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CQ VHF

Ham Radio Above 50 MHz

June 1998

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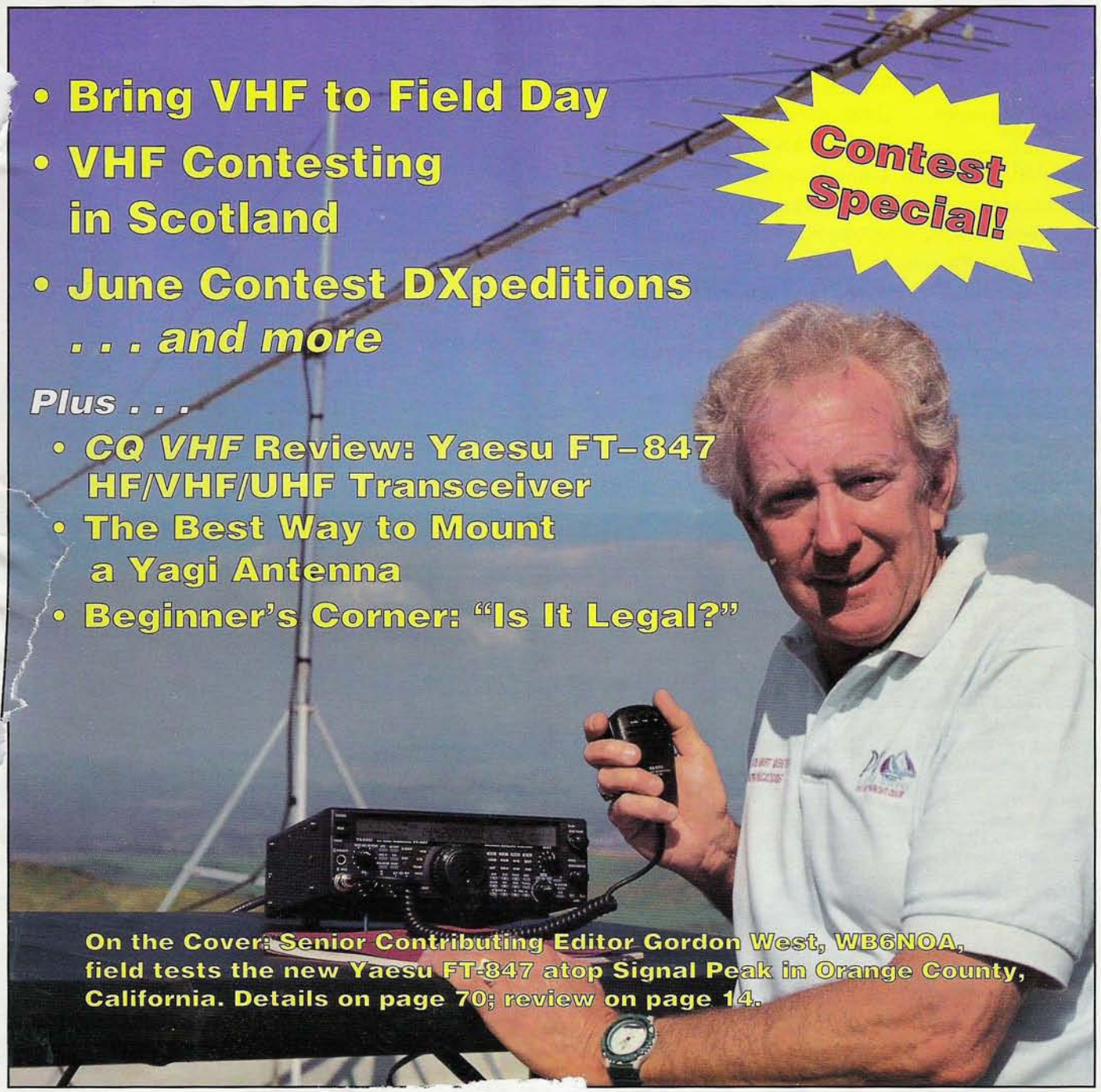
- **The Best Way to Mount a Yagi Antenna**
- **Beginner's Corner: "Is It Legal?"**



On the Cover: Senior Contributing Editor Gordon West, WB6NOA, field tests the new Yaesu FT-847 atop Signal Peak in Orange County, California. Details on page 70; review on page 14.

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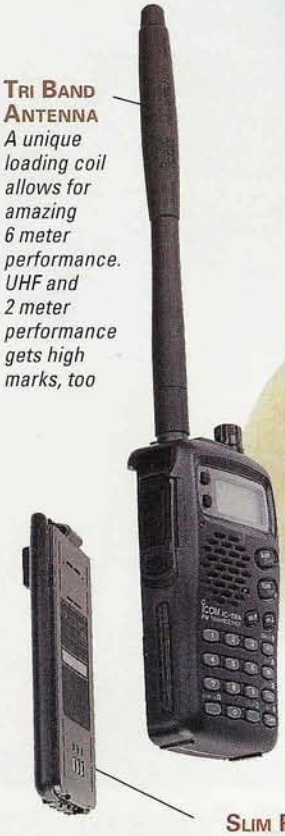

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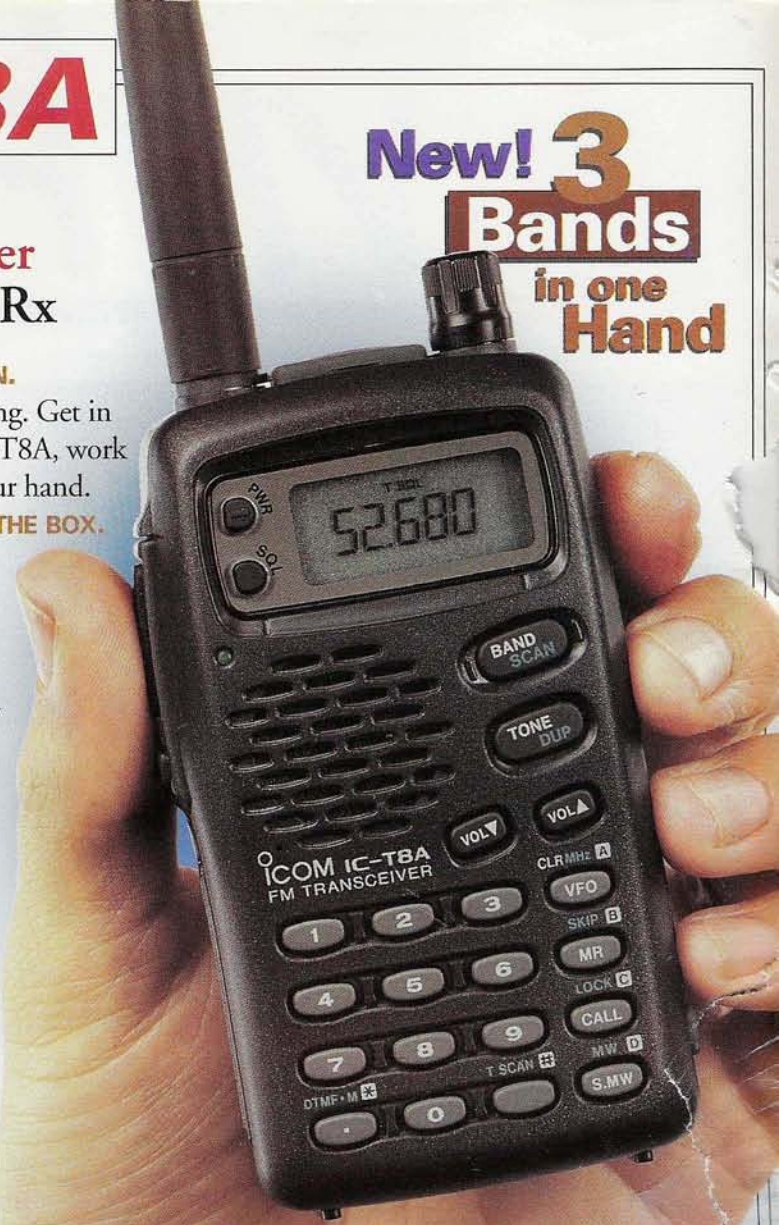

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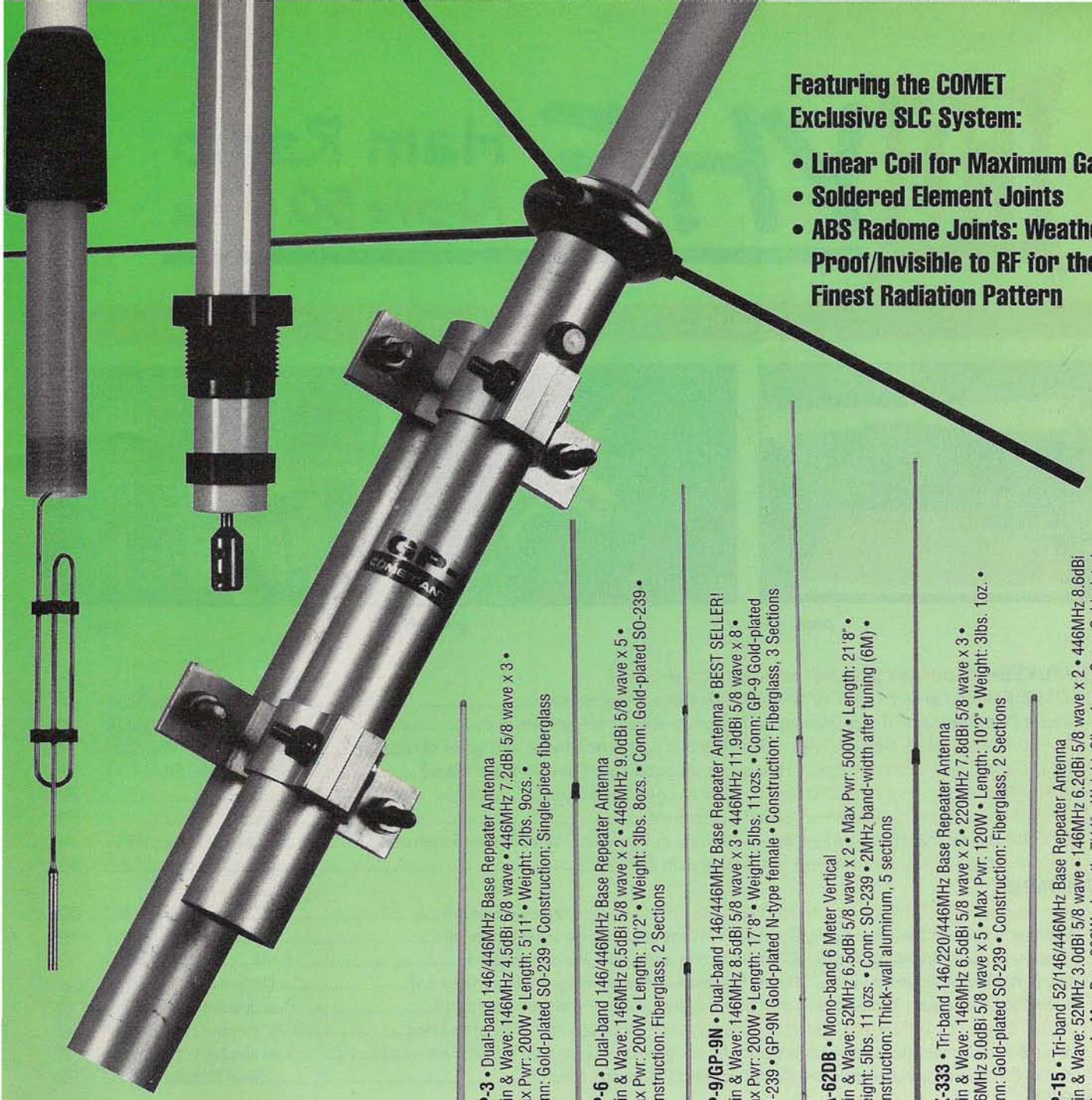

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Conn: Gold-plated SO-239 • Construction: Fiberglass, 2 Sections

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CQ VHF Ham Radio Above 50 MHz

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FEATURES—"Contest Special" articles listed in red

COLUMNS

BASICS

DEPARTMENTS

Next Month: "Bringing a Swan 250 Back to Life," by Dave Booth, KC6WFS

Road Show

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Battling Band Bigotry

It's time to end "mode-ism," "code-ism," and other forms of "band bigotry." We hams all need to stick together...not only with each other, but also with our "cousins" in the radio hobby—scannists, shortwave listeners, and, yes, even CBers.

Back when I was 15 years old, my high school had a ham radio club, but it didn't have a ham radio station (at least not yet). At the first meeting I attended, one of the members brought in a shortwave receiver. He threw a piece of wire out the window and turned on the radio. The first station we tuned in was Radio Tirana, in Albania—then one of the world's most closed societies. Even as a 10th grader, I knew this was pretty cool stuff, and I knew I wanted to see what else was out there.

On the Road to Hamdom

As a result of this first "contact" with shortwave listening, I became an avid SWLer, collecting broadcast schedules, sending in reception reports, getting back QSL cards, and even joining a few of my favorite broadcasters' "shortwave clubs." I started reading magazines about shortwave listening, and even got my own "monitor callsign" from *Popular Electronics* magazine—WPE2RIY (later WDX2RIY, after the magazine dropped the monitor registration program and it continued on its own). Not too long after that, I added another callsign to my wall—my first ham radio callsign—a symbol of my latest "step up" in the radio hobby.

Actually, my involvement with hobby radio went back farther. It started with my discovery that my standard AM broadcast radio was capable of tuning in faraway stations after the sun went down. It continued in Boy Scouts, with a Scoutmaster who was a CBer, and who encouraged my whole family to get involved in that part of the radio hobby. (And guess what? It was fun!) I brought all that with me to my introduction to shortwave radio.

Notice the one word that runs through all of these different activities—*radio*. This is what unites us, what sets us apart from the average person whose only interest in radio is music, news, and weather, and who simply won't believe you if you try to explain that their TV set and cellphone are actually radios. We love radio—all of us, CBers, broadcast band DXers, SWLers, hams.

In fact, when I visited the Weinheim VHF Conference in Germany last fall, I was fascinated to see that all of the German ham magazines devoted regular columns to shortwave listening, scanning, and, yes, even CB. In Europe, it seems, ham radio is recognized for what it really is—one part of the much larger *radio* hobby. Here, of course, the reality is the same. Only we don't advertise it to our fellow hams. But our survey of *CQ VHF* readers last fall showed that 82% of you are either current or former scanner enthusiasts; 80% current or former SWLers, and 71% current or former CBers.

Something else I noticed in Germany was an apparent lack of what I'll call "mode-ism." Even the most diehard weak-signal operator, it seemed, carried an HT and wasn't embarrassed to use it. Pull out an HT at a weak-signal VHF conference in the U.S., and, unless you're using it for something esoteric, like making satellite contacts, then you may as well not be there.

But the factionalism and prejudice we see in ham radio are not limited to FM, or VHF. They are pervasive throughout the hobby. I remember hearing one VHFer who designs and sells specialized equipment talking about an amplifier he'd built for EME (moonbounce) work and commenting, "I didn't design that amplifier to have a bunch of ATVers using it." (except the language was a little bit stronger than that).

"...our survey of* CQ VHF *readers last fall showed that 82% of you are either current or former scanner enthusiasts; 80% current or former SWLers, and 71% current or former CBers."

Factionalism = Band Bigotry

The entire radio hobby in the U.S. is beset by "isms": band-ism, mode-ism, code-ism. It results in "you're not as good a ham as I am because you don't operate the right bands, or the right modes, or didn't pass the right license exams." In addition to squabbling among subgroups of VHF operators, we have HF/VHF squabbles, code/no-code squabbles, and ham/CB squabbles.

There's no end to the different activities available to ham radio operators, and it seems that every activity has developed its own faction that doesn't like people in some other faction. This "band bigotry," for lack of a better term, leads to the same problems that you find with any other form of bigotry—preconceived notions about the members of other groups—what kind of people they are, what they know, and even what they're capable of learning. And any attempt to change those perceptions is met with additional derision.

A few years back, our publisher, CQ Communications, put out a short-lived

By Rich Moseson, W2VU, Editor (e-mail: cqvhf@aol.com)

magazine for CBers, called *CB Radio*. Its antenna columnist was none other than our own Kent Britain, WA5VJB, a recognized expert on antennas and microwaves, among a host of other areas. At one VHF conference, I remember overhearing someone who had seen the magazine (a curiosity in itself, since not one person at such a conference would admit to any connection with CB), commenting, "Oh my God, I can't believe that their antenna columnist is the same Kent Britain that we know and love."

Imagine the gall—the heresy—of having someone who knows a lot about a topic sharing that knowledge with others who may know less. Imagine the heresy of trying to educate "the lower classes."

Thankfully, with human nature being what it is, even the best efforts to "keep the lower classes in their place" are doomed to failure—because people have this terrible habit of learning, even if we don't want them to. All too often, we hams consider ourselves to be at the "top level" of the radio hobby, and that people who enjoy other segments of it are somehow "below us," less educated, less sophisticated, less "worthy" (of what, I'm not sure). Even I've been guilty of this from time to time. But remember, nearly every ham today started out in some other part of the radio hobby, and many (if not most) of us continue to enjoy one or more of those other parts today.

So the next time you're tempted engage in some "band-bigotry" on the air or at a meeting or hamfest, remember that you may once have been part of a group that other hams criticize...and remember that you didn't much like what the other folks had to say about you then, because you knew it wasn't true—and it probably still isn't true today.

Bigotry in any form hurts us all. We need to oppose it in all its forms. And we need to start with ourselves. We need to band together—VHF hams, HF hams, SWLers, scanner monitors, and CBers—all of us radio hobbyists need to mend our fences and begin to work together for the common future of our hobby.

Speaking of Bigotry...

While we're on the topic, there's another type of bigotry that's showing up on our bands these days with alarming frequency: old-fashioned religious, ethnic, and racial bigotry. You can hear it on HF, you can hear it on VHF—members of hate groups using amateur radio to spread their poison. It is a well-established fact that ignoring this sort of activity will not make it go away. If anything, it will strengthen it and embolden the people responsible. We must tell these people that we know they're out there, that we know what they're doing, that what they're doing is wrong, and that we're not going to tolerate this intolerance on our bands.

"The first station we tuned in was Radio Tirana, in Albania—then one of the world's most closed societies. Even as a 10th grader, I knew this was pretty cool stuff, and I knew I wanted to see what else was out there."

In his April "Op Ed" calling for hams to demand a "get-tough" law-and-order policy by the FCC in enforcing its amateur rules, Bill Pasternak, WA6ITF, made one passing reference to the growing "acceptance of broadcast hatred in our ham radio mini society." That was enough to generate at least one anonymous letter asking if he (Bill) was a member of the Communist Party. Believe me, if Bill is a Communist, then so is Ronald Reagan!

If you really feel the need to dislike some other group of hams, why not forget about HF versus VHF or code vs. no-code, and focus in on the hate groups that are abusing our frequencies?

Full Circle

One closing note on this discussion: my wife recently bought me a new shortwave receiver for my birthday with double the features of the radio I had 20 years ago at half the price. After tuning around a while and not finding anything much to listen to, I settled on a strong station playing pre-sign-on music. What station was it? Radio Tirana! ■

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

Goodbye, Form 610!

By the time you read this, the venerable Form 610, the FCC's amateur license application, will probably be history—replaced by a new Form 605. The latter consolidates applications for hams with those for other services administered by the Wireless Telecommunications Bureau that are "not presently required to submit extensive technical data to receive a license." According to the ARRL and the *W5YI Report*, this new Universal Licensing System (ULS) is designed to help reduce the number of different forms being submitted to the FCC's license processing center in Gettysburg, Pennsylvania.

In proposing to adopt the new form, the FCC also announced plans to do away with reciprocal operating permits for foreign amateurs, saying that a valid license from any foreign country with which the U.S. has a reciprocal operating agreement would "stand as proof that the foreign operator is qualified" for reciprocal privileges. In addition, permission to operate would be automatic, eliminating the need to file the current Form 610-A.

Separate applications for club callsigns and vanity callsigns would be eliminated as well, and the FCC is proposing to delegate the responsibility for club callsign issuance to VEC-like club callsign administrators. This is a revival of a proposal first made by the ARRL in the 1980s. Finally, the new Form 605 will require applicants to include their "Taxpayer Identification Number," which in most cases is your Social Security Number. The FCC says access to that information will be limited to "only a small number of Commission employees."

Vanity Call Cost May Drop

The FCC has proposed lowering the amateur vanity callsign fee from $50 ($5/year for 10 years) to $12.90 ($1.29/year for 10 years) for the 1998 fiscal year. According to the ARRL and other sources, the new fee is included in a proposal for an overall FCC fee schedule for the year, issued in late March. No effective date for the lower fees was available at press time. Last year, the Commission increased the vanity call application fee from $30 to $50, saying it needed to "round off" all fees to the nearest $5 (so $3/year became $5/year). No explanation was offered for the new proposal or for why the "rounding off" was no longer necessary.

Ham Spectrum Protection Bill

A bi-partisan bill to mandate "equivalent replacement spectrum" for any amateur frequency reallocations has been introduced in the House of Representatives at the request of the ARRL. HR-3572, the Amateur Radio Spectrum Protection Act of 1998, was introduced by Florida Republican Rep. Michael Bilirakis, and co-sponsored by Rep. Ron Klink, a Pennsylvania Democrat.

According to the ARRL, the bill, if approved, would preclude the reallocation of any primary amateur radio frequencies, reduction of any secondary allocations or the introduction of additional users on secondary bands "that would substantially reduce their utility to Amateur Radio," unless the FCC provides hams with "equivalent replacement spectrum" at the same time. Several years ago, Congress passed a non-binding resolution urging the FCC to "compensate" hams for any spectrum reallocations. This bill would make the requirement part of the Communications Act of 1934.

House Passes Amended Privacy Bill

By a nearly unanimous vote, the House of Representatives approved HR-2369, the Wireless Privacy Enhancement Act of 1998, but the bill no longer poses the threats it once did to hams, shortwave listeners, and scanner enthusiasts. The ARRL and other concerned groups worked with subcommittee staff before the vote to produce a committee report—the official statement of "Congressional intent" on major bills—that made it clear that the bill was not intended to prohibit legal modification of linear amplifiers for 10- and 12-meter operation, nor to ban modification of amateur transceivers for MARS and Civil Air Patrol use.

During debate on the bill, according to *The ARRL Letter*, the bill's primary sponsor, Rep. Billy Tauzin (R-LA) made special mention of amateurs' volunteer work in the wake of natural disasters. The full text of the report is available on the World Wide Web at <ftp://ftp.loc.gov/pub/thomas/cp105/hr425.txt>. At press time, the Senate had yet to act on the bill.

Antenna Bill Passes VA Legislature

The Virginia state legislature has passed a bill that would incorporate into state law most of the FCC's limited preemption of amateur antenna regulations. The bill—still awaiting Gov. Jim Gilmore's signature as we went to press—requires local antenna ordinances to impose the "minimum regulation necessary to accomplish the locality's legitimate purpose," according to the ARRL, and includes bans on restrictions below 200 feet in rural areas and 75 feet in more densely populated areas, unless the antenna "clearly represents an unreasonable risk to human health or life." The bill passed over the fierce objections of the Virginia Municipal League and the Virginia Association of Counties.

APRS QSY Debate Continues

Debate continues over the change of frequency (QSY) for Automatic Position Reporting System (APRS) stations on 2 meters from 145.790 to 144.390 MHz, even as networks in many parts of the country made the move to meet the April 1 target date. The switch was proposed last year by an AMSAT-led group in an effort to prevent interference between APRS signals on 145.79 and voice contacts by astronauts and cosmonauts on 145.80 MHz. The previously used frequency of 145.55 MHz created major interference problems in Europe.

In March, the North East Weak Signal (NEWS) Group went on record in opposition to using 144.390 as a national APRS frequency, noting the unofficial 2-meter AM calling frequency at 144.400 MHz, along with beacons and FM simplex operations on adjacent frequencies. The NEWS Group mainly fears that the growing popularity of APRS will result in its expansion beyond 144.390, and it suggested looking for an alternate fre-

Compiled by the CQ VHF Staff

quency in the 145.500 to 145.780 range, or that APRS be accommodated in the current packet frequencies between 144.90 and 145.10 MHz.

ARRL President Rod Stafford, W6ROD, responding to the NEWS Group proposal, said it was the League's feeling that "except for some sporadic simplex operations, a few ATV users and a few 2-meter AM operators, [144.390] appears viable for national use. These sporadic issues are being worked at the local level...I believe the most appropriate action for [the ARRL] to take is to make sure that the concerns of the members of NEWS...are communicated to [those] who are working on the QSY activity. I will make sure that is done."

One local group, the New England VHF AM group, suggested (with support from top AMSAT officials) moving the AM calling frequency (the only direct conflict at the moment) up slightly to 144.425 MHz.

Tune in Mir on the Web

Bob Bruninga, WB4APR, has established a World Wide Web site that allows anyone with Web access to see what's up on Mir's packet station. Bruninga—best known as the developer of APRS, the Automatic Position Reporting System—says this first Internet-linked Mir ground station captures all east coast passes of the Russian space station and posts the packet transmissions on the Web site (after removing all connect requests, busy messages, etc.). According to the AMSAT News Service, Bruninga says his goal is to build a network of linked ground stations to provide nearly continuous coverage not only of Mir and the space shuttle (when it's carrying a ham station), but several digital ham satellites as well. The Web address for his prototype station is <http://web.usna.navy.mil/~bruninga/mirex.html>.

Mir/APRS Tests Successful

On a related topic, Bob Bruninga, WB4APR, reported success in a March experiment to relay real-time APRS signals via the Mir packet station. According to the AMSAT News Service, there were more than 11,000 "hits" on the special Web page that collected and plotted the data received from the Mir digipeater. Due to scheduling problems, the tests were conducted during late night passes, so most of the APRS stations digipeating through RØMIR were home stations, although five mobiles and one boat took part as well. In addition, school groups around the world were able to monitor the action on the World Wide Web.

Bruninga, Feldman, Bellows Win Dayton Awards

Speaking of WA4APR, Bob Bruninga has been named the winner of the Dayton Amateur Radio Association's 1998 Technical Excellence Award in recognition of his development of the Automatic Position Reporting System. APRS uses packet radio to report on the location of moving objects. Recently, it has gained wide use in weather reporting as well, with data from electronic weather stations automatically transmitted via APRS.

Dayton's 1998 Ham of the Year is Andy Feldman, WB2FXN, in recognition of his longtime dedication to amateur radio public service communications. Feldman coordinated amateur response to the 1996 crash of TWA Flight 800 off the coast of Long Island, New York, and also during a weeks-long outbreak of brush fires on Long Island in 1995.

The Dayton Special Achievement Award this year goes to Jay Bellows, Jr., KØQB. Bellows, the ARRL Dakota Division Vice Director, was recognized for his leadership in promoting and implementing the FCC's limited preemption of local antenna ordinances (PRB-1) issued in 1985.

TECHSAT II Set for Launch

The Israeli TECHSAT II satellite may be in orbit as you read this. The *SpaceNews* newsletter reported in late March that a launch was scheduled from Kazakhstan in late April or early May. TECHSAT I, Israel's first attempt at an amateur satellite, was lost in a launch accident in 1995, along with the Mexican UNAMSAT-1 satellite.

10 GHz at the "Top of the World"

Larry Lipitz, NY2US, has installed a 10-GHz beacon at the top of the World Trade Center in New York City (FN20xr). According to Del Schier, KD1DU, one of the first to copy the beacon, it's putting out a strong, if slightly unstable, signal on 10368.210 MHz. At a height of 2,200 feet above average terrain, and looking out on the Atlantic Ocean, it should have excellent coverage.

6 Meters on Hold in Germany

Don't look for any German stations on 6 meters during any of this summer's Transatlantic band openings. *Newsline* reports that the special permits issued to 1,000 German hams for 6-meter operation expired at the end of 1997 and were not renewed. The ban on 6-meter activity will reportedly continue until the German government drafts new rules for operation on the band.

Hams Asked to Help Track Owls

The Canadian Wildlife Service in March asked hams and scanning enthusiasts in the central U.S. to help track the northward migration of 12 endangered burrowing owls. Equipped with radio collars last fall before they flew south from Saskatchewan for the winter, the owls took off on schedule, but bad weather kept biologists from following them and their signals were lost somewhere over North Dakota.

According to Joe Moell, KØOV, the wildlife service asked anyone living between Texas and North Dakota who had a radio capable of tuning the 170-MHz region to listen for pulsed signals from the owls' transmitters between late March and early May. By the time you read this, it will probably be too late to participate, but you should be able to get updates on the project from Moell's Web site at <http://members.aol.com/homingin/>.

Ham Gets His Own Asteroid

Finally, the *ARRL Letter* reports that New Mexico amateur Warren Offutt, AF9Q, is now the proud owner of his very own *asteroid!* Offutt and his wife, Beverly, N9JVN, are amateur astronomers as well as amateur radio operators and have made significant contributions in identifying and measuring faint objects in the solar system. In February, Offutt learned that the International Astronomical Union was recognizing his contributions by naming renaming "Minor Planet (7639)," which orbits the sun between Mars and Jupiter, in his honor as "Minor Planet (7639) Offutt."

Just what do you do with your own asteroid? "I've thought about setting up a repeater on (7639) Offutt," joked Offutt, "but the technical challenges seem formidable."

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.*

Finding the Magic

Dear *CQ VHF*:

Your March editorial, "A Dying Hobby (Not)" was a breath of fresh air. Our hobby is strong and robust. It may be continuously changing but what's wrong with that? Folks who feel the magic is gone haven't demonstrated amateur radio to a fourth grade class. The kids see the magic. Thank you for the outstanding article. I hope many people read and understand it.

73,

Bob Nelson, N5EW
Kerrville, Texas 78028

April Fool!

Dear *CQ VHF*:

Regarding "The Effects of Moon Phases on EME Signal Strength," April 1998: At last an article worthy of Emil Heisseluft; beyond the ken of Hashafisti Scratchi. Never has moonbounce-ology been so clearly obfuscated. For those readers who did not get it, may they endure an enlightening session of Applied Wouff Hong and Rettysnitch 101.

73 de Ray Totzke W9KHH
Grafton, Wisconsin

Ray—Your familiarity with Heisseluft, Scratchi, the Wouff Hong and the Rettysnitch belie your age (note that I'm familiar with them, too). For those among us who haven't been around ham radio that long, Prof. Emil Heisseluft has written prolifically for CQ *magazine, but always in the April issue; Hashafisti Scratchi wrote a humor column in* CQ *over the course of many years; and the Wouff Hong and Rettysnitch were fearsome devices used without mercy on hams who showed disrespect for our traditions.*

I put that in the past tense because, even though the Wouff Hong and Rettysnitch were applied primarily (exclusively?) by ARRL officials acting on behalf of "The Old Man," there is no mention of either device in the current edition of either the ARRL Handbook *or* ARRL Operating Manual.

Dear *CQ VHF*,

I greatly enjoyed Chip's April article. He is a man of rare knowledge.

Maybe you can talk him into a future article on the new FT-846 CB. This is Yaesu's new HF/VHF/UHF/CB radio. What a great marketing idea. I understand it will be introduced at Dayton and is slated to be sold at truck stops.

Or how about Chip's latest DXpedition to the Medulla Oblongata region of southern Mongolia? I believe he has been on many trips to this region.

73 de Don DeJarnette, KC4YRT
Tuscaloosa, Alabama

Dear *CQ VHF*:

Clearly, the April '98 article on pages 39–42 was at least partially in jest. (on sabbatical in the Isles of Langerhans?!?!) Please tell me the whole thing was a (bad?) joke.

73,

Jeff Loudin, KF4VEH

Dear *CQ VHF*;

Please, no more April Fool articles. Although they are fun, I think the space would be better utilized by a real article. For instance, I have never seen an article on how to generate CTCSS codes and why the odd-ball frequencies are used.

73,

Ruddy Ellis, W4LNG
Atlanta, Georgia

Dear *CQ VHF*:

Boy, do I love magazine articles this time of year! Chip really outdid himself with this one; almost surprised he lent his name to the article. Should get him some interesting questions at Dayton!

Seriously though, *CQ VHF* has mostly newer readers, I would guess; and I question the validity of putting such a technical farce in such a magazine.

Being an active moonbouncer though, I roared with delight while reading it.

Craig Henderson, N8DJB
Pemberville, Ohio

Craig—It was exactly because *it was a fairly high-level technical article that we thought it would be safe. Not too many new hams are into moonbounce! But we managed to fool quite a few old-timers, too! Apparently, some people didn't notice the bold type in the center column on page 42—if you read down, ignoring everything that wasn't bold, you'll see that we told everyone what it was, right in the article.*

We apologize to those of you who felt it was a waste of space, but offer the following advice: Lighten up! Have some fun. It's a hobby! It's also a tradition in ham radio magazines to have at least one "April Fool" story each year, and we're happy to join that tradition. As for those of you who got fooled, no apologies—that was the whole idea!

"Politically Correct" Feedback

The following letters were forwarded by Bill Pasternak, WA6ITF, which he received in response to his "Op-Ed" article in the April, 1998, issue of CQ VHF:

Dear Bill;

Just read your piece in the April '98 *CQ VHF* and I'm in your (our) corner. One point I wish you had had room for in your "opinion" was that the "community" has the right to decide what behaviors it will and will not accept; and, in this case, we're talking about a world-wide amateur radio community which *does not* accept foul language and rude behavior, regardless of what time it is done. There is no such thing as "safe hours" for that kind of garbage because, while the kids here may be in bed already, those youngsters in Australia or Japan may be just getting home from school and cranking up the ol' ham rig. Youngsters aside, *I* don't care to hear that trash on the air.

C. Singleton, KC5WJM
Kingsland, Texas

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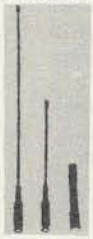

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MFJ-1728B, $24.95. 5/8 Wave 2/6 Meter Magnet Mount antenna. On 2 Meters, it gives you the maximum possible theoretical gain of any single element antenna -- no matter how much others cost. On 6 Meters, it's a high performance full ¼ wave antenna. Free BNC handheld adapter, low SWR, handles 300 Watts PEP, heavy duty magnet mount, 12 feet coax, 48 inch stainless steel radiator.

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Dear Bill;

All I can add to your article is "AMEN!". All this "Politically Correct" BS is not only hurting amateur radio, but the country itself. It is just another way of saying "I am not responsible. Everything is someone else's problem, my hands are tied." Pure BS. But as you said very clearly in your article, we, the taxpayers—who are also voters—can and should fire those officials who hide behind the Politically Correct facade. Good article, enjoyed the fresh approach.

Ed Ciecierski, WB5WOU
Azle, Texas

Dear Bill;

I stand with you about the FCC issue. Something has to change .The rules have to be enforced. And the guys that say something are viewed as mean! What a lawless country we are in.

Darrell Fuglseth, KF8YP
Muskegon, Michigan

(Dear Bill);

Just read your short story in the *CQ VHF* April 98. I'm wondering if your a member of the comunist party? If not you should join, You goose stepping comunist WANA-BE

Sincerly,

AN AMERICAN

Hunting for Foxhunting Gear

Dear *CQ VHF*;

Hi, my name is Ralph Nahigian, KE1GL, from Coventry, Rhode Island. I am a member of a local club and we hold about two local foxhunts a year. We do not have a great turnout but we have fun. The problem is we do not have a radio "fox." We have to have a person using an HT talk for 30 seconds after every four minutes. The problem is when we get into the five- or six-block range of the fox, they fall into the "let me check here" syndrome, instead of relying on instruments to go directly to the source.

You can count on me to erect a fox hunt for April 25, 1998 in Rhode Island, but I only ask one thing: Could you find me a kit or project for a fox transmitter? There are members in the club as well as myself who could build the kit. I have been looking in articles for some and I can't seem to find any.

The perfect kit would be a tone that would beep every second at, say, 100 mW. Let me know if you can help. I also will start now on erecting a hunt for "National Fox Hunting Weekend" in Rhode Island. Thanks again for your time.

Ralph K. Nahigian, KE1GL
Coventry, Rhode Island

Ralph—Joe Moell, KØOV, responded directly to you with some specific suggestions, including references to projects in his "Homing In" column in the March and April issues of 73 magazine. I hope those were helpful. I'd like to add that creativity in coming up with a "fox" transmitter is part of the challenge of foxhunting. I joined a group of foxhunters recently in Orlando, Florida, in which the "fox" disguised himself as one of the "hounds," using only an HT and a hand-carried quad antenna (varying with a rubber duck). We walked among the other hunters—occasionally transmitting instead of listening—and it took quite a while for anyone to figure it out. Don't limit yourselves!

"Rolling Your Own"

Dear *CQ VHF*;

Returning to the VHF/UHF/microwave world after a long hiatus, I have been reading *CQ VHF* regularly for the past year. I think *CQ VHF* does an excellent job of appealing to the entire range of the amateur "experience" because I always find something that interests me—even if it's something I've forgotten (as my age advances).

I think that's why I became so upset at KG2DI's letter in the April issue. His attitude is the antithesis of amateur radio as I know it. I think your answer to Mr. Mayers was reasoned and considerate. But I just cannot imagine people enjoying this hobby without "rolling their own."

Building transistor radios as a teenager got me interested in electronics in the first place—it was not the other way around. If an Advanced class ticket holder can't "turn a schematic into a working rig," he/she is missing some of the best recreational activity the hobby offers.

73,

W. John Good, W1GS
Londonderry, New Hampshire

John—You obviously find great pleasure in building radios, others find their enjoyment in operating them. If the process of building a radio is difficult and frustrating, as it can be for many hams, then the activity isn't very "recreational," regardless of your license class. Ham radio offers plenty of room for all different interests. That variety and diversity is one of its great strengths.

CQ VHF Ham Radio Above 50 MHz

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A publication of

CQ Communications, Inc.
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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.

U.S. Government Agencies: Subscriptions to CQ VHF are available to agencies of the United States government, including military services, only on a cash with order basis. Requests for quotations, bids, contracts, etc. will be refused and will not be returned or processed.

Printed in the United States of America.

Postmaster: Please send change of address to CQ VHF magazine, 25 Newbridge Road, Hicksville, New York 11801.

Hamfest Calendar

The following hamfests are scheduled for June, 1998:

June 6, Bergen ARA Annual Hamfest, Fairleigh Dickson University, **Teaneck, NJ**. Talk-in: 146.790-600. For information, call Jim Joyce, K2ZO, (201) 664-6725, no calls after 10 p.m. (exams)

June 6, 18th Annual IRA Hamfestival, Hudsonville Fairgrounds, **Grand Rapids, MI**. For information, call Randy Chelette, N8KQX, at (616) 532-5450 after 4 p.m.

June 6, 5th Annual Hamfest, Agriculture Building and adjoining building, Tennessee State Fairgrounds, **Nashville, TN**. Talk-in: 145.47. For information, contact Bill Pingley, KTØC, 4823 Shoshone Dr., Old Hickory, TN 37138-4109, or call (615) 889-7376.

June 6, Bangor Hamfest, Hermon High School, **Bangor, ME**. Talk-in: 146.34/94, 146.52 simplex. For information, contact Roger W. Dole, KA1TKS, RR#2 Box 730, Bangor, ME 0440, or call (207) 848-3846. (exams)

June 7, Hamfest, New York Hall of Science parking lot, Flushing Meadow Corona Park, **Queens, NY**. Talk-in: 444.200, PL 136.5. For information, call Stephen Greenbaum, WB2KDG, (718) 898-5599 (evenings only); or e-mail: <WB2KDG@bigfoot.com>.

June 7, 44th Breezeshooters' Hamfest, Butler Farm Showgrounds, just north of **Butler, PA**. Talk-in: 147.96/36. For information, send SASE to George Artnak, N3FXW, 3350 Appel Rd., Bethel Park, PA 15102; call Breezeshooters' Hotline (412) 854-5593, or e-mail: <geoart@usa.net>; Web site: <http://www.users.sgi.net~wolfie/>.

June 7, 21st Annual Swapfest and Auction, U.S. Army Reserve Center, **Junction City, WI**. Talk-in: 146.670 WB9QFM/R, and 146.985 W9NN/R. For information, contact John Feliz, W9JN, 973 E. First St., Junction City, WI 54443-9614; or call (715) 457-2506; e-mail: <jfw9jn@tznet.com>. (exams)

June 7, Hamfest, Medina County Fairgrounds Community Center, **Medina, OH**. Talk-in: 147.630 in, 147.030 out. For information, call Medina 2-Meter Group Hamfest Committee (330) 273-1519. (exams)

June 12–13, 16th Annual Albany Hamfest, Hasan Temple, **Albany, GA**. Talk-in: 146.82. For information, contact Arthur Shipley, N4GPL, c/o AARC, P.O. Box 70601, Albany, GA 31708-0601, or call (912) 439-7055; e-mail: <ashpley@isoa.net>. (exams)

June 13, Tailgate Swapfest, on Cape Cod, **Dennis, MA**. Talk-in: 147.045 repeater (no PL tone). For information, call Don Haaker, WA1AIC, (508) 760-1571. Rain date, June 20. (exams)

June 13, 24th Annual Fleamarket, the Fergus Community Center, **Fergus, ON Canada**. Talk-in: 146.97- or 145.21-. For information, contact Bill Smith, VE3WHS, 32 McElderry Rd., Guelp, ON Canada N1G 4K6, or call (519) 821-6642; packet: <VE3WHS@VA3SED.#SWON.ON.CA.NA>; Internet: <smith.ve3whs@sympatico.ca>.

June 13, Hamfest, Executive Inn Convention Center, downtown **Paducah, KY**. For information, contact Paducah Amateur Radio Assoc., P.O. Box 1022, Paducah, KY 42002-1022; or e-mail: <KC4ENA@Apex.Net>. (exams)

June 14, 31st Annual Hamfest and Family Picnic, Goodyear's Wingfoot Lake Park, **near Suffield, OH**. Talk-in: 147.135+. For information, contact Don Longshore, 1835 Esther Ave., Akron, OH 44312-1014, or call (330) 733-7989. (exams)

June 14, Annual Egyptian Fest-Hamfest, Computer Fair and FleaMarket, Granite City Campus of Belleville Area College, **Granite City, IL**. Talk-in: 146.79. For information, contact Egyptian Radio Club, P.O. Box 562, Granite City, IL 62040, or call Bill Dusenberry, N9OQK, (618) 398-1456.

June 14, Long Island Hamfair, Briarcliffe College, **Bethpage, NY**. Talk-in: W2VL 146.85 repeater. For information, call the LIMARC 24-hour infoline: (516) 520-9311. (exams)

June 14, "Ham-O-Rama '98," Erlanger Kentucky Lions' Park, **Erlanger, KY**. Talk-in: 147.255+ or 147.375+ repeaters. For information, contact N8JMV c/o NKARC, P.O. Box 1062, Covington, KY 41012, or call (513) 797-7252 (evenings).

June 14, 41st Annual Hamfest, DuPage County Fairgrounds, Wheaton, IL. Talk-in: K9ONA, 146.52; K9ONA/R 146.37/97 (107.2). For information, call 24-hour InfoLine: (708) 442-4961. (exams)

June 19–21, 28th Annual Picnic/Hamfest, Burbank Campsite, northeast of Red Deer, **Alberta, Canada**. Talk-in: 147.150

(Continued on page 83)

Special Event Station

June 20–21, Special Event Station W5P, in celebration of the New Mexico Star Party on June 25, 1998, in Rio Rancho, NM, which will be open to the public. On air from 1600 to 2400 UTC (Sat. & Sun.), operating CW, SSB, RTTY, and FM on all bands from 40 to 2-meters. QSL with #10 SASE to: W5P, c/o Jay Miller, WA5WHN, P.O. Box 6552, Albuquerque, NM 87197-6552. For information, e-mail: <wa5whn@rt66.com>; or visit <http://www.swcp.com/~n5zgt/> on the World Wide Web, and click on the W5P icon.

Operating Notes

For June, 1998:

June	
7	Arietids meteor shower peak
9	Zeta Perseids meteor shower peak (don't confuse this with the major Perseids shower in August)
13–15	ARRL June VHF QSO Party (see rules, this issue)
20–21	SMIRK 6-Meter QSO Party (see rules, this issue)
27–28	ARRL Field Day
29	Good EME conditions

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

Product Update

ICOM IC-746 HF+6+2 Transceiver

ICOM has a new addition to its line of HF/VHF all-mode transceivers: the IC-746 base radio. The IC-746 features 100 watts out on all bands from 160 meters through 2 meters, Digital Signal Processing (DSP), and a built-in automatic antenna tuner for 160 to 6 meters (ham bands only).

Additional features include true FSK (RTTY) on all bands and a host of interference-fighting features, including twin passband tuning, auto notch, and audio peak filtering. Digital noise reduction is variable, along with a noise blanker. Plus, a band scope is included on the display window to monitor band activity, and weak-signal reception is enhanced by the IC-746's IF DSP features and its two-stage preamplifier (single-stage on 2-meters). The radio also includes a full-featured memory keyer (including serial number generator for contesting) and adjustable weight control is standard, as are a triple band stacking register and 100 memories (with alphanumeric tagging capability).

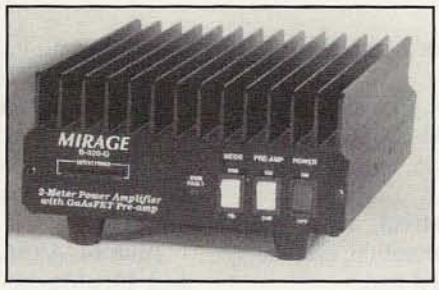
The IC-746 has three antenna connections, one each for HF, 6 meters and 2 meters. An auto-tuner for 160 to 6 meter operation has memories for tuner settings every 100 kHz for quick, efficient antenna tuning. List price is $2,280 ("street" price is generally below $2,000).

For additional information, contact your ICOM dealer or ICOM America, 2380 116th Avenue NE, Bellevue, WA 98004; Phone: (425) 454-8155; or visit ICOM's Web site at: <http://www.icomamerica.com>.

Circle 101 on reader service card

Two New Amps from Mirage

Mirage's new B-320-G BruteFORCE™ dual purpose amplifier is actually two 2-meter amplifiers in one. A flip of a switch gives you 200 watts out from either your low power (.25- to 10-watt) handheld or high power (10- to 50-watt) mobile rig. It gives you all-mode FM/SSB/CW 2-meter operation, and a low noise 15 dB GaAsFET preamp lets you dig out weak stations and can be used even if the transmit amplifier is off.



The B-320-G comes with SWR protection with LED, RF sense Transmit/Receive switch, and reverse polarity protection. A custom wrap-around heatsink and quiet cooling fan provide excellent heat dissipation for cool operation. It's compact (2 3/4 H x 7 3/4 W x 9 3/4 D inches) and comes with mobile mounting brackets, mobile patch cable, and rubber feet that keep it in place on your table. List price for the B-320-G is $449.95.

The Mirage B-510-G is a professional-grade 2-meter amplifier which features adjustable output power along with several other unique features. A front-panel control lets you choose any power level between 5 and 100 watts Mirage's LED PowerGraph™ indicator makes this power adjustment easy by accurately displaying your output power.

The 15-dB attenuator helps eliminated intermod by vastly attenuating interfering signals below and above the 2-meter band while leaving your desired signal at full strength. Plus, the 5- to 15-dB GaAsFET preamp helps you to dig out really weak stations. The B-510G includes protection from high SWR, overheating, and reverse polarity. The amplifier comes standard with a mobile mounting bracket and a PL-259 to BNC handheld patch cable. The unit measures a compact 2 1/4 H x 6 1/2 W x 9 D inches. The suggested retail price for the B-510-G is $224.95.

For your nearest dealer, call (800) 647-1800; Fax: (601) 323-6551; E-mail: <mirage@mfj@enterprises.com>; or check out dealer and ordering information on Mirage's Web site at <http://www.mirageamp.com>.

Circle 102 on reader service card

HAMCALC Version 31

Version 31 of HAMCALC (over 200 Painless Math and Design Programs for Radio Amateurs and Professionals) is now available. If you like to design circuits or antennas, want to be able to calculate decibels, or even work out the dimensions for a proper staircase to your attic or basement ham shack, you'll find easy-to-use help in this MS-DOS software. The programs are free, but you need to send in a nominal amount for the cost of the diskette and airmail postage. For a free 3 1/2-inch 1.44 Mb MS-DOS/WINDOWS HAMCALC diskette, send $5.00 check or money order (U.S. funds; no stamps or IRCs please) to George Murphy, VE3ERP, 77 McKenzie St., Orillia ON L3V 6A6, Canada.

Circle 103 on reader service card

NuTest Version 1.50

UK radio amateur Tony Lacy, G4AUD, has released Version 1.50 of NuTest. This is a PC/Windows-based software package that provides students with the skills and knowledge required to pass the FCC radio amateur theory tests at all levels from Novice to Extra classes. The new version includes teaching materials for the new General class test, effective from July 1, 1998.

The program will print or display realistic tests, and provides explanations, diagrams, and tables as well as correct answers. Prices start at $14.95; a free Novice class demonstration is available now from Tony's Web site at <http://www.btinternet.com/~tony.lacy/> or you can cotact Tony by e-mail at <tony.lacy@btinternet.com>. Orders and inquiries by standard mail should be addressed to Tony Lacy, 58 Bilbrook Road, Codsall, Wolverhampton, WV8 1ER United Kingdom.

Circle 104 on reader service card

FULL-FEATURED!

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

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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

Yaesu FT-847 HF/VHF/UHF Multimode Transceiver

Yaesu's near "DC-to-light" FT-847 just might be the only rig you'll ever need. We put it to the test on a California mountaintop—one shared with a bunch of intermod-generating transmitters.

By Gordon West, WB6NOA*

The general product description of Yaesu's new FT-847 will certainly grab your attention: *Yaesu FT-847 LF/MF/HF/VHF/UHF Transceiver*. Reads much like "DC-to-Daylight," doesn't it? And what we found during our mountaintop tests was a rig that truly lived up to this name!

This rig has all of the bands built in—there are no additional band units necessary for 6 meters, 2 meters, or 70 centimeters—the VHF and UHF bands are fully integrated into the HF transceiver for one compact radio that does it all.

The FT-847 is *really* compact, measuring just 3-1/2 inches high, 10-1/4 inches wide, and 10-3/4 inches deep (see Photo A). I was expecting something a lot larger, but this transceiver is perfectly sized for mobile operation, yet has all of the "big knob" features that you would expect from base station equipment. It runs directly off of 12 volts DC, keeping the size and weight down to a minimum for portable Field-Day-type applications, and it uses the same Molex 12-volt plug and receptacle as that used on many other HF radios.

An externally placed power supply is required for 110-VAC use. Yaesu offers the FP-1030A, a 30-amp, heavyweight, transformer-type base station power supply; or, for traveling, you could run the FP-1025A, a 25-amp switcher power supply. Both supplies would be placed next to, or down out of the way of, the transceiver. There is no provision (or room!) to build in any type of 110-VAC supply on the inside of the radio.

Photo A. The compact FT-847 is the first commercially made radio to operate from 160 meters to 70 centimeters without the need for add-on modules. It offers 100 watts out on HF and 6 meters and 50 watts out on 2 meters and 70 centimeters. (WB6NOA Photo)

The radio has four antenna jacks (see Photo B). There's one SO-239 connection on the rear for MF/HF (160 to 10 meters), and two additional SO-239s, one for 6 meters and the other for 2 meters. The fourth output is an N-type jack for 70 centimeters.

Frequency Coverage

When I say "DC-to-Daylight" frequency coverage, this radio comes closer than any other. For a rundown of what you get, straight out of the box, check out the "FT-847 Frequency Coverage" box on the next page.

According to the specifications, power output on high frequency and 6 meters is 100 watts SSB and 25 watts AM. I measured somewhat more power output than these minimum specs. FM output on both 10 and 6 meters was measured at 105 watts.

On 2 meters and 70 centimeters, the specs show 50 watts of SSB power output, and I saw slightly higher peaks during our field test. On FM, power output was measured at 55 to 57 watts.

Double Field Test

My first brief in-the-field operation of the Yaesu FT-847 took place during a very rainy Sunday afternoon while doing

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

Photo B. There are four separate antenna jacks on the back of the radio: one each for HF, 6 meters, 2 meters, and 70 centimeters. In the photo, Gordon is pointing to the computer control jack that allows the FT-847 to be used as a remote base. (K7JA photo)

a mobile loop antenna review down at the beach (see "Two-Meter Loop Shootout" in last month's issue). Chip Margelli, K7JA, Yaesu USA's Research and Development Manager, was able to score a demonstration unit in between ham shows, and he loaned it to me for the day's loop review with the proviso that I had to learn to run the equipment without an instruction manual (he hadn't finished writing it yet!).

Absolutely no problem. There was no mystery at all in getting everything up and running without looking at the book. Hit the power button, top left, crank the RF gain all the way clockwise, AF volume to 9 o'clock, band up to 2 meters, hit SSB, and start the loop review at 144.240 MHz after an initial announcement on the 144.200 calling frequency. An absolutely logical operation for getting started on simplex operation. I suppose there were a host of menu items that I could have adjusted, but for this brief and limited operation, no instruction manual was necessary.

The rig ran flawlessly in my mobile communications van down at the beach. But I needed a few more hours of "play time" with the FT-847 to really put it through its paces. So, a month later, Chip and his wife, Janet, WØMF, Manager of the Ham Radio Outlet store in Anaheim, California, came by with the 847 and a car full of homebrew weak-signal long Yagi antennas, and suggested we take the rig up to a local mountaintop where we could really put it through its paces (see Photos C and D). This particular hilltop was suggested by Yaesu's National Sales Manager, Kevin Karamanos, WD6DIH, as being a good location to bang a signal on 2 meters and 430 MHz all the way up to the San Francisco Bay area, 300 miles away. Kevin also gave us a little bit of advice before we went behind the locked gates: "You may want to turn off all of your other radio equipment when you get to the top," he told us. It didn't take us long to figure out why.

Our operating position at the mountaintop—one of the tallest hills overlooking all of Southern California—was just 300 feet away from a triple-tower commercial/military repeater and microwave system. Kevin later told us that more than one ham has left this location with an HT that no longer worked, probably because of a burned up front-end transistor from all of the RF coming off the top of the hill. This would really put the FT-847's receiver to the test.

Contest-Style Setup

Our first job was assembling the antenna systems. Chip and Janet set up their 24-foot-long homebrew, 19.4-dB gain, 432-MHz long-boom Yagi and aimed it in the general direction of San Francisco. I was trying out my new telescopic flagpole antenna system that anchors to the ground by driving over the lip of the receiving tube (see "Need a Portable Mast? Try a Telescoping Flagpole!" elsewhere in this issue). The flagpole, which collapses to 90 inches, and telescopes out to 20 feet with a 2-5/8-inch outside diameter, was stout enough not to flex in the wind. The 2-meter antenna I chose for this Yaesu test was the extremely lightweight Maspro 144 WH10 10-element Yagi, "spec"ed out at 9-dB forward gain. This is not a real common 2-meter weak-signal DXer's beam because of its modest gain and short boom length, but I like it because it's extremely lightweight and handles easily on our new telescoping flagpole mast (see "Resources").

For high frequency, the rig was tested on several base station three- and four-element tri-band Yagis, as well as mobile up at the mountaintop, using the Outbacker Outreach antenna. All coaxial feedlines were low-loss 9913-type, including a short run of LMR-400 coax, and 12-volt power was taken directly from the communications van's power system.

Intermod Tests First

The first test up at the mountaintop site was just to see whether the receiver was going to handle the kilowatts of ERP (Effective Radiated Power) hammering it from the nearby repeater towers. We didn't really know if there might be so much RF in the air that the receiver would be desensitized, or *desensed*, to incoming signals. To our amazement, the hillside was extremely clean of stray RF garbage, and reception on HF, VHF, and UHF bands was intermod-free. Most amazing! But we knew we were getting pounded because most of the other FM equipment in the vehicle was showing

FT-847 Frequency Coverage

Receive Capabilities	Transmit Capabilities
100 kHz–30 MHz	160–10 meters (+5167.5 kHz**)
36 MHz–76 MHz	6 meters
108 MHz–174 MHz	2 meters***
420 MHz–512 MHz	70 centimeters

** 5167.5 kHz is the State of Alaska distress frequency (see "Northern Exposure?"
*** It's likely that there will be mods for extended transmit for authorized members of CAP (Civil Air Patrol), MARS (Military Affiliate Radio System), and USCGA (U.S. Coast Guard Auxiliary). However, Yaesu will *not* comment on this.

absolutely full tilt on the S-meters with nothing but garbled conversations coming out of the speakers. Yet on the FT-847, interference was not encountered.

Next, we turned both beams toward the repeater transmitting station, and, sure enough, you could hear the noise floor rise on both 2 meters and 430 MHz, but both bands were still able to hear signals coming in from the back of the beam without any desense noticed.

According to Chip Margelli, this outstanding receiver performance is the result of a comprehensive effort to optimize strong-signal-handling performance, both with regard to out-of-band *and* in-band signals. "The engineers concentrated on a multi-tone IMD [intermodulation distortion] environment, not the simpler two-tone tests which do not reflect today's crowded bands," Chip explained, adding that "on 432 MHz, we even incorporated a High-Electron Mobility Transistor [HEMT] preamplifier, to ensure very low system noise figure." The HEMT preamplifier contributes to the rather remarkable sensitivity specification of .0125 mV for 10-dB S/N SSB bandwidth.

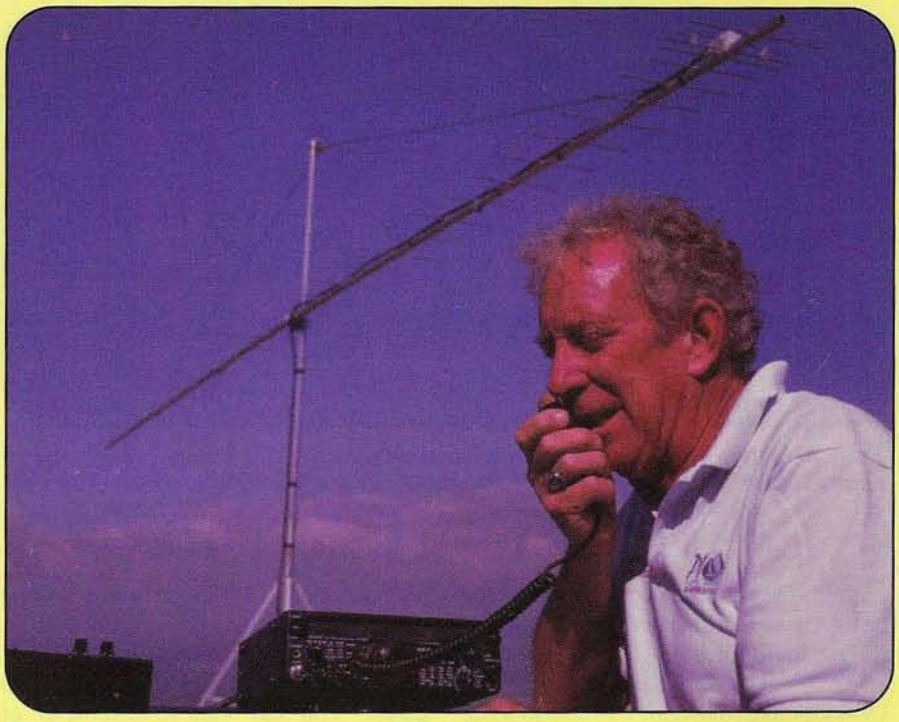


Photo C. The author field-testing the new Yaesu FT-847. There was no intermod or desense, despite the presence of very strong signals from nearby commercial transmitters. (K7JA Photo)

Transmit Tests

We made a quick call on 144.200, and instantly hooked up with W6OMF up in the Bay Area some 420 miles away, who was coming in at an astonishing S7 on the analog-looking LCD S-meter. Chip switched him up to 432, and—presto—signal levels were again in the 5/6-5/7 area. And when received signal levels would take a dip from the long-haul path, we switched on the adjustable digital signal processor (DSP), and were able to hold onto the signals, even if they dipped all the way down and into the noise. The DSP knob is located conveniently down in the lower right-hand corner of the transceiver (see Photo E), and you can adjust the knob with two fingers and push the individual buttons on and off with your third finger for digital filter, digital notch, and digital noise reduction that makes weak voice signals come in with a rolling sound; but, nonetheless, makes them much more copyable than without any DSP filtering at all.

"Where DSP really plays an important part in reception is working moonbounce as I did later on in the week with K5GW," commented Chip. "And this radio has enough power, with the right long Yagi, to hammer enough signal off the moon that another station with a big antenna system similar to K5GW could hear our signals," he added.

If you're planning this type of operation with the new FT-847, Janet Margelli suggests the optional 500-Hz Collins mechanical filter. "This filter is ideal for data signals, such as CW and RTTY," adds Janet. The Collins 500-Hz CW filter is front-panel selectable, and ,when combined with the included DSP audio filters, the mechanical filter options make the FT-847 the ultimate rig for moonbounce and weak signal VHF/UHF work.

Satellites, Too

Our next test was to see how well the rig worked on satellite Mode A (Transmit on 145 MHz, Receive on 29 MHz), Mode B (TX 435 MHz, RX 145 MHz), Mode J (TX 145 MHz, RX 435 MHz), and Mode T (TX 21 MHz, RX 145 MHz). The radio provides independent displays of both uplink and downlink frequencies. Uplink and downlink normal and inverted VFO tracking is similar to what I've seen on the Yaesu FT-736R. This tracking feature in the FT-847 will slave the two VFOs according to the requirements of the satellite transponder. You can tune across the downlink subband without having to make manual uplink adjustments.

As an example, when we worked with RS-12, uplink and downlink frequencies track in the same direction. But for such satellites as AO-10, FO-20, and FO-29, full duplex operation and tracking require the VFO to move inverted—going higher on the uplink signals will cause the downlink frequency to shift lower. In addition, you can manually make minor Doppler-shift frequency corrections to either the transmit (uplink) or the receive (downlink) frequency,. And we even discovered that we could label each of the 12 special satellite memories with alphanumeric tags to remember which satellite and what mode we were operating on!

I was most impressed with the very low noisefloor on 70 centimeters as we waited for a pass of the AO-27 satellite to begin. The radio was nearly silent until the satellite came into view and its beacon just came out of nowhere.

For data operation over the satellites, a rear-panel data in/out and PKT jacks can accommodate 9600-bps GMSK, 1200-bps PSK, or 1200-bps AX.25 AFSK modes. I can't wait until the Phase 3D satellite gets up into space to really give this rig a workout! (*GMSK, by the way, stands for Gaussian Minimum Shift Keying and is essentially what's produced by a G3RUH-style modem used for digital satellite contacts. PSK is Phase*

Shift Keying, also used on some satellites, and AFSK is Audio Frequency Shift Keying, the modulation used for standard terrestrial packet.—ed.)

Exercising Your Fingers

Moving around the VHF and UHF bands (for that matter, all of the bands) is easy with the big tuning knob. Spin the knob and away you go. But if you need to really get to somewhere in a hurry, in behind the main knob is the unique Yaesu "Shuttle-Jog" tuning ring. This was introduced on the FT-1000MP and FT-920 HF radios. Get your fingers around the inside ring, rotate a little bit to the right, and zingo, up you go in frequency. Give it a little harder nudge to the right, and whamo, you're racing up the band in megahertz. I prefer to prowl around the band with the VFO channelized rotary switch encoder knob. This click-click-click knob lets me get around in tuning steps that I can actually feel. The step sizes may be changed via the menu, and are independent for each mode of operation, such as SSB/CW, AM, and FM. This allowed me to tune in 1-kHz steps on 2-meter SSB, but in 5-kHz steps on FM.

All the while, you watch the frequency on a massive LCD screen on which the big, bold numbers and metering system are easily seen in broad daylight, or in the dead of night. The screen has a blue electroluminescence lighting behind it, and you can dim it down to just where you want it for working those weak ones at 3 o'clock in the morning. Incidentally, for the visually impaired, Yaesu offers a voice synthesizer (model FVS-1A) that announces the current operating frequency down to 100-Hz step resolution. There is also an adjustable beep level to suit your operating requirements when you're pushing away at all of those buttons.

Special CW Features

Since Chip is an avid weak-signal CW operator, you can be sure that the rig was developed around some very tight bandwidth requirements. Is 25 Hz sharp enough for you in the DSP mode, with 100 Hz, 200 Hz, or 400 Hz also available? The 847 has a built-in iambic electronic keyer with adjustable weighting, and it operates with semi-break-in T/R control. Either upper- or lower-side injection can be selected for CW reception; and, if you really want to get down to fine-tuning a weak CW signal, you can use the menu to get the VFO to track all the way down to $^1/_{10}$th of a hertz tuning. Close enough?

Finally, for those of you into monitoring weak-signal propagation beacons, you'll enjoy the squelch *hysteresis* built into the FT-847. This smooth squelch action—a feature found only in a few VHF SSB transceivers, most notably the Kenwood TR-751, TR-851, the Yaesu FT-726 (but not the FT-736), and now the FT-847—allows you to silence the background noise, but still allow micro-weak signals or noise bursts to open the squelch.

Instead of a DC clamping squelch circuit that causes weak signals to go undetected until they build to about 5 microvolts of sensitivity, and then chatter the squelch, the "smooth squelch" on the 847 allows extremely weak signals to glide in and out of the audio circuit. When the squelch opens, it stays open for about a second, and then silently clamps.

While this may not seem like a big deal, it *is* for those of us who aim our antennas at a distant beacon and wait for the tropo to come in. Every now and then, you may hear the squelch open and pass a second or two of signal (or of passing automobile sparkplug noise), and then slowly drop back into full squelch. This means that a weak signal can get through when it's just beginning to come in above the noise level.

Photo D. From their mountaintop perch, Gordon and Yaesu's Chip Margelli, K7JA, were able to work several hundred miles on 2-meter and 70-centimeter SSB. They tested other bands and modes as well. (WB6NOA photo)

Northern Exposure?

Did you notice an unusual frequency—5167.5 kHz—in the specifications listed in the main text? This is a special allocation for amateurs operating in or within 50 nautical miles (92.6 kilometers) of the State of Alaska, and it is to be used only for emergency communications (protection of human life or property). It's almost unknown and virtually unused because practically no ham gear has been able to transmit there. But a menu on the FT-847 allows you to enable this frequency as a new "band" between 80 and 40 meters—the RIT (receive incremental tuning) works, so you could follow a drifting distress call, but you can't change the dial frequency to transmit elsewhere. Kudos to Yaesu for thinking of the KL7 hams and their special emergency communications needs up in the auroral zone.

No Complaints on Transmit

Everyone we talked to from the mountaintop liked our transmitted audio. The radio has a built-in RF clipping-type speech processor, which could give us an additional 6 dB of "talk power," but we didn't use it. We *did* discover a menu item that allows you to adjust the IF passband frequency of the transmitted signal to enhance the frequency characteristics of your voice pattern. Independent upper sideband and lower sideband alignment menus are provided for this purpose. You

can listen to your own audio changed by the IF transmit passband by pushing in the SSB monitor button.

And for transmitting data, the back of the 847 has just about every interface jack that you'll need. There's even a three-pin data in/out jack that supports push-to-talk control, in addition to AFSK input and output. For 1200/9600-bps VHF/UHF packet, the PKT jack provides optimized input and output data lines, plus PTT and squelch status lines, all set for your terminal node controller (TNC). The data input/output jack RX connection may also be used for 137-MHz weather satellite signals, or for pulling high-frequency weather facsimile signals out of the air and sending them to your computer for decoding. And for scanner listeners prowling the 150-MHz, 500-MHz, or 460-MHz public safety bands, there's also the capability of driving a tape recorder.

Members of the Western States Weak Signal Society were very excited to hear this equipment on the air and had many questions to ask. About the only negative comment came from a ham who raised the question of what happens if something should malfunction on the 2-meter side of things within the unit: "Will the entire rig need to go back to the factory?" The answer appears to be "Yes," because everything was designed as one integral unit. But in my experience of operating the new breed of solid-state equipment, failures for absolutely no reason at all are quite uncommon. Janet Margelli points out that, even if there should be a failure in either the 2-meter, 430 MHz, or 6-meter side of things, the radio will continue to operate on all of the other bands. She also points out that Yaesu's warranty repair turn-around time is typically two weeks or less.

FM Operating

My next challenge was operating the unit, still without the instruction manual, on the 2-meter and 440-MHz FM bands. There's a 10-key direct frequency entry keypad to allow you to drop in your favorite repeaters. Plus, there are independently programmed repeater shifts for the repeater subbands on 10, 6, and 2 meters and 70 centimeters. The automatic repeater shift built into this rig may help the beginning operator figure out what's plus and what's minus on 2 meters and 440 MHz. Plus, the 847 has a built-in encoder *and decoder* for both CTCSS and, catch this, DCS (Digital Coded Squelch). And, to make sure you're absolutely on frequency, the S-meter can also double as a center-reading discriminator meter showing frequency excursions of as little as 100 Hz. (Using the discriminator meter can help you develop "signatures" for stations operating on the input of a repeater as you "listen down" to the input with the single push of a button and see exactly *who* they are by *where* they are actually transmitting. Few stations are absolutely dead-on in frequency, and you'd be surprised how easy it is to identify a station by looking at the discriminator meter and seeing whether they are slightly high or slightly low of the center frequency.)

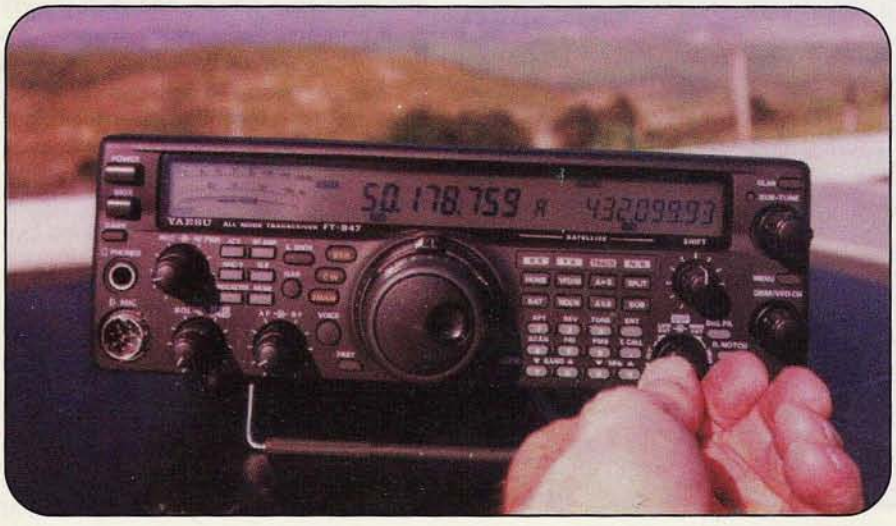


Photo E. The DSP (digital signal processing) filters improve signals on VHF at least as much as on HF. On 6 meters, DSP adjustments pulled in some 3,000-mile DX! (WB6NOA photo).

"Operating through repeaters on 2-meter and 70-centimeter FM was a delight—and again, I didn't even need to crack the instruction manual. That was good because...I didn't have one!"

Operating through repeaters on 2-meter and 70-centimeter FM was a delight—and again, I didn't even need to crack the instruction manual. That was good because, as you'll recall, I didn't have one!

Another on-air comment came from Brad Thomas, KC6AUY, with the A.L.E.R.T. Radio Club, who noted that, with its ability to be computer-controlled (see Photo B), the right controller and software should make the 847 into a nice cross-band remote base unit. I wonder who'll be the first to do *this* with the 847?

This 'n That

Let's see now, what are some of the other things we tested when up on the hill? Ten meters was coming in quite well, and, while listening to some South Americans rolling in on 28.500, we could hear a nearby radio operator getting all tuned up with that annoying steady carrier. But a single push of the DSP auto notch filter completely eliminated him—one second, the carrier is blasting your eardrums, and the next second, the carrier gets DSPed away and you're now listening in on the intended signal. I love the capabilities of DSP and all it can do on the VHF and UHF bands. Those of us who also operate HF may already know what it can do down on high frequency, but you've *gotta* listen on VHF and UHF with DSP turned on.

The radio is loud (if you want it to be), with about 1.5 watts of audio on the built-in speaker. But adding an external speaker really lets you go "hi-fi" with the DSP turned on.

In FM, we tuned around the public service bands from 150 to 160 MHz, and from 450 to 470 MHz. Lots of neat stuff up there; and, as long as you're not listening to telephone calls or remote broadcast pickup, you're within the scanning rules. I also tuned just below the 6-meter band, and—my oh my—all the things that you can hear down there from unat-

tended baby monitors around 46 MHz. But don't tune into cordless phones at 49 MHz; that's taboo.

If you're into flying, the radio automatically goes into AM on the aeronautical frequencies; and if you're into boating, you can easily tune into the 156-MHz marine VHF band. And if the FBI is your thing, you'll find lots of neat stuff around 167 and 420 MHz.

On the Inside

When I looked inside the unit, I couldn't find the built-in antenna tuner. That's because it doesn't have one. No room. That's an outboard option—the FC-20. But the unit is VSWR protected; and, like a good ham, you should resolve high VSWR up at the antenna, rather than masking it by clicking on a built-in tuner. I couldn't find a built-in SWR meter, but you can roughly judge SWR by looking at the power output indicated on the LCD display. If it's putting out its full-rated power (say, 100 watts on 6 meters), then your SWR is flat or nearly so. But if you're only putting out 50 watts, your SWR is above 2:1. If the power output is barely showing as you scream into the microphone, chances are you have the wrong antenna (or no antenna) hooked up to the jack! Best bet—use an outboard SWR meter.

Radio Roast?

I understand that at one recent hamfest, someone accidentally wired up the radio backwards. Better yet, they did it without a fuse (I always say, if you're going to try to roast a radio, why stick a fuse in series?). Reports have it that they smoked the front panel on/off switch, and blew a couple of regulators, and that was it. I'm told that the radio was specifically designed for such a catastrophic event, and had there been a fuse in place, there would have been no damage. But even without the fuse, the damage was confined to some easily replaceable power supply components. It's good to know design engineers preplan when hams may get things backwards and go without fuses.

OK...How Much?

Now for the $64,000 question: *how much*? No, it won't be $64,000! The list price for the FT-847 is $2,399, but the "street price" is very likely to be under $2,000. Not many options are available for this equipment because almost everything is built in. Sure, you can add a desk-style microphone, or a mobile mic with a keypad on it, or maybe the voice synthesizer unit, or a selection of tighter CW filters. The mobile mounting bracket *is* extra, but things like the encode/decode board, DCS, digital signal processing, and the VHF/UHF bands are all included.

Oh Yes, HF

Just before we were ready to pull the plug, Janet reminded us to test out the equipment on HF. In our excitement about getting onto VHF and UHF, we almost forgot about the "DC bands." Yes, the FT-847 does a fantastic job on HF, too. But we'll leave it to the HF-oriented magazines to go into detail on HF performance.

For VHF and UHF, sit down in front of one of these rigs at your local ham radio store and listen for yourself. With DSP, it's truly a step up in performance over all of the other rigs you may have listened to before. And for Technician operators, the 6-meter band with 100 watts output is so full of excitement, you could literally work the world as we continue up solar cycle 23.

The Yaesu FT-847—what a rig! ■

Resources

For more information on the FT-847, contact Yaesu USA, 17210 Edwards Rd., Cerritos, CA 90703; Phone: (562) 404-2700; Internet: <http://www.yaesu.com>; or your favorite Yaesu dealer.

Additional information on the antennas mentioned in this article is available from the following:

The Maspro 2-meter Yagi is distributed by DNL Antenna Supply, Div. of Power Source Products, 3410 Gibbs Rd., Kansas City, KS 66106. Phone: (913) 677-4766; Internet: <http://www.wavehunter.com>

Outbacker Antennas are distributed by Alpha Delta Communications, P.O. Box 620, Manchester, KY 40962; Phone: (606) 598-2029; Fax: (606) 598-4413.

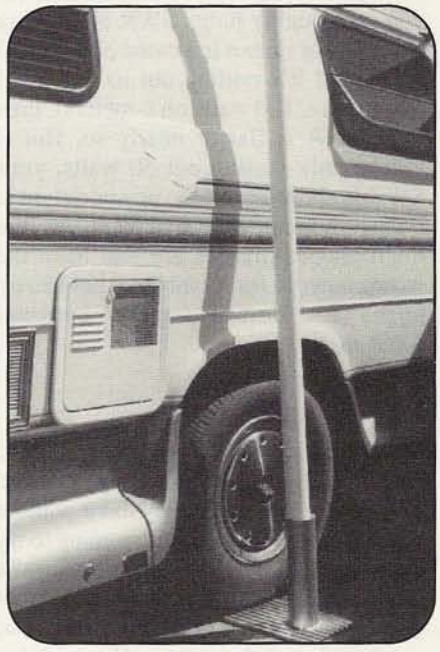
Need a Portable Mast? Try a Telescoping Flagpole!

Gordon's field test of the new Yaesu FT-847 also gave him the chance to try out something else—making an antenna mast from a telescoping flagpole designed for mobile use!

By Gordon West, WB6NOA*

It's June. Flag Day is on the 14th. But for many active hams, June means portable contest operating, whether for the ARRL VHF Contest or for Field Day. Setting up antenna supports for such temporary installations is a perennial challenge for the mobile VHFer, and I wanted to share one approach that's easy, durable and relatively inexpensive—especially after I used the same setup at a recent amateur radio demonstration in front of Fry's Electronics. Most of the hams who attended were more interested in the antenna support than in the radio equipment inside my comm van. So here's the information:

Your vehicle provides the base support for the Sunsetter telescoping flagpole/mast. You simply drive onto the grooved aluminum wheel stand and set the parking brake.



Here's the collapsed flagpole/mast anchored in the wheel plate, ready to be telescoped upward. The collapsed length is 90 inches.

She's a Grand Old Flag(pole)

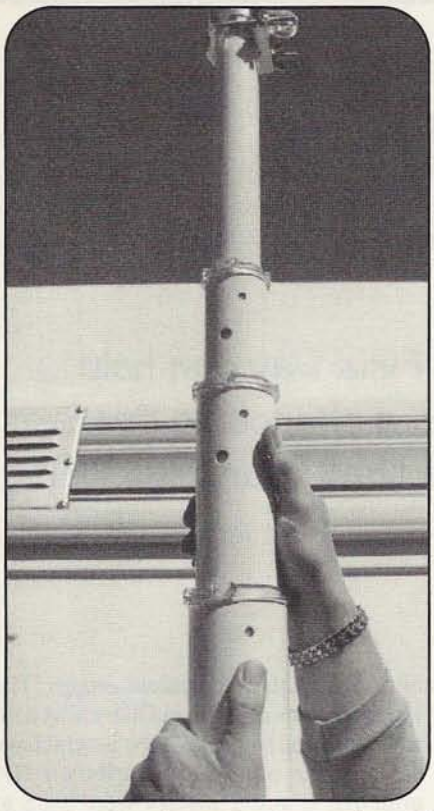
The lightweight Maspro Yagi antenna used in field-testing the Yaesu FT-847 (see review elsewhere in this issue) was held up by a collapsible flagpole designed for recreational vehicles (RVs). The flagpole is manufactured by SunSetter (see "Resources"), and I bought mine from National Awning & Flagpoles (although other distributors may sell them as well). It extends up to three times its original height—from 90 inches (7-1/2 feet) collapsed to 20 feet, fully extended—in under 10 seconds (there's also a 16-foot model).

The company installed plastic runners on the inside of the tubes, allowing for smooth, low-friction action as the flagpole is slid up or down. The runners also keep the flagpole sections in line with each other, so there's no need to twist or search for locking holes. There's also a child-resistant lockable collar to prevent accidental unlocking of the telescoping sections. The whole thing is held up by a lightweight aluminum wheel stand which has grooves on the top side to keep the stand firmly in place—right under your tire (see photos)! There's also an optional ground sleeve that would let you place the flagpole in your back yard, anchored to the ground, plus a deck mount and even a dock mount, for boaters.

Strong and Stout

The flagpole I used as my antenna support is high-tensile, 16-gauge aluminum that is painted white. It's also available in silver or anodized gold. Best of all, the flagpole is stout enough to resist major swaying in the wind. This was one of my concerns, especially for hilltop operat-

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



Extending the telescoping elements is quick and easy, thanks to plastic runners on the inside of the tubes that help them move smoothly and keep everything lined up properly. Typically, it takes only 10 seconds to extend the pole to its full height.

How Much?

20-foot flagpole	$ 239
White or bronze finish	+ 30
Wheel stand with PVC insert	+ 59
Shipping & handling	+ 15
Double flag harness	**
Ground sleeve receiver	**
3' x 5' nylon USA flag	**
3" gold ball (maybe a corona ball?)	**
** No additional charge	
Total:	$ 343

For ordering information, see the "Resources" box.

ing, since hilltops tend to be windy. This is also why I chose the lightweight Maspro 2-meter Yagi antenna, as opposed to heavier long boomers. While these bigger antennas would probably have given me a dramatic increase in signal strength, they no doubt would sway in the wind. The flagpole company doesn't specify a maximum weight aloft, but does say that a pair of 4 x 6-foot nylon flags can be flown without overstressing the tubes. The company also has replacement tubes available in case of a catastrophic failure due to high winds. I've used the flagpole-mast several times since reviewing the FT-847, and it continues to be an excellent performer, even out on windy mountaintops.

As I mentioned earlier, I ordered my flagpole/mast from National Awning & Flagpoles. They shipped my pole out within weeks, and even followed up with a phone call wanting more information about how ham radio operators could benefit from this smooth-action, telescoping flagpole with rigid standing characteristics. I told them it worked out better than planned!

For a basic rundown of what I paid for my SunSetter collapsible flagpole/mast with grooved aluminum wheel stand, see "How Much." The price also included a five-year warranty. ■

Resources

For more information or to order Sunsetter flagpoles, contact National Awning & Flagpole, 14643 Hunter's Way, South Beloit, IL 61080; or call (888) 999-6347, enter PIN #1971 and ask for Gary.

The Maspro 2-meter Yagi is distributed by DNL Antenna Supply, Div. Of Power Source Products, 3410 Gibbs Rd., Kansas City, KS 66106. Phone: (913) 677-4766; Internet: <http://www.wavehunter.com>

Add a small antenna, such as this Maspro 2-meter Yagi, and you're on the air with a 20-foot mast from any place you can reach by car.

Operating Field Day? Don't Forget VHF!

Despite recent rules changes, a VHF station at Field Day can help your club rack up extra points and gives all hams a chance to operate, regardless of license class. And the best part is that your first VHF station is "free"!

By Ken Neubeck, WB2AMU*

Field Day is one of the biggest amateur radio operating events of the year, giving hams get a chance to set up portable stations under emergency conditions, operate in a competitive atmosphere, promote ham radio to the public, and generally have a good time on a summer weekend. While many clubs have a VHF station on the air throughout the year, VHF is often overlooked as part of a Field Day station. This is a poor strategic choice for two reasons: 1) hams without HF privileges may feel left out in an HF-only setup; and 2) Field Day rules make it more favorable for clubs to run a VHF station.

A "Free" Station

The current Field Day rules allow a club's VHF station to operate during the contest period without being charged as a separate transmitter. That means the transmitter count is the number of HF transmitters that are operated simultaneously. In addition, there's a 100-point bonus for making an ATV contact. Other VHF bonuses, such as those for making 10 contacts on VHF, or making just one packet contact, have been dropped as of this year (see "New Field Day Rules Affect VHF/UHF Operation"), but even so, it makes sense for clubs to set up a decent VHF station for Field Day.

While some clubs have the means to go all out on all bands and all modes, clubs with more limited resources will want to set up a station for 6 and 2 meters as a minimum. All-mode radios such as the Yaesu FT-290 and FT-690 series, are desirable since all modes are common during Field Day, although SSB weak-signal is the most popular mode used.

Horton's Point Lighthouse in Southold, Long Island (New York), site of the Peconic Amateur Radio Club's Field Day efforts in both 1995 and 1997. The lighthouse proved to be a good anchor for several of the HF dipoles. (Photos by the author)

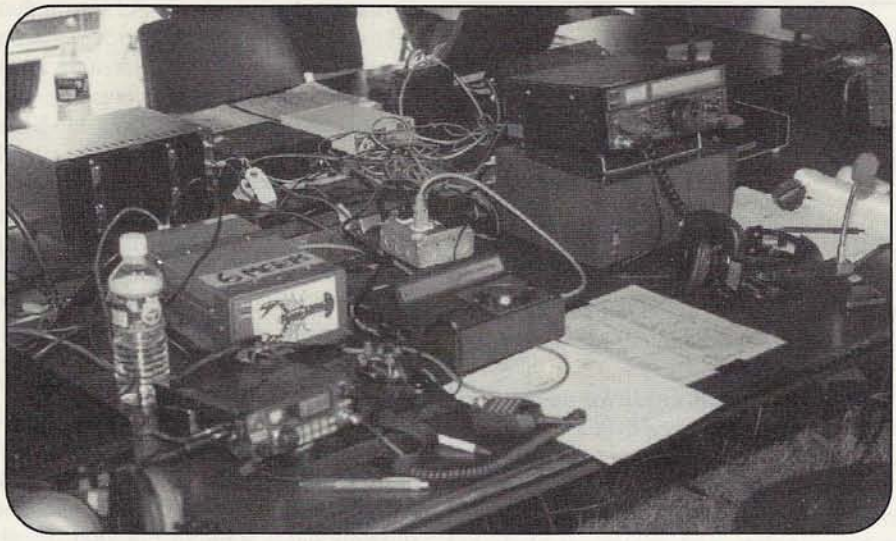
I have over two decades of Field Day experience, both with organized radio clubs and with independent groups. The latter includes a two-man QRP effort with my friend Joe Nehm, W1JN, in which we ran 5 watts or less, primarily on HF, although 6 and 2 meters were used to make contacts when stations were heard on those bands. But, generally, up to the early 1990s, there never seemed to be a lot of VHF activity.

When the Field Day rules were changed to allow a "free" VHF station (not counting as a separate transmitter), however, activity increased tremendously to where clubs today *must* have a VHF station in order to maximize their efforts. Plus, the recent upsurge in popularity of 6-meter operating means it's easier than ever to make a meaningful number of VHF contacts. A good example of how popular this band has become during Field Day is what happened to me during Field Day 1994.

A Hot Weekend on Six

During this particular Field Day, there were several sporadic-*E* cloud formations during the first four hours of the contest. (*For those of you who aren't familiar with sporadic-*E, *it's a type of propagation, or signal enhancement, caused by "clouds" of ionized particles in the* E*-layer of the ionosphere that refract radio waves over considerable distances. The summer months are the peak time for sporadic-*E *propagation in the Northern Hemisphere.—ed.*) There were formations that allowed stations on the east coast to work into the Midwest and the west coast. But the biggest sur-

Ken Neubeck, WB2AMU, is a Contributing Editor of CQ VHF.



This was the VHF setup at the Peconic ARC's Field Day station. On the left is the 6-meter station with the Yaesu FT-690 all-mode radio (in the foreground) as the basic rig. On the right is the ICOM IC-820H that was used for 2-meter SSB. Note that both stations are equipped with headphones, essential when you have multiple stations in close proximity!

prise of all was the tremendous band opening between Florida and Western and Central Europe! A number of stations not participating in Field Day were cleaning up while Jordan, WB2QLP, operating at W4FA, reported that the QRM was so heavy that many people walking by thought that they were listening to 20 meters instead of six! Eventually, stations in the northeastern U.S. could also work a few of the Europeans. (*It should be noted that DX contacts have no multiplier value during Field Day, which is designed as a domestic U.S.-Canada event.—ed.*)

Prior to 1995, my Field Day participation had been limited to HF work. But after I gave a talk on 6 meters to the Peconic Amateur Radio Club (situated in the North Fork of Long Island) in early 1995, the club invited me to set up a 6-meter station for their upcoming Field Day effort that would be held at Horton's Point lighthouse in Southold, New York, on the bluffs overlooking Long Island Sound. Other hams in the club would set

Close-up of the Peconic ARC 6-meter Field Day station. The FT-690 puts out 10 watts and is fed into a Mirage linear amplifier (left) for 150 watts output. Most 6-meter contacts were on SSB with some on CW and FM as well.

"But the biggest surprise of all was the tremendous band opening between Florida and Western and Central Europe!...Jordan, WB2QLP, operating at W4FA, reported that the QRM was so heavy that many people walking by thought that they were listening to 20 meters instead of six!"

up 2-meter and 70-centimeter (440 MHz) stations. The location was ideal for VHF, as it would reasonably easy to work into New England on the VHF bands due to the decent takeoff angle of the location. It was going to be interesting to see what we could work on VHF for Field Day.

The Basic VHF FD Station

For the 6-meter station, I set up a two-element Yagi on 20 feet worth of five-foot section poles that were carefully guyed by rope. I prefer two-element beams, as stations off to the side can be worked even when I'm not pointed directly at them. (Plus, two-element beams are especially convenient when I don't have an electric rotator, meaning I have to use the "armstrong" method; that is, using my "strong arm" to turn the antenna). However, many stations use three- and five-element beams for 6 meters with electric rotators with very good results. For 2 meters and 440, multi-element Yagi antennas of five elements or more yield the best results.

Often, I hear of Field Day groups that use non-directional antennas, such as verticals or halos, for six and two instead of using a directional antenna of some sort. While you won't miss stations "off to the side," this can actually make it more difficult for the operator to make contacts, particularly if there is little skip activity and most of the contacts have to be made via groundwave. This can be very frustrating for new VHF operators who can get the wrong impression that you cannot make that many contacts via VHF. I've seen many a 6-meter Field Day station with just a halo antenna up 20 feet. While a halo is good for mobile work since it's horizontally polarized, it's omni-directional which makes it less than desirable for Field Day work in general. My feel-

New Field Day Rules Affect VHF/UHF Operation

The following is the text of a recent ARRL bulletin outlining the VHF-related changes in the Field Day rules, effective with this year's event (with some key points highlighted by us in *italics*). For the complete Field Day rules, see the May, 1998, issue of *QST:*

ARLB019 Major changes in Field Day rules

Some new rules go into effect this year for Field Day. The popular summertime operating event takes place each year on the fourth full weekend in June. This year, it will be June 27–28.

A major change this year is the elimination of bonus-point credit for packet and VHF/UHF contacts. Field Day stations no longer will be allowed to count contacts via digipeaters, packet nodes, or similar arrangements. Class 2A and higher Field Day stations still may operate a "free" transmitter exclusively for VHF or UHF operation (i.e., above 50 MHz) without changing their basic entry classification, but not for bonus points. "It's better than bonus points, and groups are likely to spend more time on VHF and UHF because of that," predicted ARRL Membership Services Manager Chuck Hutchinson, K8CH. As in the past, crossband and repeater contacts other than via satellite do not count for Field Day credit.

Field Day stations now can earn point credit for digital (i.e., non-CW) contacts on each band. The phone, CW, and non-CW digital segments are considered separate "bands" in the Field Day rules. This means, for example, that you now may work the same station for point credit on 40 meters three times: once on SSB, once on CW, and once on RTTY, packet, or one of the 'TOR modes. SSB contacts count one point, and CW and non-CW digital contacts count 2 points apiece, so adding non-CW digital capability presents a real opportunity to rack up substantial additional points. "We're expecting an interesting year because of the digital modes," Hutchinson said.

The complete, official Field Day rules will appear in the May edition of *QST*. Basic Field Day rules have remained unchanged for several years now. The new rules undoubtedly will generate a flurry of computerized contest logging program revisions as developers scramble to incorporate the changes into their software.

ing is that, if a club has a reasonable amount of resources and is planning a decent effort, it should be able to scour up a directional antenna of some sort for the VHF station.

Feedline Considerations

Another important thing to remember is the type and length of the feedline that's used for the VHF station. The thicker type coax (RG-8U and better) or hardline coax should be used if possible. The length should be no more than what is required to get from the antenna feed directly to the station. Using too long a piece of coax will result in significant signal loss and this can be especially critical for frequencies at 440 and above.

These days, there are many decent VHF radios, as well as amplifiers, from which to choose. A 100-watt station with a directional antenna will do very well even if there are no enhanced conditions. My preferred setup for 6 meters is to use the Yaesu FT-690 all-band rig feeding 10 watts into a Mirage A1015 linear amplifier that puts out 150 watts. I use a Ham Station 7-amp battery supply for the FT-690 and a separate 20-amp supply for the amplifier. The battery supply has proven useful during an occasional generator outage, as I was still able to make contacts running 10 watts. Power levels of 25 to 100 watts are desirable for decent success on 2 meters and 440.

A Learning Experience

Field Day is a good opportunity for hams to see—in action—bands and modes that they normally don't use. For example, I had the opportunity to see an ATV contact between New York and Connecticut made on 432 by the Peconic Amateur Radio Club during the last Field Day. It was a mode to which I had not previously been exposed and Field Day was an excellent setting to see ATV in action. Likewise, VHF operators can see what HF conditions are like by listening to the other stations and vice versa. The vice versa is very important! Many HF hams still have the misconception that VHF bands are only good for local contacts. Besides the possibility of some interesting surprises, like the European opening mentioned previously, a decent sporadic-*E* opening on six can bring in many contacts from all over the U.S. and Canada.

A great example of this occurred during my first effort with the Peconic ARC in 1995. I made 90 contacts on 6 meters via groundwave and another 35 via sporadic-*E* propagation. My biggest thrill was pulling out my headphones and showing hams some of the loud signals that were coming in from the Midwest via sporadic-*E*. It was an enlightening experience for many of the previously HF-only hams!

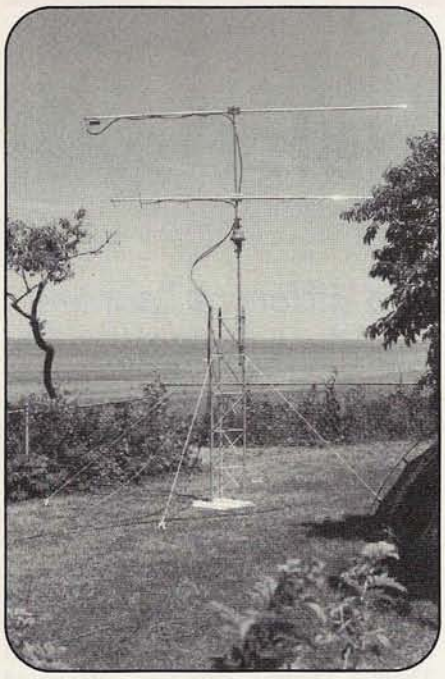
A VHF station can also help the HF efforts, if the VHF operator acts as a scout for the HF crew. For example, if there is a decent sporadic-*E* opening on 6 meters, then 10 meters will be open as well. Often, 10 meters is not a dedicated transmitter for a small Field Day group and it is shared with 15 and 20 meters with one operator/transmitter combination.

The converse is also true: if close-in stations are being worked on 10 meters, this can be a tip-off to the VHF station to listen carefully on six for the first sign of a developing opening. Often, marginal openings only a few minutes long may show up on six and it's good to get advance notice of a potential opening.

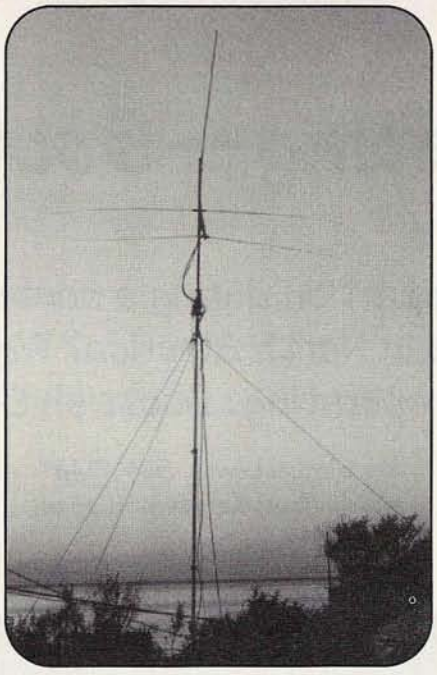
Choosing a VHF-Friendly Site

If your club or Field Day group has a few possibilities for Field Day sites and a VHF station will be used, site selection can be very important. Height, of course, is very important and the highest location

"I've seen many a 6-meter Field Day station with just a halo antenna up 20 feet. While a halo is good for mobile work since it is horizontally polarized, it is omni-directional which makes it less than desirable for Field Day work in general."



These are the 2-meter and 70-centimeter multi-element arrays with Long Island Sound in the background. Connecticut and Rhode Island were within reasonable reach of all of the VHF stations.



Silhouettes against the sunset of the two-element Yagi used on 6 meters, along with a 2-meter vertical (used for packet) that was mounted on top of the Yagi.

is generally the most desirable. However, another thing to consider—particularly regarding VHF—is whether there are other Field Day groups operating nearby, say, within a 100-mile radius. If there are no enhanced conditions such as sporadic-*E* on six or tropo on 2 meters or 440, the VHF station can be pretty quiet throughout the Field Day contest.

With the Peconic ARC Field Day effort, we had the advantage of high ground, and even though we were on the far end of Long Island, we were still in reasonable striking distance of stations in the metropolitan New York and Connecticut area. A Field Day effort in wide open areas away from population centers, such as a state like Montana and Wyoming, may not have that many stations to work via groundwave. Thus the VHF station may be relegated to a mode where it's more of a standby station with the 6-meter receiver on, just in case of sporadic-*E* opening occurring.

Image Building

It's interesting to note that bonus points are given to a Field Day group that sets up in a public place, as well as publicizing the event in local newspapers. Particularly VHF stations, it's a good opportunity to show the public that a modest setup with decent antennas can be set up during an emergency with only moderate effort. In addition to demonstrating the VHF station to the public, the station can be demonstrated to hams who primarily operate in the HF range. As I mentioned previously, many hams are ignorant of the tremendous capabilities of 6 meters, not only for long-range skip contacts but also for groundwave contacts covering hundreds of miles. Likewise, when good tropo conditions are present, long-range contacts are equally possible on 2 meters and 70 centimeters, especially on SSB.

"Field Day is a good opportunity for hams to see—in action—bands and modes that they normally don't use. For example, I had the opportunity to see an ATV contact between New York and Connecticut made on 432...a mode to which I had not previously been exposed...."

So whether you are participating in a club setup or an independent group Field Day effort, make sure you have something on the air on VHF! ■

Rover Operating—Scottish Style!

Ever wonder if "Rover" operation during a contest is different "across the pond" than it is here in North America? Well, here's a glimpse across the sea at rover operating...Scottish Style.

By Simon Lewis, GM4PLM*
slewis@pacsat.demon.co.uk

Editor's Note: From Simon's description in the following article, it would appear that "rover" operating in Europe more closely resembles "portable" operating here in the States, as the experiences he describes all involve operating an entire contest from a single remote location. "Rovers" in the U.S. move among different grid squares during the course of one contest. For more on portable operating in the U.S., see this month's "Weak Signal News" column.

I receive *CQ VHF*, which I read with great interest. I thoroughly enjoy reading about your rover exploits around the U.S. and thought *CQ VHF* readers might like to see how we operate rover, "Scottish Style"!

Welcome to Scotland!

Scotland is a beautiful country and I can thoroughly recommend that if you get the chance, pay a visit, you won't regret it! I live in a small town called Helensburgh on the west coast of Scotland, about 30 miles north of Glasgow, out on the River Clyde estuary. Helensburgh is not a particularly fantastic VHF location, as it is surrounded by the hills that have been created over the centuries as the Clyde cut through the landscape. The great thing about Helensburgh is that it is close to some large mountains and they are all within a few hours easy drive, perfect for roving!

The author erecting the 27-foot telescopic mast used to hold microwave and VHF antennas during rover operating, this time at the summit of Cairnsmore of Fleet (2,700 feet above sea level) in Dumfries and Galloway, Southern Scotland.

When I say mountains, they are nothing like the monsters you have in the U.S.! The highest peak in the UK, Ben Nevis, is in Northern Scotland and tops at 4406 feet. Scottish mountains over 3,000 feet are called *Munroes*, after Sir Hugh Thomas Munroe, who first catalogued them in 1891. Scottish mountains are well-trodden and usually have some paths up them, but very rarely will they have roads to the summit. This does lead to some problems with access, but most hams do not head for the dizzy heights and settle for lower areas with good, clear horizons, finding them much easier to find and operate from, as they usually have nice tourist carparks (parking lots) and viewpoints!

Not that all good sites need to be high! Mark Hughes, GM4ISM, another local microwaver, made some good narrowband QSOs out to nearly 1,000 kilometers (620 miles) last year from an almost sea-level position on Scotland's east coast, at a place called Stonehaven (see "The North Sea Duct" for a closer look).

Up Lowther Hill

Although most sites do not have vehicle access, there are a few with good roads up them and one in particular springs to mind. Lowther Hill is located 50 miles south of Glasgow and is one of the highest peaks in the Southern Lowlands. What makes Lowther particularly interesting is that it is owned by the Civil Aviation Authority, the UK version of the U.S. Federal Aviation Administration (FAA). A number of 24-centimeter radar stations operate from the site, but as long as you don't want to operate 24-centimeter SSB/CW, then the site is good. One of the engineers is an amateur and lets a few of the local microwavers use the site for contests and activity periods.

Simon Lewis, GM4PLM, is Editor of The European Microwave News *and a frequent contributor to CQ VHF. He lives in Helensburgh, Scotland, and can also be found on the World Wide Web at <http://www.pacsat.demon.co.uk>.*

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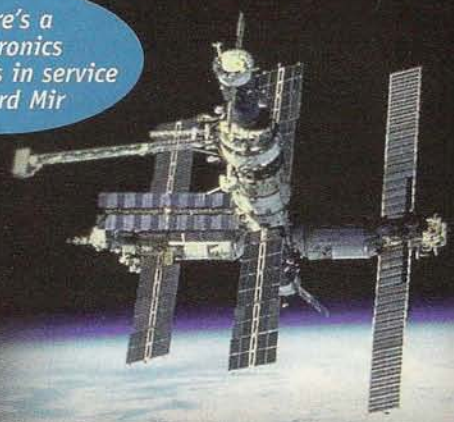
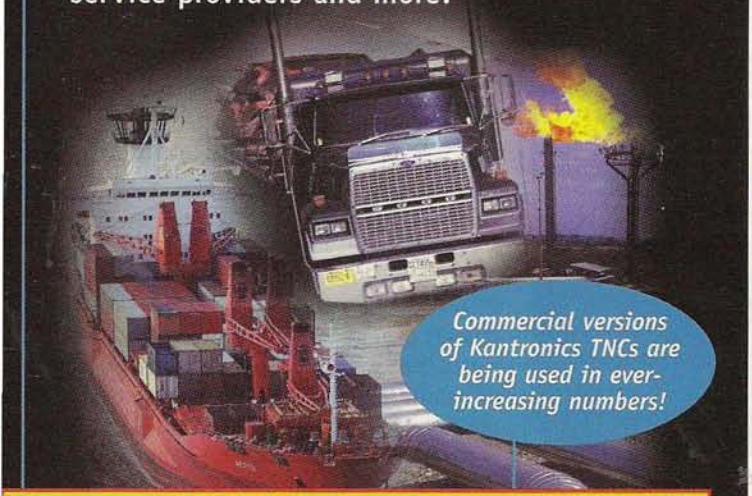
There's a Kantronics 9612 Plus in service aboard Mir



There's a world of digital communications fun and adventure that *only hams can enjoy* and Kantronics makes it possible for you to explore it. No matter if you call our products TNCs, wireless modems or digital controllers, the "Outernet™" offers a world of adventure, including satellite communications, APRS®, DX spotting, BBS operations, WEFAX, EMWIN, TCP/IP links, remote control and sensing, telemetry, HF e-mail with ham gateways or commercial service providers and more!



Commercial versions of Kantronics TNCs are being used in ever-increasing numbers!

Kantronics offers a number of ways to enjoy the growing field of digital communications. Choose the unit that suits your interests and budget. All Kantronics units come with a one-year limited warranty and can be upgraded when firmware updates become available.

KPC-3 Plus

8.2 Firmware now with Advanced GPS/APRS UI digipeating available for all 4 models!

- 1200 bps - Now with more features!
- Packet, GPS/APRS, Host, KISS and WEFAX modes, use with EMWIN
- Personal Mailbox (PBBS) now supports multiple calls
- Remote access, sensing and control with two A/D and two control lines
- PBBS 100k, expandable with optional 512k RAM
- Uses external power or internal 9v battery
- NEWUSER mode and online help

KPC-9612 Plus

Optional 1200 or 9600 third port expansion boards now available

- 1200 port AND second port of 4800 ~ 38,400 bps
- Most modes/capabilities of the KPC-3 Plus and POCSAG (paging)
- Unique design allows the addition of *another port, high or low speed*
- Remote access, sensing and control capability
- Telemetry transmission capability

KAM '98

New!

- **Single Port** multimode TNC for HF or VHF use
- All the modes of KAM Plus with addition of A/D inputs/TTL outputs
- HC11 for more processing power to accommodate future upgrades
- Wider range of speeds; use 1200bps packet on 10 meters

KAM Plus

- Dual port VHF/HF (1200/<=300 bps) multimode TNC
- Packet, GPS/APRS, Host, KISS, WEFAX, CW, RTTY, AMTOR, PACTOR, G-TOR™, TOR, and Free Signal Detection for HF e-mail
- 100k personal mailbox standard, expandable with optional 512k RAM
- Remote access capability
- NEWUSER mode and online help

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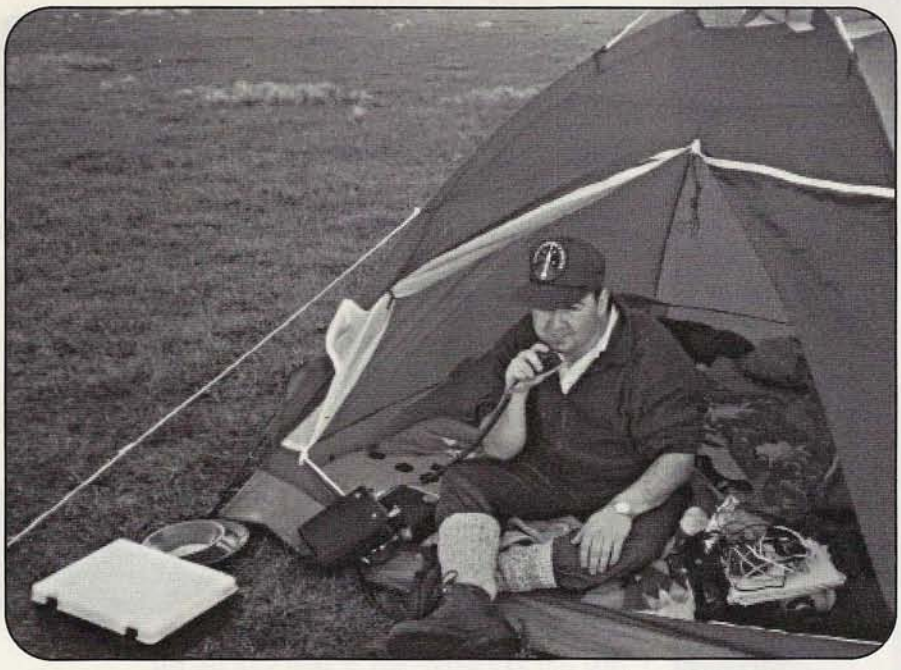
web: www.kantronics.com



GM4PLM says he occasionally uses a lightweight backpacker's tent for shelter. June in Southern Scotland can be wet above 1,000 feet!

Our first visit last June coincided with some particularly vicious summer low pressure weather systems, and we were greeted by the sight of Lowther's summit in the clouds and strong winds and rain. We arrived during the evening prior to the contest and had been told to wait until next morning, when the engineers would arrive and open the gates to the road which winds its way to the summit. We camped at the base of the mountain in our trusty caravan (a UK version of a trailer) and waited for the engineers to open the gate next morning.

The next morning arrived, but, by 0900, the engineers had still not arrived and we were starting to panic! I tried to find a telephone in the small village to see if we could contact the engineers, fearing they had forgotten us! I couldn't reach Mark, GM4ISM, who knew the ham-engineer, as he had been called away by his work to deal with system faults caused by the weather! Disaster!

The author's "caravan," the UK version of a trailer. This time, he was out rovering from the most westerly point in Scotland, the Mull of Galloway. It was a very stormy day with excellent rainscatter on 10 GHz (note the heavy thunderclouds).

As I made my way back to the site, Lyn, my XYL (licensed as 2M1EJK), came to find me in the car. Apparently, a leather-clad biker had opened the gate, waved at her, and roared off up the hill! Not a word was spoken! So, with caravan in tow, we drove up to the summit. The weather at the top was much worse than the bottom! The wind was buffeting the car and caravan all over the place and I was seriously worried about it staying upright. We drove to the far end of the site, well away from the radar golf balls, and parked the caravan in the lee of a site building. That was much better! The generator was flashed up and we unpacked the gear and set up the dishes and talkback antennas.

We made some good QSOs from the site and we did have a good day out, apart from a switching anomaly that took out my 10-GHz preamp! One thing that did puzzle us while we were on site was the large motorway-style crash barrier around the car park. We found out why it was there when looking over the other side of it! A gap in the clouds wandered past at foot level and we could suddenly see a couple of thousand feet down! I have never seen a group of amateurs move so quickly!

The Rhinns of Kells

Not that the weather is always bad! A recent DXpedition was made to a range of mountains in the Southern Uplands called the Rhinns of Kells, and, in particular, to a large mountain called Cairnsmore of Fleet. Cairnsmore is one of the highest peaks in the Southern Uplands, with a summit 2,400 feet above sea level, but what makes it so interesting as a VHF site is its fantastic view of the lower ground to the south, all the way into England.

We decided to investigate the site before attempting to bring microwave gear up the mountain, as it has no road and requires all equipment be brought in by foot. As this was our first time at Cairnsmore, we decided to operate during a 2-meter portable contest run by one of our national magazines, *Practical Wireless*. The contest is a QRP (low power) event and has a power limit of 3 watts. So, with the trusty FT-290MKII onboard, and a small 7-metre portable mast, we trudged up the mountain.

The weather had been very sticky that day, with some very heavy showers, but had improved by the time we arrived on site. The climb up to the summit was slow

The North Sea Duct

GM4ISM's microwave QSOs from Scotland into Europe across the North Sea are due to something called the North Sea Duct. The cold water in the North Sea forms excellent sea-surface ducts during periods of hot, still weather—leading to the availability of some very good paths into Europe. This anomaly is well-documented and can affect microwave link paths to offshore oil installations and even low-angle satellite links! These sea surface ducts, just a few metres deep, can be so intense that they can act like metal reflectors and give beam headings completely different from those expected. Plus, they can scatter signals as well.

Mark also noticed that many stations he worked did not have any sharp peak when pointing the dish at them, but had much wider and less well defined signals, another anomaly we need to learn more about. The sea-surface ducting in the North Sea has also been used on the higher bands, and a recent near-world-record 24-GHz QSO was made between Petra Suckling, G4KGC, and Ari, PAØEZ, across the same North Sea path.

Again this QSO revealed a great deal about what we *do not* know about microwave propagation! Petra's QTH is some way inland and there were doubts that ducting on 24 GHz would penetrate inland for any distance. Well, this QSO proved that it does, and leads the way to further experimentation on the bands.

and uncomfortable due to the high humidity and the high temperature, and, strangely, there was not a breath of wind. (The lack of wind almost marked the arrival of a very unwelcome visitor, the dreaded Scottish midge! This small black fly is renowned for its love of fresh plump hikers and they certainly enjoyed their meal of fresh, sweaty, climbers! We had come prepared with lots of insect repellent but, alas, they didn't seem to mind this one bit!)

The mist came down and enveloped us at around 800 feet, and we couldn't see anything as we reached the small stone monument that marked the summit and the end of the climb. The monument is actually a memorial to the crews of nine aircraft that have crashed on the hill over the years, the last a USAF F4 Phantom on a training exercise in the 1970s (the area is used heavily by the military for low level training).

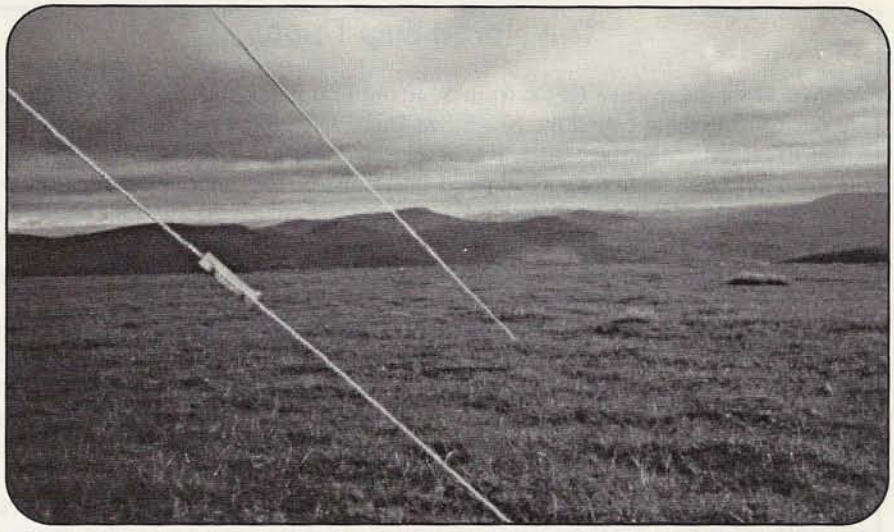
A hot meal was quickly prepared, and then work started on the mast erection and equipment testing. Once the equipment was operational, I swung the 2-meter beam to the southeast and was greeted by a loud CW identifier from the GB3VHF beacon in Kent, some 500 miles away.

Another stormy sky! Again from the summit of Cairnsmore of Fleet. Here, Simon is accompanied by his contest partner, Andy Hood, GM7GDE.

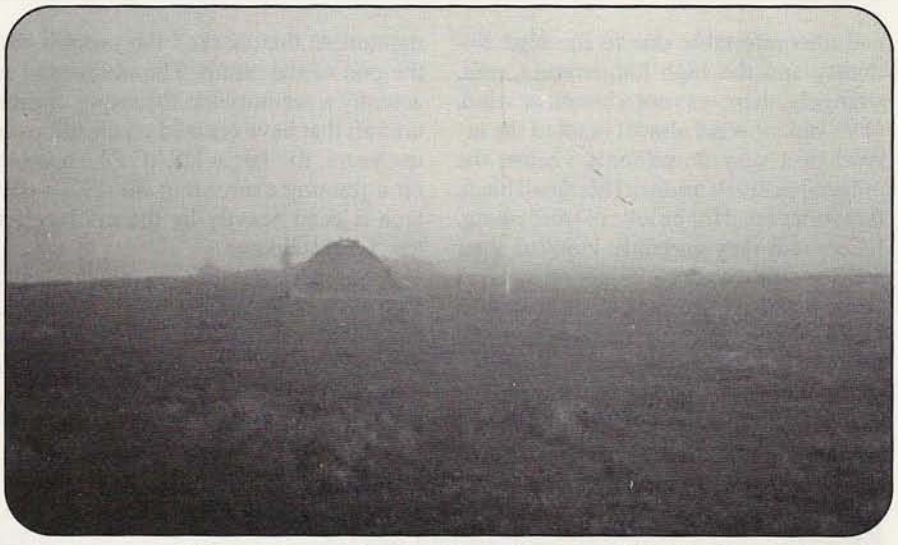
Further checks revealed GB3ANG in Aberdeen to the north and GB3MCB in Cornwall to the southwest. GB3MCW in Ireland, just a few miles across the water, was end stopping (*translation: pinning the meter—ed.*)! This was indeed a good site for microwaving! The weather was still very misty and Lyn and I relaxed in the tent listening to the calling frequency, snuggled up in our sleeping bags.

Although the time was getting on and now fast approaching 2300 hours, the sun was still high in the sky because of our height and northerly latitude. A sudden burst of brightness from outside caught our attention and we opened the flap of the tent to an amazing view of the setting sun and the horizon out to almost 100 kilometers. A perfect end to a hard day.

Next morning, the sun awoke much earlier than we did and bright clear conditions meant that it was hard to sleep much past 0600 hours! Not that it made much difference, I was awakened by the sound of Lyn racing around outside, half dressed, chasing sheep away from guy lines and the food! You see some strange sights on these hills! A group of scouts had joined us on the peak overnight and was up making breakfast as we ate ours.



There's more to rovering than just operating. Here, for example, is the beautiful view across Merrick and the Galloway hills, looking north towards Glasgow.



A foggy day at 2,000 feet. This was the view during last June's 144-MHz Practical Wireless QRP contest. You need to be good with a map and compass, and have the right equipment, to stay safe in these conditions.

Explanations of amateur radio, followed by short demonstrations, amazed our visitors who had never experienced any radio apart from the low-power, short-range UK CB service. A few of the scouts decided that they would like to try for their communications badges when they returned home and excited conversation ensued as they disappeared back off down the mountain and home. Peace reigned once more, leaving us to the sheep and the start of the contest!

The contest conditions weren't too bad, but did drop off just after lunch. Overall, some 100 QSOs were made over the six-hour duration of the contest, with 22 locators (grids) worked. Not a bad day's work. Our walk back down the mountain was very pleasant, with a warm breeze keeping our hungry midges at bay and a beautiful view across the Mull of Galloway. Our trip was very enjoyable (even without the microwave gear!) and we met many walkers interested in our activities at the summit. One walker gave us some good information on the local farmer who tends the land around the summit and we hope that we will be able to entice him into loaning us a quad motorbike to transport equipment to the site (it's amazing what a bottle of best Scottish malt whiskey can do!), and so

Sometimes the fog gives rise to some amazing views! This was sunset during the middle of June, the time was 2300, and, as you can see, the sun is still bright at a height of nearly 3,000 feet above sea level.

we should be operating microwaves from this new site shortly.

Mulling It Over

Other rover DXpeditions have followed, more recently down into the Mull of Galloway, a very nice site located conveniently on a campsite just a few feet above sea level but with a fantastic sea path down into England, an excellent site that should reveal some good sea surface ducting. Additional rover outings are planned for 1998. I am currently building transverters for 3.4 and 5.7 GHz and we should be out with these sometime this year. Some new contest and activity periods have been unveiled and should encourage more rover stations out onto the hills!

"The contest conditions weren't too bad, but did drop off just after lunch. Overall, some 100 QSOs were made over the six-hour duration of the contest, with 22 locators (grids) worked. Not a bad day's work."

Come and Visit!

If you plan a trip to Scotland, please e-mail me (or phone, write, etc.) and let me know. I am more than happy to book accommodations, find tourist information for non-radio activities, or suggest possible operating sites for visitors to the area. I also like to meet visiting amateurs and can always arrange to meet and discuss the finer points of microwaving whilst discussing the merits of our liquid exports! Enjoy your radio!

GriDXpeditions for the June VHF Contest

If you're hunting for grids, or states, or a good contest score, the teams of VHF hams who operate from "rare" locations will help you toward your goal on the weekend of June 13–14.

Once again, the biggest event of the year for the VHF weak-signal community is upon us...the ARRL June VHF QSO Party (see rules, this issue). No other weekend has as much activity from mountaintop stations in rare grids as this one. Many of us spend months preparing for the event, for the chance to be "DX" from an inactive grid, for the opportunity to compete from a huge station, for the chance to *WIN*!

This month's column is dedicated to those who go the extra mile to field the large stations from seldom-heard grids in hopes of winning. Below is a list of planned GriDXpeditions I've gathered from the Internet, by mail, by telephone, and on 2-meter and HF nets (plus some "big-gun" home stations). These hardy souls spend many hours and hundreds (if not thousands) of dollars, assembling stations that have the potential to really compete. Though not complete by any stretch of the imagination, this list is a good indicator of who you should expect to hear and from where.

Snapshot of a record-breaking performance. K7XC/R operated from a record 20-plus grids in the 1998 January VHF Sweepstakes. Here, Tim's operating partner, Ward Wheaton, WB7VVD, sets up the 10-GHz station at a stop atop Mt. Gleason, California, in DM04. Tim is preparing a full report on the record-setting trek for an upcoming issue. (K7XC photo)

Planned Contest GriDXpeditions for the 1998 ARRL June VHF QSO Party:

• N6JO (formerly AC6CM) will again be single-op QRP portable at 8,500 feet in the mountains north of Los Angeles (DM04?) on 50, 144, 432, and 1296 SSB/CW.

• N6NB plans to be at 7,000 feet in the Tehachapi Mountains DM05 on 6 through 1296.

Synchronize Your Watches!

• ND3F/Rover (/R) plans to activate FN00, FN10, FM19, FM09, FM18, FM16, FM26, and FM27. QRV (on the air) on 6 meters through .03 meters with good antennas and power. He uses the "clock method" when possible (beaming north at the top of the hour, east at 15 after, south at half-past, and west at :45), and plans to be at each site for at least two hours. Alternate plans include FM06, FM07, EM96, and EM97.

• WA6KLK (with WD6HDY and KD6LTB, and maybe a few others) is planning to be in DN12nr atop South Mountain near Jordan Valley, Oregon. QRV on 6, 2, 432, and 1296. The possibility of a rover for DN02, 03, 04, 12, 13, 14 is being discussed but have no firm details as yet.

• The N9RLA/R team will be in EM78, EM68, EM69, and EM79. No solid schedule yet, but will probably do EM78/EM68 on Saturday, then move to EM69/EM79 on Sunday.

• Ward, WB7VVD, will be in DM34 with 6, 2, 222, 423, 903, 1296, 2304, 3456, 5760, 10368, 24192, and laser. He's starting to get interested in HSMS (high-speed meteor scatter), but no firm plans yet.

• Russ, K6KLY, QRV from home in CM87 on 6 to 1296 but no 902. Contact <k6kly@gte.net> for skeds.

By Tim Marek, K7XC (K7XC@VHF.RENO.NV.US)

"These hardy souls spend many hours and hundreds (if not thousands) of dollars, assembling stations that have the potential to really compete."

• Dan, WA7TDZ, says he might go to Horsefly Mt. in CN92, depending on his school finals schedule.

• The multi-op team of W6TOI will be on Onyx Peak in DM14pe, a half-hour drive southeast of Big Bear, California. They will be QRV on 50, 144, 222, 432, and 1296 MHz.

• WB7RBJ/R and Hal, WA7EGA, are planning a little rover jaunt starting in CN99, taking a leisurely drive south along Interstate 5 to CN81/91 on Saturday. After a late breakfast Sunday, they plan on cruising north via US 97 and 395 to the four corner intersection of DN 07/08/18/17. If all works well, they should visit 24 grids. They plan to operate 6 through 1296 with reasonable power and antennas.

Hogs on Bald Knob?

• The Bald Knob DX Hogs (KB9QKL, KB9QRR, N9LAG, N9KJE, and N9QKZ), using the callsign N9LAG, will be active on 6 through 432 from atop Bald Knob Mt. in EM57. Anyone wishing to make skeds can contact them at <N9LAG @intrnet.net>.

• N2VJV/R (with KB2SGX) plans on a modest rover outing in New York, hitting from 9 to 12 grids: FN01, 02, 03, 11, 12, 13, 21, 22, 23, and possibly FN10 and 43. QRV on 2, 6, and 432. On SSB at various hilltops and FM while on the road.

• Bill N3KKM, is looking at trying at least a moderate rover schedule in eastern Kansas on 6, 2, 222, 432, and 1296. He's still working out the final details of his itinerary.

• N9JIM and N5XSA will operate multi, limited/multi or rover! CN70, 50 MHz: 150 W, six elements; 144 MHz: kilowatt, 16 elements; 432 MHz: 250 W, 42 elements; 2304 MHz: 10 W, 22 elements; 10 GHz: 200 mW, 2-foot dish; laser: 5 mW, 8x10 Fresnel/PMT antenna. They might operate mobile down to CM87 on Sunday afternoon.

• KB8QIR FM09fr, on 6, 2, and 440 FM from 2,700 feet on Coopers Rock Mt. in north-central West Virginia (13 miles east of Morgantown).

• VE7DXG will be running limited multi-Op on Saturday from CN88 with 2 and 6 meters at 4,000 feet. DXG notes that he may have misplaced some QSLs from last year. He says, "if I owe you one, let me know at <ve7dxg@seaside.net>."

Adding AM

• Dave Booth, KC6WFS, will operate rover in grids DM12, DM13, DM03, DM04, DM15, DM05, CM95, and CM94. QRV on the following bands: 6-meter SSB/FM/AM, 150 W, KB6KQ loop; 2-meter SSB/FM, 350 W, KB6KQ loop; 222 SSB/FM, 10 W, Vertical; 432 SSB/FM, 100 W, KB6KQ loop.

• Paul AA4ZZ and Roger W4MW, ex-WB4WTC, plan a limited multi-op from EM96 Boone, North Carolina. Running kWs on 50, 144, 222, and 432 MHz from their 4,700-foot mountaintop site.

• Tommy, W7RV, will be operating from Radio Mesa in DM35re near Big Black Mesa, north of Prescott, Arizona. QRV on the following bands: 6 meters, 400 W 5-over-5 M^2; 222, 150 W 7wl M^2; 432, 100 W 9wl M^2; 903, TBD; 1296, 40 W 55el F9FT; + HF liaison. He will be QRV two days before and one day after the event.

• Dick, K3MQH, plans on going to his mountaintop. K3MQH FM19hx QRV 50 MHz—Light! Significant power/antennas up to 2.3 GHz.

• The W4IY Contest Group will return to FM08 as Multi Unlimited.

• Chuck Smallhouse, WA6MGZ, not exactly a mountaintop or portable operation, but QRV from his new home on Oracle Ridge at 5,000 feet in DM42oo; 6 meters through 1296 with stacked arrays and power on all bands.

Pirates on this Knob!

• K8GP, the Grid Pirates, will be operating from FM08fq atop 4,863-foot Spruce Knob, the highest point in West Virginia. Hopefully all bands from 6 meters through 10 GHz SSB/CW.

• Tracy Lane, KC5RBQ/7, will be in CN88 atop Mt. Erie on Fidalgo Island up in northwestern Washington State on 6-meter CW/SSB plus 6, 2, 220 and 440 FM simplex.

• Dave, N3XUD/R, plans to rove FM19, FN10, FN00, and FN01, starting in FN20. QRV 144 SSB, 223.5 FM and 6 meters. It will be a QRP operation as he has no amps. KA3LJL might join him. For more info, contact him at <n3xud @gte.net>.

• Jim, K7ND—not a rare grid but K7VHF will be on 6 meters through 10 GHz from CN87 atop Crag Mt., 4,000 feet high in the northeastern corner of the Olympic Peninsula, Washington.

HSMS Rocks!

• Phil, NØKE, plans to activate W1XE in DN80 again (plus NØKE and WBØGAZ). They expect to have HSMS capability and hope many others will also. They think it's time for an HSMS calling frequency (some are using 144.100). They will be running kWs on 6 and 2 meters.

• Charlie, N7SFT, plans to be atop 9,000-foot Monte Cristo, 40 miles northeast of Ogden, Utah, in DN41. QRV on 50-, 144-, and 432-MHz SSB as well as 223.5-MHz FM.

• Doug, N7CNH, plans to activate Herman's Peak, CN74 in western Oregon.

• Jack, N6XQ, anticipates being in Baja California (Mexico) for the contest, but is uncertain as to the location. He says DM10, DM20, and DL29 are getting too dangerous to operate solo or duo, with crime—including murders of tourists—increasing exponentially. If he's solo, he most likely will be in DM11 where he has a relatively safe site.

• Burt, W8TL, will be operating from FM09 QRP/portable on 6 meters to 1296. Maybe 5760 if, according to Burt, "I can get my act together."

• Pierre, VE2PIJ, will be atop Shefford Mountain in FN35qi on 6, 2, 222, and 432 MHz.

• K5AM will be in DM54 atop Horse Mountain; on Rattlesnake Ridge at 7,900 feet in Catron county, New Mexico. QRV on 50, 144, 222, and 432 MHz. This is a permanent contest site with cabin, towers, and generator power. Please QSL to *Callbook* QTH; replies may be delayed until he returns home in October.

Packrats on Camelback

• Once again this year, the Mt. Airy VHF Radio Club—The Packrats—will be operating W3CCX/3 from Big Pocono State Park, Camelback ski area, in FN20hb. They will be QRV on all bands from 6 meters through 24 GHz.

Please check their Web page, <http://www.ij.net/packrats> for club info, including pictures of past contest efforts from the mountain.

• George K5TR, W5KFT Multi/Limited will be QRV from EM00. KWs on 6, 2, and 432; 100 W on 222.

• Jack Nyiri, AB4CR/R, will be active with AB4CR and W8ULC Ops. Grids, in order: EN62, EN61, EN72, EN71, EN82, EN81; then, starting 1200 Z Sunday: EN70, 80, 71, 81, EN91, 90, EM99, EM79, 89, 78, and 88 for 15 Grids ±. QRV 50 MHz through 24 GHz, SSB, CW, AM, and FM. WBFM on 10 and 24 GHz. The lasers will probably not be ready in time for the contest. He'll have the route finalized by Dayton.

Don't Look Down!

• KF7NP DM36vi 9,200 feet, above the North Rim of the Grand Canyon. QRV on 50, 144, 222, 432, 903, and 1296 MHz. This was the site they used last year, but the weather was awful and conditions were terrible. Operators will be Burke, KF7NP, and Alf, NU8I, but they're trying to get Stu, N7QJP, and Jay, KE7OT, to come along as well.

• Stu Mitchell, W7IY, will activate CN82 from Mt. Ashland on 50, 144, 432, and 1296 MHz SSB/CW.

• Pete, WA7JTM, is planning to activate DM53, with 6 meters through 1296 MHz possible.

• Pat, N6RMJ, says the WB2ODH group will be on 8,013-foot Frazer Mt. in DM04 with 50, 144, 222, and 432 MHz, running 1 kW all bands. Ops include WB2ODH, K6KWQ, WA6DJS, N6RMJ, and K6ZE.

• N8UM/Portable in EM85, the Great Smoky Mountains National Park, QRV on 50, 144, 222, 432, 903, 1296, and 2304 MHz SSB/CW.

• KA6NBC will be on Signal Peak in CM99, QRV on 50, 144, 222, 432, and 1296 MHz (possibly 10-GHz wideband FM, as well). Ops will be KA6NBC, WA5YWC, KC6TEU, KC6BWO, and WA6TMJ.

• Robert N7STU, DM07aa, plans to have a kilowatt on 6 and 2, 350 watts on 1.25 meters, 100 watts on .7 meters and .33 meters, and 15 watts on .23 meters.

• Phil K6LS, is a "maybe" for working from Mt. Evans in DM79. He will most likely operate 6, 2, 432, and 1296 SSB, 220 FM and 10 GHz WBFM.

• Neil, N6VHF/R, says his tentative schedule has him traveling from CM98 (Sacramento) down the I-5 freeway to DM13 (L.A.) QRV on 2-meter SSB and 440 FM; hopefully he will be able to borrow some gear for 50 and 222 MHz and operate those bands as well.

• Lew Sayre, W7EW, is going to stay at home in CN84 and, if he gets lucky, will have full smoke on 6, 2, and 432 with serious hardware, plus adequate gear/power on 222 and 1296 to catch the attention of the faithful.

If the Snow Melts...

• Jim, WB7DHC, has tentative plans to be atop 5,271-foot Sun Top Mountain in CN97 with 50, 144, 222, 432, and 1296 MHz (snowmelt conditions permitting). With normal spring conditions, he can make it up to the summit. Last year, late snowmelt conditions blocked access until early July. The alternate site is about five miles due west on 5,150-foot Huckleberry Ridge. Both sites are five miles north of Mount Rainier.

• Jennifer, N7TUA/R, will Rover through the Nevada grids of DM09, DM08, DM18, DM28, DM29, DN20, DN21, DN11, DN10, and DN00 with 50, 144, 432 SSB/CW and 222 FM.

• Ellis, W7FHI, along with Mark, K7XW, plans on operating Multi-Op at 5,000 feet from DN05. Bands: 50, 144, 222, 432, 903, 1296, and probably 2304.

• Dave, N8NQS/R, in support of the CAC's (ARRL Contest Advisory Committee's) efforts to bring rovering back to its former greatness, will be operating from EN71, 72, 73, 81, 82, and 83. QRV on 6, 2, and 432.

• Ron, K7UV/R, says his first-ever roving plans are for DN31, DN32, DN42, and DN41 on 50 and 144 MHz.

• KE4RGH/R, with WB2QLP, plans on activating grids EL86, 95, and 96 on 6, 2, 432, and 1296 SSB/CW.

• Don, W6GYD, plans to be on Sky Line Blvd. with 100 W on 6, 2, 432, and, hopefully, 20 to 30 W on 1296.

• Shawn, N7LQ, plans to activate Fox Mt. in DN01 on 6, 2, 432, 1296, and 2304. The 432-MHz station will have full AZ/EL (azimuth/elevation) capability for EME. Power levels to be the legal limit on all bands except 1296 and 2304, those to be 35 and 60 W respectively.

In Conclusion...

It still looks good for a group of us from Reno to activate Mt. Moses in DN10 on 50, 144, 223, and 432 MHz. At the very least, I'll be a large single-op! At press time, I'm half finished assembling a 50-MHz amp based on a single 4CX250R. It's small, compact, but powerful enough to be worth the effort. Later, I'll build a bigger supply and swap the 250 out with a Svetlana 4CX 400A, which should yield 600 watts output. Not bad for a single tube under $150 brand new with maximum specs to 500 MHz! Eventually, I plan to have one per band through 432 in a single rack just to use while mountaintopping.

Keep all the reports coming in to Tim Marek, K7XC, 360 Prestige Ct., Reno NV 89506; Phone: (702) 972-4722; Fax: (702) 972-5011; E-mail: <K7XC@VHF.RENO.NV.US>. Thanks!

73 from DM09bp de Tim K7XC/R

1998 ARRL June VHF QSO Party

For VHF contesters, every other contest is a warmup for the main event—the ARRL's annual June VHF QSO Party. Here are the rules.

Here are the rules for the 1998 ARRL June VHF QSO Party, courtesy of the ARRL Contest Branch. Please note that these rules are specific to this contest and that the League's general rules for all contests, and for VHF/UHF contests, also apply. They can be found in the *ARRL Contest Yearbook* or on the ARRL Web site at <http://www.arrl.org/contests>.

1. Object: To work as many amateur stations in as many different 2 degrees X 1 degree grid squares as possible using authorized frequencies above 50 MHz. Foreign stations work W/VE amateurs only.

2. Date and Contest Period: The second full weekend of June. Begins 1800 UTC Saturday, ends 0300 UTC Monday (June 13–15, 1998).

3. Entry Categories:

3.1. Single Operator.

3.2. Single Operator, QRP Portable.

3.3. Rover.

3.4. Multioperator.

3.5. Limited Multioperator.

4. Exchange: Grid-square locator (see April 1994 *QST*, p 86).

4.1. Exchange of signal report is optional.

5. Scoring:

5.1. QSO points:

5.1.1. Count one point for each complete 50- or 144-MHz QSO.

5.1.2. Count two points for each 222- or 432-MHz QSO.

5.1.3. Count three points for each 902- or 1296-MHz QSO.

5.1.4. Count four points for each 2.3-GHz-or-higher QSO.

5.2. Multiplier: The total number of different grid squares worked per band. Each 2 degrees X 1 degree grid square counts as one multiplier on each band it is worked.

5.3. Final score: Multiply the total number of QSO points from all bands operated by the total number of multipliers for final score.

5.4. Rovers only: The final score consists of the total number of QSO points from all bands times the sum of unique multipliers (grid squares) worked per band (regardless of which grid square they were made in) plus one additional multiplier for every grid square activated (made a contact from).

5.4.1. Rovers are listed in the contest score listings under the Division from which the most QSOs were made.

6. Miscellaneous:

6.1. Stations may be worked for credit only once per band from any given grid square, regardless of mode. This does not prohibit working a station from more than one grid square with the same call sign (such as a Rover).

6.2. Only one signal per band (6, 2, 1 1/4, etc) at any given time is permitted, regardless of mode.

6.3. Multioperator stations may not include QSOs with their own operators except on frequencies higher than 2.3 GHz. Even then, a complete, different station (transmitter, receiver, and antenna) must exist for each QSO made under these conditions.

7. Awards:

7.1. Plaques (if sponsored) will be awarded in the following categories:

7.1.1. Top ten single operator scorers

7.1.2. Top five single operator QRP portable scorers

7.1.3. Top five rover scorers

7.1.4. Top ten multioperator scorers

7.1.5. Top five limited-multioperator scorers

7.2. Certificates will be awarded in the following categories.

7.2.1. Top single operator in each ARRL/RAC Section.

7.2.2. Top single operator on each band (50, 144, 222, 432, 902, 1296, and 2304-and up categories) in each ARRL/RAC Section where significant effort or competition is evident. (Note: Since the highest score per band will be the award winner for that band, an entrant may win a certificate with additional single-band endorsements.) For example, if WBØTEM has the highest single-operator all-band score in the Iowa Section and his 50- and 222-MHz scores are higher than any other Iowa single operator's, he will earn a certificate for being the single-operator Section leader and endorsements for 50 and 222 MHz.

7.2.3. Top single-operator, QRP portable in each ARRL/RAC Section where significant effort or competition is evident. (Single-operator, QRP por-table entries are not eligible for single-band awards.)

7.2.4. Top rover in each ARRL Division and Canada where significant effort or competition is evident. (Rover entries are not eligible for single-band awards.)

7.2.5. Top multioperator score in each ARRL/RAC Section where significant effort or competition is evident. (Multioperator entries are not eligible for single-band awards.)

7.2.6. Top limited multioperator in each ARRL/RAC Section where significant effort or competition is evident. (Limited multioperator entries are not eligible for single-band awards.)

8. Other: See rules for All ARRL Contests and for VHF Contests.

What You've Told Us...

Our March issue began our third year of conducting reader surveys to determine who reads *CQ VHF*, what your interests are, and what you'd like to see in the magazine. According to your responses, the typical *CQ VHF* reader is younger than the average ham and is *not* necessarily a newly licensed Technician. Let's look at the sometimes-surprising numbers:

Our readership is still overwhelmingly male (98%) and married (71%). Fully 50% of you are between the ages of 35 and 54 (23%, 35–44; 27%, 45–54), while another 38% are 55 or older, and 12% are under 35. Since the average ham is around age 55, the large number of younger readers is good news.

The majority of you are also experienced hams, with only 21% licensed for less than 2 years (versus 42% in 1996!); the biggest group (30%) has been licensed 3–5 years; 13% for 6–10 years; 11% for 11–25 years; and a full 25% for over 25 years. Plus, while 37% of you hold Technician class licenses and another 19% hold Tech-Plus licenses, 42% hold General class or higher licenses (10% General, 13% Advanced, and 19% Extra), and another 2% are not currently licensed.

Finally, activity on all bands has risen since we asked these same questions a year ago (except for 2 meters, which held steady at 96%). A majority of you are now active on both 70 centimeters (68%) and 6 meters (53%), 21% are active on 222 MHz, and 9% operate on 902 MHz and the microwave bands.

This month's winner of a free one-year subscription is Michael Borer of Anchorage, AK. As always, thank you for your responses.

CQ VHF Ham Radio Above 50 MHz

Reader Survey—June, 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 education, your job, and your basic VHF interests:

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

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

Annual VHF Contest Calendar

Want to know when to plan to play on SSB, CW, or FM simplex... and have the best chance of making lots of contacts? Our annual calendar of major North American VHF contests will help you plan.

There's a major VHF or UHF contest nearly every month in North America. The following calendar, based on data published in *CQ Contest* magazine, is taken from the *CQ VHF* Web page at <http://members.aol.com/cqvhf/navhfcon.htm>. It includes the major North American events plus several European contests in which North American stations regularly operate (see below for further information on European VHF contests.). Additions or corrections are welcome.

European VHF Contests

Non-FM VHF operating is much more popular in Europe than it is in North America, and not surprisingly, there are many more VHF contests in Europe than in North America—in fact, there are nearly 200 separate events on this year's calendar! Rather than try to list them here, we'll refer you (at the end) to a comprehensive listing on the World Wide Web.

"Non-FM VHF operating is much more popular in Europe than it is in North America, and not surprisingly, there are many more VHF contests in Europe than in North America—in fact, there are nearly 200 separate events on this year's calendar!"

But to keep you from getting overwhelmed as you scan the long list of contests, we'll pass along some advice here from contester Catharinus van Tuijl, PE1AHX/N4QXT, in the Netherlands, who tells us there are five *really* big contest weekends on which many countries hold simultaneous competitions (see "Viva Contesting!").

Month	Date	Contest
Jan	3rd full wknd	ARRL VHF Sweepstakes
Mar	1st full wknd*	DUBUS EME 144, 1296 MHz (European)
Mar	Last full wknd*	DUBUS EME 432, 2304+ MHz (European)
Apr	3rd Mon.**	ARRL Spring Sprint (144 MHz)
Apr	4th Tues.**	ARRL Spring Sprint (222 MHz)
Apr/May	Last/First Weds.**	ARRL Spring Sprint (432 MHz)
May	1st/2nd Fri.**	ARRL Spring Sprint (902 MHz)
May	2nd/3rd Thurs.**	ARRL Spring Sprint (1296 MHz)
May	3rd/4th Sat.**	ARRL Spring Sprint (50 MHz)
June	2nd full wknd	ARRL June VHF QSO Party
June	3rd full wknd	SMIRK 6-meter QSO Party
Jul	2nd full wknd	CQ WW VHF Contest
Jul	2nd full wknd	Internet 6-meter Contest
Aug	1st full wknd	ARRL UHF Contest
Aug	3rd full wknd	ARRL 10-GHz Cumulative Contest (1st wknd)
Sept	2nd full wknd	ARRL Sept. VHF QSO Party
Sept	3rd full wknd	ARRL 10-GHz Cumulative Contest (2nd wknd)
Oct	Last full wknd*	ARRL International EME Contest (1st wknd)
Nov	Last full wknd*	ARRL International EME Contest (2nd wknd)
Dec	3rd week	BCC Meteor Scatter Contest (European)

* = Specific dates of the EME contests vary, to allow for scheduling based on best EME conditions. Check the monthly contest calendars in *QST* and *CQ VHF* magazines for specific dates each year.

** = Weeks on which ARRL Spring Sprints take place vary, but the day of the week is always the same. The 2-meter Sprint is always on a Monday, the 222-MHz Sprint is always a week later, on Tuesday; the 432-MHz Sprint is a week later, on Wednesday, etc.

The Whole Thing

For a comprehensive list of VHF/UHF contests in Europe, get on the World Wide Web and point your browser to DK3XT's "Make More Miles on VHF" Web site at <http://www.ilk.de/sites/gap/contcal.htm>. We also have a link to this page from the North American VHF contest calendar on the *CQ VHF* Web site. *CQ VHF* would like to thank PE1AHX for providing us with the above information, as well as the link to DK3XT's calendar page.

Viva Contesting!—Competition European Style

There are at least 100 contests a year over here. However, the main ones are the VHF/ UHF/SHF contests on the first full weekends of March, May, July, September, and October. These are all 12-hour contests, running from 1400 UTC Saturday until 1400 UTC Sunday, and include all bands from 2 meters up (except the IARU Region 1 144-MHz contest in September and the 432-MHz contest in October). There is very little 6-meter contest activity, which I'll explain below. *(IARU is the International Amateur Radio Union, and Region 1 comprises Europe and Africa. North and South America are in Region 2, and Asia/Oceania are in Region 3.—ed.)*

National Contests

The March, May, and July contests tend to be national contests, with each country running a separate event. However, most countries schedule these contests on the same weekends, so the bands are very active (Britain is a notable exception, often scheduling its contests on a different weekend).

Some very popular international contests are the Alpe-Adria contest in southern Europe, the European-wide Marconi CW Contest, and the Nordic Activity contests, held every Tuesday night, with a different band each week (i.e., 144 MHz on the first Tuesday of every month). The CQ World Wide VHF Contest is popular here as well, as shown in the consistent good results of participants from Region 1. In addition, there are long-term competitions, such as one for whomever has the most contacts over 500 kilometers in a calendar year (sponsored by VHF-Gruppe West/DL8EBW, in Germany).

"The March, May, and July contests tend to be national contests, with each country running a separate event. However, most countries schedule these contests on the same weekends, so the bands are very active."—PE1AHX

The Situation on Six

Six-meter contests are still very rare in Europe, mostly due to the fact that 50 MHz is still a relatively new ham band in many countries *(Until recently, there was a European TV channel covering 50–54 MHz—ed.)* And some countries still limit power output and prohibit contesting on 50 MHz. Here in the Netherlands, for example, until recently, we were limited to 25 watts output on 6 meters.

Of course, 6 meters is so far the only band on which there'd be any possibility of making contacts between U.S. stations and Europeans, since the ocean has yet to be crossed on 144 MHz or higher and all of these contests prohibit EME (moonbounce) and MS (meteor scatter) contacts for contest credit.

—Catharinus van Tuijl, PE1AHX/N4QXT

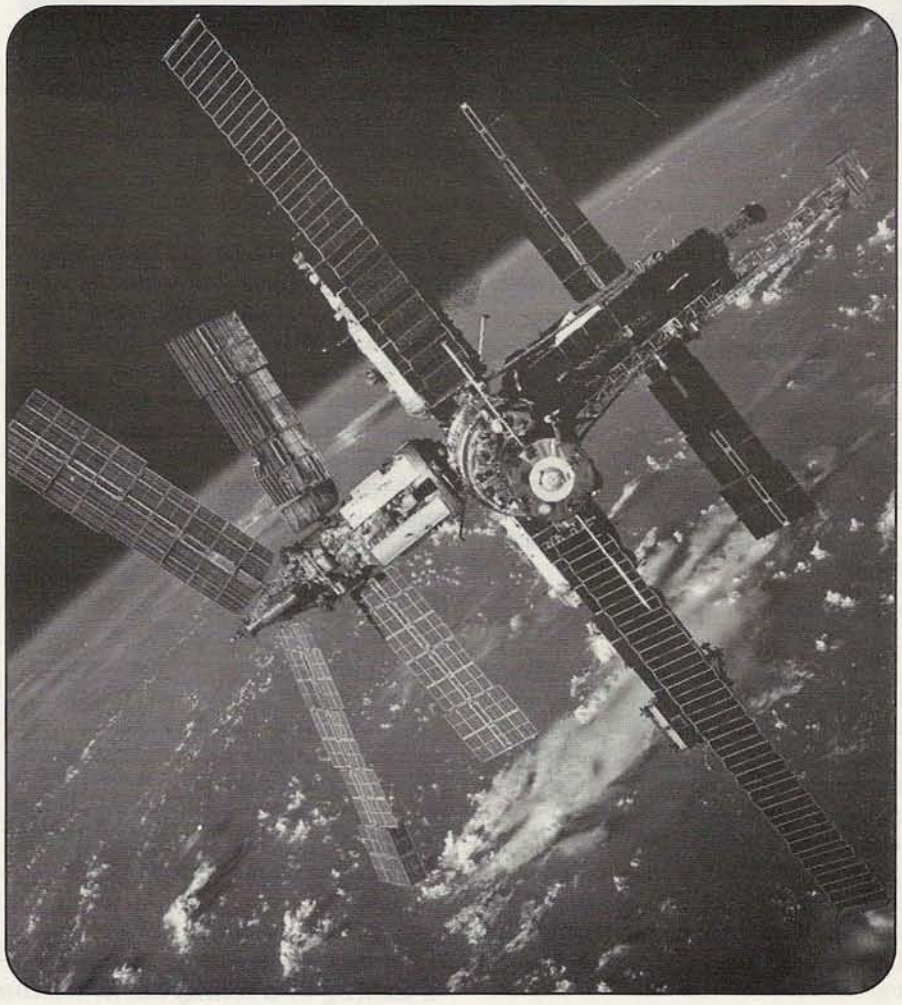
Mir Gets a New TNC (from Us)—Part 2

Getting new packet equipment for the Mir space station was one thing...getting it delivered and on the air was something else. Here's Part 2 of "the story behind the story," along with a glimpse—through packet messages—of day-to-day life on Mir.

By Miles Mann, WF1F*

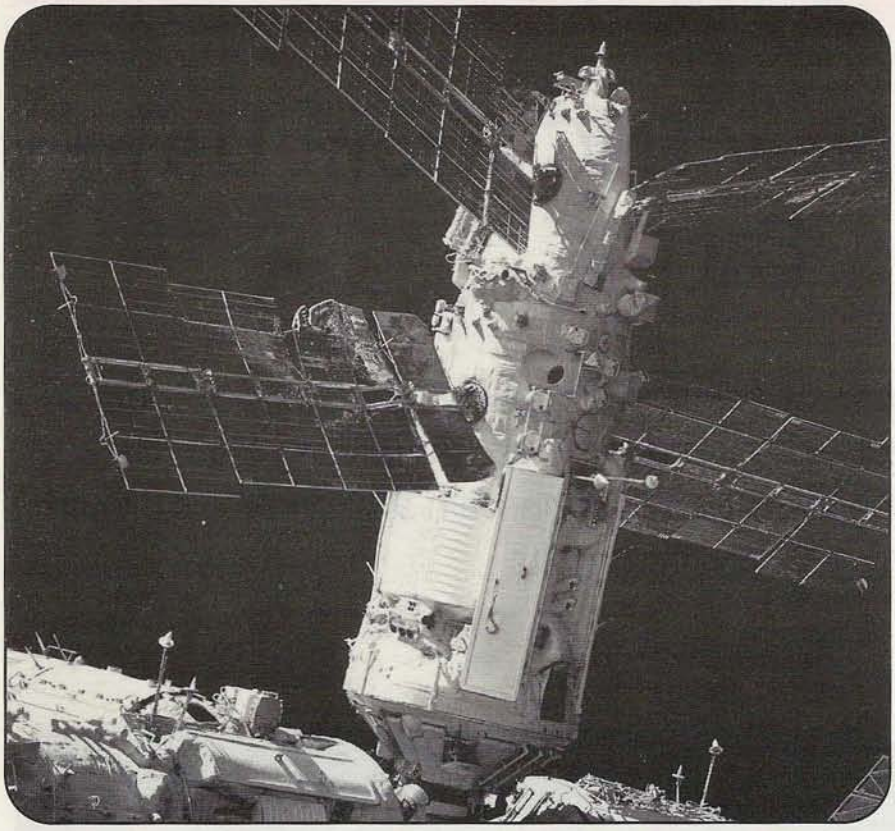
Editor's Note: In Part 1 of this article (May, 1998, CQ VHF), WF1F took us through the process of choosing, buying, and testing a new TNC to upgrade the packet capabilities of the hams aboard the Russian Mir space station, and of shipping two identical units to Moscow: one for launch and the other for ground use. When we left off, is wasn't clear whether the TNC had gone up to Mir, but those concerns were about to take a back seat to a major crisis aboard the space station—a crisis in which ham radio played a critical role in keeping crew members in touch with the ground. In Part 2, we alternate between Miles' narration and packet messages from the crew.

On June 24, 1997, the unmanned cargo rocket Progress 34 collided with Mir's Spektr module. It was the station's worst accident in its 11-year history. The accident caused the Spektr module—one of six modules that make up the station—to depressurize, and the crew had to seal it off and abandon it. This made the station critically short of power, as Spektr had provided 60% of Mir's electricity. To make matters worse, the station's attitude control computer was broken and would only run for a few days



Here's one place where UPS doesn't deliver! Getting a new packet TNC delivered to the Mir space station was almost as great a challenge as getting it hooked up and operating properly. (NASA photos)

*Miles Mann, WF1F, is the Education Director of MIREX, the Manned International Amateur Radio Experiment.



Damage to Mir's Spektr module from a June, 1997, collision with a supply ship created a severe shortage of power and space aboard the space station.

at a time before crashing. But the crew kept a positive attitude...at least in public.

Message from Mike Foale to Dave Larsen, N6CO:

Posted : 06/26/97 18:50
To : N6CO
From : RØMIR
Subject : Back on line

Dave, looks like we are back in business - less one module.

Mike. kb5uac

You might think that the priority of amateur radio on Mir would drop to an all-time low during this crisis, but just the opposite happened. The crew realized that the ham station was one of the most important experiments aboard. The crew needed to be in constant contact with ground control, but a constant communication link was not possible because of the station was tumbling (remember, the attitude control computer was broken) and their commercial satellite relay link was temperamental.

The crew members found themselves out of radio contact with Moscow Mission Control for several hours of each day, and the official Mir radio channels were booked solid during every VHF pass over a Mission Control ground station. The backlog of radio messages left very little time for family traffic over the commercial channels. The crew realized that MIREX (the Manned International Ama-teur Radio Experiment) could help handle some of the family traffic. Dave Larsen, N6CO, began handling some of the personal e-mail traffic between the Mir crew members and their families. And I started running weekly phone patches between the crew members and their families in the UK and Moscow.

The success of the phone patches and the reliable e-mail service elevated the Mir amateur radio station to the top of the priority list. Even when the crew was floating around with flashlights in their mouths and no heat, they still made power available to dedicate to PMS (Personal Message System) experiment (amateur radio saves the day again!).

Posted : 06/28/97 17:58
To : ALL
From : RØMIR
Subject : Mir Status

We have now got the base block, the module Kvant 2 back on line, leaving 2 more modules [unpowered].

Working very hard, lights in our mouths, in the dark, moving batteries about, to enable better charging, with solar arrays.

O2 electrolysis soon, in old Kvant.

Much interest from control center to do internal EVA to reconnect power to lost Spektr module, to receive its substantial electrical power from its large arrays.

Thanks for all your good wishes. Mike.

Stat : PR
Posted : 06/29/97 09:50
To : WF1F
From : RØMIR
@ BBS:
BID :
Subject : batteries

Miles, we know about batteries dying.

Floating in a totally silent station, with 3 flashlight bulbs left, in darkness, with only the stars to light you up, is pretty memorable. Bulbs in end pieces of mags [flashlights] used up.

Yesterday, I thought I [had] lost High power transmit capability, because they [W5RRR] could not hear me.

When I switched [the Kenwood TM-733] to Medium power, they heard me. On High power I saw signal so dont know what to think.

Maybe coincidence. Anyway, am still on Medium power.

Mike. kb5uac.

It turned out that the power supply for the Kenwood radio was being overloaded. When Mike transmitted on high power, the supply would shut down. When the Spektr module was abandoned, the crew also lost a few of the DC-to-DC 28-volt to 12-volt converters, and the SAFEX (German 70-centimeter packet) amateur radio power supply was now being used to run most of the laptop computers as well as the Kenwood radio. Mike now had to be careful not to overload the 15 amp power supply.

"Floating in a totally silent station, with 3 flashlight bulbs left, in darkness, with only the stars to light you up, is pretty memorable."—Astronaut Mike Foale, KB5UAC, from aboard Mir

Posted : 07/02/97 14:00
To : ALL
From : RØMIR
Subject : Mir IVA/EVA (*spacewalk—ed.*)

We are still in low power status, only one module and base block are powered presently.

Crew preparing to do EVA inside node, to open hatch of Spektr module, and replace with hatch with special pass-throughs, to allow power from Spektr.

Date TBD, but after 11th July. Progress docking planned for 8th.

Mike. kb5uac.

Posted : 07/07/97 09:40
To : ALL
From : RØMIR
Subject : Mir Progress Docking

Progress docked normally this morning. We are waiting 3 orbits before we start to unload it, checking the integrity of the hatch seals.

The station attitude control system is working well, using the girodynes, and the base block and module Kvant 2 powered (airlock and toilet) with modules Kristall and Priroda unpowered.

Greenhouse experiment is continuing, using power from the base block, to dry the seed pods that have formed quite nicely.

Mike. kb5uac

Commercial Packet Problems

Then one day, Mike told me he was having problems with the commercial packet link. Mike thought the TNC was broken; I thought it could be just a parameter problem. It seemed that when Moscow sent a large file up to Mir, the 20-kilobyte file would fail to load during the short 10-minute window. Mike sent me a complete list of the TNC parameters from the commercial radio station. I analyzed the parameters and found a few problems.

I sent Mike a packet message and followed up with a voice explanation of the changes. To make the new parameters work correctly, the Moscow ground stations would need to make most of the changes. On the very next orbit, I heard Mike calling Moscow and relaying the information I had given him. Rather than changing the parameters, Moscow decided to have the crew switch to a different TNC, one with a known good working history. The Mir crew took the PacCom-2 TNC off the PMS station and connected it to the commercial radio.

But all was not lost. We still had the PacCom-1 TNC with the dead memory battery on board. Mike reconnected the old TNC to the Kenwood and figured out how to load in all of the correct parameters. The old TNC worked well, except during the numerous power failures, which required a manual reload of all of the TNC settings.

Posted : 07/25/97 09:53
To : ALL
From : RØMIR
Subject : Mir status

Lost power to TNC again - lost all messages.

Possibly will get new TNC, with memory protection, in August, with next crew.

We are doing experiments, especially Vassily and Sasha, even though they now have very little time Peiroda and Kristall still without power, but a little drier now, though still dark.

I planted the first ever space produced seeds, two days ago, in Greenhouse. No sprouts yet.

Mike. kb5uac.

Back on Earth...

Mike Foale was looking forward to getting the new TNC during his mission so he could experiment with the 9600-baud option. Unfortunately, due to schedule changes, Mike would be coming home before the TNC arrived. The KPC-9612 Plus was rescheduled for the October 21st Progress 36 cargo rocket and I began counting the days.

In September, David Wolf, KC5VPF, replaced Mike Foale aboard Mir after 134 days in space. A few weeks later, the Progress 36 cargo rocket took off from the Balkanour Space Cosomodrome, headed for Mir. After the docking, I called David and explained the project to him.

David was not an experienced amateur radio operator; having been licensed for only a short time, and he had not been trained on the operations of the Mir amateur radio equipment. When I first asked him if he found my TNC, he said, "Oh yes, I have it right here in my hand. It says MFJ-1270."

This was a false alarm. Dave had found the old commercial TNC. On further discussions, David said the cargo rocket had been unloaded, but that the crew was too busy to open any of the boxes except the fresh food, and that it may take a few weeks to find the Kantronics TNC. I had regular chats with David over those next few weeks, but I tried to refrain from bugging him about the TNC. Then, in October, while sitting in my car during lunch hour with a few co-worker friends, David called me from Mir and told me he had found the TNC. Needless to say, I was very excited and the guys in my car were also quite impressed.

Getting the New TNC Online

Now came the fun part, trying to schedule a time slot to install the new TNC. I sent an e-mail to Sergej Sambrouv, the Chief of the Amateur Radio Cosmonaut department at Energia in Moscow. I had requested to arrange a schedule in

Astronaut Mike Foale, KB5UAC, returned to Earth before Mir's new TNC arrived. The fresh fruit was a special treat delivered by a shuttle crew.

November, 1997, to work with one of the crew members to install and verify the new Kantronics TNC.

While we were discussing a schedule date, we had a minor setback. It seemed that during the November 5 spacewalk on Mir, the 2-meter PMS coax cable outside came loose. The 2-meter station has to be shut down until the next spacewalk in January 1998. I decided to wait until January and try again. The down side was that the PMS would be off the air for over eight weeks.

The SAFEX team came up with the idea of sharing the Tri-Band antenna mounted on the Prodia module for both the SAFEX-II 70-centimeter repeater and the 2-meter PMS. There is a diplexer filter built into the SAFEX-II repeater which will pass 2-meter signals through the repeater to the outside antenna. In theory, both projects could share the same antenna at the same time.

The Mir crew was given the information and then moved the 2-meter PMS station from the Mir-Core module into the Prodia module. During the move, the crew decided this would be a good time to install the new Kantronics KPC-9612 Plus TNC. Of course, the crew made all of these changes while I was away on a family vacation (without my radio or computer). When I got home, I found several e-mail messages from hams who heard Astronaut David Wolf calling for me on 2 meters. I also had received a packet data dump from Mir indicating the Kantronics KPC-9612 Plus had been put on line.

```
07-Dec-97 18:12:58 CONNECTED to
    RØMIR-1
[KPC9612P-8.1-HM$]
96242 BYTES AVAILABLE
THERE ARE 12 MESSAGES NUM-
    BERED 7-20
Welcome to the Mir Personal Mail System
ENTER COMMAND: B,J,K,L,R,S, or
    Help > L
MSG# ST SIZE TO   FROM  DATE
    SUBJECT
21  PN 166  ALL   N6CO  12/08/97
    05:15:58  2 Line MIR Keps 12/05
ENTER COMMAND: B,J,K,L,R,S, or
    Help >
```

(The key line in the above message was the one identifying the TNC as "KPC9612P-8.1HM$"—ed.)

The good news was that the Mir crew found all of the required parts to get the new TNC connected. The bad news was that the crew had "Reset" the TNC and erased all of the pre-configured settings. The "Reset" rendered the TNC almost useless. There were several commands which needed to be set to correctly match the Mir environment. One of the parameters that needed to be fixed was the CD (Carrier Detect) command. This command had defaulted to the "Internal" squelch control setting. The default parameter requires the crew to set the squelch knob on the radio to the proper level to control the "busy" signal to the TNC. On Mir, the crew normally keeps the squelch and volume controls set to the "OFF" position. As a result, the TNC always thought the channel was busy and would only send out random bursts of packet data.

Astronaut David Wolf, KC5VPF, took Mike Foale's place on Mir and got the new TNC hooked up and on the air.

The correct setting should have been an auto detect mode, in which the TNC monitors the audio stream specifically looking for packet tones to determine if the channel is busy. This TNC also has the ability to allow the system operators (sysops) to remotely change parameters, and the sysops on the ground had been planning to use this feature to fine-tune the parameters. Unfortunately when the TNC was reset, the access codes were also erased.

Dave and I began to go through channels, with formal e-mail messages, phone calls and faxes to Sergej describing the TNC problem. Sergej then forward the messages to Mir over the official channels. Unfortunately the crew had a very heavy workload between December and February and there was not much spare time to fiddle with the amateur radio experiment.

Finally, on February 21, the Mir crew was able to reconfigure the basic TNC commands, allowing MIREX sysops to remotely access the KPC-9612 and begin to fine tune the TNC settings. A few orbits later, MIREX was uploading message traffic reliably to Mir from VK land (Australia).

New Features of the KPC-9612 Plus

We hope that some of the new features of the KPC-9612 will make it easier for the sysops on the ground to support the Mir PMS, and, at the same time, help reduce the amount of crew time required to maintain the mailbox. Another goal is to improve the overall reliability of connections and increase the number of users of the PMS during an orbit. Some of the options below will help us achieve our goals.

1. Check Timer—The Check Timer is like an Idle timer. If someone logs in to Mir and is unable to log out of the mailbox, the adjustable Check Timer forces a logoff. This will help reduce the amount of time the mailbox is stuck waiting for

"Then in October, while sitting in my car during lunch hour with a few co-worker friends, David [Wolf] called me from Mir and told me he had found the TNC. Needless to say, I was very excited and the guys in my car were also quite impressed."

an out-of-range station to respond. If you've used the Mir PMS in the past, you've probably had experience more than once of seeing the PMS fly by with no one being able to log in because the connected station was "out of range." The old PMS did not support the ability to change this timer, as a result, it required seven minutes to time out when the connected station went out of range. The new PMS will force a logoff after 60-120 seconds of inactivity.

2. Remote sysop access—This option proved its value in the first few days of operation. At last, the sysops can remotely fine-tune the TNC settings, without using any of the Mir crew's time. The TNC settings used on Mir are not the same settings you would use for terrestrial packet operations. With the old PMS, changing any of the parameters always required the intervention of the Mir crew. Schedule crew time required numerous expensive phone calls and faxes to Moscow. The crew time is very precious, and the amateur radio station should not be intrusive into their schedules.

3. More memory—The old TNC had 13 k of memory for Mail storage. The new TNC has 100 k of memory just for Mail messages. In hindsight, I should have gone for the 512 k version.

4. Software-Adjustable Audio Levels—With the new Kantronics KPC-9612 Plus, we have the ability via software to remotely adjust packet audio levels in the TNC. The audio levels were set in the lab to be compatible with our Kenwood TM-733. The 733 on Mir may have slightly different audio characteristics. This option will allow the sysops to fine-tune the packet down link audio to the best possible level.

5. 1200 + 9600 baud—This TNC supports both 9600- and 1200-baud data rates. Even so, the 1200-baud rate will be

Reader FEEDBACK!

Dual Polarization IS Possible

CQ VHF reader (and author) Joe Moell, KØOV, offers the following additional information about antenna polarization:

In the article, "A Few 'Facts' About Antennas" on page 54 of *CQ VHF*, April, 1998, your Editor's Note states: "...if you feed it on the side, it'll be vertically polarized; a bottom feedpoint gives you horizontal polarization. But you still can't do both at once."

I hate to disagree with you, but readers might be interested to know that it is *indeed* possible to operate a single quad (or quagi) with multiple polarizations. OSCAR satellite enthusiasts use dual feedlines and baluns to achieve circular polarization, feeding horizontal and vertical feedpoints simultaneously with 90-degree phase shift. Two interesting references:

Robertson, VK5RN, "The 'Quadraquad'—Circular Polarization the Easy Way," *QST*, April 1994, p. 16.

Marcus, W3PM/GM4YRE, "Circularly Polarized Quagi Antennas for Space Communications," *QST*, January 1990, p. 24.

I use a dual-feedline quad for 2-meter direction finding, allowing me to select horizontal or vertical polarization from inside my van. It was not difficult to achieve 35 dB of RF isolation between the two feedlines, even though there is DC connection between them through the driven-element loop.

Additional Reference: Moell, KØOV, "Homing In: Build a Multiple-Polarization Quad," *73 Amateur Radio Today*, February 1997, p.56.

Yes, Kantronics "Kan"

Dear *CQ VHF*:

In the April issue ("Digital Data Link"), you state that TheNET will not work on products from Kantronics. Is this true? I have a KPC9612+.

Gerald Pauls, KE4GOT
Walterboro, South Carolina

"Digital Data Link" editor Don Rotolo, N2IRZ, replies:

Yes, it is true that Kantronics products cannot run TheNET X1. To clarify, that means that you can't use a KPC 9612 *as a node in the network*, if you *must* run TheNET X1. It does *not* mean that you cannot *use* a TheNET network with a KPC-9612 as a user—you most certainly can! The standard software supplied by Kantronics with its products will let you use virtually any packet network. Also, Kantronics offers its own networking software which works well in a TheNET network; so, you *can* use a KPC 9612 as a part of a network, *if* you use their software.

This, of course, doesn't mean that Kantronics products are in any way inferior; it only means that the software (TheNET) was written for a different microprocessor (the Z-80) than the one used in their products. Actually, Kantronics products are quite advanced.

"Finally...the Mir crew was able to reconfigure the basic TNC commands, allowing MIREX sysops to remotely access the KPC-9612 and...fine tune the TNC settings. A few orbits later, MIREX was uploading message traffic reliably to Mir from VK land (Australia)."

the primary rate, with 9600-baud reserved for special testing at a later date. The MIREX team believes there should always be one or more satellite projects specifically designed to allow beginners worldwide access to an "Easy-Sat." The Mir 1200-baud, 2-meter monoband PMS project has proven to be the simplest and least expensive mode for beginners to use.

The addition of a dual-speed TNC does not mean that the 1200-baud PMS will be shut down. There is now enough amateur radio equipment on board Mir to support two simultaneous monoband projects. If the multi-radio configuration project is approved, it will be possible to simultaneously support both 1200-baud packet on 2 meters for beginners and a 9600-baud packet station on 70 centimeters for stations who want a greater challenge. For now, 9600-baud operation will be limited to brief tests (announced in advance), and we will always bring the system back to 1200-baud FM monoband for the rest of the world.

Still Some Limits

The Mir PMS is still a single-user mailbox, meaning that only one station at a time can connect to it. All stations must wait until another station connected to the mailbox logs off. And you must be sure to connect to R,MIR-*1*. This callsign goes into the PMS area. The callsign RØMIR (without the *–1*) goes to the keyboard port which is not used. Think of the keyboard port as a big bit bucket in the sky.

Finally, MIREX asks the stations monitoring the PMS to please be patient while we make adjustments.

What's Next?

MIREX's next project got launched while this article was being prepared for publication. A while back, the SAFEX engineers from Germany told MIREX that there was a problem with interference from one of the commercial transmitters desensing the 2-meter amateur station. It is important to note that the amateur radio station was not *causing* interference: it was *receiving* interference from one of the commonly used commercial radios which is using a channel very close to the 2-meter 145.985 frequency. When the commercial radio is transmitting, the sensitivity of the amateur station is reduced, making it unable to receive weak signals from hams back on Earth.

The MIREX team contracted with Digital Communications Inc. (DCI) to custom-build three special passband-notch filters specifically for the Mir 2-meter PMS station. The first filter was built and displayed at the first Amateur Radio International Space Station conference at the Johnson Space Center, on November 1996. Red tape and limited MIREX funding delayed the filters' launch until mid-March of 1998. The filter system is tentatively planned for installation in the April/May timeframe.

Also on the drawing board is a Slow Scan TV (SSTV) project. This project is still in the proposal stage, which means it has not yet been approved. However, MIREX has gone ahead and built four prototype systems for test and evaluation. If the project gets approval, you may be able to hear and see the crews living in space via two-way SSTV.

Acknowledgments

The TNC replacement project (and the 2-meter filter project) would have been much more difficult if it were not for the support of dozens of volunteers from around the world and from corporate sponsors as well. The MIREX team would like to thank all of the people and companies who have helped make the Mir amateur radio projects a big success, especially: CQ *VHF* magazine, DCI Digital Communications, Inc., ICOM America, Kantronics, Inc., Kenwood Communications, Inc., KLM Antennas, SAFEX, SAREX Working Group. Thanks to all of you, Mir continues to be the most popular amateur radio satellite in the world. ■

Resources

For more information about MAREX and MIREX, please check out the MIREX Web page at <http://www.ik1sld.org/mirex.htm> or <http://www.geocities.com/~ik1sld/mirex.htm>. If you have trouble connecting via either of these URL "aliases," try the full (long) address at: <http://www.geocities.com/CapeCanaveral/Lab/3431/mirex.htm>.

For more information about the products mentioned in this article, please contact the following:

CQ VHF magazine, 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/>.

DCI Digital Communications, Inc., Box 293, 29 Hummingbird Bay, White City, SK S0G 5B0 CANADA; Phone: (306) 781-4451 or (800) 563-5351; Fax: (306) 781-2008; e-mail: <dci@dci.ca>; Internet: <http://www.dci.ca>.

ICOM America, Inc., 2380 116th Ave., NE, Bellevue, WA 98004; Phone: (425) 450-6088; Internet: <http://www.icomamerica.com>.

Kantronics, Inc., 1202 E. 23rd St., Lawrence, KS 66046; Phone: (785) 842-7745; Fax: (785) 842-2031; e-mail: <sales@kantronics.com>; Internet: <http://www.kantronics.com>.

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>.

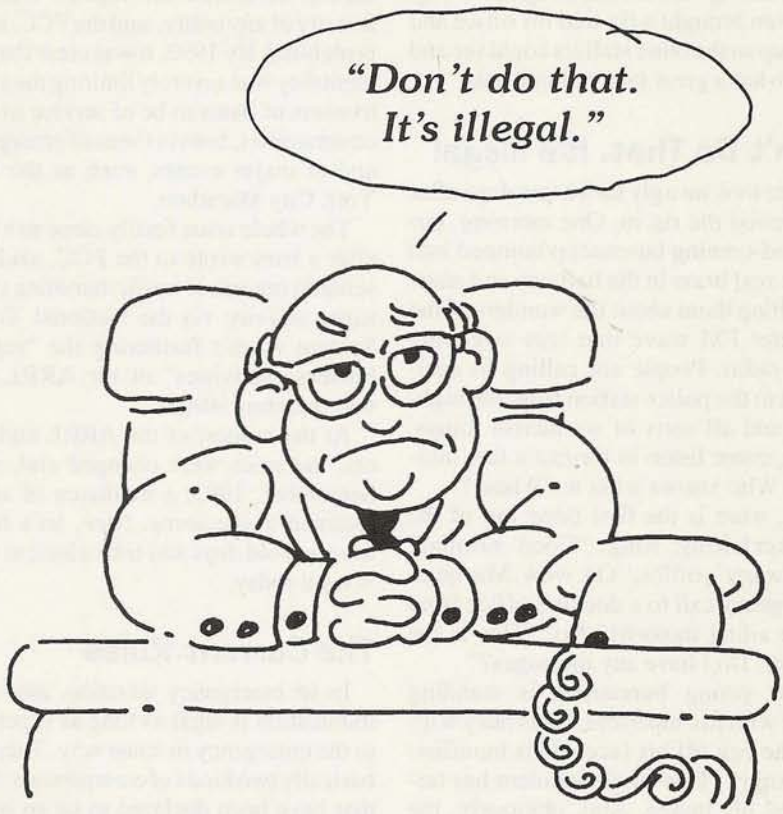
KLM Antennas, Inc., P.O. Box 694, Monroe, WA 98272; Phone: (360) 794-2923; Fax: (360) 794-0294; e-mail: <klm_antennas@msn.com>; Internet: <http://www.klm-antennas.com>.

Can You Really Do That?

Exactly what is and isn't legal to do and say on the air? It can be pretty confusing...especially when some folks make up their own rules or haven't kept up with changes in the FCC's rules.

Some old-time hams may seem rather off base when it comes to what is and isn't allowed in emergency and public service communications. "You can't do that because it violates the 'regular business' rule," they might tell you. "It's against FCC rules to do anything on ham radio that furthers the 'regular business' of any party."

Problem is, when you look up the "regular business" rule in Part 97, it isn't there. Are these old-timers crazy? Or just stupid? Neither, actually, but they *are* behind the times. Had you been around the hobby in the early 1970s, you would know why they act the way they do. That still doesn't make them right, but a little bit of background will give you an idea of where their thinking comes from.



Let's Go Way Back...

Back before the time of most of today's "old-timers," back in the *real* early days, radio served much the same function as telegraph or long-distance telephone service of today. Forget e-mail, there was nothing equivalent to it, except maybe ham radio. Radio companies like RCA were paid so much for each message that they passed. Basically, they did not want a bunch of amateurs undercutting their pricing. That's understandable.

So, we had a rule that prohibited hams from engaging in business communications. It was pretty clear that the intention was to keep hams from opening shop and competing head-on with the regular radio companies. This historical background can also be used to explain how the National Traffic System evolved and some of the quirky rules and traditions surrounding third-party traffic (especially the restrictions on international third-party traffic). But that is another column.

By the 1970s, long-distance telephone service had pretty well eliminated the radio message business except for ships at sea and that sort of thing. But the language in the FCC rules was still the same as it had been for over 30 years. But then, it hadn't been much of an issue, either.

The Rise of Repeaters

But then, along came a big change in the technology of amateur radio. Suddenly, most hams were getting involved in VHF-FM communications, particularly 2-meter repeaters. One of the biggest drawing cards for repeaters (then, not so much now) was the autopatch, an automatic link between the repeater and the phone lines. Suddenly, it was very cool to make phone calls from your radio.

Remember, there was no cellular phone service then, just a very clunky, expensive, inefficient thing called IMTS (Improved Mobile Telephone Service—heaven only knows what it was improved over; I wouldn't want to guess what the system was like before then). A good autopatch and 2-meter radio were equal to or better than an IMTS phone...not to mention, a whole lot cheaper!

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

Also, there was the rule-making and interpreting side of things. You've got to understand that the number one concern of any bureaucrat is CYA—Cover Your Assets (*or something like that—ed.*). Buy an IBM computer, not because it is the best on the market, but because it is so safe that no one ever got fired for recommending it. Always CYA.

Who runs the FCC? Not the commissioners; that's just a myth of how things ought to be in an ideal world. The FCC is run by its staff members, and they are, by definition, bureaucrats. Some of them are hams, too. So, as the 2-meter FM repeater fad really took off, one of the up-and-coming bureaucrats caught the bug. He even brought a rig into his office and set it up so the other staffers could see and hear what a great innovation it was.

Don't Do That. It's Illegal

Fate took an ugly turn a few days after he moved the rig in. One morning, our up-and-coming bureaucrat bumped into some real brass in the hallway and started telling them about the wonders of the 2-meter FM wave that was sweeping ham radio. People are calling in accidents to the police station from the highway and all sorts of wonderful things. Here, come listen in for just a few minutes. Who knows what we'll hear?

So, what is the first thing out of the speaker? Ring. Ring. "Good morning. Dr. Swartz's office." Oh, wow. Maybe an emergency call to a doctor's office from some ailing motorist? No. "This is the Doctor. Do I have any messages?"

Our young bureaucrat is standing there with his superiors. He is busy wiping the egg off his face. He is humiliated. Angry. This single incident has tarnished his image. And, obviously, the cover has fallen off, and his Assets are exposed and waving in the wind for all to see. Not a comfortable place to be, if you're a bureaucrat.

Now as fate would have it, this bureaucrat was the one to whom hams turned to find out what is and isn't legal. Do you think he was in the mood to take chances again? I don't think so. What is the safest answer from a career standpoint to give to any question that isn't absolutely clearly allowed? "Don't do that, it's illegal."

So, from that day until the early '90s, any question that came up pretty much got an automatic answer of "Don't do that, it's illegal." After a while, just thinking about using ham radio in any way that might somehow benefit someone's business interests became the equivalent of speeding in Ohio—potentially a capital offense.

"After a while, just thinking about using ham radio in any way that might somehow benefit someone's business interests became the equivalent of speeding in Ohio—potentially a capital offense."

In the 20-odd years that followed, the FCC interpretation of what was legal and not legal became more and more restrictive, particularly in the area of public service communications. If ham communications furthered the regular business activity of any entity, said the FCC, it was prohibited. By 1992, it was clear that this mentality was severely limiting the effectiveness of hams to be of service to their communities, both in times of emergency and at major events, such as the New York City Marathon.

The whole issue finally came to a head after a ham wrote to the FCC, asking if sending reports of traffic-handling (message) activity via the National Traffic System wasn't furthering the "regular business activities" of the ARRL, and was therefore illegal.

At the request of the ARRL and others, the rules were changed and, as of September, 1993, a modicum of sanity returned to the scene. Now, let's forget the good old days and take a look at what is legal today.

The Current Rules

In an emergency situation, any communication is legal as long as it pertains to the emergency in some way. There are basically two kinds of emergencies: those that have been declared to be so by the FCC and those that involve a common-sense decision that it is an emergency. The first is pretty clear cut: if the FCC declares a situation to be an emergency, it is. End of discussion. The other requires a minimal amount of thinking and decision making. The rules talk about emergency communications being "in connection with the immediate safety of human life and the immediate protection of property when normal communications systems are not available (Section 97.403). Here, you do need to use some common sense.

For instance, your town is flooded. It may be the regular business of the police and fire department to look for survivors and care for the injured. It may be the regular business of the Red Cross to provide aid to the now homeless families. But that is not the primary concern here. Lives and property are at risk. Invariably, normal emergency communications channels are overloaded. There is no question that you should be in there helping out. Yet, some hams have been known to question just what help they could give in such situations. There is a very simple answer to this question. Do whatever needs to be done, and forget about the fears of those who lived through the '70s and '80s. For instance, suppose a doctor needs to speak to an Emergency Medical Technician and give him some technical medical instructions. Be reasonable. Just hand the mics to the doctor and med tech and let them do their job. You can ID when they no longer need the radios. Believe me, in that sort of situation, neither one is going to say one more word over the radio than is absolutely necessary. And you're not going to get a "pink slip" from the FCC if you go 12 minutes between IDs instead of 10 during an emergency.

And there are some nervous nellies who will worry that a nonham in such a situation might utter some profanity over the radio. It might happen, but no one is going to cite a ham because some EMT used a four-letter word in the frenzy of trying to save a life. Be reasonable.

What about a situation that is not quite as "clean" as a flood? For instance, suppose you spot a stranded car on the highway. Should you call it in on the autopatch? Of course. Even if you don't live in an area prone to drive-by shootings, a stranded car presents a safety hazard for the driver, passengers, and occupants of other vehicles. Just use some common sense. (*Check with authorities in your area, though, as to whether they want you to call disabled vehicle reports into 911 or to a non-emergency number. Preferences vary.—ed.*)

Public Service Events

Here, the new rules focus in two areas. Instead of a blanket prohibition on business-related communications, the rules now focus on whether *you* or *your em-*

ployer stand to benefit financially from the communication. So our 1970's doctor would still be in violation, because he was using ham radio to benefit his own personal business. On the other hand, if you are traveling and need to find a motel room, it would be OK for someone to bring up the patch and call a motel for you. You could even order a pizza if you wanted to. In reality, though, cellphones are so prevalent and inexpensive now that examples like this seldom come up any more. (*Note that some repeater trustees continue to prohibit these calls via their autopatch, even though they are legal. It is within their rights to do so.—ed.*)

"At the request of the ARRL and others, the rules were changed and as of September, 1993, a modicum of sanity returned to the scene."

As far as providing communications for some charity event, it is now perfectly legal. The FCC figures that such situations will tend to be self-regulating. The events typically come up once or twice a year for most organizations. How much time would a bunch of volunteers be willing to donate to an organization? You might do it a few Saturdays a year or something on that order, but not every day.

The FCC even went so far as to single out one area where hams provide assistance to an organization on an on-going basis that is not only legal, but just the sort of thing that the FCC feels hams *should* be doing. What is it? Collecting data for the National Weather Service when storms threaten. This activity was singled out by the FCC as something that should be encouraged.

You're still prohibited from accepting payment for any communications that you provide. But what about out-of-pocket expenses? That's less clear. But if you're 100 miles from home at some disaster site, and the Red Cross offers you a cup of coffee, it's OK. Take it. And the free meal, and a room to sleep in, if it's available. And the bike-a-thon can give you a doughnut or a T-shirt without any concern that the FCC will be fining you. On the other hand, a check for $500 for services rendered is still a big No-No.

"Net from Mile Five"

Another topic that sometimes causes the old-timers to wheeze and gasp is the use of so-called *tactical callsigns*. These are identifiers other than your FCC-issued amateur callsign. Suppose that your group is providing communications for a marathon. Typically, there will be aid stations and activities of one sort or another at each mile marker. Most groups will position a ham at each mile marker, too. It just makes common sense.

It's also common sense to use tactical callsigns that easily identify the station in question to both hams and nonhams alike. It's much easier to figure out who "Mile 17" is than trying to remember or look up where KZ4XYZ is. And it *is* legal as long as the participants properly identify themselves according to the rules. The rules on IDing are pretty straightforward. You must ID once every 10 minutes and at the end of a series of transmissions (identifying at the *beginning* of a transmission is no longer required, either).

"As far as providing communications for some charity event, it is now perfectly legal. The FCC figures that such situations will tend to be self-regulating."

Your group can figure out some very simple ways to comply with this rule. It's not rocket science.

The Next Time

So, the next time you're involved in a public service event, don't be angry with the old-timer who questions whether or not what you are doing is legal. He lived through some rough times brought on by technology outstripping the language of the rules, by some hams who were using bands for their own personal gain, and by a lot of fear and anger.

So, just ask him if he knows that the rules were changed in 1993. Tell him to go look it up in ARRL's *FCC Rule Book*. But be kind. Then, just go ahead and call that tow truck, or help out at that walk-a-thon. It's legal to do that on the air now. ■

Mounting Yagis

What's the "right" way to mount a Yagi antenna? Doing it wrong can do a number on your signal pattern.

Over the years, I have heard many "theories" on how you should mount a Yagi antenna, but there was very little published data. At the request of AMSAT's Frank Perkins, WB5IPM, I set out to measure these mounting effects. Most of these measurements were carried out four years ago on 435 MHz using an 11-element DL6WU Yagi.

But the specific antenna is less important than the basic concept: The antenna designer, either working with advanced NEC or Larson-based software programs, or through hours of tweaking and pruning on the antenna range, has come up an antenna design. All dimensions are carefully measured to 1/16th of an inch...and now you're going to stick 10 feet of 2-inch diameter pipe right though the middle of it? That mounting mast is going to drastically change the pattern of your new antenna.

I remember one local ham who put up his 15-element Super-Whatsit with the mast passing through the antenna. Oh, he was so proud of his new antenna. He could point it in any direction and still hit all the repeaters. But in fact, his antenna pattern was so badly distorted that, for all practical purposes, he had a side-mounted dipole on his tower.

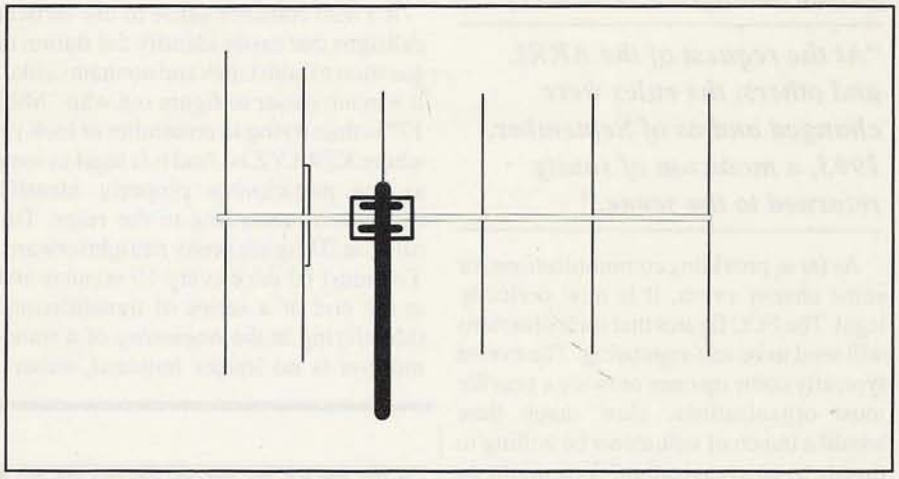


Figure 1. Wanna mess up a finely tuned antenna pattern? Just stick a random length of metal through the middle of it? Careless mast placement can cost you as much as 11 dB of forward gain! In this case, putting the mast right next to an element cost the antenna a whopping 10 dB!

What Are the Choices?

Actually, there are really only two ways in which the mast will affect the performance of a Yagi antenna:

1. The mast is resonant and becomes an active element in the antenna;
2. The capacitance effects of the mast detune one of the elements.

In Figure 1 we have this carefully tuned antenna with a big piece of random metal stuck through the middle of it. In my antenna-range tests, I measured forward gain drops of as much as 11 dB, depending on where along the boom the mast was placed. As you can see, mounting the mast right next to an antenna element is a recipe for disaster. I never recommend mounting a Yagi in this manner.

In Figure 2(A), we have the mast coming into the antenna at a right angle. As long as the mast is kept a reasonable distance from an element (i.e., have the clamp *between* elements, not close to one), gain change is virtually unmeasurable, <.1 dB.

In Figure 2(B), we have an end-mounted Yagi. The mast acts like a second plane reflector behind the reflector element. If the reflector is too close to the mast, the mast will detune the reflector element and distort the pattern. If you mount the Yagi at least 1/20 of a wavelength—and preferably 1/10 of a wavelength—away from the mast, the effect on forward gain will be less than .1 dB.

Figure 2(C) shows a reasonable way to mount a Yagi if you have to keep it vertically polarized on a vertical mast. Put the clamp between elements and keep the mast length above the clamp as short as practical.

Figure 2(D) is almost as bad as (sometimes worse than) the mounting method

"...there are really only two ways in which the mast will affect a Yagi antenna: 1. The mast is resonant and becomes an active element in the antenna; 2. The capacitance effects of the mast detune one of the elements."

By Kent Britain, WA5VJB (<cqvhf@aol.com> — Attn: WA5VJB)

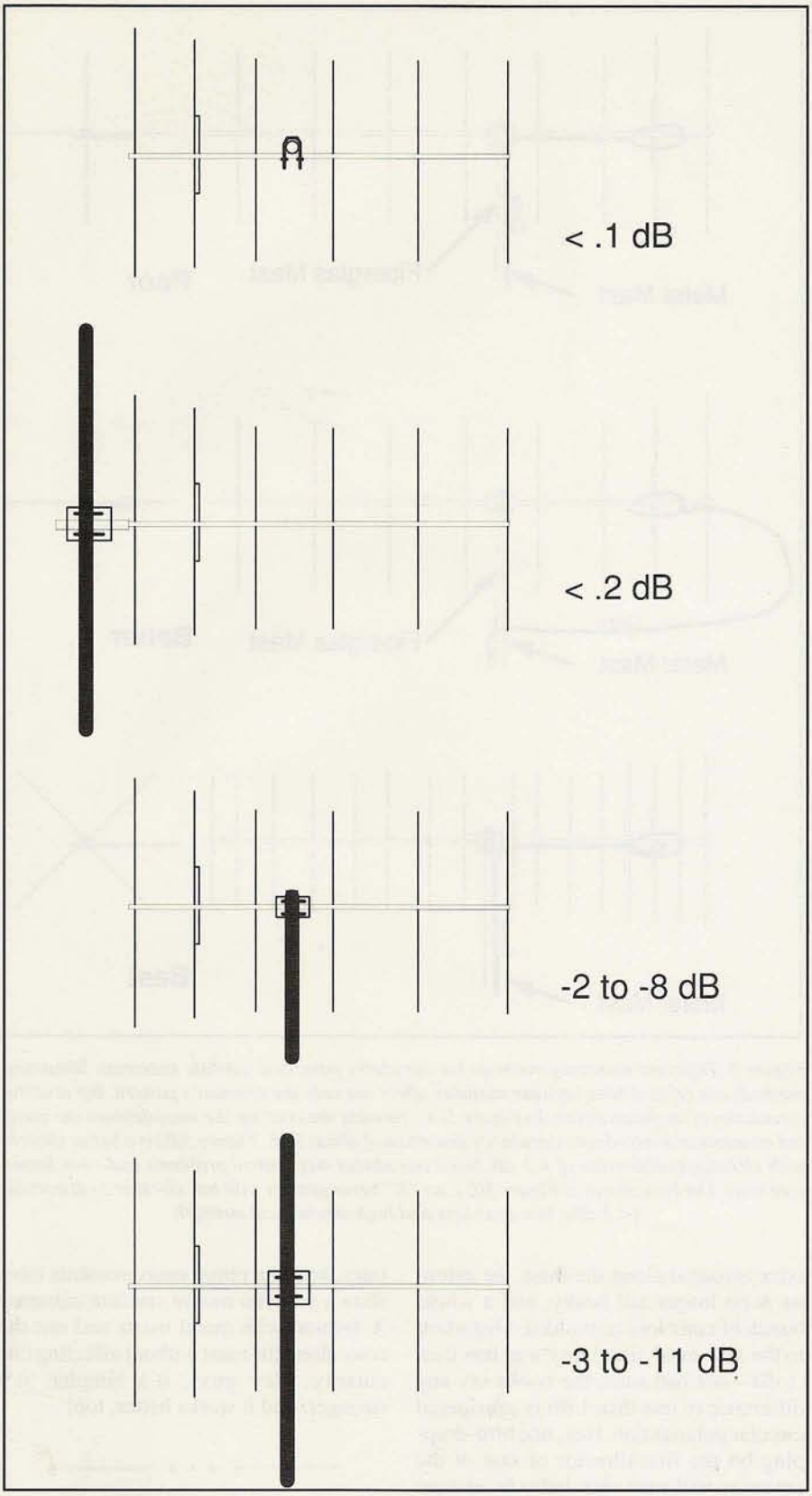


Figure 2. Some alternate ways of mounting a Yagi antenna. In Figure 2(A), the mast comes in at right angles to the elements—a good method as long as the mast and the elements are well separated. Figure 2(B) shows an end-mounted Yagi. You have to be careful that the mast doesn't detune the reflector (see text). Figure 2(C) shows an acceptable alternative if both the mast and the elements must be vertical; and Figure 2(D) is a way you definitely don't want to mount your Yagi.

"If you go into the charts for a two-element Yagi, you will see that a driven element/director combination has more gain and a better front-to-back ratio than the driven element/reflector combination. So just one director does a better job than just one reflector."

shown in Figure 1. Passing the mast through the entire plane of the antenna results in losses of 3 to 11 dB.

Routing the Coax

How the feedline is routed is a complex and often overlooked factor in antenna mounting. One trick is to use a short piece of PVC pipe, wood dowel, or fiberglass rod to mount the Yagi as shown in Figure 3. Nonconductive, right? OK, what do you do with the coax cable? The coax is a conductor, just like the metal mast, and it will distort the antenna pattern just like a metal mast. So, using a non-conducting section of mast and running the coax along your non-conducting mast accomplishes nothing.

Again, if you go ahead and use a conductive mast, just mount the mast between elements and keep it as short as practical. Now the coax can be run along the mast without any additional degradation of the antenna pattern.

Mounting Satellite Antennas

Many satellite stations use circularly polarized antennas. The most common method of generating circular polarization is with two Yagis, one vertical, one horizontal, and feeding them 90 degrees out of phase. But if the pattern of one of these antennas is distorted, then the circular polarization is distorted as well. So mounting is even more important here, as not only the pattern, but also the polarization, is at risk.

Figure 3 shows the mounting methods that were tested for satellite antennas.

In Figure 3(A), the elements were mounted vertically and horizontally, with a non-conducting boom and the coax routed along that boom. As explained above, the coax defeated the purpose of the non-conducting boom, with resultant distortion of the antenna's circularity.

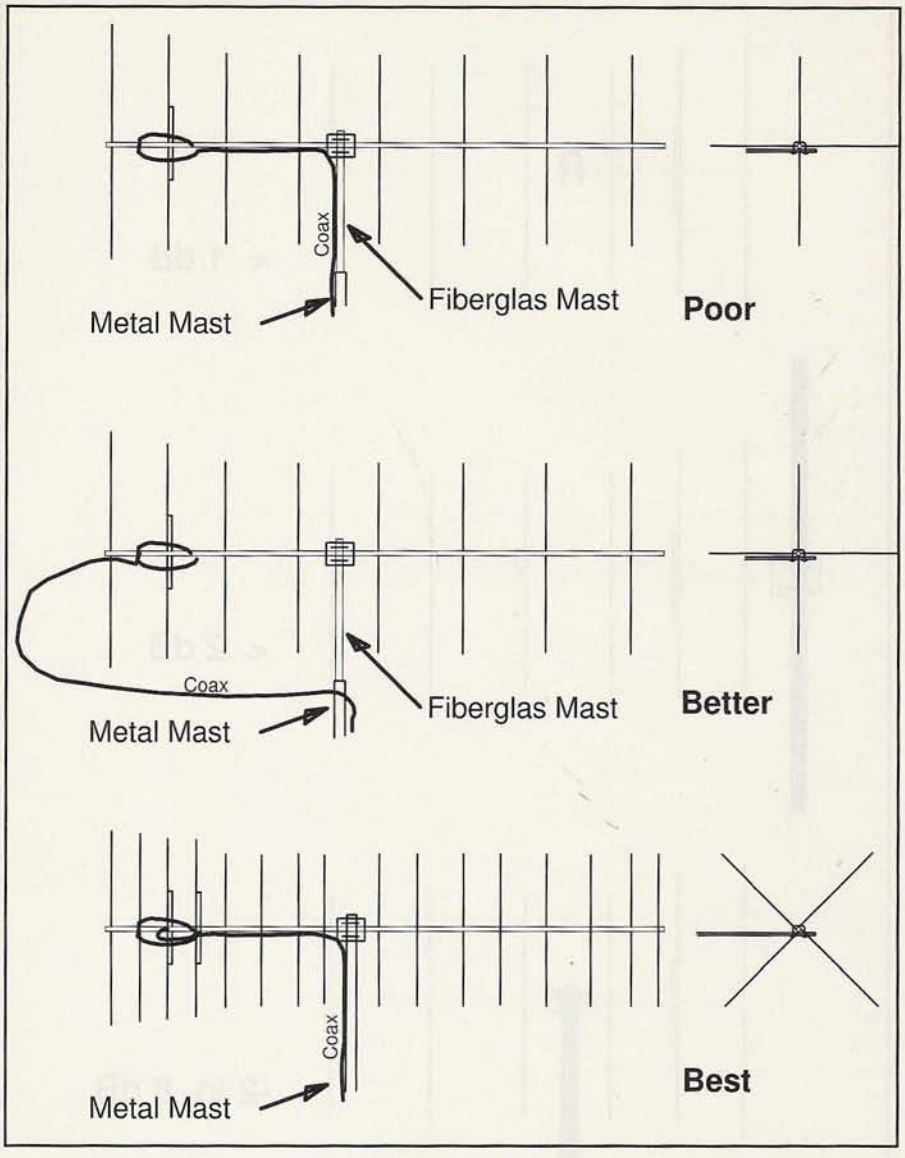


Figure 3. Different mounting methods for circularly polarized satellite antennas. Mounting methods are critical here because mistakes affect not only the antenna's pattern, but also the circularity of its polarization. In Figure 3(A), running the coax up the mast detunes the vertical elements and introduces circularity distortion of about 3 dB. Figure 3(B) is a better choice, with circularity distortion of <.1 dB, but it introduces mechanical problems and coax losses (see text). The best choice is Figure 3(C), an "X" arrangement with low circularity distortion (<.1 dB), low coax loss and high mechanical strength.

Figure 3(B) shows a common method of mounting satellite antennas. It's basically the same as Figure 3(A) except that the coax is routed out and around the back of the antenna (see the big improvement?). Electrically, this is a good way of mounting the antenna, but it's very poor mechanically. Also, that large loop of coax makes the array tail-heavy and causes a lot of signal loss—loss that hurts you on both transmit and receive.

In Figure 3(C), the antenna is mounted in an "X" fashion. This keeps the element tips as far as possible from the mast. The mast is kept as short as possible and is mounted at an equal distance from the two sets of directors. Now a stronger (and cheaper) metallic boom can be used, the coax is routed along the mast, the antenna is no longer tail heavy, and a whole bunch of coax loss is avoided. Distortion to the antennas' circularity was less than .1 dB—not bad since the books say any difference of less than 1 dB is considered circular polarization. Hey, one bird-dropping on the first director of one of the antennas will vary circularity by at least that much!

"How the feedline is routed is a complex and often overlooked factor in antenna mounting....The coax is a conductor, just like the metal mast, and will distort the antenna pattern just like a metal mast."

I published a full analysis of mounting satellite antennas X-fashion with metal masts in the AMSAT-NA 1993 *Proceedings*. But the bottom line is quite simple: Despite many theories to the contrary, antenna range measurements have shown you can mount satellite antennas X-fashion with metal masts and run the coax along the mast without affecting circularity. Hey guys, it's simpler, it's stronger, and it works better, too!

• • •

On the Subject of Reflectors

For years, Yagis had one reflector element. Then K2RIW and F9FT came out with Yagi designs with two reflectors,

and finally the National Bureau of Standards published the NBS Yagi with *three* reflectors. So...more is better, right?

Well, how about a Yagi with *no* reflectors? Look closely at the photo—you'll see a 432-MHz "ringer" I had built up for the Central States VHF Society antenna contest. It has *no* reflector! On the antenna range, it demonstrated 10.7 dBd (or 12.8 dBi) of gain with a front-to-back ratio of 28 dB (phooey, the computer had predicted 40+ dB)!

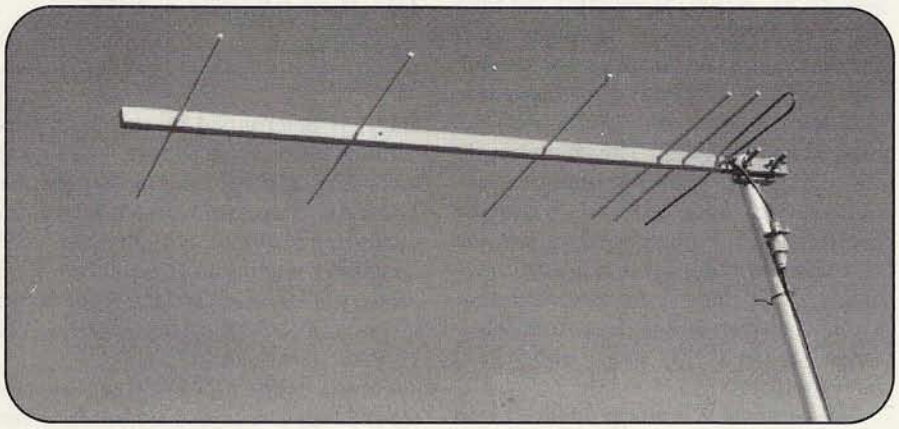
If you go into the charts for a two-element Yagi, you will see that a driven element/director combination has more gain and a better front-to-back ratio than the driven element/reflector combination. So just one director does a better job than just one reflector. This doesn't "make sense to the eye," though, so you rarely see just the driven element/director combination used on commercial antennas...even though it really does work better.

At the 1992 2-Meter EME conference, an East German antenna engineer, Olaf Oberrender, Y23RD (now DL2RSX), said, "With a tightly tuned Yagi, you can just take the reflector off, it doesn't really change anything." Ridiculous, I thought, but I played around with my YagiMax program, and Olaf was right: You *can* design a high performance Yagi without any reflectors!

Well, the reflector does make impedance matching a little easier, and the bandwidth of the Yagi improves, but multiple reflector designs were just using the extra reflectors to cover up design problems elsewhere in the antenna. So your Yagi antenna needs one reflector, proper size, proper distance...but if you have that one reflector designed correctly, you don't need two.

So when you read that a Trigonal Reflector (a reflector array with three reflector elements in a triangular configuration) gave a Yagi .75 dB more gain, the reality is that that Yagi demonstrated .75 dB gain with that reflector! If the other antenna elements had been properly adjusted, the Yagi would have gotten .75 dB more gain with a normal single-element reflector.

Mathematically, the gain of a Yagi is a function of its length—plain and simple. So changing the number of elements will tweak the bandwidth and impedance slightly, but the gain is almost entirely determined by how far it is between the *reflector* and the *last director*.



How many reflectors does your Yagi need? Take a close look at this one—it has NO reflectors...but it does have 10.7 dBd gain and a 28-dB front-to-back ratio! See text for details.

Coming Up...

In the August issue, we will be talking about a family of simple and inexpensive Yagis. In the meantime, if you have any antennas that you believe beat anything else out there, WBØTEM and I with be setting up our 144-MHz to 24-GHz antenna ranges at the Central States VHF Society Conference in Kansas City, Missouri, this July 24th. For more info, visit the Central States VHF Society Web pages at <http://www.csvhfs.org>. I look forward to meeting you there.

As always, I welcome ideas for topics. Just send your e-mail to <cqvhf@aol.com> to the attention of WA5VJB, or send "snail mail" to Antennas, Etc., c/o *CQ VHF*, 25 Newbridge Rd., Hicksville, NY 11801.

A Close-Up Look at Power Supplies

A power supply doesn't really supply power—your electric company does that. What a power supply supplies is the correct type and level of power you need to operate a particular piece of equipment. This month, Dave shows us...how it works.

Are you ready for more theory 'n practice views and discussions of amateur radio gear and accessories, friends? Well, we're tuned right to your wavelength and another popular subject is lined up for discussion both this time and next month: power supplies. We'll begin with "How It Works" descriptions of main components in a power supply, trace current flow to visualize how everything works in tandem, then check out some commercially available power supplies. The overall study promises to be quite interesting (given half a chance, power supplies can be quite exciting items—especially homebrewed ones. Really!). We have plenty of ground to cover, so let's get rolling!

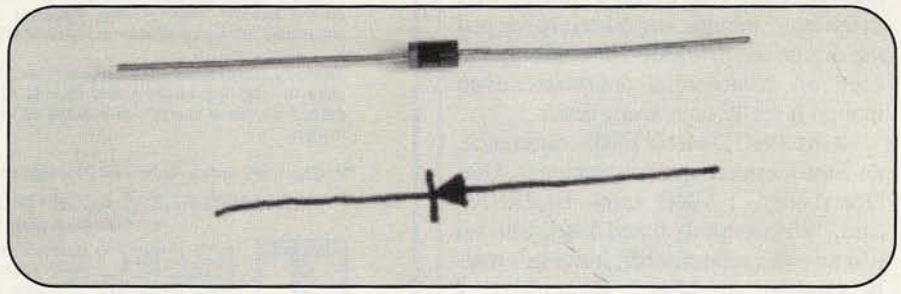


Photo A. A modern silicon diode like that used in a power supply (top) is quite small, but very effective in changing AC to pulsating DC. Below the diode is its pen-drawn schematic symbol. Note that the band on the diode's left side corresponds to the symbol's cathode (or "base") on the left side of the drawing. Current flows through the diode from left (cathode) to right (anode).

Transforming Energy to Our Needs

Changing household-type 120-volt alternating current (AC) to 12 or 13 volts direct current (DC) for powering amateur gear involves three basic steps: *transforming* or "stepping down" the AC voltage, *rectifying* it to make pulsating DC, then *filtering* out the AC ripple. Although possibly not a "basic" step, a means of *regulating* the output voltage so that its light or no-load and full-load values stay within tolerable limits is also included in most modern power supplies. Let's begin with an overview of how transformers work.

As Don Stoner discussed in one of his late 1997 "In Theory" columns, applying DC to a coil wound on a nail or iron core will produce an electromagnetic field capable of attracting small metal particles. What do you suppose would happen if AC were applied to such a coil (*just imagine; don't try it—dinking with household 120-VAC power is dangerous*). An electromagnetic field would start to build or expand, but, before reaching a "fixed maximum level," the applied AC would change its positive and negative polarities. The field would then collapse and another field would begin building or expanding in the opposite direction. Assuming the frequency of applied AC was 60 Hertz (Hz), the field would literally vibrate in place as it changed direction 60 times per second. Now suppose we place an insulated second coil near (or wind it on top of) the first, or primary, coil. The continuously expanding and collapsing lines of (electromagnetic) force will *induce* voltage applied to the primary winding *into* the secondary winding: this is *transformer action.* Note there is no electrical connection between the windings; an electromagnetic field is their only link. Interesting, eh?

"Changing household-type 120-volt alternating current (AC) to 12 or 13 volts direct current (DC) for powering amateur gear involves three basic steps: transforming or 'stepping down' the AC voltage, rectifying it to make pulsating DC, then filtering out the AC ripple."

The amount of voltage induced into one coil (secondary) by the other coil (primary) is determined by the turns ratio between the two coils. If both primary and secondary have 100 turns (a 1:1 ratio) and 120 VAC is applied to the primary, the secondary's output will be 120 VAC (assuming negligible losses). But if the primary is 100 turns and the secondary is 10 turns (a 10:1 ratio), the output will be 12 VAC. Get the idea?

Transformers in power supplies operate at a very low frequency (60 Hz), thus an iron core is used to assist primary-to-

By Dave Ingram, K4TWJ

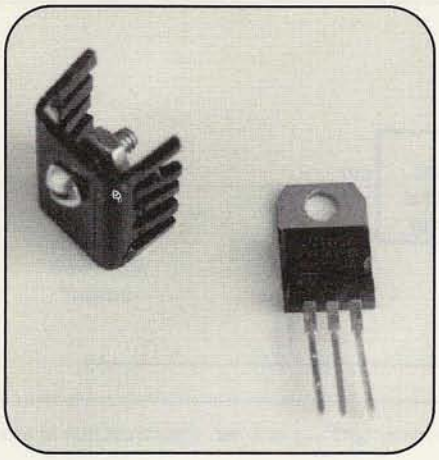


Photo B. A 7812 three-pin regulator capable of handling 12 volts at up to 2 amps and a small bolt-on heat sink for cooling is often used in small power supplies. Sometimes, the regulator is bolted to the power supply's metal case (with special washers for insulation) for even more effective cooling.

secondary coupling. Since that core must respond to rapid changes in magnetic flux, it's made of numerous laminated sections stacked on each other like a deck of playing cards (this helps reduce losses within the transformer core). Developing new core designs and materials, incidentally, is a big-time pursuit among transformer manufacturers.

Diodes and Regulators: Super Semis!

One of the special rewards in writing this monthly *CQ VHF* column is occasionally relating true tales from amateur radio's magnificent past to a new generation of amateurs. Hopefully, some of our younger readers will remember these tales, pass them along to another generation of amateurs, and continue the legacy. Bear with me while I introduce diodes and semi-conductors with one such tale.

Few people may realize it, but crude forms of solid-state diodes have actually been with us since the early days of spark gap transmitters and crystal set receivers (1910s and 1920s), and well before the era of vacuum tubes. Indeed, articles in the *Pacific Radio News* magazine (see "*Pacific Radio News:* the *CQ* Connection") described the fine art of "galena hunting" to wireless operators of yesteryear.

Following those tips, ship radio ops on shore leave searched the countryside for special galena rocks (which looked similar to fool's gold). Back aboard ship, each rock was mounted in a metal holder and a fine wire called a "*catwhisker*" was moved over its surface to locate spots exhibiting the best "*detector action*" (highest front-to-back ratio). A handful of galena rocks was vital to radio operators, as signals from a super-strong transmitter aboard a ship passing by while leaving port easily burned out prime detector points. A really good operator could quickly change galenas while receiving a message without missing a full word of copy. Ah, those golden days of the past truly proved "the operator rather than the rig made the difference!" Galenas faded into the woodwork during the era of vacuum tubes, then re-emerged a few decades later in highly refined form. These "chunk" components inspired the development of transistors and kicked off today's era of solid-state electronics.

Today's Diodes

Two types of diodes are popular today: the sensitive germanium type used in detectors and switching sections of transceivers, and the more hearty silicon type used as rectifiers in power supplies. Look closely at a clear glass detector diode like a 1N34 and you can see a tiny replica of an old-time detector (complete with galena chip and catwhisker) in its casing.

Silicon diodes have the unique ability to pass current in only one direction. In other words, they're a one-way valve for electrons. A diode can thus change AC (like that from a transformer's secondary winding) to pulsating DC. Modern silicon diodes are enclosed in a solid plastic case with wires extending from each end, as shown in Photo A. The *cathode*, or negative end, is marked with a solid band and the *anode*, or positive end, is unmarked. Looking at a diode's schematic symbol (also in Photo A), current passes "against the arrow" or from negative to positive.

During production, silicon diodes can be *doped* with special additives to establish their voltage and current ratings. These are usually specified as *Peak Inverse Voltage* or PIV (maximum voltage before breakdown) and *average current* (safe mA or ampere handling ability). Rather than being labeled accordingly, diodes are marked with a "1N—" number that can be referenced on manufacturers' data sheets.

A good rule of thumb when using diodes in power supplies is selecting

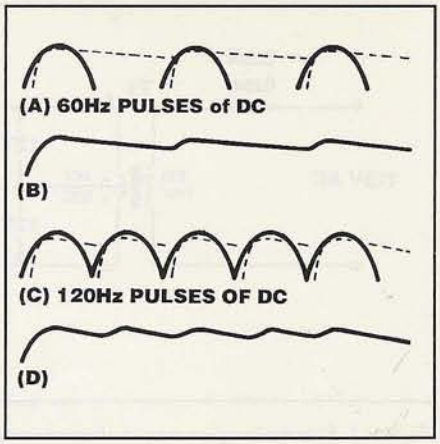


Figure 1. Graphic study of filter capacitors smoothing pulsating DC from the output of a rectifier into "closer to pure DC." (A) and (B) show the output of a half-wave rectifier, while (C) and (D) show the output of a full-wave rectifier. See discussion in text.

types with PIV ratings two to three times larger than the supply's output voltage, and two or three times greater than the supply's maximum output current.

Three-terminal regulators are a shining example of how far technology has advanced during recent times. These little wonders contain a sensing and voltage referencing section, an error amplifier, a small "pass transistor" element, and can be visualized as a miniature power IC. Regulators packaged in TO-220 cases look like power transistors and handle up to 2.5 amps. They are usually marked with "78——" numbers (like 7806/6 volt, 7812/12 volt, etc.), and one is

Pacific Radio News: The CQ Connection

In our brief look back at the history of semiconductors, I mentioned a magazine called *Pacific Radio News*. This magazine also warrants recognition of its own. It started in California during the teens, its name was changed to *Radio News* during the 1920s, and then shortened to *Radio* in 1929. In the 1940s, *Radio* moved east and split into two magazines: one which would become today's *Audio* magazine, and another devoted to ham radio, titled *CQ—The Radio Amateur's Journal*. That's right, *CQ* and its new sister publication, *CQ VHF*, along with their predecessors, have been keeping amateurs informed and enthused ever since the days of spark! Long live *CQ*!

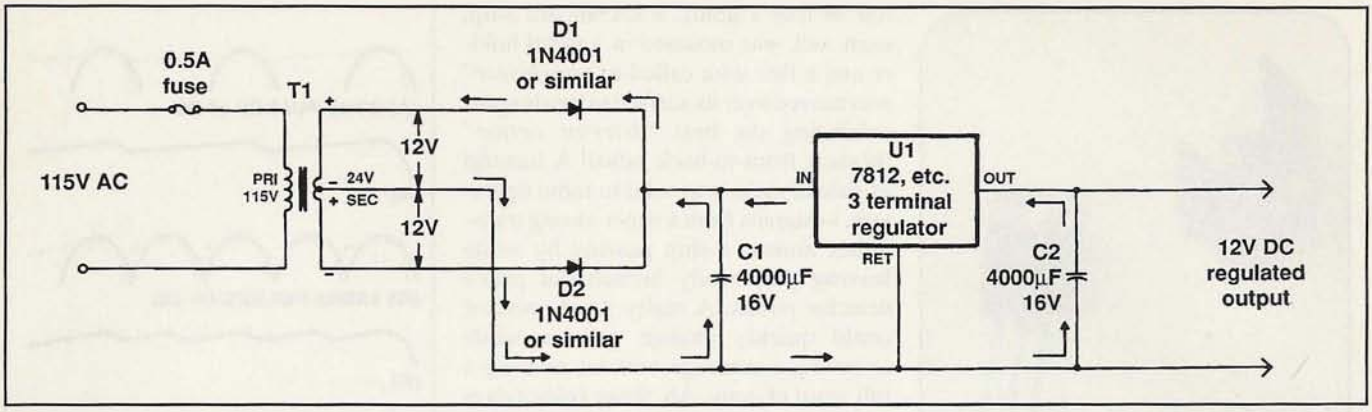


Figure 2. Schematic of an easy-to-homebrew power supply for operating a 5-watt FM talkie or 6-meter QRP rig at home. See discussion in text.

shown, along with its bolt-on heatsink for cooling, in Photo B. Integrating a regulator in a power supply is simple: unregulated voltage is applied to its input pin, its control pin is grounded for referencing, and regulated voltage is taken from its output pin.

Filtering Out the Hum

After being stepped up or down in level by a transformer and rectified by one or more diodes, a power supply's voltage is a series of single polarity pulses called *pulsating DC*. Large-value filter capacitors like those shown in Photo C are then used to "filter out AC ripple" (which you would hear as hum in a rig), or to smooth the pulses into almost pure DC. This action is accomplished as follows.

First, rectified pulses charge up the filter capacitors. Then, in between pulses, the filters attempt to discharge through the load. Assuming that the filters are large enough in capacitance (microfarads, or µf) and the DC pulses are close together, the output voltage will be almost hum-free. Figure 1(A) gives us a closer look at this filtering process. A solid line indicates pulsating DC from the rectifier, and a dotted line shows how capacitors "fill in the blanks" between pulses.

Notice that the resultant output/waveform in Figure 1(B) still contains "waviness," or a significant amount of AC ripple/hum. Assuming we could add an extra set of DC pulses in the blanks being filled by the filters and increase the capacitors' values (in other words, change from a half-wave to a full-wave rectifier arrangement and use beefy filter caps), the output would be almost pure and hum-free DC. This arrangement is shown in Figure 1(C) and (D).

Technically orientated readers may now be visualizing yet another way filters remove AC hum—by shunting or bypassing it to ground or around the load. Yes, and that viewpoint also illustrates how larger value filters are more effective than smaller filters. How so? Using the formula **Xc = 1/F(Hz) x C (farads)**, we find that a 100-µf capacitor's reactance (Xc) at 60 Hz is 166 ohms and a 4000-µf capacitor's reactance is only 4.16 ohms. Only a small amount of AC ripple will be shunted to ground by 166 ohms, but most of that ripple will pass through 4.16 ohms without opposition.

Confusing? I will simplify it: just use 100-µf (or larger) capacitors in power supplies for vacuum tube gear and 4000-µf (or larger) capacitors for solid-state gear (overkills are rare and never hurt), and enjoy hum-free DC!

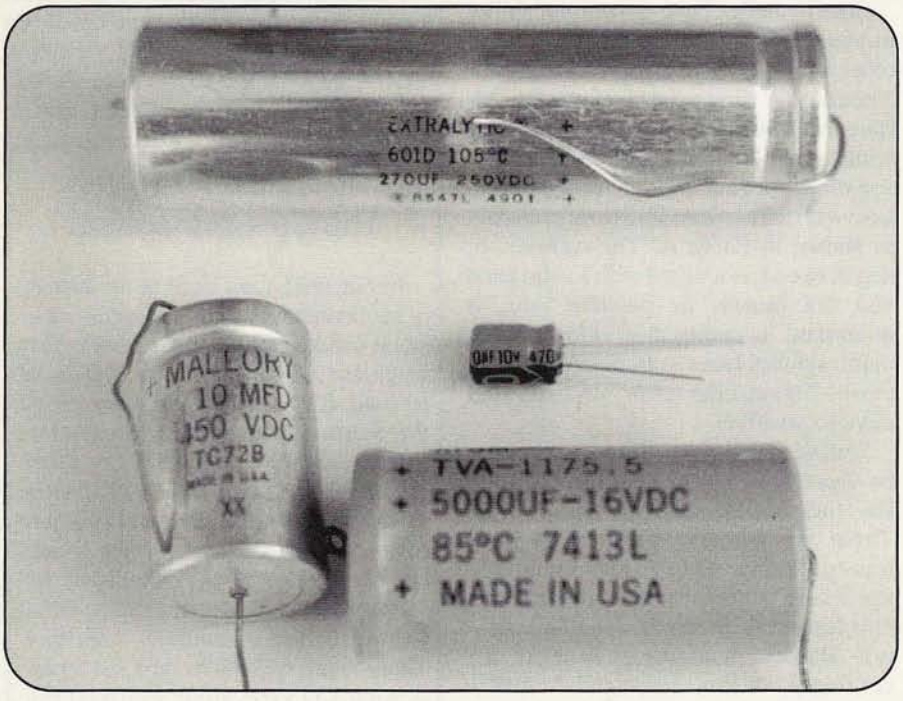


Photo C. Filter capacitors are made in a variety of shapes and sizes according to the value (in microfarads, or µf) and working voltage. The upper capacitor is 270 µf at 250 volts, for example, while the small middle capacitor is 470 µf at 10 volts and the lower capacitor is 5000 µf at 16 volts. Finally, the one on the left is 10 µf at 150 volts.

Homebrew a Power Supply? Sure!

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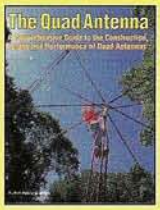

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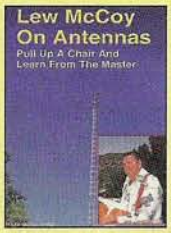

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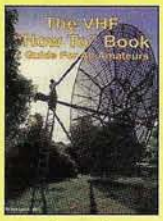

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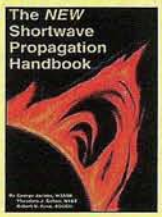

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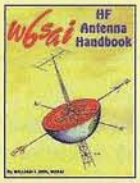

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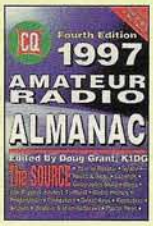

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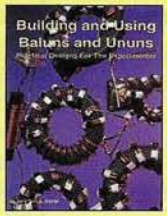

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"Few people may realize it, but crude forms of solid-state diodes have actually been with us since the early days of spark gap transmitters and crystal set receivers (1910s and 1920s), and well before the era of vacuum tubes."

wave rectifiers are prone to AC hum and bridge rectifiers will be discussed in next month's column, let's look at a full-wave design you can use with readily available 24-volt center-tapped transformers. Folks seem to overlook or shy away from 24-volt transformers, so they're often available at bargain prices in hamfest fleamarkets. Rectified "full wave" rather than "bridge style," they form the heart of a neat 12-volt DC supply.

The circuit of our bare bones power supply is shown in Figure 2, and its theory of operation follows. Let's begin by freezing an instant in time when the top of T1's secondary is positive with respect to the center tap, and the bottom is negative with respect to the center tap. At this instant, current flows from the center tap, up through C1 and C2 (visualize U1 as a low value resistor; I will explain it later), through D1, and back to the secondary's top wire. Current did not flow through D2 because it was reverse-biased and because the secondary's bottom wire was negative rather than positive.

During the next instant in time, polarities on secondary wires toggle (the top becomes negative and the bottom becomes positive). Current then flows from the center tap, through C1 and C2, through D2 and back to the secondary's bottom wire (which is positive). Current did not flow through D1 during this time because it was reverse-biased by a negative polarity on the secondary's top wire.

In between pulses, C2 attempts to discharge through the load/rig, thus removing AC ripple/hum from the DC output voltage. Simultaneously, sensing circuitry in U1 increases and decreases the resistance of its "pass circuitry" to oppose minute fluctuations in voltage at its input. These fluctuations result from AC "riding on DC" that was not completely filtered out by C1. In other words, C1, U1, and C2 work together to produce pure DC output. Savvy?

Incidentally, if you wish to build a small power supply like the example in Figure 2 for your FM talkie or 6-meter QRP rig, here are some notes to help you along the way: T1's secondary should have three wires, one of which is the center tap. Using your ohmmeter, you should measure/read 24 volts between "end wires" and/or 12 volts (AC) between the center tap and either end wire. The transformer should be rated at 2 to 4 amps, which usually equates to an overall size of 3 to 4 inches square. **CAUTION: Never touch primary, secondary or AC power cord wires when "plugged in": the resulting tooth-rattling shock can be hazardous to your body!**

Silicon diodes rated at 50 volts and 4 to 6 amps (or greater) are good choices for D1 and D2. I like IN4001s, as they are rated at 50 volts and 15 amps and cost less than 20 cents each. Two 4000 µf 16-volt capacitors should be fine for C1 and C2, but there's nothing wrong with overkill—especially if local amateurs like to critique each others' signals. I found a pair of 20,000 µf/16 volt capacitors at a hamfest fleamarket for one dollar each. Now that's a deal no one could pass up!

The three terminal regulator is a 12-volt/2-amp, TO-220-cased item I purchased for less than $2 (Mouser 511-L7812CV). If you have a new style talkie that runs on 6 volts, substitute a 6-volt/2-amp regulator (Mouser 511-L7806CP) and a 12-volt center tapped transformer. Remember to heat-sink the regulator, include a .5-amp fuse in the transformer's primary line, and enjoy using your home-brewed power supply!

Technically Speaking

Transformers accurately illustrate a basic law of physics which states that energy cannot be created or destroyed, but only changed in form. They also show us how everything in electronics equates, or "balances even," so to speak. Consider, for example, the transformer depicted in Figure 3. Its primary winding is 100 turns and its secondary is 10 turns: a 10-to-1 ratio. With 120 VAC at .1 amp applied to the primary, voltage on the secondary will be 12 volts at 1.0 amp. Multiplying 120 volts times .1 amp equals 12 watts. Multiplying 12 volts times 1.0 amp also equals 12 watts. In practice, actual secondary current will be around .95 amps, or 11.5 watts. The difference (.5 watts) is dissipated in heat loss, which consists of *hysteresis losses* (losses due to resistance to rapid changes in the transformer core), *Eddy currents* (induced currents that flow in circles), and *copper losses* (resistance in coils).

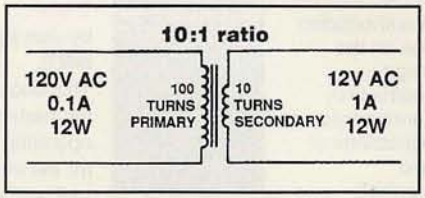

Figure 3. The total energy on the secondary coil of a transformer is always equal to the energy on the primary coil (ignoring minor heat losses), illustrating the basic law of physics that energy can neither be created nor destroyed, only changed.

After a couple of hours of operation, you can feel the heat loss with your hand (the transformer will be slightly warm). Manufacturers are continually improving transformer designs. One familiar example is the new Hypersil core for maximizing efficiency. This is a fascinating area of study, and we have only skimmed its surface!

"...use 100-µf (or larger) capacitors in power supplies for vacuum tube gear and 4000-µf (or larger) capacitors for solid state gear (overkills are rare, and never hurt), and enjoy hum-free DC!"

Looking Ahead

Next month, we'll continue with some interesting "How It Works" views of bridge rectifiers and commercially made power supplies for both low and high power rigs. Stay tuned! Meanwhile, drop us a note on special topics/subjects you would like to see featured here in "How It Works."

Hot note: Watch for a hands-on story of communicating via AO-27 "QRP Style"—coming soon in this column. It's a blast! 73, Dave, K4TWJ

Tornadoes, Bomb Scares, and...Hams

Whenever normal communications are disrupted—by nature or by man—hams have historically pitched in to fill the gap. But ham radio's importance **beforehand** is now gaining greater recognition.

The year was 1948. Robert C. Miller (now a retired Air Force Colonel) was assigned forecasting duty at Tinker Air Force Base near Oklahoma City, Oklahoma. On March 25, Miller and his companion predicted that atmospheric conditions were ripe for tornadoes—a prediction that soon came true, as Miller recounted years later to the National Weather Service.

To our horror, [we received radio] reports of a heavy thunderstorm with winds gusting to 92 miles per hour and worst of all at the end of the message, '*tornado south on ground moving northeast*!' We had it for certain! We could only pray that this storm would change course and move southeast.

There was no such miracle and at 10 p.m., the large tornado, visible in a vivid background of continuous lightning, and accompanied by crashing thunder, began moving from the southwest to northeast across the base. We watched it, not really believing, as it passed just east of the large hangars and the operations building where we crouched in near-panic. Suddenly the glass in the control tower to our right succumbed to the pressure differential caused by the vortex, and all the glass shattered. The control tower personnel were badly cut. They had not abandoned the tower despite the 78 mile an hour winds around the outer fringe of the tornado. Seconds later the Operation Building's large window blasted outward into the parking area. Debris filled the air. Then, suddenly, the churning funnel lifted and dissipated over the northeast edge of the Base.

The twister caused approximately $6 million in damage on Tinker AFB, tearing down power lines, tossing fighter planes on their sides, and damaging the main runway. But there were no fatalities, due in part to the advance forecast. What's significant about this forecast, according to the National Weather Service, is that it was the *first* tornado forecast. The prediction was instrumental in advancing the nation's commitment to protecting the American public and military resources from the dangers caused by natural hazards.

A night of tornadoes and severe thunderstorms left scenes like this across central Florida in late February. Hams helped with storm spotting before the twisters hit, and with communications and damage assessment afterwards. (Photo courtesy Federal Emergency Management Agency)

50 Years Later...

From the Severe Storms Prediction Center in Norman, Oklahoma (not far from Tinker AFB), forecasters kept a watchful eye on Florida. Conditions were ripe for severe storms to develop. As one forecaster said, if everything comes together, Florida will be in trouble.

Florida was in trouble. Conditions were right. A waterspout had already come ashore and caused some damage.

Once the Oklahoma facility issued an alert that severe weather might generate tornadoes, it would be up to the local forecasting office to find the tornadoes and warn the residents.

Florida forecasters geared up for the worst. Some remained after their shifts ended. Others came in early. No amount of sophisticated radar technology in the world can tell when or where a tornado might touch down, or even if it will. But forecasters are good at seeing conditions that can create killer tornadoes.

In a repeat of 50 years ago, the Florida meteorologists, unnerved, watched those conditions start coming together—slow-

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

ly at first, then with frightening speed. The Melbourne National Weather Service Field Office sent out a warning of a "significant threat of severe weather." They also requested a ham radio operator be brought in.

While much has changed and advanced in storm prediction and warning over the past half century, nothing takes the place of a visual sighting. Forecasters explained that Doppler radar is great for detecting clouds a few thousand feet up, but nothing beats a pair of eyes to see exactly what's going on at ground level. And ham radio instantly links forecasters to a network of other storm watchers.

As the bad weather moved in, Central Florida hams activated a SKYWARN net on advice of the National Weather Service in anticipation of severe storms. Storm-spotting hams stayed on duty during the evening of February 22—when the first tornado was reported in Volusia County—and into the early morning hours of February 23.

One of those storm watchers, Norman Lauterette, WA4HYJ, told the Orlando *Sentinel* newspaper that, "It was very frustrating because the National Weather Service kept asking, 'Do you have any confirmed sights of tornadoes?' Our answer was, 'We cannot *see* anything.' But we could *hear* the roaring, the trees snapping and banging. The lightning was fierce, and the rain was almost horizontal."

The tornadoes and heavy thunderstorms—blamed by weather observers on the El Niño weather system—struck while most people were asleep, surprising the residents of the affected areas between Daytona Beach and Orlando. More than three dozen people were killed, hundreds more were injured, and many others were left homeless by the storms, now being called the deadliest and most destructive in Florida's recorded history. In one tragic incident, a tornado wrenched an 18-month old toddler out of its father's arms; the child later was found dead. In another miraculous case, the storm picked up a youngster on his mattress and placed him gently in an oak tree.

Ham Response Continues

According to *The ARRL Letter*, Northern Florida Section Emergency Coordinator Nils Millergren, WA4NDA, said the tornadoes mostly affected Florida's East Central District, while the West Central District—Sumter County in particular—experienced flooding. At least three Red Cross shelters were reported open in the days right after the storms struck. Millergren says amateurs were providing communications for shelters and had put in hundreds of operator-hours in Sumter County alone. Seminole County ARES/RACES member Allen Wilson, WB7BCI, was among dog-handler hams activated to assist in the search and rescue effort. Other hams were involved in damage assessment and in providing backup communication to relieve already-congested commercial systems.

One of the hardest counties hit was Osceola County. County Emergency Management Coordinator Steve Proctor says hams bridged the gap when the disaster struck. "We had a great response," Proctor said. He estimated that as many as 30 hams, some of them from Brevard, Indian River and Polk counties, were directly involved in providing disaster communication and in damage assessment activities in his area. "We had ARES, RACES, and REACT in here working," Proctor said. "Emergency Management was certainly grateful for the assistance." Proctor said he hopes to have his own ham ticket soon.

The Red Cross was among the first agencies requesting amateur support. In the hours right after the surprise storms, the Red Cross did not have any communication from its four emergency shelters, Proctor said. Telephone service was disrupted when a main telephone trunking station was badly damaged by the storms, and Proctor said Osceola County had to move to its secondary Emergency Operations Center (EOC) in Kissimmee as a result. ARES and RACES teams were also activated in Orange, Seminole, and Volusia counties.

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9*1*1 Dials H*A*M*S

Bomb scares are an unfortunate fact of life in the United States, it seems. However, what do you do when the threat is against the building that houses the 911 response center?

At approximately 3:30 p.m. on a February weekday, a bomb threat was phoned into the Chester County, Pennsylvania, 9-1-1 center located in suburban Philadelphia. An immediate evacuation of the building was ordered, and eight minutes later, Chester County ARES/RACES (CCAR) members were being activated. Nine members responded to the call, which came during working hours.

"Bomb scares are an unfortunate fact of life in the United States, it seems. However, what do you do when the threat is against the building that houses the 911 response center?"

With an immediate evacuation of the building being ordered, plans were put in motion to move the Emergency Operations Center to a backup site. Chester County Emergency Coordinator Vern Nelson, KC3XL. reports that hams were being dispatched to various locations before a "stand down" was issued one hour later. The "stand down" literally came minutes before the county's Director of Emergency Services would have activated "Operation Switch." This would have involved moving the 9-1-1 phone lines and radio dispatch to an alternate location and would have required a major effort by Bell Atlantic (the local phone company), to quickly establish service at the alternate site.

CCAR would have been there to fill in the "blanks" in such a major tactical move. Nelson reminded his staff of the group's operational procedure. "The Incident Command System would prevail as a result of off-site locations," he said, explaining that CCAR would be activated in five stages.

First, the county Department of Emergency Services would activate the CCAR officers; then there would be a CCAR roster call out. Net activation would occur on the 146.985 repeater; members would be deployed to various tactical locations such as the county communication towers and the local trauma center; and finally, they would establish communications from those various locations.

Considering that no one had any previous experience making such a tactical move, everything went very well. The CCAR action was without frustration and moved as if rehearsed. Nelson says the smoothness of the operation "was a matter of following instructions from the Director of Emergency Services."

"Just Leave a Message"

In reviewing the incident, Nelson offered the following comments:

Phone message answering machines are great tools to receive messages when not at

home but may delay notification. It is not always possible to be reached, but there may be other alternatives that you may suggest trying, such as alternate phone numbers for home, work, relatives, page numbers, cellular, unlisted, etc. Numbers that you may supply and do not wish to have printed on the roster will be held by CCAR officers in confidence. In any case, there will be a message placed on message machines for response as soon as possible. The bomb threat incident indicated that a significant number of message machines were encountered. Your EC was on the train returning from Philadelphia when the page was received, unable to respond for almost an hour.

All affected units were debriefed the next day to review the actions and to determine future needs for dealing with such an incident. Interestingly, the Chester County Sheriff asked what would have happened if there really *were* a bomb, and if all phone and 9-1-1 communications were disrupted by an actual bombing. One answer: CCAR would have played a major role until communications links could be restored.

Chester County ARES/RACES has a very good relationship with the County Emergency Staff and its members have trained and relate very well with other county emergency units. Each and every member is ready to serve.

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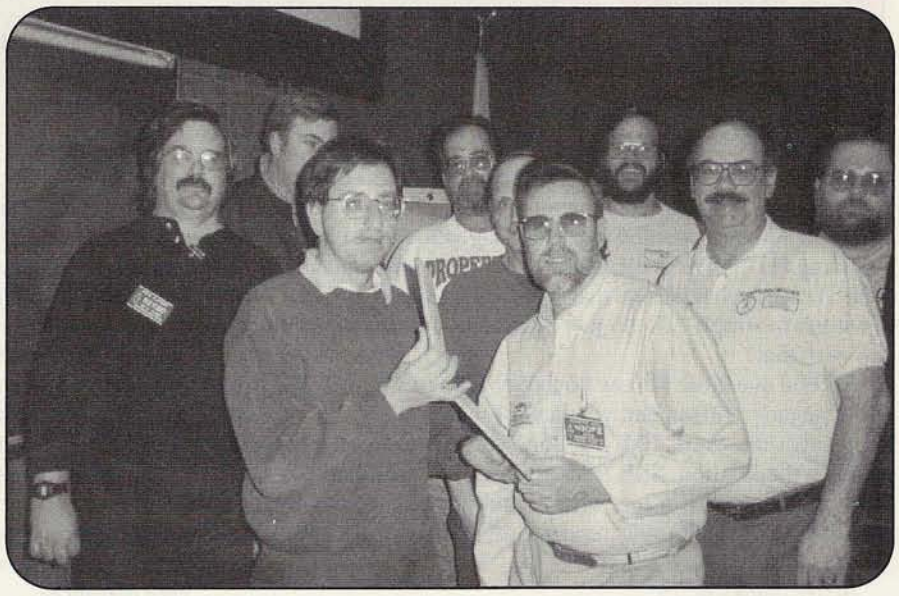
SKYWARN Committee Receives NWS Award

The SKYWARN Technical Committee for the National Weather Service Office in Mt. Holly, New Jersey, recently received a "Special Service Award" from the National Oceanic and Atmospheric Administration (NOAA), the weather service's parent agency. The award was in recognition for the committee's help in reorganizing the SKYWARN amateur radio network, development of APRS (the Automatic Position Reporting System), development of the SKYWARN paging system and for organizing SKYWARN spotter training programs.

In accepting the award from Warning Coordination Meteorologist Joe Miketta, Technical Committee Chairman Robert Hill, WX3ROB, of Monroe County, Pennsylvania, said "I will have some very large shoes to fill, as former chairman Paul Toth, K2SEC, did a tremendous job. I am looking forward to keeping the goals, momentum and enthusiasm of the tech committee going and in the forefront of the amateur radio community for 1998 and beyond." Toth recently moved to Florida. The Mt. Holly office serves parts of Eastern Pennsylvania, New Jersey, Delaware, and Maryland.



Joe Miketta, Warning Coordination Meteorologist at the National Weather Service's Mount Holly, New Jersey, forecast office (front left), presents a Special Service Award to SKYWARN Technical Committee Chairman Robert Hill, WX3ROB (front right; and formerly N3OFZ), and other committee members. (WA3PZO Photo)

As a side note, it was a very nice surprise to hear Dennis Dura, a senior planner with the New Jersey State Police Office of Emergency Management, say that he read an article in *CQ VHF* (June, 1997 issue) on APRS and SKYWARN. Dura said it acted as a catalyst for the that office to purchase three complete APRS digipeaters to be located on state police towers in areas where there currently is no coverage.

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Getting the Word Out...

For the past several months, we've been reporting on El Niño-related weather damage that has hams serving in the public interest. While many have been involved with emergency communications, the rest of us are learning how to respond and what to do when the "drills" become the real thing.

During the Florida tornadoes, I heard of a local reporter in New Jersey who wanted to do a story on health and welfare traffic being handled into the disaster area. The scenario raised the question of how well we are doing at letting the public know that we are there to serve in the public interest.

Let's take a look at the tornadoes. This was a national story receiving coverage in all newspapers and on the evening television news. While there was no activity in New Jersey directly related to the Florida disaster, it did open up some other possibilities. If severe weather hit *your* area, would *you* be helping your local emergency management agency, participating in the local SKYWARN program, using neat technology like APRS to gather weather data and report it to the weather service?

Here's the perfect opportunity to get the word out to your community that your ARES/RACES group is ready to respond in time of need. Here's the opportunity to work with your local club or group Public Information Officer and tell your community what ham radio operators can do and are doing.

You can also use a local angle anytime there is a SAREX/MIR activity, balloon launch that involves ham radio, or other activity that might be of interest to the general public. Let's hear how you're getting the word out about ham radio operators serving in the public interest. Send your stories to <CQVHF@aol.com> or directly to me at <bjosuweit@aol.com>.

Acknowledgments

This month, I want to thank the Orlando *Sentinel*, the CCAR *Backscatter* newsletter, the National Weather Service, and *The ARRL Letter* for providing information for this column. ■

Q & A

Questions and Answers About Ham Radio Above 50 MHz

Q: This might sound weird or stupid; but I was curious about a few things. I have been a ham for a few years now, and from the start I always wanted to know why is it when I am mobile with my HT (2.5 W with a 5/8 wave mobile antenna on a mini-van), I can reach repeaters that are 30-plus miles away; but when I switch to simplex, I can just make 3 to 4 kilometers. What's up with that?

Second question: I know how to change to simplex, and positive/negative offset. But whenever I read a magazine I always run across the words FM, SSB, and AM. I know that FM is frequency modulation, SSB is single sideband, and AM is amplitude modulation. But just what are they? Are they any relation to simplex or the famous repeater offsets? How do they affect your transmission, etc.?

Many thanks & 73,

Loren Butler, VO1PWF
Plum Point, Newfoundland

A: First of all, Loren, there are no stupid questions. Your experience with repeater versus simplex range shows exactly why we have and use repeaters. Forgetting for a moment about enhancements that make your signal go farther than usual, VHF/UHF signals are basically line-of-sight. This means that your unenhanced signal range is generally limited to your visible horizon plus about 30%. Of course, the higher up you go, the farther away your visible horizon becomes. In addition, a more sensitive receiver will pick up weaker signals better than a less sensitive one. And more transmitter power will (with certain exceptions) go farther than less power—the moon is line-of-sight, but you can't work moonbounce, or EME, with a handheld.

Repeaters generally are located in high places, either atop tall buildings, mountains, towers, etc., which greatly enhances their "line-of-sight" coverage. Plus, they have very sensitive receivers and powerful transmitters. As long as the repeater's receiver can pick up the signal from your 2.5-watt HT, then you can communicate with any other station within the repeater's coverage area.

When you operate simplex, unless you're on the mountaintop along with the repeater, then your range is considerably reduced. And when you use a low-power HT with a less-than-overly sensitive receiver, your range is reduced even further. Add a directional antenna, a little bit of power and some height, and you'll find it's possible to cover quite a good distance on simplex.

Your second question is actually two questions. First, FM, SSB, and AM are three different ways, or modes, of transmitting a voice signal over the radio. Virtually all VHF and UHF repeaters in North America use FM, which has the advantages of excellent audio and greatly reduced noise (as opposed to AM and SSB). The disadvantages of FM include a relatively wide bandwidth (about 15 kHz for most of the gear currently in use), the "capture effect," in which the stronger of two signals transmitted simultaneously will "capture" the frequency and the weaker signal won't be heard (and if the noise level is louder than a weak signal, the noise will "capture" the frequency), and, because of having to compete with the noise level, the range of an FM signal, for practical communication purposes, is somewhat less than the range of an AM or SSB signal. (The signal travels just as far, but it isn't as copyable).

SSB, or single sideband, is a type of AM (amplitude modulation) signal which takes up less frequency space (bandwidth) than a full-carrier AM signal. There is also less interference among nearby SSB signals than among nearby AM signals. While AM is finding new popularity on both HF and VHF due to its superior audio quality, SSB is the primary non-FM mode used on VHF and the primary voice mode used on HF. Two-meter contacts in excess of 200 miles are common on SSB (without repeaters), primarily because SSB operators tend to use more power and higher-gain antennas than FM operators who are relying on repeaters to do the "work" of covering any real distances.

Your third question deals with offsets and simplex. Because repeaters are receiving and transmitting simultaneously, they must do so on different frequencies (to avoid interfering with themselves). The separation between the repeater's receive and transmit frequencies is known as the "offset" or "split." The standard 2-meter repeater offsets in North America are "-600 kHz" (the repeater listens 600 kHz below where it transmits) below 147 MHz and "+600 kHz" (the repeater listens 600 kHz above where it transmits) above 147 MHz. There are also some "non-standard splits," such as +1 MHz. When you operate without a repeater, every station is either receiving or transmitting (never both at once), so you can both receive and transmit on the same frequency. This is known as simplex. Virtually all AM and SSB contacts are made on simplex, but this is primarily because all repeaters today use FM. In the earliest days of repeaters, there were several AM repeaters on the west coast. They worked just fine, but eventually switched to FM because of its predominance elsewhere.

Q: I am interested in being able to construct "passive repeater"-type antennas for 2 meters, i.e., antennas with *no* hard-wire connections to the ground, but mounted well off the ground, that could somehow couple RF energy and send it in the direction desired. The purpose would be to help cover "dead" areas, or to change the pattern of an omnidirectional antenna that is transmitting.

I have a small number of antenna books (including ARRL's), but have not found anything at all on the subject. I have heard that repeater clubs (especially in mountain areas) use some passive repeaters to move their signals through difficult terrain.

Terry May, KIØFW
Crosslake, Minnesota

A: CQ VHF *antenna columnist Kent Britain, WA5VJB, replies:*

Passive repeaters are usually used much higher up in frequency than 2 meters. One way is to make a big metal "Billboard" that reflects the repeater into a valley. On 2 meters, you would need something with dimensions like 50 by 50 feet. Not all that practical.

Another way is to build a long 2-meter Yagi and point it back at the repeater, then connect the coax to another long 2-meter Yagi looking down into the valley. Sometimes, a 20 to 30 dB amplifier is placed in the coax line, but the system becomes directional, i.e., one way.

These methods do work, but expect them to be many S-units weaker than an active system.

Q: I would like to know more about transmitting, transmitting a DTMF, and "blowing" the finals on your radio. You see, a friend of mine had told me that if an antenna is matching improperly, and you do have a high SWR, you could ruin your transmitter, in the audio stage, but not in the DTMF stage. Is that true?

Also is it advisable to run an HT with a rubber "duck" other then the one supplied with the radio?

Nicholas Chernoff, VA3NSC

A: First, let's clear up some confusion about DTMF versus audio. DTMF stands for Dual-Tone Multi-Frequency, and it's the generic name for the tones that are produced by the "dial" pad on your push-button phone. These tones are a form of audio and are applied to the audio sections of your transmitter in the same way as the voice signal from your microphone. The only difference between DTMF audio and mic audio is that the tones are at a constant frequency and amplitude (volume), while both of those components in your voice are constantly changing. It would be very hard for high SWR to damage the audio sections of your transmitter, although the output of your audio section can contribute to "blowing the finals" in a high-SWR setting.

We asked WA5VJB to explain that part of the answer:

"Blowing finals" is all a matter of voltage. Let's take a CB rig. They put 13 volts on the final amplifier transistor. When transmitting, there's about 10 volts of RF. Total 23 V.

OK, let's whistle into the mic. Now I have 10 volts of audio and the RF peaks to 20 volts. Let's see, 13+20+10 = 43 volts. If the company used 60-volt transistors, then there's no problem.

Now let's transmit into a high-SWR antenna. The 20 volts of RF reflects back into the transmitter and we have 13+20+10+20, or 63 volts. Bye-bye, transistors. If the company had used 75-volt transistors (they cost 20 cents more), then the rig would not have cared. No damage done.

Rubber duckies are horrible antennas. Convenient, but horrible antennas. They always have a high SWR. But handheld radios are made to work into high SWRs, so no damage is likely. Hey, try all the rubber duckies in your collection and use the one that works best!

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."

A Portable Club Satellite Station

The Larkfield Amateur Radio Club uses its portable satellite station for demonstrations and Field Day operations. Its evolution from humble beginnings to high performance can be your model for building either a home station or a club Field Day station.

In the Spring of 1995, I had the privilege of helping to plan and build a portable satellite station for my club, the Larkfield Amateur Radio Club, WA2PNU. I was one of three principal architects, along with Ron Hardesty, N2PLK, and John Gordon, KD2JF. We had taken on the responsibility of setting up a satellite station for the club Field Day station at West Hills County Park in Long Island, New York.

When we began this project, I was upgrading my home satellite station from a modest "Mode A" setup to the high altitude "Mode B" satellites and the complementary low altitude "Mode J" satellites (Table 1 defines these and other satellite operating modes). The plan was that WA2PNU's setup would borrow the radios from my home satellite station. The two stations were therefore designed with interchangeable equipment.

You may be wondering why we decided to build a club satellite station. In the past, Larkfield's Field Day satellite operations were made up completely of members' home station equipment. If we only wanted a station for Field Day operating, this would be an option worth considering. However, we also wanted to have a satellite station we could set up with little effort and use for either emergency communications or recreational amateur satellite demonstrations.

Photo A. Mode A Satellite Station made of an ICOM IC-211 and a Realistic HTX-100. (The IC-211 is now a proud part of KB2YJH's Satellite Station.)

Getting Started

I began my satellite operations on a budget. The radios were an ICOM IC-211 2-meter all-mode transceiver and a Realistic HTX-100 10-meter SSB/CW transceiver (see Photo A). These two radios and a RadioShack discone antenna for 2 meters and a 10-meter Cushcraft Ringo antenna made up the Mode A satellite station I used to make contacts with over 40 states.

When John, KD2JF, upgraded his satellite station with a Yaesu FT-736R 2-meter/70-centimeter all-mode satellite transceiver, he loaned me his ICOM IC-471A 70-centimeter all-mode transceiver. The combination of the three transceivers now gave us access to satellites using Modes A, B, and J.

In 1995, there were two Mode B satellites operating: AMSAT OSCAR 10 (AO-10) and AMSAT OSCAR 13 (AO-13). (In December, 1996, AO-13 burned up after re-entering the atmosphere.) Both satellites were in highly elliptical (or Molniya) orbits. The portion of the orbit around its highest altitude (apogee) is very useful for demonstrations since the satellite has the best long-distance (DX) coverage and the Doppler frequency shift is relatively small.

What We Bought

To communicate with AO-10 and AO-13, we needed 2-meter and 70-centimeter beam antennas and a two-axis (AZ/EL)

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

Table 1. Uplink and Downlink Bands for Satellite Operating Modes

Mode	21 MHz	29 MHz	145 MHz	435 MHz	1.2 GHz	2.4 GHz
A		Downlink	Uplink			
B			Downlink	Uplink		
J			Uplink	Downlink		
K	Uplink	Downlink				
L				Downlink	Uplink	
S				Uplink[1]	Uplink	Downlink
T	Uplink		Downlink			

1. OSCAR 13 used 435 MHz for the Mode S Uplink; 1.2 GHz is the standard Mode S Uplink
2. Modes appended with an "A" or "D" suffix indicate Analog or Digital operations, respectively.
3. Satellites operating in two Modes simultaneously list letters for both Modes.

rotor so we could track the satellites across the sky. We wanted circularly polarized antennas that could switch between right- and left-handed polarity. Ultimately, we chose a KLM model 2M-14C (2-meter, 14-element, circularly polarized) and a 30-element Hygain circularly polarized 70-centimeter OSCAR beam.

The rotor is the Yaesu G-5400B—a standard for amateur satellite work. We mounted the antennas to the rotor from a 7.5-foot KLM fiberglass cross boom reinforced with 1-inch diameter wooden dowels. (The dowels mainly prevent the hollow cross boom from being crushed when tightening the antenna mounting "U-bolts.") The "tower" is a 5-foot tripod staked into the ground and uses a metal fence post as a vertical mast. The rotor and antenna assembly mounts at the top of the vertical mast, approximately 10 feet above the ground (see Photo B).

The cables between the operating position and the tripod are approximately 80 feet long. The 2-meter and 70-centimeter coaxial (coax) feed lines are Belden 9913 equivalents; each rotor axis has its own eight-conductor control line. Since each rotor axis only uses six of the eight conductors, we used the two extra conductors in each control cable for powering the antenna polarity switching relays. One more coaxial cable provides 13.8 volts of power to an Advanced Receiver Research MML144VDG 2-meter preamplifier mounted on the tripod. The 9913 coax cable is fairly stiff, so we used 12-foot "jumpers" of a flexible, low-loss RG-213 coax from the antennas to the tripod.

"The 80-foot run from the operating position to the antenna tripod consists of five cables: two RF feed lines, two eight-conductor rotor control (and antenna polarity relay) cables, and the preamp power cable."

Photo B. The WA2PNU Satellite Antenna System Mounted on its Tripod Tower. See text for details.

The 10-meter antenna is what's known as a turnstile because of its shape. It consists of two dipoles oriented perpendicular to each other and fed 90 degrees out of phase for circular polarity. Each leg of the dipole measures 7 feet 11 inches, making it resonant in the satellite subband around 29.4 MHz. For the two dipoles to be a quarter wave out of phase, we fed one directly and inserted a quarter-wave RG-8X mini coax phasing line between the feed point and the other dipole. Because of the 0.75 velocity factor of the coax delay line, its length is 5 feet 11 inches to produce a quarter wave phasing delay. We set up the two dipoles

as "inverted Vs" with the apex 8 feet above the ground (supported by a PVC mast) and the wires oriented 30 degrees from horizontal.

Quick Setup Features

We designed the station for quick setup and takedown. Most of the equipment, including the tripod arrangement, was well suited to accommodate this goal. We added electrical connectors to the AZ/EL rotor control, the 2-meter pre-amp, and the two antenna polarity switching relays. Ron, N2PLK, demonstrated his superb craftsmanship in assembling the cabling and connectors for the WA2PNU satellite station—a job that required large amounts of both skill and patience.

The Azimuth (AZ) and the Elevation (EL) axes of the G-5400B rotor each have six electrical connections. These six connections must be made for both AZ and EL at both the rotor actuator head on the tripod and the rotor controller box at the operating position. That's 24 connections that have to be made correctly just for the rotor to function properly. Now add in the (two each) conductors for two antenna polarity relays and another two conductors for the preamp. That's a total of 36 non-RF connections between the operating position and the tripod. Making these connections each time we set up the station would be tedious and error-prone. Instead, we used keyed nylon connectors (all available at RadioShack).

Getting Wired

The AZ/EL rotor wiring was done first. Both the actuator head and the control box were wired with six foot lengths of the control cable. The free ends of the cables were mated with complimentary six conductor connectors, allowing the controller box to be connected directly to the actuator head. This arrangement is useful for orienting the rotor during setup. (You probably need to actually experience a setup to appreciate how convenient it is to just plug in at the base of the tripod and operate the rotor.) Once the rotor is correctly oriented, the controller gets moved to the operating position and we connect two 80 foot "extension cords" with mating nylon connectors between the controller box and the tripod.

The antenna polarity switches were also wired with nylon connectors on each end. At the operating position, the preamp and polarity switching cables get connected to a plastic project box. This box has three switches (one for each device) and a corresponding LED to tell you whether the switch is in the "on" or "off" position.

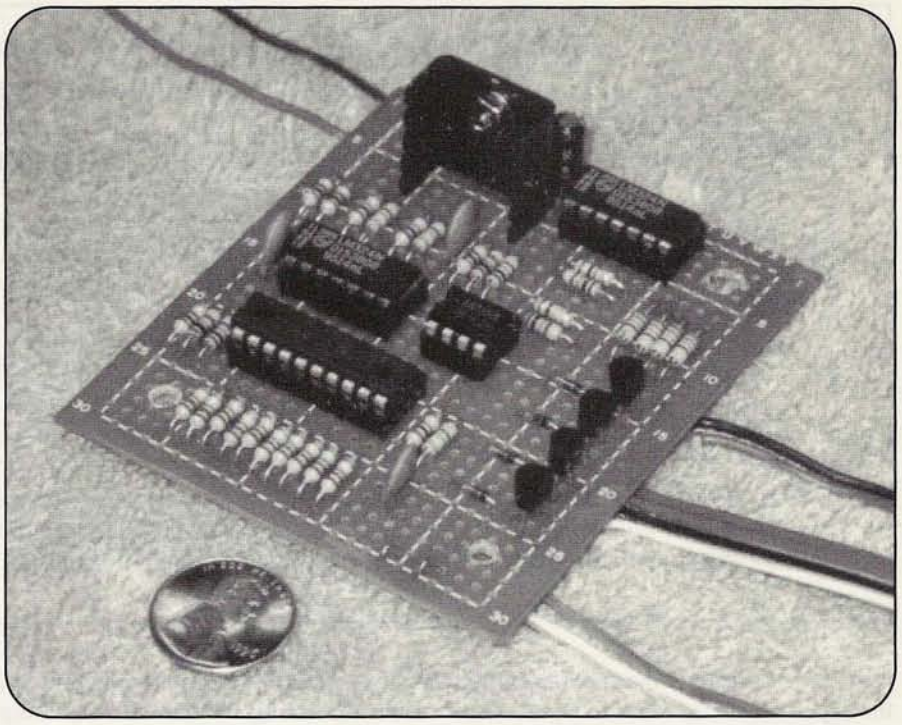


Photo C. The FODtrack antenna control circuit board.

The 80-foot run from the operating position to the antenna tripod consists of five cables: two RF feed lines, two eight-conductor rotor control (and antenna polarity relay) cables, and the preamp power cable. Coiling up and deploying these five cables would normally be laborious. However, we had the good fortune that one of our teammates was a fireman. He was able to get from his Fire Department a surplus hose reel from—a very convenient device for coiling and uncoiling these five cables.

One more hint for quick setup: keep a good supply of wire wrap ties on hand. These are important for dressing the cables on the tripod for strain relief and so they don't snag on anything as the rotor turns. We also use them for stabilizing some of the smaller pieces of equipment at the operating position.

How effective are the quick setup features? Our typical setup time is between 45 and 60 minutes, and our fastest time was approximately 30 minutes.

Satellite Tracking

The last step in building our portable satellite station was having the ability to track the satellites. We chose the STSPLUS tracking software because it's inexpensive ($10) and easy to use. STSPLUS does an excellent job of predicting when the satellites will be above the horizon, but its real-time tracking features are outstanding. Besides giving very attractive map displays with the satellite positions, the program gives the AZ and EL antenna pointing angles and Doppler compensation (tuning) information. We run STSPLUS on a laptop PC.

"How effective are the quick setup features? Our typical setup time is between 45 and 60 minutes, and our fastest time was approximately 30 minutes."

How Well Did It All Work?

We tested this satellite station twice in the Spring of 1995, before Field Day. Both tests were successful and we each made numerous DX contacts via satellite. The first test was especially useful since it helped us work out some minor equipment and setup problems. We also used these opportunities to refine our operating techniques with the station.

WA2PNU's satellite station was suc-

Table 2., WA2PNU Satellite Station Equipment Summary

	29 MHz	145 MHz	435 MHz
Transceiver	Realistic HTX-100	Yaesu FT-736R	
Antenna	Turnstile	KLM 2M-14C	Hygain 30 Element
Antenna Mount	8 foot Telescoping PVC Mast	5 foot Tripod and 5 foot Vertical Mast	
Rotor	-	Yaesu G-5400B and FODtrack Interface	
Feed Line	RG-58	9913	9913
Pre-Amp	-	ARR MML144VDG	-
Sat Tracking	Pentium 120 Laptop using "The Station Program"		

cessful for Field Day 1995. We made our contacts on the two high altitude satellites: AO-10 and AO-13. The excitement began with AO-13 climbing out of a perigee pass across North America. I established a solid signal on the satellite and soon had a pileup of both North American and European stations. The pileup was going strong for several hours with a few stations responding to each of my "CQ Field Day" calls. I responded to a "Whiskey-One" station and was pleasantly surprised that W1AW in Newington, Connecticut, came into my pile-up. The AO-13 contacts continued past midnight until the satellite settled below the horizon.

Shortly before sunrise on Sunday, AO-10 rose above our western horizon. The signal was noticeably weaker than AO-13's, but I soon established a reasonable signal there, too. The pace was a little slower, but I made my first-ever contact with Alaska. A short time later, my relief arrived and continued making contacts through AO-10.

1997 Upgrades

Although we had some very successful field demonstrations in 1996, WA2PNU had a lackluster Field Day on the satellites that year. The two major obstacles were that we had no usable AO-13 passes and marginal signals from AO-10. While we hoped AO-10 would be better in 1997, we planned to use Fuji OSCAR 20 (FO-20) and FO-29 extensively. Since FO-20 and FO-29 are Mode J satellites in Low Earth Orbits (LEOs), they move quickly across the sky with a rapidly changing Doppler shift. This makes them a little more challenging to operate than other satellites.

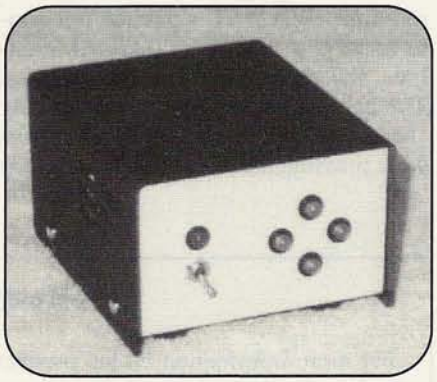


Photo D. The FODtrack antenna control interface in its enclosure.

To reduce operator fatigue, we decided to automate the antenna tracking and Doppler compensation.

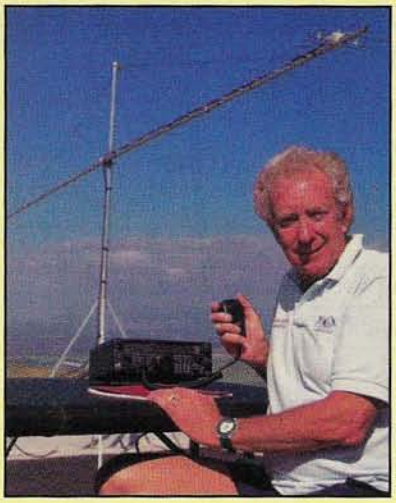
We automated antenna tracking by building a FODtrack interface (named after its designer XQ2FOD). The FODtrack gets AZ and EL information from the computer through its parallel (printer) port, and guides the YaesuG-5400B rotor through its controller box. The FODtrack interface was homebrewed for about $30. Photo C shows the FODtrack's circuit board; and Photo D shows the finished FODtrack in its cabinet.

In the meantime, I upgraded the satellite station with the addition of a Yaesu FT-736R transceiver. This allows automatic tuning (and, therefore, Doppler compensation) through the radio's Computer Aided Transceiver (CAT) port. We overcame a minor compatibility problem. Computer serial (COM) ports transfer binary (1 and 0) data at ±10-volt RS-232 levels; the CAT port transfers data at 0-volt, +5-volt Transistor-Transistor Logic (TTL) levels. Yaesu sells a $100 commercial interface to connect the CAT to a COM port. KD2JF instead obtained a schematic of a homebrew interface (via e-mail) from James Miller, G3RUH. John built this interface (with a slight modification) from about $10 worth of parts. The circuitry is all built inside the shielded connector hood on the COM port side. The interface looks like a DB25 connector on the computer side connected by a cable to a 6 pin DIN connector plugged into the radio's CAT port.

We initially tested these two interfaces with available software. Unfortunately, we couldn't find one program with the tracking features we needed that drives both interfaces. I, therefore, wrote driver software for each interface with the thought of having STSPLUS author Dave Ransom incorporate the control functions in his software. STSPLUS is packed with features and had unfortunately reached the practical size limitation for a DOS program.

I found a willing accomplice in Paul Willmott, VP9MU of AMSAT Bermuda. Paul is the author of The Station Program, satellite tracking software designed for automatic antenna tracking and Doppler compensation. Paul added my FODtrack driver software to The Station Program. (This program already had features to

"I established a solid signal on the satellite and soon had a pileup of both North American and European stations. The pileup was going strong for several hours with a few stations responding to each of my 'CQ Field Day' calls."



On the Cover

CQ VHF Senior Contributing Editor Gordon West, WB6NOA, tests the new Yaesu FT-847 HF/VHF/UHF transceiver for his review in this issue. Gordon conducted his field tests from the top of Signal Peak in Orange County, California. As its name implies, the peak is home to a wide variety of commercial, military and public service repeaters and links—three towers' worth of antennas spewing RF 24 hours a day! Gordon says he was advised to shut off all his other radio equipment before going up the hill because more than one ham had come down from the top with equipment that no longer worked...most likely due to front-end transistors being literally burned up by all the RF in the air up there! As you'll see in his review, Gordon was pleased to report that the 847 exhibited virtually no intermod problems despite being within a very strong RF field.

The advantage of the location—and the reason that all the other transmitters are up there—is that it's one of the tallest hills in southern California, and it offers an unobstructed VHF/UHF path from Los Angeles all the way up the coast to the San Francisco Bay area, some 300 miles to the north.

The hilltop operation also gave Gordon the opportunity to test his new telescoping RV flagpole (it's held up by parking one tire on a special "wheel stand") as a VHF/UHF antenna mast. You can't see it in this photo, but we have plenty of pictures of it in Gordon's article about the flagpole, right after his FT-847 review. (Cover photo by Chip Margelli, K7JA)

control the Yaesu FT-736R as well as all other popular amateur satellite radios). The combination proved very effective, giving us an automatically controlled satellite station. Table 2 is WA2PNU's current satellite station configuration.

Field Day 1997

Field Day 1997 began with guarded optimism because RS-10 had gone silent a month earlier and AO-10 had only been marginal in the preceding weeks. However, both FO-20 and FO-29 were operating in voice and CW mode. Furthermore, the antenna tracking and Doppler compensation equipment had been thoroughly tested on these two satellites. WA2PNU operated horizon-to-horizon on the two Fuji OSCAR satellites, making multiple contacts per pass. The new equipment gave us a virtually "hands off" operation; the biggest tasks were pressing the push-to-talk button on the microphone and occasional Doppler fine tuning on the computer. Our portable satellite station had matured to where an "ordinary Ham" could make contacts on the satellites with only a few minutes of training.

In Summary

WA2PNU has a portable satellite station used for Field Day and amateur satellite communications demonstrations. We designed this station for both good performance and ease of setup and takedown. The station's equipment evolved from manual to automatic operation and will continue to evolve as Phase 3D microwave modes become more popular. If you're planning your own home or portable satellite station, I invite you to borrow our ideas and add your own improvements.

Next month, we'll take a closer look at STS Plus and The Station Program. ■

Resources

For more information on the products mentioned in this article, please contact your favorite dealer or the following manufacturers:

Radios & Antennas

Advanced Receiver Research (ARR), P.O. Box 1242, Burlington, CT 06013; Phone: (860) 582-9409.

Cushcraft, Inc., 48 Perimeter Rd., Manchester, NH 03103; Phone: (603) 627-7877; Fax: (603) 627-1764; e-mail: <hamsales@cushcraft.com>.

Hygain Div., Telex Communications, Inc., 8601 E. Cornhusker Hwy., Lincoln, NE 68505; Phone: (402) 467-5321 x 238.

ICOM America, Inc., 2380 116th Ave., NE, Bellevue, WA 98004; Phone: (425) 450-6088; Internet: <http://www.icomamerica.com>.

KLM Antennas, Inc., P.O. Box 694, Monroe, WA 98272; Phone: (360) 794-2923; Fax: (360) 794-0294; e-mail: <klm_antennas@msn.com>; Internet: <http://www.klm-antennas.com>.

RadioShack, 1500 One Tandy Center, Ft., Worth, TX 76102; Phone: (800) 843-7422; Internet: <http://www.radioshack.com>, or at your local RadioShack.

Yaesu USA, 17210 Edwards Rd., Cerritos, CA 90703; Phone: (562) 404-2700; Internet: <http://www.yaesu.com>.

Computer Software

FODtrack is available from AMSAT-NA's Web site at <http://www.amsat.org/amsat/ftpsoft.html>.

STSPlus (also known as STSOrbit Plus) may be downloaded from <http://tie.jpl.nasa.gov/dransom/stsplus.html>.

The Station Program is available from the AMSAT-Bermuda Web site at <http://www.amsat.bm>.

Please note that some of these programs are shareware, *meaning that they may be freely downloaded, but for continued use, a registration fee to the author/provider is expected. See each program for specifics.*

A Four-Star Sporadic-E Opening

On 6 meters, there are openings and then there are OPENINGS! Here's the story of one June event that shows you why six is called "the Magic Band."

I would venture to say that a number of the regulars on the Magic Band have their own rating systems for the various sporadic-*E* openings that occur throughout the year. The main items for grading these openings are things like duration of the opening, amount of coverage, and how much power you need in order to work stations. I use a four-star rating system in which the best—a four star opening—is one that lasts for several hours, has wide coverage that may include double hop and allows me to run power levels of less than 10 watts for the entire opening. A four-star sporadic-*E* opening seems like there's a giant mirror in the *E*-region of the ionosphere.

It's not uncommon to have one or two of these openings once or twice a year, particularly during the summer season, and sometimes the opening reaches as high as 2 meters. The best opening I've seen in recent years occurred on Saturday, June 10, 1994. Normally, this date would have been during the ARRL VHF contest, but that year the contest was moved up to the previous week to accommodate VHFers in the Midwest who had scheduled their annual conference on June 11th and 12th.

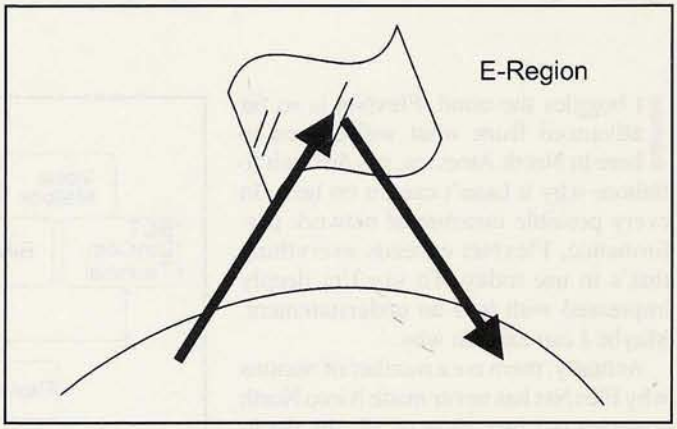
"A four-star sporadic-E opening seems like there's a giant mirror in the E-region of the ionosphere."

Up to that date, the summer sporadic-*E* season had been fairly decent, but nothing special. The day before, I had worked into central Mexico and into the Cayman Islands on six at noon local time. The 11th was a Saturday and I didn't hear any activity during the morning or afternoon. But at 5:00 p.m., something very strange started happening on the Magic Band.

I heard a number of beacons coming in with strong signals, including some that were less than 800 miles away. I heard a Delaware station, K3CNH in grid FM28, run a major league pileup. His signal was so strong and solid that it was definitely sporadic-*E* and not tropo. I suspected (and later found out) that, because of the shorter distances between me and the stations I was hearing, 2 meters was also open. I started working a number of the close-in grids that always seem to have been "in-between" over the years (too close for sporadic-*E* and too far for ground wave).

10 Watts and a Dipole

I was working everybody using 10 watts and a dipole antenna. I thought about running to my car and retrieving my linear amplifier, but then thought, "Why bother?" since I was able to work everybody I heard. Plus, I had no local competition and it seemed I had the whole band to myself with stations from the south and the Midwest coming in. Then at 10:40 local time, I heard OX3LX—in Greenland!—on CW on the calling frequency! His signal was in the opposite direction of the stations that I had been working. I didn't get him on the first shot, but I got through 10 minutes later with a 579 report. I couldn't believe it! If this had been the contest weekend, there would have been a major-league pileup on his signal and I wouldn't have been able to get him. The band stayed open until well after midnight.



"Then at 10:40 local time, I heard OX3LX—in Greenland!—on CW on the calling frequency!"

Many hams lamented that the VHF contest had been moved, not only because of this opening but because there were also terrific sporadic-*E* openings the next day. I worked KC4SUS in Florida for a solid hour using 2.5 watts from a portable location near the water. But the highlight of the weekend was that terrific opening on Saturday night—perhaps the greatest opening I've ever experienced on the Magic Band!

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.

By Ken Neubeck, WB2AMU

Inside FlexNet—Part 1

The FlexNet packet network is well-established in Germany and other parts of Europe. Now, says N2IRZ, North America may be ready for it as well. This month and next, Don will tell you how FlexNet works, then guide you through setting up a FlexNet node.

It boggles the mind. FlexNet is so far advanced from what we're used to here in North America, it's difficult to fathom why it hasn't caught on here. In every possible measure of network performance, FlexNet exceeds everything that's in use today. To say I'm deeply impressed with it is an understatement. Maybe I can explain why.

Actually, there are a number of reasons why FlexNet has never made it into North America (so far). First of all, the documentation was only available in German. Then, it used a hardware platform developed in Germany, and only available there. No significant papers were written in English, and, finally, most of us were satisfied with what we had already. So why fix what isn't broken?

Then, a few years ago, all the documentation was translated into English and French. The code was ported to the DOS/PC platform. The system developers started writing papers for the DCC (ARRL/TAPR Digital Communications Conference) in English (and I even translated a few). Now, I think, North America is ready for FlexNet.

In keeping with our format for the past few months, first I'll tell you a little about how FlexNet works, then lead you through setting up your own FlexNet node. Because FlexNet is relatively unknown here, we'll cover it in somewhat greater detail than with other networking systems. Also, since the introduction of anything new requires a more complete explanation, this column will be a two-parter, with the conclusion coming next month.

I wrote a little about FlexNet in the June 1997 issue of *CQ VHF*. I recommend reading that again, if you have it, as it covers more of the background and history stuff, as well as some of the reasons packet has such a strong following in Europe. There are also a few papers in most of the DCC *Proceedings* books for the past couple of years that provide some of the nuts 'n bolts stuff—look at the TAPR Web site for the abstracts and to get a copy for yourself.

Of course, the documentation that comes with the software *really* explains it well. Each module, including the kernel, comes with ASCII-formatted documentation which explains everything in detail. Also, you can contact the author of a specific module if you have any questions not covered in the documentation. Most .DOC files are bi- or tri-lingual, with German, English, and some French, too.

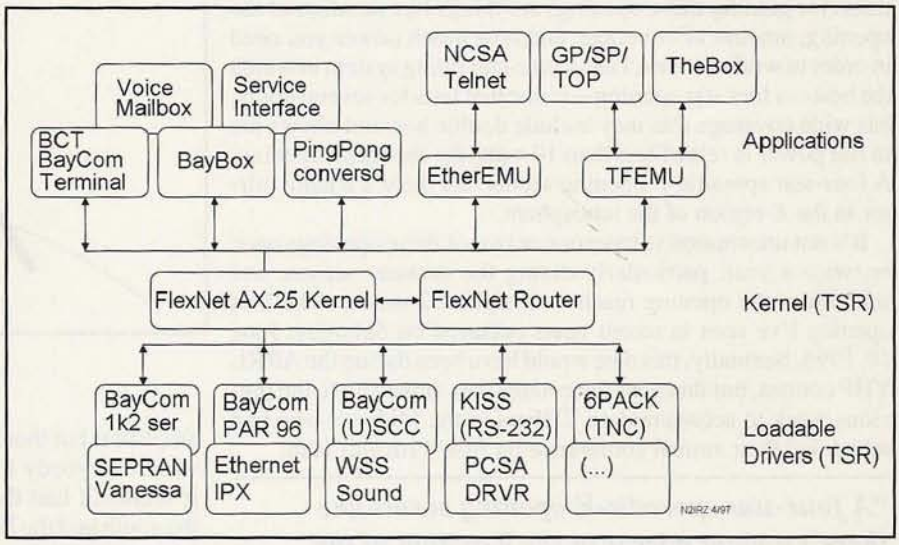


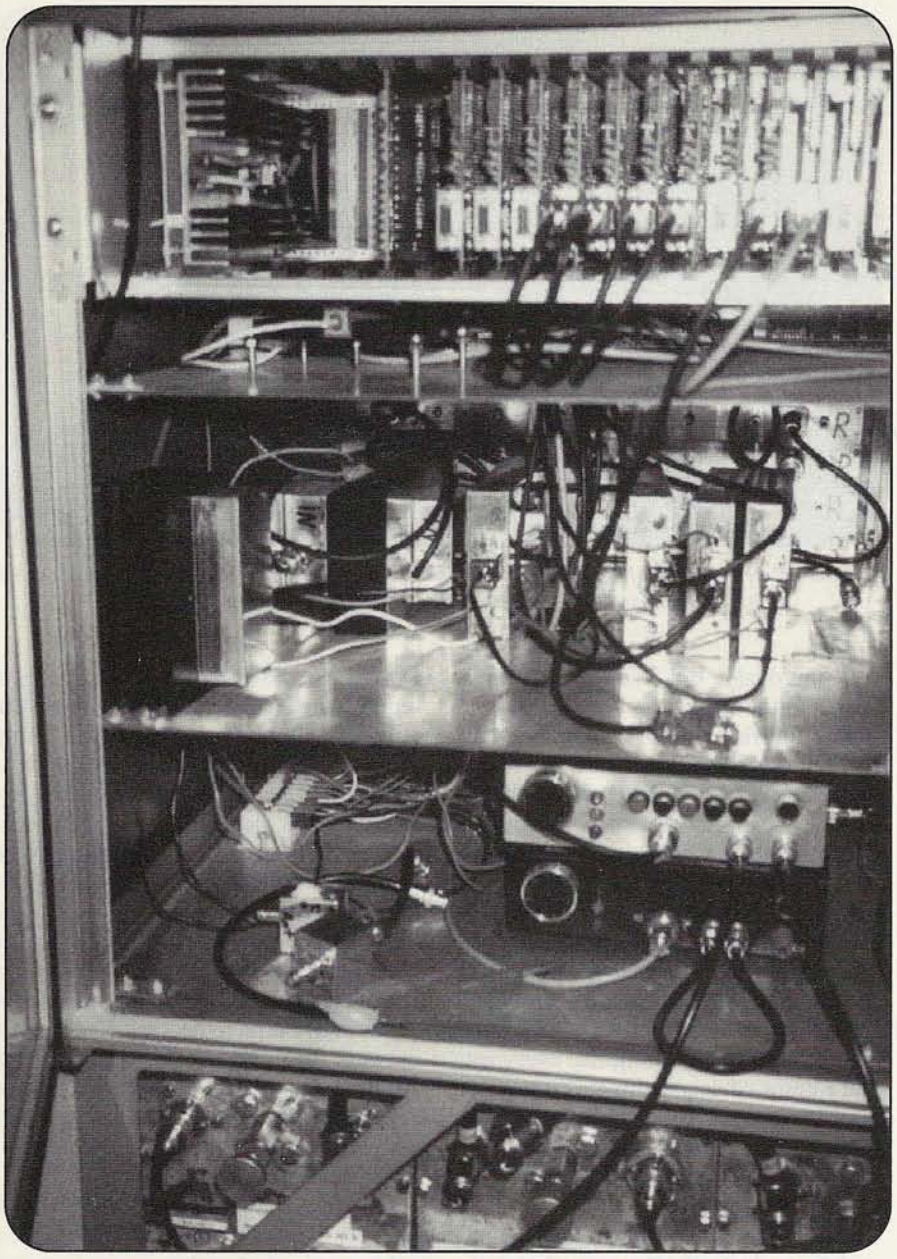
Figure. The FlexNet modular architecture. The main kernel sits in the middle, with the optional network module. Above it are the various application modules, and below it are the channel drivers. Although many applications and drivers are shown, you only load what you need.

Making It Modular

The most important concept in FlexNet is the software's modularity. There is a main *Kernel* program which does most of the work. Hanging off this central kernel is a *Network module*, which takes care of the routing and other network stuff. Beneath the kernel you load whichever *Channel Driver* modules you need, and above the kernel you load the *Application* modules you'd like.

For a typical user, you would load in the kernel, then a channel driver for a TNC, or maybe a BayCom modem, for

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



A typical RMNC/FlexNet node setup (DBØME in this case). At the top, you see the card cage with the RMNC cards installed, one for each channel. Below are the radios—about a half-dozen DF9IC high-speed full-duplex link radios for 1.2 GHz, below them are the user port radios on 70 centimeters, and at the bottom are some duplexers. (Photo courtesy of ADACOM eV)

the RF side. You'd then load an application, such as a terminal program, for the user interface. Running FlexNet on your user station offers a number of powerful features, such as the wide variety of channel drivers and adaptive parameters for the radio channel.

On the other hand, you don't need to have FlexNet running on your home station in order to access a FlexNet node. A regular TNC and terminal or hostmode program will work just fine. In other words, users don't have to do anything differently, but they *do* have the option of making everything work a lot better. In this case, you would basically interact with the FlexNet module running on your own computer, instead of the module running at the local node site. For a node site, you'd also load the network module, but this isn't necessary at home.

They Call Me Channel Driver...

The power of this modular architecture is that you can write your own channel drivers if you like, just in case one doesn't exist for whatever you're working with. The source code for every channel driver, as well as a Developer's Kit (including documentation on the API), is available for download. Even though a driver exists for nearly every kind of channel hardware (TNC or modem) you might be running, it's nice to know that you can adapt the system to your specific needs.

"For a typical user, you would load in the kernel, then a channel driver for a TNC, or maybe a BayCom modem, for the RF side. You'd then load an application, such as a terminal program, for the user interface."

Some of the more common channel drivers are for the TNC-2 and clones, for 1200- and 9600-baud BayCom modems, an RS-232 driver for linking computers locally, a number of Ethernet drivers, TCP/IP stacks, a driver that lets you use your SoundBlaster card as a modem, as well as ones for the BayCom SCC cards and a few DSP cards (such as the DSP Starter Kit available from Texas Instruments). There's something for everyone in the driver collection.

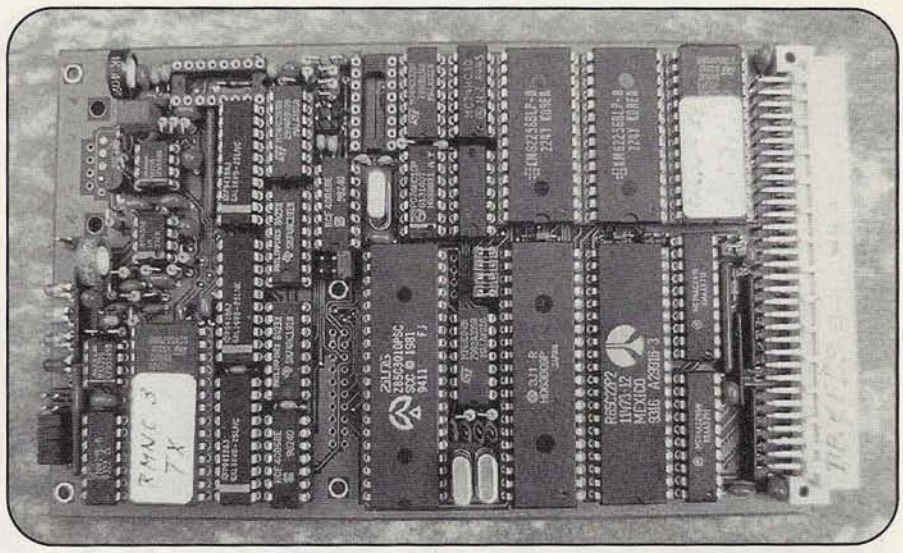
There are also a number of applications available. These include a Firmware emulator which allows nearly any "regular" application (such as a BBS, terminal, or hostmode program) to speak directly with FlexNet, a Chat Node, an Ethernet emulator, a Remote Terminal which allows complete control over a computer through the network, even a TCP/IP stack for Windows 95. There are even a few popular (in Europe) hostmode programs available, such as the BayCom Terminal program. Again, the system can be interfaced directly with nearly anything, and, for the exceptions, there's a Developer's Kit.

So far, we've discussed only the PC version of FlexNet. The *RMNC version* is virtually identical, but the channel drivers are somewhat limited to what the RMNC (Rhein-Main Network Controller) hardware supports: a 1200-baud modem, a G3RUH-type (multi-rate, speed selected with software) modem, and an RS-232 driver (which is used with other hardware for, say, an Ethernet interface).

A node site using the RMNC hardware is generally less expensive to implement, and more robust than a PC, however this

has a few drawbacks for us: The hardware is available only in Germany (though they'll ship overseas), it is available only as a kit, and the kit's documentation is available only in German. Because of this, I won't mention the RMNC version again, but there is plenty of documentation on the FlexNet Web site. For those who demand even more flexibility, there's even a version being implemented for Linux. There's no timetable for its completion, but I'm assured that they're still working on it.

Of necessity, this only covers the barest minimum to explain what's available. Visit the FlexNet Web site for more info. I also hope to post some information, such as the Sysop's manual in English, on the *CQ VHF* Web site. Let's just say that, no matter what you want to do, FlexNet can do it.



A close-up view of an RMNC card. On the left are the channel I/O connectors, and on the right is the local Bus connector. (Photo courtesy of ADACOM eV)

A Look at PC/FlexNet

For the record, all of the following concerns the PC version of FlexNet, known as PC/FlexNet.

Now let's have a look from the user's point of view. Although it seldom occurs, whenever a network changes its basic software, chaos and pandemonium often result among the users. There is often a learning curve, during which the users are frustrated in their attempts to figure out how to get where they want to go. FlexNet, true to its name, is flexible in this regard as well.

There are four basic ways to establish a connection on a FlexNet network.

The first is to simply specify the destination. The network knows how to get to every server (such as a BBS), so no further input from the user is required. If you're running FlexNet at home, just type in the callsign or alias of the server (otherwise you connect to the local user port), then type in the server's call.

The second way allows the user to establish a connection hop-by-hop. You can single-step or multi-step hop around the network, much like TheNET. The network won't allow you to create a static loop (where you pass through a certain node site more than once), but otherwise allows you the freedom to go where you like.

The third way makes use of the HEARD lists. You simply tell your local node to Find a specific callsign, and it attempts to establish a connection for you, wherever that callsign was last heard in the network. This type of connect request takes a little longer than others, obviously, but it is an extremely powerful tool.

The fourth method is to specify the destination callsign and the node and port (RF channel) on which it is reachable. The network might not know where your friend's station is located, but if you do, then you can save the time of a Find command and specify the node he's reachable from and his callsign. Of course, the network already knows how to get to the specified node!

These four basic methods, used alone and in combination, comprise every way that I know of establishing a connection in any network I've ever used. Users don't need to learn anything new—existing methods might not be optimal, but they'll work just fine!

Users may also interact extensively with the node itself. Of course, there's the usual **Users** and **Heard** lists, **Info** text, **Help** file, and node/network parameters and statistics, although there's a lot more data in the **Parms** and **Stats** displays. There's also a **Current Information/ Status** text display, the **Connect** and **Find** commands, **Route** and **Link** information, a **Destinations** table showing all known destinations, a whole array of remote sysop commands, and even the possibility (in the RMNC version) of reading the status of up to 16 binary input/ output lines.

Connecting via FlexNet

There are four possible phases for any given connection or QSO: Link setup, Information transfer, Link failure, and Disconnect. After a user sends a connect request, the local node acknowledges the request with the message "Link being setup." The **Connect** (SABM) frame is routed through the network without any ACKs, much like a UI frame. If the destination station responds, the user sees the message "*****Connected to <call>**". If unsuccessful, the user sees a message "*****failure with <call>**" (or some other appropriate message, such as "*****busy from <call>**"). Although it's possible for the SABM frame to become "lost" in the network (because there's no hop-by-hop ACK in this phase), this rarely occurs, and, if it does, the user's station will simply generate another until success or failure is determined.

Once the connection is established, all packets sent across the network are acknowledged at each network hop, and all packets follow the same exact path. The packets are therefore protected against loss at each step, and retries for whatever reason are only on a single link, not the entire path. Also, once the connection is established, the network becomes completely transparent to the data—each frame passes through the network completely unchanged. Thus, data with other PIDs (Protocol IDs), such as TCP/IP, are carried through the network without any problems.

If, during the Information transfer phase, the path is broken for some reason, the end nodes report the failure to both stations with a "**Link Failure**" message, and the session is disconnected. The link failure message also reports which link had the failure.

At the end of a session, when one station disconnects, it is ACKd directly by the local node. The node then attempts to sever the connection to the other station. If there is still data "in the pipeline" for the distant station, it is sent first, then the connection is cleared. If there was data from the distant station still in the pipeline, it is lost.

In the Information Transfer phase, considerable network transfer efficiency is gained from header compression. The node compresses the AX.25 header, saving a few bytes on each packet. During a TCP/IP session (the network knows the difference), the TCP header is also compressed according to the scheme proposed by Van Jacobsen in RFC 1144, as explained in a paper in the 16th DCC *Proceedings*. The FlexNet group has also successfully tested on-the-fly data compression for all packets, but it presently isn't implemented because some of the network hardware, such as RMNC, doesn't have the CPU capacity for it.

There is so much more, as described in the papers and documentation, all adding up to superior performance and efficiency. For instance, there's what's called *Adaptive Parameters*—the network adjusts the link parameters (such as FRAck, PAClen, and so on) in real time, adjusting to the actual channel conditions. The hardware platforms permit data rates in the Megabit-per-second range. Wired, wireless, wormhole connections, even on Novell networks, are all handled with aplomb. The list goes on and on.

OK for APRS, too

Even though APRS (Automatic Position Reporting System) isn't well-known in Europe, FlexNet even works well with it: There is no problem with routing Unnumbered Information (UI) frames to a specific destination (APRS sends out UI frames, usually not routable through a network). Assigning a path like "WIDE v N2IRZ-3, WU2Z-5" will send an APRS frame addressed to WIDE out the RF port of WU2Z-5, assuming the N2IRZ-3 node (the local network port) can hear it. Naturally, FlexNet routes the UI frame to get to WU2Z-5, wherever it may be.

Next Month: Nuts 'n Bolts

Next month, we'll get into the nitty-gritty of setting up a FlexNet node, with a few examples. In the meantime, I suggest visiting the FlexNet site and poking around a little. We'll cover exactly what you'll need next month, but if you can't wait, be sure to get the Kernel (FLEXNET.EXE) and at least one channel driver and one application. That's enough for a typical user station, but if you plan on setting up a network (you should!), then you need to request a copy of the Networking module (FLEXDIGI. EXE) by e-mail.

"...the network adjusts the link parameters (such as FRAck, PAClen, and so on) in real time, adjusting to the actual channel conditions. The hardware platforms permit data rates in the Megabit-per-second range."

While the FlexNet group freely offers all this software without charge for amateur use, they ask that you please follow one simple rule: Do not distribute the networking module on your own—just pass on the e-mail address, please. More on why next month. Until then, 73

—N2IRZ

Resources

All FlexNet software is available from the FlexNet home page, <http://www.home.pages.de/~flexnet/>. For the FlexNet Networking Module, read the detailed instructions on the Download page <http://www.afthd.tu-darmstadt.de/~flexnet/downld.html>, which explains what information is required and the e-mail address to use.

Abstracts of papers presented at past ARRL/TAPR Digital Communications Conferences, along with information on ordering copies of the *Proceedings*, are available on the TAPR (Tucson Amateur Packet Radio) Web page at <http://www.tapr.org>.

The Value of VHF (and Radio Clubs)

This is the tale of two new amateurs and how VHF—and friendly hams in two different radio clubs—made a difference for one of them.

Editor's Note: This article originally appeared in the January, 1998, issue of The Microvolt, *a net newsletter in Wisconsin.*

Sometimes, we who mainly use VHF/UHF feel a little defensive around the HF folks. But for starting out in amateur radio, I think VHF is the best place to be. I'll explain why, based on my own experience and that of a friend, who left amateur radio within a year.

Jim's Quick Start

My friend, Jim (a fictitious name), studied for his amateur radio license during a lull in his life and—being quite gifted and also very musical—he immediately passed the Elements 2, 3A, 3B and 1B (13 words per minute code) exams. He claims he could have copied even faster, but the examiners ran out of time and didn't want to give him yet another code test. Right out of the gate, he began on HF with a General Class license and I, by comparison, began by first obtaining the Technician Class license. I tried the Element 1A (5 wpm) code exam, but was far from being ready.

It was a proud moment when my license arrived and then reality sank in—all the equipment I had purchased from Jim, as he left amateur radio, was for HF and I couldn't actually get on the air. I had never stopped to think about the equipment that would be necessary to operate VHF. Luckily, I did have a beautiful Drake R8 that I had used briefly for shortwave listening (SWLing), and I ruefully traded it in for a dual band VHF/UHF mobile unit.

Getting that equipment and not waiting until I had a General Class license was one of the best decisions I ever made, because it very quickly got me on the air. Just as I got the VHF/UHF equipment, a new friend, Loren, NØHYZ, stepped forward and said, "Do you want to borrow a 5/8-wave vertical I have lying around?" That's all it took and my first contact was with Bob, WBØWSE, who noticed that I was on the repeater frequency but was only using simplex. It took me another hour to figure out how to program the rig for duplex operations and then I was really up and going.

"Elmers" and a Radio Club

As I soon learned, Loren and Bob were members of the Great River Amateur Radio Club (GRARC) in Dubuque, Iowa, and as good Elmers, they soon had me using the club repeater on a regular basis and coming to the club meetings. Getting on the repeater wasn't the HF activity that I had originally anticipated, but I was on the air and members of the club were greeting me, welcoming me into their QSOs, passing on their tips and inviting me to drop by to see their radio shacks and antennas.

One evening, Donnie, NØRWR, suggested that we QSY (change frequency) to 146.55 for some simplex practice and still later, he gave me my first taste of VHF SSB (single sideband). It wasn't too long until the club members were asking me to join them for their regular Saturday morning breakfast. As you can see, I was surrounded by new friends who shared my interest in radio and who were willing to help and guide me.

"Getting that equipment and not waiting until I had a General Class license was one of the best decisions I ever made, because it very quickly got me on the air."

From Breakfast to RAGBRAI

Actually, the fun was only beginning, because I soon started participating in the club's Sunday evening 2-meter net, on which we practiced checking in and using some emergency procedures. Then there was the GRARC Hamfest, and finally, the day we drove to nearby Guttenberg, Iowa, to provide communications for the famous RAGBRAI (Register's Annual Great Bicycle Ride Across Iowa). This is an annual event during which thousands of bicyclists from all over the country use Iowa's country roads to ride from the Missouri River to the Mississippi River. And in this particular year, Guttenberg became the Mississippi terminus.

The sleepy, little rivertown of Guttenberg (population 2,275) suddenly tripled in size as the tired but happy bicyclists descended upon it. We helped the bicyclists find their support teams, their

By Colin Wheatley, KBØUPK*

*Colin Wheatley, KBØUPK, now lives in Madison, Wisconsin. He's an executive editor at WCB/McGraw-Hill and publishes college textbooks on medical topics.

loading sites, their friends, food and drink, and did a hundred other things that only could be accomplished with a good communications network of amateur radio operators. It was a great opportunity to use my newly acquired communications skills to provide community service.

After that, I was able to participate in all the fun of Field Day, putting up antennas, getting the computer to run, and assisting in making HF contacts on the air under the supervision of an Advanced Class license-holder.

Becoming an "Elmer" Myself

And then, near the end of the summer, I had the opportunity to help some members of my church earn their own Technician Class licenses so we could have emergency communications in the event of a natural disaster. With the assistance of Fred, KØMM, and Ed, WØOIC, we organized a course and six new members joined the ranks of amateur radio. Of course, we got members of the local club involved in the process by getting several of the students up on the local repeater for some real on-the-air experience. And our education chair, Carl, NØKAX, came and provided a sample test so they all went into the licensing exam knowing they could pass. It was a wonderful experience to share the excitement of amateur radio and what I had learned about it through VHF.

"It wasn't too long until the club members were asking me to join them for their regular Saturday morning breakfast...I was surrounded by new friends who shared my interest in radio and who were willing to help and guide me."

New Home, New Friends

Abruptly, that fall, I had to relocate to Atlanta, Georgia, for a career change and I had to leave all my friends in the Great River Amateur Radio Club. However, as I drove into Atlanta after 14 tedious hours on the road, a strange thing happened: I suddenly heard something familiar and reassuring, a repeater, this one in Kennesaw, Georgia. A "welcome to the Atlanta Area" QSO ensued and, within four days, I had identified a 2-meter net in which to participate. Shortly after that, I joined the Kennehoochee Amateur Radio Club. Well, you can probably guess the rest—I was making new friends, joining the club for breakfast, cleaning the repeater site on Sweat Mountain, being invited over for code practice, taking down a hundred-foot tower, and attending the club meetings.

But What about Jim?

Well, back to my friend Jim. Why didn't he have all this fun? Why is he out of amateur radio today? And why did he sell me his HF equipment at a real bargain price? I believe it was because he started with a General Class license, began operating on HF, and never had the introduction to local hams that one gets on VHF. He made a fair number of contacts on HF and was even well along with his WAS (Worked All States) Award, but even at

A Potential Dropout Saved

Editor's Note: Colin's article has already had a positive effect on at least one ham who was thinking about quitting the hobby. KBØUPK forwarded us this e-mail message he received after the article first appeared in a local newsletter (we've dropped the writer's name to protect his privacy).

Hi,

I've been meaning to write and tell you that you contributed a great article in the January issue of *Microvolt*.

I am very new to the hobby, as I got my Novice license in November and my Tech Plus in December of 1997. I bought an HF radio and had great dreams of heading out into the distant countries. But problems with the radio I purchased, Morse code and lack of time and activity on 10-meter SSB has caused me to rethink my desire to get involved with the hobby.

Then I read your article and it helped me to focus my direction in the hobby. I was heading in the direction of "Jim" and could see this HF radio collecting dust. So I joined a local ham club and learned a little more about repeater operation. Then I bought a mobile 2-meter radio. I installed it in the car and have had fun ever since.

The club members have helped me and have shown me how to operate on the repeater. Now, I look forward to my 30 minute drive to work and back. I listen and talk and make new friends over the radio. It is really great fun and I hope to get involved in the activities of the club when the weather gets warmer.

So, thanks a lot! You have saved me from being disenchanted with ham radio and have given me a new exciting direction. I will still continue to work HF and perfect my Morse code to try and get my General Class license. But I will go slowly.

My wife and many of my friends can't figure out what is so exciting about ham radio. I think it is great to make contacts and develop friendships over the radio. Also, I'm interested in emergency preparation and hope to get involved more in area preparedness. I only need to figure out how to add 4 to 6 more hours to each day!

Looking Ahead in

CQ VHF Ham Radio Above 50 MHz

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

- "Search & Rescue 'Boot Camp'," by Sam Vigil, WA6NGH
- "A Repeater-Internet Interface," by John Hansen, W2FS
- "Setting a Rover Record," by Tim Marek, K7XC

Plus...

- two *CQ VHF* Reviews:
  - -"Kenwood TH-G71 Dual-band Handheld," by Rich Moseson, W2VU
  - -"Cherokee AH-50 6-Meter Handheld," by Heather Hampton, KE6HEY

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 send a written request along with an SASE (self-addressed stamped envelope) to *CQ VHF* Writers' Guidelines, 25 Newbridge Rd., Hicksville, NY 11801.

13+ wpm, he found the going a bit slow and he began to tire of pounding the key. And as he explained to me, the foreign QSOs (CW or SSB), usually amounted to a quick exchange of callsigns, QTHs, RSTs, etc., and then the other party was on to making other contacts.

Jim wanted camaraderie and conversation, and he wasn't finding them fast enough. He actually did join the local club and got to know some of the members, but making new acquaintances was slow since he saw the club members only once a month and didn't have daily chats with them on the local repeater. HF contacts were too infrequent and sporadic. Soon he naturally lost interest. By the time I got my license, he had given up finding friends and conversations in amateur radio and had put his equipment up for sale. He had discovered that he could use the Internet, "quite well, thank you," for finding what he wanted.

People get into amateur radio for a multitude of reasons and not everyone is looking for friends, conversations and opportunities for service. But personally speaking, VHF was a great way to be inducted into the hobby. And don't misunderstand me, I'm not against HF; as a matter of fact, I'm still committed to upgrading so I can use my HF equipment. But VHF will always remain an important part of my radio activities.

I wonder what would have happened to Jim if he had started on VHF instead of HF? He'd probably still be active...but then I wouldn't have all that bargain-priced HF equipment, would I?

Tips for Successful Hamming

My tips for having fun, getting involved and making friends in amateur radio:

- Get some VHF/UHF equipment and begin making acquaintances over a local repeater.
- Join a good club.
- Don't be bashful; just ask for help and advice.
- Volunteer to help with the club activities and serve on a committee.
- Don't just hang out on the local repeater, but begin exploring all the other things one can do with VHF.
- If operating on HF is your goal, use what you learn on VHF to springboard to it.
- Get involved with teaching someone else about ham radio.

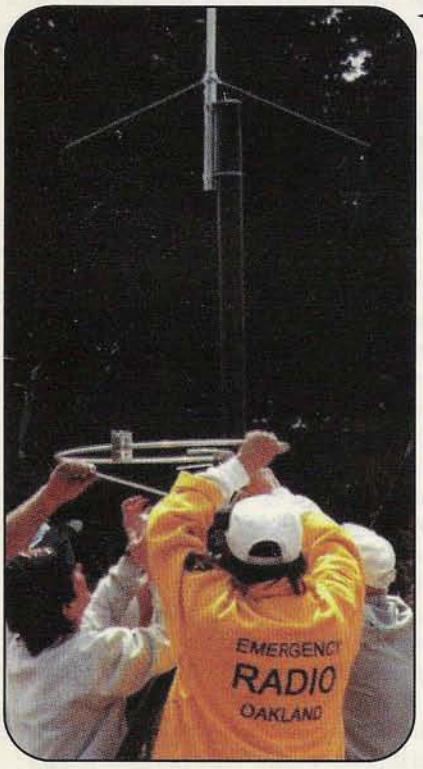
This article is dedicated to my great friends and Elmers in the Great River ARC and the Kennehoochee ARC. You and VHF made the difference. ■

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.*

Picture This! "Phun Photos"

No, this van is not parked next to a huge tower—the tower goes wherever the van goes! That's the Tallahassee (Florida) Amateur Radio Society's Emergency Communications First Response Unit, and it's ready whenever it's needed during communications emergencies. As you can see in the close-up view below, the tower collapses and folds over onto the van roof for travel. In this case, the TARS van was set up for a demonstration at the 1998 Orando Hamcation™. (W2VU photos)



Are you including a VHF/UHF station in your club's Field Day plans? The Oakland, California, ARES (Amateur Radio Emergency Service) group put four VHF+ bands on the air last year. In this photo, they're installing the main VHF/UHF mast. The big vertical at the top is a Diamond tri-bander, covering 144, 440, and 1296 MHz. The loop that everyone seems to be twisting is for 6 meters. The group made contact on all four bands, on SSB, packet, and FM. For more on operating a VHF station on Field Day, see Ken Neubeck's article, "Operating Field Day? Don't Forget VHF!" elsewhere in this issue. (Photo by/courtesy of Ted Stewart, W6NPB)

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 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 to you, please tell us so and include an SASE (self-addressed, stamped envelope) with sufficient postage. Thanks!

The 1998 SMIRK QSO Party, June 20–21

If 6 meters is your "thing," take advantage of this 6-meter-only contest at the peak of the sporadic-E season.

The SMIRK QSO Party, sponsored by the Six Meter International Radio Klub will be held from 0000 Z June 20, 1998, through 2400 Z June 21, 1998. Contacts must be on 6 meters only, voice and/or CW. No contacts involving another band for one side of the contact count.

One need not be a SMIRK member to take part.

Logs must be postmarked no later than 1 August, 1998, and sent to:

Pat Rose W5OZI, P.O. Box 393, Junction, TX 76849

Basic Rules

No contacts between stations in the 48 contiguous U.S. states and lower tier Canada (VE1 through VE7) are allowed between 50.100 and 50.125. Only contacts with and between stations outside of these areas may take place in this band segment.

All contacts must be made by a single operator. There is no multi-operator category in this contest.

Exchange is callsign, SMIRK number, if the station worked has one, and grid.

Partial contacts, in which one of the above pieces of information are missing, do not count.

All contacts must be made via natural propagation. No contacts using repeaters, or any manmade device for relaying transmissions are allowed.

All participants must observe the rules governing Amateur Radio operation in the participant's country.

Scoring

Scoring is as follows:

One point for each completed contact.

If station worked provides a SMIRK number, multiply by 2.

In addition to the SMIRK number multiplier, the following additional multipliers apply:

For participating stations located in the 48 contiguous U.S. states and VE1 through VE7, a multiplier of 2 should be applied to all contacts made above 50.200 MHz.

For participating stations located outside of the 48 contiguous U.S. states and VE1 through VE7, a multiplier of 2 should be applied to each contact no mater where in band the contact is made.

For participating stations located in the 48 contiguous U.S. states and VE1 through VE7, a multiplier of 2 should be applied to each contact made with stations located outside of these areas no mater what part of the band the contact takes place.

A station can be worked only once for score, but contacts may be made below 50.2 for the purpose of QSYing above 50.2 to obtain the x2 multiplier.

Final score is contact points times grids worked. New log forms incorporating this scoring system are available from W5OZI at the above address.

Certificates

Certificates will be issued to the highest scoring participant submitting a valid log, in each ARRL Section, the Maritime Provinces, and each of the remaining Canadian provinces and each other DXCC country. If different from the above, a certificate will also be awarded to the highest scoring SMIRK member from each of these areas submitting a valid log.

For the purpose of this contest, a SMIRK member is anyone who has ever been issued a SMIRK number, whether or not he or she has paid dues in recent years. Of course, all 6-meter operators are encouraged to join SMIRK or renew. Renewals may be obtained by sending $6 to the above address, noting the SMIRK number. Anyone not a member may join by sending a list of six SMIRK members worked on 6 meters, along with $6, to the above address. An attempt will be made to issue a SMIRK number to each new member applying in time to fully participate in this year's SMIRK QSO Party.

SMIRK members as well as non-SMIRK members are invited to take part in this fun event. Why not give it a try?

Kitmaker Contact Info

One of the companies listed in Sam Vigil's article, "The Golden Age of Kit Building Returns," (May, '98 *CQ VHF*) provided us with their phone/fax number after our issue deadline. For those who are interested, here's the complete information for EleCraft, maker of the K2 SSB kit:

EleCraft, Inc., 434 Vista Del Mar Dr., Aptos, CA 95003; Phone/Fax: (408) 662-8345; e-mail: <radios@elecraft.com>; Internet: <http://www.elecraft.com>.

Packet Bulletin Boards—Ham Radio's "General Store"

Basics

Today's digital communications networks—including ham radio packet networks—fall under the buzz phrase of the "information highway."

The reason you get onto a highway, any sort of highway, is to go somewhere. Usually, on a real highway, we have a specific destination in mind before we ever leave home. It's not much different on packet. Most of us turn on our packet stations to make contact with another specific station. In many cases, that station is our local *PBBS*, or *Packet Bulletin Board System*.

Since we're using a travel analogy, let's think of our PBBS as a small-town general store. In many towns, the general store is a combination post office, newsstand, and gossip center. If you want to find out what's happening, you stop by the general store.

On the ham bands, you can "stop by" your PBBS to pick up your mail, send off a note to a friend across the country or across the ocean, find out the latest ham radio news, and see if anybody knows where you can find that elusive piece of gear you're looking for. See the similarities?

In many ways, ham radio's general store is better than a real one. It's open 24 hours a day, seven days a week, you don't have to leave home to get there, and all the local stores are hooked together in a global network that automatically forwards messages and bulletins around the corner or around the world.

Using a PBBS

Let's take a look at how you connect to a packet bulletin board and what you can expect to find there. Like other specialized packet stations, most bulletin boards are either identified by a ham radio callsign followed by a dash and one or two numbers, or by an *alias* that generally includes the letters BBS (for example, the WA2SNA BBS in northern New Jersey uses the alias "BBSNNJ").

There are several different types of bulletin board software and each one is a little different. But they all have some features in common. When you log on for the first time (by typing "C," a space, the callsign or alias of the BBS, and pressing "enter"), you'll get a "new user" screen that asks a few questions, such as your name, location, and "home" BBS.

That last one's important. Your "home" BBS is where you want to receive your packet mail. Generally, it's the board you check into most frequently. If you check into a different board sometime, don't worry—you won't insult it by telling it you "live" someplace else. But you will let that system do two things: First, on some systems, any messages you send out from the board you're "visiting" will direct the receiving station to reply to your "home" BBS. And second, if a message coming to you without a full address happens to reach this bulletin board, it will automatically forward it to your correct "home address." *Please*...have just one "home" BBS.

Once a bulletin board "knows" who you are, it'll let you see what's there. The basic command for "listing" messages is "L." Just press "L" and "Return" or "Enter." The board will send you a list of all bulletins plus personal messages to or from you that have been posted since your last check-in. If this is your first, prepare for a long list. If you only want to see your mail, type "LM." It means "List Mine."

What Does It Mean?

On a typical listing of messages, each line represents one message. The information you'll see includes the message number, the type of message (is it "P" for personal or "B" for bulletin?), and a status code ("Y" or "N" to indicate whether it's been read), its size in bytes, the message address, including callsign and destination, plus the return address, the date and time the message arrived on this BBS, and a brief description of what it's about.

To read a message, type "R," space, and the message number. You can string together several numbers to read a group of messages with just one request. After you've read a message addressed to you, it's a good idea to delete it by typing "K" for kill, followed by the message number and a "return."

Sending a Message

To send a message, the basic command is "S." For a personal message to another ham, type "SP," space, that ham's callsign, and, if he or she is at a different bulletin board, the "@" sign, followed by the call of the destination BBS. Don't include the dash and SSID number, but it is good practice to provide routing information—basically a two-letter state abbreviation, the country and the continent, each separated by a period. A typical address would be <W2VU @WA2SNA.# FN21.NJ.US.NA>. This would tell

Checking into your local packet bulletin board will let you send and receive mail, get the latest ham news, see what other hams want to buy and sell, and even download files and computer programs. This is Tom Klimala, KM4LB, of Raleigh, North Carolina, at his packet terminal.

any forwarding station that the message is heading—in reverse order—to North America, the United States, New Jersey, Grid Square FN21 (different systems use different regional identifiers), and finally, the WA2SNA bulletin board. WA2SNA will hold the message for W2VU until he checks in, and then will list it as a waiting message.

After you tell the BBS you want to send a message and who you want to send it to, it will ask you for a short description, then tell you to type the message. When you're finished, type "CONTROL-Z" or "/EX" on a separate line. Your message will now be automatically forwarded by the BBS to its destination.

Sending a Bulletin

Sending a bulletin is pretty much the same, except that you type "SB" instead of "SP" and the address generally isn't a callsign. It's either "All" or some descriptive name, such as "Info." "Info@ USBBS" will send your information request to all packet bulletin boards in the U.S.

Please think carefully before you distribute a message widely; for instance, do you *really* need to send this to the whole country? And try to avoid "ALL@ALLBBS," or "ALL@WW," world-wide, unless it's truly important for hams everywhere to see your message. If it isn't, then your message just becomes clutter on the airwaves.

Files and Programs

Most bulletin boards also include file sections which contain either computer programs or long text files which you may download. One example is a file which will give you schedules and beam headings for working amateur satellites. You may also be able to download a public-domain program for tracking those satellites. Procedures vary on different systems, so check the help screen of your BBS or ask the *sysop* (system operator) how to access and download files on your system.

Handling Traffic

You can't travel on any sort of highway without seeing other traffic. In ham radio, the term *traffic* usually refers to radiogram messages sent via the American Radio Relay League's "National Traffic System." Many BBSs forward ARRL message traffic (generally addressed to "XXXXX@NTSzz," where the Xs are a Zip Code and the "z"s are a state abbreviation. A radiogram going to Hicksville, New York, for example, would be addressed to <11801@NTSNY>. There's a whole separate procedure for handling ARRL messages. We won't cover them here except to say that, if you see a message for someone local to you, feel free to pick it up (read it) and deliver it (generally by phone). If you do, be sure to then "kill" the message (using the procedure outlined above) so it's not picked up and delivered a second time by a second ham. To find out about traffic-handling, check into a local VHF voice net on a repeater, or contact your ARRL Section Manager.

Exit Ramp

When you've gotten your mail, checked the latest news, and maybe picked up a new program for your computer, it's time to leave "Ham Radio's General Store." That's the easiest command of all. Simply type "B" or "Bye" and press "return." The BBS and your TNC will do the rest. ■

The 6-Meter DX Windows

Six meters is unique among VHF/UHF bands in that it can regularly support long-distance (DX) contacts without help from satellites or the moon. To hold down interference between U.S. and foreign (DX) stations, certain frequencies have been set aside informally as "DX windows."

For DXers Only

You should avoid these frequencies for domestic contacts, including those between stations in the mainland U.S. and the southern tier of Canadian provinces. (From a U.S./Canadian perspective, Alaska and Hawaii, Canada's northern provinces, the Caribbean, and Mexico, are all considered DX.) On the other hand, if you want to work DX, the DX windows are the place to look for foreign stations calling CQ.

The main 6-meter DX window goes from 50.100–10.125 MHz, with a calling frequency at 50.110 MHz. (Note: There's a proposal to expand this DX window up to 50.200 MHz to accommodate the rapid growth of 6 meters in Europe and Africa, but for now, it's only a proposal).

In addition, there's a Pacific DX window from 51.000–51.100 MHz for stations in Asian countries which don't permit amateur operation below 51 MHz. West coast stations should listen for DX here and should keep these frequencies clear of domestic QSOs.

Calling, Not Chatting

If you call CQ on 50.110 looking for DX—or answer a DX station calling CQ there—please remember to move off of the calling frequency (QSY) for your contacts. Be courteous and clear the calling frequency. And don't forget to listen for DX stations throughout the DX window. If the band is active and you leave your dial set on the calling frequency, you might miss out on some great DX!

Hamfest Calendar

(from page 11)

+600 MHz or 146.520 simplex. For information, contact Bob, VE6BLD, 5540 54th Ave., Lacombe, Alberta, Canada T4L 1L6; or call (403) 782-3438 evenings; Packet: <VE6BLD@VE6RDR. AB. CA>; e-mail: < kingel@telusplanet.net>.

June 20, "98 Hamfest," Columbia Park, **Dunellen, NJ**. Talk-in: 146.625 (r), 447.250(r) tone 141.3, 146.520(s). For information, contact Bob Pearson, WB2CVL, at (908) 846-2056; Packet: <R W P E A R S O N - W B 2 C V L @ WORLDNET.ATT.NET>.

June 20, **Bluefield Hamfest**, Brushfork Armory, **Bluefield, WV**. Talk-in: 145.49 (BR549). For information, send SASE to Bluefield Hamfest, 412 Ridgeway Dr., Bluefield, VA 24605-1630, or call Don Williams, WA4K, at (540) 326-3338; e-mail: <wa4k@amsat.org>; Internet: <http://www.inetone.net/erarc/hamfest/>. (exams)

June 20, 1998 Hamfest & Computer FleaMarket, Marmora Area Curling Club, Crawford Dr., **Marmora Ontario**. Talk-in: VE3KFR repeater, 145.330 MHz -600 kHz. For information, contact Pete, VA3PGB (613) 473-1171 or Paul, VE3UUM, (613) 472-3449; e-mail: <rhobson@blvl.igs.net>; WWW: <www.redden.on.ca/~tcarc/tricnty.htm>; packet: Paul, VE3UUM, <ve3uum@ve3hqr.#econ.on.can.na>.

June 20, **Hamfest**, Gerstacker Fair Center, Midland County Fairgrounds, **Midland, MI**. Talk-in: W8KEA, 147.000+ MHz. For information, contact MARC Hamfest, P.O. Box 1049, Midland, MI 48641, or call Jeff W8CQ (w) (517) 636-0643, (h) (517) 839-9371; e-mail: <w8cq@bytethis.com>. (exams)

June 21, **Hamfest**, Monroe County Fairgrounds, **Monroe, MI**. For information, call Fred VanDaele, KA8EBI, at (313) 242-9487 after 5 p.m..

June 21, **Annual "Dad's Day" Hamfest**, Lake County Fairgrounds, **Crown Point, IN**. Talk-in: 147.00, 146.52 & 442.075. For information, contact Malcom Lunsford, W9MAL, 6721 Harrison Ct., Merrillville, IN 46410-3323, or call (219) 769-3925; e-mail: <w9mal@cris.com>. (exams)

June 21, Tailgate Electronics/Computer/Amateur Radio Flea Market, Albany & Main Street, **Cambridge, MA**. Talk-in: 146.52 & 449.725 / 444.725 pl 2A-W1XM/R. For information, call (617) 253-3776.

What'cha Up To?

Share your VHF/UHF adventures with your fellow *CQ VHF* readers! Our "Club Spotlight," "Picture This!" and "Reader Snapshot " features are designed to showcase you, our readers, and what you're doing on the air. We know that lots of you are doing great things! Don't keep them secret! Here's a closer look at each one:

"Club Spotlight" is just what it sounds like—spotlighting successful radio clubs and their VHF-related activities. Tell us about your club, the special things it does, and why you're proud to be a member. Send a photo if you've got one.

"Picture This!" is our department of "Phun Photos." If you've got a cool picture of yourself or others, doing something "VHFical," but not enough to wrap a whole article around it, send it into "Picture This!" along with a brief explanation of what's going on in the photo(s).

"Reader Snapshot" is all about you and your fellow readers. Submissions should include a photo of you at your operating position or engaged in some VHF/UHF ham radio activity, plus a brief introduction and any necessary explanation of what we're seeing in the photo.

General info: No, we don't pay cash money if we publish your submission. But we will give you (or your club) a free one-year subscription (or extension) to *CQ VHF* if we print your "Reader Snapshot" or "Club Spotlight." All we can offer for "Picture This!" submissions is your 10 minutes of fame.

Photos should be color glossy prints, snapshot size or larger. Please DO NOT write on the pictures, front or back, with a ballpoint pen. And don't use paper clips on photos. Your best bet is to write caption information plus your name, call, and address on a self-stick label, and stick it on the back of the photo once you're sure the ink is dry. Or, write caption info on your computer, print it out and either tape the photo to the sheet (don't put tape on the front of the photo) or cut out the caption and tape it underneath the photo (again, taping to the back of the photo).

Electronic photos in .BMP, .GIF, .JPG, .PCX, or .TIF formats are also acceptable. E-mail electronic photos and a separate caption/text file to <CQVHF@aol.com>.

Otherwise, mail your submissions to the appropriate department at *CQ VHF*, 25 Newbridge Rd., Hicksville, NY 11801. Let's hear what you're up to!

CQ VHF Ham Link

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).

All 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 also 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

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>; WWW: <http://www.geocities.com/Heartland/Ranch/4881>. For more information, contact Robert Cruz, KE4MCL, President, <react4881@juno.com>.

IL, Logan Area Amateur Radio Club, Logan County, IL: 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, (217) 735-2506; <KB9JSE@ccaonline.com>.

PA, Lambda Amateur Radio Club (LARC), Philadelphia, PA: 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@netquest.com>.

TN, Cleveland Amateur Radio Club: Meetings held every 2nd and 4th Tuesday of the month (except December) at the C.A.R.C. Clubhouse, 560 Johnson Blvd., Cleveland, TN, at 7:00 p.m. EST, and at 7:30 p.m. EDT. C.A.R.C. 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/Silicon Valley/ Lab/1660>.

ONT, Canada, Muskoka Amateur Radio Club, Huntsville, ONT. Meets at Huntsville Hospital Board Room at 2:00 p.m. on second Sunday of each month. Visitors welcome. Net at 7:00 p.m. Monday on 146.775. Muskoka Amateur Radio Club, VE3MZY, 437 Aspdin Road, Huntsville, ONT, P1H 1Y4, Canada.

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 Third Tuesday of month at 7 p.m., West Regional Library, 2224 West 51st Street, Tulsa, OK. Breakfast Meeting, First Saturday of month at 8:00 a.m., Ollie's Restaurant, 4070 Southwest Blvd., Tulsa. For more information, call, (918) 446-6451, Vince Moore, N5RFW, Public Service Liaison Officer.

CO, Bicycle Mobile Hams of America: A national non-profit club of bicyclists who use VHF ham radios for emergencies, lost riders, route information, chatting, etc. 450 members in 46 states, 6 countries. Annual Forum at Ham-Vention. 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.

OH, The Firelands Amateur Repeater Association (FARA): An association of amateur radio operators and their families in North Central Ohio, dedicated to the operation and maintenance of a repeater system south of Berlin Heights. We meet monthly on 4th Tuesday at the Erie County Services Cntr., 2900 Columbus Ave., Sandusky at 7:00 p.m. in the basement cafeteria. For more info, write to 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>.

Exam Sessions

IL, Lincoln (L.A.A.R.C): Our club 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, (217) 732-6323. Exam fee, $6.39.

IL, Chicago: Ham testing session first 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 in Chicago, just 4 blocks from Midway Airport, first 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: <www.megsinet.com/dsladek>; e-mail:<dsladek @megsinet.net>.

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 no required.

Personal Web Site Listings

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.

Jim Bridge, KQ6BS, URL: <http://www.qsl.net/kq6bs>. Specialty: weak signal.

Commercial Web Site Listings

Woodhouse Communication: Antennas and publications for weather satellite imaging: <www.view2earth.com>.

Teletec: manufactures 6, 2, 1 1/4 meter and 70 cm Linear Amplifiers as well as Receive Pre-Amplifiers. <http://www.Teletec-usa.com>.

MS-Windows Software: RAC Callbook CD-ROM, Ultimeter Weather Stations and more, info <n2ckh@cybercomm.net>, <www.QTH.com/n2ckh.bytewise.org>.

Looking for "Looking Ahead?" Look back—it's on page 78.

Advertisers' Index

EARTH STATION FT-847

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"Compact, too-- great for our next 'rover' operation."

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Seeing is Transceiving

Portable SSTV is here! Kenwood's new VC-H1 Visual Communicator combines an image-scan converter, CCD camera and LCD monitor in a compact battery-operated unit. Simply hook it up to your Kenwood transceiver to start sending and receiving color images over the air.

VC-H1 Visual Communicator

◗ Ideal for outdoor SSTV

Until now, for anyone interested in SSTV (slow-scan television), portability has not been an option. But thanks to component miniaturization the VC-H1 is not only small enough for handheld use but it runs off 4 AA batteries so you can take it anywhere. This makes it ideal for field days, special events, disaster communications and even fishing trips.

◗ Full compatibility

The VC-H1 can be connected to any transceiver with just a cable, and it offers full compatibility with all of the standard SSTV formats. Uploads/downloads are quick and easy; the images are also sharp and clear.

◗ All-in-one design

In addition to the detachable 1/4-inch CCD camera, the VC-H1 features a 1.8-inch color TFT (thin film transistor)-type display. As well as viewing incoming pictures, you can review your own prior to transmission. The built-in microphone & speaker can be used in place of a separate speaker-microphone for your transceiver.

◗ Image memory

Up to 10 pictures can be stored in memory. This allows you to compare and pick the best shot to send. You can also store incoming pictures and protect them from unintentional deletion.

◗ Computer connectivity

One of the great features of the VC-H1 is the ability to work with a personal computer. Hook it up to the RS-232C port on your laptop using the optional connection kit (includes Microsoft® Windows® 95 software) and you can save pictures (in JPEG format) that you send and receive. You can then cut and paste using standard graphics software, or even superimpose your own text. What's more, you can actually control the VC-H1 from your computer.

◗ Call sign superimpose

◗ AF mute

◗ Auto power-off

SPECIFICATIONS

• Terminals : Data I/O (for transceiver), Video in, Video out, COM (for computer),DC IN (4.8 ~ 7.0V) • Dimensions, projections not included (WxHxD): 2-5/8 x 1-3/8 x 6-3/4 in (62 x 30 x 160 mm)

Specifications are subject to change without notice.
Screen-shot photographs are simulated.
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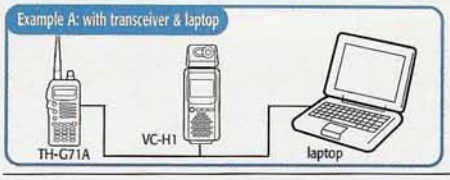

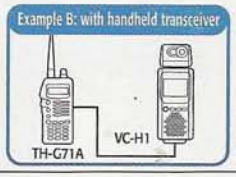

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