3/4 x 5 (HWD) inches.

Suggested retail price for the Code Practice Oscillator is $79.95. MFJ is also offering a special deal: the MFJ-554 Practice Code Oscillator, MFJ-281 ClearTone™ Communications Speaker, MFJ-550 Telegraph Straight Key, and MFJ-1315 AC Adapter for $99.95. MFJ's Practice Code Oscillator comes with a 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 and ordering information on the MFJ Web site: <http://www.mfjenterprises.com>.

Circle 100 on reader service card

ADI/PREMIER's AT-600 PC Programming Kit...

Tired of keying in 200 memories by hand? Need a quick way to program and reprogram your ADI AT-600 dual-bander? Try the new AT-600 PC programming kit. Using the included Microsoft Windows™-compatible software and serial interface cable, you can edit all the advanced features of your AT-600, including all 200 memory channels, alphanumerics, frequency step, and power saver. You can even save and load different configurations, such as for different areas that you might travel to. For instance, you could save 200 local channels for use in your home city, and also save another 200-channel database for use when you're on the road.

Features include simple Windows PC programming with your mouse and keyboard; easy-to-use pull-down menus that simplify the task of programming your radio; easy access to advanced radio features; and the ability to save and load different radio configurations.

Requirements are 3.5-inch HD floppy drive, less than 1-MB free hard disk space, Windows 3.1™ or higher (including Windows 98™), and one available 9-pin serial port.

For a look at a few of the editing screens for the AT-600 program, see <http://www.adi-radio.com/amateur/radios/software.html>. Software updates may also be obtained from this Web site.

The programming kit for the ADI AT-600 is currently available from all major ham radio retailers. Suggested price is $39.95 U.S. Call: (800) 666-2654 for more information.

Circle 101 on reader service card

...Or Get the AT-600 Pre-programmed

Today, radio manufacturers include many important accessories with their handheld radios. From battery packs to wrist straps to user's manual, all of the things that you need to get on the air can be found right inside the box. All except one: the proper operating frequency.

Now even that is not a problem. ADI's AT-600 now comes pre-programmed with over 100 active frequencies personally recommended by ham radio instructor Gordon West, WB6NOA.

Gordon's favorite frequencies include the most popular amateur repeater and simplex frequencies, based on polls of repeater owners nationwide. Also included is a mix of receive-only frequencies that take advantage of the AT-600's wide band scanning range, such as popular airband, police, fire, paramedic, land mobile, and 800-MHz public service frequencies.

These frequencies come pre-loaded and ready for use on your AT-600 handheld. Just take the radio out of the box and turn it on—no more hours of tedious programming or paging through outdated repeater guides. The AT-600's 200-channel capability also means that you'll also have as many as 100 unused memories to store your own favorite local frequencies.

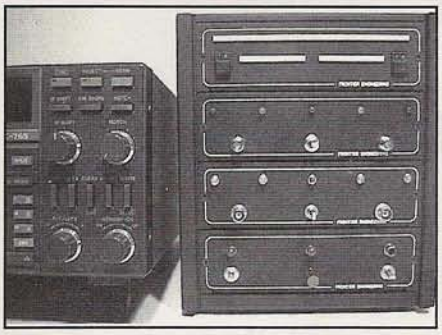
For more information on Gordon West's Favorite Frequencies see the ADI/PREMIER Communications Web page at <http://www.adi-radio.com>. Current users of both the AT-600 and PROG-600 PC programming kit can also visit the Web page and download a custom Radio Data File containing Gordon's Favorite Frequencies for easy upload to their own AT-600.

For more information, contact Premier Communications, 20277 Valley Blvd., #J, Walnut, CA 91789; Phone: (909) 869-5711; Fax: (909) 869-5710; Web: <http://www.adi-radio.com>.

Circle 102 on reader service card

Frontier Engineering's Communications Control Console (C3)

Frontier Engineering has announced its C3 product range. Designed to fit neatly beside the average rig, it allows the user to repackage some of the small items that clutter the hamshack. Each box comprises four trays. The bottom tray contains an adjustable power supply which can be used to supply internal and external devices. The remaining trays can be



ordered as blanks, allowing purchasers to build their own circuits into each one, or containing individual products, such as preamplifiers, QRP rigs, filters, keyers, etc., which can be ordered from an extensive options menu and configured at the factory. A test equipment version is also available. Finished in black, it measures approximately 9 x 8 x 10 inches (HWD). These units enable projects to be finished in a very professional looking cabinet, and new trays can easily be installed as interests change.

The price of the basic unit, which comprises one power tray plus three blank trays is $235.

For more information, contact Dave Wilson at Frontier Engineering, P.O. Box 837, Platteville, CO 80651; Phone/Fax: (970) 785-2897; E-mail: <FRONTIER@LANMINDS.NET>; Web site: <www.amplifier.net>.

Circle 103 on reader service card

TAPR 1998 CD-ROM

The TAPR 1998 CD-ROM—now in its third year—is currently available. The CD features updated information and software, as well as virtual audio segments, including the 1997 ARRL and TAPR Digital Communications Conference (plus an entire section of conference photos); Ham Radio Town Meeting held at Dayton HamVention on Saturday, May 17th, 1997; 1997 Texas Packet Radio Society Fall Digital Symposium. Price is $20 plus $5 s/h. Check the TAPR Web page, <http://www.tapr.org/tapr/html/cdrom98.com>, for a list of current updates.

For more information, contact Tucson Amateur Packet Radio, 8987-309 E. Tanque Verde Rd #337, Tucson, AZ 85749-9399; E-mail: <tapr@tapr.org>; ftp: <ftp.tapr.org>; Phone: (940) 383-0000; Web: <http://www.tapr.org/>; Fax: (940) 565-2544.

Circle 104 on reader service card

Leather Radio Pouches

Cutting Edge's line of radio holders helps keep mini radios in good condition. These glove-quality leather pouches are designed to provide a secure fit for the Yaesu VX-1R, ICOM IC-Q7, Standard C508A, C108A, and Alinco DJ-C1T, DJ-C4T, DJ-C5T. Leather-covered belt clips won't scratch your belt, and the Velcro closures secure radios, yet give easy access without any buckles or clips. Speaker holes let you hear transmissions easily; pouches come with a lanyard.

The Radio Pocket PROtector pouch fits in your breast-pocket, holding your mini-radio upright and centered without slipping. Transmissions are easy to hear, and it provides a convenient spot to tuck in a pen and spare antenna.

Pouches retail for under $20. For distributor nearest you, call (800) 206-0115; Cutting Edge Enterprises, 1803 Mission St., Suite 546, Santa Cruz, CA 95060.

Circle 105 on reader service card

Is Your New HT Antenna Dangerous?

Those new, longer, super-flexible HT antennas are great, but they need to be used and maintained with care to prevent injury to yourself or others.

By Gordon West, WB6NOA*

The shorter your rubber duck HT antenna, the less performance you're going to get out of your handheld transceiver; the longer the antenna, the better your signal and the greater your range. This is a matter of basic physics, regardless of what some ads might try to tell you. On 2 meters, anything shorter than 19 inches—the length of a natural one-quarter wavelength antenna—is a compromise. (*For more on the hows and whys of VHF/UHF "whip"-type antennas, see this month's "How It Works" column.—ed.*)

"New on the scene of HT antennas are the super-skinny, ultra-flexible 12- to 15-inch-long whips....They offer much improved performance over shorter ducks when you try to work repeaters in a fringe area with your handie."

But walking around with a 19-inch antenna on your HT can be a little bit unwieldy. So most 2-meter antennas are short, stubby, semi-flexible whips that do the job passably, despite the losses inherent in shortened antennas. Of course, there are dual-band and even tri-band "rubber ducks" as well.

A New Kid in Town

New on the scene of HT antennas are the super-skinny, ultra-flexible 12- to 15-inch-long whips (see Photo A). They offer much-improved performance over shorter ducks when you try to work repeaters in a fringe area with your handie. And when you're in close or working simplex, these new super-thin whips are so flexible that you can actually tie them in a loose knot and they come out straight as a whistle after you undo them. Terrific, huh?

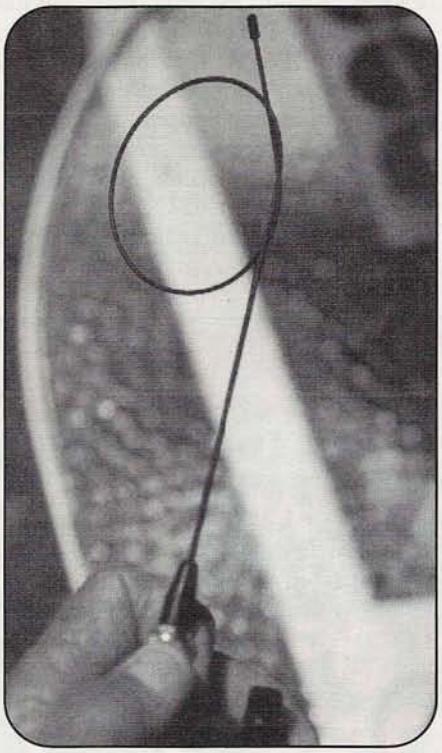


Photo A. New, super-skinny HT whips are so flexible you can tie them in a knot! But be careful of their tiny tips, which can make them a hazard for eye injury! (WB6NOA photos)

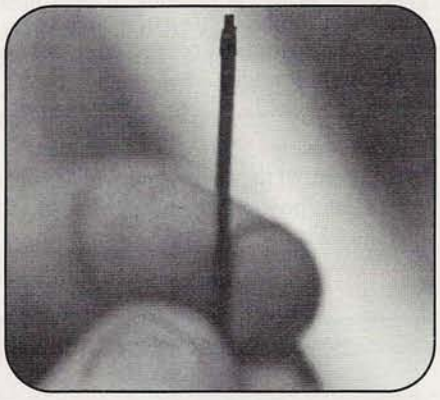


Photo B. A potentially hazardous antenna tip becomes downright dangerous if the little rubber tip falls off, as this one did. See Photo C for a suggested improvement.

But there is one major danger when operating these antennas fully extended. The problem is that the tip of the whip is extremely small and more than capable of injuring someone's eye. When you wear your handheld on your belt and are sitting down, the whip tip ends up at about eye-level to anyone sitting nearby. If you suddenly grab your handheld and pull it up to your face to transmit, you could easily injure someone's eye or some other part of his or her face.

It gets worse: on one popular brand of super-flexible, skinny whip, the little rubber tip has a tendency to fall off, expos-

"The problem is that the tip of the whip is extremely small and more than capable of injuring someone's eye."

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

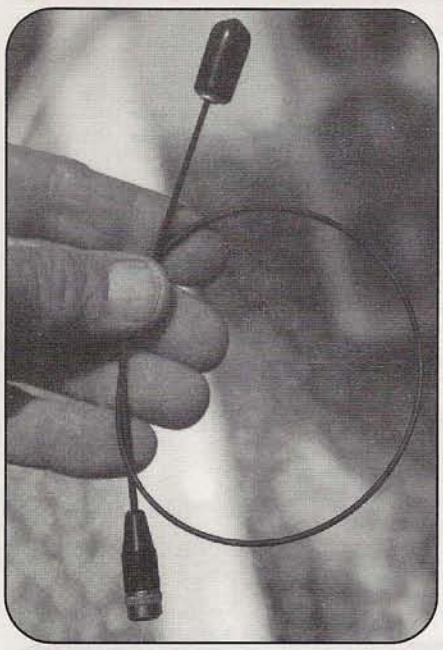


Photo C. A soft plastic or rubber tip applied to the end of the antenna can go a long way toward reducing hazards it may pose. But you still need to be careful to avoid poking anyone with it.

ing the sharp and dangerous antenna tip. The exposed tip easily could penetrate the skin or an eyeball (see Photo B).

Safety Tip: Watch Your Tips!

I have spoken with the two major distributors that market these antennas in the U.S., and, while they acknowledge the potential hazard described here, they both say it's the responsibility of the individual amateur to operate the equipment

"It gets worse: on one popular brand of super-flexible, skinny whip, the little rubber tip has a tendency to fall off, exposing the sharp and dangerous antenna tip. The exposed tip easily could penetrate the skin or an eyeball...."

safely. So steer clear of these 15-inch super-flexible whips if they've lost the protective tip. And if you have or buy one of these antennas—remember, they *will* improve your HT's performance—I suggest that you place a small, soft protective tip on the end (see Photo C) as an added measure of safety to everyone around you. ■

Results of the First CQ VHF National Foxhunting Weekend

From Delaware to California, over 50 hidden transmitters beaconed and beckoned to intrepid hams: "Come and find me!" Now, the results are in...

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

Imagine a ham radio contest that took place all over North America, but not necessarily on the same date or time for everyone. Rules for competitors in one place were completely different from the rules elsewhere. All of the contestants were away from home, but some were mobile while others were on foot. To top it off, the participants didn't know where they would end up and they didn't know exactly what they were looking for. But everyone had a great time. That's what "ET" might have put in his report to home base after a close encounter with the first *CQ VHF* National Foxhunting Weekend (NFW).

What's foxhunting? To hams, foxhunting is an advanced form of hide-and-seek for all ages, with radios. The name comes from the British hare-and-hounds sport, but the game is called other things, too. In southern California, where I live, it has taken place on weekends for 40 years and the name has been "T-hunting" for as long as anyone can remember. Others refer to it as "bunny hunting" or simply "hidden transmitter hunting." Whatever you call it, it means a contest of *radio direction finding* (RDF).

Most National Foxhunting Weekend (NFW) events started out with mobile direction-finding. This specially outfitted van belongs to Kevin Kelly, N6QAB, who lives in Maryland and was "hunting" with the Kent County Amateur Radio Club in Delaware. (Photo by Larry Mulvehill, WB2ZPI)

Getting In On the Fun

Far too many ham clubs have never experienced the fun of hidden transmitter hunting. The advance NFW publicity in *CQ VHF*, Amateur Radio Newsline, and the RAIN Report convinced quite a few of them to try it for the first time. Other clubs took advantage of the NFW to have special RDF events and to get newcomers to join in their regular T-hunt fun.

For example, the Northern Alberta Radio Club joined with the Strathcona Radio Volunteers to put on a day-long hunt series in Edmonton, Alberta. James Ewen, VE6SRV, wrote, "Well Joe, thanks for the kick in the [pants]! We've had monthly hunts for about a year now. With this National Foxhunting Weekend invitation, we managed to scare up a new hunter and have fun in the process."

Just in case the adventure of finding hidden transmitters wasn't enough to bring out first-timers, some groups had added attractions. In his report chronicling the Santa Barbara Amateur Radio Club's on-foot foxhunt, organizer Marvin Johnston, KE6HTS, wrote, "Since the way to a ham's heart is through the stomach, I decided that a tri-tip barbecue afterwards would be a nice touch. And to encourage people to help and par-

**Joe Moell, KØOV, has hunted hidden transmitters for over 20 years and has written over 120 articles on RDF. In February, 1998, he was appointed by ARRL to the newly created position of National ARDF Coordinator.*

Once you're in the general vicinity of the "fox," you need to get out of your vehicle and walk. Here, Russell Ranum, AA3HX, of the Kent County group, searches in a clearing. (Photo by Larry Mulvehill, WB2ZPI)

ticipate, the food was free to helpers and competitors. I am not above using bribery! With the wonderful weather and setting, people stayed around eating and talking for several hours after the hunt was over."

Most, but not all, NFW hunts were held on the last weekend of April, as *CQ VHF* suggested. When events conflicted, hunts weren't canceled, they were merely postponed. For instance, the last weekend of April is always a very busy time for hams in southern California because of the annual Baker-to-Vegas Law Enforcement Relay Race. Hundreds of amateur radio operators head for the desert to support their local police and sheriff departments as they jog a brutal 140-mile course. Ham support includes voice, packet, APRS, and ATV. That's why the Fullerton Radio Club's on-foot foxhunt was rescheduled to coincide with "Antennas In The Park," an annual pig-out hamfest at Tri-City Park in Placentia, California, that took place during the following month.

"All Day" Event

On the other hand, a few southern California stalwarts let nothing stand in the way of T-hunting. Except for Field Day weekend, they always run a 2-meter "All Day" mobile T-hunt on the fourth Saturday morning of the month. It normally starts at the top of Rancho Palos Verdes, south of Los Angeles, and the boundaries almost always are declared to be the continental U.S.! As you can imagine, an "All Day" hunt often turns into an all-weekend marathon, with multiple transmitters to find and lots of driving in the mountains and deserts. "All Day" hidden T's have been as far away as southern Utah (344 airline miles), but hiders Deryl Crawford, N6AIN, and Ray Hughes, N6EKS, decided to let the hunters enjoy the spring wildflowers on April 25. Deryl wrote:

Transmitter number one was on a dirt road about a quarter mile east of the California Poppy Reserve entrance on Lancaster Road in the Antelope Valley. It was emitting 40 watts into an 11-element horizontally polarized beam, pointed at Mt. Wilson for good signal bounces. There were two other transmitters around the poppy fields and one underneath a tower where three major power lines intersected. These mini-Ts were each running about 250 milliwatts into vertical antennas. Two microwatt-level transmitters were also deployed, one located across the road from T1. The other was located on a fence post along a dirt road at the point where a dry stream went through. After finding all or most of the Ts around 8 p.m., several hunters went to an Italian restaurant in Lancaster. This was a highlight of the hunt—good food, good company, good stories.

A Learning Experience

NFW was a learning experience for everyone, whether first-timers and old hands. In the sprit of ham radio, several groups made special efforts to provide special RDF training. Ernie Howard, W8EH, of the Dial Radio Club in Ohio, told us:

We conducted a four-week foxhunt class in anticipation of this hunt. It was at the same time and location as our normal Novice/Tech license classes. On the fourth week, we had an on-foot hunt at the local Miami University branch campus. There were six foxes to find: five were automated and one was a person in a car. This turned out to be a very interesting event, as everyone got to practice their technique using the antennas they had just built. There were lots of woods and parking lots to hide things in. There were plenty of reflections to follow, too. We now have a dozen or more people interested in fox hunting and everyone wants to know when the next one will be.

About the Stats

The Table is a tabulation of all hunts that were reported to me, listed alphabetically by states and provinces (*for the non-Canadians among you, "QC" is the abbreviation for Quebec—ed.*). I know that there were other NFW events that didn't get included. For instance, the South Shore Amateur Radio Club of Massachusetts and the Straits Area Amateur Radio Club of Michigan announced NFW hunts, but I was unable to obtain reports for them afterwards. All the reader reports I received were very good, but they didn't necessarily provide exactly the details that I decided to put into the Table. Next time, we'll have a report form.

"Mobile" in the **Type** column indicates that hunters could drive all the way to the fox in their vehicles. "Mobile + Sniff" means that they had to get out of their vehicles at the end to bag the fox on foot (this is traditionally called "sniffing"). "IARU" in this column means that the hunters were all on foot in a large wooded park using a map and compass in addition to their RDF gear, as called for by International Amateur Radio Union (IARU) rules (see "Team USA Takes on the World").

Most mobile hunts have "sniffs" of only a few hundred feet. However, Charles Scharlau, NZØI, turned the North Kitsap Amateur Radio Club's NFW hunt into a hike. "The second transmitter was a few kilometers from the starting point," he wrote. "Its camouflaged ammo-box rig was on the ground beneath the branches of a small pine tree beside a woodsy trail. A half-kilometer stroll, starting from the north trail head, was required to reach it. A considerably longer trek was required to get to it from the south trail head, as one team discovered!"

The number (#) in the column to the right of the **Type** column in the Table indicates how many transmitters had to be found. In most cases, hunters were looking for all of them at the same time. They had to choose which one to seek first, which one next, and so on. There were either continuous signals on multi-

No, it only looks like "Field Day." Tom Smith, WQ3A, and Breckinridge Smith, K4CHE, close in on the "fox" in a field in Delaware. (Photo by Larry Mulvehill, WB2ZPI)

ple frequencies, multiple intermittent signals on the same frequency, or a combination of the two.

The NFW event in Research Triangle Park, North Carolina, was a good example of a multiple-frequency hunt. Ed Lappi, AE4EC, reported:

As the teams homed in on the first fox and found it, they recovered numbered tags to show which team was first, second, third, and so forth. Also on the first fox was a note which told the frequency of the second one. The same thing was repeated at the second fox for the third one. Some hunters reported that the second fox was more difficult to find because it had continuous carrier without audio tones. One reported hearing the third fox while searching for the second, because he passed close by it and his receiver bandwidth was wide enough to let the tones leak in."

Everyone's on Two

All of the reported NFW events were on the 2-meter band. A large majority used 146.565 MHz. This simplex frequency was coordinated several years ago by the Two-Meter Area Spectrum Management Association for transmitter hunting in southern California. Since then, it has become a popular RDF frequency in many other parts of the U.S. and Canada.

Like any sporting contest, T-hunts need rules. It seems as if no two groups choose to have exactly the same ones (*We didn't set specific ones—intentionally.—ed.*). Sometimes a rigid set of restrictions and boundaries is written by club consensus and followed for every hunt. In other places, each hider makes some or all of the rules, and they're different every time. In the majority of hunts, though, the winner is the first person to reach the transmitter or antenna. If he or she can't be seen by the hider or a referee when arriving, there may be a sign-in sheet or a special tag to be removed as proof.

It can be argued that time-only scoring (versus mileage-only or a combination) gives an unfair advantage to experienced local drivers and encourages recklessness. Because of this, the "All Days" and most other Los Angeles area T-hunts are won by the team with the lowest elapsed odometer mileage, no matter how long it takes. A few NFW hunts were scored by mileage, too. At least two of them used a combination of time and mileage as the winning criteria.

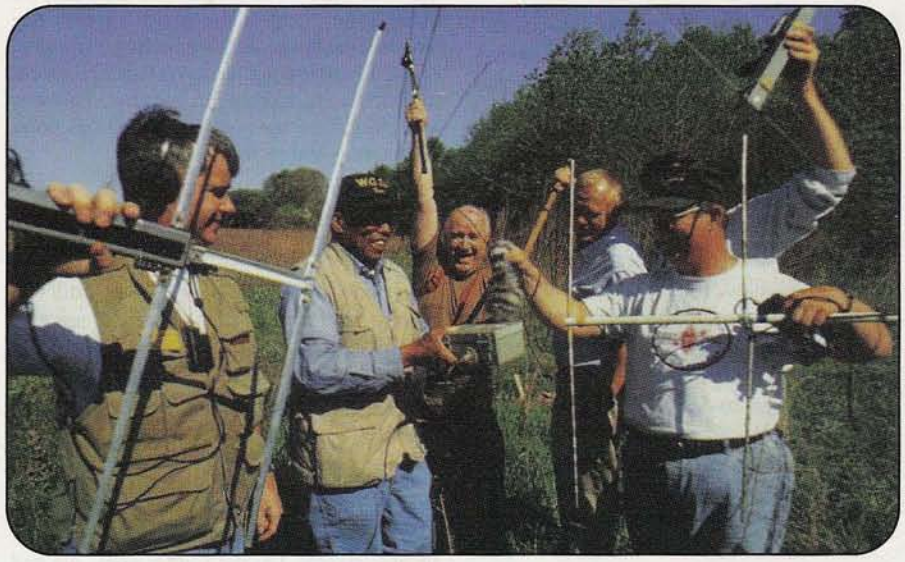
John Hirth, W2KI, likes mileage scoring. "You can't just drive around all morning, hoping to stumble upon the foxes' lairs," he wrote. This scoring method added spice to the Hudson Valley Direction Finding Association event in New York. W2KI continued:

With 40 minutes left to the three-hour hunt, the ZIKWIG team (KB2WHG and KA2ZIK) tore the identifying tag off the last transmitter and radioed back, "The eagle is coming home to roost." They were the first to find all four transmitters and first back to the staging area. Confidence beamed from their faces. Smiles turned to apprehension as the next team to arrive, YARC #1 (W2XV/N2ROD), also turned in four tags. It was ZIKWIG's three-element Yagi versus YARC's four-element model. Would the narrower beamwidth give YARC an edge in planning the shortest route?

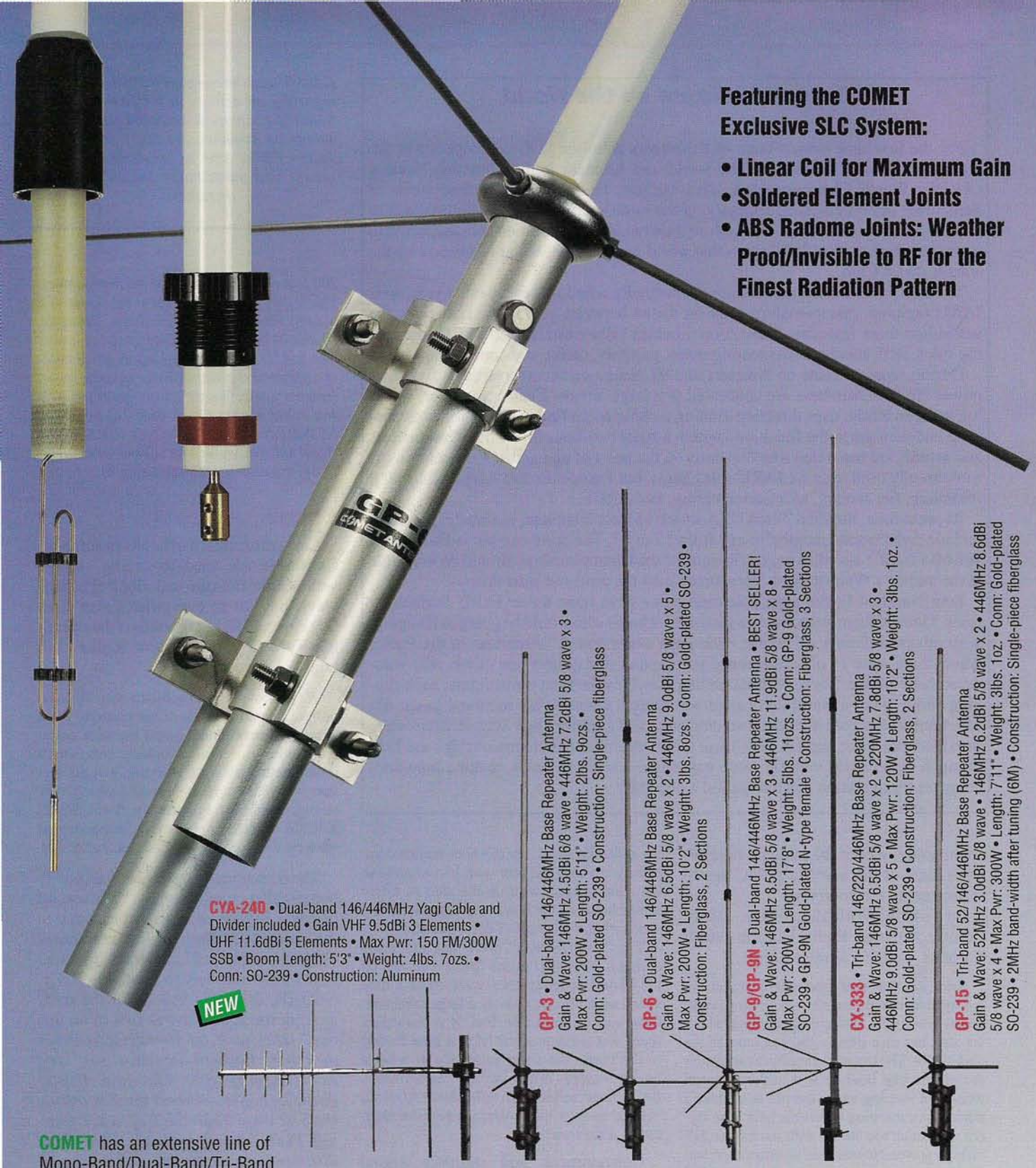
As it turned out, second-finisher YARC was the overall winner.

Trickery and Intrigue

Good hiders include an element of surprise in their hunts, and a little deception adds a lot to the fun. A good example was the beginning of the North Kitsap hunt, as described by NZØI: "The first part was a 'keep 'em honest' hide. The transmitter was stashed beneath the eaves of a barbecue pit just 50 meters from the starting point. The transmitter's signal was attenuated so that its strength at the starting point was just barely full scale. When the fox came on the air, the teams took to their vehicles and headed out to scour the



Success! Kevin Kelly, N6QAB; Tom Smith, WQ3A; Sam Guccione, K3BY; Breckinridge Smith, K4CHE; Sean Kelly (no call); and Jerome Palmer, N3KRX, hold the "fox" in a moment of glory before "letting it go" for the other hidden-transmitter hunters to find. (Photo by Larry Mulvehill, WB2ZPI)



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GP-15 • Tri-band 52/146/446MHz Base Repeater Antenna Gain & Wave: 52MHz 3.0dBi 5/8 wave • 146MHz 6.2dBi 5/8 wave x 2 • 446MHz 8.6dBi 5/8 wave x 4 • Max Pwr: 300W • Length: 7'11" • Weight: 3lbs. 1oz. • Conn: Gold-plated SO-239 • 2MHz band-width after tuning (6M) • Construction: Single-piece fiberglass

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Team USA Takes on the World

For the first time ever, a team of foxhunters from the U.S. is competing at the most prestigious RDF event in the world: the Amateur Radio Direction Finding (ARDF) World Championships. This contest, held during the first week of September in Nyiregyhaza, Hungary, is the ninth world championship foxhunt to be held since they began in 1980. More than two dozen countries were expected to send their best on-foot RDFers to this world competition, being organized by the Varosi Radio Club.

The ARDF World Championships are normally scheduled every other year, with IARU regional championships held on the in-between years (IARU divides the world into three regions). These formal events follow established IARU foxhunting rules, with standard orienteering maps, punches, cards, and control flags.

During separate heats on 2 meters and 80 meters on successive days, five low-power "fox" transmitters are concealed in a large woods. Each competitor, working independently, uses direction-finding techniques to find as many foxes as possible and then get to the finish line within a strict two-hour time limit. Competitors and awards are separated into divisions on the basis of age and sex. Foxhunting is a commonly used term for IARU-rules hunts, but Europeans and Asians also call it foxtailing, fox-teering, radio-orienteering, and ARDF.

At press time, the final Team USA roster was not complete, but was expected to include five persons ranging in age from 17 to 52. The team captain is Dale Hunt, WB6BYU, of Yamhill, Oregon. Results of the Championships should be available at the author's Web site (see "Resources") by the time you read this.

Four National Foxhunting Weekend hunts were done under IARU foxhunting rules. Three of them were practice sessions for hams who would be going to Hungary, with others welcome, of course. One such event was at "Antennas in the Park," where there were 11 officially timed participants and quite a few others who wandered out onto the course without getting punch cards. Five transmitters, each running about 3/4 of a watt into quarter-wavelength whips, were scattered in the 65-acre hunt area, which included two city parks and a Junior High School. Maps were provided, but most hunters didn't use them. International championships are held in much larger areas with far more vegetation and fewer paths, making map-and-compass triangulation and navigation a necessity.

countryside. About 20 minutes later all were back at the starting point, busily crisscrossing the courtyard."

Ed Griffin, W4KMA, of the Stanly County Amateur Radio Club in North Carolina, pulled a similar stunt.

Knowing that everyone would expect the fox to be several miles from the starting point, I tried to be crafty. The college campus where we start has nice plastic garbage cans in the parking lot. The fox was placed in a can, under the plastic bag liner so it would be unseen when just looking under the lid. A mistake I made was not testing before the hunt. The signal was much too strong with the hidden HT on high power. No team had an attenuator, and that made it worse. As soon as the teams left the area, I changed to the low-power setting."

Concealment was a deception method practiced by many NFW hiders. W2KI of Hudson Valley wrote:

Howie, WB2AWQ, seems to take great pride in frustrating the searchers. He's been known to run a 30-gauge wire antenna inside the stalk of a weed, but this time he just completely covered the box with leaves and ran the slim antenna wire up the side of a tree trunk. Some of the hunters later said the box was buried, but...well...I don't know.

The "north foxes" were another story entirely. Running far less than 1 watt and on the same frequency, they were about a mile apart, each on one side of a large reservoir. One was within a few feet of a chain-link fence that ran around the lake. A little further to the north, the sheer rock face of a large quarry stared down at the transmitters. Reflections, reflections, reflections! After all, we had to give the hotshots a bit of a challenge, didn't we?

Concealment and multiple signal sources came together to make the NFW hunt in Rockford, Illinois, memorable, according to Roger Sellers, N5EEA:

The fox (Dennis Gray, N9XKH) stipulated before the hunt that we were to find the transmitter and not him. He would be in plain sight, the transmitter would be another story. Dennis hid in Page Park within some woods. There were three beams, separated by about 200 feet or so, up about 30 feet in pine trees. The beams aimed the signal at the center of a triangle formed by their locations. The coax, about 600 feet, was buried under the pine needles and leaves on the ground. A small cooler contained the transmitter, antenna tuner, repeater controller, and cross-band radio. It was under a large pile of dead tree branches. All the hunters drove to the park following the signal and then walked for an hour within sight of the transmitter without seeing it.

Table. This is the complete list of those groups reporting on activity in the first CQ VHF *National Foxhunting Weekend. See text for details on anything you don't understand. Author KØOV says he knows of additional groups that participated but did not send in reports.* →

Sights to Behold

Law enforcement officials in southern California are used to seeing strange vehicles on hilltops and along the freeways, but not so everywhere else. Sam Guccione, K3BY, reported on the start of the Kent County Amateur Radio Club hunt in Delaware:

We almost ran into problems with the local police, since the owner of the property lived across the street and thought we were suspicious with our strange looking cars, weird looking stuff we were carrying, and the fact that we were standing around looking very strange in general. Fortunately, Breck Smith, K4CHE, had the opportunity to explain what we were doing. We left very quickly after that.

The occasionally outrageous acts of T-hunters also cause notoriety. "The second box was hidden near a railroad track in the town of Camden," K3BY continued. "This is *not* an abandoned track, so it was both funny and scary to see Kevin Kelly, N6QAB, drive his van down the track looking for it. Kevin was first in on this one." (*Hey, guys, let's not get too carried away here. Being first to find a "fox" isn't worth risking your life—and driving down an active railroad track is among the best ways I can think of to kill yourself. Park, get out, and walk, all at a safe distance from the tracks.—ed.*)

Non-participants sometimes react in unusual ways, too. W8EH wrote, "The funniest occurrence was a fellow who heard the fox on 146.52 sending CW. He kept calling the fox and asking it if that was one of those new vanity calls. He wanted it to go to voice and talk. We never did tell him what was going on, but we all had a good laugh."

Table

S/P	Reporters	Club	Date	Starting city	Freq	Type	#	Scoring	Hiders	Winners
AB	VE6SRV	Northern Alberta RC/ Strathcona Radio Volunteers	Apr 25	Edmonton	146.565	Mobile	10	Time	Many	Many
CA	WB6TMH	Valley of the Moon ARC	Apr 25	Sonoma	146.79	Foot	1	Time	WB2TMH	N/A
CA	KE6HTS	Santa Barbara ARC	Apr 25	Santa Barbara	146.565	Mobile w/sniff	4	Time	KE6HTS, KE6QEF, KF6EDD	KF6DI, KE6UGY
CA	KE6HTS	Santa Barbara ARC	Apr 26	Santa Barbara	146.565	IARU	5	Number & Time	KE6HTS + 10	KF6DI
CA	N6AIN, N6EKS	None (Southern California All Day)	Apr 25	Rancho Palos Verdes	146.565	Mobile	6	Mileage	N6AIN, N6EKS	N6MJN, N6XFC
CA	KØOV	Fullerton RC	May 16	Placentia	146.565	IARU	5	Number & Time	KØOV	KJ6HZ
DE	K3BY	Kent County ARC	Apr 25	Camden	146.54	Mobile w/sniff	2	Time	N3WDN	N3KRX, N6QAB
IL	N5EEA	None	Apr 26	Rockford	146.55	Mobile w/sniff	2	Time	N9VJU, N9XKH	N9QBT, N9QJS, KB9OSK
NC	W4KMA	Stanly County ARC	Apr 25	Albemarle	146.565	Mobile w/sniff	1	Time & Mileage	W4KMA	KD4OZI, KF4NJF
NC	AE4EC, W4WDN	[none given]	Apr 26	Research Triangle Park	146.565 147.455	Mobile	3	Mileage	AE4EC	KE4IXL
NY	W2KI	Hudson Valley Direction Finding Assn	Apr 25	Spring Valley	146.565 146.535 147.515	Mobile w/sniff	4	Mileage	W2KI, N2KI, WB2BNH, WB2AWG	W2XV,N2ROD KB2WHG,KA2ZIK WA2RVF
OH	W8EH	Dial RC	Apr 25	Middletown	146.52 146.46	Mobile w/sniff	2	Time & Mileage	WD8DEZ	W8EH, K8CM, N8RYS, WD4HPC
ON	VE3EFY	Lake o' the Woods ARS	Apr 26	?	146.560	Mobile w/sniff	1	?	?	?
OR	WB6BYU	Friendship ARS	Apr 19	Wilsonville	146.565	IARU	?	Number & Time	Many	Many
QC	VE2EMM	Union Metropolitaine des Sans-filistes	Apr 26	Montreal	146.565	Mobile w/sniff	3	Time	VE2JX, VA2JX	VE2ESX, VE2CYS
QC	VE2EMM	Union Metropolitaine des Sans-filistes	May 9	Montreal	146.565	IARU	3	Number & Time	VE2EMM	VE2DSK
WA	NZØI, N7KXU	North Kitsap ARC	Apr 25	Kingston	146.500	Mobile w/sniff	2	Time	NZØI	AB7LH, KBØEPY

For true T-hunting addicts, one fox is never enough. If the hider doesn't provide more than one, the hunters do. In his report from Edmonton, VE6SRV wrote:

We ran a series of hunts in sequence, with the first person tagging the fox starting the countdown sequence for the next hunt. Once the first tag was made, all other hunters had a 30-minute window of opportunity in which to tag before the next hunt started. The challenge was on each winner to find a great hiding spot with only half an hour to do so. All hunts were on 146.565 MHz, with the VE6GPS UHF repeater used as an intercom. Either hunting is so demanding that there is no time for general chit-chat, or else the hunters were very concerned about giving away their locations, as the UHF repeater was awfully quiet. The 10th and final hunt of 5 kilometers (3 miles) took us back towards the city core. After nine and a half hours, it was mutually decided that we'd had our fill of hunting for the day. Everyone had covered in excess of 200 kilometers (120 miles).

There was lots of food for competitors at the Fullerton Radio Club's "Antennas in the Park" foxhunt, including this special cake by WA6OPS. (Photo by Joe Moell, KØOV)

National Elephant Hunting Weekend?

Perhaps you've heard the fable of the group of blind men touching different parts of an elephant and each subsequently describing the beast in completely different terms. Similarly, the NFW experience was different in every locality. But everyone who reported was enthusiastic about the experience and eager to have more RDF fun. I hope there will be an NFW next year, but don't wait until then to experience the fun of hidden transmitter hunting in your town.

Take the advice of VE6SRV, who wrote to say:

We keep our hunts at the simple level so that everyone can participate. We find that a nice strong signal keeps beginning hunters from getting discouraged. Nothing is more frustrating than not being able to hear the fox. As our group gains experience, we will start adding more difficulty, to continue to provide a challenge. But for now, we enjoy simply getting out there and chasing down the hidden transmitter.

"We hold hunts every couple of weeks in the warm weather months," wrote VE3EFY of Ontario. "Some are during the day and some are in the evening. They average one and a half to two hours in length. Since we have few hunters, we ensure that everyone finds the fox and gets to try all the different equipment. Usually one of the licensed, but non-hunting, XYLs hides the fox. They tend to be very devious in choosing a location.

See you on the hunt! ■

Resources

For additional information about putting on mobile T-hunts and international-style foxhunts, we suggest the following sources:

The NFW announcement article in the April, 1998, issue of *CQ VHF* magazine.

Mobile T-hunting was detailed in "Foxes, Hounds, and Hams—An Introduction to Fox Hunting" by KB8TEP, on page 12 of the September, 1996, 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.

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, including postage, from *CQ VHF* Back Issues, 25 Newbridge Rd., Hicksville, NY 11801; Phone: (516) 681-2922; Fax: (516) 681-2926; E-mail: <cqvhf@aol.com>; Internet: <http://members.aol.com/cqvhf/>.

Technical information about VHF RDF methods is in the "Repeaters, Satellites, EME and Direction Finding" chapter of *The ARRL Handbook*, available from the CQ Bookstore (same address as above), or 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. Your local bookstore should be able to get this for you. If not, contact Tab Books, Division of McGraw-Hill, Inc., Blue Ridge Summit, PA 17294-0850; Phone: (717) 794-2191; Fax: (717) 794-2103.

The first RDF 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 mobile T-hunting and on-foot foxhunting, a bibliography of 115 more articles, information on 20 RDF equipment suppliers, and over 110 RDF-related Web links and local T-hunting e-mail contacts.

Kenwood TH-G71 Dual-Band Handheld

A tiny powerhouse of an HT, the TH-G71 gets highest marks from our reviewers for its excellent receiver and its overall flexibility.

By Gordon West, WB6NOA*

The new Kenwood TH-G71 handheld has completed its tour of the country, and it did exceptionally well in our field tests. In fact, it survived a 30-foot drop to a wood shake roof during one tower episode, and it managed to continue working after a major splashdown on a boat ride. It was also well received by both scannists (scanner enthusiasts), and the many hams who gave it a test during its travels.

For our review, we gave the TH-G71 to several new ham radio operators and asked them to read over the manual, double check the quick reference guide, and begin programming by themselves. (Actually, we had two tests going on simultaneously. While I was taking the radio around the country in my travels, *CQ VHF* editor Rich Moseson, W2VU, had an additional review unit that he was using at home. His thoughts are summarized in "Further Impressions.")

Single-Band Dual-Bander

The Kenwood TH-G71 is a 200-channel, 6-watt dual-band (2 meters and 70 centimeters) handheld that's PC-ready for a computer upload of memory channels. But the feature that first catches the eye is that the G71 lights up at night (see Photo A). This turned out to be important when I took the equipment out on a boat ride to see how "seaworthy" it was.

The G71 is a dual-band radio with single-band operation. In other words, when the unit is on your belt and someone gives you a call, you won't need to worry about whether the call came in on VHF or UHF. You get just one band at a time, although frequencies on any band may be programmed into the memories, letting you switch instantly between repeaters on different bands. The G71 includes a wide-range receiver which—out of the box—tunes 118 to 135.995 MHz aeronautical AM; 140 to 174 MHz FM; and 400 to 470 MHz FM. A couple of modifications will expand the frequency coverage even further (see "Expanding the G71's Frequency Coverage").

Photo A. The greenish backlight is the most eye-catching feature of Kenwood's TH-G71 dual-band handheld. Its outstanding receiver will catch your ear as well. (W2VU photos)

"I tuned in local police, emergency medical service, aircraft, and the Kenwood G71 is just as sensitive as any scanner I own," said one reviewer. And since many hams enjoy scanning the public service frequencies, the 200 memory channels may fill up fast.

As a test of receiver sensitivity *and* scanning selectivity, I operated the handheld in Los Angeles, Dallas, Dayton, Miami, and New York City. On both VHF and UHF, scanning performance as well as reception of ham frequencies was "hot," without any major intermodulation problems encountered.

On Top of the Radio

The G71 comes with a small flexible antenna that terminates to an SMA connector, something that's becoming common with small handhelds.

"I suppose the SMA is more secure than the easy-to-break BNC connector," writes one reviewer, "but availability of adapters to change an SMA to either a BNC receiver, or to an SO-239, is limited. Kenwood should offer an adapter cable that would easily allow this unit to accept an external antenna."

In looking over the "optional accessories" for the G71, this cable kit does not appear available. There are SMA to SO-239 adapters out in the market, but these adapters are all one piece, and I would worry about a big hunk of coax straining the little threads of the SMA and doing some damage. I like the cable idea much better than a fixed adapter.

The knob on the top of the G71 is actually two knobs: the lower, larger knob controls volume, and the upper knob controls channel changing, menu selection, and a host of other options. When you turn up the volume, it's remarkably LOUD. Plenty of bass, too, giving a loud volume setting lots of gusto to be heard when worn on the belt. Every reviewer commented on how much they liked having the volume control on a rotating knob, as opposed to pushing or holding buttons to raise or lower volume.

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

Squelch is adjustable, but not with a knob. You pre-set squelch by keystrokes. And to check your frequency activity, there is a **Monitor** button (labeled **Moni**) on the side of the handheld that lets you briefly override squelch and CTCSS decode to listen in on what's happening on the frequency you've dialed up. Just above that side **Moni** button is the **Lamp** button. The lamp can stay on all the time, or just when you make keystrokes. And, as I said before, one of the neat things about the new Kenwood G71 is the backlighted keys that are very visible in the dead of night.

Operation and Programming

The unit turns on with a blue power button on the front of the unit with a double high beep. The different beep tones are handy to confirm you've completed all of the keystrokes when entering frequencies. They progress higher in stepped pitch as you key in the MHz, and then descend in pitch as you final out with kHz (*the beep is programmable and may be turned off—ed.*).

"Programming was pretty intuitive, as I've come to expect from Kenwood radios," comments another reviewer. "Kenwood seems to have found the knack for making user-friendly radios that can be programmed easily without needing to pore over the manual each time you want to make a change." Not only does the instruction manual clearly indicate how to program channels, but Kenwood includes a plasticized quick reference

Photo B. The battery pack makes up half the size of the TH-G71, as is the case with many of today's HTs. Putting the belt clip on the back of the battery pack, though, makes quick-changing batteries in the field inconvenient, unless you're ready to buy a belt clip for each battery pack.

Further Impressions

The TH-G71 is a great scanner! Not to detract from its transmit capabilities, but its receiver is clearly superior. The combination of broad frequency coverage and very sensitive receiver makes it a pleasure for listening to police, emergency medical service, aircraft, etc. I can sit in my basement office, with just the rubber duck antenna attached to the radio, listening to local public service folks with full-quieting signals. On ham frequencies, I get full-scale reception of repeaters I couldn't even hope to access with this or any other HT. And that can be kind of frustrating at times.

Where I live in hilly and highly built-up northern New Jersey, you rarely have a clear shot at a repeater that isn't really local to you—especially if, as I do, you use your HT while on the move, walking or biking, with just the rubber duck. With the G71, I can reliably access two area 2-meter repeaters and one 440 machine (each within about 10 miles of me), about typical for any HT I've used around here.

Cool Features

The bright backlit display is great for nighttime use, and the ability to switch it on only as needed helps conserve battery power. The audio is excellent, both on receive and transmit, and I'm starting to get used to squelch being a menu setting rather than a dial (the **Moni** button to momentarily unsquelch the receiver is handy).

Switching between bands is as easy as pressing the **Band** button or simply punching up the frequency you want on the tone pad. I also like the standard 430- to 450-MHz transmit coverage on 70 centimeters, allowing access to the FM satellites, such as AO-27 or the Mir repeater (if it's still operating).

The ability to further "open up" the G71's frequency coverage adds to the radio's flexibility as a VHF/UHF receiver (see "Expanding the G71's Frequency Coverage"). But you've got to be experienced in working with surface-mount components to do anything more than the MARS/CAP modification (cutting a wire), as you need to remove tiny chip diodes. Personally, I'm afraid I'll kill the whole thing if I try to take out any of these parts.

Overall, though, it's a great little radio, and I'm sitting here listening to the police and EMS in my basement as I write this. If you enjoy combining public-service scanning with your hamming, you should give the TH-G71 serious consideration.

—W2VU

guide that shows how to program the equipment and what page of the manual to look in for further details.

Computer Connections

My sample equipment also included the just-released MCP-100 memory control software for the TH-G71 for Windows 95™. No disk is included: you load the software off of the Kenwood Web page at <http://www.kenwood. net>. From the home page, get to the main menu and click on the FTP site. Then click on software, and then click on **MCP-100.exe**. The "save as" window will open, and you save the file on your hard drive.

The connection between your computer and the G71 is with a PG-4P cable kit that goes between the handheld and a serial port on your computer, Com 1 or Com 2. Once the serial cable has been connected to both the radio and the computer, you turn on the radio, go to menu 15, turn on TC, and click on start.

There were mixed reviews on how "friendly" or "unfriendly" the software program was. One reviewer commented that he would much prefer to get the software on disk from RT Systems (as you can for some other radios) than by downloading it from the Internet.

New Ham Reviewers

All of our new ham reviewers did well once they got the hang of where everything was within the menu, which is chock-full of selections, including band limits, power options, scan options, and more. Plus, the more common sub-function items, such as CTCSS encode/decode and tone selection, repeater offset direction, memory channel lockout, etc., are available without going into the menu. Just press the **F** key and the appropriate additional key on the keypad.

When selecting many of these items, the display will go alphanumeric and give you a hint what to do without having to

Expanding the G71's Frequency Coverage

Kenwood has released three modifications that expand the frequency coverage of the TH-G71, both on receive and transmit. One is fairly simple and the other two shouldn't be attempted unless you have experience working with surface-mount components. Each, of course, requires opening up the case. That may not be as easy as it seems at first, because of the stringent requirements that go along with the radio's "mil-spec" (to military specifications) rating...which is what let it survive a fall into salt water!

Photo C. To make the extended-frequency modifications to the TH-G71 (see text), you start by removing the battery pack and antenna, opening the rubber covers for external jacks, and removing the tiny screws holding on the radio's back plate.

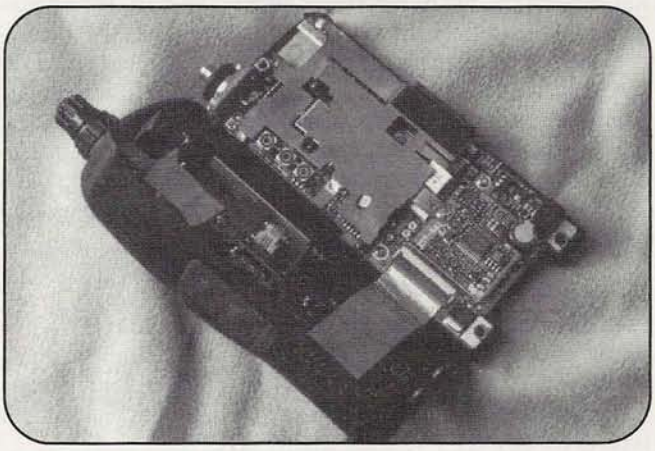


Photo D. Once the radio is opened, you'll see two circuit boards, connected by a ribbon cable. One board is attached to the back plate that you just removed, and the other is attached to the front section of the radio. You'll need to access the front board to make the frequency coverage mods.

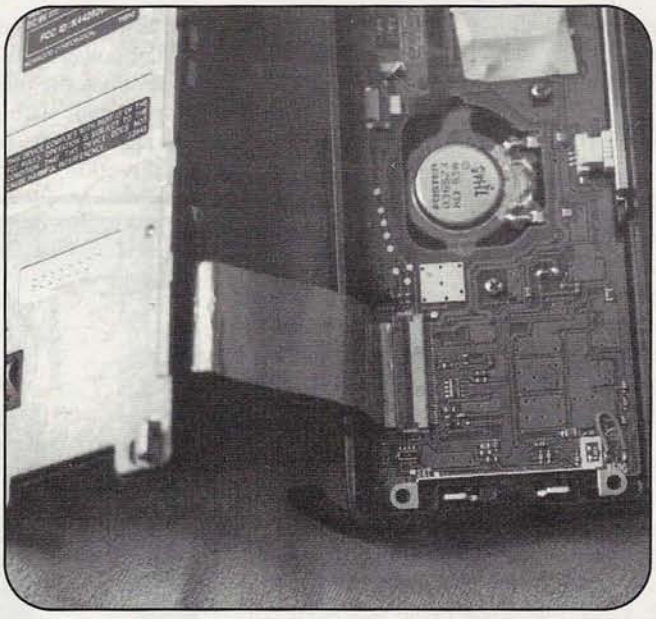


Photo E. Once the back section is removed and carefully placed off to the side, you'll be able to work with the green wire (lower right corner) and two tiny chip diodes involved in opening up the TH-G71's frequency coverage.

Opening the Case

First, remove the battery pack *and the antenna* (the case will not open with the antenna attached) and pop open the rubber covers for the external mic and power jacks. Next, remove the three small screws holding the back plate onto the front part of the radio (Photo C). Now, carefully remove the back section by gently pulling it down (to release the antenna jack), then away from the front section (Photo D). Be careful not to damage the ribbon cable that connects the two sections. Move

look at the book. Again, this is good, especially to a first-timer!

The whole idea for the new operator is to get information into memory channel so you begin to develop a bank of hot frequencies. Memory channels may then be named alphanumerically so you know exactly what is where! Each of the memory channels can hold a variety of commands, so you're not stuck having to put certain kinds of frequencies into certain channels. Do whatever you want, and then go for channel lockout to selectively scan what you have just entered.

And there are plenty of scan options to choose from. You can set the radio to scan all frequencies, scan all frequencies within a 1-MHz region, scan all frequencies in a programmed range, scan memorized channels only, scan the call channel plus current VFO frequency, or scan the call channel plus the memory channel last used.

When you scan, you can program the G71 to listen for five seconds on a busy frequency, and then move on even though a signal is present. Or, you can have it hold

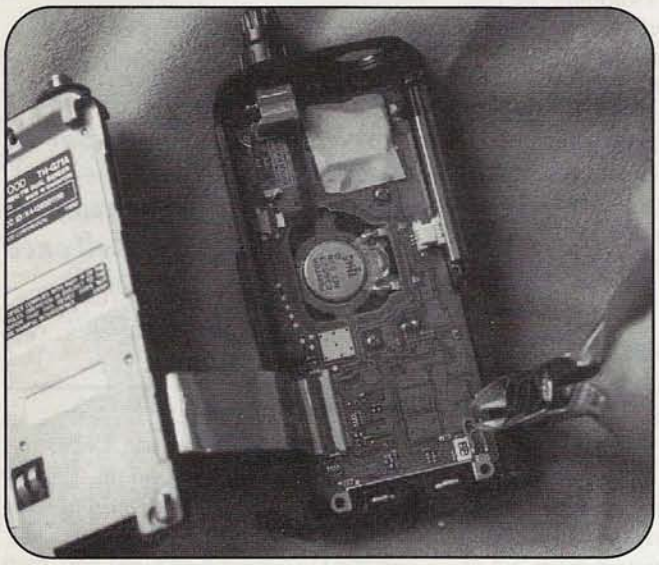


Photo F. To make only the MARS/CAP modification, opening both transmit and receive coverage to either side of the ham bands, simply snip the green wire with a pair of wire-cutters. But be sure to read about all of the mods before making this one.

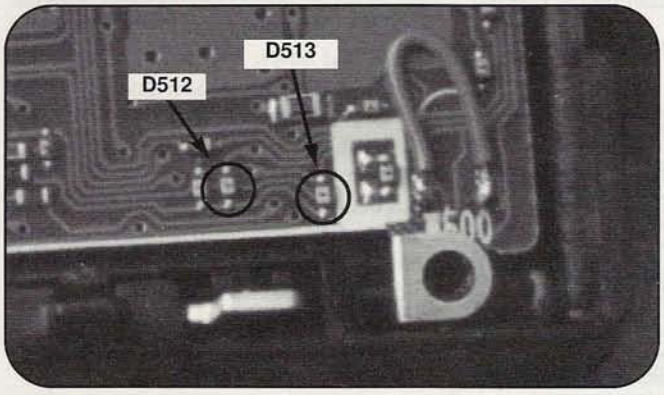


Photo G. If you're handy with surface-mount components, then clipping diode D512 will significantly expand the TH-G71's receive coverage. Clipping D513 will open up the transmit coverage to a greater range than the MARS/CAP mod. See text for details.

the back section off to one side (Photo E), giving you clear access to the circuit board inside the front section.

The Easy Mod

Looking down at the lower right corner of the front circuit board, you'll see a green wire (the only actual wire on the board). Snipping this wire (Photo F) will perform the "MARS/CAP modification," opening up both transmit and receive coverage outside the ham bands for properly authorized members of MARS (Military Affiliate Radio System), CAP (Civil Air Patrol), or the USCGA (U.S. Coast Guard Auxiliary). With this mod, the radio will transmit—and receive—between 142 and 151.995 MHz, and between 420 and 449.995 MHz. *But don't do this before you read the rest of the mods—you may have to reconnect the green wire if you're going farther.*

Extended Receive Mod

You can expand the TH-G71's coverage even more if you feel comfortable working with surface-mount components. This "extended receive modification" opens up the following additional scanning capabilities: 320 to 399.99375 MHz; 800 to 823.9875 MHz; 849 to 868.9875 MHz; 894 to 949.9875 MHz. The big holes in the 800-MHz range, of course, are the cellular phone frequencies, which are blocked. The modification also allows the transceiver to select menu item 16, the capability to switch the normal 118 to 136 MHz AM reception to FM as well.

To make this mod, you have to locate and remove diode D512 (See Photo G). This, and neighbor D513 (which you need to remove for the next mod), are not labeled on the printed circuit board because of their micro size. You can use our photos as a guide, download the info sheet for this mod from the Kenwood Web site (see "Resources"), or buy the new ARTSCI modification handbook, to figure out exactly where these diodes are and which ones to nip. Smacking the wrong diode may lead to major problems, so don't undertake this mod unless you're really good at working with surface-mount technology.

"Beyond MARS..."

No, we're not talking interplanetary travel here, but rather a mod to open up the TH-G71's transmit coverage beyond that accomplished by snipping the green wire in the "MARS/CAP modification." This mod—which consists of clipping D513 (Photo G) as well as D512, *and reconnecting the green wire if you already clipped it*—provides all the extended receive coverage described above, plus it opens the transmit ranges to 136 to 173.995 MHz and 400 to 469.995 MHz. This could be handy for hams who are also authorized users in other services occupying these frequency segments. Keep in mind, though, that the G71 is not FCC-type-accepted for transmitting outside the ham/MARS/CAP frequencies, and that it's a serious offense to transmit on any frequency without the proper FCC license or other official authorization.

on a channel and then delay two seconds after the channel clears before scanning again. You can also scan for the seek mode, where the unit will roam through the squelch setting looking for any kind of signal and then stop and hold permanently. And we found you can stop scanning momentarily by pressing and holding the **Moni** button. (*Turning the knob at the top will reverse the scan direction, and you can stop scan altogether by pressing the **MR** button, which is what you press and hold to begin scanning.—ed.*)

Toning Up

One of our reviewers liked the automatic tone squelch ID. This allows you to monitor the input of a repeater and detect what tone operators are using to access it. But a word of caution here: even though you may know the tone for a particular repeater input, double-check that the repeater is listed as "open" before using it. FCC rules clearly state that repeater owners may restrict who might operate through their system, and

tone-coded squelch is one way to restrict access.

The keypad DTMF (touch-tones) may be used for placing phone calls via a repeater autopatch, and may also serve as repeater control tones. For quick autopatch access, you can store up to 16 digits in each of 10 dedicated DTMF memory channels. For most hams, 10 is plenty!

Getting a Charge Out of It

"One thing I didn't like was that the wall charger plugs into the radio, not the battery pack," comments a reviewer. "This means the radio is out of commission for the six to 10 hours you need for recharging from the slow wall charger." And if you have a second battery pack, this pack must charge off of a rapid charger, because your G71 is already tied up charging the first pack. Also, the belt clip on the battery pack means you need to buy a belt clip for each battery pack if you're planning on swapping battery packs quickly in the field without changing belt clips (see Photo B).

Kenwood offers the BC-19 rapid charger to help you out with this battery dilemma, plus the BT-11 battery case, which holds alkaline cells. I strongly recommend every emergency communicator get a couple of these cases and stock them with alkaline AA cells for emergencies.

High Marks Overall

On the air, the Kenwood G71 received excellent signal reports. Everyone commented that the transmit audio sounded "rich" and "full." I also had the opportunity, at the Dayton Hamvention™, to plug in the Kenwood VC-H1 visual communicator. I sent a still picture from out at the flea market over to David, WA6TWF, in the Kenwood demo booth. He received my 45-second color shot clearly. I think the new VC-H1 communicator will be a fun addition to the Kenwood G71, especially when mountain-topping. (*Watch for a review of the VC-H1 in an upcoming issue—ed.*)

"For our review, we gave the TH-G71 to several new ham radio operators and asked them to read over the manual, double check the quick reference guide, and begin programming by themselves. All did well once they got the hang of where everything was within the menu...."

So the G71 from Kenwood gets high marks from all the reviewers. Everyone liked the illuminated keypad and the ability to assign names to every memory channel. And 200 memory channels that may be PC-uploaded will satisfy both the ham and the scanner enthusiast. And more good news: tone decode is included as a standard feature on the G71 so you don't have to crack the case and stick anything else in.

And even after the tower fall and the brief ocean bath, the tough little TH-G71 continued to work well. I like it! The list price for the TH-G71 is $409 with a 3-watt battery pack, and $429 with a 5-watt battery pack. "Street prices" are generally lower. ■

Resources

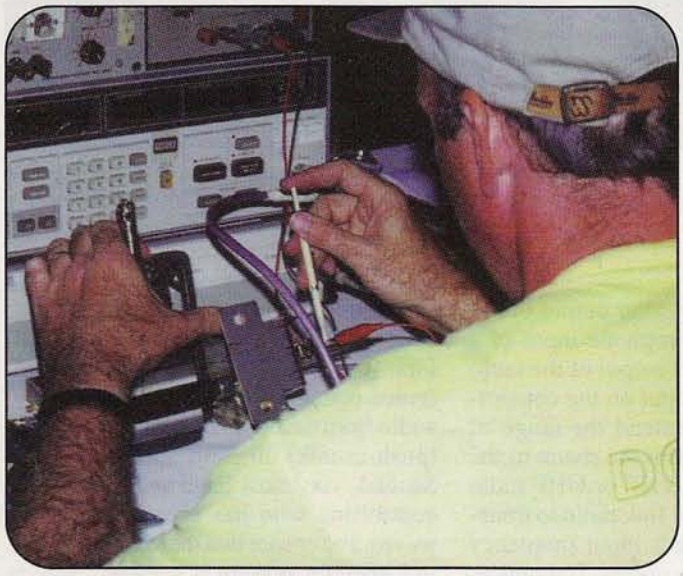
For additional information on the TH-G71, contact Kenwood Amateur Products Group, P.O. Box 22745, 2201 E. Dominguez St., Long Beach, CA 90801-5745; Phone: (310) 639-5300; Internet: <http://www.kenwood.net>.

The Extended Receive Modification described in "Expanding the G71's Frequency Coverage," may be downloaded from Kenwood by going to their Web site (address above), then clicking on FTP, then Amateur, then Extended Receive Modifications, and selecting the TH-G71. Additional details on the extended transmit modifications are available from Kenwood's customer service department on submission of proof that you're authorized to transmit outside the amateur bands.

Snapshots at Central States

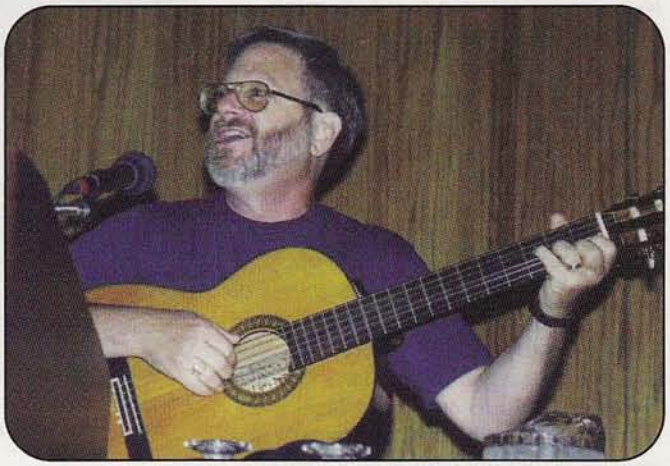
Just in case you thought that VHF conferences were all long, boring lecture sessions, think again. Our roving photographer caught these decidedly non-lecture-ish shots at the 1998 Central States VHF Society Conference last July in Kansas City, Missouri. (And by the way, the lectures weren't boring in the least!)

Fetch, Rover! Northern Lights Radio Society President Rich Westerberg, WØHJZ, accepts the 1998 "Big Bone" rover award from Rod Blocksome, KØDAS. In VHF contests, "rover" stations travel from grid square to grid square, handing out contest contacts from each grid they visit. (W2VU photos)



Makin' some noise! Tommy Henderson, WD5AGO, makes noise figure measurements during the Central States conference. Amplifiers brought in by participants were put to the test, with readings made for noise figure and gain on each device.

Al Ward, W5LUA (left), presents a plaque to Dave Blaschke, W5UN, in recognition of Dave's participation in the first single-Yagi to single-Yagi EME (moonbounce) QSO, from Texas to France, on 2 meters on September 21, 1997. The station on the other end was F/G8MBI. The Single Yagi EME Challenge was sponsored by Texas Towers and the VHF EME Report.



He wasn't playing "Stardust," but Paul Shuch, N6TX, did manage to entertain the conference participants with some songs he's written himself about SETI, the Search for Extra-Terrestrial Intelligence. Paul is Executive Director of the SETI League, which is recruiting hams to become amateur radio astronomers and help scan the skies for signs of life elsewhere in the cosmos.

If you've got a cool snapshot to share with us, but don't have a whole article to build around it, send it in to "Picture This," along with a brief description of who and what we're seeing. If we like it, too, and have the space, we'll print it (no pay, just glory). Send your color prints to *CQ VHF*, 25 Newbridge Road, Hicksville, NY 11801. Please don't write on the front of the photos or use ballpoint pen on the back. If you'd like your photo(s) returned, please tell us so and include an SASE (self-addressed, stamped envelope) with sufficient postage. Thanks!

Put Your Repeater on the Internet with a PIC Microprocessor Interface

Want to get more activity on your repeater? Try a link to the Internet...with an approach that offers several improvements over earlier methods. A versatile PIC microprocessor is at the heart of the connection.

By John Hansen, W2FS*
(<hansen@fredonia.edu>)

There is no shortage of repeaters in my area, but I've found that most of them are inactive most of the time. This is especially true in the middle of the day, in between the morning and evening rush hours. I've often wanted to find someone to talk to and found that dropping my callsign on any of the local repeaters produced nothing in response but a repeater ID—particularly when I operate from my bicycle, which I do a lot through at least half of the year. As a result, I'm always on the lookout for ways to encourage greater use of our local repeaters.

A Link to the Internet

I was extremely interested a couple of years ago to discover that it was possible to hook our local repeater into the Internet, thereby allowing users from all over the world to enjoy our local communications facilities.[1] Conceptually, the procedure for doing this is relatively simple. Using a program called "Internet Phone"[2] with a computer that has a sound card and a microphone, it's possible to send your voice over the Internet and speak to someone on the other end of your town, the other end of your state, or the other side of the world.

The author's son, Eric Hansen, KC2CDV, enjoys the fruits of his father's project by being able to use an HT to talk all over the world—via the Internet. (Photos courtesy of the author)

If you hook the speaker output of the computer to the microphone input of a radio and the speaker output of the radio to the microphone input on the computer, it's possible to extend the range of your conversation from the shack to the other end of a local VHF or UHF radio link. If you set up this link radio to transmit on your repeater's input frequency and receive on its output frequency, everyone using the local repeater can communicate with whoever drops in by way of the Internet.

Three complications arise in the course of doing this: one technical and two legal. First, you must have some sort of VOX (voice-operated switch) circuit so that the audio from the computer will trip the PTT (push-to-talk) line on the link radio. Second, you must have some means of controlling who has access to the airwaves, and ensure that there will be a control operator present if someone who is not a licensed amateur is accessing the system via the Internet. Third, if the system is to run in unattended operation, not

John Hansen, W2FS, is a professor at the State University of New York at Fredonia. He's former editor of the AMSAT Journal *and has recently gotten involved with discovering ham radio applications for Basic Stamp and PIC microcontrollers.*

Amateur Radio and Embedded Microcontrollers

Perhaps you've heard it said that "computers are in everything these days." It's almost true. While you don't find Pentium processors in everyday products, a vast number of products, including virtually all new amateur radio transceivers, contain tiny "computers on a chip" called microcontrollers. A microcontroller generally contains a CPU (central processing unit, the "brains" of any computer), plus on-board memory, input/output functions, and perhaps some peripheral devices like analog-to-digital converters or serial communications ports. Microcontrollers are referred to as "embedded" when they are completely contained within another product. Most appliances these days include embedded microcontrollers because they're extremely versatile and extremely cheap (some cost less than 50 cents each!).

The fundamental purpose of an embedded microcontroller is to take some sort of input signal (a button press, a sensor signal, serial port data, whatever), and convert it to some sort of output (turning on a light, making a sound, a serial data stream, a character on a screen, or input for some other device). Because it's relatively easy to program these devices and because they are so cheap, they're becoming very widely used in amateur radio construction projects. This trend will undoubtedly accelerate as more hams develop the skills necessary to work with them.

The microcontroller used in this project (a PIC 16F84) is made by Microchip, Inc. (*The folks at Microchip say "PIC" doesn't really stand for anything, although some people in the industry say it means "Peripheral Interface Controller." Your pic...—ed.*) It's unique because it can be programmed and reprogrammed electrically. You do need a programmer (a piece of equipment, not a person) to program it, but this equipment is relatively cheap and you don't need any special equipment to erase it for reprogramming. So you can "try out" the program you write for the chip and, if you need to make changes, you can easily do so. I've found that doing development work with "PIC" chips is a tremendous amount of fun because it lets me combine my interests in creating new hardware with my interests in programming software.

Information on how to get started designing and programming with PICs will be available this fall in a *QST* article I've written entitled "Using PIC Microcontrollers in Amateur Radio Projects." (*The* QST *editors say they're planning to run this article in their October issue, as long as it doesn't get "bumped."—ed.*)

only must you have some method of excluding non-hams, but you must also provide a mechanism for the system to transmit a legal identification.

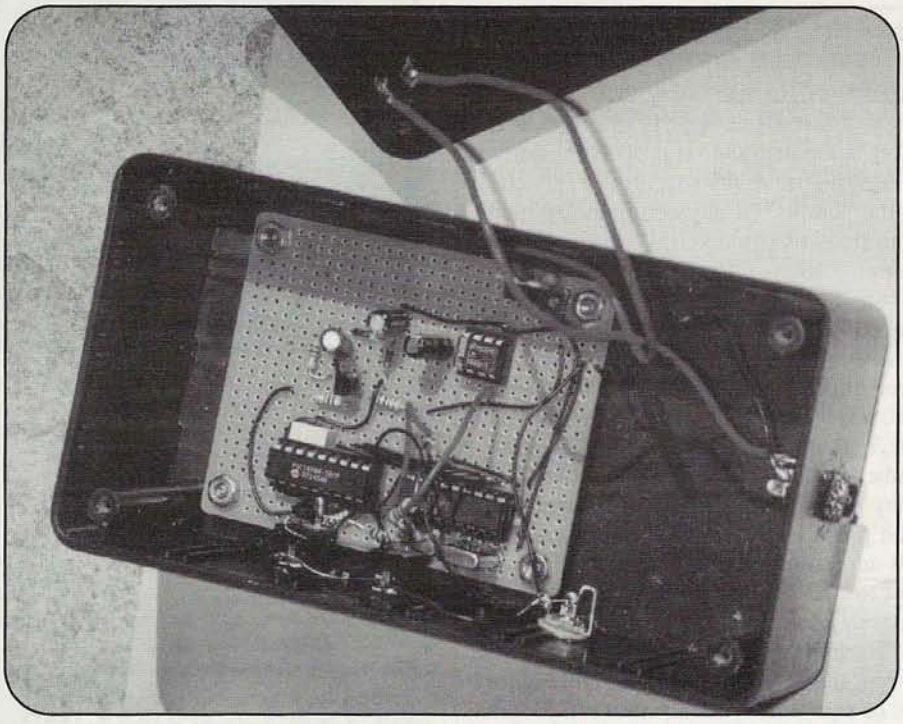
RepeaterLink

Mark Brown, N9YNQ, and Jack Leverich, KC9KY, devised a fairly clever scheme for getting around the legal problems associated with linking amateur radio repeaters to the Internet. They developed a program called "RepeaterLink," which works in conjunction with Internet Phone to check the callsigns of incoming users from the Internet to make sure that they're actually licensed amateurs. They also built in a mechanism that would allow the RepeaterLink station to ID periodically.

When this software first became available, I put up a link from the Internet to one of our local repeaters and sat back to see what would happen (*be sure you have the repeater owner's OK first!—ed.*). Over the course of a week, we had users on our repeater from almost every continent. Local hams were amazed to be making DX contacts with their HTs. A number of "local" hams who were more 50 miles away from our repeater put up new antenna systems just so they could access our Internet link. I found I worked so many stations on my daily bike rides that my batteries would run down toward the end of the ride. All of a sudden, we had regular users of our local repeater with QTHs like Australia and Okinawa. Once I even worked a station in the Dominican Republic who was using CW. In short, we had a ball!

A Few Problems

There were some problems with this system, however. First, we found that the RepeaterLink authentication method often failed. Individuals who really were licensed hams, and really were in the online callbooks, still would not be let into the system. Second, if we ran the RepeaterLink software, only Internet



The protective interface board, which the author wired together on a piece of breadboard. Printed circuit boards for this project are available from FAR Circuits (see "Resources").

The author's interface board (in the black box at top of photo) connects his Internet link with a local repeater by feeding audio between a VHF/UHF radio (center) and his sound-board-equipped computer (bottom). The UHF section of the radio is used for the control link that can remotely turn the unit on or off.

end users who were also running this software would be allowed into the system, even when it did authenticate properly. Third, while the RepeaterLink software could transmit either a voice or code ID, the software did not know (without some significant hardware modifications) whether it was "stepping" on someone when it sent an ID. Fourth, even with the RepeaterLink software, I believed I would feel a lot better about operating this system when I was away from my shack if I had the ability to control it remotely from my HT.

Finally, the most common approach to implementing the VOX circuit was to use a RadioShack Voice Activated Telephone Recording Control box (RS 43-1263). This was fairly expensive ($35) and, more importantly, the box was difficult to adjust properly. In fact, while some boxes worked quite well, others were almost impossible to adjust so they would trip the PTT line every time, yet still release it when the audio disappeared.

A Different Approach

It seemed to me that I needed a somewhat different approach to an interface box. I wanted it to utilize an inexpensive and robust VOX circuit. I wanted it to automatically ID using a Morse Code IDer that would only transmit when the link radio was transmitting anyway (this way, it wouldn't key the transmitter when someone on the local side of the conversation was talking). I also wanted to make it possible for the Internet link to be legally operated without using the RepeaterLink software. This would allow non-ham guests and hams without RepeaterLink software (as well as other hams who were experiencing problems with the RepeaterLink authentication method) to have access via the Internet *when a control operator was on duty*. To accomplish this, the interface unit should provide a mechanism for remotely exercising the control operator function using DTMF (Touch Tone®) commands.

In short, I needed a "smart" interface (see first Photo). I decided to design the interface around three basic components: a VOX circuit to key the transmitter, a DTMF receiver chip to listen for the control tones that would turn the link on and off, and a microcontroller to run the whole thing and provide the Morse code ID.

For the VOX circuit, I found that a handful of parts, all of which are available through RadioShack for just a few dollars, would do a better job than the RadioShack pre-built package. This circuit uses an LM386 single-chip audio amplifier to boost the incoming signal level. A two-diode circuit is then used to rectify the signal. A timing circuit made up of a resistor and capacitor then assures that the VOX does not drop out between words in normal speech. Finally, an NPN transistor (2N2222 or almost any other NPN will do) provides a 5-volt output when no signal is present, but a zero-volt output when a signal is detected.

"I decided to design the interface around three basic components: a VOX circuit to key the transmitter, a DTMF receiver chip to listen for the control tones that would turn the link on and off, and a microcontroller to run the whole thing and provide the Morse code ID."

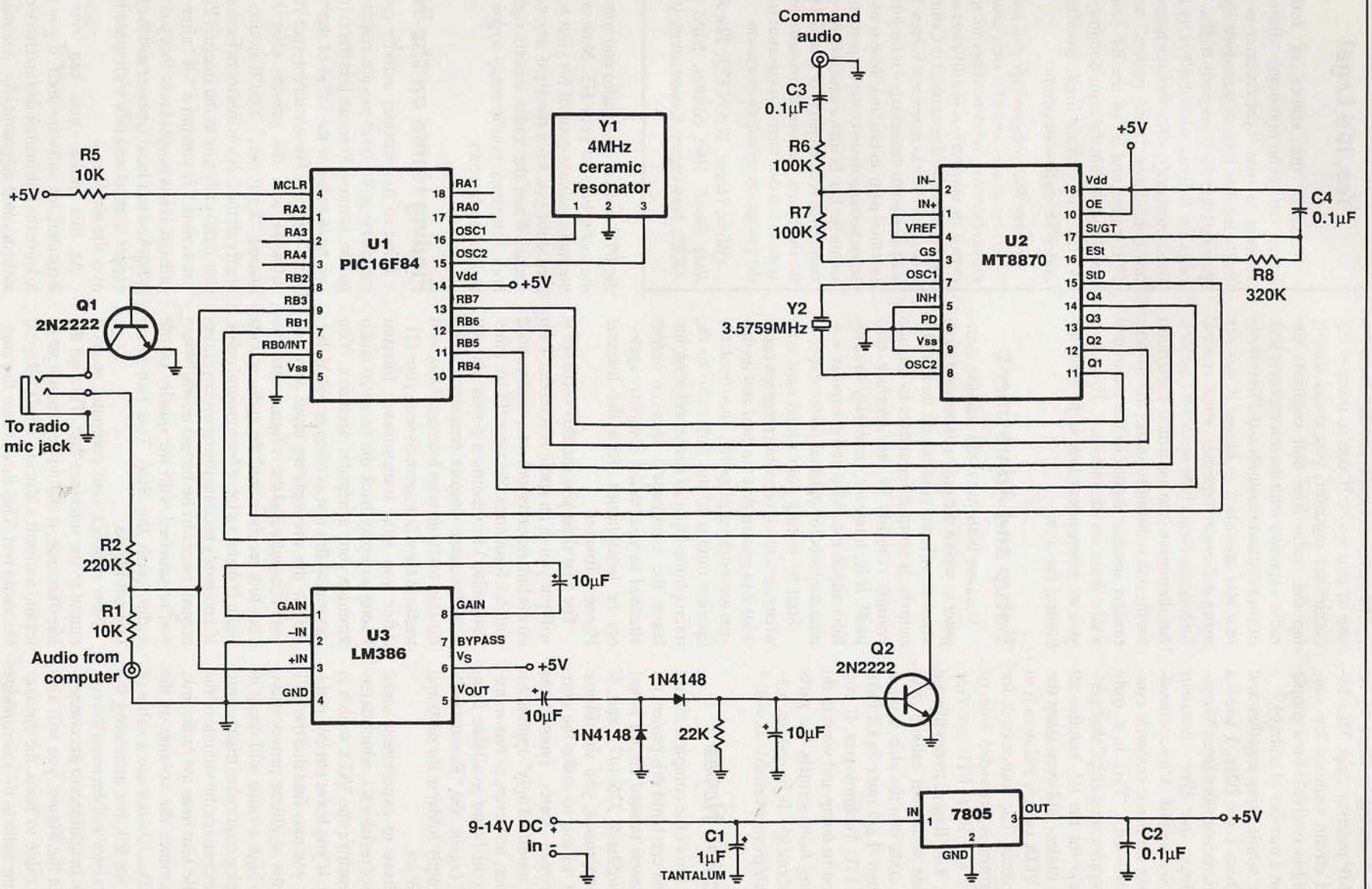


Figure. Schematic for the repeater/Internet interface unit. Connections go to power, computer audio, rig audio, and "command" audio. This is a separate input for a remote control link.

The DTMF decoding is done by an MT8870 DTMF receiver chip. This 18-pin integrated circuit requires few outboard parts and is available for a couple of dollars from a number of sources.[3]

To hold the whole thing together and provide a Morse code IDer, I used a 16F84 PIC microcontroller from Microchip Technology, Inc. (*See "Amateur Radio and Embedded Microcontrollers," for more on these versatile one-chip computers—ed.*). This is a truly amazing "computer on a chip" that generates the audio for the ID, handles all the ID timing duties, and even takes the output of the VOX switch and uses it to key the transmitter. The source code for the PIC program is provided free of charge on the *CQ VHF* FTP site (see "Resources"). You'll have to modify the code to include your own callsign and then burn the code into the chip using a PIC programmer (I got mine in kit form for $39 from ITU Technologies. If you know what you're doing and want to do the whole thing from scratch, the parts will cost you about $5). If you prefer, pre-programmed chips are available as well.[4]

Construction Notes

The Figure shows the complete circuit schematic. You can build this project on a piece of generic printed circuit board (such as RadioShack 276-147), and, if you use this approach, you should use point-to-point wiring to make the connections between parts (sometimes known as the "modified ugly" approach). It's much easier, however, to buy a pre-fabricated circuit board available from FAR Circuits (again, see "Resources"). In this case, simply solder in the parts and you're in business.

You may have to experiment some with the value of resistor R1, which determines how sensitive the VOX switch is to audio input. If you leave out this resistor altogether, you may find that the PTT line trips at the slightest provocation. However, too high a value will result in a loud noise being required to trip the unit. Resistor R2 determines the volume of the computer audio sent over the radio link. And R3 determines the volume of the Morse code IDer. Do not use a value of less than 1K for R3, but increasing the value of this resistor will decrease the volume of the ID. In addition to the connections shown in the Figure, you will also need a patch cable to hook the speaker audio from your radio to the microphone jack of your computer sound card.

The command audio can be handled in one of two ways. If you're using a 70-centimeter repeater, you could simply tap the audio line that connects the radio's speaker with the microphone jack of your computer sound card. *Please note that this approach is illegal if you are using a 2-meter repeater, since control links cannot legally be made on 2 meters.* An alternative is to use a dual-band radio for the link radio and connect the 70-centimeter speaker output to the command audio input on the interface. This gives you an independent link to provide the control function.

Setup and Adjustment

Because both the radio and the computer to which the unit will connect have separate volume controls on their audio outputs, it seemed redundant to include volume controls in the interface unit itself. It is, however, necessary to carefully adjust the radio and computer volume controls for optimal performance.

Start by testing your sound card with whatever sound recording program came with it to ensure that the card and its drivers are working properly. Then hook the speaker output of the link radio to the microphone input of the sound card, but leave the computer's speaker output attached to your usual computer speakers or headphones. Run the Internet Phone software.

The first time you run this software it will put you in an audio test mode. Turn on the link receiver and set it to an unused simplex frequency. Set your HT (or other transmitter) to minimum power and put it on the same simplex frequency. Push the start test button on Internet Phone and transmit for a few seconds with your HT. After you stop transmitting, Internet Phone will play back the received audio through your computer speakers. You can repeat this test as often as you'd like. Adjust the microphone input level on your computer and the volume control on your link receiver until the audio sounds right. If there's a lot of background noise, it's probably because the receiver volume control needs to be turned down. When you're satisfied with the quality of the audio, push the Stop Test button on Internet Phone.

Now connect your computer speaker output to the interface unit. Turn on the interface unit; it should key the transmitter and transmit a Morse Code ID. Repeat the audio test. This time, when the computer plays back the audio, it should trip the PTT line on your radio and transmit the audio back to your HT. Now adjust the main volume control for your sound card until you have the right amount of audio. When the audio sounds right in both directions, you're ready to join the fun on the Internet.

Yes, It's Legal

Relaying the voices of foreign hams—and even non-hams—from the Internet to your local repeater is perfectly legal as long as you abide by the general rules for third-party traffic. The rules for *international* third-party traffic *do not apply*, since foreign hams are not considered "third parties" under FCC rules, and all of the RF control points are within the same country. The ARRL's *FCC Rule Book* specifically addresses such a situation:

> If both first (originating) and second (receiving) parties are in the same country, the international prohibition does not apply, even if the third party is in a different country. For example, if an amateur in California sends a message to an amateur in New York who then sends the message via the Internet to a third party in England, there is no violation because the over-the-air portion was within the US. In such a situation, the communication is delivered to or received from the third party via normal communications systems and thus there is no revenue loss to the foreign communications system.

(Bliss, Norm, WA1CCQ, *The FCC Rule Book*, 10th edition, page 7-2; ARRL, Newington, Connecticut, 1995)

Finding Hams on the 'Net

Most of the repeater activity on the Internet is going on in private, rather than public, forums. You can join the fun, but you have to know the name of the "chat room" to do so. Have your Internet Phone software join the private chat room named "RptrLink." You'll notice that nearly all the folks in this room have amateur radio callsigns in the Internet Phone "nickname." If you put a "-R" after your callsign, it lets people know that your site is hooked to a local repeater and they can expect to meet and talk with other hams over the air there.

At this point, you can run the RepeaterLink software itself, if you wish to leave the link unattended and have users authenticated automatically. Alternatively, if you plan to have a control operator

Resources

Hardware

A printed circuit board for this project is available for $4.25 + $1.50 shipping from FAR Circuits, 18N640 Field Court, Dundee, Illinois 60118; Phone/Fax: (847) 836-9148; E-mail: <farcir@ais.net>; Web: <http://www.cl.ais.net/farcir/>. Visa/MC accepted, with $3 surcharge.

The MT8870 DTMF decoder chip is available from several sources, including BG Micro, P.O. Box 280298, Dallas, TX 75228; Phone: (800) 276-2206; Web: <http://www.bgmicro.com>.

The 16F84 PIC chip is available from Microchip Technology, Inc., 2355 W. Chandler Blvd., Chandler, AZ 85224; Phone: (602) 786-7668; Web: <http://www.microchip.com>.

For more information on the RadioShack Voice Activated Telephone Recording Control box, visit your local RadioShack or contact: RadioShack, 1500 One Tandy Center, Ft. Worth, TX 76102; Phone: (800) 843-7422; Web: <http://www.radioshack.com>.

PIC programmers are available from a variety of sources, including ITU Technologies, 3704 Chevoit Ave., Suite 3, Cincinnati, OH 45211; Phone: (888) 448-8832 (sales only) or (513) 661-7523; Fax: (513) 661-7534; E-mail: <sales@itutech.com>; Web: <http://www.itutech.com>. (*Note: The ITUtech home page includes a link to an excellent page of ham radio links—ed.*)

Software

RepeaterLink software is available from: <http://mebcs.ezl.com/rptrlink/>.

A free trial version of Internet Phone is available from <http://www.vocaltech.com>. For more information, contact VocalTech Communications, Ltd., 35 Industrial Parkway, Northvale, NJ 07647; Phone: (201) 768-9400; Fax: (201) 768-8893; E-mail: <info@vocaltech.com>.

PIC source code for this project may be downloaded from the *CQ VHF* FTP site at <ftp://members.aol.com/cqvhf/98issues/w2fscode/vox.c> and <.../vox.h>. The two files must be compiled using a CCS C compiler and then loaded into the 16F84 PIC chip using a PIC programmer. (*If you don't have access to these tools or know how to use them, your best bet will be to take up the author on his offer to provide partial kits with preprogrammed chips; see Note 4.—ed.*)

on duty (either locally or over the command link using the DTMF commands), you should simply set the Internet Phone software for "Auto Answer."

When the interface unit is first turned on, it assumes that you wish have the link up. To take it down, simply key in on your HT the two-digit sequence that you've programmed as the "off" code. To bring it back up, key in the "on" DTMF sequence.

DO Try This at Home

Try this yourself and you'll be surprised how the level of activity on your repeater will pick up (*but, again, make sure you have the repeater owner's permission first—ed.*). In addition to raising the general level of activity, it also allows you to meet new hams from all over the world in an environment that's free from interference, noise, and fading. ■

Notes:

1. This technique was first described by James Millner, WB2REM, in "A New Band for Your Radio," *QST*, December, 1996.
2. The product is made by VocalTech Communications, Ltd. See "Resources" for contact info.
3. BG Micro, for example, sells them for $2.25 each.
4. I will provide a partial kit, including a preprogrammed PIC chip, the MT8870 DTMF chip, the ceramic resonator, the crystal, and the 320-K resistor (which is not stocked by RadioShack) for $35 postpaid. When ordering, clearly specify the callsign you want to use, a two-digit code for bringing up the link, and a two-digit code for turning the link off. Address your request to: John Hansen, W2FS, 49 Maple Ave., Fredonia, NY 14063.

ATV Today and Tomorrow

Our amateur television column returns from a "hiatus" (TV talk) with a new editor, some new distance records, and some new ideas on recruiting new ATV operators. Isn't it time you tried something new?

Hello, ATVers (and potential ATVers). Let me take this opportunity to introduce myself. My name is Ed Manuel and the call is N5EM. I'm a native of Houston, Texas, and a founding member of the Houston Amateur Television Society, Inc. (HATS). My hope is that this column can be a focal point for what's happening in ATV and what's developing for the coming years.

New Opportunities for ATV

ATV is certainly changing. Those of you who have been playing with ATV for the last 20 or 30 years certainly know what I mean. It's all about cost. You can get into ATV for less than ever before, and it's only going to get better. The rapid pace of technological change in the consumer video arena has made available cheap video equipment. Once, a video camera was the most expensive part of an ATV station. Today, you can find them at sidewalk sales, flea markets, and pawn shops for under $50. That, combined with the large number of ATV-related suppliers, has made it very economical to assemble a station.

So why aren't more hams giving ATV a try? I think it boils down to the need for some marketing. I want to make this column a place where you can find out what's going on in the world of ATV. I'd like to fill it with ideas that will help you recruit hams in your area. And, I'd like *you* to help. Please consider taking a few minutes to report on your local activities.

Some ATV groups have done a splendid job of publishing articles on their public service activities. I've enjoyed reading tales of the Rose Bowl Parade, the hot-air balloon competitions, and other special events. This past winter, our local ATV group (HATS) provided live video coverage of the Houston Marathon for the fourth year in a row (I'll tell you all about that in a future column). If you don't feel up to writing an article on your ATV event (and I'd encourage you to do that), then send an e-mail and some photos (either paper or .TIF, .JPG, or .GIF files) to me and I'll put it into the column for you.

ATV record-breakers: Here is the team on one end of the recent record-breaking ATV QSOs on 10 and 24 GHz. From left to right: SWL Jacky; Michel Vonlanthen, HB9AFO; and Charly Girardet, HB9ADJ. See text for details. (Photo courtesy Swiss ATV Web site)

Get People Watching First

So let me start with an idea that you may be able to try in your own local area. It's hard to sell ATV until someone has actually *seen* ATV activity. For that, you need to get receive going. In Houston, we're currently using 421.25 MHz as an ATV repeater output (actually, one of several). This is our primary recruiting tool, since it can be tuned in on any cable-ready TV set connected to an antenna (*not* to cable) and tuned to cable channel 57.

We started with a simple, inexpensive ATV Yagi design by Kent Britain, WA5VJB. This Yagi is made from a hardwood boom and 3/16-inch diameter brass welding rod elements. The design is optimized for 75-ohm cable to match the input of a cable-ready TV. It's also optimized for your wallet—these antennas cost around $10 apiece to make.

One of our retired members, John Coles, W5AUH, volunteered to make

By Ed Manuel, N5EM (<n5em@amsat.org>)

these antennas in quantity. To date, he's made over 200 of them. Most are somewhere in the Houston area. We typically ask for a donation of $20, but John has been known to take one to an interested ham and *give* it to him if he'll put it up. Often, to make sure there's no fundamental terrain problem with reception at a prospect's QTH, John will take his mobile ATV setup into the field. Sitting in front of the prospect's house, John will not only show him reception from the ATV repeater, he'll also fire up the mobile ATV station and show him full-duplex video from the truck. Now that's taking the bull by the horns. But don't expect to see John at your door if you don't live in the Houston area. (Anyone else willing to follow John's lead in other parts of the country?) Once an interested ham learns just how easy it is to receive the ATV repeater, that interest level begins to climb.

Club Loaner Units

Perhaps you don't have the luxury of a "cable-ready" 70-centimeter output on your ATV repeater. Your particular system may require a downconverter from either 902 MHz or 1.2 GHz to feed that cable-ready TV. How about your club purchasing one or two receiving systems (downconverter, antenna, and feedline) and *loaning them out* for a few weeks to interested hams? Better yet, how about getting a couple of the gang together and going over to the ham's house and helping him or her install the antenna and get it running?

We're applying a little psychology here. First, we take away the excuse that someone is too busy to get the equipment put together and the antenna up (I never use that one, of course). Second, we take away the objection to spending money to get into something that they may not like after all. Finally, we get them watching what's going on. That's the ticket for getting them hooked. I could tell you stories about HATS members who got their receiving systems running and joined in on the 2-meter talk-back frequency. It started driving them crazy that they couldn't send video like the rest of us. In no time, they were at the meetings talking about getting a transmitter and finding a used camera.

Showing Off...

Another requirement for successful recruiting is to get in front of prospective hams. You have to tell your story. When we started HATS, we visited nearly every ham club in the greater Houston area. Houston is one of the largest cities in the country. You can literally take over an hour to cross from one side to the other. With so much space for people to live in, it's natural for local ham clubs to spring up, and we have at least a dozen (I'm not sure of the current count). I have personally visited over half of these, preaching the gospel of ATV. Some of these clubs have us back once a year as regulars on their program.

"If you try [giving ATV presentations] don't just get up and talk 'off the cuff.' You have to work on your presentation. It needs to have impact. It needs to have energy. If you want those listening to you to get excited about ATV, you have to sound like you are excited about ATV."

If you try this, don't just get up and talk "off the cuff." You have to work on your presentation. It needs to have *impact*. It needs to have *energy*. If you want those listening to you to get excited about ATV, you have to sound like *you* are excited about ATV. I have an advantage in that I do this for a living. My job requires that I present technology to customers and get them excited about what we have to offer. You can do this, too. In a future column, I'll talk about how to present ATV and what kind of demonstrations seem to work best for us. And, please let me know about your successes. I know that there are some very active, effective clubs out there. Let us know what works for you and we'll pass it on.

New Microwave ATV Distance Records Claimed

Thanks to John Jaminet, W3HSM, for alerting us to two new claimed ATV distance records. First, a new world record for ATV on 10 GHz was accomplished between TM2SHF (operators: F1AAM, F1JSR, F5BUU, and HB9DLH), located on the Col de Piana on the Island of Corsica in grid square JN42HF, and EA5/HB9AFO/P (ops: HB9ADJ, HB9AFO and SWL Jacky), located on Monte Pego in Spain in IM98XU. The distance is 821 kilometers or 510 miles (701 km. / 434 mi. was the prior record). P5 (the visual equivalent of S9, a very strong signal) strength signals were exchanged over the course of more than two hours, with power levels of 1 and 20 watts and antennas between 2 feet (60 centimeters) and 40 inches (1 meter).

Second, a new European ATV record was made on 24 GHz between TM2SHF in JN42HF, Corsica, and F/HB9AFO/P in JN23WE, Mont Caume, France. Distance this time was 248 kilometers or 154 miles (no information on what the old record was). This was a one-way "QSO," with the HB9AFO group hearing TM2SHF's signal at a level of P3 with QSB (fading). TM2SHF was running 200 milliwatts to a 2.5-foot (75-centimeter) dish antenna. HB9AFO was receiving on a DB6NT converter using a special feed and a 40-inch (1-meter) parabola.

Additional information on these new records can be found on the Swiss ATV Web site at <http://www.cmo.ch/swissatv/news025.htm>. Congratulations to our European friends on these splendid accomplishments. Anyone on this side of the pond willing to take up the challenge?

Communicate!

That's all for this first column. I'm looking forward to correspondence from the ATV community and sharing your ideas with everyone. You can reach me via e-mail at <n5em@amsat.org>. Please send me information on your activities, your success stories, and anything else you think would be of interest to the ATV community. If you have digital images, please attach them to your e-mail and send them along. If you send images, please include photo credits with them. If you need to send paper photographs, you may send them to Ed Manuel, N5EM, 4734 Shetland Lane, Houston, Texas 77027. Please include an SASE if you would like them returned. (*Editor's Note: Paper prints still work best for us, but don't take a film photo of a digital image. If you do have digital images, please make sure they're of the highest possible resolution, and save them in a major image format, such as .TIF, .JPG, or .GIF. And please send them as separate files, rather than embedding them in your text file. Thank you.*) ■

What You've Told Us...

Our July survey asked you about *us*, for a change, instead of about you. How are you getting your copy of *CQ VHF*? How good a job are we doing?

First of all, most of you get the magazine by mail: 78% said the issue was addressed to them. Of the rest, 78% bought it at a bookstore or newsstand, 11% at a ham radio dealer, 4% at a library or from "other," and 7% weren't telling! The post office is doing a pretty good delivery job: 71% of the subscribers said their copy came on time, 23% got it early, and only 6% said it was late.

Looking at content, we continue to do well at meeting the needs of our individual readers. Overall, while 68% of you said we're meeting the needs of newer hams, and 58% said we're doing the same for experienced hams—79% of you say we're meeting *your* ham radio needs! And, asked specifically about the July issue, 61% said it met the needs of newer hams, 56% said it was good for experienced hams , and 73% said it was just right for *you!*

Finally, we asked what you'd like to see more of in future issues. First of all, 39% are happy with the current mix; 55% would like to see more beginner-level technical articles; 43% want more operating-related articles; 30% want more high-level technical articles and projects; and 22% would like to read more news/opinion-related articles (yes, that's more than 100%, but we said you could circle all options that applied).

As always, thank you for your responses to our survey. This month's winner of a free one-year subscription to *CQ VHF* is Robert Livrone of Lower Burrell, Pennsylvania.

CQ VHF Ham Radio Above 50 MHz

Reader Survey—October, 1998

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 involvement in emergency and public service communications.

	Circle Reader Service #
1. Please indicate whether you have *ever* been a participant in:	
Emergency communications	1
Disaster communications	2
Severe weather net	3
Public service event/activity (e.g., bikathon)	4
Emergency/disaster drill	5
Emergency training net	6
Message-handling (traffic) net	7
Other public service communications/activities	8
2. Please indicate whether you *regularly* participate in:	
Emergency communications	9
Disaster communications	10
Severe weather nets	11
Public service events/activities (e.g., bikathon)	12
Emergency/disaster drills	13
Emergency training nets	14
Message-handling (traffic) nets	15
Other public service communications/activities	16
3. Please indicate which, if any, of the following groups you belong to (circle all that apply):	
ARES (Amateur Radio Emergency Service)	17
CAP (Civil Air Patrol)	18
MARS (Military Affiliate Radio Service)	19
Public-service-oriented radio club	20
RACES (Radio Amateur Civil Emergency Service)	21
REACT (Radio Emergency Associated Citizens Teams)	22
SAR (Search and Rescue) Group	23
SKYWARN (Severe weather spotter)	24
Other emergency/public service group	25
4. Please indicate whether you feel you'd be prepared to respond and provide needed communications if a major emergency or disaster occurred in your community.	
Yes	26
No	27
Not sure	28
Not interested	29

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

The 6-Meter DX Window: Why, Where, and How Big?

Debate continues over a proposal made more than two years ago to broaden the "DX window" on 6 meters and move the SSB calling frequency from 50.125 to 50.200 MHz. We asked two 6-meter authorities, Bill Tynan, W3XO, and Ken Neubeck, WB2AMU, to take up opposing sides on the issue. First, Bill provides some background and his reasons in support of the proposal; then Ken responds in opposition.

Expand the 6-Meter DX Window

By Bill Tynan, W3XO*
(<w3xo@amsat.org>)

Six-meter operators new and old have heard that the band has a "DX window," but many may not be familiar with how it began or even its purpose. This article will attempt to provide background on how the 6-meter DX window got started, to show how it has always been intended to be used, and to justify its continuance and even expansion.

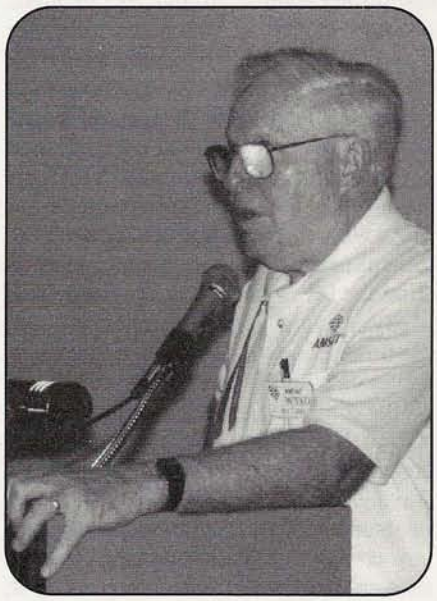
How Did It Get Started?

The origin of the 6-meter DX window can be traced back to the late 1970s, when a group of 6-meter operators in south Florida proposed that 25 kHz of the band be set aside for working stations outside the continental U.S. In those days, most 6-meter CW and SSB activity was centered around 50.110 MHz. Solar Cycle 21 was in full swing and DX was rolling in from all over. But during the peak of many of these worldwide openings, many hams intent on working DX stations experienced QRM (interference) from stateside stations working other stateside stations, or even stateside stations responding to their own calls for DX contacts.

At the time, I was a *QST* Contributing Editor, responsible for the monthly column "The World Above 50 MHz." As I considered it appropriate news for the column, I gave space to the suggestion from the south Florida operators. I must admit that not much happened for a while.

A few years passed, and, with the decline of solar activity, worldwide 6-meter DX became pretty much a thing of the past. But the summer months still offered occasional DX opportunities via sporadic-*E*. DXpeditions, such as those conducted by Jimmy Treybig, W6JKV, as well as some resident activity from nearby DX locations, such as the Caribbean islands, afforded considerable excitement during the summer months.

A favorite time for such operation was during the annual ARRL June VHF QSO Party. But the great amount of activity that event evoked made it difficult for many everyday users of the band to work the DX that popped up during the contest. What made this particularly difficult was the fact that those participating in contests are very focused on running up as high a score as possible; they're not particularly inclined to QRX (stand by) or QSY (change frequency) so others can work a DX station. In fact, working one or two DX stations themselves does not hold much appeal for many contesters, as the points gained are about the same as



Bill Tynan, W3XO.

Bill Tynan, W3XO, is a member of the Board of Directors of SMIRK, the Six Meter International Radio Klub, and a past VHF columnist for QST *magazine. He is also President of AMSAT-NA.*

"The origin of the 6-meter DX window can be traced back to the late 1970s, when a group of 6-meter operators in south Florida proposed that 25 kHz of the band be set aside for working stations outside the continental U.S."

working another stateside station, and certainly fewer than working a string of perhaps 10 stations in quick succession. That's just the nature of contesting.

Particularly in the case of multi-operator operations, often set up on high hills or mountains, a contest station tends to dominate a frequency, often for the entire contest. Quite naturally, these stations try to pick the lowest frequency in the band not already occupied by another dominant contest operation. If major QRM is encountered, they simply move up just a few kilohertz. Thus, 50.100 to 50.120 MHz, or even higher, would often be completely dominated by very loud contest stations for the entire contest period.

Now, remember, in those days 6-meter operation centered around 50.110 MHz, so that's where the DX stations would try to call. Of course, it was also where the contest stations tended to be. The conflict was particularly acute along the U.S. east coast, with its many contest operations set up on hills and mountains. This situation led a few east coast operators to plead with me to "do something to get the League to ban domestic contest operation from the lower portion of the band."

My answer was quite simple: Until we, the 6-meter operators, agree among ourselves on a modus operandi for the band, all the time, not just during contests, the ARRL is not likely to impose specific contest rules based on the pleadings of a small group of people. On the other hand, I contended, if a particular operating pattern could be established as the "norm," then such a contest rule, recognizing it, might be considered. I reminded them of the idea proposed by the south Florida group a few years earlier and suggested that it might represent the basis for establishing such a norm.

On this basis, I suggested the concept of a 25-kHz-wide DX window, as well as a new calling frequency of 50.125 MHz, in "The World Above 50 MHz." I conducted surveys and found that most, but not all, of those who responded were in favor of the idea. One of the questions asked was about classifying lower tier Canadians (VE1 through VE7) as if they were in the 48 contiguous states (*meaning they would not count as DX for the intent of the "window"—ed.*). Most, including the VEs who responded, also agreed with that premise.

After a year or so from publication in "The World Above 50 MHz," the idea began to take hold and, today, 6-meter activity in this country and the adjacent Canadian provinces is concentrated at 50.125 and above. Of course, adherence is not 100%. Observance of the DX window is voluntary and nothing voluntary is ever 100%. But very seldom does one encounter domestic QSOs between 50.100 and 50.125 MHz. Usually, when one does hear such a ragchew in that segment, the stations will QSY after informing one of them that they are operating in the DX window. Nine times out of 10, they immediately move up the band or terminate the contact. Such positive results don't happen every time, but, as I have said, it's voluntary. There is no FCC rule mandating the 6-meter DX window, and I, for one, would not want one.

Some Confusion Still Exists

However, there continues to be some confusion concerning the use of the DX window. A very few have contended that it's intended to be used only for *intercontinental* contacts, such as North America to Europe. Controversy concerning this arose during the DXpeditions to Sable and St. Paul Islands in the past few years. A few contended that these DXpeditions should not have operated in the DX window when attempting to make contacts with North America.

One possible source for this contention may stem from the rules published for the various ARRL-sponsored VHF contests. For a number of years, these rules have stated: "Participants are reminded that the segment 50.100 to 50.125 is by convention, reserved for intercontinental QSOs only." Even though the League didn't outlaw domestic contest contacts as the east coast operators urged, it certainly took a step in the intended direction by publicizing the existence of the DX window. This brought about the result sought by a number of 6-meter operators, with the almost complete elimination of contest operation in the DX window. Unfortunately, however, the specific wording of the rules published for each League-sponsored VHF contest has led to the misconception that the window is intended for contacts between continents only.

That idea is rather silly in the first place. For example, it's probably harder to work Puerto Rico from California than to work western Europe from New England. The DX window has always been intended to facilitate the working of DX stations by everyone using the band, no matter what part of the country they're in. For example, 4U1UN, located at the United Nations building in New York City, is a DXCC country. So, during those rare times when that station is activated, it's perfectly OK, even for people residing in the New York City area, to work 4U1UN in the DX window.

The following interpretation should eliminate any confusion about the use of the DX window: *For us here in North America, if the station is located in a DXCC country that is not part of the 48 contiguous U.S. states or the lower tier Canadian provinces, it's OK to call and work it in the DX window*. So, although 4U1UN is located in New York State, it does count as a separate DXCC country, and thus *may* be worked in the window. So, work it when and where you can. The same goes for other close-in DX countries, such as VP9, CO, C6A, FP, and XE.

The other bit of confusion is whether U.S. and lower-tier Canadian stations may operate in the DX window *at all*. Most of those who have been opposed to the window seemed to be so because of the mistaken notion that its establishment would put that portion of the band off limits to them. Nothing could be further from the truth. Of course they, and everyone

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else, may, when they are working or attempting to work DX, operate inside the DX window.

It's perfectly all right, for example, to call CQ in the window if you have some reason to think that DX might be coming through. One way you might conclude that DX is likely is by hearing the European TV video carriers at 48.25 and 49.75 MHz. What is frowned on is, say, one stateside station answering another stateside station calling CQ DX in the window. But even that is acceptable sometimes; for example, if the station is someone you particularly want to talk to, such as an old friend whom you haven't heard in a long time.

Be sure, though, when answering a domestic station in the DX window, to quickly respond and suggest an *immediate* QSY out of the window. A short exchange that occupies only a few seconds is not going to raise anyone's ire, but a five- or 10-minute QSO in the window probably will. Nevertheless, some who call CQ DX—in the window or elsewhere—are not particularly happy with getting continual calls from non-DX stations. So use your judgment. (*We now move from background into Bill's arguments in favor of expanding the 6-meter DX window and moving the SSB calling frequency to 50.200 MHz.—ed.*)

If It Ain't Broke, Why Mess with It?

The 50.100- to 50.125-MHz DX window served us quite well during the last solar cycle, from 1989 to 1992, and also in the intervening years of low solar activity. So why change it?

The idea of expanding the DX window, and hence moving the calling frequency, was first offered at the SMIRK (Six Meter International Radio Klub) breakfast held at the Central States VHF Society Conference in Minneapolis in July, 1996. About 25 very active 6-meter operators were present, including Jimmy Treybig, W6JKV, famous for conducting countless DXpeditions to rare countries to provide contacts for hundreds, perhaps thousands, of eager 6-meter operators. W6JKV told the group that, because of the many new radios coming on the market which combine 6 meters with HF coverage, as well as the inexpensive transceivers and transverters now available for the band, there will be many more 6-meter operators active in the coming cycle than has ever been the case before,

"Due to the tremendous increase in 6-meter activity...the situation is completely different than it was during the last [solar] cycle, making the current 25-kHz-wide DX window too narrow to support the DX and stateside activity which is certain to be present during the next few years."—Bill Tynan, W3XO

both in this country and throughout the world. For that reason, he said, a 25-kHz-wide DX window will prove woefully inadequate to support all of those trying to work DX both here and overseas. Therefore, he strongly urged that the DX window be expanded up to 50.200 MHz and that 50.200 become the new domestic SSB calling frequency.

This proposal was given publicity in a number of VHF columns and publications following that meeting. *CQ VHF* was one of those airing it. It was also prominently mentioned in Joe Lynch's "VHF+" column in *CQ* and in *QST*'s "The World Above 50 MHz" column, now conducted by Emil Pocock, W3EP.

As a result of this publicity, more and more activity was being heard above 50.2. While this is a distinct improvement, it still falls far short of representing a majority of domestic 6-meter activity.

SMIRK Contest Incentive

In an attempt to boost the idea, the SMIRK Board of Directors decided to include, in the 1997 SMIRK Contest rules, an incentive for making domestic contacts above 50.2. The point value of each contact would be doubled if the contact were made above 50.2. This approach seemed to work very well, with most of the activity in the 1997 SMIRK contest taking place above 50.2. I, for one, made no contacts below 50.2 during the contest and I found plenty of activity. Even though contestants were told that they could solicit contacts below 50.2 and then move up to complete the exchange, most found this unnecessary. I didn't find the need to resort to it even once.

The same approach was also implemented in the 1998 SMIRK Contest. Unfortunately conditions that weekend, in most of the country, were so but that the contest did not afford a good demonstration of the viability of the band above 50.2 MHz.

In order to bolster the expansion of the DX window and the associated moving of the calling frequency from 50.125 to 50.200, the SMIRK Board again addressed the matter at its meeting held last January. The Board, consisting of Tex Kennedy, N5TX; Ray Clark, K5ZMS; Pat Rose, W5OZI; Jimmy Treybig, W6JKV; Don Abell, KC5TK; and me, passed a resolution fully supporting the expansion of the DX window to include the 100 kHz from 50.1 to 50.2 and the establishment of a new calling frequency at 50.200 MHz. I was directed to write to various VHF editors documenting SMIRK's position, asking for support, which I did.

Not surprisingly, the publicity that followed the SMIRK Board's action brought forth quite a bit of support as well as some dissent. Some of the dissenters feel that no expansion of the DX window is warranted. Others feel that a 100-kHz-wide window is taking too much of the band for DX work. They contend that an expansion to 50.150 would be enough. In fact, this was the consensus at the 1998 Central States VHF Society Conference, at which members voted to accept a plan expanding the DX window only to 50.150, but to still move the domestic calling frequency to 50.200. SMIRK members meeting the following day overwhelmingly voted to go along with the CSVHFS proposal (more on this later).

Nonetheless, it was interesting that almost no one advocated going back to the old days before there was a DX window. Apparently almost everyone agrees that the concept has served us well and that it doesn't hamper domestic QSOs.

Responses to the Opposition

Some of the arguments against expansion the window are certainly worth examining. In response to them, I offer the following points:

1. A DX window helps everyone to work DX, especially low-power stations not able to "move" higher power stations out of the way as the higher power stations are often able to do.

2. A DX window helps the DX stations because they do not suffer strong QRM

from stateside and lower tier Canadian stations attempting to work each other, either by direct F_2 or F_2 backscatter. The stateside QRM will come only from stations trying to work the particular DX station, or another DX station on that, or a nearby, frequency.

3. Due to the tremendous increase in 6-meter activity as a result of the large number of new rigs now available, the situation is completely different than it was during the last cycle, making the current 25-kHz-wide DX window too narrow to support the DX and stateside activity which is certain to be present during the next few years. Thus, an expansion of the DX window to 50 kHz is justified if all of us—stateside, Canadian, and DX stations alike—are to derive the full benefit of what some predict may be one of the best solar cycles yet.

4. The current DX window from 50.100 to 50.125, in addition to being inherently too narrow, is also inadequate because a substantial portion of it suffers QRM in the vicinity of 50.110 from TV sets, computers, and other electronic devices.

5. A calling frequency at 50.200 makes good sense. Most VHFers are accustomed to the 2-meter SSB/CW calling frequency of 144.200. Having a similar spot on 6 meters should help alleviate confusion, especially among newcomers, and it will permit people to "move off" for QSOs *below* the calling frequency as well as above.

6. "Local," sporadic-*E*, and F_2 transcontinental QSOs will be just as viable around 50.200 as below. Weak-signal F_2 backscatter QSOs within the states may actually be facilitated around 50.200, as they will suffer less QRM from DX stations, or from stateside stations trying to work DX.

7. Despite what some may contend, most equipment, including antennas, will work just as well in the vicinity of 50.200 as around 50.125.

8. Some have contended that moving the calling frequency to 50.200 will inhibit sporadic-*E* contacts, because "the band opens from the low end up." While this progression of propagation from lower frequency to higher frequency is basically correct, it is much more true of long-haul F_2 than it is of sporadic-*E* or even the strong single-hop F_2. The number of contacts lost because the band is open at 50.125 but not yet at 50.200 will be extremely small. Whatever sacrifice made because of that will be much more than offset by the additional contacts everyone will be able to make with a 50-kHz-wide DX window.

"A calling frequency at 50.200 makes good sense. Most VHFers are accustomed to the 2-meter SSB/CW calling frequency of 144.200. Having a similar spot on 6 meters should help alleviate confusion, especially among newcomers."—Bill Tynan, W3XO

Update: The Central States Alternative

This topic came up for discussion again in July at the 1998 Central States VHF Society Conference held in Kansas City. The nearly 200 active VHFers present at the CSVHFS membership meeting voted overwhelmingly for a compromise which had been informally suggested earlier. It involves widening the DX window by a factor of two, so that it becomes 50.100 to 50.150, and moving the calling frequency to 50.200. This makes the 6-meter calling frequency consistent with that on 2 meters and affords the opportunity of QSYing either up or down from the calling frequency after contact is established. This CSVHFS resolution was brought up at the SMIRK meeting the next morning and the 30 SMIRK members present also overwhelmingly agreed to it. The SMIRK board is expected to follow suit.

Everyone Benefits

I hope that this explained why a 6-meter DX window is beneficial for everyone and provided a little background as to how it got started; as well as why it should be expanded at this time. By the time you read this, F_2 DX from such places as South America, Europe, Africa, and the Pacific may already be rolling in. You will surely want to maximize your likelihood of putting these exotic calls, which many of us have never before heard on 6 meters, in your log. An expanded DX window will materially enhance your opportunity to do so.

The SMIRK Calling Frequency Proposal: An Opposing View

By Ken Neubeck, WB2AMU*
(<kneubeck@suffolk.lib.ny.us>)

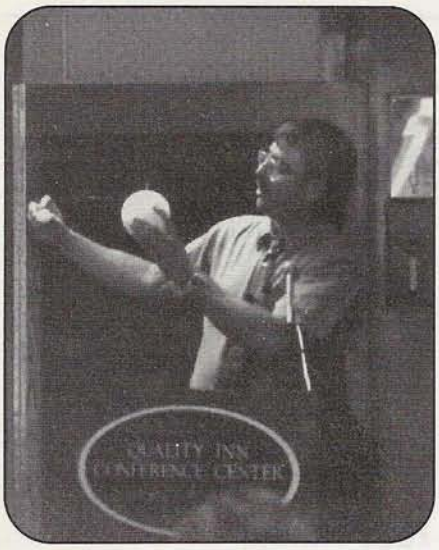
At the 1996 Central States VHF Society conference, a proposal was developed by a dozen SMIRK board members to expand the DX window from 50.100/50.125 MHz to 50.100/50.200 MHz and concurrently move the domestic SSB calling frequency from 50.125 MHz to 50.200 MHz. This proposal was pushed initially for the 1997 sporadic-*E* summer season and is again being pushed by the SMIRK board for the upcoming sunspot peak.

On the surface, many of the reasons for making the change would seem valid if one is to base the experiences cited on the past F_2 season from the last sunspot peak. However, the band has grown significantly since that time, both in Europe and the U.S. The conventions that were in place in the early 1990s have been accepted by the U.S./Canadian ham population and are in wide use today on the Magic Band.

Too Much, Too Late

At the risk of being viewed as anti-progress, I respectfully disagree with this proposal. I feel that this proposed change comes much too late at this stage of

* *Ken Neubeck, WB2AMU, is a* CQ VHF *Contributing Editor who writes regularly about 6 meters, and is author of* Six Meters: A Guide to the Magic Band, *published by Worldradio Books.*



Ken Neubeck, WB2AMU.

"I feel that the proposed 100-kHz window (or even the newly proposed 50-kHz window) for DX is overkill, since DX only occurs on the band less than 1% of the time. It seems somewhat contradictory to create a window this big that will end up being quiet better than 99% of the time."—Ken Neubeck, WB2AMU

development for the 6-meter band and can only serve to confuse matters on the air. A change like this made sense five years ago, but many more hams have gotten on the band since that time. It's much too late to try to make hams give up using 50.125 MHz as their main starting point for their daily 6-meter observations. There are several hams who have told me that they will still use 50.125 MHz as their calling frequency and focal point for the band, regardless of any proposed band plan changes.

If hams continue to use good operating procedures on six by spreading out during an opening, there's no problem. The SMIRK proposal suggests that 6-meter operators are not capable of employing proper operating procedures and that SMIRK knows what is good for those of us who use 6 meters.

There was a potential window of opportunity for effecting the proposed change during the 1997 sporadic-*E* summer season, when notices were posted on the Internet and in the various ham radio publications. To see if this change would be accepted by current 6-meter operators, I conducted an impartial statistical study of U.S. and Canadian 6-meter operators to see what frequency they operated on a month by month basis from May through August of 1997. The results showed that, by the end of the summer, there was *no significant migration* by hams towards using 50.200 MHz as the calling frequency, nor was 50.1 to 50.2 MHz left just for DX-to-North American contacts. Hams *did* spread out up to 50.2 during the contests and during major openings. This has generally been done by most in the past. The results of my survey were printed in the November 1997 issue of *Worldradio*.

Six-Meter Elitism?

It's important to note that the proposal was made by members of the board of SMIRK and not approved by the association's general membership. It would seem that a proposal of this magnitude should have been voted on by the general membership and not just by a small sample of hams My observation of discussions during some of the VHF conferences showed that there was mixed opinion on this subject and no clear consensus emerged.

It's also important to realize that there are many new hams on the band right now who are interested primarily in making any contact that they can, not necessarily DX. Many of these newer stations have a stake in the band and they have been keeping it active for the past five years through all of the sporadic-*E* openings during the sunspot minimum. They may not be members of SMIRK or other organized clubs anyway, so they will probably continue to operate as they've been doing, such as using 50.125 MHz as their launching point on the band. It will be too difficult to move so many hams if there is no concurrence with such a change.

Overkill

I feel that the proposed 100-kHz window (or even the newly proposed 50-kHz window) for DX is overkill, since DX only occurs on the band less than 1% of

the time. It seems somewhat contradictory to create a window this big that will end up being quiet better than 99% of the time. For such a small percentage of the time, why should another 100 (or 50) kHz of dead space be created on 6 meters, particularly on the low end of the band?

Many hams are justified in opposing making the band more quiet than it is, and this is what the expanded window will do during the quiet times on the band, particularly during the dog years of the sunspot minimum and during the equinox months when sporadic-*E* is rare. It just does not warrant this amount of band space. There is no such window on 10 meters and the one on 160 meters is about the same size as the current 6-meter window. Why deviate from what has worked well on other amateur radio bands? The proposed change will be self-defeating in promoting activity on 6 meters.

Creating a 50- or 100-kHz window is like stocking trout in one's backyard pool so that it's easier for an inexperienced person to catch trout. However, in the long run, this really does not help develop one's skill when trying to catch trout in real lakes and streams. This situation is somewhat similar to when lists are taken for artificial QSOs for working DX on HF bands like 20 meters. A skilled operator with good listening skills does not need such a broad window on *any* band to catch DX. Creating an artificial trout pond on 6 meters is not in the best interests of 6 meters or amateur radio.

"A skilled operator with good listening skills does not need such a broad window on* any *band to catch DX. Creating an artificial trout pond on 6 meters is not in the best interests of 6 meters or amateur radio."—Ken Neubeck, WB2AMU

Expanding the DX window is a little bit like the old fairly tale about "what day shall it rain?" How wide should a DX window be? The larger you make the DX window, the more ridiculous it becomes. How do you enforce the rules on a window that's 50 or 100 kHz wide? It is tough enough to enforce a 25-kHz window on six and other bands like 160. I don't think that there are enough ham radio "cops" available to police a 100-kHz DX window. Twenty-five kilohertz is generally a workable size for a DX window.

Use Good Operating Techniques

I contend that the better DX stations and DXers will use good strategy by looking up higher on the band anyway in order to thin out the pileups. Good listening practices are still fundamental skills for hams. A case in point is that several times during past summer season, I managed to make double-hop sporadic-*E* contacts to DX stations using the simple setup of 10 watts and a dipole!

One of my best contacts was a CW QSO with OX3LX on 50.127 during a tremendous sporadic-*E* opening in June, 1994. How did I manage this? It was a little bit of luck, but mainly, I listened across the band very carefully and caught the DX station when it first came on. This strategy worked for me during various HF contests and when I was working towards getting 100 countries on 80 meters. Listening is still the key to success in DXing! I might add that there will be many Europeans for North American stations to work when strong F_2 activity returns shortly. It's a different situation than it was for the last sunspot peak, and the need for a larger DX window is diminished.

Moving the SSB calling frequency to 50.200 to match what is done on 2 meters (144.200 is the calling frequency there) is not necessary or valid. Six is not purely classified a VHF band; it's actually an HF band with VHF characteristics, particularly since F_2 activity can be worked on the Magic Band.

Poor Timing

Regardless of its merits, though, it's too late for this proposal to be implemented now. The critical mass for this proposal being accepted by the majority of the 6-meter operators was the summer of 1997. It didn't happen. Operators did not change frequency at that time and the change will probably not happen now either. If we concentrate on the correct use of the 50.110 and 50.125 frequencies, there would not be as great a need for the proposal. Spread out when the band opens and observe the sanctity of the existing 25-kHz DX window. If we do what we're all supposed to do, there is no need for drastic measures as called for by the SMIRK proposal!

Central States Change Doesn't Change Much

The Central States VHF Society proposal described above, which changes the width of the proposed DX window expansion from 75 kHz to 25 kHz, was made after the main text of this article was written. In my view, it really makes little difference in the basic points that I've made here. I feel that even a 50-kHz DX window is still more space than is needed for a window for long-term usage of the band and still will be difficult to enforce. Regarding my other main point on moving the existing calling frequency, I still think it will be very difficult to modify the current amateur use and acceptance of 50.125 as the calling frequency, as so many hams have adopted this frequency as their focal point on 6 meters. This is borne out by so few hams having made 50.200 their calling frequency since the original SMIRK proposal came out two years ago. ■

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*:

- "The Magic of Radio Wave Propagation"—A 2-part primer by Lew Ozimek, N2OZ
- "Two Meters on Top of the World," by Lorraine Aubert, AC6XK
- "Make Your HT Talk Forever," by Ken Collier, KO6UX

Plus...

- "*CQ VHF* Review: ICOM IC-Q7A Micro Handheld," by Gordon West, WB6NOA
- "The 550T+ Laser Team," by Eric Stroud, KB2TCQ

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://members.aol.com/cqvhf/> 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.

Q & A

Questions and Answers About Ham Radio Above 50 MHz

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

Hi Kent, I enjoyed your article on "Really Cheap Antennas" (August, '98 issue). I have recently started working 2-meter single-sideband, using a stacked pair of KB6KQ loops. They work great! But I would really like to build a beam for 2 meters and can't wait until next month's article. Being new to rotating antennas, could you talk about how to rotate them cheaply and how to feed a rotating antenna? Tnx and 73

Richard Robb, III, KB6NIM
Rancho Cucamonga, California

A.: WA5VJB responds:

You'll find the dimensions for 2-meter and 222-MHz versions of the "Cheap Yagi" in this month's "Antennas, etc." column. As for turning the antennas, a RadioShack TV rotator is about the cheapest way to go at this time. I once had an eight-element 6-meter beam, a 15-element 2-meter beam, an 11-element 220-MHz beam, and a 21-element 432-MHz beam, all on one RadioShack rotator with a thrust bearing.

Q: The following question was addressed to "Digital Data Link" columnist Don Rotolo, N2IRZ:

Thanks for your previous help and encouragement with packet. ("Q&A" printed in *CQ VHF* in July). Since our discussion, I have been contacted by some of my old group that is taking a new interest in packet after leaving the hobby for a couple of years. They are setting up their old packet systems again and will eventually go to 9600 baud. Ham radios are even being placed back in vehicles!

The TNC that I had borrowed will soon be going back to its owner, so I purchased an MFJ-1270B at a hamfest the other day. After an extended search on the net, I am still looking for a diagram for connecting the MFJ-1270B to an ICOM IC-T22A HT. I have found conflicting diagrams, so I thought I would contact you for further info. Packetradio.com and packetradio.org had diagrams for ICOMs, but not specifically for the IC-T22A. Any suggestions?

Also have you come across any software written specifically for the MFJ-1270B? I was unable to find any specific DOS software, so I will probably stick to a generic Packet TNC program if no specially written software is available. Thank you for your continued help!

Michael D. Stephan, KB9MDQ
Tippecanoe, Indiana

A: N2IRZ responds:

Michael—Thanks for your letter. I'm not only glad to have been of help, but it's really nice to hear the great "follow-up" news! The 1270B is a great TNC. I don't know of any software written specifically for it, but there are a few programs that will work with it, and these tend to have a number of useful features, making packet operations easier. KAGold comes to mind, as does WinPack, but not having Windows limits what's out there. BayCom <http:// www.baycom.de> offers a program called BCT, or BayCom Terminal, but I'm not sure if it will work with the 1270B as is (you might need a WA8DED HostMode EPROM, available from many sources). GraphicPacket (GP) and MFJ <http://www.mfjenterprises.com> sell DOS software (MultiCom for DOS), but their catalog lists it as "for the 1270C." It might work with the 1270B, but you'd have to ask.

As for the interface to the ICOM T22A, I'm afraid that I'm not familiar with that particular radio. I see that it's a tiny 2-meter HT. For the straight scoop, do what I do: call ICOM. If you call them, they'll tell you what to do or fax you a diagram. Of course, you can also send them e-mail at <75540.525@compuserve.com>, and they'll take good care of you.

[Basically, you need four signals: Transmit audio (TXA) from the TNC, Receive audio (RXA) from the radio, Push-to-talk (PTT), and ground. RXA is easy—use the earphone jack. You can get ground from there, too. TXA goes into the external microphone input, and, strangely, so does PTT. To isolate TXA from PTT, you put a capacitor (1 µF to 10 µF) in series with TXA, and a resistor (ICOMs usually use 2200 ohms) in series with PTT, with both signals feeding into the single microphone input point.]

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, then 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 <CQVHF@aol.com> or <72127.745@compuserve.com>; or via our Web page at <http://members.aol.com/cqvhf/>. Be sure to specify that it's a question for "Q & A."

More Really Cheap Antennas

If you enjoyed Kent's August column on cheap Yagis (and many of you did), you'll love this month's installment, with dimensions for "rolling your own" on 2 meters and 222 MHz.

We've been discussing how to make a high-performance Yagi antenna out of readily available materials and how to do it simply and cheaply. In the last column, we went over the background of these really cheap Yagis; this month, we'll talk about 144-MHz and 222-MHz versions of the Cheap Yagi.

"Design compromises...cost about 1/2 dB of gain. But you can build these antennas for about $5! When it comes to dBs per dollar, you'll find these designs hard to beat!"

Self-Matching Antennas

The simplified feed uses the structure of the antenna itself for impedance matching. So the design started with the driven element and the other elements were built around it. Impedance matching is accomplished through the loading effect of the other elements, so Gamma, Delta, T, and other impedance matching methods and their complex parts are not needed. Design compromises for the feed impedance, asymmetrical feed, simple measurements, wide bandwidth, the ability to grow with the same spacing, and trade offs for a very clean pattern cost about 1/2 dB of gain. But you can build these antennas for about $5! When it comes to dBs per dollar, you'll find these designs hard to beat!

The antennas were designed with YagiMax, tweaked in NEC, and the driven element experimentally determined on the antenna range. Typically, the three-element version measures 8 dBi gain with a little over 20-dB Front-to-Back ratio. The four-element Yagi measures 9 dBi with 30-dB Front-to-Back, and the six-element beam gives you 11 dBi gain with 35 dB Front-to-Back. These figures are the same for both the 2-meter and the 222-MHz versions.

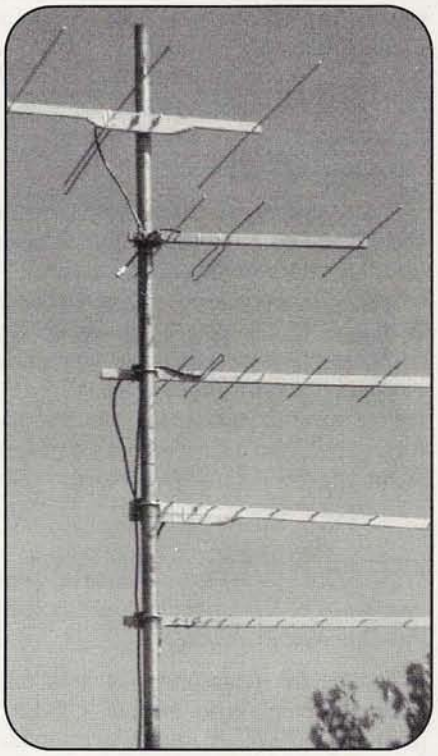
You can go longer than six elements—W5UN has had good luck with 16-foot-long wood boom Yagis in the past—but I felt that a 6-foot-long, six-element version was about the limit for rover operations and 3/4-inch diameter booms.

Building the Antennas

For the 2-meter and 222-MHz versions of the Cheap Yagi, I used a boom made from 3/4-inch square wood. A drop of Super Glue (or RTV) is used to hold the elements in place. Figure 1 provides the details of attaching your feedline to the driven element, and Figure 2 gives you the details on the 2-meter driven element. Other dimensions and element spacings for the 2-meter version are in Table 1. These measurements provide the best match in the single sideband portion of the band (around 144.200 MHz). To optimize the antenna for the FM portion of 2 meters, simply shorten each element .5 inches.

The dimensional details for 222 MHz are found in Figure 3 and Table 2. Like the 2-meter version, this antenna is peaked for SSB use at 222.1 MHz, but performance is barely changed at 223.5 MHz, the national FM simplex frequency. Actually, the gain is slightly higher at 223.5 MHz, but the pattern is not quite as clean.

My three- and four-element versions are end-mounted (see Photo) and I have two sets of holes drilled in the boom so I can mount the antenna either horizontally for SSB or vertically for FM.



Yes, you've seen this photo before...this time, though, we're interested in the top two antennas on the stack (144 and 222 MHz) instead of the middle one (432 MHz).

As I mentioned the last time, a coat of spar varnish or polyurethane will help these antennas last for years. After portable or rover use, I just store the antennas in the garage, and they still look fine after six years.

Other Materials

The question of using other materials for the boom has been asked by many

By Kent Britain, WA5VJB (<WA5VJB@cq.net>)

Table 1. 144 MHz

# of Elements		Reflector	Driven Element	D1	Directors D2	D3	D4
3	Length	41.0	*	37.0			
	Spacing	0	8.5	20.0			
4	Length	41.0	*	37.5	33.0		
	Spacing	0	8.5	19.25	40.5		
6	Length	40.5	*	37.5	36.5	36.5	32.75
	Spacing	0	7.5	16.5	34.0	52.0	70.0

*See Figure 2 for details on Driven Element (DE) dimensions

Table 1. Element dimensions and spacing for the 2-meter "Cheap Yagi." All dimensions are in inches. Spacings are all from zero; NOT *the closest element. Reflector and directors are made out of 3/16-inch diameter material. If you can't find 3/16-inch diameter material and want to use 1/8-inch material for the elements, you need to make the 1/8-inch elements .25 inch longer to compensate for the smaller element material.*

readers. Using PVC pipe for the boom has been a common question. Personally, I've had better luck keeping wood in the air for years than keeping PVC pipe in the air. But as long as you use smaller diameters (I don't recommend 3- or 4-inch pipe for the boom), it will work fine.

A few of you have asked about using metal booms. I'll be talking more about metal booms in future columns, but how the element is attached to the boom, the diameter of the boom, hardware, and even the plastic used in insulated elements, all affect the length of each element. So I've avoided metal boom antennas up to this point. They're more complicated and you have to be very careful to duplicate the design exactly.

Entrepreneurial Spirit

I was at a hamfest in Belton, Texas, a few months ago and there was an enterprising lad selling 450-MHz versions of my Simple Yagi for $25 each (at $25, I didn't feel Cheap Yagi was the proper name anymore). It looked like he did a pretty good business. I kind of asked him how he had the spunk to sell antennas that cost him $2 to make for $25. He just grinned. I don't think he ever figured out that he was chatting with the designer.

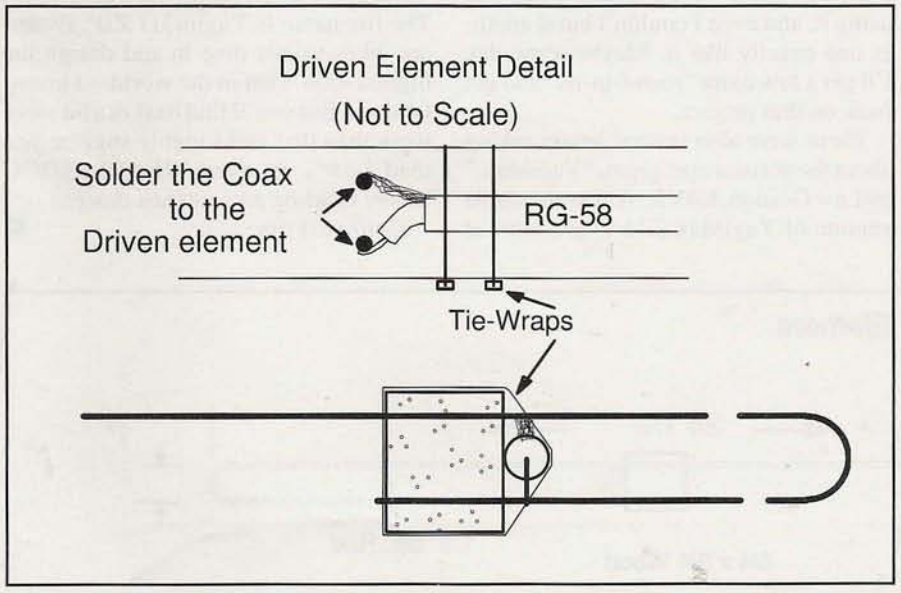


Figure 1. We're not *going to repeat August's photo of attaching the coax to the driven element of the Cheap Yagi, so if you can't figure it out from this diagram, you'll have to go dig up your copy of the August issue. The article starts on page 57.*

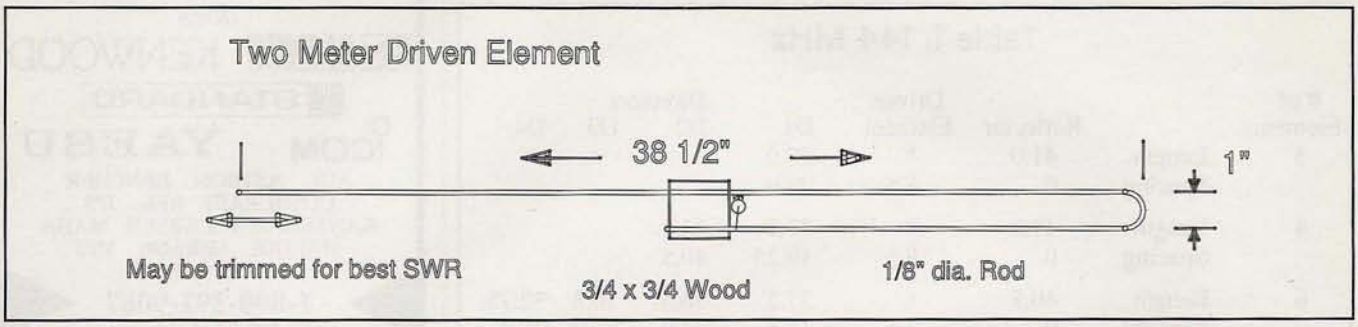


Figure 2. Details of the driven element for the 2-meter version of the Cheap Yagi. Use this in conjunction with the other dimensions in Table 1 to build your beam.

"Like the 2-meter version, [the 222] antenna is peaked for SSB use at 222.1 MHz, but performance is barely changed at 223.5 MHz, the national FM simplex frequency. Actually, the gain is slightly higher at 223.5 MHz, but the pattern is not quite as clean.

Next time we'll cover 900- and 1200-MHz versions of this antenna. The Houston Amateur Television Society, HATS, has built hundreds of them for ATV use. They also work well with 900-MHz spread-spectrum packet and 1200-MHz repeaters or L-Band satellites.

Table 2. 222 MHz

# of Elements		Reflector	Driven Element	D1	Directors D2	D3	D4
3	Length	26.0	*	23.75			
	Spacing	0	5.5	13.5			
4	Length	26.25	*	24.1	22.0		
	Spacing	0	5.0	11.75	23.5		
6	Length	26.25	*	24.1	23.5	23.5	21.0
	Spacing	0	5.0	10.75	22.0	33.75	45.5

*See Figure 3 for details on Driven Element (DE) dimensions

Table 2. Element dimensions and spacing for the 222-MHz "Cheap Yagi." As in the 2-meter version, all dimensions are in inches and the reflector and directors are made from 3/16-inch diameter material. Spacings are all from zero; NOT *the closest element. If you want to build this antenna using 1/8-inch material for the elements, simply make the Reflector and Directors .1 inch longer to compensate for the thinner element material.*

We Get Letters...

Interesting...my brief mention of a 6-meter version of the Cheap Yagi generated the most interest. Unfortunately, I have built only one 6-meter version—it didn't tune up the way it was supposed to. I used parts that are not readily available; and, well, it's not exactly duplicable. So, at least for now, there is only one 6-meter version of the Cheap Yagi; I'm using it, and even I couldn't build another one exactly like it. Maybe some day I'll get a few extra "round-to-its" and get back on that project.

There were also several letters asking about the software program, "YagiMax," by Lew Gordon, K4VX. A downloadable version of YagiMax 3.11 is available at <http://www.qrz.com/files/antenna>. The file name is Yagim311.ZIP. Everyone likes to just dive in and design the highest gain Yagi in the world—I know, I did too. But you'll find it takes a bit more work than that and I highly suggest you read Lew's excellent README.DOC before tackling any antenna designs.

Until next time, 73. ■

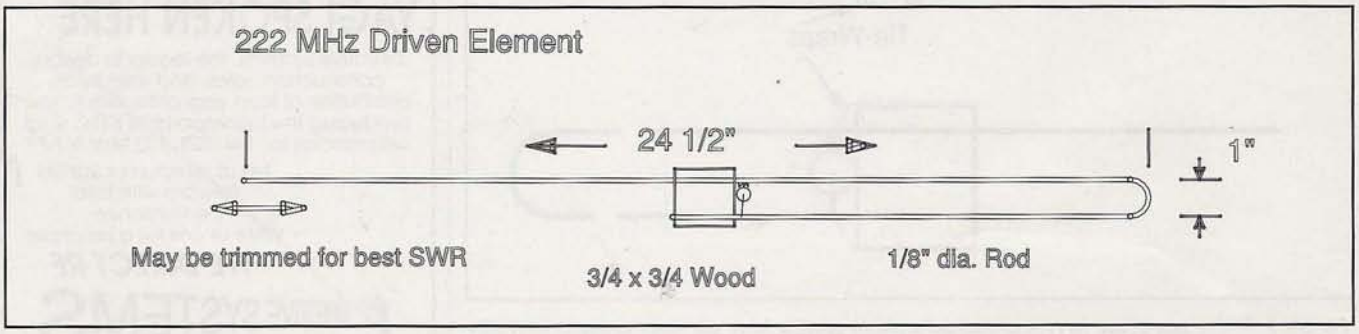


Figure 3. Driven element dimension details for the 222-MHz Cheap Yagi. You'll find the rest of the dimensions for the three-, four-, and six-element versions in Table 2.

In the Spotlight: Mobile VHF & UHF Antennas

Did you know that a 1/4-wave antenna can sometimes work better than a 5/8-wave? Read on to see how and why...

Do you remember your first 2-meter FM mobile rig and antenna? If you've been in the game since its early days or started out "low-budget-style," the setup probably consisted of a basic no-frills transceiver and a simple 1/4-wave whip or "spike" for an antenna. The setup may not have been elaborate, but it put you in the middle of hot local area activities, right? If you joined the action only a few years ago, you might have started out with a more deluxe-featured rig and a popular 5/8-wave mag-mount antenna (it worked great until a low tree limb or parking deck claimed the antenna, eh?).

But if you're a new mobileer presently gearing up with a fancy 2-meter/70-centimeter dual-band FM transceiver, choosing an antenna from today's wide variety of styles can be rather confusing. That's especially true if you're going mobile in a composite (non-metal) body auto, on a bicycle, or in a fiberglass boat.

This month's column features a close-up look and a simple discussion of mobile antennas, how they work, and the special attractions or benefits of various types. We'll even include a couple of easy-brew antenna ideas for homebrewing or impromptu use. I think you'll find this discussion both interesting and informative, so let's get started!

General Notes, Facts, and Theory

Some folks consider tall gain-type antennas better than short "basic" antennas for mobiling. But, depending on your lifestyle and daily routine, that's not always the case. Do you live and work in the big city or in the country? Short antennas slip in and out of parking decks without entanglements and may actually get the signal out better than bigger ones from amid tall buildings in crowded metropolitan areas. That's because a 1/4-wave radiator exhibits a higher angle of signal radiation (30 degrees above horizon) than a 5/8-wave antenna, which radiates at a lower angle (10 or 15 degrees) and its signals are often attenuated by nearby buildings. On the other hand, tall antennas get out better on flat terrain or on open-road areas where they can "breathe," so-to-speak.

"...choosing an antenna from today's wide variety of styles can be rather confusing. That's especially true if you are going mobile in a composite (non-metal) body auto, on a bicycle, or in a fiberglass boat."

An antenna's height also affects distribution of voltage and current along its length and consequently determines its base/feedpoint impedance. This is illustrated with the full-wave radiator seen in Figure 1 (the flat horizontal line in the middle). Notice that voltage (E) is maximum and current (I) is minimum at 1/2-wave points A, B, and C, while current is maximum and voltage is minimum at 1/4-wave points D and E. By inserting some random values for voltage and current (for simplicity, I use 50 volts maximum, 5 volts minimum, and .1 amp maximum, .02 amps minimum), we can also see feedpoint impedance (Z) is low (30 to 50 ohms) at a 1/4-wave point and high (2000 to 2500 ohms) at a 1/2-wave point.

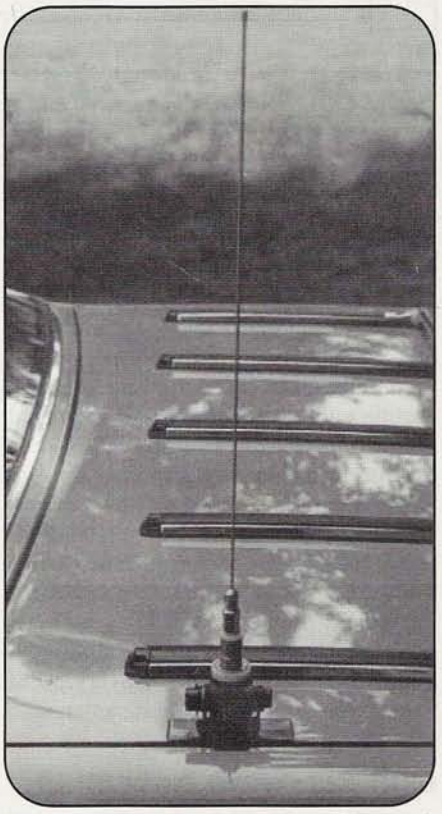


Photo A. The ever-popular 1/4-wave antenna has been produced in dozens of varieties. Assuming they're "worked against" a metal ground as discussed in the text, they make a good metropolitan area radiator. Version shown has 3/8-24 thread base and fits into a heavy-duty HF-type mount.

Likewise, the impedance of an antenna RF-fed at a 3/8 or 5/8-wave point is greater than 50 ohms, but less than 2000 ohms. Since the output impedance of modern

By Dave Ingram, K4TWJ

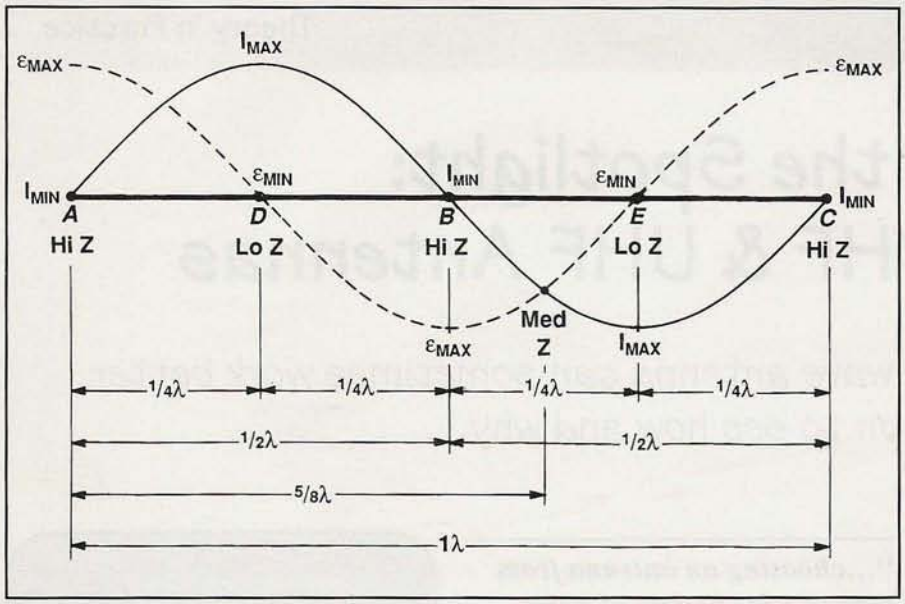


Figure 1. Distribution of voltage (E) and current (I) along a radiator's length produces a varying impedance (Z) that may be low or high, according to where the antenna is fed with RF energy.

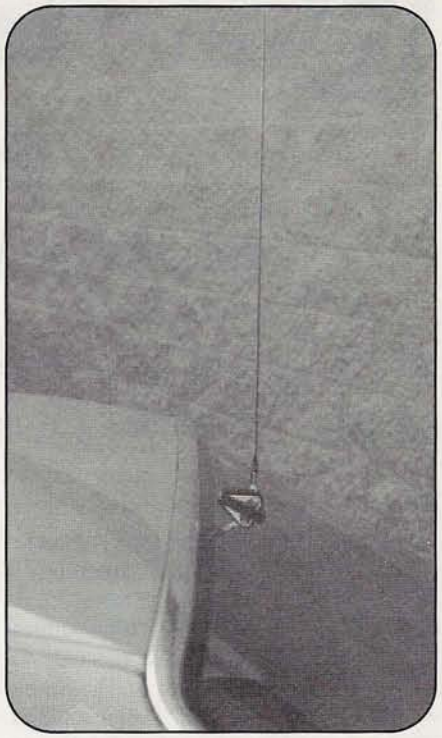


Photo B. Through-glass antennas—although susceptible to a slight coupling loss which is usually overshadowed by a longer length and gain-type radiator—produce a clean installation and neat appearance for mobiling.

transceivers is 50 ohms, 1/4-wave antennas exhibit a good direct match, while antennas of other lengths require some form of matching network to produce a low SWR (standing wave ratio).

In addition to matching impedance, a mobile whip also needs a span of metal below or near its base/feedpoint to serve as a ground plane. This is vital for 1/4-wave antennas, as well as 1/2- and 5/8-wave antennas. Even new-style dual-band antennas perform best when "worked against" a metal ground (one exception: the J antenna featured elsewhere in this column is fully ground-independent). Now, let's take an overview of some popular types of mobile antennas.

Quarter-Wave Antennas

Surely the best-known and, yes, still popular, VHF or UHF antenna is the classic 1/4-wave whip like the one show in Photo A. These basic radiators have been, and continue to be, homebrewed and commercially made in a wide variety of styles. Some are thick, some are thin, some are stainless steel, some are black, some have a mag-mount base, and some have a 3/8-24 thread adapter that screws into a regular HF-type mount. Commercial varieties are usually supplied with a cutting chart so they can be trimmed for operation with low SWR on any frequency between 140 and 1000 MHz. The easiest way to cut a stainless steel whip, incidentally, is by filing a deep groove around it with a sharp-edge file, then securing the whip in a vise and quickly snapping off the excess length.

All 1/4-wave antennas have one common characteristic that must be considered: As noted above, they must have a good electrical ground connection at their base. This span of metal or ground is necessary to produce a mirror image of the antenna's "missing section" (that would make up the second half of a 1/2-wave dipole), present an acceptable load impedance to your transceiver, and efficiently radiate your signal.

If your vehicle has limited metal surface area, adding a *counterpoise* below the antenna's base is a problem-solving idea that works great. Use wide copper braid (such as can be removed from large RG-8 coax cable) or copper foil (available from equipment dealers such as Ham Radio Outlet) to make this simulated ground. Cut the straps (two minimum, four or more ideal) at least 1/2 wavelength long, spread them out as straight as possible (maybe under a trunk lid lip), and secure them in place with double-sided tape. Connect all the ground straps together at the antenna's base mount terminal, and enjoy respectable ground-plane antenna performance from an otherwise impossible installation. (*Editor's Note: I once did this quite successfully—using aluminum foil strips taped to a mag-mount base—for installing a 1/4-wave whip* inside *a non-metal van.*)

"In addition to matching impedance, a mobile whip also needs a span of metal below or near its base/feedpoint to serve as a ground plane. This is vital for 1/4-wave antennas, as well as 1/2- and 5/8-wave antennas."

Half- and 5/8-Wave Antennas

Two other economical styles of mobile antennas are 1/2-wave and 5/8-wave radiators. These are available in through-glass styles (Photo B), mag-mount and 3/8-24 thread (Photo C) varieties, and have an impedance-matching network built into their coupling box or base section. The network consists of a small coil and capacitor, which is usually SWR-adjustable on a through glass antenna.

A 5/8-wave antenna exhibits a theoretical 3-dB (decibel) gain compared to

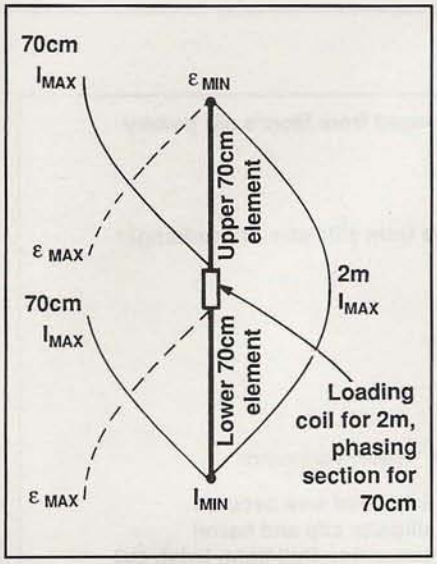


Figure 2. Phasing ensures that radio waves emanating from stacked antenna elements are identical in voltage/current distribution and so aid each other. In a dual-band antenna, the 2-meter loading coil serves as a phasing section for 70 centimeters. See discussion in text.

a 1/4-wave antenna, which is roughly equivalent to doubling your transmitted power. In other words, it can make a 25-watt transmitter sound like a 50-watt transmitter. Does that mean it doubles your range? Not really. Power and range are not directly proportional (bearing such facts as these can be quite painful but, alas, someone must do it!). However, the additional gain and lower angle of signal radiation will help you "work out" better from an urban fringe area. Typically, it will improve your signal on a particular repeater from noisy to almost full quieting.

Like the 1/4-wave radiator, a solid metal ground connection at or near the base of a 1/2- or 5/8-wave antenna is necessary for respectable performance. With a mag-mount, this is accomplished through *capacitive coupling*. The mount's bottom area forms one plate of a capacitor that couples to the auto's body through a 1.5-mil dielectric of paint (the thinner the paint, the better the ground!). There

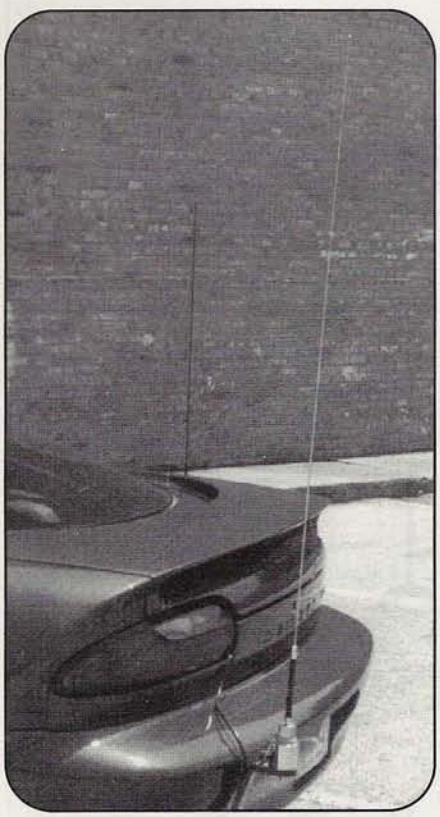


Photo C. Low cost 5/8-wave antennas like this 3/8-24 thread version are typically fitted with an impedance-matching base section and radiate a respectable signal. Although not visible, strips of copper strapping have been added inside the bumper (and connected to the mount's base) to serve as a ground counterpoise.

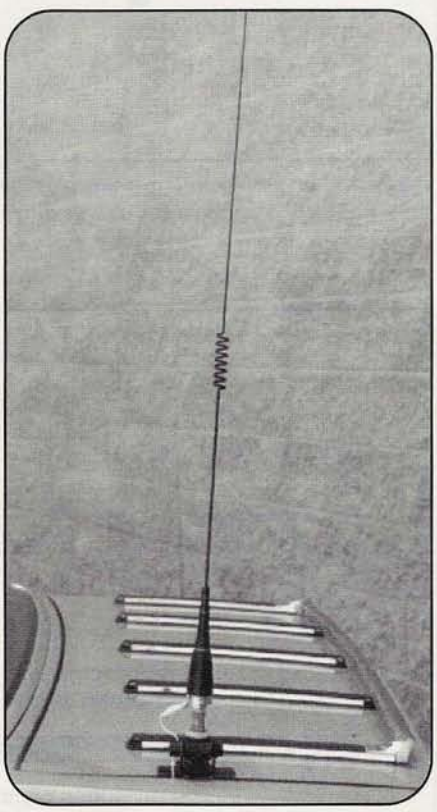


Photo D. Dual-band antennas typically feature a coil (enclosed or open) that makes the whip's overall length longer on 2 meters; and "stacks," or phases, whip sections above and below the coil on 70 centimeters. Barely visible in photo is a white clip lead to ensure grounding of the impedance-matching section in the base.

Quik Brew 'Tenna

Say you need an ultra-low-cost mobile antenna for impromptu use? If you've been around a while, you might be visualizing something comparable to the classic "coat hanger and SO-239" ground plane for home use. And that's basically what we've got here: two quick-assemble 1/4-wave mobile antennas that defy fading into the annals of time. The "clip-on" or "gutter clip" version (Figure 3) is made by first cutting a coat hanger or whip to length, soldering one scraped, shiny-clean end to the center pin of a PL-259, then gluing a tiny bead to the tip on its opposite end for safety. The PL-259 is then plugged into an 83-1J barrel connector, and a 17- or 18-foot length of RG-8X coax with PL-259s on each end then plugs into the barrel connector's other end. Next, a large alligator clip is secured to the barrel connector assembly with stiff wire. Finally, the antenna is clipped to an auto's metal rain gutter, the whip is pruned for lowest SWR, and then its PL-259 is filled with epoxy for insulation and support. This antenna's design is simple and its performance is good—especially in the city. Remember it!

The trunk lip version (Figure 4) also uses a coat hanger or stiff wire radiator soldered to the center pin of a PL-259, and insulated from the shell with epoxy. It plugs into a chassis mount SO-239 bolted to a small, stiff bracket cut from sheet metal. The bracket is bent so it fits against a fender's inside lip for a trunk lid, secures with two sheet metal screws, and positions the antenna over the fender so it doesn't interfere with trunk lid movement. For mounting on a truck, the bottom bend can be eliminated and the mount's vertical strip can be attached with screws to the truck's front fender. Paint the antenna and mount black with non-metallic Krylon® and you have a neat and low profile antenna capable of good performance.

The length of either antenna's whip for any frequency, incidentally, is calculated by the formula 234/F (MHz) = length (in feet). For example, 234/146.0 = 1.60 feet, or 19.2 inches (from top of PL-259 to tip of whip.). Good luck with these quik-brew antennas.

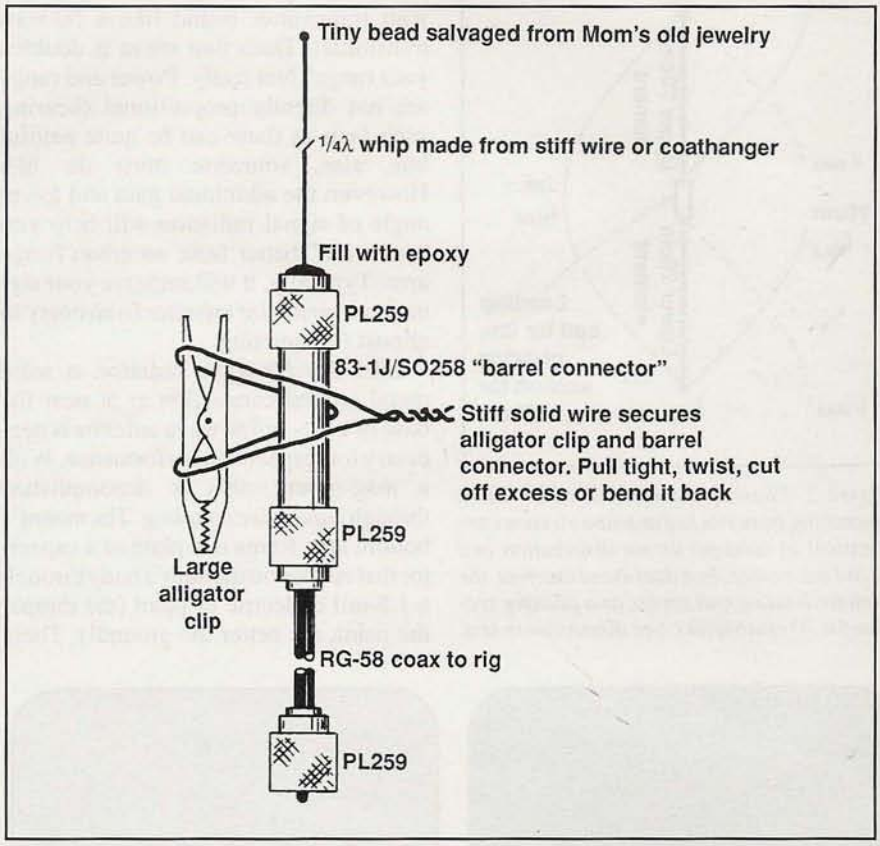


Figure 3. Quik-brew mobile clip-on antenna made from stiff wire, a PL-259, a coaxial barrel connector, and a large alligator clip. See discussion in text.

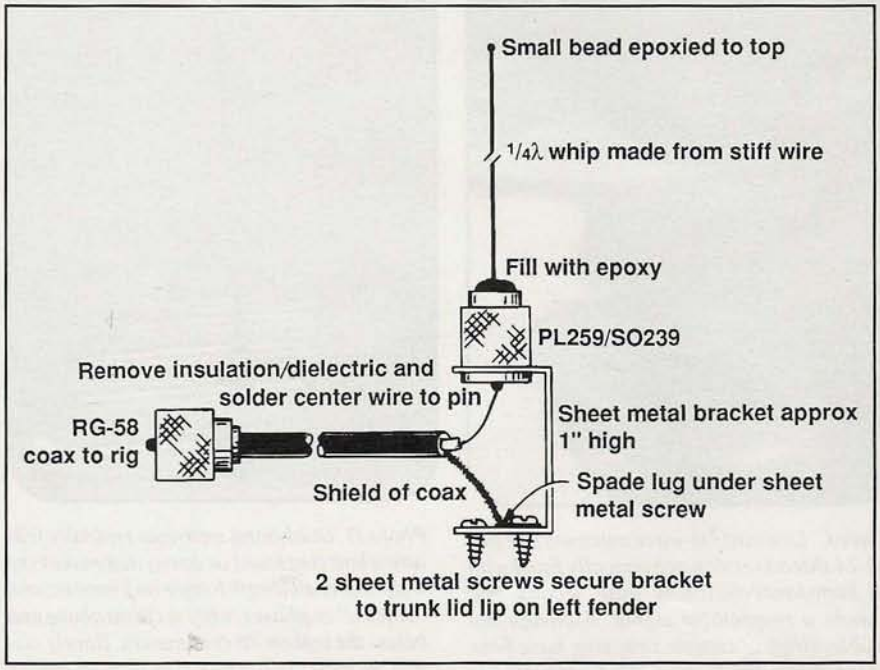


Figure 4. Trunk lip or front fender-mount version of the quik-brew antenna is easily homebrewed and works great. See discussion in text.

Photo E. New ground-independent 2-meter/ 70-centimeter J-pole from Rocky Mountain Antennas really is ideal for big-time mobiling use in non-metallic body vehicles. This antenna delivers good gain on both bands. See discussion in text.

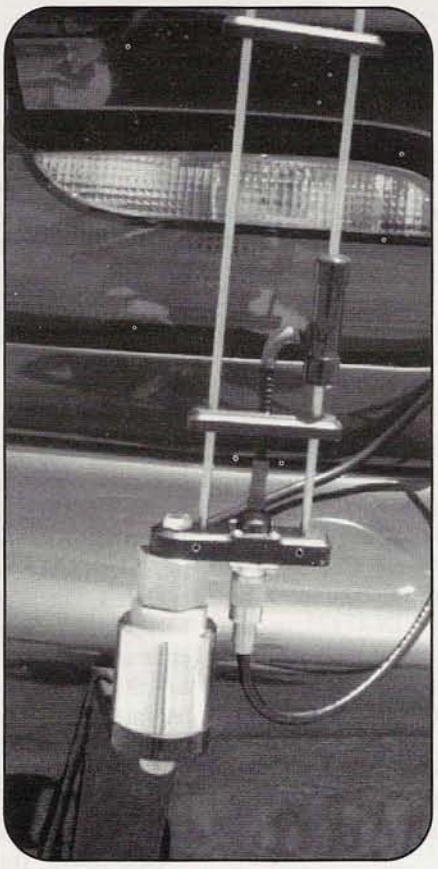


Photo F. Close-up view of base mount and enclosed inductive matching section on the Rocky Mountain J. The bolt securing the base is only for mounting—it does not connect to the antenna.

are some minor losses associated with mag-mount antennas, so the previously mentioned 3-dB gain does not apply to all installations. Mag mounts, however, have the advantage of easy installation—assuming your auto has a metal body. Taping a mag mount on a composite body vehicle does not work! Switching to a glass mount also may not solve the problem—unless counterpoise straps are added inside the vehicle's roof. Yes, you might read ground conductivity between a dome light screw and negative battery terminal, but the two are probably connected only by a wimpy thin wire. Trust me. Been there. Done that.

Dual-Band Antennas

Scan the advertisements in your favorite amateur radio magazines, and you'll surely agree that dual-band antennas (and the dual-band mobile rigs they connect to) are very popular today—and with good reason. They're pretuned, easy to install, convenient to use, and they work great. (Photo D). Particularly in demand are tall versions exhibiting high signal gain on both 2 meters and 70 centimeters. Although not immediately apparent, these sleek antennas also sport weather-protected impedance matching networks built into their base. Nice indeed!

Open coils or enclosed tubular sections along the antennas' length serve two unique functions. First, they extend the radiator's electrical length into a single tall whip on 2 meters. Second, they serve as a phasing network to electrically separate sections of the whip and "stack" them into two or more shorter length radiators on 70 centimeters. As illustrated in Figure 2, phasing ensures that waves emanating from stacked elements reinforce rather than oppose each other, thereby acting like double or triple antennas. This concept might be visualized as follows: Imagine two or three blinking lights mounted above each other on a pole. If the lights blink at different times, total brightness is comparable to a single light. If the lights blink together, total brightness is doubled or tripled. Pretty neat, eh?

The J-Pole: A Clever 'Tenna!

Surely the most formidable challenge facing modern mobileers is establishing a solid ground connection/system for their antenna. Wouldn't it be terrific if we had a real ground-independent antenna for composite body autos, fiberglass boats, bicycles, wheelchairs, etc.? Well, friends, meet the new JP-2M dual-band J-pole from Rocky Mountain Antennas, shown in Photos E and F. This 58-inch-tall delight delivers a 4-dB gain on 2 meters and 6-dB gain on 70 centimeters; and just like a dipole, beam, or halo, it requires absolutely no ground connection for top performance. You can mount it on a wooden broomstick, if want, and still get full range results. Neat!

Column space is tight, so I will jump right to the pertinent details. First, J-poles have proven their merit in both amateur and military setups for many years, mainly on the HF bands. Jerry Bustin, WA7SIC, of Rocky Mountain Antennas, simply adopted the concept for VHF/UHF operation, added an inductive matching unit and unique base mount. The Rocky Mountain J is RF-fed at a medium-impedance point for both 2 meters and 70 centimeters, so it functions as an extended-length radiator with integral counterpoise on both bands. No loading coils or phasing sections are used, and the antenna works like a champ. Quite possibly, it will prove to be a most timely solution to an increasingly common problem. (See "Resources" for more information.)

Looking Ahead...

That winds down the column for this month, friends, but stay tuned for some really interesting topics on "fun pursuits in amateur radio" during coming months. We will talk satellites, Slow Scan TV, collectible mics (and maybe keys), and more. 73,

—Dave, K4TWJ

Resources

For more information, or to purchase a Rocky Mountain JP-2M, contact Rocky Mountain Antennas, 1400 Pine St., Everett, WA 98201; Phone: (425) 303-0684; Orders only: (888) 277-4643. The JP-2M is $49.95 in stainless steel, $79.95 in black, plus $7.50 shipping and handling.

Hamfest Calendar

The following hamfests are scheduled for October, 1998:

Oct. 3, YCARS Hamfest, Knights Stadium (the baseball exit), **Rock Hill, SC**. Talk-in: 147.03 down 600. For information, contact Pete Krenn, KC4ZAR, at (803) 366-5932 or e-mail to: <pete@cetlink.net>. (exams)

Oct. 3, 42nd Hamfest, Pompey Fire Department, **Syracuse, NY**. Talk-in: 147.90/30 MHz. For information, contact Vivian Douglas, WA2PUU, at (315) 469-0590, or <www.pagesz.net/~rags>. (exams)

Oct. 4, Annual HAMARAMA, Bucks County Drive-In, **Warrington, PA**. Talk-in: 146.52 (simplex). For information, contact Mark Schreiner, NK8Q, 662 Cafferty Rd., Ottsville, PA 18942, or e-mail: <nk8q@amsat.org>; or call (215) 497-1414.

Oct. 4, Hoosier Hills Hamfest, Lawrence County 4-H Fairgrounds, **Bedford, IN**. For information, contact John Scheiwe, KB9LTI, RR 11 Box 1234, Bedford, IN 47421; or call (812) 279-0050; E-mail: <jscheiwe@dmrtc.net>; Web: <http://dmrtc.net/~jscheiwe/hamfest.html>. (exams)

Oct. 4, The Hall of Science Amateur Radio Club Hamfest, New York Hall of Science parking lot, Flushing Meadow Corona Park, **Queens, NY**. Talk-in: 440.200 repeater PL 136.5. For information, contact Stephen Greenbaum, WB2KDG, (718) 898-5599 (evenings only); E-mail: <WB2KDG@bigfoot.com>.

Oct. 10, Augusta Hamfest, Evans Middle School, **Evans, GA**. For information, contact Frank at: <ks4oc@bellsouth.net>; or Terry, KE4MHN, at: (706) 796-7635 or write to: P.O. Box 3072, Augusta, GA 30914.

Oct. 10, Annual Fall Hamfest, Fairleigh Dickinson University, **Teaneck, NJ**. Talk-in: 146.790 -600. For information, contact Jim Joyce, K2ZO, at (201) 664-6725 (no calls after 10 p.m. please). (exams)

Oct. 10, Hamfest, President's Hall, Kitsap County Fairgrounds, **Bremerton, WA**. Talk-in: 145.31 (-) offset KC7FA repeater on 146.52 simplex. For information, contact Susan Johnson, AB7MD, P.O. Box 1226, Poulsbo, WA 98370; Packet: <AB7MD@N7WE.#WWA.USA.NOAM>; or E-mail: <sujohnso@linknet.kitsap.lib.wa.us>.

Oct. 10–11, 2nd Annual Hamfest & Computer Show, in the Unit Building, **Tampa, FL**. Talk-in: 147.105. For information, contact J. F. Strom, K9BSL, at (813) 822-9107, or write to 233-34th Ave. N., St. Petersburg, FL 33704-2241.

Oct. 10–11, 38th Annual Memfest and Computer Show, 2585 N. Hollywood at I-240, **Memphis, TN**. Talk-in: 146.22/146.82 (input/output). For information, contact Lee Bowers, KA4KVW, at (901) 867-3461, or Ben Troughton, KU4AW, at (901) 372-8031. (exams)

Oct. 11, Maysville Hamfest, Community Center, **Maysville, NC**. For information, contact Jo Ann Taylor, WD4JYR, at (252) 393-2120. (no exams this year).

Oct. 11, LCDRA & CMARC Hamfair, Ingham County Fairgrounds, **Mason, MI**. Talk-in: 145.390. For information, contact Don Tillitson, WB8NUS, at (517) 321-2004, or LCDRA, P.O. Box 80106, Lansing, MI 48908.

Oct. 11, Lima Hamfest & Computer Show, Allen County Fairgrounds, **Lima, OH**. Talk-in: 146.07/67, 146.34/94, 147.63/03, 448.625/3.625, 449.775/4.775, 449.625/4.925. For information, contact the info phone at (419) 647-6321 or (419) 358-7376 (no calls after 9 p.m.).

Oct. 17, Swapmeet, De Anza Drive-In Theater, **Tucson, AZ**. For information, contact George Lynch, KA1TY, P.O. Box 42601, Tucson, AZ 85733 (include e-mail address).

(Continued on next page)

VHF Conferences

Oct. 3, The 1998 Mid-Atlantic States VHF Conference, Hampton Inn, **Warrington, PA**. For information, contact John Sorter, KB3XG, 1214 N. Trooper Road, Norristown, PA 19403, or e-mail: <johnkb3xg@aol.com>; or call (610) 878-5674. (HAMARAMA will be held on Oct. 4).

Oct. 3, The Western States Weak Signal Society and The 50 MHz and Up Group are sponsering the **WSWSS '98 Conference** at the Sunnyvale Hilton, **Sunnyvale, CA** from 9:00 a.m. to 9:00 p.m. The conference will feature two lecture tracks: one technical, the other general. The advance fee of $35 includes lunch. A banquet will be held at 6:00 p.m. For tickets contact Jim Moss, 862 Somerset Drive, Sunnyvale, CA 94087-2223; or call (408) 746 2789 for more information; or e-mail: <N9JIM@aol.com>; Web: <http://www.qsl.net/wb9ajz/wswss98>.

Oct. 16–18, 16th AMSAT Space Symposium and Annual Meeting, Vicksburg, MS. For information, contact the conference Web site at: <http://pages.prodigy.com/DXHF93A>. It is also accessible via the AMSAT Web page, <http://www.amsat.org>.

Oct. 16–18, Microwave Update '98, Holiday Inn Resort, **Estes Park, Colorado**. For more information, visit the Microwave Update Web page at: <http://home.att.net/~nøugy/mw_update_98.html>, or contact Conference Chairman Bill McCaa, KØRZ, at P.O. Box 3214, Boulder, CO 80307-3214, or via e-mail to: <wmccaa@aol.com>.

Operating Notes

For late September, October, and early November, 1998:

September

19–20 ARRL 10 GHz Cumulative Contest, 2nd wknd (see rules, August issue)

October

3–4 IARU Region 1 (Europe/Africa) UHF/SHF Contest

4 Good EME Conditions

10–11 ARRL International EME Competition, 1st wknd (see rules, this issue)

November

7–8 ARRL *non-competitive* Microwave EME wknd (see ARRL International EME Competition rules, this issue)

EME data courtesy W5LUU. More contest info is available on the CQ VHF *Web page at:* <http://members.aol.com/cqvhf/navhfcon.htm>.

Oct. 17, 14th Annual Tri-Cities Hamfest, Appalachian Fairgrounds, **Gray, TN**. For information, write to P.O. Box 3682 CRS, Johnson City, TN 37602.

Oct. 18, RH Hill ARC Hamfest, Sellersville Fire House, **Sellersville, PA**. Talk-in: 145.31. For information, contact Hamfest Hotline, Linda Erdman, at (215) 679-5764, 2220 Hill Rd., Perkiomenville, PA 18074; or visit their Web page at <HTTP: //WWW.RFHILL.AMPR.ORG>. (exams)

Oct. 18, Tailgate Electronics, Computer & Amateur Radio Fleamarket, Albany and Main St., **Cambridge, MA.** Talk-in: 146.52 & 449.725/444.725 - pl 2A - W1XM/R. For information, call (617) 253-3776.

Oct. 18, 16th Annual Kalamazoo Hamfest, Kalamazoo County Fairgrounds, **Kalamazoo, MI**. Talk-in: 147.040 K8KZO repeater. For information, send self-addressed stamped envelope to Gary Hazelton, N8GH, 75075 M-40, Lawton, MI 49065; or see their Web site at: <www.net-link.net/wmat>; E-mail: <ka8blo@net-link.net>.

Oct. 18, Foothills Amateur Radio Club Hamfest, Hose Co. No. 1, **Greensburg, PA**. Talk-in: 147.18+ repeater. For information, see their Web page at: <http://www.geocities.com/Heartland/Acres/7896>.

Oct. 23–25, Texoma Hamarama, Texoma State Lodge, **Kingston, OK**. For information, see their Web page: <www.qsl.net/kc5sig/hamarama/>.

Oct. 24, Octoberfest '98, Grandview Middle School (East Junior High), **Grandview, MO**. Talk-in: 147.12 repeater. For information, contact SSARC P.O. Box 701, Grandview, MO 64030; or call Donna Quick, KBØYJN, at (816) 537-7464; E-mail: <kbøyjn@juno.com>; or Mark Sevy, KBØVWD, at (816) 331-8948; E-mail: <kbøvwd@juno.com>. (exams)

Oct. 24, 4th Annual SWAP-TOBERFEST, Amateur Radio Emergency Services Convention, Polk County Fairgrounds, **Rickreall, OR**. Talk-in: 146.86 repeater. For information, contact Bob Boswell, W7LOU, at (503) 623-2513; E-mail: <w7lou@goldcom.com>; to download a copy of the flyer, visit their Web page: <http://www.teleport.com/~n7ifj/swaptobe.html>.

Oct. 24–25, '98 Southwest International Hamfiesta, Ysleta Independent School District's Cultural Arts Center, **El Paso, TX**. Talk-in: 146.880. For information, contact Clay Emert, K5TRW, P.O. Box 971072, El Paso, TX 79997, (915) 859-5502; E-mail: <cemert@ dzn.com>; Web page: <www.hamfestia@dzn.com>.

Oct. 25, Boone-Clinton Co. ARC Hamfest, Boone County Fairgrounds, **Lebanon, IN**. For information, contact Don Lecklitner, K9DFK, at (765) 249-2020. (exams nearby)

Oct. 25, 25th Annual Hamfiesta & Computer Show, Marion County Fairgrounds coliseum, **Marion, OH**. Talk-in: 147.90/30 repeater. For information, contact Karen Eckard, N8KE, 6583 So. Street, Meeker (Marion), OH 43302, (614) 499-3565; or Betty Krist, N5UDT, 132 N. Seffner Ave., Marion, OH 43302, (740) 387-3533 (after 5:00 p.m.).

Oct. 31, Halloween Hamfest, Kirkwood Community Center, **St. Louis, MO**. Talk-in: 146.91. For information, contact Steve Welton, WBØIUN, 9847 Arv-Ellen, St. Louis, MO 63123; Phone: (314) 638-4959; E-mail: <SLW@partyline.net>. (exams)

Oct. 31, Hamfest Chattanooga, Camp Jordan, **East Ridge, TN**. Talk-in: 146.790-. W4AM/R, 444.100+, W4AM/R. For information, contact Ms. Louise Carter, KE4DGW, P.O. Box 142, Lookout Mtn., TN 37350; or call (423) 821-4043. ■

APRS Supports Search-and-Rescue Operations

Hams in Washington State demonstrated the immense value of the Automatic Position Reporting System in search-and-rescue missions, first in a drill and then for "the real thing." But old habits die hard...

The value of APRS (Automatic Position Reporting System) in search-and-rescue (SAR) operations was demonstrated last spring during the annual Mock Search in Mason County, Washington. The demonstration—given to the county's Department of Emergency Services, its Search-and-Rescue Organization, Sheriff's Department, and the Civil Air Patrol—was very successful, it and showed what can be done with a little planning and some help. (*If you're not familiar with APRS, see "APRS & GPS Basics" elsewhere in this column.—ed.*)

Hams in Washington State demonstrated the potential value of APRS (Automatic Position Reporting System) during a Mock Search last spring. Here, volunteers and rescue officials gather at the base camp. (Photo by Steve Hiltbrunn, KC7NUD)

Getting Started...

Herb Gerhardt, KB7UVC, first heard about APRS a little over a year ago when he saw a demonstration at a local hamfest. After asking a few questions, Gerhardt, who was already involved in SAR, saw an immediate practical use during the county's SAR operations. Shortly after becoming a ham a few years ago, Gerhardt spent several days in the Olympic Mountains during an actual search as the ham radio operator in the county's communications van. He says that was his first exposure to a real SAR operation, adding that it was a "real rewarding experience, especially since the two subjects were found alive and well after being stuck on a steep snow covered shelf for three days."

The Sheriff's Department was not able to establish radio communications on its own frequencies, so the local ARES/RACES operators were called out to help handle the communications. According to Gerhardt:

They were so impressed with our services that our Department of Emergency Services now calls on us to handle all of their communications during all local emergencies, which have included other search-and-rescue operations, floods, major ice storms, and even during some crime scenes.

Problems Identified...

Gerhardt picks up the story at this point:

One of the problems I saw during this SAR operation was uncertainty about areas actually searched. The Incident Commander sent many search teams into the mountainous areas to search for the subjects, and several of these teams were dropped off by Army helicopters on mountain ridges which were still under 10 feet of snow. The searchers then covered their prescribed search area and were later picked up by the Army helicopters and returned to base camp. The problem was that everyone was working what they *thought* was their assigned area, but no one really knew *for sure* if they were searching the correct assigned area. This is where I thought APRS should come into the picture.

If each team had an APRS Tracker (a self-contained APRS position locator and transmitter) or a GPS (Global Positioning System) receiver and voice radio with them, then we

By Bob Josuweit, WA3PZO (<bjosuweit@aol.com>)

The totally portable APRS Tracker station assembled by Herb Gerhardt, KB7UVC. The HT, GPS receiver, and TNC can all be packed into the camera bag in the rear of the photo. (KB7UVC photo)

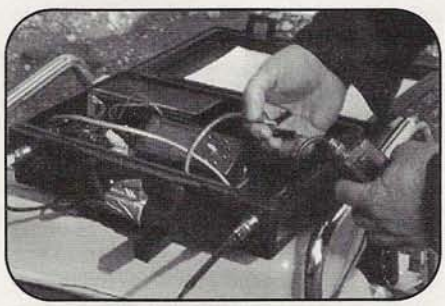
could follow their progress at the base camp and keep track on a topographic map of all the areas searched. Utilizing this system would give the Incident Commander positive control of knowing which areas had been searched and the ability to redirect the search teams by radio to other areas that still needed to be searched. That was my idea of how APRS could function during a SAR mission and save time and lives by increasing the efficiency of a search.

Planting the Seed

Over the next year, I only *thought* about how valuable APRS could become to our SAR efforts. I never even loaded the program into my computer. Being an outdoor enthusiast, I like to spend my time hunting, fishing, hiking, and backpacking, and not sitting in front of a dumb computer. Therefore, this thought remained just that, a dream.

However, as the planning began for this year's SAR Mock Search, I began to plant the seed that APRS should be utilized to see if it could be useful in a real SAR mission. As a result of my continuous prodding, Nick Jones, W7AA, our RACES Officer, asked me to become our local APRS Coordinator. Since it was my idea, I had no choice but to accept. Plus, I considered it a real challenge and I figured that, since I wanted to learn how to run APRS and didn't know anything about it, I could now get all the Western Washington APRS gurus to help me learn the system.

Boy, was I ever right about that! After I signed up for the local APRS e-mail reflector on our Northwest Web page (<http://www2.localaccess.com/nwaprs/>) and Nick put out a notice of our intentions, I had help and prodding from all the APRS heavies in Western Washington. I hit a point of no return almost overnight! Nick asked me what I needed to make this event a success and I told him I needed a laptop computer. A few days later, he came and gave me county Emergency Services Director Joe Murray's laptop computer!



A typical APRS Tracker unit—this one put together by Michael Colyar, K7ITL—with HT, GPS receiver, and TNC in an equipment case, with external connectors for GPS and 2-meter antennas. (KC7NUD photo)

Learning on Short Notice...

I loaded the program into my computer in the beginning of March, which gave me less than two months to learn the program and make this event a success. I had to shop around and buy a new TNC so that I could build my own Tracker for this event. My (very) old TNC would not support GPS inputs. I wound up purchasing a Kantronics KPC-3+ TNC and got my Tracker built and on the air about a week before the Mock Search.

My Tracker was comprised of my ICOM HT with a "super" rubber duck, a borrowed Garmin GPSII+, and my new TNC. My goal was to keep my Tracker completely portable, so that a search team on foot could carry it with them in the field. I had a small soft camera case, so I stuffed all three items in the case and I had my portable Tracker. It was very light (less than three pounds) and the foot team had no problem carrying it along with the rest of their equipment.

Additional Trackers for this event came from other hams in Western Washington who heard about this demonstration on the Internet and contacted me by e-mail or phone to offer the use of their Trackers. I wound up with a total of eight Trackers to use for this event.

Obtaining such a variety of Trackers also gave me a real opportunity to learn the ins and outs of an APRS Tracker. Some of them were really neat packages with which all you had to do was place the GPS on the dash of a car and plug one plug into the car's cigarette lighter socket and the entire unit came to life. Others had lots of wires, a gel cell battery, and required you to turn each unit on individually. A small plastic box with a power switch on the outside and BNC connections on the outside for the radio antenna and the GPS antenna seemed to be the preferred choice for mobile/portable Trackers. I would encourage

APRS & GPS Basics

APRS is short for Automatic Position Reporting System (sometimes also referred to as Automatic Packet Reporting System), which uses packet radio to transmit location data and other information from properly equipped stations. Originally designed by Bob Bruninga, WB4APR, to track stations in motion—the use illustrated in this article—it has also become very useful to weather forecasters, as APRS-equipped Skywarn members connect electronic weather stations to their systems and automatic report on conditions at their locations. APRS was originally written in DOS; versions for Windows and Mac have been written by Keith Sproul, WU2Z, and his brother Mark, KB2ICI.

The advent of the Global Positioning System (GPS) made APRS even more accurate and useful. GPS is a satellite-based system that allows users to quickly and accurately plot their location, anywhere on Earth. GPS receivers have become reasonably priced in the past few years, and many hams are making them essential parts of their mobile and portable stations. While APRS stations originally had to manually enter their position coordinates, GPS receivers linked to APRS stations can now do it automatically and update the information continuously.

For more information on APRS, see the August, 1996, and June, 1997, issues of *CQ VHF*, or visit APRS Web sites at either <http://aprs.rutgers.edu> or <http://www.tapr.org/tapr>. APRS software may be downloaded from either location.

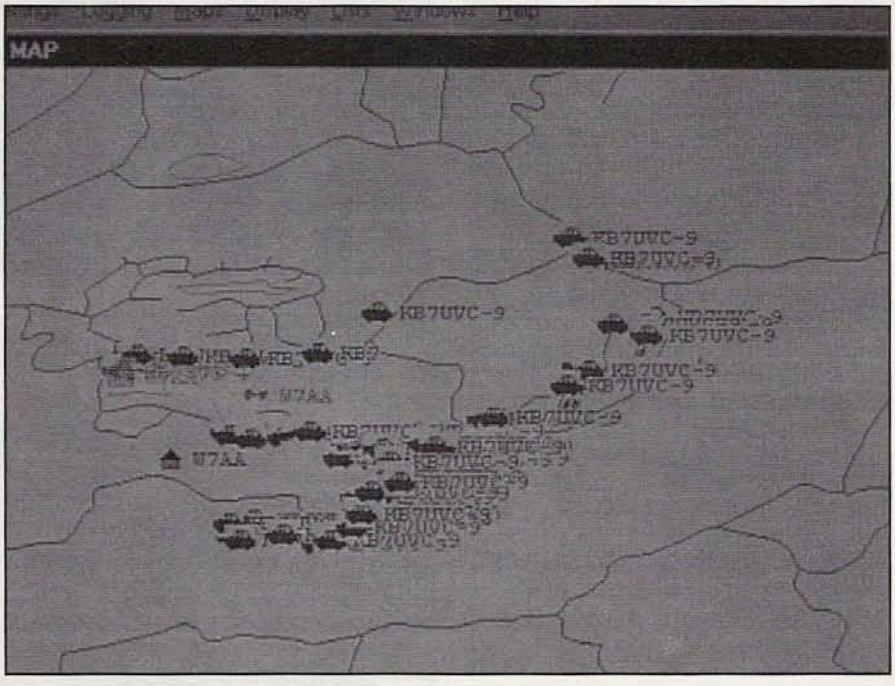
For more information on GPS, see the April, 1997, and February, 1998, issues of *CQ VHF*. Back issues of *CQ VHF* are available for $4 each, postage included (in the U.S.), from *CQ VHF* Back Issues, 25 Newbridge Rd., Hicksville, NY 11801; Phone: (516) 681-2922; Fax: (516) 681-2926.

others building Trackers to keep them simple, lightweight, and compact.

The Big Day Arrives...

When the big event finally arrived, it was time to set our APRS station up in our county's ARES/RACES communications trailer. With all the help I got, it took only 10 minutes from the time I arrived at base camp to get the station set up and on the air.

On Friday evening, as a warm-up for the Saturday drill, the SAR organization sent several 4-wheel drive vehicles out to perform search patterns of some of the dirt roads in the area. I installed a Tracker in one of the vehicles and it took off for a several-hour-drive while I sat in the communications trailer relaxing and watching every movement of this vehicle on the laptop computer screen. I was really impressed, especially when I noticed that it went down a dirt road that I knew to be a dead end, even though the maps showed it as a through road. About 30 minutes later, we noticed the vehicle going back the way it came. In the future, we will be able to direct the vehicles from the base camp and give them updated directions. This is especially helpful since most of the searchers are not familiar with the search area.



Tracking the path of a 4-wheel-drive vehicle driving a "search pattern" before the Mock Search began. The composite screen is created by not refreshing the screen display. (Courtesy KB7UVC)

"The problem was that everyone was working what they thought was their assigned area, but no one really knew for sure if they were searching the correct assigned area."

The APRS maps that we used during this Mock Search were custom made for us by Dave Dobbins, K7GPS, and Doug Wetzel, K7IP. They made me a number of different maps until they finally came up with one of our search area that satisfied my desires. These maps were of such detail that they even showed the dirt logging roads.

Ready to Roll

By the time I went home that night, I felt pretty good and knew that this APRS demonstration was going to be a success. That was the first night in two weeks that I was able to get a good night's sleep! The next morning, Roger Attwell, WN7M, showed up at my house with several Trackers, ready to assist in our demonstration.

We drove to the base camp (only about 12 miles from my house) and tried to fit a Tracker into as many of the SAR scenarios as possible. Unfortunately we could not get all eight of the Trackers to work reliably, and decided to use only the ones that worked flawlessly. Later, Doug Wetzel, K7IP, also came to assist our demonstration with his expertise.

We had a simulated plane crash as part of our drill and the Civil Air Patrol (CAP) radioed the Lat/Lon (latitude and longitude bearings) of the crash site to our base camp, based on signals received from the training ELT (Emergency Locator Transmitter). I entered that position into the APRS laptop computer and it immediately showed us where the crash site was located. To our surprise, it was a long way (about 17 air miles) from our base camp. We outfitted one of the vehicles that was taking the searchers to that site with a Tracker and gave the searchers my camera bag Tracker to use while they were on foot, using radio direction finding (RDF) equipment to locate the ELT. We watched that vehicle drive all the way to the plane "crash."

We had no problem receiving the Tracker signal from the vehicle, but were concerned

Horsing around...Heidi Grannell; Herb Gerhardt, KB7UVC; and Roger Attwell, WN7M, installing a Tracker on Sha-Mar, a horse. The whip antenna on the HT flopped around and bothered Sha-Mar, who didn't cooperate until the APRS unit was moved to a backpack and put on the rider's back. (KC7NUD Photo)

about our ability to hear signals once the searchers set out on foot. Since the target area was about 17 miles away, and my camera bag Tracker contained only a 2-watt HT with a rubber duck antenna, we were sure that we would not be able to receive that signal at base camp. However, as soon as they turned it on, a signal immediately appeared on our screen! We later figured out that the Tracker on the vehicle digipeated the portable Tracker signal to the W7AA-10 APRS digipeater on South Mountain in the Olympic Mountains, and from there we received the signal at base camp. Now we were really impressed with how well this system worked! At least, we hams were impressed.

Getting Warmer

Persuading non-hams of the accuracy of APRS took a little more doing. In this case, we watched the Tracker-equipped vehicle drive to within a couple of hundred yards of the ELT and then *keep going* for several more miles. I asked the Incident Commander if I could tell the driver to turn around and direct him to the area where he should park, but my request was denied. They were to find the ELT using the radio direction finding equipment, just as they had always done. It will take another year or so—if we're lucky—before we will be allowed to direct a search via APRS.

Sky Mobile...

Prior to the exercise, the CAP installed a Tracker on one of its planes by just putting a GPS unit on the dash of the plane, connecting the 2-meter radio to an outside antenna, and plugging in the power cable. Once that Tracker came alive, it was a very impressive sight. We could watch that plane take off and fly over the search area. We were also able to monitor the plane's speed, heading, and altitude. We then turned on the CAP grid on the APRS program and instructed the plane to fly the grid boundary lines. It was really amazing because they covered three out of the four legs exactly on the grid lines.

I elected to display the multiple images on the screen until I did a manual screen refresh. By seeing the multiple images of the plane, SAR officials would know how effective the coverage of the search pattern was and could instruct the plane to fly over areas that were not adequately covered. At base camp, CAP members and the county sheriff watched the flight on the laptop screen. They were really amazed at the possible uses of APRS.

A Horse Is a Horse

The final demonstration was to put a Tracker on a horse that was also being used for the Mock Search. This was our only disappointment of the event. We used a Tracker that was mounted inside a 10-pound ammunition can inside the saddlebag and taped the radio antenna to the side of the saddle. This was the wrong Tracker to put on a horse.

The antenna was long and real flexible and not very well supported. So when the rider took off, the antenna bent over and began to whip the horse, causing the heavy saddle bag to start bouncing and also slapping the horse on its side. That caused some real problems for both horse and rider. It took the unfortunate rider almost a mile to get the horse back under control and tell us to get that Tracker off the horse! Once the Tracker was removed the horse calmed down. We replaced it with my lightweight Tracker in a small backpack worn by the rider. That solved the problem. Apparently, horses don't like whips of any sort...even whip antennas!

The Real Thing...Almost

While most of us were wrapping up the July 4th holiday weekend, the ARES/RACES group in Mason County got a chance to demonstrate the capabilities of APRS during a real search and to test their own knowledge of the mode as well. Mason County APRS Coordinator Herb Gerhardt, KB7UVC, reports that he set up his APRS station in the command center at the site of a search for a missing woman, to begin integrating APRS into the county's SAR efforts.

According to Gerhardt, the system was still used only for demonstration, as top officials still needed to be convinced of its value. He says the incident commander and others involved with the search did look at the system and he is confident that they will slowly accept APRS.

This was a localized search in the Lake Cushman area, says Gerhardt. The APRS demonstration started by just clicking the mouse on the map to enter the GPS coordinates for the King County Sheriff's

"If each team had an APRS Tracker...or a GPS...receiver and voice radio with them, then we could follow their progress at the base camp and keep track on a topographic map...."

Department "Guardian One" search helicopter to fly. Gerhardt reports, "They even double checked my coordinates, figuring them out the old way of the topographical maps, and were amazed that I was within 6 seconds of their calculated values." (*If you're not familiar with latitude and longitude, it is traditionally measured in degrees, minutes, and seconds.—ed.*)

Gerhardt installed his APRS tracking unit on the helicopter. He says,

> I taped my "super" rubber duck on the side window and taped my Trimble GPS antenna in the Plexiglas dome of the helicopter. Initially, it did not track and my "red car" symbol (the APRS symbol for a moving vehicle) on the APRS screen remained stationary at the Landing Zone. I called the helicopter and had them turn each device off and back on, including unplugging and replugging the cord to the external battery. The Tracker then came alive and worked flawlessly.

Gerhardt's "red car" then flew all over the computer screen and, by replaying the track, the staff had a real good idea that the helicopter had actually covered the area of interest. Both helicopter pilots were very impressed with the APRS setup, and one of them came to the operations center to view the replay of their track. He was very impressed with what he saw and expressed great interest in permanently setting up a Tracker in their helicopter and getting an APRS setup for their King County SAR missions.

The Challenge

Gerhardt says the real challenge will be getting enough other local hams involved in APRS in order to have enough knowledgeable operators to support an active search-and-rescue mission.

Our thanks this month go to Herb Gerhardt, KB7UVC, for sending in this information. Do you have a story to tell? Send your stories of hams serving in the public interest via e-mail to <bjosuweit @aol.com> or <cqvhf@aol.com>, or by "snail mail" to *CQ VHF* "In the Public Interest," 25 Newbridge Rd., Hicksville, NY 11801. ■

Handling Messages

Maybe you've listened to a traffic net and wondered, "Why do these people need all this practice in sending messages? How hard can it be?" Or maybe you thought, "I could never do this. It's just too complicated." The truth, as usual, is somewhere in between.

We often look at something like traffic handling and say, "Oh, that. It's easy. I could do that with my hands tied behind my back. It's too simple. It's boring." And maybe it is...now. But will it always be? What happens when the pressure's on? What happens when you have to jury-rig your station just to make a contact? Things that are simple under normal circumstances often become nightmares when the chips are down.

Moving Day

While writing this column, I moved across state. No big deal (sure). Just pack everything up, have three burly guys load it on a big truck, and drive 140 miles across Alligator Alley. Then all you have to do is unpack. Piece of cake (sure). Things that would normally take no time at all or would be simple are now pretty complex. And it will stay that way for a while as we get unpacked and organized in our new home.

When something disrupts your routine, routine activities may no longer be routine. (Honest, you don't want to know why it took almost three hours to get the computer to dial the Net and pick up e-mail. Let's just call it "pilot error.") And a ham station. It's going to be a few more days. And all that's from simply moving my belongings within state.

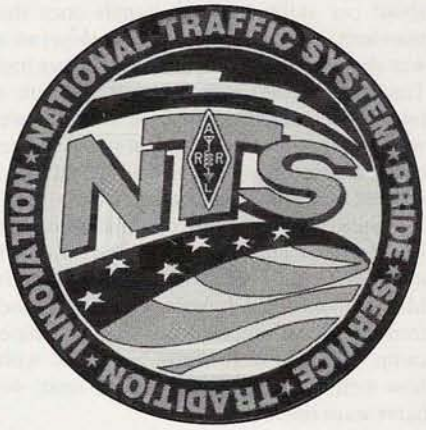
So, what happens in a disaster? First of all, you may or may not have a station left. You may or may not have power. You may need to relocate your station. That's what Field Day and various practice drills are all about. But what about the other side of the coin? You know, the "pilot error" side. Can you think and perform under pressure? In short, are you ready to handle traffic? Are you ready to accept messages from the public? Do you know what to say and how to say it? Do you understand National Traffic System (NTS) procedures, precedences, and handling instructions?

Before we get started on our "how-to," let's get some terminology straight. *Traffic* is ham radio talk for a message, usually a written message in some standard format that's sent during an organized session of a *net*, a group of hams gathered on the same frequency at the same time for a specific purpose. If that specific purpose is to *pass traffic* (send and receive messages), then the net is called a *traffic net*. Traffic may be passed on nets organized for other purposes, and it may not always be *formal* (written). But anytime you're sending a message—especially a message to or from someone other than you and the ham you send it to—it's *traffic*.

Messages sent in the standard ARRL format must conform to a specified format. This is to assure that any ham anywhere in the country can pick up this message and understand where it's going, where it came from and what it means. First, let's look at the *structure* of a typical message.

The Preamble

Regardless of the mode of transmission, all messages have pretty much the same structure. Four main parts comprise the standard message form. The **Preamble** identifies and summarizes (form, not content) the message. Each message



The National Traffic System (NTS) is the American Radio Relay League's nationwide web of traffic nets, capable of sending ham radio messages to the next town or across the United States and Canada.

begins with a **number** assigned by the station of origin. Many stations start over with "number 1" at the beginning of each month. Only the station of origin assigns a number to a message. Subsequent relay stations simply pass the message along "as is."

Precedence is the next part of the preamble. This is essentially a ranking of importance, with four distinct levels: *routine, welfare, priority,* and *Emergency*. The first three may be abbreviated on CW and packet, but *Emergency* is always spelled out, regardless of mode.

Routine is pretty much what it sounds like. "Having a great time at the fair" or "Have you seen the new Speilberg movie?" are pretty obviously routine messages. Of course, we want to deliver

By Peter O'Dell, WB2D (<success@qth.com>)

them as quickly as possible, but the world will not end if it takes a day or two.

During an emergency, very little routine traffic will be handled. It's not a matter of it being against the rules, but in a typical emergency or disaster, traffic with higher precedence ranking will take up most of the message-handling resources. Welfare messages tend to come in two flavors: *queries* ("are you OK?") and *statements* ("we survived the storm just fine."). These are of equal importance and can be thought of as roughly equivalent to the Red Cross's *Disaster Welfare Inquiry* (DWI) message. Considered more important than routine traffic, Welfare messages still take a back seat to priority and emergency messages.

Priority messages often have a specific time limit, or they are official messages that don't qualify as an emergency message. Press dispatches and notification of death or injury fall into this category, too.

Emergency messages are those that have life and death urgency to any person or group of persons, and they're transmitted via ham radio in the absence of regular communication channels. An example might include the Red Cross asking for supplies, materials, or instructions vital to the relief of the stricken in emergency areas.

How do you know what precedence to assign to a message? Sometimes it will be pretty obvious, as in the case of typical welfare messages. Certainly, participating in lots of drills and emergency exercises will give you exposure to what others believe about these rankings. As for the *Emergency* precedence, ARRL's advice is "when in doubt, do not use it." But the only real way to develop a "feel" for it is to handle a lot of traffic.

After the precedence in the preamble, comes **handling instructions**. These are optional for the station of origin, but, if included, they must be passed along by all relaying stations. The instructions are standardized notes to help the last ham in the chain know exactly how the message should be treated, and they always consist of the letters "H" and "X" plus one other. For instance, HXE is a special code that requests that the receiving station get a reply from the addressee and send a message back. On CW and packet, the three-letter instructions are simply sent as three letters. On phone, the sending station pronounces the H and X and gives the phonetic for the third letter; for example, "HX Echo," or sometime uses phonetics for the whole thing, such as "Hotel X-Ray Echo." A complete list of Handling Instructions is available on the ARRL leaflet, "Amateur Message Form."

Next comes the **station of origin**. This is simply the callsign of the station that first introduced the message into the amateur circuits. The "**check**" follows the station of origin and consists of a numeric total of the number of words in the body of the message. Note that normal punctuation symbols are not used in the message text and are replaced with "X" (pronounced "X-Ray" on voice). X is used between each sentence or fragment. Each "X" is counted as a word. Why have a count? Simple. The count helps ensure that the message is transmitted from one station to the next exactly as it started. If the receiving station counts 12 words in the message text while the count is sent as 14, he knows that there's a problem and that he should not acknowledge receipt until he's positive that he has the message copied perfectly.

Finally, the preamble contains **place of origin**, **time filed**, and **date filed**. Suppose you live in Ravenswood, West Virginia, and someone from Ripley, the next town over, calls you on the landline and asks you to send a message to Cousin Gert in Iowa. You would list Ripley, WV as the place of origin. Next comes the time of filing (optional) and the date—these show when you introduce the message into the National Traffic System. This completes the preamble, the first major part of the message.

The Message Body

Now we move on to the **body** of the message. The housekeeping is taken care of and this part tells the receiving station who the message is going to and what the actual message is.

The **Address** is the first part of the body and is exactly what it sounds like. You should have the same information that the post office would need to deliver a letter, including the Zip code. A Zip code is useful in routing the letter to the right area of a state. Also, most NTS traffic is delivered via telephone, so always try to include a phone number (with area code).

After the address comes the **text** or **body** of the message. Here, less is more. Messages should always be kept brief and to the point. Aim for no more than 25 words (including "X"s), but if the message requires more words, that's OK. The ARRL has created a list of numbered messages that function much like the Q-signals used on CW. For instance, message

number four reads "Only slight property damage here. Do not be concerned about disaster reports." It would be sent in the text part of the message as "ARL FOUR." The letters ARL are always inserted ahead of each numbered message. So, you might have a text that is sent as ARL FOUR ARL SIX. The ARL FOUR would still translate the same, but a new sentence is added to the message that reads, "will contact you as soon as possible." Not all the messages deal with difficult situations; for example, ARL SIXTY ONE reads "Wishing you a very Merry Christmas and a Happy New Year."

A couple of notes about ARL messages: 1) The numbers should always be spelled out (as above) when a message is sent via CW or packet. 2) Because of this, each digit counts as one word in your "check." So ARL SIXTY ONE would give you a check of three. 3) Actually, in this case, the check would be "ARL 3." You should add the letters "ARL" to the check of all messages that have ARL numbered messages in the text. This alerts receiving stations to watch for these abbreviated messages.

Any salutation, such as "Love," or "73," is counted as part of the message body, but the signature is not.

Signed...

Finally, the last major part of the message is the **signature**. It's the name of the person who originated the message, not the ham who first filed the message. If the message is being sent in some official capacity, then the title of the person originating the message should be included in the signature as well.

That's the structure of a piece of traffic in a nutshell, and it's all you really need to know about traffic handling to join in on the fun and, at the same time, prepare yourself to be professional and efficient in a real disaster. Enough theory. You need practice, practice, practice. The best way to get practice is to begin to participate in traffic nets. Most, if not all, of the local nets now meet on VHF repeaters. Just listen in a few sessions, get a feel for how the net flows, and then join in.

Joining a Traffic Net

One of the things you'll quickly notice is that these nets, even the local ones on repeaters, tend to be structured. The Net Control Station (NCS) will call for check-ins with traffic first. Then he (or she) will call for other stations who wish to check in to take traffic. In general, stations only transmit when the NCS invites them to. (*Some NCSs may invite people to "join" the net. This is simply another way to say "check in." There is no formal sign-up needed to take part in an NTS traffic net.—ed.*)

Here are some other tips that can help you. Traffic nets and silly phonetics (Willy Billy Two Dorko) don't mix. Stick with the standard phonetics. Also, it's considered "liddish" (poor operating) to use Q-signals on phone. Most hams do it a little bit now and then, but you're likely to get called on it on a phone traffic net. Speak distinctly and use plain English.

Sooner or later, some traffic will come your way. Just relax and write down the message just as you hear it. Make sure that your word count of the message text agrees with the count in the preamble. Don't guess. If you miss something, or you're not sure, don't be afraid to ask for a repeat, which is generally called a "fill." If you heard "...arriving Tuesday at gvilseinpf...," you'd ask for a fill of "all after Tuesday," or "all between Tuesday and X-ray." Ask for repeats only of words you missed or aren't sure of. Once you're sure you've copied everything correctly, and your word count agrees with the message "check," acknowledge receipt (usually by message number and precedence; say, "Roger number 142 Routine"), and hand the frequency back to the NCS ("WB2D back to net," for example).

Training for "The Real Thing"

Traffic handling is both fun and great training, but 99% of all the message you pass will be routine. How can you get practice dealing with messages that are of a higher precedence? Simple. Become involved in your local Amateur Radio Emergency Service (ARES) group. Most ARES groups sponsor practice drills several times each year. These exercises will give you a chance to hone your skills and get some solid practice handling traffic other than routine—even if it is just pretend. (*There may be other groups in your area that hold emergency drills as well, such as RACES—the Radio Amateur Civil Emergency Service, which operates as part of the local Office of Emergency Management—or other emergency communications groups. ARES and RACES are the most numerous.—ed.*)

"The ARRL has created a list of numbered messages that function much like the Q-signals used on CW. For instance, message number four reads 'Only slight property damage here. Do not be concerned about disaster reports.' "

The ARRL has a number of free and inexpensive aids to help you learn traffic-handling. The **Amateur Message Form** is a free card that summarizes the structure of a piece of traffic and covers precedences, handling instructions, Q-signals, and common abbreviations. **ARRL Numbered Radiograms** is another free paper that explains how to send and receive numbered radiograms as well as lists each along side its translation. The *Public Service Communications Manual* explains ARES and other organizations as well as giving a short tutorial on traffic handling. Finally, the *ARRL Operating Manual* has a whole chapter devoted to traffic handling.

Learn to handle traffic now, when there's no pressure. Then when you're needed, you'll be ready. You'll know what to do and how to do it. It'll become second nature to you. ■

Resources

The **Amateur Message Form** and **ARRL Numbered Radiogram** sheets Peter mentions are available without charge from the ARRL Field Services Department (see address below), and may also be downloaded from the League's Web site at <http://www.arrl.org/field/forms/>. Also, they're often found at ARRL tables at hamfests, where you can also often find local League volunteers who can talk to you about traffic-handling.

The *Public Service Communications Manual* and the *ARRL Operating Manual* are not free, but they're both worthwhile additions to your ham library. They may be ordered 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>.

A Look at Modems... Plus APRS and the Internet

Many hams think of TNCs as "radio modems," but they're not quite right...the modem is only one part of a TNC. And, speaking of modems, let's look at how APRS is blending with the Internet to do something even the commercial folks haven't figured out yet.

With only a few exceptions, all of the packets sent on amateur digital networks today use either the venerable (and now obsolete) TCM3105 modem (for 1200 baud) or a variant of the G3RUH modem (for 9k6—9600 baud—or faster). Last month, we discussed the difference between AFSK and FSK, and this month, we'll have a quick look at the most popular modems in use today.

"There are dozens of modulation and demodulation techniques...However, amateur use has settled on two basic techniques: Frequency Shift Keying (FSK) and Audio FSK (AFSK)."

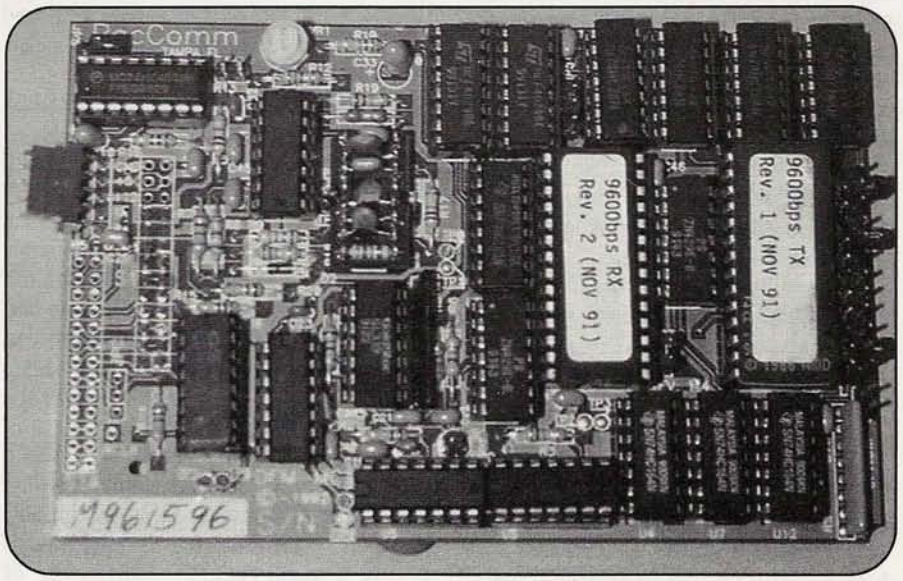


Figure 1. PacComm's implementation of the G3RUH modem. Most of the components that are sensitive to baud rate are on a header, allowing easy data rate changes.

What IS a Modem, Anyway?

The name MODEM is a contraction of the circuit's two functions, MOdulator and DEModulator. When sending data through a medium other than short pieces of wire, we can get better performance by translating the data into another form. We do this to make it easier to use a certain medium for the data, such as radio or telephone, and to make the data less likely to suffer from the effects of noise or interference. First, we modulate the data in some way, then send it through the medium; and, at the other end, we have to demodulate it to make it useful to our circuits again.

There are dozens of modulation and demodulation techniques. We discussed some of the more important ones last month. However, amateur use has settled on two basic techniques: Frequency Shift Keying (FSK) and Audio FSK (AFSK). This doesn't mean that other methods are not used, or are in some way inferior; it only means that FSK and AFSK seem to be used more often than other methods.

Getting to Know Your TCM3105

By far, the most commonly used AFSK modem in amateur work is the Texas Instruments (TI) TCM3105. When it was introduced, this single 16-pin modem chip was less expensive and easier to use than its competitor, the XR2206/XR2211 Modulator/Demodulator chipset, which was in the original TAPR TNC-2. It was developed in an era when 1200-baud computer modems were considered fast, but is now obsolete and out of production. In a recent visit to the TI Web site (<http://www.ti.com>), it wasn't even listed. Maybe that should tell us something about the state of the art.

The TCM3105 is a model of simplicity. It uses a single power supply, only a few external components, and offers

By Don Rotolo, N2IRZ (<N2IRZ@compuserve.com>)

"But the real magic of the G3RUH modem, despite its complexity, was its simplicity. Complex to design and build, but simple to use."

good performance at a reasonable price. There are only two adjustments, neither of which is critical. The Carrier Detect level adjustment determines the point at which the modem signals that it is receiving data, and the Receive Bias adjustment determines where the modem decides between a zero and one data bit.

A crystal oscillator running at 4.433 MHz provides a stable time base for the modem. The modem can be set, by shorting certain pins to ground, for baud rates other than 1200, and can even have different modulation and demodulation speeds. Although TI doesn't mention it in its data sheet, a well-known trick allows you to use this modem at 2400 baud by simply changing the reference crystal to something in the 6.5-MHz range. Details on this trick are in my December, 1997, column.

As used by amateurs, the TCM 3105 follows the Bell 202 standard, meaning it uses audio tones of 1200 Hz and 2400 Hz to signify ones and zeros. These tones can be carried by nearly any voice-grade channel around—telephone, radio, whatever. This is AFSK's greatest advantage: You can send data through virtually any radio, without the need for modifications. You connect it, set the transmitter audio drive level (to keep from overmodulating and distorting), and go. This is as close to "plug 'n play" as it gets.

The FSK Alternative

The most popular FSK modem used by amateurs is the G3RUH or a licensed variant. First introduced 10 years ago at the 7th ARRL Digital Communications Conference (DCC), the G3RUH is still popular and is readily available. Its greatest advantage is its ability to work at just about any baud rate, from 4800 to 76,800 and beyond, by only changing a handful of passive components.

However, it requires the radio or other communications channel to have very specific characteristics, the most important being a frequency response from DC to about twice the data rate. Until recently, few radios could meet these requirements, so most radios had to be modified by the user in order to use higher data rates. Not everyone was comfortable with these modifications, and so high-speed packet was not very popular. Recently, though, many amateur FM radios have been introduced which feature 9600-baud data ports and modified PLL circuits, allowing the G3RUH to be used more easily.

The G3RUH modem is considerably more complex than the TCM3105. Instead of a single chip, the G3RUH device required an entire circuit board with nearly a dozen ICs. It cost over $100 when first introduced commercially, compared with the "free" TCM3105 that came with every TNC. Besides needing specially modified radios, the deviation adjustment was critical, expensive test equipment was essential, and getting a link to work was part technical skill and part black magic. No wonder so few chose to get involved.

But the real magic of the G3RUH modem, despite its complexity, was its simplicity. Complex to design and build, but simple to use. Only the analog parts—essentially, the audio drive level into the radio—needed adjustment; the rest, being digital, needed no adjustment. Changing baud rates, assuming you had a radio that could handle it, only involved changing a couple of capacitors and a resistor. In one variant, designed for the FlexNet RMNC card, the baud rate could be changed on the fly, through software.

For transmitting, the modem uses some interesting techniques. First, the incoming data is scrambled, a technique used to ensure a quasi-random distribution of ones and zeros, helping to keep RF bandwidth under control. The resulting data is used to look up a digital representation of the "ideal" transmitted analog waveform in memory. This "ideal" waveform data is sent to a Digital-to-Analog (D/A) converter, which generates this waveform. Instead of trying to shape the actual data bits using conventional analog techniques, G3RUH simply uses a look-up table of waveforms for essentially every data bit, and generates it with digital precision. A simple analog filter (those capacitors and resistor we mentioned earlier)removes unwanted "alias" frequencies generated by the D/A process. The resulting signal is sent to the radio.

Receiving is even simpler: the incoming data is filtered a little to remove unwanted high frequencies, then amplified and passed on to the data detector. A flip-flop samples the pulses and decides if it is a one or a zero. This data is sent to the descrambler. The descrambled data is passed directly to the TNC.

The key to the receive process is determining exactly when to sample the incoming data. If you sample at the wrong time, the Bit Error Rate (BER) will become excessive. So, you use a *zero-crossing detector* to send out a pulse each time the incoming signal crosses the zero-volt line. These pulses are examined by a Digital Phase-Locked Loop (DPLL) circuit, which smoothes out variances in the timing and creates a clean and stable "Recovered RX Clock" signal. This signal is then used to time the sampling of the incoming data.

The Data Carrier Detect (DCD) signal, by which the modem signals the TNC that data is being received, is generated by comparing the RX Clock signal to the output of the zero-crossing detector: If the two signals tend to coincide, it means that data is coming in and DCD is turned on.

Of course, these explanations are simplified considerably. For details, you can contact TI and request a data sheet on the TCM3105 (Phone: 972-644-5580), and you can read the original article by James R. Miller, G3RUH, in the *Proceedings* of the 7th ARRL Computer Networking Conference, which is available from TAPR and the ARRL. "Digital Data Link" (March and April, 1996; July and August, 1997) has also covered the

Beyond FSK

While Frequency Shift Keying (FSK) and Audio Frequency Shift Keying (AFSK) are the most popular modulation methods used in ham radio digital communications, they are by no means the only methods.

For example, Phase Shift Keying (PSK) is typically used for satellite work because it's more tolerant of frequency errors, which is important when Doppler shift is significant. FSK performs poorly under these conditions. The popular WA4DSY 56-kilobit modem uses Minimum Shift Keying (MSK), which helps keep the transmitted signal's bandwidth down. The choice of modem is a complex issue, but, in amateur circles, availability and ease of use are more important than absolute performance.

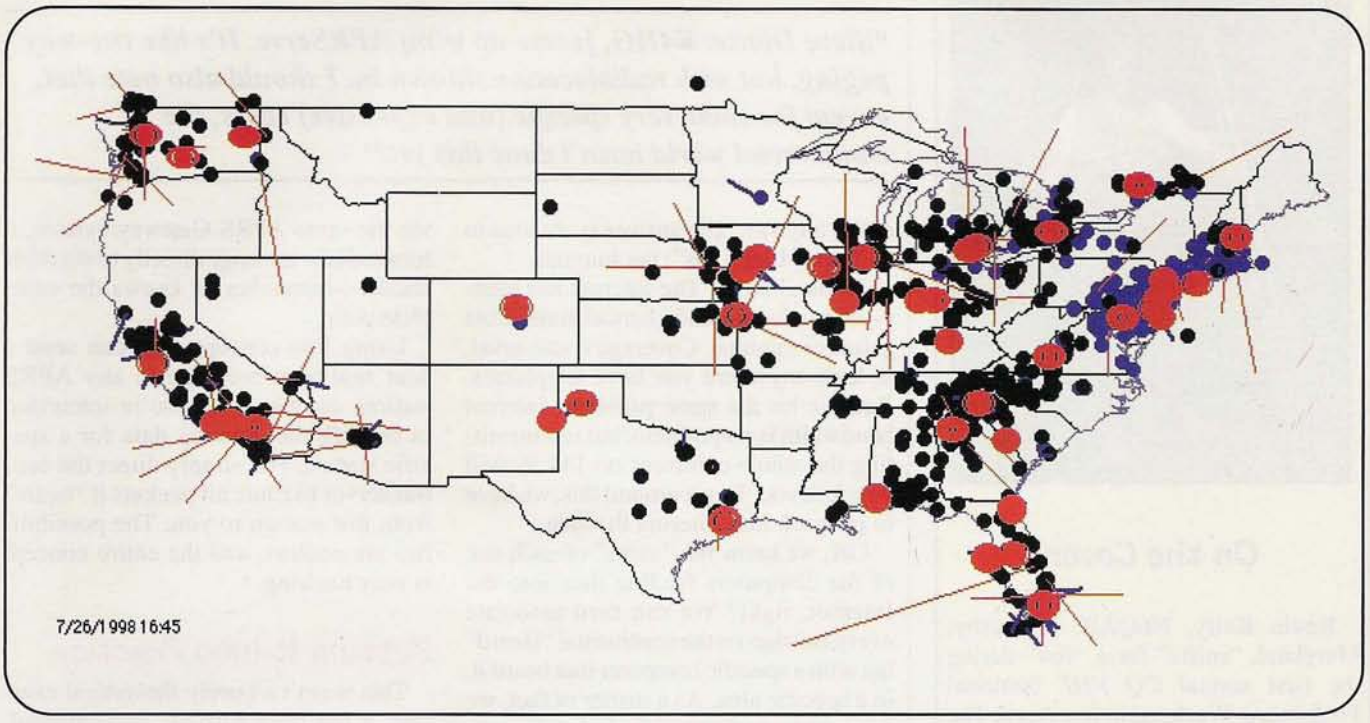


Figure 2. Some nationwide real-time data, in late July 1998, from the APRServe system, as seen at <http://wu2z.rutgers.edu/aprs.html>. The large red circles show the locations of the I-Gate (Internet Gateway) stations.

G3RUH modem, and radio requirements for same, in great detail in the past.

Modems in Summary

Both modems have their advantages. The TCM3105 is easy to use over any voice-grade path. It suffers from a relatively high error rate and very limited data rates, but it remains popular. Before you dismiss it as too slow, remember that a well-designed 1200-baud link will outperform a marginal 9600-baud link; and, in any case, 1200 baud is a lot better than nothing. Honestly, for emergency traffic, 1200 baud is plenty, as most of us cannot type even 1/20th that fast. The G3RUH will work at nearly any data rate, and can be modified in minutes or, in one case, instantly in software. There are two problems which stand in the way of widespread (wider-spread?) use of this modem: first, the need for radios having a wide frequency response extending down to DC along with a smooth phase response; and second, the need for high-speed data sources, much greater than a standard TNC can supply.

Neither problem is insurmountable. In Germany, hams have designed a radio for 76,800-baud operation—perhaps this design can be translated and published, if there's enough interest. The TAPR Web site has a number of detailed articles on converting commonly available commercial gear over to amateur use, and at 9600 and 19,200 baud. For data sources, our recent foray into PC/FlexNet has provided a data source that can push most anything from 1200 bits per second up to 10 Mb/s, so we needn't look further.

If you know of any radio designs for high-speed data, especially in the over-40-kB range, I'd be interested in hearing about them. Long-time readers should now have everything they need to brew their own super-high-speed data network, except cheap radios. There's a definite need for radios that can push data at better than ISDN rates, but the only commercial offerings I've seen so far are in the multi-thousand dollar range. Maybe FM-ATV transmitters? If you have any ideas, please write. I'll be keeping my eyes open for sources.

APRS "I-Gates"

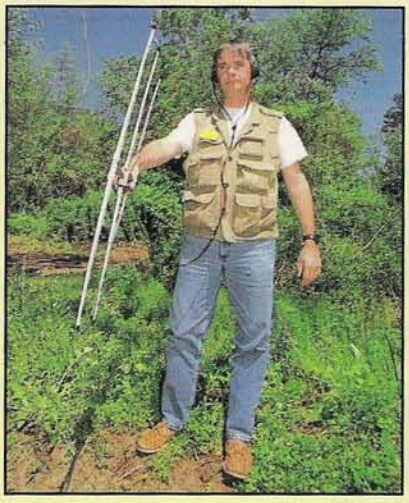
The latest APRS phenomenon is nationwide tracking and messaging. If you're familiar with the Automatic Position Reporting System (APRS), you probably know that brief messages can be exchanged along with position reports. However, on a nationwide basis, sending messages out to some randomly located ham wastes considerable channel time by having to send the message to everyone on the planet (almost) just to hit the intended recipient...through inefficient digipeaters, no less. It generally doesn't work well.

Steve Dimse, K4HG, took note of this, and came up with an ingenious solution, known as *APRServe*. It's like two-way paging, but with radiolocation thrown in. I should also note that, except for some very specific (and expensive) cases, the commercial world hasn't done this yet.

Getting Wired

The first step is to understand that a randomly located ham who's using APRS is visible to someone, somewhere. With some luck, the signal is received by a RELAY or WIDE station and is digipeated for greater range. Now, if we were to break up the continent into smaller areas, you could reliably state that you can hear, and communicate with, most of the APRS stations any given small area.

Here's the cool part: simply link up all of those "areas," and you have nationwide coverage. "Wait," you say, "we already do that, on HF." True, but most of the stations are filtered out, and there really isn't enough channel time on HF to retransmit every packet (plus dupli-



On the Cover

Kevin Kelly, N6QAB, of Lusby, Maryland, "sniffs" for a "fox" during the first annual *CQ VHF* National Foxhunting Weekend in late April. The "fox," in this case, is a hidden radio transmitter, and ham radio "foxhunters" use radio direction-finding (RDF) techniques and equipment to track down the source of the signals.

Kevin, who's been foxhunting for a decade, is out on a hunt with the Kent County, Delaware, Amateur Radio Club. He's using a Russian-built ALTAI 145 self-contained RDF receiver/antenna. The three-element beam is made of strong but flexible steel tape-measure material. On-foot foxhunting is very popular in Europe and Asia, which is why you can find off-the-shelf RDF equipment in such places as Russia and Japan (but not yet in the U.S.). Kevin bought his unit from a Russian team member at the 1993 Friendship Radiosport Games in Victoria, British Columbia, where he was a member of the U.S. foxhunting team. In 1991, he won a gold medal at the first such event in North America.

He has also started transmitter-hunting clubs in California and New Mexico, after first becoming interested in the sport during a talk by Joe Moell, KØOV, at a 1988 ARRL convention in California. "To me," says Kelly, "transmitter hunting has always been an adventure, and that's why I like it so much."

KØOV's report on the first annual *CQ VHF* National Foxhunting Week-end appears elsewhere in this issue. The second annual event is tentatively scheduled for April 24–25, 1999. (Cover photo by Larry Mulvehill, WB2ZPI)

"Steve Dimse, K4HG, [came up with] APRServe. It's like two-way paging, but with radiolocation thrown in. I should also note that, except for some very specific (and expensive) cases, the commercial world hasn't done this yet."

cates) anyway. The answer is obvious to us "Land-Line Lids": the Internet.

Think about it. The Internet has plenty of bandwidth and channel time. Cost is free or minimal. Coverage is universal, at least anywhere you have telephones. But, we hit the same problem: Internet bandwidth is no problem, but retransmitting the whole continent on 144.39 will wreak havoc. To get around this, we have to get back into filtering the data.

OK, we know the "name" of each one of the computers feeding data into the Internet, right? We can then associate every callsign on the continental "Heard" list with a specific computer that heard it, in a specific area. As a matter of fact, we can even learn the specific digipeater path (consisting of a particular computer plus RF path) we can use to reach every APRS station in the country!

An Internet APRS Server

Using this key concept, we first set up a central APRS server on the Internet. Its job is to listen to all traffic and keep the path to each individual station, both the Internet part and the digipeating part, straight, in real time. Next, we connect a large number of Internet "APRS Gateway" stations (I-Gates) to this central server, each feeding everything it hears on the RF side into the central server.

Now, If I send a message to some other APRS station, it is digipeated locally and to the central server. If the central server knows of a path to that station that isn't via the same APRS Gateway system, it forwards the message directly to the other station—remember, it knows the complete path.

Using this concept, you can send a near real-time message to any APRS station, anywhere. If you're interested in hearing the tracking data for a specific station, you simply direct the central server to route all packets it "hears" from that station to you. The possibilities are endless, and the entire concept is very exciting.

Putting It into Practice

This wasn't a purely theoretical exercise: it has been partially implemented, and you can read all about it at <http://www.aprs.net/aprserve.dcc.html> and other pages at www.aprs.net. If (like me) you don't have a Java-enabled browser, you can still see the data at <http://wu2z.rutgers.edu/aprs.html>. As I mentioned earlier, Steve Dimse, K4HG, is the one responsible for all this wonderful stuff, but (other than what was presented at the last DCC) I didn't know much of this until Keith Sproul, WU2Z, enlightened me to its existence.

Just goes to show you what you can accomplish if you set your mind to it, although it helps if you have some spare time on your hands. In the coming months, we'll explore some aspects of digital data that you might not have encountered yet. Until next month, 73.

—N2IRZ

Resources

To purchase copies of the Digital Communications Conference *Proceedings* discussed in this article (7th ARRL Computer Networking Conference for the G3RUH modem; 1997 Digital Communications Conference for APRServe), contact either TAPR or ARRL at the following addresses:

ARRL, 225 Main St., Newington, CT 06111; Phone (orders only): (888) 277-5289 or (860) 594-0355; Fax: (860) 594-0303; Web: <http://www.arrl.org>.

Tucson Amateur Packet Radio, Inc., 8987-309 E. Tanque Verde Rd., #337, Tucson, AZ 85732; Phone: (940) 383-000; Fax: (940) 566-2544; E-mail: <tapr@tapr.org>; Web: <http://www.tapr.org>.

The TAPR Web site will also provide links and other information relevant to this month's topics.

ARRL International EME Competition

This is the ultimate DX contest—seeing how many stations you can work OFF THE MOON! It's in two weekends, one in October and one this year in December, with a special non-competitive microwave EME weekend in between.

Here are the rules for the 1998 ARRL International EME Competition, courtesy of the ARRL Contest Branch:

1. Object: Two-way communications via the earth-moon-earth (EME) path on any authorized amateur frequency above 50 MHz.

2. Date and Contest Period: Date is determined each year, and is announced in *QST*. Two full weekends, full 48-hour period UTC each weekend. Contest dates in 1998 are October 10–11, and December 5–6 (*see box for details on a non-competitive microwave EME event in November—ed.*).

3. Entry Categories:

3.1. Single Operator: One person performs all operating and logging functions, equipment adjustment and antenna alignment.

3.1.1. Multiband.

3.1.2. Single Band: Single-band entries on 50, 144, 222, 432, 902 and 1296-and-up categories will be recognized in awards offered. Contacts may be made on any and all bands without jeopardizing single-band entry status. Such additional contacts are encouraged and should be reported. Also see Rule 8, Awards.

3.2. Multioperator: Two or more persons participate; includes neighboring amateurs within one call area, but with EME facilities for different bands on different team members' premises, as long as no two are more than 50 km (30 miles) apart. Multioperator neighborhood groups cannot use the same call signs at each location; all calls will be listed in the results.

3.3. Commercial equipment: Stations using equipment that is not amateur (such as a dish antenna or lab equipment owned by an institution or government agency) will have their scores listed separately.

4. Exchange: For a valid contact to occur, each station must send and receive both callsigns and a signal report in any mutually understood format, plus a complete acknowledgment of the calls and report. Partial or incomplete QSOs should be indicated on your log, but not counted for contest credit. Stations may be worked once per band for credit.

5. Scoring:

5.1. QSO Points: Count 100 points for each complete EME contact.

5.2. Multiplier: Each U.S. and Canadian call area, plus each DXCC country (not US/Canada) worked via EME on each band.

5.3. Final Score: Multiply QSO points by sum of multipliers worked on each band for your final score.

6. Miscellaneous:

6.1. Fixed or portable operation is permitted. Stations operating outside traditional call areas must indicate so, identifying the call area of the operating site.

6.2. Contacts may be on CW or SSB. Only one signal per band is permitted.

6.3. A transmitter, receiver, or antenna used to contact one or more stations under one callsign may not be used subsequently under any other call sign during the contest, except for family stations where more than one call has been issued, and then only if the second callsign is used by a different operator.

6.4. There is no specified minimum terrestrial distance for contacts, but all communications must be copied over the moon-bounce path, regardless of how strong (or weak) a nearby station's terrestrial signal may be.

7. Reporting: Entries must be postmarked no later than 30 days after the contest and must include complete log data. Official forms are available in the ARRL Contest Yearbook ($5). Your summary sheet should show a band-by-band breakdown of QSOs and multipliers, and include details of your station setup and a photo.

8. Awards:

8.1. Certificates will be issued to the top five stations worldwide in each of the entry categories: single operator, multiband; single operator, single band (separate awards for each band); and multioperator.

8.2. Additional awards will be issued where significant achievement or competition is evident. In addition, each station that successfully completes at least one EME contact during the contest period will receive a certificate commemorating that achievement.

8.3. Participation Pins are available, while supply lasts, to all who make at least 1 contact during the contest. This includes all operators of qualifying multioperator efforts. Price is $5 for each pin. Make check or money order payable to the ARRL (no cash please). Include a return mailing label (preferably a self-adhesive type), and send order to: ARRL Contest Branch, 225 Main Street, Newington, CT 06111.

9. Other: See Rules for All ARRL Contests, available on the ARRLWeb (<http://www.arrl.org/contests>), or in the *ARRL Contest Yearbook*, available for $5 plus postage from ARRL HQ at the above address.

Non-Competitive Microwave EME Weekend November 7–8

The ARRL is sponsoring a one-time-only non-competitive EME weekend for microwave frequencies (1296 MHz and higher) on November 7–8, 1998. According to ARRL Contest Manager Billy Lunt, KR1R, the event came about as a result of a scheduling conflict with IARU Region 1 (Europe and Africa) for the "good EME" weekend in November, plus a desire expressed by many EME operators for a contest-like, but non-competitive, atmosphere in which to work on microwave EME contacts. In a competitive event, Lunt explained, these operators feel as though they need to concentrate on bands where they know they can make contacts and rack up points, and aren't willing to sacrifice the points to experiment with new bands. It is hoped that this non-contest EME weekend for microwave frequencies only will encourage more activity via EME on the microwave bands.

Amateur Radio on the International Space Station (ARISS)

The manned space flight community is planning a first-class amateur radio station for the International Space Station (ISS). If you've enjoyed SAREX and MIREX, stand by for the exciting possibilities offered by ARISS.

Amateur radio has been enjoying an increasing presence on manned spacecraft ever since it went on board the Space Shuttle *Columbia* STS-9 mission in 1983. On that mission, Astronaut Owen Garriott, W5LFL, first made 2-meter FM amateur radio communications part of the space program. Since that time, there has been a nearly continuous amateur radio presence on manned spacecraft. In addition to the Space Shuttle's Space Amateur Radio Experiment (SAREX) program, the Russian Mir space station has both 2-meter and 70-centimeter amateur radio equipment, providing voice and digital (packet) communications as well as an FM repeater.

The amateur radio communications modes pioneered on the Space Shuttle and Mir will continue on the International Space Station, which will also add several new modes. This article gives you a schedule of early Space Station assembly activities, the amateur communications that will be available during assembly, and the plans for the station's permanent amateur radio station.

"The amateur radio communications modes pioneered on the Space Shuttle and Mir will continue on the International Space Station, which will also add several new modes."

Station Assembly

The International Space Station will be in an orbit similar to Mir's, with a 354-kilometer (220-mile) altitude and a 51.6-degree inclination (meaning the spacecraft's orbit will take it approximately 52 degrees North and South of the Equator). Because of its orbital altitude, the station will make one orbit around the Earth every 92 minutes.

As of this writing, the first piece of the station—the *Control Module*—is scheduled for launch by a Russian Proton booster in November, 1998. Station assembly is due to begin the following month, with the Space Shuttle STS-88 mission. STS-88 will bring up the station's *Utility Node* with its two *Pressurized Mating Adapters*. One of the mating adapters will connect the Utility Node to the Control Module; the other adapter will connect the Shuttle to the Utility Node. Table 1 lists space station assembly flights scheduled through December, 1999 (subject to the usual slippage associated with space launches).

The first permanent crew occupation is scheduled for July, 1999, following docking by a Russian Soyuz capsule. Further details and information are available on the International Space Station Web page at: <http://station.nasa.gov/>.

Transportable Amateur Radio Station

The initial ARISS equipment, called the *Transportable Station*, will be similar to the equipment used for SAREX. Space Shuttle STS-96 cargo mission (ISS mission 2A.1)—currently scheduled for May, 1999—is slated to carry the transportable station into orbit.

The Transportable Station will give the ISS an interim set of amateur radio communications equipment, consisting of handheld 2-meter and 70-centimeter FM transceivers connected to externally mounted antennas. These transceivers will give the ISS amateur radio voice communications and, through a PacComm PicoPacket TNC, a packet radio bulletin board similar to the one on board Mir.

Permanent Amateur Radio Station

The real excitement will begin when the permanent ARISS station arrives. Space Shuttle STS-118 mission (ISS mission UF-4) is to carry the permanent ARISS equipment into orbit. This mission is currently scheduled for May, 2002. STS-118 will deliver the ARISS equipment on "EXPRESS" pallets to be mounted on the Space Station's S3 (starboard) truss segment. Plans are for an FM repeater (similar to the SAFEX on Mir) and microsat-type digital communications payloads.

The permanent station will be installed later in 2002 and will be given a dedicat-

By Ken Ernandes, N2WWD (<n2wwd@amsat.org>)

Table. International Space Station Initial Assembly Sequence

Scheduled Date	Flight	Launch Vehicle	Elements
Nov 98	1A/R	Proton	Control Module (Functional Control Block—FCB)
Dec 98	2A	Space Shuttle STS-88	Utility Node (1 Storage Rack); 2 Pressurized Mating Adaptors
Apr 99	1R	Proton	Service Module
May 99	**2A.1**	**Space Shuttle STS-96**	**Spacehab Double Cargo Module; Transportable Ham Station**
Jun 99	3A	Space Shuttle STS-92	Integrated Truss Structure (ITS) Z1; PMA-3; Ku-band Communications System; Control Moment Gyros (CMGs)
Jul 99	**2R**	**Soyuz**	**Soyuz Space Capsule; 1st permanent crew arrives; will put Transportable Station on the air**
Aug 99	4A	Space Shuttle	Integrated Truss Structure P6; Photovoltaic Module; Radiators STS-97
Oct 99	5A	Space Shuttle STS-98	U.S. Laboratory Module
Dec 99	6A	Space Shuttle STS-99	MPLM (U.S. Lab Outfitting); Ultra High Frequency (UHF) antenna; Space Station Remote Manipulating System (SSRMS)

*Table. Tentative Assembly Schedule for the International Space Station through December, 1999. Flights important to ARISS are highlighted in **bold type**. The permanent ARISS station is scheduled for launch in 2002.*

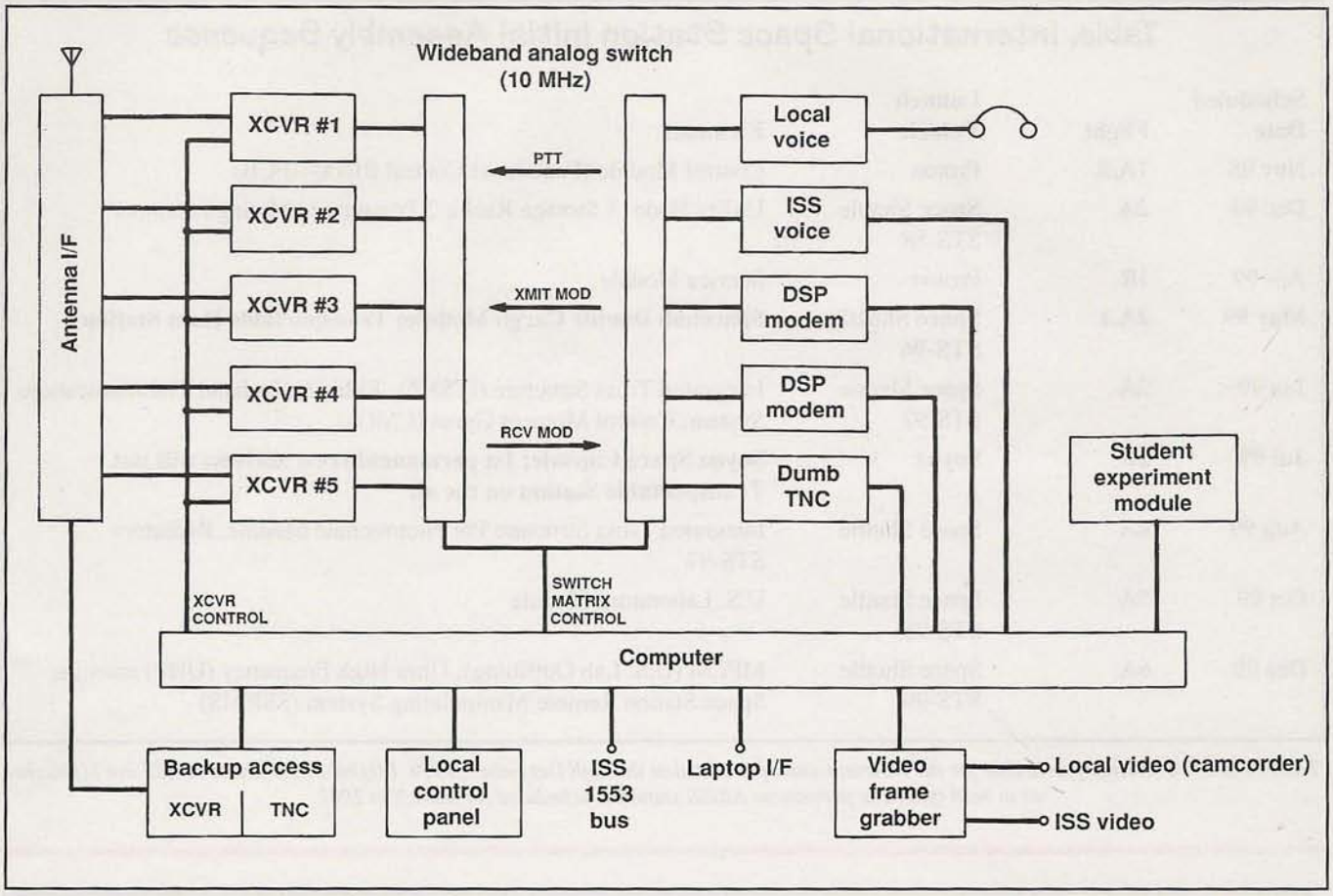


Figure 1. Block diagram of the U.S. ARISS team proposal for the permanent ham station aboard the International Space Station. The equipment would be tied together in a rack and linked through a computer-controlled matrix which would also give a network of amateur control stations the ability to command the ARISS station from the ground.

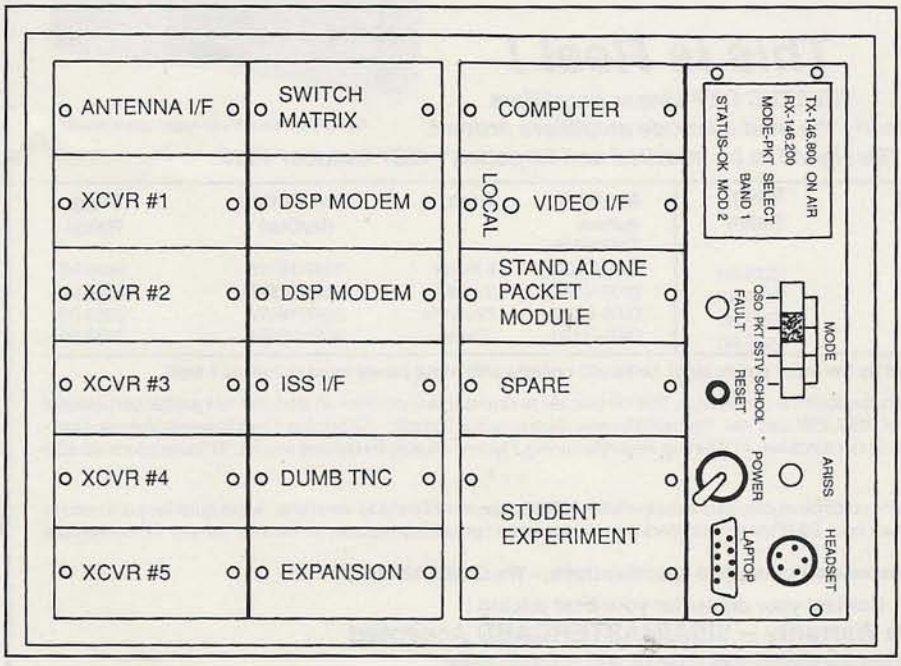


Figure 2. A conceptual illustration of the ARISS equipment rack front panel. This setup could have a variety of configurations, including analog voice, digital modes, crossband repeaters, and stand-alone bulletin board systems.

ed 19-inch rack in the U.S. Habitation module. The details are still being debated between the international partners, but there is agreement that this station should have slow-scan TV, fast-scan TV, packet, voice, and experimental modes. They're also planning to have multiple frequency bands and modes (FM and SSB), as well as an interface with the Station's audio and video systems.

The international ARISS committee includes delegates from Canada, France, Germany, Italy, Japan, Russia, the United Kingdom, and the U.S. Each country may submit proposals for the permanent station. Several of the countries have done so, including the U.S. (I'll summarize the U.S. proposal in the next section *as an example*). The ARISS committee will determine the final configuration after reviewing each of the proposals.

U.S. Proposal

The U.S. ARISS proposal is modular in design, with components that can plug

"The details are still being debated between the international partners, but there is agreement that this station should have slow-scan TV, fast-scan TV, packet, voice, and experimental modes [along with] multiple frequency bands and modes (FM and SSB)...."

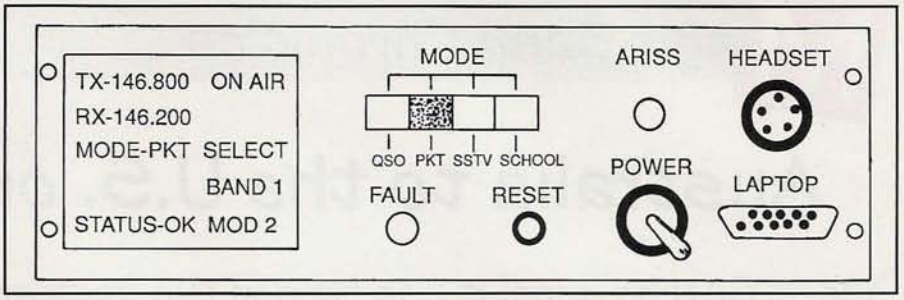


Figure 3. The control panel envisioned in the U.S. ARISS proposal will allow the crew to quickly set the station up in one of the "standard" operating modes: QSO, Packet, SSTV, School Contacts. Final decisions on the configuration of the permanent Space Station ham station will be made by the international ARISS committee.

in and out on orbit for easy repair or upgrade. Figure 1 shows how the equipment would be tied together in a rack and linked through a computer-controlled matrix. The control matrix computer would also give a network of amateur control stations the ability to command the ARISS station from the ground.

Figure 2 is a conceptual illustration of the ARISS equipment rack front panel. Notice that the equipment includes five different transceivers as well as packet and video equipment and a module for student experiments. This setup could have a variety of configurations, including analog voice, digital modes, crossband repeaters, and stand-alone bulletin board systems. The ARISS team also expects to connect the equipment to the Space Station's MIL STD-1553 data bus (a standard hardware interface for aircraft and spacecraft). With this connection, users could download Space Station orbital and attitude information and possibly other "housekeeping" information. Discussions are also underway to allow connections with the ISS intercom and video networks.

Figure 3 is a close-up of the control panel located at the top of the equipment rack. This is designed so the crew can quickly set the station up in one of the "standard" operating modes: QSO, Packet, SSTV, School Contacts. This panel also would have an LCD status display and connectors for a microphone headset or computer as needed for the different modes.

Just to Summarize

The first piece of the International Space Station is scheduled for launch in November of this year, with assembly beginning in December. The first set of amateur radio equipment, the ARISS Portable Station, is due to arrive in May, 1999, and to go into service in July, once the Station is permanently manned. The portable station will provide amateur communications modes equivalent to what is currently used on the Mir and Space Shuttle.

The ARISS Permanent Station, which is scheduled for installation in 2002, will extend the communications modes with both voice and digital equipment. The permanent station will also have multiple transceivers allowing simultaneous operation of voice and digital modes as well as a crossband repeater. ■

Resources

Publications:

Amateur Radio on ISS, AMSAT News Service Bulletin 285.01 (ANS-285.01), 12 October 1997.

Amateur Radio On-Board the International Space Station, Frank Bauer, KA3HDO, and Will Marchant, KC6ROL, *Proceedings* of the AMSAT-NA 15th Space Symposium, 1997, ARRL, $15.

Amateur Radio on the International Space Station, Frank H. Bauer, KA3HDO, and Matt Bordelon, KC5BTL, *Proceedings* of the AMSAT-NA 14th Space Symposium, 1996, ARRL, $12.

These *Proceedings* books may be ordered 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>.

World Wide Web Pages:

International Space Station Web Page: <http://station.nasa.gov/>
ARISS Web Page: <http://garc.gsfc.nasa.gov/~ariss/ariss.html>

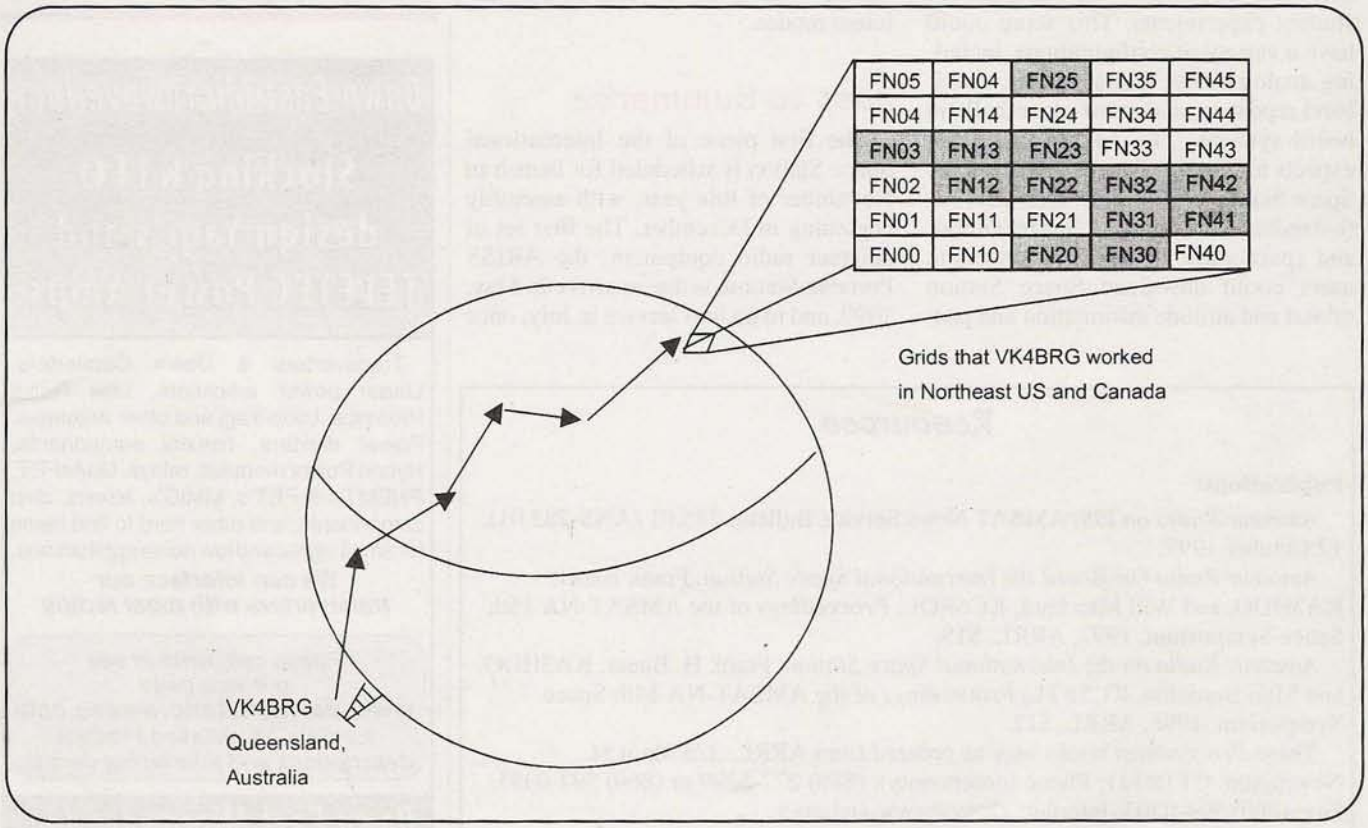
Australia to the U.S. on 6 Meters!

Yes, it CAN be done! It has been in the past and it could be in the future. Will you be the one?

One of the most distant places on Earth for stations in the U.S. to work on any band is Australia—over 12,000 miles away. Imagine this happening on 6 meters! Well, it has happened a number of times during the F_2 skip season, and there were several vigilant 6-meter operators in the U.S. and Canada who were able to make contact at the end of the last sunspot cycle during two days in October and November of 1991. On those days, Ron Graham, VK4BRG, of Queensland, Australia, was heard on the Magic Band, and the results were absolutely fantastic.

"His Jaw Dropped..."

The first opening occurred on October 29th. One U.S. station that worked VK4BRG was Frank Moorhus, AA2DR, of Long Island (Grid FN30), who came home from work, flipped on his ICOM 736 radio and tuned around on six. His jaw dropped when he heard VK4BRG calling CQ loud and clear on 50.117 MHz. Frank called him with 100 watts to a beam. VK4BRG came back to him with a good signal report. After completing the QSO, Frank did not hear too many other stations come back to Ron, so he decided to run out to his truck and see if he could work Australia using 100 watts and a Saturn Six mobile antenna. Frank moved his truck to an open field across the street and then called Ron. Imagine Frank's surprise when Ron came back to him and another QSO was made.



On October 29, 1991, at the peak of the last sunspot cycle, VK4BRG in Queensland, Australia, managed to work a dozen grids in the northeastern U.S. and Canada via combined sporadic-E and F_2 propagation. Less than two weeks later, he worked stations from Colorado to Georgia. It can happen again—will you be listening when it does?

By Ken Neubeck, WB2AMU (kneubeck@suffolk.lib.ny.us)

On the Other Side...

It's interesting to see what was happening on the other side of the contact. VK4BRG's incredible day started with his working about 20 stations in the southern part of the U.S. in the 4th and 5th call areas at about 2000 Z (which is early morning, local time, for him). Ron suspected that this was where the F_2 skip was ending. Then around 2100 Z, an additional hop (probably sporadic-*E*) developed into the northeast U.S. and eastern Canada, and Ron worked 35 stations in this area.

While this opening was incredible, Ron experienced another opening on November 9th in which he worked 126 mainland U.S. stations on 6 meters from 2300 Z on. Again, the main part of the F_2 opening ended in the 5th call area and additional sporadic-*E* links put his signal into Colorado, Tennessee, Georgia, and Kentucky. In fact, WØKEA in Colorado reported hearing Ron's 4-watt beacon on 50.077 MHz—the best reported DX for his beacon, which uses a sloping dipole antenna!

Multiple Modes

The two openings described above show how multiple propagation modes such as F_2 and sporadic-*E* can link distant stations together. It's important to note that during October and November, Australia is in the late spring season (when F_2 is unlikely for that area and the most probable first link of the two openings for Australia into the area near the equator is sporadic-*E*. So sporadic-*E* may have been the first and last link of the skip with F_2 sandwiched in between. This type of multiple propagation mode will be explored further in a future article in *CQ VHF*.

These examples show what can be worked on the Magic Band when conditions are optimal for both F_2 and sporadic-*E* propagation. With the increase in the number of hams on the Magic Band since the last sunspot peak, expectations are very high that similar types of events can occur again and that the band will have to monitored regularly every day. No one wants to be that 6-meter operator who missed the big opening to Australia because he didn't turn on the radio that day!

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...!

"Rocks" in His Head...

Dear *CQ VHF*:

By writing his article, "Two Meters—A Band That Really 'Rocks' " ("Weak Signal News," August, 1998), Tim Marek has done a great service for those of us who really love meteor scatter. We need more people working at it. But I have a few quibbles with what he says.

From my experience, meteor scatter at a distance of 500 miles is not just difficult—it's darn near impossible, at least during non-shower periods. K8TQK and I ran a long series of tests trying to work over a distance of 501 miles. We have no problem communicating on tropo over that path, but what we heard on meteors was very short and we never made a contact. We also tried a series of off-path ("bank-shot") tests and had no success. I've had excellent results with VE3AX at 652 miles. Somewhere between 500 and 652 miles will work. Exactly where, I don't know! Major showers might work OK.

Please refer to the "What do you send" paragraph. Why send "Break" at the end of the sequence? Trust your clock and the other Ops—say something needed, even if it is only part of a call or signal report—it might be just what the other Op needs to hear!

Same paragraph: There should not be a "standard report" for M/S. The purpose of the report is to convey information. One of the requirements if a "contact" is an exchange of information. The "S" reporting system for M/S used to be as follows: S1, a burst of up to 5 seconds; S2, 6 to 10 seconds; S3, 11 to 15 seconds; S4, 16 to 20 seconds; and S5, over 20 seconds.

In the early days, skeds were commonly run in 30-second sequences and mostly by CW. SSB changed that, and, with 15-second sequences, S4 and S5 became obsolete. But S1, S2, or S3 will convey some useful info (I always wonder what the other Op has heard from me). By use of a meaningful signal report, you can tell each other what you have heard and at the same time conform to the spirit as well as the letter of the rule: an *exchange of information.*

Sorry Tim, one more quibble! (same paragraph): There should be no doubling of words ("S2 S2") *ever!* Why? Here is a sample of what happens: I hear "MQS K7XC S2 S2". If there had been no doubling, what I would have heard was MQS K7XC S2 KØ"—and I'd have had complete calls and could have immediately responded "Roger S2" (a burst of under 5 seconds). But instead I have to go on sending calls only, often to the end of the sked! It's happened to me many times!

No more quibbles, just a thought! I prefer " Roger, Roger" (it is OK to "double" here!) to "Roger 73". There's one less syllable and, for some reason, people who do weak-signal work can copy "Roger Roger" under *incredibly* adverse conditions!

Richard Hart, KØMQS
Delta, Iowa

Richard—Thank you for your additional input. We didn't have time to forward your note to Tim for a response, but I think you have more disagreements in style than factual quibbles with Tim. It's unfortunate that records aren't kept for minimum *distances via various propagation modes, so the minimums generally are approximations. And if you can make a 500-mile QSO during a major shower, then it is indeed within MS range.*

I checked several other references for procedures, such as saying "break" at the end of an exchange and repeating information ("S2 S2"). These procedures both have their proponents, but perhaps the most useful suggestion came from the ARRL Operating Manual, *which noted that many stations are replacing the signal report in their exchanges with grid squares—since nearly everyone is "S2" and, as you point out, the goal is to exchange useful information.*

—W2VU

The ARRL Restructuring Proposal: Additional Voices

In an effort to present as many viewpoints as possible on the ARRL license restructuring proposal, we're replacing our usual Op-Ed with a variety of hams' comments, both pro and con.

Editor's Note: The following comments are excerpts of letters to us, letters to the ARRL posted on the Internet, and general postings on Internet mailing lists. They have generally been edited for length, spelling, grammar, and clarity. And no, we're not going to give everyone here a free subscription. We'll return to that when we have just one person writing the whole column.

If you're not familiar with the ARRL's' proposal to restructure amateur licensing, see this month's "Line of Sight" editorial. Now, without further ado, and without further comment, we share with you a variety of views on the topic.

From Jerry Daugherty, W9FS:

I have been a ham for 40 years. I have seen many things happen, some good some bad. I am not opposed to change if it is good. If what I have read is true, everybody is going to gain. Class A will have more phone privileges than Extras do now; and these should be closer to the DX phone bands we can't work now.

You can still operate CW, but as an Extra, you feel hurt (yes, hurt) because your pride says: "I worked my way up the ranks and now I am top dog." I feel the same way, too! But there is a time to set pride aside, and do what is best for the whole! I believe this is that time. Let's keep this hobby awhile longer. Our grandkids are coming along and let's give them a hobby they too can enjoy. And let's face it, with this change they will be able to enjoy it just the way you and I have done it, maybe a little differently.

From Ernie Howard, W8EH:

The locals that I've talked to here seem pretty much in favor of a change like this. The Generals, Advanced, and Extra people I've talked to don't seem to be looking at this as their license being "diminished" in any way. Being an Extra class who passed the 20-wpm code test the old-fashioned way (and can still do 20 wpm), I don't see the elimination of 20 wpm diminishing me.

The testing procedure for the present six license classes is burdensome. Having to teach prospective Technicians all the HF operating stuff in the Novice element is unnecessary. Some of you may not be happy that the Novice and Tech Plus will be basically upgraded to General without further testing. Get over it, we are *all* hams. If their license was "eliminated," and they were all "forced" to take a test or downgrade to upgrade their license, think of the good hams that we would lose or the ill will that would be generated. It wouldn't be right. It only makes sense to do it the way the ARRL proposes. Let's give them a break and welcome them to their new bands and teach them how to fit in with those who are already there!

From Gregory Williams, KE4HSM:

Like all things in this world, we must evolve in order to survive. Now, how we "evolve" is of course up to us. Yes, I said "us." By writing to our ARRL representatives (remember, the ones who send you the "vote for me" firewood every so often?) and voicing your concerns in a mature and sensible manner. That is what they are there for. They represent us as a whole, and we must let them know how we feel. Silence can be deafening when you choose to stay quiet.

Yesterday as I read off the proposal over the air, someone commented that Class D would be known as "Class DUH." Even now the stereotyping begins. Such closed-mindedness is what hinders the service. I think we should all look at this objectively, and not belly-ache. There is nothing concrete to what has been proposed. We have been given the mold, now how we shape it is up to us. Let the ARRL know your feelings. Even if you are not a member, you are still a ham.

From Gordon West, WB6NOA:

If the 13-wpm General class code test should drop to 5 wpm, we will immediately see the 184,000 No-Code Technician class operators giving second thought to learning the code. Getting to 5 wpm might be accomplished in less than a week, and the additional few questions on General theory are really not so difficult that the dedicated Technician could not easily prepare for an upgrade within a couple of weeks. Weeks, not months.

Our Radio School weekend Technician-Plus classes will soon turn into being weekend General classes. Students will still need to study at home ahead of time to cover the theory as well as learn the code, but in three days, they should be easily able to pass the written and the code exams, with plenty of time to spare in which amateur radio operating procedures can be covered and demonstrated in detail.

From Chuck Kelsey, WB2EDV:

We have to look at the BIG picture—survival of ham radio itself. Five or 13 or 20 wpm means nothing if there's no place to operate because ham radio gets abolished. This is self preservation, gentlemen. I think the proposal could be even simpler:

Class A = all operating privileges; Class B = Silent Key.

From Chris Boone, WB5ITT:

Lets get on with *advancing* the hobby *technically*, not grumbling because the FCC wants to cut down more barriers into this hobby. Want to correct the problem in ham radio? *Take a look in the mirror* and *help* make changes (self police, Elmer, *teach*.....don't complain, file lawsuits, etc. Those who do complain, etc., seem to me to have nothing else to do in this hobby. Me? I build and experiment).

From Don Milbury, W6YN:

Unlike "Incentive Licensing" of 30 years ago, the current ARRL proposal doesn't take anything away from anyone. The Extras will get larger phone bands; the Advanced class will get larger phone bands and can become Extra class without a 20-wpm code test—just pass element 4B (easy); the Generals will get larger phone bands; the Technician Plus and Novices will get General class privileges; the (No-Code) Technician will get nothing, but won't lose anything.

Personally, I feel the Tech-Plus should be required to pass Element 3B and the Novice should be required to pass Elements 3A and 3B before being granted General class privileges. The FCC will consider this too much work, so I won't hold my breath. By the way, the FCC is working on a plan of its own which may or may not agree with this [ARRL] plan.

Regarding the code: The original ham license required only 5 wpm, later was increased to 10 wpm, and then, because the bands were becoming too crowded, in 1936 the requirement was raised to 13 wpm. In those days, it was freely and openly discussed that the CW test was designed as a "rite of passage" to keep people out of amateur radio. Today we just say that "you must pass a code test if you want to operate phone." Now, figure that one out!

The real problem, gentlemen, is *not* your bruised egos, but the agents of doom out there who want our frequencies. Not the HF bands, but our VHF, UHF, SHF, and up through the terahertz bands that are worth billions to the existing and future telecommunications multinational corporations. Without more licensed amateurs, we cannot justify keeping these bands for our use.

If you don't like what the League does, consider joining. If *you* were a member, things could be different. Realize this: the directors of the ARRL only have to please the less than 10 percent of all licensed amateurs that keep them in office. They are not there to please you, just the less than 10 percent who vote for them.

From Ron Economos, K6MPG:

If the new ARRL/FCC licensing proposal can prevent the loss of amateur VHF/UHF/microwave spectrum, then I am all for it. IMHO (*in my humble opinion—"netspeak"—ed.*), amateur microwave frequencies are in tremendous peril. Let's take a look at the track record:

220–222 MHz lost; 1210–1240 MHz lost; 2310–2390 MHz lost; 76–77 GHz suspended; 420–430 and 440–450 MHz threatened; 1240–1260 MHz threatened; 5850–5925 MHz threatened; 5725–5825 MHz more sharing with U-NII devices. And these are just what comes to mind in recent history. Never mind what large companies and others are preparing to target next.

How can we possibly argue to keep our microwave frequencies when they are so lightly populated? Forget about Morse code and license requirements. Think about retaining frequencies to operate on at all with any mode or license class.

From Ron Lowrance, K4SX:

There are good points to the proposal as well as bad points. I believe the written portion should be strengthened as well as the CW requirements need to be left in as a part of the qualification of proficiency. I would ask each of you to send your comments to the ARRL as well as on this format. I believe they are truly interested in your opinions, whether or not you are a member. One thing is for certain, they are our representatives to the FCC and have a great/strong voice. I urge each of you to become involved and proactive as a force for positive change and the strengthening of this great hobby.

From Terry Hosack, WA3LTB:

The ARRL is going in the right direction only if they make the test more difficult by not publishing the questions and answers to the test. I have no problem with opening up the HF bands to persons who have not had the opportunity to experience the fun of world-wide DX, but it should be something that is earned not given to them. My only hope is that if all these amateurs move to the HF frequencies, they don't leave the VHF bands and give the commercial people another reason to grab up frequencies, or maybe that's the plan?

From Del Schier, KD1DU:

I can quite clearly see that the ARRL license restructuring proposal is designed to bring more people into the hobby, along with more money. I believe that the net effect of making it easier to get more privileges is to downgrade the image of the hobby as a whole in both the eyes of the licensed hams and the public. The long-term effect may be that no one wants to be an amateur radio operator.

My proposal would be to keep the standards high by increasing the technical requirements and eliminate CW requirements for phone operation. Require CW skills for CW privileges only. The ARRL seems fixated on HF and no one else wants it. How come?

From Bruce Sternstein, K2RTH:

I think a lot of individuals are missing the point on this ARRL proposal. I think less attention should be paid to substance and more to the form of the proposal. This is not an anti-ARRL memo, I am a member in good standing, [this] is only meant as an analysis of the facts.

The ARRL is first and foremost a political organization. Knowing this, their first interest is the survival of the ARRL and not necessarily the best interests of amateur radio. Reading the proposal and comments on the reflector, most individuals do not like the proposal for one reason or another. In order for the ARRL to survive, it must increase its income because costs are increasing, i.e., production costs and salaries. One way to do this is to increase the numbers of operator licenses and subscribers/members. An increase in licenses will also mean more sales of equipment, and in particular low-band equipment. By making the low bands available to all, there will be a giant surge in the sales of expensive transceivers, and the goal of the ARRL is fulfilled. They will also have the benefit of more advertising revenue for the ARRL.

In other words—Code/No-Code—the ARRL could not care less. It is the long-

term survival of the ARRL and nothing more. If there is a conflict between their survival and the interests of amateur radio, the ARRL wins.

From Jed Barton, N1JBC:

Hey there, I thought I would express my thoughts on this ARRL proposal. It is really quite sad. I don't know about you, but I thought the reason why we got out of CB was to go to a better place. Now, who knows what will happen? These guys must think that everything is a free ride; not the case. I got my license through earning the privileges. Yes, I passed the CW tests. There are a lot of people who come up with every excuse in the book, like "it's too hard," "I can't do it," whine, whine, whine. Like everything else in life, it is a challenge. Deal with it or get off the field. Maybe I am from the old school, but amateur radio is supposed to be better than CB. Hey, why not get rid of the license all together?

From Jim Worsham, W4KXY:

Like it or not, ladies and gentlemen, the time has come to decide what amateur radio will look like in the 21st Century, that's what this is all about. It's not about lack of standards. It's about what the standards should be going forward. Maybe amateurs in the 21st Century don't need to know CW; instead maybe they need to know about RS232, TCP/IP, satellite communications, fiber optics, CEPT licensing, etc. Maybe there still needs to be at least a basic knowledge of CW for some license classes. I am not going to take a position either way, I know better than that.

I encourage everyone to forget their personal bias as best they can and think, "What does the amateur radio operator of the 21st Century need to know and do in order to prosper?" and then think, what needs to be done to the licensing based on that. By the way, I agree with the statement someone made that "We are good at telling the FCC what we don't want, but not at telling them what we do want." A truer statement I have not heard in a long time. Well guys, the time has come (it's been forced upon us) to decide what we do want for the future of this hobby or others will do it. Think about it, make your thoughts (note I didn't say opinion) known, hope rational people make rational decisions, and maybe it will work out for the best (or maybe not, that's life).

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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.*

Reader Snapshot !

Ham families at a hamfest. From left to right: Jeff Sernell, N3ZTU; Rachel Sernell, N3ZVY; Walt Dzelsky, W3NFY; Matt Sernell, N3ZQX; and Dave Dzelsky, N3VFF.

Meet *CQ VHF* Reader... Matt Sernell, N3ZQX, Johnstown, PA

I would like to tell you about my amateur radio story. A year ago, Dave Dzelsky, N3VFF—a ham who is a friend of my family—gave me a book to study from to get my radio license. I studied for a month and took the test. I soon became active on 2 meters and 70 centimeters.

Soon the bug spread through the family. My father, Jeff Sernell (now N3ZTU), and sister, Rachel Sernell (now N3ZVY), started to study for their tests and passed within two months. That made all three members of the family hams. We're now starting to help my grandparents study. I am enclosing a picture of all us at the Butler County HamFest.

If you'd like to be considered for our "Reader Snapshot" column, please tell us about yourself in 150 words or less and mail, along with a photo, to: CQ VHF *Reader Snapshot, 25 Newbridge Rd., Hicksville, NY 11801. Entries become our property and cannot be returned. If we publish your "snapshot," we'll give you a one-year gift subscription (or extension) to* CQ VHF.

Radio Direction Finding

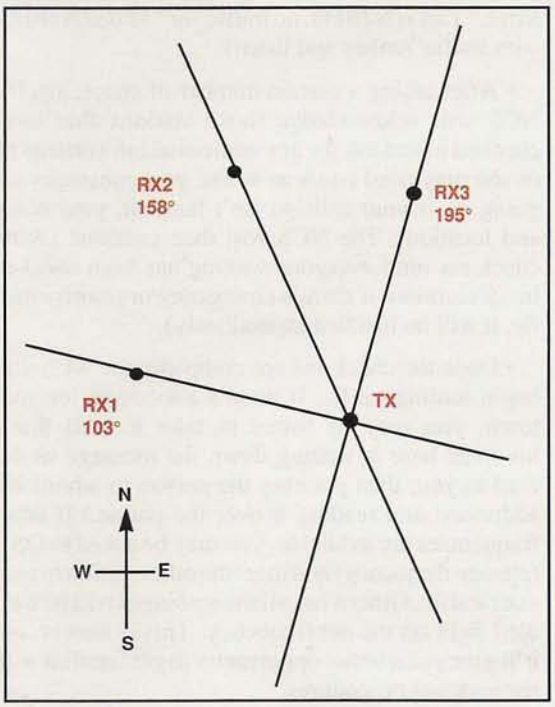
Basics

Radio direction finding—also known as RDF, DF, DFing, T (for transmitter)-hunting, and fox hunting—is the use of radio signals from a transmitter in an unknown location to track down and locate that transmitter. It's very useful in identifying repeater jammers and other unidentified signal sources. It's also a lot of fun!

Triangulation

One of the most basic methods of finding the general location of a hidden transmitter is something called *triangulation*. This works best if three or more people team up and take readings from widely separated places. But you can also do it with two receiving stations, or even by yourself, if you can drive to two or three different locations that are reasonably far apart. For now, let's assume that you have three teams working together.

Each triangulation team needs, at minimum: a receiver tuned to the transmitting station's frequency; a directional antenna, a detailed street map (preferably a topographical map), and a reliable compass.



How triangulation works. Three stations in different locations (RX1, RX2, and RX3), or one station moving to three separate locations, take compass bearings on the direction from which the signals of the unknown transmitter (TX) are strongest. These lines are plotted on a map, and the point where they intersect is the approximate location of the mystery transmitter. Happy hunting!

The teams will also need a way to keep in touch with each other (if you're tracking a jammer, use cell phones, not the radio).

Start by finding and marking your location on the map, along with the locations of the other stations you're working with. Now, listen to the mystery signal, and turn the beam until you get the strongest (peak) reading on the radio's S-meter.

Take a compass bearing on the beam (antenna) heading and draw a line across the map from your location in the direction of the compass heading. Just for fun, draw one in the opposite direction, too—in case you were picking up a strong signal off the back end of the beam. Contact the other stations, get the bearings they recorded (and give them yours), and plot those on the map as well. Remember to draw those lines from the locations of the other stations, not from yours.

If everyone's reading their compasses correctly, and there are no reflections or other false paths (we won't get into that here; *The ARRL Handbook* explains all this in detail), all three lines will intersect somewhere. The place where they intersect is the general vicinity of the hidden transmitter. Now, you can all get into your cars, drive closer to that area and do it all again; or use one of the close-in techniques described in KØOV's foxhunting article in our September 1996 issue.

The Doppler Detective

Some T-hunters use a Doppler detection system, a high-tech alternative to triangulation. This is the same system used by police departments to track stolen cars equipped with LoJack® RF alarms.

A special receiver is connected to a group of four to eight antennas on the roof of your vehicle. Circuitry inside the radio switches between the antennas at lightning speed, creating the same effect as you'd have if there were one rapidly-moving antenna. Then, by measuring the Doppler shift (the change in apparent frequency caused by the motion of the transmitting and/or receiving antennas), the device can figure out which direction the signals are coming from. The readout is constantly updated as you drive.

On the other hand, KØOV says Doppler systems aren't very sensitive to weak or horizontally polarized signals. "On our local hunts," he says, "beams work better than Dopplers....Beams may be 'low-tech,' but they win the hunts around here."

Whether you take the low- or high-tech approach to direction-finding, it's a skill that can come in very handy in times of need (such as helping to find a downed airplane or a jammer), and provide you with lots of fun and challenges as a fox hunter. ■

Basics

Touring Traffic Nets

Ham radio "traffic" nets are a good introduction to both net operations and public service. Here's an overview of what they're all about and some information on how you can join in.

Unless you live *really* way out in the sticks, there's a very good chance that, on some repeater near you, there's an "NTS traffic net" that meets there on a regular basis. But exactly what *is* an "NTS traffic net"? Let's work backwards to explain it.

Just What Is a Traffic Net, Anyway?

First of all, a *net* refers simply to any gathering of hams on a specific frequency at a specific time for a specific purpose. Most non-emergency nets are scheduled ahead of time, and many meet daily, weekly, or monthly.

A *traffic net*, specifically, is a net whose purpose is to *pass traffic*. You'll never get a speeding ticket by passing this kind of traffic. In amateur radio, *traffic* refers to *messages*. A message being relayed from point A to point B is called *traffic*. And a net that meets to relay this traffic is, appropriately enough, called a *traffic net*. (The hams who regularly pass traffic are known as *traffic-handlers*.)

An *NTS traffic net* is a traffic net that's part of the American Radio Relay League (ARRL) *National Traffic System*. NTS is a nationwide chain of nets, operating at the local, state, regional, and "area" levels, designed to smooth the flow of ham radio messages being passed along from any one part of the U.S. to any other.

Think Globally, Act Locally

Using NTS's network of nets, messages can be directed to virtually any point in the U.S. or Canada. Most messages are originated and/or reach their final destination on VHF "local" nets. These are also the nets on which most newcomers to traffic-handling start out.

When you first tune into a traffic net, you're likely to be rather confused by some of the jargon being bandied about and by the set order of doing things. So here's a basic guide to the structure and operation of an NTS local net. While there may be some variations from net to net, they all pretty much follow the same basic procedure:

• At the scheduled net time, the Net Control Station, or NCS, will "call" the net, announcing that the net is beginning, briefly explaining its purpose, and inviting everyone using the frequency to "join," or check into, the net (or to stand by or change frequency for the duration of the net). *The NCS is in charge of the net and all participants must follow his or her instructions during the net.*

• The NCS will then ask for check-ins, usually starting with anyone holding "emergency" or "priority" traffic (the two top priority classifications in the standard ARRL message format), followed by "liaison" stations representing other nets, stations "with traffic" (holding messages to be sent), and, finally, stations "with or without traffic." Be sure to go only in the correct category. If there's a specific check-in procedure, the NCS should announce it. If not, general practice is to say the NCS's call, unkey your mic to make sure you're not "doubling" with another station, then announce your callsign and say whether or not you have "traffic" to send (Example: "W2VU"/unkey and listen/"This is N2BFG, no traffic" or "This is N2BFG, with traffic"/unkey and listen).

• After taking a certain number of check-ins, the NCS will acknowledge those stations that have checked in and ask for any additional information he or she may need (such as where your messages are going or, if your callsign isn't familiar, your name and location). The NCS will then continue taking check-ins until everyone waiting has been checked in. (Exception: if there's emergency or priority traffic, it will be handled immediately).

• Once the check-ins are complete, the NCS will begin routing traffic. If there's a message for your town, you may be asked to take it. (All that's involved here is writing down the message as it's read to you, then phoning the person to whom it's addressed and reading it over the phone.) If other frequencies are available, you may be asked to QSY (change frequency) and meet the other station to pass your traffic. Otherwise, all the messages will be handled right on the net frequency. This is slower, but it'll give you a better opportunity to get familiar with formats and procedures.

• If you're on the receiving end of a message, you should always ask for a repeat ("fill") of any words that you're not sure of (*don't ever guess!*) and count the words to make sure that they agree with the "check," or word count, that's given to you as part of the opening information. When you're certain that you've copied the message correctly, say "Roger

Traffic-Handling on MARS

If you decide that you enjoy traffic-handling and want to be a part of a worldwide message-forwarding network, you might consider joining *MARS*, which stands for the *Military Affiliate Radio System*. Operating just outside of the ham bands, MARS members relay messages for members of the U.S. Armed Forces all over the world. You can be the link to home for a serviceman or woman at some remote outpost. There are three divisions of MARS: Army, Air Force, and Navy-Marine Corps.

Army MARS has a World Wide Web site at <http://members.aol.com/ aat6fv/>. Check with local hams for more info on Navy-Marine Corps and Air Force MARS.

number xxx (with xxx being the message number), (yourcall) back to net."

• Don't leave the net until it ends or you are "excused" by the NCS. Even if there's no traffic listed for you at the beginning of the net, someone may check in later with something you can take. If you're not there when NCS calls, you'll be wasting everyone's time. Besides, it's just common courtesy. If you need to leave before the net ends, just drop in your call at a break in the action (such as when a message is finished and both parties go "back to net"). The NCS will recognize you (although maybe not immediately) and you may then ask to check out.

• When all the traffic has been passed, the NCS will ask for last-minute check-ins, then "close" the net, repeating much of the same information from the opening. Once the net is closed, normal QSOs may resume.

Questions? Just Ask

In the very likely event that there's something you still don't understand after listening a few times, or even after checking in and making yourself available to receive messages, don't hesitate to ask the NCS, or a regular participant, to explain it to you. And if you don't understand the explanation, ask for a translation into English! But don't ask *during* the net, unless the NCS has opened up the net to questions and comments (this sometimes happens when there's very little traffic to pass). As a rule, though, you should wait until the net is closed and then call the NCS or another station to ask your question. You'll find most long-time traffic-handlers are more than welcoming of interested newcomers. ■

Resources

For more information on the National Traffic System, we recommend the following ARRL publications:

The ARRL Operating Manual; the *Public Service Communications Manual*; and the *ARES Field Resources Manual.*

All are available from the ARRL, 225 Main St., Newington, CT 06111; Phone: (860) 594-0200; Fax: (860) 594-0259; Internet: <http://www.arrl.org>

Line of Sight *(from page 6)*

might interfere with his efforts in California to work multi-hop sporadic-*E* or F_2 into Asia or Australia. Moving the domestic calling frequency away from the edge of the DX window lets everyone make their contacts without interference and without hard feelings.

No Frequency Cops, Please

So let's start moving from 50.125 up to 50.200 for everyday monitoring, CQing, etc. Most of the action will continue to be on .125 (as WB2AMU argues) for the foreseeable future, until more people get on the bandwagon and move up to .200. The best way to encourage activity there is to operate there. I've been trying to split my listening (yes, folks, I've finally gotten on 6-meter SSB, thanks to the ICOM 746 I'm reviewing) between both frequencies. Granted, I'm hearing more and working more on .125 right now, but if more of us start using .200 as well, then the activity will gradually shift there. And I think a natural shift is the way to go, rather than imposing dates and trying to put up with "frequency police" telling people they need to move. Let's lead by example, not by coercion.

Speaking of Coercion

Of course, when examples and education don't work, sometimes stronger measures are necessary. And that's the place that the Central States folks feel that weak-signal operators are in terms of growing interference from FM operators in the low end of the VHF/UHF bands. While the ARRL tried to take a less coercive approach to the same problem earlier this year—asking the FCC for a declaratory ruling that it's poor amateur practice to operate at variance from the established band plans—Central States is asking the FCC to "put it in the rules." It will be (or perhaps has, by the time you read this) filing a petition for rule making, asking that wide-bandwidth transmissions (such as FM voice and high-speed packet) be banned from certain frequencies on 6 meters, 2 meters, 222 MHz, and 432 MHz. The details are in "VHF News."

While I understand the growing frustration of weak-signal operators to the spread of wide-bandwidth modes, and the difficulty of enforcing "voluntary" band plans (they won't be very "voluntary" if it's against the rules to ignore them), I think there's still more opportunity for education before it becomes necessary to go the regulation route. That said, the Central States petition is well thought out and well written, relying on bandwidth instead of specific modes. If the FCC is inclined to provide more regulatory protection for weak-signal operating, it ought to follow the Central States approach and write some clear rules, with the usual opportunity for public comment, rather than going with the ARRL's *1984*-style request for a declaratory ruling that voluntary is mandatory.

"The Central States proposal represents a good compromise between the interests of the big-gun 6-meter DX community, which wants more space for when the band opens and less interference from domestic QSOs; and those of the 'typical' 6-meter operator...."

Masthead Addition

Finally, I want to welcome our newest columnist, Ed Manuel, N5EM, who is reviving "In Focus," our amateur television (ATV) column, as of this issue. Ed is one of the founders of HATS, the Houston Amateur Television Society, which is among the most active ATV groups in the United States. The column will appear bi-monthly, alternating with "Project Corner." Please help Ed out with your reports and interesting stories about what you're doing with ATV (and if you're not doing anything yet, read the column and see if maybe ATV is something you'd like to try). ■

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 <CQVHF@aol.com>, or via our World Wide Web page, <http://members. aol.com/cqvhf/>. We look forward to hearing from you.

VHF News *(from page 7)*

Weak-Signal Protection Sought from FCC

The Central States VHF Society, the nation's largest organization of VHF/UHF weak-signal operators, decided at its annual meeting in July to petition the FCC for protected subbands for narrowband signals, such as single sideband (SSB) and Morse code (CW). The Central States petition asks the FCC to prohibit wideband signals, such as FM voice or high-speed packet, from portions of the 6-meter, 2-meter, 1.35-meter, and 70-centimeter bands, specifically 50.100 to 50.300, 144.100 to 144.300, 222.000 to 222.150, and 431.800 to 432.500 MHz. These are the traditional "weak-signal" portions of these bands, but their designation as such has always been by "gentlemen's agreement," not by FCC rule. The Central States petition states that interference from wideband modes, specifically FM voice, is reaching a point that regulatory protection is needed. At press time, the FCC had not acted on the petition for rule making.

Six-Meter DX Window Open Wider?

The question of widening the so-called "DX Window" on 6 meters is back in the headlines after the membership of the Central States VHF Society voted overwhelmingly to support an expansion of the "window" by 25 kHz and to move the domestic SSB calling frequency from 50.125 MHz to 50.200 MHz. The "DX Window" is an area voluntarily reserved for making DX contacts: that is contacts outside the continental United States and the lower tier of Canadian provinces. These proposals are discussed in detail in this month's "Line of Sight" and in the article, "The 6-Meter DX Window: Why, Where, and How Big?" on page 39.

Now, This Beacon Is Smokin'!

If you tune in the XE1KK beacon from Mexico on 50.023 MHz and it sounds like it's coughing, that's because it's installed at the 4,000-meter level of Popocatepetl, an active volcano outside Mexico City. The ARRL reports that Ramon, XE1KK, said there was thick smoke spewing from the volcano as he installed the beacon. At 13,123 feet, it may—for now, at least—be the highest (and hottest?) beacon in the world.

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, Santa Barbara Amateur Radio Club, Inc.: Meets 3rd Friday of September–May at 7:30 p.m., County Schools Auditorium, 4400 Cathedral Oaks Rd., Santa Barbara. For more information about SBARC, see the club Web site: <http://www.sbarc.org>; or call (805) 569-5700.

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, 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>.

FL, Metro Dade REACT 4881: One of the few **all-ham** REACT teams in the U.S., providing public service through communications. Mtgs ev. Thurs. 8 p.m., details on 147.315 MHz (+600) repeater. For info, contact: Metro Dade REACT, 3735 SW 89 Ave., Miami, FL 33165; E-mail: <react4881@juno.com>; Web: <http://www.geocities.com/Heartland/Ranch/4881>. For more information, contact Robert Cruz, KE4MCL, President, at <react4881@juno.com>.

GA, College Park REACT 4921: Training in packet, computers, radio building, space radio, FCC. Net. ev. Mon, 8:30 p.m., MatPARC Club 145.41-repeater. Contact: Thorton Williams, 2001 Godby Road, Ste. 0-6, College Park, GA 30349.

IL, Logan Area Amateur Radio Club, Logan County: Meetings held 3rd Saturday of each month, 7 p.m., American Red Cross Bldg., 125 South Kickapoo St., Lincoln, IL. Primary repeater: 147.345+. Secondary repeater: 145.390-. Contact President, Bob Rucker, KB9JSE, at (217) 735-2506; <KB9JSE@ccaonline.com>.

IL, Olney, Olney Amateur Radio Club-Richland County: Meetings 2nd Thursday of each month, 7:30 p.m., Hardees banquet room, 912 E. Main Street., Olney, IL; Repeater: 146.760-. Contact Vice President Ben Rose, KB9OTJ, at <harley@wworld.com>.

IL, Skokie, Free Live Online Hamfest: Buy, sell, trade. Instant listing of all your items for sale or wanted! No charge for this classified listing of radios, antennas, computers. Open chat room to discuss the details of your purchase or sale! Sponsored by the Tri-County Radio Group, Inc.; Web site: <http://quality-enterprises.com/tcrg/onlinefest/>.

MA, Falmouth Amateur Radio Assoc. (FARA): Meetings held last Thursday of the month at 7:30 p.m. at Falmouth Town Hall, Main Street, Falmouth, MA. ARRL exams at all levels given at 9 a.m. second Saturday of every month at the Town Hall. Primary rptr. 146.655. Contact President Lyman Mix, WA1KPE, at Box 815, W. Falmouth, MA 02574 or visit Web page: <http://www.falara.org/index.html>.

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>.

NC, Stanley County Amateur Radio Club: Meetings held every 4th Thursday of the month at Stanly Community College. Two-meter nets held at 9 p.m., local, Wednesday (146.985) and Thursday (147.390). Six-meter ragchew each Tuesday at 8:30 p.m. (50.135). For more info, visit our Web site at <www.qsl.net/scarc>.

NY, Tonawanda, Radio Association of Western New York (RAWNY): Meets 2nd Tuesday of each month from September to May, 8 p.m., at Church of the Nativity, corner of Thorncliff and Colvin Blvd., Tonawanda, NY. Web site: <http://hamgate1.sunyerie.edu/~rawny>.

OH, Cincinnati, Weather Amateur Radio Network (WARN, W8NWS): This is the Cincinnati, Ohio, chapter of Skywarn. In addition to club details and weather-spotter training information, the Web site features a searchable southwest Ohio repeater database, and a search engine covering all known ham club sites in the Greater Cincinnati area. Membership forms and mailing list to receive club news and announcements are also available online at <http://www.warn.org>.

OH, Adena Area, Triple States Radio Amateur Club: Features an all-mode 6-meter net on 50.150 on Wednesday nights at 9 p.m. EDT (50150 FM), SSB/AM/CW. Will have a reunion of Six Meter Operators at the Wheeling Hamfest, Wheeling Park, WV Sept. 12. For info newsletter, send adr to TSRAC 2011 St. Hwy 250, Adena, OH 43901; E-mail: <k8an@aol.com>.

OH, Cleveland Area, Cuyahoga Amateur Radio Society: Meets on the third Wednesday of every month except December at 8 p.m. at the 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, Firelands Amateur Repeater Association (FARA): Assn. of amateur radio operators and their families in North Central Ohio, dedicated to operation and maintenance of a repeater system south of Berlin Heights. Meets monthly on 4th Tuesday at Erie County Services Cntr., 2900 Columbus Ave., Sandusky at 7 p.m. in basement cafeteria. For info, write FARA, P.O. Box 442, Huron, OH 44839; E-mail: Tim Stookey, N8AHK, President: <n8ahk@amsat.org>; Web: <http://www.fara.berlin-heights.oh.us/index.htm>.

OK, Tulsa Amateur Radio Club: P.O. Box 7283, Tulsa, OK 74159-4283. Repeaters 145.11, 147.045, 442.00, 443.00, 443.45, 443.75, 444.625. Autopatches on 145.11, 443.00. Net every Thursday on 145.11 @ 8 p.m. (linked to 442.00, 443.75, 444.625). Meetings 3rd Tuesday of month at 7 p.m., West Regional Library, 2224 West 51st Street, Tulsa, OK. Breakfast Meeting, 1st Saturday of month at 8 a.m., Ollie's Restaurant, 4070 Southwest Blvd., Tulsa. For more information, call (918) 446-6451, Vince Moore, N5RFW, Public Service Liaison Officer.

ONT, Canada, Muskoka Amateur Radio Club: Meets at Huntsville Hospital Board Room at 2 p.m. on 2nd Sunday of each month. Visitors welcome. Net at 7 p.m. Monday on 146.775. Muskoka ARC, VE3MZY, 437 Aspdin Road, Huntsville, ONT P1H 1Y4, Canada.

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. E-mail: <LARC@net-quest.com>.

PA, New Castle: Amateur Radio League of Lawrence County (ARLLC) and Lawrence County ARES (LCARES). Meetings every Tuesday of each month, 7:30 p.m., American Red Cross Bldg., 222 North Mercer St., New Castle, PA. Weekly informational net @ 9:30 p.m. every Thursday on 147.195(+) MHz and 146.625 (-) MHz linked repeaters. SKYWARN severe weather nets as situation requires. Contact Club Secy, ARLLC/LCARES, P.O. Box 7931, New Castle, PA. 16107-7931 or visit our Web site: <http://pages.prodigy.com/arllc>.

TN, Cleveland Amateur Radio Club: Meetings every 2nd and 4th Tuesday of month (except December) at CARC Clubhouse, 560 Johnson Blvd., Cleveland, TN, at 7 p.m. EST, and 7:30 p.m. EDT. CARC operates a 2-meter repeater on 146.925 MHz (-600), and a UHF repeater at 444.275 MHz (+5 MHz). Contact W4GZX, P.O. Box 2683, Cleveland, TN 37320-2683; E-mail: <carc@rocketmail.com>; Web site: <http://www.geocities.com/SiliconValley/Lab/1660>.

TX, The Clear Lake Amateur Radio Club of Houston TX: Meetings are the 3rd Wednesday of every month at 7 p.m. at the Webster Volunteer Fire Dept. 17100 Texas Ave. in Webster, TX. Meetings are open to anyone interested in amateur radio. Our Web site has the info <www.clarc.org>.

TX, No Code International: An international non-profit club of hams who are dedicated to the elimination of morse code testing as a requirement for amateur HF licenses. SASE for information to: No Code International, P.O. Box 565206, Dallas, TX 75356 or visit our Web site at: <http://www.nocode.org>.

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, 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>.

CA, Los Angeles: United Radio Amateur Club, K6AA, Los Angeles Maritime Museum (6th Street, on Main Channel of the Harbor). Contact Elvin, N6DYZ (310) 325-2965. VEC: W5YI. Cost: $6.35 (or current amount allowed); Dates: 2nd Saturday every month except December; Time: 1:30 p.m.; Pre-registration: Recommended, but not required.

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>.

IL, Chicago: Ham testing session 1st Thursday every month, from 7–10 p.m. We test all levels from Novice thru Extra. Reservations are NOT required. For info, contact Dennis L. Sladek, N9OZ, 4344 W. 51 St., Chicago, IL 60632; Phone: (773) 838-8088; E-mail: <n9oz@juno.com>.

IL, Chicago: VE testing, just 4 blocks from Midway Airport, 1st Thursday of every month, 7–10 p.m. Midway VE Team-W5YI affiliated, 4344 W. 51 St. (Archer & Kostner Streets), Chicago, IL 60632. Phone: (773) 838-8088; Fax: (773) 735-8469; Web site: <www.megsinet.com/dsladek>; E-mail: <dsladek@megsinet.net>.

IL, Lincoln (LAARC): Offers ARRL VEC exam sessions for Novice, Technician, and Tech Plus licenses on 2nd Saturday of every other month at Lincoln Public Library Annex Bldg., 725 Pekin St., Lincoln, IL. Pre-registration recommended but not necessary. For info, contact Mike Roos, N9WGT, at (217) 732-6323. Exam fee: $6.39.

NC, Wilmington: Azalea Coast Amateur Radio Club will hold a VE testing session on Oct. 10, 1998 10 a.m. at Morton Hall. University of North Carolina Wilmington Campus. Contact Jack, WD4OIN, at (910) 791-1556.

OH, Cincinnati: OH-KY-IN Amateur Radio Society are forming ham radio classes for all levels of amateur radio licenses, Novice through Extra, including the No-Code license in the Cincinnati, OH, area. 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 the conclusion of the 10-week course, participants will be given an FCC license exam on Saturday, November 21st 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) 5323 or Bruce Vanselow, N8FWA, at (513) 251-1555.

OH, Cleveland Area: Cuyahoga Amateur Radio Club holds exam sessions on the second 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>.

OH, Colerain: The Triple States Radio Amateur Club holds exams the last Monday of every month at 6 p.m. at Citizens Bank. Courtesy call you are coming required. Phone: (740) 546-3930; Fax: (740) 546-3685; E-mail: <k8an@aol.com>.

SC, Columbia: ARRL/VEC testing session for all license classes will be held third Saturday of each even month (August, October, and December), at 9 a.m., at Heathwood Hall Episcopal School, 3000 South Beltline Blvd., Columbia, SC. For more information, visit the Web site at: <www.qsl.net/ku4qn>, e-mail: <KU4QN@juno.com>, or call (803) 779-5234. Exam fee is $6.35. Elements 2 (Novice written exam), and 1A (5-wpm code) are free of charge.

TX, Houston: The Clear Lake Amateur Radio Club (CLARC) serves the SE (NASA) area of Houston, TX. We give VE exams the 2nd Saturday of each month, check in at 9 a.m. at the Clear Lake Presbyterian Church 1511 El Dorado in Clear Lake. Our Web site has all the info: <www.clarc.org>.

Personal Web Site Listings

Jim Bridge, KQ6BS, URL: <http://www.qsl.net/kq6bs>. Specialty: weak signal.

Robert Cruz, KE4MCL, Web: <www.geocities.com/Heartland/Estates/5281>. KE4MCL Swap Shop is a place for hams to advertise their old gear and place want ads. No dealer ads accepted.

"The Radio Picture Archive," URL: <http://www.e-ect.com/rpa>. Speciality collection of pictures of radios.

Commercial Web Site Listings

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>.

KMA Antennas: VHF, UHF & HF log periodics, Yagis and unique 6-meter antennas. Please mention *CQ VHF* when you visit <www.qsl.net/w4kma>.

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 Pre-Amplifiers. <http://www.Teletec-usa.com>.

Woodhouse Communication: Antennas and publications for weather satellite imaging: <www.view2earth.com>.

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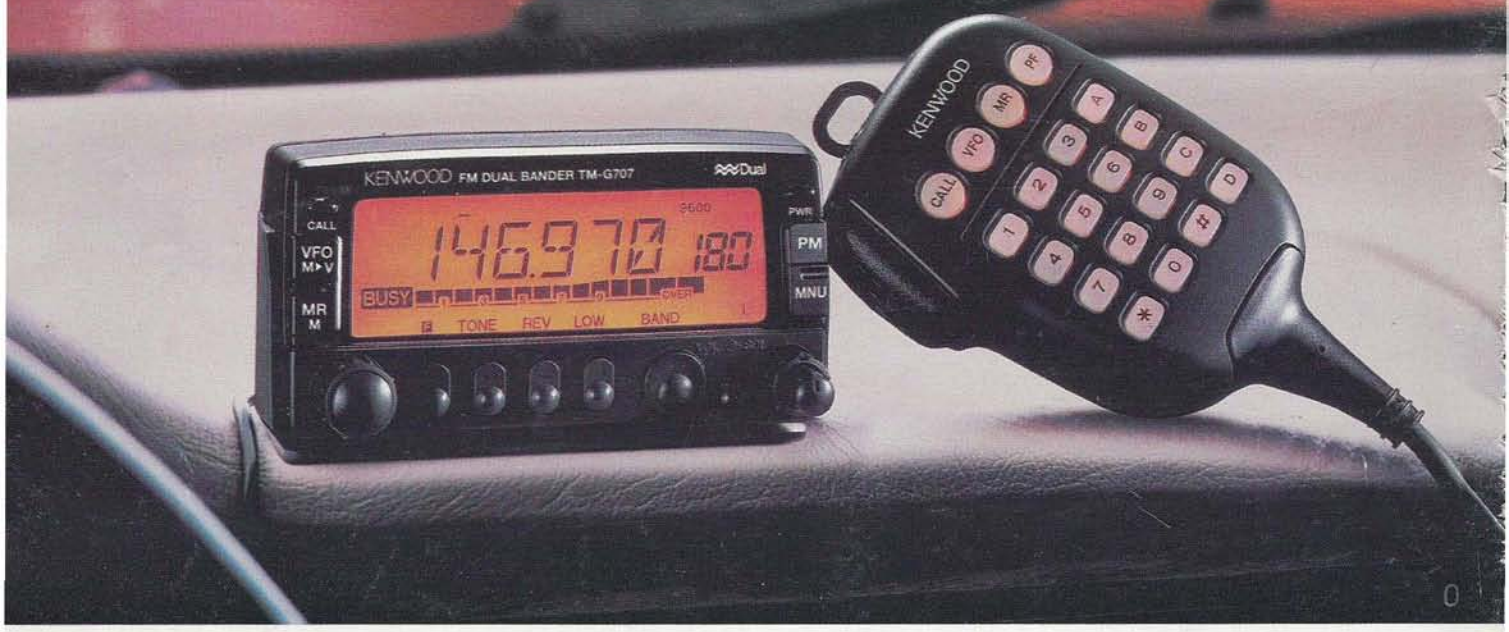

TM-G707A FM DUAL BANDER

Power up and you're greeted by the welcoming glow of an amber-colored LCD. You can always be sure of a friendly reception from Kenwood's TM-G707A, an FM dual-band transceiver that is a joy to use.

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The TM-G707A is simple and straightforward like a car stereo, thanks to **Easy Operation** mode. You just choose a frequency and press one of the 3 quick memory keys to save it. A light touch on the same key is all that is needed for recall. And with the **Five-in-one programmable memory system,** you can store five operating profiles - complete with frequency range, dimmer level, and other details - ready for instant recall at the push of a button.

Another convenience that is especially welcome on the road is the **Memory Name** function. This allows you to identify each memory position with up to 7 alpha-numeric characters. You can also switch instantly between the frequency and Memory Name displays.

Optimized convenience goes hand in hand with polished performance and a wide range of advanced features, such as a built-in **CTCSS encoder/decoder, built-in duplexer** and **priority scan.** The front panel features a 6-pin **mini DIN connector** for either standard 1200bps or 9600bps high-speed packet or APRS communications. Also, **180 multi-function memory channels** are available for storing such data as transmit and receive frequencies independently (thus allowing split-frequency operations), frequency step, and tone frequency. Among the many options available is a **quick-release detachable front panel kit** for anti-theft protection.

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- **CTCSS tone scan**
- **Voice Guide (requires VS-3 option)**
- **Selectable frequency step (5, 6.25, 10 12.5, 15, 20, 25 or 50kHz)**
- **Incremental MHz Key**
- **AIP (Advanced Intercept Point)**
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- **S-meter squelch**
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- **Auto power-off circuit**

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