ICD 08237

CQ VHF Ham Radio Above 50 MHz

June 1997

Contest Special!

- A Tale of Two Rovers
- New Contest Proposals
- Annual VHF Contest Calendar

Plus...

- First Look: Kenwood's "New Ham" Handheld
- A Packet Network that Works!
- The APRS/SKYWARN Connection
- Projects: Build a 2-Meter Notch Filter & a Remote Field Strength Meter

On the Cover: Tim Marek, K7XC, and Dave Eubanks, W7KK, set up their VHF contest station atop Booker Mountain, Nevada. Details on page 31.

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- 1750 burst

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C288A

C188A 2 Meters The Slim-Line HT

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- 5W at 12VDC
- 40+ memories (or optional 200+memories with snap-in chip)
- 115-174MHz extended receive (including AM air band)
- CTCSS Encode/Decode
- DTMF squelch with Paging
- Scanning-busy, pause or hold

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C628A 70 cm & 23 cm The Deluxe Twin-Band HT

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A27010S

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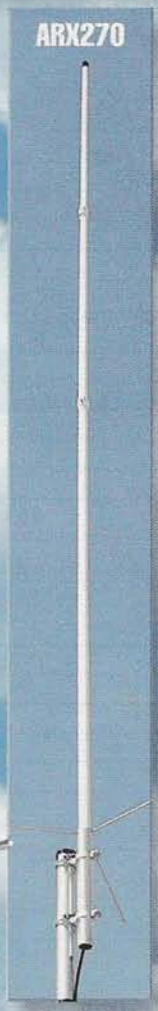
Cushcraft's full line of American made dual band antennas offers a solution for every need. The ARX270 fiberglass is an excellent choice for those demanding requirements for long-range communications or repeater applications. Now you can run your 2 meter and 70 cm repeaters into the same antenna. AR270B is designed for high performance at a moderate price and all in a package that is less than 8 feet tall. The AR270 for compact spaces provides excellent coverage and easily fits every budget. Cushcraft AR270 and AR270B feature all aluminum construction. All models have stainless steel hardware and are guaranteed to withstand winds up to 80 mph. Our CG270A "Gold" is a stylish dual band mobile which is designed for high performance and all weather durability.



MODEL	A27010S	
Frequency, MHz	144-148	430-450
No. Elements	5	5
SWR 1.2:1 Typical		
2:1 Bandwidth, MHz	≥4	≥10
Power Rating, Watts PEP	350	350
Boom Length, ft (m)	6.17 (1.9)	
Longest Element, in (cm)	40.3 (102.4)	
Turning Radius, ft (m)	6 (1.8)	
Mast Size Range, in (cm)	1.25-2 (3.2-5.1)	
Wind Load, ft^2 (m^2)	.725 (.07)	
Weight, lb (kg)	1.8 (.81)	

MODEL	AR270	AR270B	ARX270U/N
Frequency, MHz	144-148 / 430-450	144-148 / 430-450	144-148 / 430-450
SWR 1.2:1 Typical			
2:1 Bandwidth, MHz	>4 >15	>4 >15	>4 >20
Power, Watts FM	250 250	250 250	200 200
Height, ft, (m)	3.75 (1.13)	7.7 (2.3)	16.5 (5)
Mast Size Range, in	1.25-2 (3.2-5.1)	1.25-2 (3.2-5.1)	1.25-2 (3.2-5.1)
Radial Length, in (cm)	6.75 (17.1)	20 (51)	20.5 (52.1)
Wind Load, ft2 (m2)	0.27 (0.03)	0.47 (0.044)	0.95 (0.088)
Weight, lb (kg)	2 (0.9)	2.4 (1.09)	5 (2.3)
Construction style	High strength aluminum	High strength aluminum	Fiberglass enclosure

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CQ VHF Ham Radio Above 50 MHz

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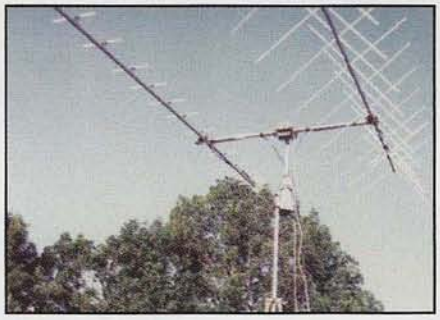

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Next Month: "Project Corner," a new column by Dave Ingram, K4TWJ!

Alinco's NEW HTs keep you in touch while you're on the go!

Alinco believes every Ham should own a dependable HT. From newest licensee to seasoned Amateur Radio veteran, you'll be impressed with the features, prices and performance. And no matter how many radios you own, no matter what brand, every Ham should have the new DJ-S11T. There's never been anything like it at the price! Check out these terrific new radios, then check the super-low prices at your favorite Alinco dealer.

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Already a "best seller," the DJ-S41T covers 425 ~ 450 MHz, has 21 memories, CTCSS encode, self-storing pivot antenna, accepts a wide range of accessories. Perfect for use with repeaters, simplex or cross-band links. At under $150, every ham in the family can own one!

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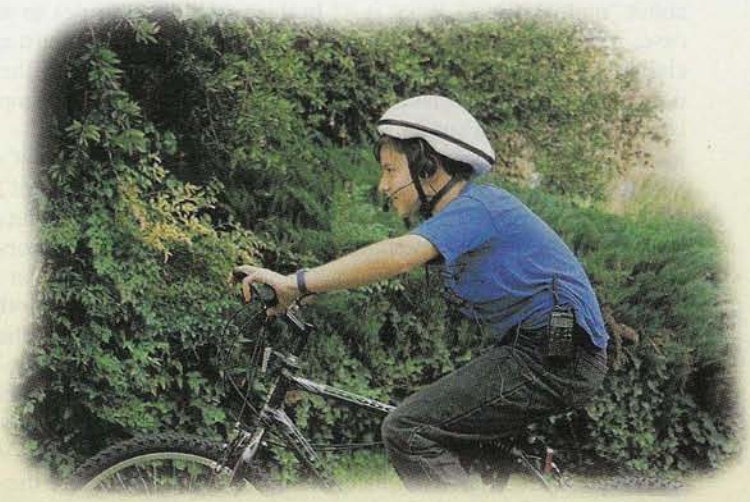

DJ-191T and DJ-190T 2 Meter HT Prices start at under $170!

If you desire a full-size HT capable of 5 watts output, look to the DJ-191T or the DJ-190T.

Available in a number of battery/power output combinations including the DJ-191TD and the DJ-190TD dry-cell pack option. Both radios have 40 memories, accept speaker/mic units, external antenna and outside power (up to 13.8 VDC direct input), have MARS/CAP capability, extended receive and many "extra" features.

Economical DJ-190 is identical to DJ-191 in most functions but comes without keypad. It's perfect for basic communications, packet or for use in APRS "tracker" units.

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Ham Radio "Multiskilling"

Being a ham encourages development of a variety of skills"—and one operating activity in particular encourages the development of skills that can be useful in other aspects of the hobby.

About year ago in this space, I wrote about contests and other types of on-air competition, and invited readers to submit suggestions for competitions that *CQ VHF* might sponsor. The response, to be kind, was underwhelming. Of the few comments we received, most were negative. Typical comments were things like, "I compete all day at work; I don't need more of it when I get home," or "I'm not into contesting; I do public service work."

More recently, I was looking through one of my wife's professional magazines when my eye was caught by an article about "multiskilling." What is it? In this case, it's about a move to replace specialists in various aspects of rehabilitation therapy with "multiskilled" generalists. So, if you had a stroke, for example, instead of being treated separately by a physical therapist, an occupational therapist, and a speech-language pathologist, each of whom was an expert in his or her chosen field, you would go to a single "multiskilled" therapist who knew a little bit about each field. Needless to say, the insurance companies love the idea. Personally, I'm not so sure.

All that aside, when I looked at the word, "multiskilling," I thought, "Gee, that's a good description of a lot of hams." While some of us are indeed experts in one or another aspect of communications technology, most of us are generalists: we all like to talk, we can build a little if we have to, fix a little if the parts aren't too small, and figure out how to get a station on the air under most circumstances. Beyond that, some specialized training is required—whether it's formal education for things like designing radios, or informal on-air training in such things as traffic-handling and emergency public service communications.

One aspect of ham radio, however, truly requires "multiskilling." Not only that, but becoming proficient in this aspect of the hobby will make you more proficient in others as well. What aspect is this? Contesting. Especially VHF contesting. And, if you think contesting doesn't fit in with your "brand" of ham radio, I hope you'll take the time to read the rest of this editorial, and then to rethink that belief.

Competition Plus...

Contesting is competition, of course. The serious players do whatever they can within the rules to make the most contacts, work the most multipliers, score the most points. But there's much more to contesting than competition. Let's take a quick look:

• *Camaraderie*—Contesters are among the closest groups of ham friends I know. It's very rare to meet a contester who *dislikes* his competitors. There are exceptions, of course, but, by and large, contesters know each other, like each other, and respect each other.

• *Traffic Handling*—The goal in traffic handling is to learn to send and receive specific written text quickly and accurately. The goal in contesting is the same: send and receive the contest "exchange" quickly and accurately.

• *Emergency Preparedness*—Ask any active emergency communicator why he or she participates in non-emergency events, such as parades and bikathons. You'll invariably be told that public service events give you critical practice in learning how to tear down your station, pack it up and put it on the air from a strange place, and how to operate in an efficient, structured manner in a less than ideal setting. Guess what? Contesting—and VHF contesting in particular—helps you develop those same skills. While many people operate contests from their home stations, the very nature of VHF encourages many *other* people to pack up and take their stations to more advantageous locations—hilltops, for example—even in January. Or they may head out as a "rovers" and set up and operate from a variety of different locations in a 48-hour period. It's also a group activity, like a public service event, that requires cooperation among the participants, either at a "multiop" station or on the air.

• *Resourcefulness*—When you're set up in a shelter after a disaster, keeping your station on the air is of paramount importance. And what do you do if the repeater goes down? Good emergency training will help you be prepared to deal with whatever comes along. So will contesting. In a contest, you learn to do whatever is needed to keep your station on the air, and, since repeater contacts aren't allowed, you learn first-hand about the alternatives, such as FM simplex, single-sideband, and CW.

• *Station design and construction*—There's nothing like a contest to test the efficiency and effectiveness of your station equipment and layout. Shortcomings stand out like a sore thumb. And when you improve them, the benefits extend beyond contesting to all of your amateur operating activities.

• *Spectrum management*—During a contest, you have a large number of people trying to operate simultaneously in a small chunk of frequency space. By and large, everyone gets through. What spectrum management lessons can you learn from listening to the operating habits of experienced contesters?

• *Fun*—The majority of people who participate in ham radio contests aren't dyed-in-the-wool "contesters." Most

(Continued on page 83)

By Rich Moseson, W2VU, Editor

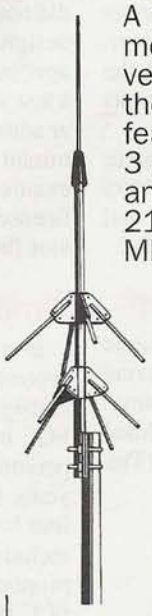
WORLD CLASS VHF ANTENNAS AND A WHOLE LOT MORE.

When you purchase an industry-leading antenna from Hy-Gain by Telex, you not only receive a product that provides exceptional performance and extraordinary reliability, you also receive a great warranty, after-sale support and knowledgeable, responsive customer service.

Highlighted here is just a sampling of innovative VHF products from Hy-Gain. For detailed information about these and many more Hy-Gain products and accessories, write, phone or FAX today.

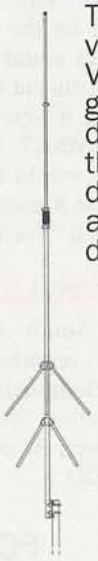
V6R

This antenna design is based on 2 collinear 5/8 wave vertical radiators and covers 51-54 MHz.



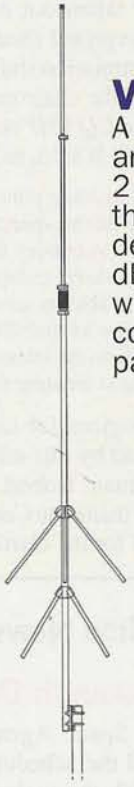
V3R

A 1 1/4 meter vertical, the V3R features a 3 dBd gain and covers 216-225 MHz.



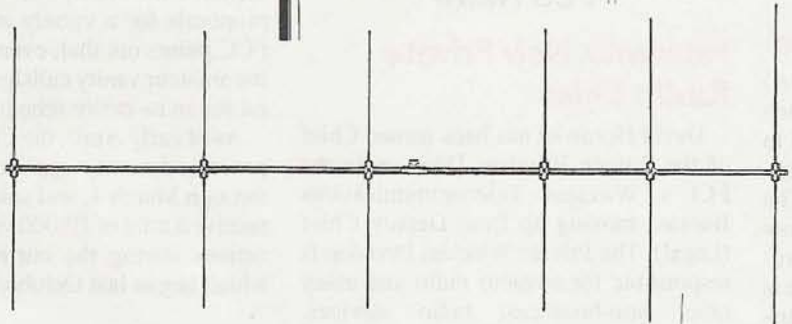
V4R

The 70 cm vertical V4R's 3 dBd gain is derived from the extended double zepp antenna design.



V2R

A rugged antenna for 2 meters, the V2R delivers 3 dBd gain with a wide coverage pattern.

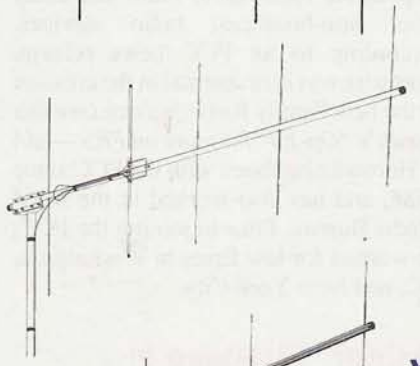


64DX, 66DX

The 4-element 64DX generates an impressive 8.2 dBd gain and the 6-element 66DX, an unprecedented 10.3 dBd.

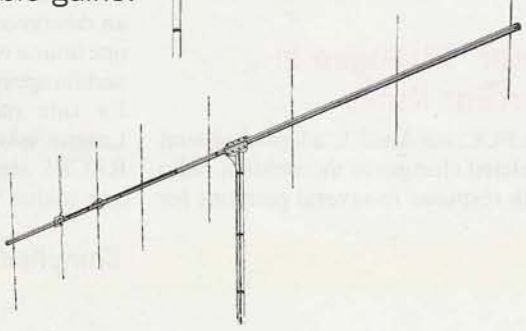
25FM

A 9.1 dBd gain antenna for 2 meters featuring Hy-Gain's exclusive Beta Match for exceptional F/B ratio and maximum obtainable gains.



28FM

This 11.8 dBd gain antenna also features Beta Match and offers unrivaled 2 meter beam performance.



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VHF News

Clarification and Update

In April's "VHF News," we reported on negative comments about "amateurs" by the chairman of the President's Commission on Critical Infrastructure Support. These comments were apparently taken out of context and were misinterpreted (See "Oops," page 80). The commission staff has clarified the intent of the chairman's comments in a letter to *CQ VHF* reader Paul Ramey, WGØG/2. It said, in part:

Please allow us to allay your concerns. The word "amateur" in this speech and elsewhere was intended to convey that people without professional-level computer training are nevertheless able to master hacker techniques due to the availability of user-friendly hacker tools on the Internet. It is not in any way directed at amateur radio.

CQ VHF apologizes for any misunderstanding caused by this misinterpretation of Chairman Robert Marsh's remarks. And we thank the Commission staff and WGØG for the clarification.

Satellite News

Phase 3D Launch Delayed

The European Space Agency (ESA) has again delayed the scheduled launch date of Ariane 502, the rocket slated to carry AMSAT's "Phase 3D" international ham radio satellite into orbit. The launch, previously set for July, is now scheduled for mid-September. According to an ESA news release, extra time is needed to modify the launcher's electrical systems and software in the wake of the post-launch explosion of Ariane 501, the first Ariane 5 rocket to be launched.

AMSAT officials note that the additional delay will mean additional expenses for the P3D project. Fund-raising efforts are currently $200,000 short of their goal, so even more money will need to be raised in coming months.

MO-30 Satellite "Lost in Space"

In a second consecutive setback for Mexico's budding amateur satellite efforts, the Mexico-OSCAR-30 satellite (known before launch as UNAMSAT-2) was unable to begin operating once in orbit and has been declared lost. The AMSAT News Service (ANS) reports that Dr. Tom Clark, W3IWI, learned that the crystal oscillator in the satellite uplink receiver's first local oscillator stage never started operating, probably because of unanticipated extreme cold. "Because there was no functioning uplink," ANS reported, "battery charging parameters suitable for the unanticipated cold temperatures could not be loaded and the satellite ran out of power. Later attempts to revive it were unsuccessful."

UNAMSAT-1, Mexico's first amateur satellite, was lost just after launch in 1995 when the Russian rocket carrying it and the Israeli "Techsat" satellite exploded.

Sunsat Launch Date Set

The South African Radio League (SARL) reports in *Radio ZS* magazine that the long-delayed South African amateur satellite, "Sunsat," is now scheduled for launch in mid-August, 1997. (Tnx ZR1AEZ)

FCC News

Horowitz New Private Radio Chief

David Horowitz has been named Chief of the Private Wireless Division in the FCC's Wireless Telecommunications Bureau, moving up from Deputy Chief (Legal). The Private Wireless Division is responsible for amateur radio and many other non-broadcast radio services. According to an FCC news release, Horowitz was instrumental in the creation of the new Family Radio Service (*see this month's "Op-Ed" for more on FRS.—ed.*)

Horowitz has been with the FCC since 1988, and has also worked in the Mass Media Bureau. Prior to joining the FCC, he worked for law firms in Washington, DC, and New York City.

"Minor" Changes in Amateur Rules

The FCC, on April 1, adopted several non-related changes in the amateur radio rules in response to several petitions for rulemaking. The new rules set up a permanent procedure for getting temporary 1 x 1 callsigns for special event stations; require that clubs have at least four members (previously two) to qualify for a club callsign; allow the use of self-assigned "indicators" both before and after a station's callsign (such as packet SSIDs, portable or special event identifiers), instead of only after; and allowed—but did not require—Volunteer Examiners to designate one person as a session manager (reiterating, however, that all VEs at a test session are responsible for its proper administration). The Commission also turned down two requests, one to allow exam credit for previously-held (expired) licenses, and the other for a lifetime operator (but not station) license.

Vanity Fee Hike Proposed

In a move certain to create howls of protest from hams for whom the vanity callsign "gates" have not yet opened, the FCC has proposed increasing the fee for personalized calls from $30 every 10 years to $50. The Commission adjusts fees for various services every year, and included the vanity call increase among proposals for a variety of services. The FCC points out that, even at $5 per year, the amateur vanity callsign fee is the lowest fee in its entire schedule.

As of early April, the Commission had processed vanity applications received through March 4, and said it expected to receive a total of 10,000 vanity call applications during the current fiscal year, which began last October 1.

ARRL Requests Greater RACES Flexibility

The ARRL wants the FCC to relax operating restrictions on RACES, the Radio Amateur Civil Emergency Service. Currently, RACES stations may not communicate with non-RACES stations (with certain specific exceptions) during an emergency or drill, and are limited to one hour a week of drill time (again, with certain specific exceptions). In a petition for rule making filed in March, the League asked the Commission to allow RACES stations to communicate with any station "actively engaged in support

Compiled by the CQ VHF Staff

The Ultimate Choice in Amateur Radio

TM-261A

FM Mono Band Mobile

- 144 MHz operation
- 62 memory channels
- 6 character alpha-numerics
- DTMF memory for autopatch
- 50 watts output power
- Multi-scan capability
- Backlit microphone
- MIL-STD 810C and 810D
- Dual menu system
- Repeater reverse switch
- DTSS selective calling
- Built-in CTCSS encoder
- Wireless cloning

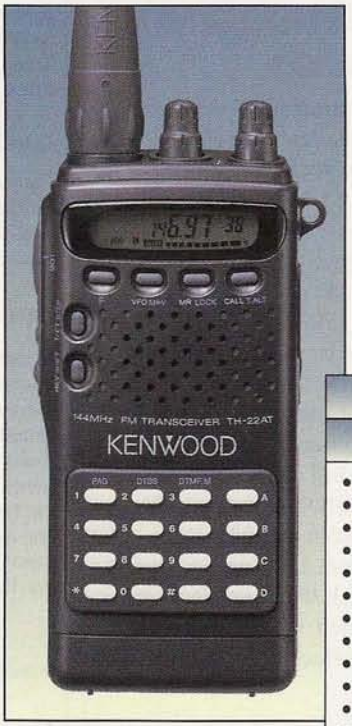
"Super! I can use alphanumeric memories to store names, call signs, and repeaters on my TM-261A."

TH-79A(D)

FM Dual Bander

- 144 MHz / 440 MHz operation
- Dual receive on 2 bands
- Dot-Matrix LCD display
- 7 character alpha-numerics
- 82 memory channels
- Operator's Guide function
- DTMF memory for autopatch
- Wireless cloning
- PC programmable
- MOS FET power module
- High performance antenna
- CTCSS encode/decode
- Remote control feature
- Airband receive

"Great! My TH-79A(D) receives on 2 bands at the same time. Comes in a 5W version too."



TH-22AT

FM Mono Bander

- 144 MHz operation
- User friendly operation
- 40 memory channels
- Compact rugged design
- DTMF memory for autopatch
- MOS FET power module
- Direct DC input
- Luminescent DTMF keypad
- Multiple scan modes
- Auto battery saver circuit
- Built-in CTCSS encoder
- Battery voltage indicator
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communications in an emergency or disaster situation," and to extend the maximum RACES drill times to five hours per week. At press time, the FCC had not acted on the proposal.

Ham Industry News

Callbook Discontinues Printed Versions

The *Radio Amateur Callbook*, a staple of ham-shack bookshelves for 75 years, will no longer be published in print form. Starting with its Spring, 1997, edition, the venerable callsign directory will be available on CD-ROM only, according to publisher Bob Hughes, who blamed declining sales of the printed books. In recent years, the *Callbook* has faced growing competition not only from CD-ROM callsign directories, but also from free online lookup services available both on packet and the Internet.

AEA Finds Buyers for Product Lines

The now-defunct Advanced Electronics Applications (AEA) has found buyers for both of its major product lines, according to former AEA Chairman Mike Lamb, N7ML. Tempo Research of Vista, California, has purchased AEA's line of antennas and antenna-related equipment, and will continue to produce all of the products under the AEA name. Lamb will also go to work for Tempo.

All other AEA products, specifically its digital communications gear, have been sold to Timewave Technology of St. Paul, Minnesota. Timewave is already well known in the amateur marketplace as a manufacturer of digital signal processing (DSP) equipment. The *ARRL Letter* reports that Timewave will retain the AEA model numbers on these products, even after it replaces AEA's name with its own, and will provide technical support and service for AEA digital gear. Timewave's phone number is (612) 452-5939; Tempo Research may be reached at (619) 598-9677.

Other Ham News

VHF Veteran Wins Dayton Honor

Long-time VHF+ operator and circuit designer Al Ward, WB5LUA, has been named recipient of the Dayton Amateur Radio Association's 1997 Technical Achievement Award. Al was recognized for his many contributions to VHF, UHF, and microwave technology.

Dayton's Amateur of the Year award for 1997 goes to World Radio Labs founder Leo Meyerson, WØGFQ, of Lincoln, Nebraska. WRL was a major player in the ham market in the years after World War II. Meyerson is 86.

And Joe Fairclough, WB2JKJ, of Sea Cliff, New York, is the winner of this year's Special Achievement award from DARA. Joe is a teacher in the New York City public schools and has been using amateur radio in his language arts curriculum for many years. (Tnx Newsline)

Ham Radio Volunteer Bill Introduced

Volunteer Examiners and members of the FCC's Amateur Auxiliary will receive special protection from lawsuits if a bill introduced by California Representative Anna Eshoo is passed by Congress and signed by the President. HR 1013, the Amateur Radio Volunteer Services Act of 1997, would give VEs and AA members the same protections as federal employees from lawsuits that result from performance of their volunteer duties, according to the ARRL.

Explaining the bill on the House floor, Representative Eshoo said, "It is simply unfair that these volunteers who are saving the government time and resources should have to risk their personal assets in carrying out their service." A similar bill had been introduced last year but did not pass.

Digital Directory Update

The North American Digital Systems Directory (NADSD), the online replacement for packet listings traditionally (but no longer) printed in the *ARRL Repeater Directory*, has grown to over 3,300 listings in more than 40 states and provinces, according to Tucson Amateur Packet Radio (TAPR) President Greg Jones, WD5IVD. TAPR is sponsoring the directory and hosting it on its Web site, <http://www.tapr.org/directory>. Additional listings are being sought, but will be accepted only from "registered providers" (of which there are over 90) to assure proper formatting.

CQ VHF Ham Radio Above 50 MHz

EDITORIAL STAFF

Richard S. Moseson, W2VU, Editor
Edith Lennon, N2ZRW, Managing Editor
Bernadette Schimmel, Editorial Assistant

CONTRIBUTING STAFF

Gordon West, WB6NOA, Sr. Contributing Editor
Bob Josuweit, WA3PZO, Public Service
Tim Marek, K7XC, Weak Signal
Peter O'Dell, WB2D, Beginner's Corner
Donald Rotolo, N2IRZ, Packet Radio
Henry Ruh, KB9FO, Amateur Television
G. Gould Smith, WA4SXM, Amateur Satellites
Donald L. Stoner, W6TNS, Theory and Upgrading

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Tracy Hayhow, Production
Pat Le Blanc, Phototypographer
Hal Keith, Illustrator
Larry Mulvehill, WB2ZPI, Staff Photographer
Joe Veras, N4QB, Special Projects Photographer

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CQ Communications, Inc.
76 North Broadway
Hicksville, NY 11801-2953 USA.

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$199

B-310-G Suggested Retail

NEW!

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

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Turn "You're breaking up . . . Can't copy" into "Solid Copy . . . Go ahead."

Talk further . . . Reach distant repeaters . . . Log onto faraway packet bulletin boards.

This rugged Mirage B-310-G amplifier operates *all modes*: FM, SSB and CW. It's perfect for *all* handhelds up to 8 watts *and* multi-mode SSB/CW/FM 2 Meter rigs.

It's great for the ICOM IC-706 -- you'll get 100 blockbuster watts on 2 Meters!

Low noise GaAsFET pre-amp

A built-in *low noise* GaAsFET receive pre-amp gives you 15 dB gain -- lets you dig out weak signals.

Fully Protected

***SWR** Protection* prevents damage from antennas whipping in the wind. *Reverse Polarity Protection* can save your amp if you connect power backwards.

Compact but Powerful

Mirage's integrated *HeatsinkCabinet™* and whisper quiet fan gets heat out fast!

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Free Accessories

Free 3 foot handheld to B-310-G coax cable -- just plug and play! ***Free*** mobile bracket! ***Free*** rubber mounting feet for home use!

Plus more . . .

Automatic RF sense Transmit/Receive switch. Remote keying jack. LEDs monitor "On Air", high SWR, pre-amp, power. Push buttons select SSB/FM, pre-amp, power. Draws 15 amps at 12-15 VDC.

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Dual Band 144/440 MHz Amp

$159.95 BD-35 Suggested Retail

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

Add this Mirage dual band amp and boost your handheld to 45 watts on 2 Meters or 35 watts on 440 MHz!

Works with all FM handhelds up to 7 watts. Power Curve chart shows typical output power.

Full Duplex Operation

Mirage's exclusive *FullDuplexAmp™* lets you talk on one band and listen on the other band at the same time -- *just like a telephone conversation!* (Requires compatible HT)

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- ***Custom wrap-around heatsink*** -- runs cool
- ***Reverse Polarity Protection*** -- saves your amp if you connect power backward
- ***Automatic RF sense Transmit/Receive switch*** -- makes operation easy
- ***Low input SWR*** -- keeps your handheld safe from overheating
- ***"On Air" LEDs*** -- for each band
- ***Free mobile mounting bracket***
- ***Free 3 foot handheld-to-BD-35 coax cable***
- ***Small size:*** just 5x1¾x5 inches
- ***Full one year MIRAGE warranty***
- ***Legendary MIRAGE ruggedness***

Call your dealer today for your best price!

35 Watts for 2 Meter HTs

B-34-G

$89.95

Suggested Retail

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

- ***35 Watts Output on 2 Meters***
- ***All modes: FM, SSB, CW***
- ***18 dB GaAsFET preamp***
- ***Reverse polarity protection***
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- ***Works with handhelds up to 8 watts***
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160 Watts on 2 Meters!

B-5016-G

$299

Suggested Retail

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

The MIRAGE B-5016-G gives you 160 watts of brute power for 50 watts input on all modes -- FM, SSB or CW!

Ideal for 20 to 60 watt 2 Meter mobile or base. *Power Curve* chart shows typical output power.

Hear weak signals -- low noise GaAsFET preamp gives you excellent 0.6 dB noise figure. Select 15 or 20 dB gain.

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Letters

Your Spot to Speak Out

CQ VHF *welcomes comments and suggestions from readers. We'll print a representative sampling each month, and we reserve the right to edit letters for length or style. All letters must be signed and show a return mailing address or valid e-mail address. Writers' names will be withheld from publication upon request. Address letters to: Letters,* CQ VHF, *76 N. Broadway, Hicksville, NY 11801; or via e-mail to <CQVHF@aol.com>; <CQ@genie.com> or <72127.745@compuserve.com>. Please specify that it is a letter for* CQ VHF.

Ham Radio: Hobby or Service?

Dear *CQ VHF*:

Don Stoner's "In Theory" column in the March, 1997, *CQ VHF* has a large error in it. Ham radio is a *service,* not a *hobby*. If we continue to call it a hobby, the FCC and the government will sell the ham frequencies off to the highest bidder, like the "Little LEO" people. We need to protect the frequencies that we have at all cost or we will slowly lose them to the big money people.

73,

Allan Avnet, AB6UB

Allan—I don't believe it's an "error" to refer to amateur radio as a hobby. It is *a hobby. Through this hobby, many amateurs provide a great variety of services to their communities, to the nation, and to communication technology. It is vital that we keep the public service aspects of our hobby before the legislators and regulators who control the destiny of "our" frequencies. But that doesn't change the fact that ham radio is, first and foremost, a hobby. We do it because it's fun. And if the skills we develop while having fun can be put to use in providing a service, then great. We're there, we're ready, and we serve. But 90% of the time or more, 90% or more of hams are not out manning fire or sandbag lines, or coordinating disaster communications from a trailer or a bunker someplace. Most of us, most of the time, operate for* fun. *It's a hobby. Yes, it's* also *a service. But it's primarily a hobby. And to characterize a difference of opinion as an "error" is, in my book, well, an error.*

Back to the Code Debate

Dear *CQ VHF*:

I have been keeping up with the debate concerning keeping the CW requirement. I think almost everybody is missing the point. I believe it is impossible to employ an arbitrary "filter" to keep the bad apples out. I have listened to the HF bands, and heard more foul language than I have ever heard on any VHF band. I'm sure that I would hear more foul language if CW were not a requirement, but our goal should be to minimize bad operating. I believe that this is easily possible. However, the point that most people I think are missing is that every ham would be responsible. We are a community, and I think we should act more like one.

I believe we can achieve this in three ways. First, change the VE examining procedure. I propose that getting a license require attendance of at least one amateur radio club meeting. At this meeting, somebody already licensed would "adopt" the prospective ham and volunteer to be his/her "Elmer." Second, all of us are interested in different facets of the same hobby. Therefore, the Elmer can help the prospective ham discover his/her interests in the hobby, such as packet, FM, weak signal, etc. Once the focus is found, the Elmer will help the prospective ham achieve these goals and learn the proper operating procedure, maybe over a few weekends. Third, related to the point above, I may support dropping some of the code requirements for HF. However, to replace the requirements, I believe that proficiency in some other skill beneficial to the prospective ham should be demonstrated.

Homebrewing comes to mind here. Maybe somebody is only interested in SSB HF work. They could be required, with assistance from the Elmer, to build a one-band SSB transceiver (it can be from a kit). Even before the ticket is received, the prospective ham would have a station that he/she would enjoy.

In closing, I don't think that we should all be electrical engineers, and I know that some are unable to homebrew due to handicaps and other medical reasons. But I believe the way to improve the quality of the community is for every ham to volunteer some of his/her time to welcoming all newcomers and getting to know the senior members of the community.

Ray Hodgkiss, N9YNG

Dear *CQ VHF*:

After reading your March, 1997, editorial, I felt I must respond. While CW may be an antiquated mode of communications, presently it remains viable since at times other modes can experience man-made problems. Satellites can go down due to solar problems, solar cells discontinue charging, etc., repeaters are operated by a group or by associations and are taken off the air by discontentment of the members. My list can go on and on, but when I transmit a CW signal I only rely on my two items, the sender and the receiver. If we eliminate CW as a requirement and the other inefficiencies that come to a third party's system, where are we?

While I commend CQ Communications' efforts in the amateur radio hobby field, I do differ with the opinion of eliminating the CW requirements of the amateur radio licensing. My suggestion is to work with the ARRL to reduce the speed of copy of the various class licenses. Now this is self-serving, since my maximum speed is 18 words per minute.

I will continue to encourage my friends and acquaintances to obtain their Technician license and to experience the thrills of CW and SSB operations. My 12-year-old son is studying for his Technician license with the understanding that code is next.

Just for the record, I'm 53 years of age and have been licensed 33 years, operate 40 meters phone (SSB) & CW (QRP) and 2 meters FM.

Best wishes,
Stu Tyler, WA4JUO

Stu—Just for the record, neither CQ VHF *nor its parent company, CQ Communications, has advocated eliminating the CW requirements in amateur licensing. All we have advocated is eliminating the* international *mandate for CW knowledge as a condition of gaining HF privileges. And, as explained in detail last month, we strongly support the ARRL's proposal to reduce the General class code speed requirement from 13 to 10 words per minute.*

Dear *CQ VHF*:

As a subscriber from issue one, all I can say is—Great Job! As a "Techie Appliance Operator" your magazine fills the gap all other magazines leave wide open.

Comments:

1. To everybody—get over the Morse issue. It's been done to death.

2. To the manufacturers/advertisers—Get behind this magazine. This is where the future of ham radio is.

3. To *CQ VHF*—More articles on beginner (very) homebrew and low-profile (again very!) satellite ham and imaging, and packet.

Carl Jensen, KE6SGU
Torrance, California

Carl—Thanks for the kind words. To briefly respond to your comments: 1) the code issue is clearly important to many of our readers. We get more letters about it than any other issue; 2) no argument here!; and 3) starting next month, we'll have bi-monthly homebrewing column with beginning and advanced projects, but the main focus will be on teaching the art of homebrewing to newcomers.

Homebrew Heaven

Dear *CQ VHF*:

You struck out in your answer to Brian Kettell, KB8ZXX, in the March, 1997, issue of *CQ VHF* by not mentioning to him the wealth of homebrewing information he can find in the *ARRL Handbook*. He would do as well even if he didn't get a current edition—any issue would certainly help him.

I like your magazine and the common-sense approach it shows to many current amateur radio problems and questions.

Tom Donohoe, W2NJS
Washington, DC

Tom—Brian was looking for a beginner's guide to homebrewing and good starter projects. While the ARRL Handbook *is certainly one of the premier sources of projects and information, there's very little there for the first-time builder, and I think most beginners would find it a bit overwhelming. That's one of the main reasons that we're introducing a homebrewing column next month (see previous letter). It'll be written by veteran* CQ *columnist Dave Ingram, K4TWJ, who has also just authored a brand new book,* 33 Simple Weekend Projects for the Ham, the Student, and the Experimenter. *Dave's book will be available from CQ at the Dayton Hamvention (May 16 to 18) and by mail thereafter.*

Product Update

Alinco Announces Two New Radios

Alinco Electronics has introduced two new "basic" 2-meter radios: one for voice and the other for packet. The DJ-190T handheld has no DTMF keypad, so you won't be able to use it for autopatch calls or direct-entry frequency programming. But the company says it will be just right for basic communication needs and for people who require portable packet or APRS units. List price for the DJ-190T is $218.00. It is also available with a high-power battery pack (DJ-190TH) and with just a case for your own alkaline batteries (DJ-190TD).

Alinco is also bringing a dedicated packet transceiver back to its product line, the 1200-baud DR-140TPKT. The company says the move is in response to customer and dealer requests after its previous packet-only transceivers were discontinued. The DR-140TPKT does not include a microphone or a mobile mounting bracket, and lists for $233. In addition, Alinco said it will begin offering radios with CTCSS *decode* as a standard feature (look for the "TQ" designation at the end of the model number). It also announced its second round of price cuts in less than a year, due mostly to changes in the dollar-yen exchange rate.

Circle 100 on reader service card

Kenwood TM-V7A Dualband Mobile

The TM-V7A dualband FM mobile transceiver from Kenwood features a large, blue reversible LCD display, an ergonomic control panel, 280 memory channels, and computer programmability. It includes alphanumeric memory capability which allows you to recall up to 180 memory channels by name. Frequency, memory channel number, and name (up to seven characters) are displayed simultaneously. Its unique programmable memory function lets you store virtually all operating data, such as frequency, offset, DTSS code, display setting, and beep function in five special channels, and "Visual scan" allows you to graphically see band activity near the current operating frequency. Other features include a user-friendly menu and guidance system, 1200-/9600-bps packet capability, AM aircraft band receive, CTCSS, DTSS, paging, backlit DTMF microphone, detachable control panel (with cable option), and voice synthesizer (VS-3 option).

For more information and pricing, see your dealer or contact Kenwood Communications Corporation, P.O. Box 22745, Long Beach, CA 90801-5745, or call customer support at (310) 639-5300.

Circle 101 on reader service card

Hard-to-Find Parts—Catalog 8

Surplus Sales of Nebraska has released its latest catalog. Catalog 8 represents over five years of locating hard-to-find parts and arranging them into a 400-page reference manual with over 5,000 photos.

In addition to the usual items most parts houses stock, Surplus Sales of Nebraska Catalog 8 includes Collins parts, vacuum capacitors and relays, high-voltage components, RF-related parts from semiconductors to microwave, high-power transmitter parts like ceramic switches, roller coils, B&W coils, turn counters and shaft couplings, rack cabinets, variacs, power supplies, and test equipment.

The catalog is $5.00 in the U.S.; $10.00 elsewhere. A $5.00 rebate is offered on your first order from the catalog. To order by credit card, call (800) 244-4567; Fax to (402) 346-2939; or mail order and payment to Surplus Sales of Nebraska, 1502 Jones St., Omaha, NE 68102.

Circle 102 on reader service card

Oak Bay Technologies' BS-25 Automatic Battery Saver

Oak Bay Technologies' newest addition to its two-way radio accessory line could save you from a dead car battery. The BS-25 Automatic Battery Saver module automatically removes power from the mobile radio or accessory shortly after the ignition switch is turned off.

Power to the transceiver or accessory is routed through the BS-25 and is controlled by the vehicle's ignition/accessory switch. Once the switch is turned on, the BS-25 begins supplying power. When the ignition/accessory switch is turned off, the BS-25 module's internal circuitry takes over, providing power for an additional four to eight minutes, plenty of time to end a QSO in progress.

Oak Bay Technologies President Mark McKibbin noted that the BS-25 also promotes proper transceiver wiring directly to the battery and is rated to handle high current radios, mobile amplifiers, and other accessories up to 25 amps at 14.8 volts. The BS-25 module is housed in a rugged steel enclosure for durability and measures only 2" x 2" x 1 1/4". It comes complete with fuse, installation instructions, and a one-year warranty.

Suggested retail price is $39.95. For additional information, contact your nearest dealer or Oak Bay Technologies, Inc., P.O. Box 65494 Port Ludlow, WA 98365; Phone: (360) 437-0718; WWW: <http://members.aol.com/oakbaytec>.

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A Tale of Two Rovers—Part 1
The Serious Competitor

K7XC (whom we used to know as NC7K) takes us along on his no-holds-barred "rover" expedition through the mountains during last January's ARRL VHF Sweepstakes.

By Tim Marek, K7XC

It was a dark and stormy night. The snow and wind combined to make driving almost impossible, and we still had five hours of travel ahead. Why were we out on a night like this? For the same simple reason we'd been out on the road all weekend: operating "rover" in the ARRL January VHF Sweepstakes.

In case you're not a VHF contester, a rover is a station that operates mobile during a contest, traveling to—and operating from—two or more grid squares. Special scoring rules give rovers extra credit for each grid from which they operate. My goal last January was to break the rover record of 20 grids in a single contest, which had been set a few years ago by NØLRJ, and to capture the #1 rover spot for the U.S.

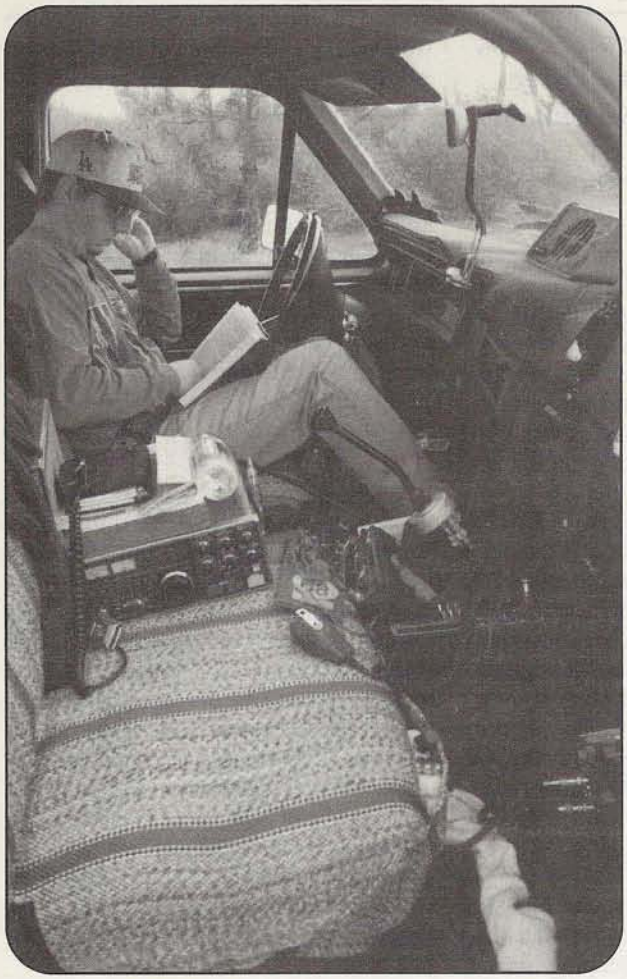
Six Months of Planning

Actually, the story began much earlier, right at the end of the 1996 June VHF QSO Party, in fact. While packing up the station for our trip home after that contest, I started thinking about breaking LRJ's 20-grid record. I ruled out the September contest, as I planned to finish my 432-MHz VUCC (VHF-UHF Century Club award) from my home grid of DM09 during that event. So that left the January '97 VHF Sweepstakes, in which I'm usually a rover anyway because the high country near me is completely snowed in at that time (not to mention, *really* cold!). By the time we were ready to head for home, I had the beginnings of a route planned to cover 20-plus grids and a few ideas on how to make my rover station more competitive.

Serious Planning... by Accident

On August 28, 1996, I was sidetracked by an automobile accident which kept me near home for several months of physical therapy. During this period, I spent many hours on the computer planning my route and strategy, locating a driver, designing a station layout that would work for either one or two people, and modeling "all-weather rover" Yagis that would stand up the demanding January weather here in the West. I came up with a 144-MHz design featuring a tremendous SWR bandwidth, good gain, and poor front-to-back, while maintaining a decent impedance at the feedpoint. *(An ideal antenna will have a good bandwidth, good gain, and a good front-to-back ratio. But, in the real world, in order to improve one characteristic of an antenna, you must give up a little somewhere else. Tim chose to emphasize*

The author and his "Rover" vehicle. Operating the January, 1997, ARRL VHF Sweepstakes as NC7K/R, Tim racked up 767 QSOs in 64 grid squares (three-band total), while operating from a near-record 18 grid squares. (Photos courtesy of the author)



The NC7K/R operating position. Designed to be usable from either the driver's or passenger's side without rearranging everything, Tim was lucky enough to have his brother Scott (pictured here) drive most of the 1,500-plus miles they covered during the contest, even while suffering from a miserable cold.

It's leg-stretching time in CM99. This photograph, taken at a stop in grid square CM99, provides an excellent view of the rover's antennas (described in detail in the text).

bandwidth and gain over front-to-back performance.—ed.)

It wasn't until mid-November that I felt well enough to start preparing for the January record assault. First, I tested, adjusted, tweaked, and (when necessary) repaired all the radios, amplifiers, and preamps. Next, I installed on my truck an updated antenna package: a single KB6KQ 6-meter "Maxiloop," a pair of KQ 2-meter "Miniloops," a pair of KQ 432 "Microloops," the M^2 440-18 (an 18-element Yagi for 432), and the back seven elements of an M^2 2M5WL (33-foot, 17-element 2-meter Yagi), as I ran out of time to build the "2ROVER8" I had so painstakingly designed on the computer.

After the antennas were in place, I set about mounting the radios, amps, preamps, and coax switches in such a way that, if a driver couldn't be found, I could use them from the driver's seat without readjusting their positions. With the Kenwood TR-9130 (2 meters) and ICOM IC-551 (6 meters) mounted on the floorboard, I had room for the rather bulky Kenwood TS-770 dualbander in the middle of the seat, the 2- and 6-meter amps on the floor, and the 432 amp bungeecorded on top of the 9130. Surprisingly, it was a very compact yet usable package, available to either driver or passenger, as circumstances required.

The Week Before

On the very last warm and sunny day before the contest (Saturday, January 11), my brother Scott and I fixed a nagging exhaust leak in my truck. As usual, what should have been a five-hour project fought us tooth and nail and lasted well into the night. Finally finished around 10 p.m., I took a shower and hit the rack. Sure enough, Sunday morning brought a 30-degree temperature and blizzard conditions. For the next four days, it didn't get above freezing! On Thursday, the 16th, I was up until 1 a.m., washing clothes, packing bags and boxes of food, water, oil, tools, clothes, adapters, cables, spares, etc....With the aid of a flashlight, I finally finished loading the truck and installing 432 MHz.

On Friday, January 17, after a short but hectic day at work, I hit the road to pick up Scott at 11:00 a.m. He agreed to be my driver for four days, which surprised me, since he had one heck of a head cold. But he said he felt up to the challenge, so we took off, hoping for the best. It was the first nice day in nearly a week, so we did a quick oil change, took one last look through the house for items I might have forgotten the night before (like my camera!) and got a bite to eat. Then we headed to CN80 to spend the night with Larry, K6AAW. Arriving after dark, Scott needed a flashlight to guide us through the trees lining AAW's 1/4-mile driveway.

On Saturday, after a fitful night's sleep, we awoke to fog...dense, wet, cold, miserable fog. Fortunately, it burned off quickly, and, after a short detour up Larry's roof to untie his 2-meter EME array (he needed a few of the grids we'd be traveling through), it was time to gas up and make our way to our starting point in CN90, above Payne's Creek.

Our planned route took us south from CN90 *(get out your grid maps!—ed.)*

"After the antennas were in place, I set about mounting the radios, amps, preamps, and coax switches in such a way that, if a driver couldn't be found, I could use them from the driver's seat without readjusting their positions."

through CN80 (Red Bluff), CM89 (Corning), CM99 (College City), CM98 (Vacaville), CM88 (Benicia), CM87 (Concord), CM97 (Newman), CM96 (Coalinga), CM95, DM06, DM05 (Kettleman City), DM04 (Tejon Pass), DM14 (Lancaster), DM13 (Palm Springs), DM23 (Joshua Tree), DM24 (Twentynine Palms), DM15 (Ridgecrest), DM16 (Coso Junction), DM07 (Bishop), DM08 (Coaldale), and finally DM18 (Tonopah)—exhausting just to list!

As we traveled from grid square to grid square, my Garmin GPS38 (Global Positioning System receiver) began to earn its keep. By directly displaying six-digit Maidenhead grid squares, it shaved miles off the edges of our route, letting us know with certainty when we'd crossed from one square to another. At only $148 brand new from Telson Communications in New Jersey (found them on the Internet), it was hard not to buy one.

It Starts...

At 11:00 a.m. PST, Saturday, January 19, the contest began. CN90 was *very* popular on all bands. Larry, K6AAW, even revived his 6-meter rig (which hadn't been on for 30 years) to give us the additional QSO (Q) and multiplier (mult). We spent an average of 30 minutes stopped in each grid making page after page of Qs. What follows are brief notes from our trip log.

• The Yagis really seemed to make a difference. I worked WJ6T in DM05 from CM89 on 432—that's 400 miles while mobile!

• At one point, we parked blocking a dirt road in the middle of nowhere in CM99, and the only person we could possibly be blocking shows up 2 minutes later and forces us to move....What are the odds on that?

• Above Newman in CM97, there's a paved road to a roadside rest atop a hill 500 ft. above the valley floor. Signals sparkled from here to each end of the San Joaquin Valley.

• After what seemed like a eternity in CM96, we finally arrived at the grid corner in Kettleman City. After a quick bite of food and fuel, we set up in DM05 and really started to rake in the Qs.

• Our stop in DM06 was in a bowl on Hwy. 41 under high tension lines and produced few Qs. By this time, it was very dark and the fog was getting thicker and thicker. Wallowing in the dark, we worked our way up the hill in CM95, finally settling for a wide spot just off the highway. Blocked to the north and west, we made few Qs. By now Scott's head cold had gotten really bad. He was coughing a lot and sounded so bad I began to feel guilty. We decided to call it quits, 100 miles short of our planned stop in Gorman. With my wallet $50 lighter, we got a good night's sleep in a comfy room.

Sunday...

Up at 5:00 a.m., fed and fueled by 6:30, we began our race south. Scott set a blistering pace Saturday, keeping us on course and ahead of schedule. We did 12 grids in 12 hours! But Sunday wouldn't be anywhere near as efficient.

Not wishing to repeat my mistake of last year (see "Confessions of a Single-Op Rover," June, 1996 *CQ VHF*), we avoided the L.A. basin and headed east on Highway 138 to Highway 14 and onto Highway 15 *(just in case you're following this on a map—ed.)*. From a turnout above Lancaster, we worked plenty of stations, including our first Nevada and Arizona contacts.

From there it was back on the road again, as we raced through Cajon Pass, Redlands, and Palm Springs to DM23, the southern end of our loop. Once again, the GPS receiver shaved miles from the route, allowing us to pick sites not far from a grid line. Next, we headed north through Joshua Tree National Monument. This turned out to be the quietest part our trip with very little activity, even though we should have been in range of both Las Vegas and Phoenix. As we broke back into DM14, N7JW in DM37 was 20 over 9 for a new mult for us. In Twentynine Palms, we headed east until the GPS assured us were in DM24. Parked behind the Rodeo fairgrounds, we worked a few folks, but cut the stop short as were running out of time to reach my goal of 20-plus grids.

No rest for the weary, we next reentered DM14 and drove diagonally across its entire length (getting lost once and losing almost an hour) to reach Highway 395. With only 11 minutes left in the contest, we broke into DM15 above Kramer Junction, our 18th grid. The pile-up that ensued will live in my memory for some time to come.

It's Over...but It's Not

With the contest over, I checked into the Southern California Western States Weak Signal Society (WSWSS) Sunday night net on 144.240 MHz. Many folks congratulated us on our efforts and wished us a safe trip home. Normally, at this point, I would have found some food and fuel, parked the truck, crawled in the cot in back and gotten some sleep, but not this time. This trip was *anything but over*!

Scott *had* to get back to Reno in time for an 11:00 a.m. job interview on Monday. He'd been between jobs for awhile and really wanted this position. So we continued north, and discovered that the most challenging part of the trip had just begun.

It was 9:00 p.m., and we were 434 air miles from home. While I fiddled with the grid maps, trying to figure out my multiplier totals, Scott continued heading home. We reached Independence around 10:00 p.m., found a quiet parking lot, and took a 90-minute nap. Feeling a bit refreshed, I now took the wheel so Scott could get some real sleep. Somehow I stayed awake until we got to Bishop. There, I gassed up the truck (our seventh gas stop, 21 gallons or so each time), grabbed some "Nodoze," and hit the only open restaurant in town. Scott was too sick to eat anything, but I wasn't. And having been on the run all day, I ordered a huge meal.

Around 1:00 Monday morning, with the food and caffeine kicking in, we resumed our trek home. As the road began to climb into the mountains, a light snow began as well. As a precaution I stopped and turned in the hubs, enabling the truck's 4-wheel drive. Little did I know how quickly we'd need it! Before long, the road was covered with snow and we found ourselves wallowing in a blizzard at near-zero visibility. Winds of 80-plus m.p.h. whipped the snow into a hor-

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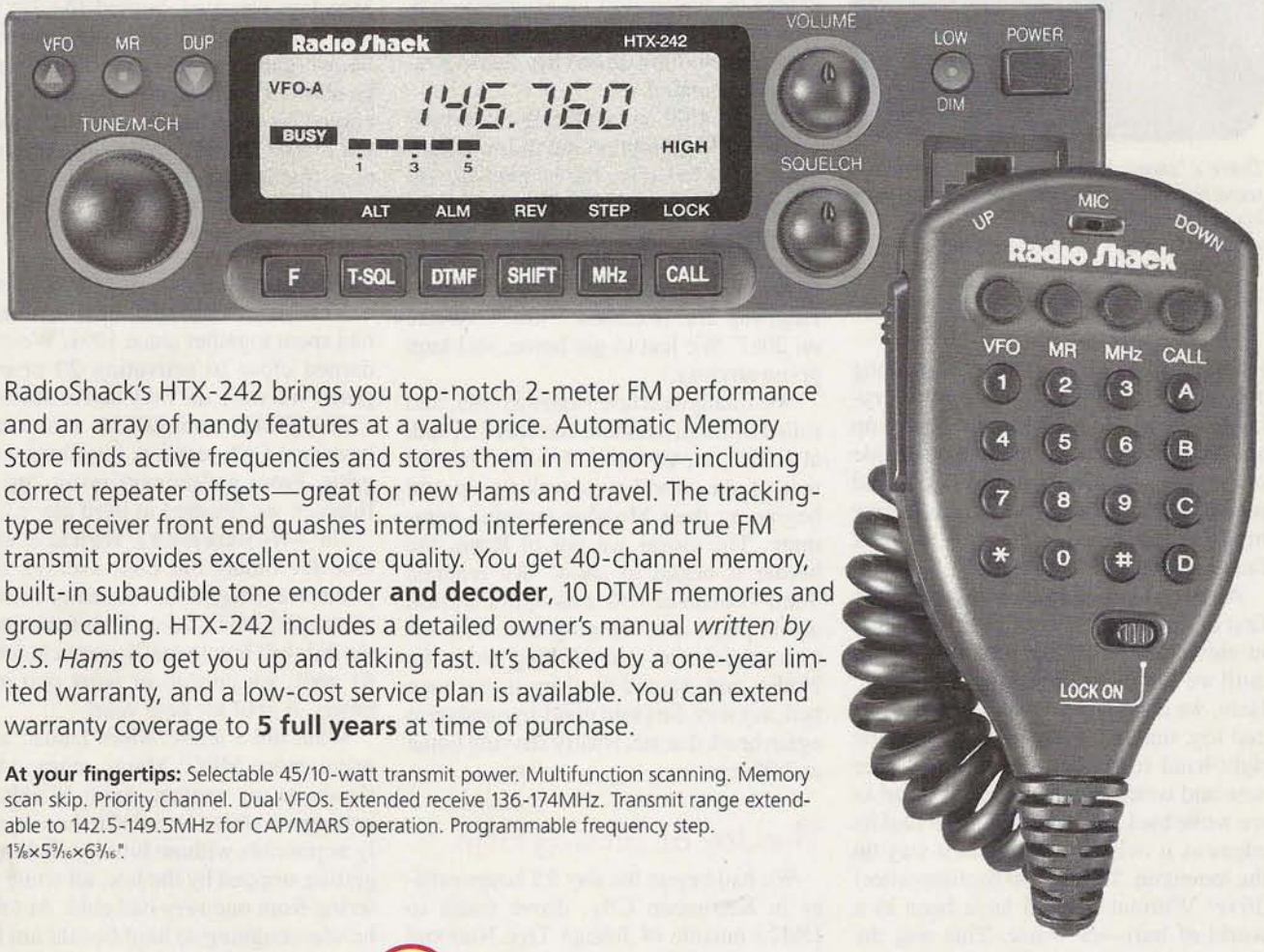

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CIRCLE 125 ON READER SERVICE CARD

There's "snow place like home." This was the scene that greeted Tim when he returned from his 18-grid adventure. Considering the weather in Reno, he probably did better in this contest by hitting the road.

izontal wall of white, and we crept along at 3 m.p.h., weaving back and forth, trying to stay on the road. Finally, I gave up and hugged the guard rail on the *left* side of the road, as it was the only thing I could see reliably. I watched as each reflective highway marker went by and the next faded slowly into view.

After a small eternity, we crested the first of three passes, each over 8,000 feet in elevation. Visibility was a bit better until we started to climb the second pass. Here, we encountered a mixture of snow and fog, making it impossible to see the right-hand road edge. Scott was awake now and watching his side of the road as we wove back and forth trying to find its edges as it twisted and turned it way up the mountain. Thank God for four-wheel drive! Without it we'd have been in a world of hurt—or worse. This was the kind of weather that can kill the unprepared. Still, it was difficult to be prepared for this. The snow on the highway was unlike any I've ever driven through before, and was windswept into foot-high piles spaced two feet or so apart. It felt like we were running over a continuous course of speed bumps.

Finally, around 2:30 a.m., we crested the second pass and began working our way up to Conway Summit, the highest and final peak before reaching the Nevada side of the mountains. Here, it was all fog and all but impossible to see. Were really zig-zagged now, trying to find our way up the Summit. Then, just as quickly as it all began, it was over. We were on top, around the corner, and below the fog descended down the mountain to Bridgeport, California.

The Longest Miles

Fourteen miles of our direct route home, Highway 395 north of where we were, no longer exists. It was erased by the Walker River during the New Year's Flood of 1997. We were forced to use a detour to Wellington on Highway 208, then on to Highway 395 and home from there. But nothing on this trip was as simple as it sounded.

Around 4:00 a.m., I finally found my favorite FM station on the radio, KBUL 98.1. As it faded in, the announcer was reading a highway closure/weather report. Just as a road sign for Highway 208 passed by, he announced that it was closed. I woke up Scott... "Huh?" "Scott. Highway 208 is closed." "So?" "We're *on* 208!" We had to get home, so I kept going anyway.

We finally reached Highway 395, and rolled through Minden, Garderville, and, at 5:30 a.m., Carson City. By now, the rest of the world was waking up and beginning their Monday morning commute. The closer we got to Reno, the harder it began to snow. We reached Scott's condo at 6:30. I thought I'd crash at his place after helping him with his gear, but I was still buzzing from the Nodoz and wanted to sleep in my own bed, anyway. So I said good-bye and once again headed north, finally arriving home at 7:00 a.m.

The Joy of Sitting Still

We had begun the day 25 hours earlier in Kettleman City, drove south to DM23 outside of Joshua Tree National Monument, and then headed for home. I just sat in the truck for a few minutes with the engine off, getting used to the silence. We had been on the move for so long I had forgotten what it felt like to be still. Finally, I grabbed the all-important log, the GPS set, camera and ditty bags and went inside. I tried to sleep but was so tired I couldn't. I unloaded the truck some more, made a quick check of my e-mail, posted a short story of our travels, and finally fell asleep around 11:00 a.m. Awakened by the neighbor's dog at 4:00 p.m., I staggered to the door and peered outside...Yep, I was really at home...It wasn't a dream.

It STILL Wasn't Over!

It took a full two weeks to sort through the log, input the contacts to a database, and run the reports. Our final tally was 767 Qs, with 27 grids on 2 meters, 21 grids on 432, 16 grids on 6, and bonus of 18 multipliers for the number of grids we activated, producing a final score of 82,820 points. We traveled 1576.6 miles from 2:00 p.m. Friday to 7:00 a.m. Monday. The truck burned 154.208 gallons of gas at an average price of $1.343/gallon, or $207 total. That's barely above 10 MPG, not exactly the best choice for an economical rover vehicle, but it goes anywhere through any conditions and for that I'm grateful.

Looking Back

Was our trip a success? Yes and no.

Yes—It was the most time Scott and I had spent together since 1991. We came darned close to activating 20 or more grids. We were the only active station in CN90, DM23, and DM24. Many folks have sent QSL requests for all-time new grids. From preliminary results off the Internet, we finished in third place.

No—We were not #1. We had more Qs than the others but their average QSO points were higher due to many contacts above 432 MHz. As a three-band rover, we did well but, to really compete for the #1 spot, we needed *at least* two more bands. A goal for next year!

What did I learn? More bands, more grids, more MPG! Many, many, many thanks to my brother, Scott Marek, for getting me where I needed to be as quickly as possible without hitting anything or getting stopped by the law, all while suffering from one *very* bad cold. At times, he was coughing so hard I could not hear the radios. Again, Thanks, Scott!

With luck, we'll be back next year—after adding 222 and 1296—for another attempt to break the 20-grid barrier! ■

A Tale of Two Rovers—Part 2
The One-Ham, One-Band "Little Gun"

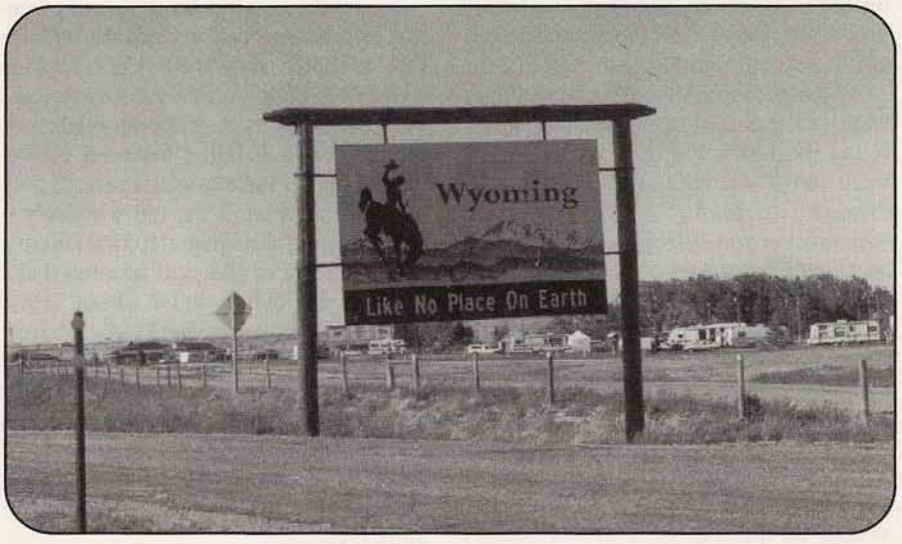
Operating by himself on only one band, WB2AMU took to the hills of Wyoming for last June's VHF Contest. Here's a look at what he did and what he learned.

By Ken Neubeck, WB2AMU

Here's a sure-fire formula for on-air popularity: activate a rare grid square...during a contest. For a long time, I've looked at my grid square map of the U.S. and fantasized about making a "griDXpedition"—or grid square DXpedition—to some of the many rare grids in the country.

Staring at me for much of the time was the state of Wyoming, which encompasses 12 full grid squares and parts of four others. The state has only about 1,600 hams, with many of them concentrated in the population centers of Cheyenne and Casper. Of these hams, only a handful are active on 6 meters, my favorite band. So it's no surprise that several grids in the state are on the "need" lists of many active 6-meter operators.

My Wyoming fantasy came true last June, when I made a trip to Colorado and, since Wyoming was less than 100 miles away, decided to extend the trip into a grid square expedition. I was able to time the trip to coincide with the ARRL June VHF contest, when sporadic-*E* conditions are generally good and activity levels on the band are as high as they're likely to get all year.



The author's "griDXpedition" to Wyoming activated some rare grid squares during last June's VHF contest. One advantage to operating along the Colorado/Wyoming border: the grid square boundaries are well-marked—the state line runs right along them! (Photos courtesy of the author)

Packing Up

Packing for this trip was a bit of a challenge. I wanted to travel light, yet I still wanted to bring enough equipment to make a good number of contacts. I decided to concentrate only on 6 meters since I'd be traveling in remote areas where 2 meters probably wouldn't be of much use. I packed up my Yaesu FT-690, a rugged rig that I've used many times while mobile or portable; two power packs (the low-power pack that comes with the rig and the Ham Station 7-amp "Power Station" battery pack); and my Mirage A1015 amplifier, which I planned to hook up directly to the car battery. With this mobile configuration, I could run 10 watts and do pretty well if the "Magic Band" cooperated.

I kept my antenna simple with a mag-mount vertical. The vertical has its limitations, but it's easy to carry around and mount. A Yagi would have been nice, but that would meant a lot more equipment to carry, and it would have been time-consuming to set up and break down at different stops. Anyway, I hoped I'd be fortunate enough to tap into a strong band opening, making the vertical antenna sufficient for good contacts.

The next challenge was getting the gear onto the airplane. Airport security is significantly higher than it was in the past, so I figured I'd better be prepared to open my ham radio equipment-laden carrying-

WB2AMU/R's makeshift station setup at one of his operating stops. Wood planks found on the ground held up the rig and "station clock," while his hand key kept the logbook in place. No computer logging on this operation!

"It was a good thing I scouted the area first, though. A number of spots that I thought would be good turned out to be turnoffs for truck drivers to test their brakes going down a hill. Not good operating locations!"

on luggage. As an added precaution, I packed copies of the manuals and a copy of my amateur radio license, just in case. The Mirage amplifier and the power pack were twice picked up by security at the X-ray machines, but once the personnel were shown the equipment, they let me through. (*Bringing along equipment manuals is a good idea for any equipment that can't be turned on for the security folks; plus it'll come in handy if you need to make repairs in the field. Carrying a copy of your license is an FCC* requirement *if you're planning to operate.—ed.)*

Overnights in Wyoming

Even though the people and places I visited on my trip were in Colorado, I stayed in Wyoming each night in order to get familiar with the area and to give myself more time on the air.

On the first night, the first station I heard was Pat, W5OZI, from Texas, and I got him using 150 watts. His was the only signal I heard and he told me that band conditions hadn't been great for the past few days. About an hour later, I worked KF7E in New Mexico using 10 watts. However, the band dropped out about two minutes into the contact. I didn't hear too much local 6-meter activity during the days leading up to the contest, although I suspected that there must have been some VHF operators around, as I saw ample copies of *CQ VHF* in the bookstore at the local mall!

I spent the next day scouting out potential operating locations in grid squares DN71, DN61, and DN60. I was looking mostly for parking areas, rest areas, and even parking lots in shopping malls, trying to find a balance between convenience and distance from the general public (the last thing I wanted was hassles from anyone). I managed to find suitable spots in each of the grid squares that I scouted, particularly in DN61 and DN60 which are located in the Medicine Bow National Forest and offered plenty of parking. It was a good thing I scouted the area first, though. A number of spots that I thought would be good turned out to be turnoffs for truck drivers to test their brakes going down a hill. *Not* good operating locations!

One of the areas I scouted was Snowy Pass, which cuts through several mountains. The pass itself is over 12,000 feet in altitude, something quite different for a ham from Long Island who's used to hills no higher than 300 feet! I heard some meteor scatter on six on the way up to the pass, but, when I got to the top, there was no propagation at all. I was, however, greeted with snow banks four feet high in 60 degree weather! Guess that's why they call it Snowy Pass!

While Snowy Pass had a tremendous height advantage and was ideal for a QRP (low power) portable location, it wasn't as appropriate for rover operation. It took a long time to reach because low gear was required for part of the trip, and I wanted to be able to move between at least three grids within 45 minutes. So I ended up choosing a route farther south (along State Highway 230), which cut through DN60, DN61 and DN71 in a 20-mile span. DN61 seemed like the logical choice from which to start the contest since it was in the mountains and in the middle of the three squares.

Contest Weekend Arrives

I didn't hear any signs of an opening during the morning prior to the contest, so I was worried about whether there would be any propagation at all once the competition began, either sporadic-*E* or meteor scatter.

I set up about an hour before the contest in a quiet parking area near Foxpark, Wyoming, on Highway 230, where only an occasional driver would briefly stop. I even found some wood and a cement block where I could set up a portable station outside the car. I set up the FT690 and the Mirage amplifier for 60 watts output into the roof-mounted vertical. The radio was dead quiet, without even the ambient TV carrier or computer noise you get used to hearing on 6 meters in more populated areas. Eventually, I started to hear some very weak signals via ground wave which I thought would be a challenge to work.

Finally, about 15 minutes before the contest began, I heard Smitty, W4UDH, from Mississippi break through, and I thought, "Thank God, there's at least some form of propagation." As the contest got under way, there was weak sporadic-*E* southeastward toward Mississippi, Tennessee, Georgia, and Alabama. Weak signals were better than no signals, and some of them got quite loud. My first contact was WA4CGC in EM72, who had a respectable 5 by 9 signal. Other strong stations I worked were AC5CS in EM54 and KC4YO in EM75 (Tennessee). The band wasn't packed and my QSO rate was

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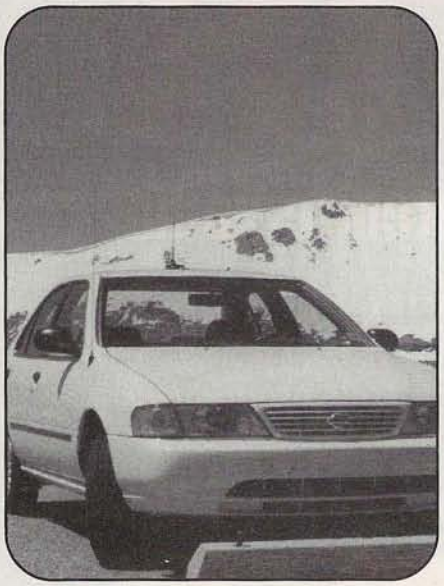
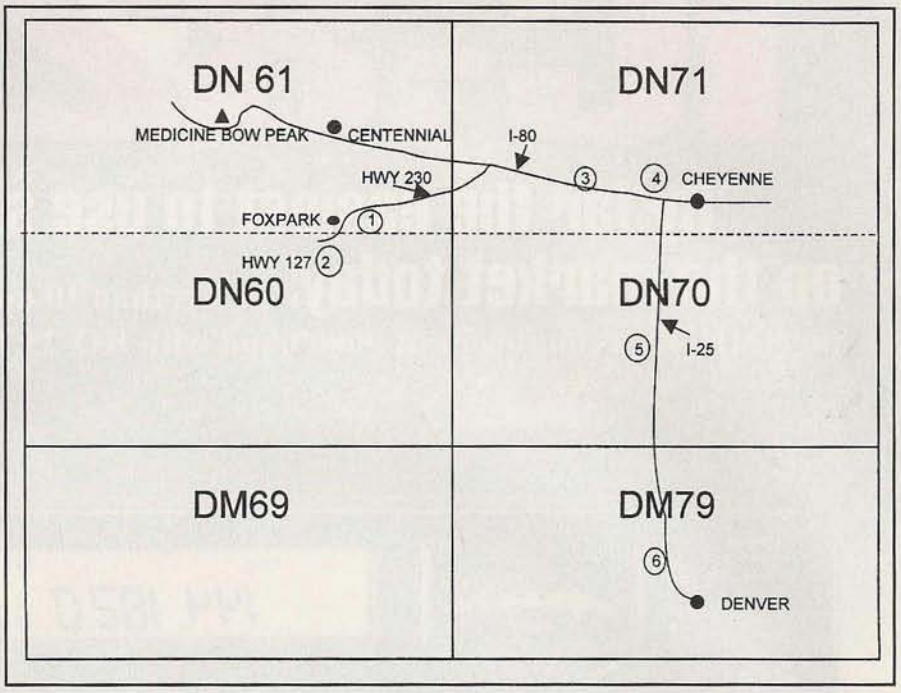


A magnet-mount vertical on WB2AMU's rental car was all the antenna he needed to make 72 QSOs in 39 grid squares on 6 meters. This photo was taken near Snowy Pass (a name that makes sense, considering that it was June) on a pre-contest scouting trip to DN61.



Basic map of WB2AMU's rover operation during the 1996 ARRL June VHF QSO Party. Ken operated at locations 1-4 on the first day of the contest, then worked from points 4-6 on day two.

about six an hour, but at least things were interesting. I was happy.

Storms and "Skeeters"

Things were going along OK until the clouds started rolling in about two hours into the contest. At that point, the mosquitoes came out and started biting my arms, so I moved my station inside my car. Then the clouds started getting darker and I heard the familiar sounds of lightning static on the radio, so I decided to hit the road and get to DN60 in Colorado before the band changed.

It took 15 minutes to get there, and I found a parking area just over the Colorado border, but the band was dying fast. I managed to work KC4YO again and that was it. Then I saw the lightning coming toward me. For the next hour I drove to different areas in DN61, getting hit with either hail or rain, and trying to make some contacts in between the lightning. I heard a brief opening to California but couldn't capitalize on it. As much as I hated to do so, I had to leave the mountain area...the lightning was getting just too close. I ended up driving nearly another hour, but at least the car battery was getting a good charge! (Here's a tip for you: it's important to check your battery at regular intervals, particularly if you're stopped. It's also not a bad idea to turn over the key every half hour or so and let the engine run for a little bit).

My next stop was about 30 miles west of Cheyenne, in DN71. I worked about five stations but had to move again because of approaching lightning. I finished the day at a state rest stop just outside Cheyenne, where I picked up a couple of stations from the midwest and the south. I also worked Duane, WA7KYM, from Cheyenne, who is one of the more active stations from that grid. All in all, the first afternoon of the contest was basically a bust thanks to weather.

Sunny Sunday

The next day was clear and sunny, and 6 meters opened at 8:30 a.m. My plan was to finish up in DN71, proceed to DN70 via Interstate 25, and then to DM79 where I'd finish up the contest prior to catching my flight out of Denver at 4:40 p.m. At the same rest stop where I finished the night before in DN71, I worked a couple of VE6 stations in Alberta, and then a decent opening developed towards the midwest into areas of Illinois, Indiana, Wisconsin, and Michigan. At last I was able to tap into some sporadic-*E* without weather problems.

WA7KYM was active on 50.150, so I moved a little farther up the band. At one point I was able to call CQ and run about 10 stations without having to move from my frequency. I was able to run a string of about 30 QSOs in one hour, still only a moderate rate. By about 10:30, the band

Table. WB2AMU's June 1996 VHF Contest Rover Operation

Grid	Time Spent	QSOs	Grids Worked
DN61	2 Hours	11	10
DN60	15 Minutes	1	1
DN71	6 Hours	45	31
DN70	1.5 Hours	12	10
DM79	30 Minutes	3	2
TOTALS	9 Hours	72	54 *

**Note: I worked 39 grids overall, but, under rover scoring rules, you total the number of grids worked from each grid in which you operate, then add the totals.*

Wide open spaces and towns like Centennial (DN61), with a population of 100, were unusual sights to out-of-towner WB2AMU, who's more used to the sardine-like suburbs of Long Island.

was dropping out again, so I decided to get on the road toward the next grid.

I worked two more stations while still in DN71, one via sporadic-*E* and the other via ground wave. When I crossed into Colorado and DN70, I worked another four stations before I settled into my next stop at another rest area. The band was up and down at this point, yet I was able to make contact with stations in both the south and the midwest.

All the while I kept a constant watch on the time to make sure that I'd make my flight home. By 12:30 p.m., the band took another bad dive, so I headed toward my next destination, a mall parking lot outside Denver in DM79. But when I arrived the band really seemed dead. I could work only three local stations in two grids, so I started to pack up for my trip home.

Wrapping Up

The Table shows the final breakdown of my rover operation during the VHF contest. The station I worked from the most grids squares (DN61, DN71, and DN70) was AB4UP in EM65. Certainly, it wasn't a great score, but there were enough contacts to make the contest very interesting and fun. My biggest regret was not being able to stay in DN61 and DN60 long enough to make more contacts. It turned out that good band conditions coincided mostly with my time in DN71, in and around Cheyenne. I also was pleased that I found some decent operating locations and that I was able to maintain my timetable for both days.

Due to the sparse ham population where I was, I was able to work only six or seven stations via ground wave to nearby grids during the contest, making me very dependent on sporadic-*E* propagation. I found out later from stations in my home grid square of FN30 that the band was very good there on both days, with Sunday morning activity being so intense that over 150 kHz of spectrum was filled with signals. So it seems there were decent conditions on 6 meters all around the country. I remember working a midwestern station during the contest who had just worked a station in my home grid of FN30 (I did not hear the FN30 station), which indicated that there were several sporadic-*E* cloud formations during the contest. This, of course, is why June is usually such a good month for scheduling VHF contests.

You Can Do It, Too!

This griDXpedition was not an elaborate effort on my part. I hope this article shows that, with a certain amount of planning and good luck, anyone can have fun on a griDXpedition. I would recommend that hams in states adjacent to rare grids plan these trips around the time of a contest, such as one of the ARRL VHF contests, the CQ World Wide VHF contest, or the SMIRK contest, because there's generally a bigger payoff since more stations are present.

But the most important thing is to get out there, get active, and have fun! If I could do it, so can you! ■

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
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)

* = 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.
** = Specific dates of the ARRL EME Contest vary, to allow for scheduling based on best EME conditions. Check the monthly contest calendars in *QST* and *CQ VHF* magazines, starting with September issues.

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

CQ VHF Contest Proposals... "Calling All Comments"

Last year, we asked for ideas on contests that CQ VHF might sponsor. Here are some "finalists" for your review and comment.

One of this magazine's original goals (see "*CQ VHF* Mission Statement," Jan/Feb., 1996 issue) is to "encourage competition." As explained in detail in this month's "Line of Sight," we believe contesting helps develop and improve a host of other technical and operating skills. And, despite the fact that many of you are not contesters, many others of you *are,* and as part of the CQ family, we have a contesting tradition to uphold.

Here at *CQ VHF*, we have made it a tradition to make this magazine a two-way discussion, so before we make any final decisions on contests to sponsor, we'd like to present a few possibilities and listen to your comments. Just one request...constructive comments only, please—we don't need "flames."

An important note: We'll need plenty of volunteers to help plan, organize and administer these events. There's no pay, just glory—and a pretty sizable time commitment. You also need to have significant experience in the type of activity you're volunteering for, since you'll be asked to make judgment calls and scoring decisions on very fine points of procedure. It's important that those who make those decisions start out with the respect of their fellow competitors.

Here are our contest ideas:

CQ VHF Worldwide Radio Relay

Possible dates: February 1–10

This would be a non-traditional contest, in which the use of relay devices would not only be permitted, but encouraged. A digital-only event, the goal of the contest would be to make the greatest number of contacts in the greatest number of grid squares during the 10-day period. Complete two-way exchange of messages would have to be completed within the contest period to count toward scoring (receiving and sending the contest message, that is, not confirmation of receipt at the other end). *This would not be limited to "live" contacts: exchanges of PBBS messages would be permitted and encouraged.*

CQ VHF March Tune-ups

Possible dates: Four weeknights in March (1st Monday, 2nd Tuesday, 3rd Wednesday, 4th Thursday)

Similar in scheduling and duration to the ARRL Spring Sprints, these would be single-*mode* events, rather than single-band. If you're not familiar with the Spring Sprints, they are four-hour, single-band, contests held on weekday evenings, with a different band "on" each week. The only exception to the one-band rule is the microwave sprint, in which all ham bands above 1 GHz may be used. In the *CQ VHF* March Tune-ups, we would activate one *mode* per week, such as SSB the first week, followed by CW, then FM, and, finally, digital. All standard contest rules would apply, for example, no relays and no use of repeater frequencies.

CQ VHF Worldwide 6-Meter Contest

Possible date: Full weekend (see discussion below), 6 meters only; standard contest rules.

Considerable DX is possible on 6 meters in the summertime. Scheduling is problematic, though, since the summer weekends that don't *already* have major contests scheduled over them, such as the 4th weekend in July or the 2nd weekend in August, are well past the mid-June peak of the sporadic-*E* season.

"...before we make any final decisions on contests to sponsor, we'd like to present a few possibilities and listen to your comments."

The other possibility is to follow the example of the Europeans, who schedule several national contests on the same weekend to maximize participation, then everyone works everyone else and all contacts count for whichever contest(s) you want to enter. If we take this approach, then the 3rd weekend in June might be ideal. This coincides with two other major 6-meter contests: the SMIRK QSO Party and the British UKSMG contest. Again, the goal here would not be to compete with either of these fine events, but rather to enhance all three by maximizing participation. At the peak of the sporadic-*E* season, the major drawback to this date (assuming it's OK with SMIRK and UKSMG) is that it falls right between the ARRL June VHF contest and Field Day, meaning three consecutive contest weekends in what is already a very busy month for many people.

CQ VHF Foxhunting Weekend

Possible date: Last full weekend in April (participants choose which day)

"Does this give you any ideas for other on-air competitions we may be able to adapt as nationwide (or even worldwide) activities?"

In Europe and Asia, foxhunting, or radio direction-finding (RDF), is an organized international sporting event (see KØOV's article "World Class Foxhunting Comes to America," October, 1996, *CQ VHF*), operating under a single set of rules in each IARU region. Here in North America, foxhunting is generally done by car, not on foot, and each event is organized separately by its sponsoring club.

A nationwide "foxhunting weekend" with uniform standards would provide additional focus on this increasingly-popular activity, and perhaps lead to organized regional and even nationwide championships in the future.

What Are Your Ideas?

There's a group of hams in Colorado who plan to set up shop one weekend this summer on 14 mountain peaks and try to work as many people as possible. The goal for everyone else will be to work as many of the 14 as possible. This appears to be an FM-only event, with each mountaintop station assigned a specific simplex frequency. Last year in Colorado, there was a multimode event to activate all counties. These types of events serve to generate activity and build interest in on-air competition.

Are you involved in something similar? Does this give you any ideas for other on-air competitions we may be able to adapt as nationwide (or even worldwide) activities? Let's hear from you. You can reach us by mail at *CQ VHF*, 76 N. Broadway, Hicksville, NY 11801; by fax at (516) 681-2926; or by e-mail to: <cqvhf@aol.com>. And remember to tell us if you want to be part of planning, organizing, and running of any of these contests, and, if so, what makes you qualified to do so. Many thanks in advance to all who respond.

—W2VU

Announcing

The 1997 CQ World-Wide VHF Contest

Make the most of enhanced summer propagation with the CQ World-Wide VHF Contest! Here are the complete rules.

Dates/Times:

Starts: Sat., July 12, 1997, 1800 UTC
Ends: Sun., July 13, 1997, 2100 UTC

I. Contest Period: 27 hours for all stations, all categories. Operate any portion of the contest period you wish.

II. Objectives: The objectives of this contest are for amateurs around the world to contact as many amateurs as possible in the allotted 27-hour period, to promote VHF and above activity, to allow VHF and above operators the opportunity to experience the enhanced propagation available at this time of year, and for interested amateurs to collect VHF and above Maidenhead grid locators ("grid squares") for awards credits.

III. Bands: All authorized amateur radio bands above 50 MHz may be used, as authorized by local law and license class.

IV. Class of Competition:

1. Single op fixed station.
2. Multi op class I fixed station.
3. Multi op class II fixed station.

A fixed station is one that is a regular home station location. You may operate from your home station or you may be a "hired gun" at another home station to qualify for a fixed station category.

A multi op class I station is one that operates five or more transmitters simultaneously on all authorized amateur frequencies above 50 MHz.

A multi op class II station is one that operates four or less transmitters simultaneously on all amateur frequencies above 50 MHz.

4. Single op portable station.
5. Multi op class I portable station.
6. Multi op class II portable station.

A portable station is defined as one that you set up away from a regular home station location.

7. Rover station. A rover station is one that is manned by no more than two operators, must travel to more than one grid locator and must sign "rover" or /R. The spirit of this class is to encourage operation from rare grid locators by persons who are inclined to do so. It is not the intent of this class to encourage one operator to move from one super station to another super station in another grid locator in order to compete in this category.

8. QRP station. Anyone operating a station running 25 watts output, or less, is eligible to enter this category. There are no location restrictions. You can operate from your home QTH, or from the highest mountain you can find. However, you cannot run more than 25 watts output on any band.

V. Exchange: Callsign and Maidenhead locator grid locator (4 digits, e.g., EM15). Signal reports are optional and need not be included in the log entry.

VI. Multipliers: The multiplier is the number of different grid locators worked per band. A "Grid Locator" is counted once per band. Exception, the rover who moves into a new grid locator can count the same grid locator more than once per band as long as the rover is himself or herself in a new grid locator location. Such change in location must be clearly indicated in the rover's log. It is required that rover category operators maintain separate logs for each grid locator location.

A. The rover who changes location during the course of the contest is free to contact as many other stations as he or she wishes. The rover becomes a new QSO to the stations working him or her when that rover changes grid locator.

B. The grid locator is the Maidenhead grid locator to four digits (FM13).

VII. Scoring: One point per QSO on 50, 70, and 144 MHz; 2 points per QSO on 222 and 432 MHz; 4 points per QSO on 903 and 1296 MHz; 6 points per QSO on 2.3 GHz and above. Work stations once per band, regardless of mode. Multiply total QSO points times total number of grid locators (GL) worked. Contest entrants may not transmit on 146.52 MHz, or your country's national 2 meter FM simplex calling frequencies, or commonly recognized repeater frequencies for the purpose of making or requesting contacts. Contacts made within your own country, in the DX window of 50.100– 50.125 MHz, are discouraged. Contacts made on the SSB calling frequencies of 50.110 MHz, 50.125 MHz, and 144.200 MHz are discouraged. Contest participants are required to use UTC as the logging time. Incentive scoring: Operators completing two-way CW or MCW contacts may add one point to the QSO value for each contact.

Example: W1XX works stations as follows:

37 QSOs, with 3 QSOs on CW (34 x 1 = 34; 3 x 2 = 6; 34 + 6 = 40) and 10 GLs (10 multipliers) on 50 MHz.

45 QSOs (45 x 1 = 45) and 8 GLs (8 multipliers) on 144 MHz.

26 QSOs (26 x 2 = 52) and 4 GLs (4 multipliers) on 222 MHz.

38 QSOs (38 x 2 = 76) and 5 GLs (5 multipliers) on 432 MHz.

2 QSOs (2 x 4 = 8) and 2 GLs (2 multipliers) on 903 MHz

6 QSOs (6 x 4 = 24) and 2 GLs (2 multipliers) on 1296 MHz.

W1XX has 245 QSO points (40 + 45 + 52 + 76 + 8 + 24 = 245) x 21 multipliers (8 + 4 + 5 + 2 + 3 = 21) = 5,145 total points.

VIII. Awards: Engraved plaques will be awarded to the top scoring stations in each category in the world (for a total of eight plaques). Parchment certificates suitable for framing will be awarded to the top-scoring stations in each category in each continent. Certificates may also be awarded to other top-scoring stations who show outstanding contest effort. Certificates will be awarded to top scoring stations in each category in geographic areas where warranted. Geographic areas include states (U.S.), call areas (Japan), provinces (Canada), and countries, and may also be extended to include other subdivisions as justified by competitive entries.

IX. Miscellaneous: An operator can sign only one callsign during the contest. This means that an operator cannot generate QSOs by first signing his callsign, then signing his daughter's callsign, even though both callsigns are assigned to the same location. All contacts above 300 GHz must use coherent radiation on transmissions and employing at least one stage of electronic detection on receive. A station located exactly on a dividing line of a grid locator must choose only one grid locator from which to operate for exchange purposes. A different multiplier cannot be given out without moving the complete station at least 100 meters.

X. Log Submissions: You must request log sheets from: the CQ VHF Contest, *CQ* magazine, 76 N. Broadway, Hicksville, NY 11801. Please include an SASE with your request. Completed logs must be postmarked no later than August 31, 1997, to be eligible for awards. All logs should be mailed to: Joe Lynch, N6CL, VHF Contest Chairman, P.O. Box 73, Oklahoma City, OK 73101. Logs may be submitted on disk, provided a hard copy of the log is sent with the disk and the data is in an ASCII format compatible with an IBM-PC type computer.

MIDLAND EQUIPMENT

MODEL 73-030

Micro Miniature 2 meter VHF transceiver.

Covers 144-148 transmit and 138-174MHz receive. Palm size...only 4 1/2 x 2 1/4 x 1" with battery, yet loaded with features. Two watts output with battery supplied but 5 watts is available with an optional 9.6V battery. Features included several battery save modes, 72 user programmable memories, scanning, built in DTMF with auto dial memories. Full LCD panel with frequency and function, channel steps from 5 to 50kHz, keyboard entry, repeater splits, three power ranges, priority channel scan and more. Supplied with 6V-600MA rechargeable battery, flexible antenna. Wall battery charger, belt clip and instructions. Jacks for speaker/microphone, antenna and power.

MODEL 73-009

Car adapter plus linear amplifier 135-170MHz The 73-009 is a wide band linear amplifier allowing you to convert handheld transceiver into mobile units. The installation of the 73-009 on the vehicle's driver side window makes the unit even more handy, in a place which is not usually used for other accessories but very close to the driver's side. Adding a speaker microphone and an external antenna, completes the mobile station. Voltage 13.8VDC. Current drain 5A. Frequency range 135-170MHz. Max output power 30W. Impedance 50 Ohm. In/Out Connector BNC/SO239. Size (4 3/4 x 4 3/8 x 1 3/4"). European craftsmanship.

MODEL 73-007

Miniature 70 CM (440MHz) UHF Transceiver

Same as the 73-005a but covers 430-450 transmit and 420-470MHz receive.

MODEL 73-005A

Miniature 2 Meter VHF Transceiver

Covers 144-148 transmit and 130-170MHz receive. Backlighted keyboard. Two watts of power output expandable to 5 watts. Miniature 9 cubic inch size, 18 function LCD multi-function readout. Three power levels. Keyboard or rotary frequency entry. Multi-function scan. 20 independent memory channels. Frequency steps of 5-10-12.5-20-25 or 50kHz. Built-in DTMF and paging. Optional tone squelch. Multifunction dial lamp. Dual watch. Battery save feature. Auto power off. Repeater offset and reverse. Monitor switch. Frequency/function lockout. Jacks for external antenna, speaker, microphone. Supplied with 7.2V 700mA rechargeable battery, flexible antenna, wall style battery charger and belt clip.

MODEL 75-510

14 Channel PLL Family Radio

The 75-510 offers maximum channels, power and control. All 14 channels are included in this PLL handheld. Maximum allowable power output. Full FM. 39 frequency CTCSS tone code included for ultra privacy. LCD control panel. Other features include fully automatic squelch control, LCD ON/OFF light, scan, busy channel bypass and delete, channel up-down controls, mode function, battery low indicator, keylock system, transmitter time out timer for safety and memory retention. Jacks are provided for an earphone or speaker/microphone. The unit is supplied with a flexible antenna and belt clip. Size: 2 1/4W x 4 3/4H x 1 1/4D. Weighs 1 lb.

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Vienna, VA. 22180

Ph: 703.938.8105
FAX: 703.938.4525
www.elecdist.com

For more info see your favorite dealer.

EDCO

CIRCLE 122 ON READER SERVICE CARD

First Look: Kenwood TH-235 2-Meter Handheld

Kenwood goes after the brand-new ham with this under-$200 beginner's HT for 2 meters. WB6NOA got a quick peek as the TH-235 was unveiled.

By Gordon West, WB6NOA*

For the first time in a long time, Kenwood is going after the "first low-cost handheld" radio market—and going head-to-head with RadioShack—with its brand new, under $200, TH-235 2-meter transceiver. When you first see this set, you'll swear you're looking at a radio from Kenwood's land mobile division. This is a relatively large handheld radio (by today's standards) with some incredibly big features, including:

- 60 cloneable memory channels
- CTCSS encode, optional decode
- Tone signaling and selective calling from keypad
- Multi-scan capabilities
- Big 16-digit DTMF keypad

A Close-Up Look

Over the last several years, virtually all of the manufacturers have been making their handhelds smaller and smaller. Kenwood is going back to big with this one, maybe looking at some of the success ICOM had many years ago with its IC-32AT. Let's take a closer look at the TH-235's features.

This is a single-band 2-meter transceiver with 60 memory channels that don't require battery back-up. Each of these memory channels will hold frequency, tone, offset, and selective scan. I like its readout—nice and big, and crisp, clear, bold LCD numbers; but, sorry, no alphanumerics on this one. CTCSS tone encode is built in, but decode requires the TSU-8 option. I wish this weren't an option, but at least tone encode is standard. You also get three-digit selective calling code capabilities, including a group call feature.

"The new Kenwood TH-235 will have a major impact on the beginner amateur radio market...."

Three Scan Modes and No Squelch Knob

For the beginner, scanning is easy with multi-scanning modes. Full-band scan, programmable band scan, and memory scan with programmable memory channel lockout are some of the scan options. You can also time-operate the scan, or have the scan hold until the signal drops. Best of all, programmable memory channel lockout is addressable to any one of the memory channels.

The unit can clone, too, from one set to another without any hard-wire hookup. Plus, you can keep your frequencies secret by cloning with each channel as a channel number, rather than a frequency.

Kenwood eliminated the squelch rotation control on the TH-235, and instead

Kenwood's TH-235 handheld, at under $200, is aimed squarely at the first-time ham buyer. (Photo courtesy Kenwood Communications)

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

gives you programmable squelch that can be easily sampled by pushing a single monitoring button.

First-Timer Features

For the new operator, automatic repeater offset will generally swing the 146-MHz channels to a –600-kHz "split," and the 147-MHz channels to a +600 offset. A single push of a button also lets you listen to a repeater input frequency in order to determine whether you might want to switch to simplex.

Another good feature for the newcomer is the built-in time-out timer. This will save the day when you get into your vehicle with the unit still strapped on your belt, and unknowingly lean back onto the transmit key: the unit will automatically cycle down on an uninterrupted long TX.

What I liked best about the new Kenwood TH-235 is its size, relatively larger than the current crop of mini- and micro-handhelds, as well as the logical way of programming it without actually having to pore over the instruction manual. The audio output is incredibly loud, approaching what you might hear from a commercial Motorola HT—no surprise when you consider that this beginner handheld has the size, weight, and audio of Kenwood's own commercial land mobile equipment.

A Major Impact

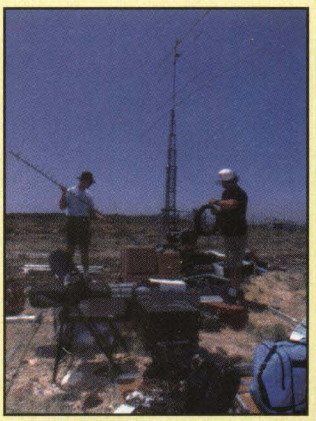
The new Kenwood TH-235 will have a major impact on the beginner amateur radio market, and will certainly help Kenwood build brand loyalty from the start among its very newest customers. Put it in your hand, turn up the volume and hit the squelch override button, then stand back for some big equipment performance with a small price tag!

List price for the TH-235 is $199 ■

Resources

For more information, see your Kenwood dealer or contact Kenwood Communications Corp., P.O. Box 22745, Long Beach, CA 90801-5745; Phone: (310) 639-5300; WWW: <http://www.kenwood.net>.

On the Cover



Setting up for the June VHF Contest. *CQ VHF* "Weak-Signal News" editor Tim Marek, K7XC (then NC7K), and Dave Eubanks, W7KK (then NR6E), prepare to operate the June, 1996, ARRL VHF QSO Party from the peak of Booker Mountain, in grid square DM18, above Tonopah, Nevada. Once set up, their station was operational on four bands, from 6 meters through 70 centimeters, and netted them 617 QSOs in a total of 270 grid squares (with repeats between bands).

On 6 meters, Tim and Dave ran a kilowatt, alternating between a seven-element rotatable Yagi and a second, four-element beam fixed toward the north. That snagged them 456 QSOs in 189 grids. They also ran a kilowatt on 2 meters, feeding a pair of 18-element Yagis at 40 and 50 feet, respectively, accounting for another 125 QSOs in 55 grids.

Their 222-MHz station put out only 140 watts into a seven-element Yagi, but it was lack of activity rather than station performance that accounted for low totals here—only 12 QSOs in 10 grids. Finally, the 432-MHz station put 110 watts into a pair of 25-element Yagis mounted between the two 2-meter antennas, which rounded out their score with an additional 24 contacts in 16 grids.

Tim commented that conditions on all bands were terrible on Saturday (the first day of the contest), but outrageously good on Sunday. "We worked 15 grids from EN00 to EN50 during a 23-minute sporadic-E opening on 2 meters," he noted, adding that "50 MHz was reminiscent of 28 MHz during the 1989 Sweepstakes contest (*at the peak of the last sunspot cycle—ed.*), with activity spread out all the way up to 50.325 MHz. It was our best effort ever on six."

For a preview of what Tim and Dave are planning for *this* June's contest, along with the plans of many other stations, check out this month's "Weak Signal News" column. (Cover photo by Larry Mulvehill, WB2ZPI)

Build a 2-Meter Intermod Notch Trap

Bothered by intermod from high-powered pagers? Trap their signals before they reach your receiver with this build-it-yourself notch filter.

By Jim Ford, N6JF*

If you've heard a grumbling tone on your 2-meter rig, chances are you've become a victim of *paging intermod.* In case you haven't noticed, pagers have become a ubiquitous consumer device. Since they're very small and normally sit next to your body, they have very inefficient antennas. The paging companies make up for this with lots of transmit power and many transmitter sites. Herein lies the problem for hams: their frequency band is close to our 2-meter band (roughly 152.4 MHz for the Southern California area).

Intermod Reduction Techniques

The effects of intermod, or intermodulation distortion, are heard when two or more strong off-the-air signals create additional signals inside your receiver. The fact that these additional signals are not really there is little comfort to the person receiving the interference. What causes the "phantom" signals is *non linearity* of the receiver itself. All receivers have it to some extent, but some are more prone to problems than others.

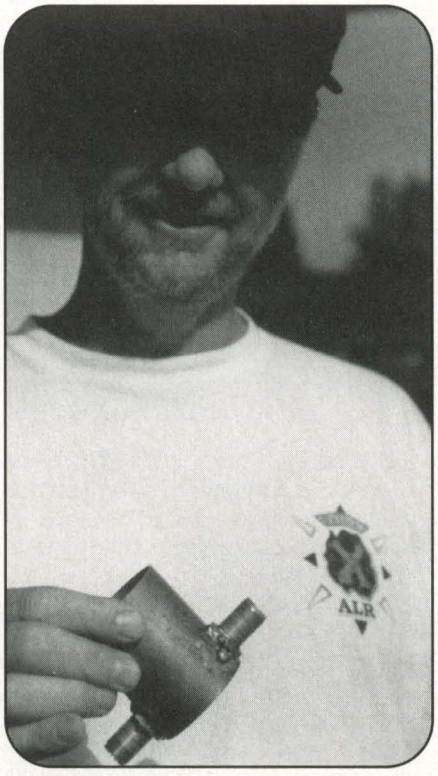
There are three common methods of reducing intermod problems.

1. Strengthen receiver front end (RF stage, mixer, and IF)
2. Add a bandpass filter
3. Add a notch filter

Let's briefly look at each of these, starting with the front end.

Receivers today are often designed with more emphasis on price than on big signal performance. For example, many receivers use dual gate MOSFET transistors as first mixers. These transistors are good considering their price, but are not so good when encountering big signals such as the pagers.

A more expensive but "bulletproof" mixer is a *diode double-balanced mixer.* These are immune to interference, but they have loss instead of gain and require much more local oscillator power to drive them. This requires two additional amplifier stages, one to make up for the lost gain in the mixer and the second to amplify the local oscillator signal. This, of course, raises the price. Finally, IF (intermediate frequency) amplifiers that are designed for big signals are generally current hogs with more power supply drain than other devices, and perhaps even require a small heat sink. Good RF front end design can reduce both in-band (144 to 148 MHz) and out-of-band intermod. But receiver front end redesign is a major project, and not our emphasis here.



The author with the completed 2-meter helical notch filter. Tuned to 152.4 MHz, it "notches out" interference from nearby pager transmitters. (Photos by Gordon West, WB6NOA)

"Since [pagers are] very small and normally sit next to your body, they have very inefficient antennas. The paging companies make up for this with lots of transmit power and many transmitter sites. Herein lies the problem for hams...."

Bandpass Filters

Bandpass filters are a good way to reduce intermod caused by out-of-band signals (*for more on bandpass filters, see "Sniffing Out 'Birdies' on Your Radio,"* CQ VHF, *September, 1996.—ed.*). But the most common paging frequencies are just slightly out-of-band, in percentage terms, to 2 meters. A bandpass filter will have to work hard to eliminate the paging signals. Getting the necessary level of rejection often requires more than one stage—and that, again, means a greater expense. To its credit, a bandpass filter will reduce interference caused by any-

**Jim Ford, N6JF, is a digital and RF designer and a college electronics instructor. He is also a regular contributor to a variety of radio publications.*

Top view of the filter. Note that there is no top connection for the helical coil. Solder blob indicated is the connection point for the bottom end of the coil. See text for attachment details.

"A notch filter blocks all signals from a narrow frequency band. It does not need to be bypassed when listening outside the 2-meter band (unless you like to listen to pager signals)."

thing outside of the band, including mixer images. But that also means you'll need to bypass it if you want to listen to anything outside the 2-meter band, such as aircraft or weather. And, generally speaking, the bandpass filter needed to eliminate paging signals from a 2-meter receiver will have more loss than another alternative, which *is* the focus of this article. Enter...the notch filter.

Take a Notch out of Intermod

The final common method of reducing paging interference is a *notch filter*. A notch filter blocks all signals from a narrow frequency band. It does not need to be bypassed when listening outside the 2-meter band (unless you like to listen to pager signals). And a notch filter generally has less loss than a bandpass filter. The only disadvantage is that it eliminates interference from only a very narrow group of frequencies. Is this a problem? Only if your interference comes from a variety of sources on many different frequencies.

One of the ads from a notch filter manufacturer states that 99% of intermod comes from the paging frequencies. I don't know if this is true for everyone, but I know that paging transmitters cause the majority of *my* intermod problems.

I recently had a chance to test a bandpass filter by DCI and a notch filter by Par Electronics. Both of these products are excellent, and I'd recommend them wholeheartedly. However, if you want to brew your *own* notch filter that has very low loss, excellent VSWR, and can handle the power of a 50-watt transceiver, then read on—this project's for you.

What You'll Need

This notch filter is basically a helical resonator hooked up as a "suck-out trap" with a tuned coupling loop as an input/output. The design uses a 2-inch copper water pipe (type M) available from many plumbing supply houses. It should be 2.65 inches long (being off by a 1/10 of an inch should cause no problems). I had to buy a minimum length of 12 inches for just under $10, but it was good to have extra pipe, since I tried two versions of this project.

While a hacksaw will work, I got a much cleaner cut by premarking the length and having the local plumbing supply house cut it for me with its large tubing cutter. They charged me $2 for this service. You'll also need:

- Three feet of bare #10 copper wire for the coil. Actually, this is enough for two coils in case you make a mistake.
- About 6 inches of #12 enameled wire for the coupling loop. You can use the #10 wire for this as well, but it's harder to work with.
- A loop tuning capacitor. I used a 15-pF, 100-volt disc ceramic (Digi-Key part number 1328PH). A silver mica or a chip capacitor should work at least as well.
- Some sort of feedline connector (two of them). The type you use is your choice, but I used two SO-239s.

Building the Filter

The helical coil should be 1.1 inches in diameter, 1.625 inches long, and about 5.75 turns. I say *about* 5.75 turns because it will vary according to your exact diameter, pitch, and centering in the tube. I'd start with 6.25 turns and a length of 1.66 inches, then tune it by cutting the top with stout wire cutters (more on this later). I used a piece of 3/4-inch Schedule 40 PVC tubing as a form to wind the coil. It has a diameter of 1.05 inches, and the coil diameter was just right after I removed the PVC. If you don't have a 1.05-inch form, then use a 1-inch form with two or three turns of black tape on it. Wind the helical coil as tight and close as you can on the form. It's easy to stretch the coil to the right length but harder to get good form if you have to squeeze the loops back together.

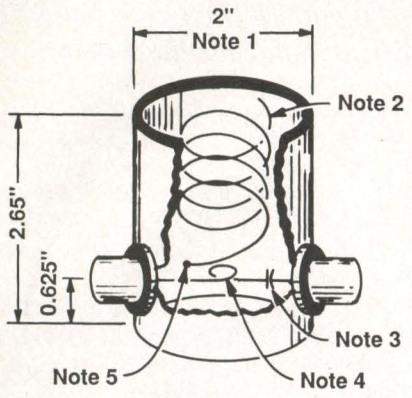
The coupling loop is 1-1/2 turns close wound on a 5/8-inch form. It should be parallel to the larger coil, but shouldn't touch it, and in the same plane as the connectors. The smaller coil should be centered in the tube and wound in the same direction (clockwise, for example) as the main coil for maximum coupling.

The 15-pF capacitor is soldered directly between one of the connectors and the 1-1/2-turn coupling loop. I didn't like an unsupported connection at the coil, but thought more hardware in the RF field inside of the tube would create more problems than it would solve.

Connecting the Connectors

I found that a regular SO-239, connected to the copper tube with two brass nuts and screws, was the easiest approach to connecting the coax. The start of the helical coil and both connectors are .625 inch from the bottom of the tube (see Figure). I used a 5/8-inch chassis punch to make the connector holes on my second version. The chassis punch slightly flattens the copper tube, but that isn't a problem. The connectors should be mounted directly opposite each other. The flange on the SO-239 should be mounted on the *outside* of the tube because, otherwise, the connector would protrude too far into tube and interfere with the helical coil. In fact, you'll still need to file off about half of the connector pin to avoid being too close to the helical coil, but there will be enough pin left to make a solder connection.

In addition to the holes for the connectors, you'll need to drill a 7/64-inch hole about 3/4 of an inch away from one of the connectors (technically, it should be measured in degrees, but this is close enough). This is where you'll connect the helical coil. The #10 wire is almost exactly .100 inch in diameter, so the nearest fractional drill bit for the hole is 7/64, which is .109 inch. Insert the end of the coil in the hole and solder it, both on the inside and



Notes
1. 2-inch (type M) copper water pipe
2. Helical coil made from #10 bare wire, 1.1-inch diameter, 1.65 inches long. Start with 6.25 turns, then trim to match specific notch frequency (approximately 5.75 turns; see text), then squeeze or compress coil for fine tuning
3. 15-pF, 100-volt capacitor (disc ceramic or silver mica)
4. 1.5 turns #12 enameled wire, 5/8-inch diameter, close-spaced. Wind coupling loop in the same direction as the large coil (e.g., clockwise) and position for maximum coupling or *worst* SWR at 152.4 MHz
5. 7/64-inch hole spaced 3/4-inch from connector and 0.625 inches from bottom (same as center point of connectors). Insert bottom end of coil and solder inside and out with propane torch, using silver solder if possible (see text). Do this *before* attaching the connectors.

Figure. Parts layout of the helical trap (notch) filter. See notes and text for construction details.

Bottom view of the filter. The author suggests attaching the coax connectors to the tube with brass screws and nuts, rather than trying to solder them on, as he did. Note the smaller coupling coil and capacitor connected between the coax connectors.

"This notch filter is basically a helical resonator hooked up as a 'suck-out trap' with a tuned coupling loop as an input/output."

the outside, using a propane torch (see instructions below). Do this *before* you put in the connectors to avoid burning them. The inside connection is the most important, electrically, as most of the RF is on the inside of the tube. The outside solder connection is for added strength.

Attaching the Main Coil

First, brighten the end of the #10 wire with some steel wool (*without soap*) or sandpaper, and pre-tin (coat with solder) about an inch of the end with regular 60/40 solder. Leave a little extra on the end so you can grab the wire from the outside of the tube *with pliers* to rotate the coil inside the tube if necessary, before soldering. You can then hang a pair of "Vise Grip"-type pliers on the wire to help hold it in place during soldering. Solder the coil on the inside of the tube with 60/40 regular solder.

After soldering the coil, I suggest you *resolder* the connection with silver solder (you can get a small roll of it at most hardware stores for about $2). Silver solder is much stronger and will hold the coil much better without the danger of it breaking off because of vibration. Silver solder does require a higher temperature, but a propane torch (or soldering gun when not soldering such a large mass) has more than enough heat. The amount of silver in the solder is small and doesn't help conductivity much, but it does add strength. (The reason for soldering first with regular solder is that it seems to adhere better. Perhaps the 60/40 solder has a more active flux. In any case I've had better luck with this method.) There is no connection at the top of the coil.

As always, safety comes first. I use a flame tip for soldering and not a soldering tip attachment, so I also use safety glasses, hat, and gloves for a project like this. Consider doing the same.

Tune Up

The best way to tune the filter is to terminate either connector with a 50-ohm resistor or dummy load and connect an SWR analyzer to the other connector. If you don't have an SWR analyzer, such as the MFJ 259, borrow one if you can (next to a multimeter, I believe these are the most useful pieces of test equipment a ham can own). Tune the SWR Analyzer from about 100 to 150 MHz. There should be a marked increase in SWR at some frequency which should be *lower* than the frequency you want to notch out, since the coil should be a little too long at this point. What you want is to have the worst SWR fall out at roughly 152.4 MHz. Cut a maximum of 1/4 inch off the top of the helical coil and remeasure the worst SWR frequency. It should have moved higher. If you overshoot the desired frequency, don't worry because you can compress the coil slightly to lower the frequency. You can change the frequency by as much as a couple of MHz by expanding or compressing the coil, but it is best to keep this to a minimum since the length of the coil was calculated to give maximum Q (approximately 1200) and performance. (*"Q" is a measure of efficiency of a coil or tuned circuit.—ed.*)

If you can't get your hands on an SWR analyzer, an alternative tuning method is to hook up a signal generator to one connector and use a 50-ohm terminated oscilloscope as a null detector on the other connector to determine the best "suck out" frequency.

No Covers Needed

There are no top or bottom covers on the trap because they generally aren't needed. I tested it with and without covers and found no difference in performance, except that the covers lowered the resonant frequency by a MHz or more.

There are, however, two situations in which you might want to put on covers. Without covers, the resonant frequency of the trap will change if the top is within 3/4-inch or the bottom within 1/2-inch of a metal surface. Mine sat on a nonmetallic operating table, so it wasn't an issue for me. Another reason might be RFI from a computer in the same room. I ran a before-and-after test with a handheld using low power and a dummy load in the same room as the computer. The signal was about 10 dB louder with the covers off, suggesting a slight loss of shielding without covers.

If you want to put covers on the trap, first tune up the filter *without* any covers attached. Next, solder on a bottom cover. Then temporarily hold on a top cover and find the new lower frequency. Slowly

Resources

Most of the parts for this filter can be purchased at a local plumbing supply house or home center. Contact information for the manufacturers/dealers mentioned in this article is as follows:

DCI Digital Communications, Inc., Box 293, 29 Hummingbird Bay, White City, SK S0G 5B0 Canada; Phone: (306) 781-4451 or toll-free from the U.S.: (800) 563-5351

Digi-Key Corp., 701 Brooks Ave. S., P.O. Box 677, Thief River Falls, MN 56701-0677; Phone: (800) 344-4539; Fax: (218) 681-3380; Internet: <http://www.digikey.com>

MFJ Enterprises, P.O. Box 494, Mississippi State, MS 39762; Phone: (601) 323-5869; Fax: (601) 323-6551; Internet: <http://www.mfjenterprises.com>; for the location of a dealer near you, call (800) 647-1800.

PAR Electronics, 6869 Bayshore Dr., Lantana, FL 33462; Phone: (561) 586-8278; Fax: (561) 582-1234; e-mail: <par@magg.net>

trim the coil until it's resonant at the desired frequency. Once that adjustment is made, the final cover soldering operation (the top cover) shouldn't change the resonant frequency.

Results

This filter has eliminated over 95% of my intermod. The VSWR across the 2-meter band is an excellent 1.1:1, or better. The loss is also very low, at .1 dB, which is better than most commercial vendor specs. The 152.4-MHz null is 18 to slightly more than 20 dB, which is less than the commercial vendors who advertise over 30 dB.

At first I was disappointed, but it did the job very well and with very little loss. I think the reason has to do with intermodulation theory. Remember that the intermod interference you hear is a product of at least two signals. When you reduce the strength of one of the signals by 1 dB, the product (your interference) goes down by at least 3 dB. So by reducing the strength of your paging signal by 10 dB, the interference is reduced by a whopping 30 dB!

Really Stubborn Cases

Getting more reduction generally costs you more insertion loss. If you have an extreme case of interference and need more rejection, there is one thing you can try. Increase the inductance of the coupling loop by increasing either the diameter or number of turns. You'll then have to reduce the value of the capacitor to compensate for the increased inductance. I was successful without this change and hope you are, too.

Tuning Out

Once the completed filter is in line between your radio and your antenna, you should find a dramatic decrease in the amount of pager intermod, if not a complete elimination of the problem. I'd like to acknowledge Wes Hayward, W7ZOI, for his helpful suggestions concerning this project. ■

What You've Told Us

The results of our March survey show that, as our magazine matures, we are reaching a more broadly-based audience. March's questions were repeats of what we asked in March, 1996, *CQ VHF*'s second issue.

Our readership is still overwhelmingly male (97% in '97 versus 96% in '96) and most of you are still married (67% versus 70% last year). Our readers' ages have become more evenly distributed since the magazine's first days. Last March, 13% of our readers were under 35; 60% were between 35 and 55; and 27% were over 55. Now, it's 17% under 35; 49% 35 to 55; and 34% over 55.

There have also been some significant changes in the experience levels of our readers. While the greatest number of readers a year ago (42%) had been licensed two years or less, that distinction now belongs to the "old-timers"—39% of our current readership has been licensed over 10 years. Second place now belongs to the 3 to 10 year group (31% versus 25% last year), and the percentage of "newbies" dropped from 42% last year to 30% this year.

Does that mean fewer new hams are reading *CQ VHF*? Doubtful. Most likely, it means that many more experienced hams are joining the newcomers among our readership. This is borne out by the responses to the next question, which asked what class of license you hold. This year, 46% of our readers hold basic Technician licenses (up from 44% last year), while another 17% hold Tech-Plus licenses (down from 21% last year). The percentages of General and Advanced class readers held steady, at 8% and 14%, respectively, while the number of Extra class readers jumped from 12% last year to 15% now.

Finally, more of our readers are active on 6 meters (42% versus 38%), probably reflecting the growing popularity of the band; 2-meter usage held pretty steady (96% versus 97%), and more of you are active on both 222 MHz (20% versus 16%) and 432/440 MHz (57 versus 55%). In addition, 8% of current readers are active on 902 MHz and above (there was a problem with last year's numbers on this choice, so we can't make a comparison).

This month's free subscription winner is Roger Green of San Jose, California. Thanks again for your responses. Next month, we'll continue with more comparisons to 1996.

Reader FEEDBACK!

In his article on RF connectors ("Beginner's Corner," April 1997, *CQ VHF*), Peter O'Dell says PL259s have a "multitude of shortcomings," with their "main advantage" being their low cost and easy availability. He goes on to say that 90-95% of antenna problems are due to bad UHF connectors but that the connectors don't go bad as much as the *installation* of the connectors. The editor adds a note that properly soldered and installed connectors are good for use up to 225 MHz.

Seems to me that PL259s will work if you use the right iron, good soldering techniques, and protect exposed connections with sealants. The PL259/SO239 combination has been around a long time and it looks like the industry leaders aren't about to make a massive switch to another standard anytime soon, although the BNC, N, and T families are making gradual progress.

My own Alinco DJ850T is fed with a length of RG8X terminated in a PL259. The cable is linked with a barrel connector to another length of RG8 cable to a discone antenna up 20 feet. The overall run is under 60 feet. I picked up a solder-and-crimp BNC connector to fit the Alinco HT at a computer electronics store. While dimensions for preparing and installing the BNC were found in the *ARRL Operating Manual*, I found no instructions for use with RG8X cable. I visited a commercial radio installer and together we determined that the BNC connector I bought requires the use of an appropriate crimping tool (around $30), tiny but surgically precise cuts for dressing the cable, and post-soldering trim of the dielectric to properly seat the male contact pin.

I dropped the BNC installation and went back to using silver-plated UHF connectors. Granted, I need an adapter to fit the HT but I'm getting out and working repeaters 40 miles away. True, the BNC connector has electrical and mechanical advantages over the venerable '259, but I'll postpone its use until these criteria are met:

1) There is a BNC connector which doesn't require an expensive crimp tool.

2) A stripping tool for RG8X and similar cables which will dress the cable as required.

3) A BNC which can be installed without worrying about the cable's dielectric swelling due to soldering.

If anyone is successfully using BNCs with RG8X, I'd like to hear from my fellow hams as to their experience with combination.

Joe Guerra, N5YPE
Kingsville, Texas

E-Mail Lists for Repeater Owners

If you operate a repeater using a controller made by Link Communications or ACC, WA3QKX has set up an e-mail list that you may join to compare notes with other repeater control-ops. According to a report on "Newsline," there's a separate group for each manufacturer. You may join either one by "surfing" to either of the following World Wide Web sites:

To join the Link controller list, point your Web browser to <http://rrc2@engmg.pitt.edu/~rrc2/link.html>.

For the ACC group, make that <http:// rrc2@engmg.pitt.edu/~rrc2/acc.html>.

CQ VHF Ham Radio Above 50 MHz

Reader Survey—June, 1997

To help us serve you better, 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.

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 gauge your attitudes about VHF contesting.

1. Please indicate your current level of involvement with VHF contesting:

	Circle Reader Service #
a. I am an avid VHF contester	1
b. I regularly operate VHF contests (SSB/CW)	2
c. I regularly operate VHF contests (FM only)	3
d. I occasionally operate VHF contests (SSB/CW)	4
e. I occasionally operate VHF contests (FM only)	5
f. I don't operate VHF contests but would like to someday	6
g. I have no interest in VHF contesting	7

2. Please indicate your general views toward VHF contesting (circle all that apply):

a. They are fun and exciting	8
b. They challenge your operating skills	9
c. They challenge your technical skills	10
d. They help prepare you for emergency operating	11
e. They're OK for other people, but not for me	12
f. They're a waste of time and frequency space	13

3. Please indicate your feelings about the current major VHF contests (North American contests only, please):

a. They're great! Don't change a thing	14
b. They're OK but need some tweaking	15
c. They should be limited to SSB/CW	16
d. There should be more encouragement/opportunity for FM activity.	17
e. Don't know.	18
f. Don't care.	19

4. Please indicate whether you would favor any of the following (circle all that apply):

a. Single-mode contests (e.g., SSB, CW or FM-only)	20
b. Credit for each mode on which a station is contacted	21
c. Moving FM contesting frequencies closer to SSB frequencies	22
d. International-style "fox-hunting" competitions	23
e. Competitions that allow relayed (repeater/digi/satellite) contacts	24
f. Long-duration (not just one weekend) competitions	25

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

SSB the Easy Way

If you've got a 10-meter single sideband rig, then a transverter from a kit can put you on 2-meter SSB for under $200.

By Charlie Zusman, WE2R*

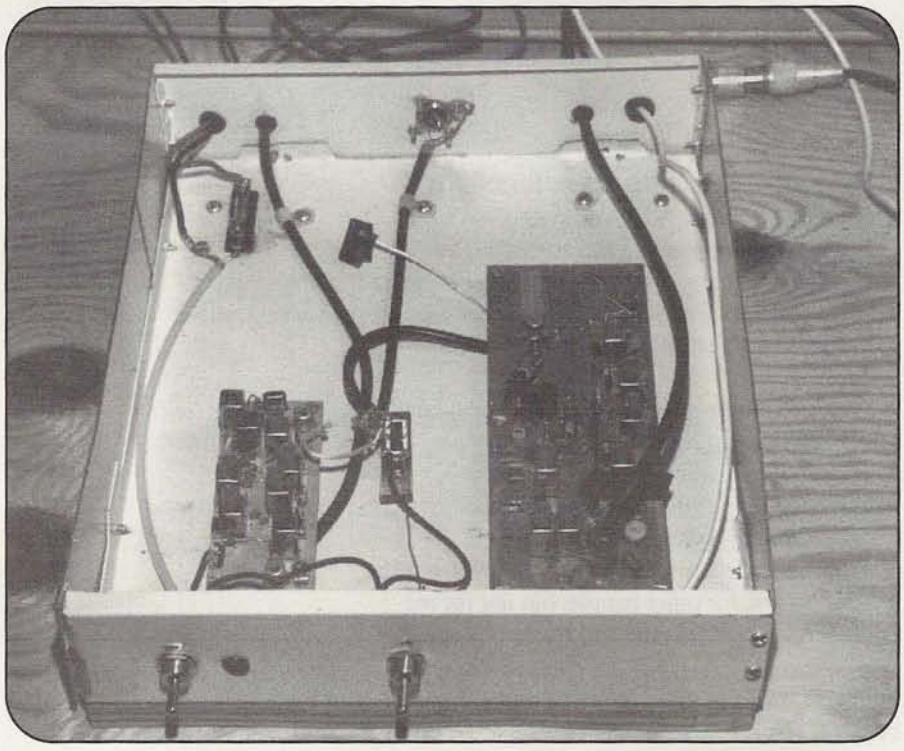
"You're solid copy here, Charlie. That rig of yours is doing a real fine job."

Never mind that the other station was a just a mile away, or that the contact was arranged over the phone. It was my first 2-meter SSB contact, and that signal report was music to my ears. That the rig was something I pieced together myself made the music that much sweeter.

My radio table was a mess of cables and meters only a ham could love, and now it was time to tidy it all up and put the new rig in its place on the operating shelf. Well, perhaps rig, in the singular, is a misnomer. I actually had several units, functioning together as a transverter, letting me work 2 meters through a 10-meter transceiver. By taking a modular approach, I had a setup with extra versatility. Also the system was pay-as-you-go: I bought the units separately so there was no single big cash outlay.

Using the transceiver that I already owned, and separate receive and transmit converter kits from Hamtronics, I put together a 2-meter SSB and CW system for under $200. Today, this setup is giving me my first taste of a new area of ham radio, VHF weak-signal work, plus the satisfaction of doing something electronic with my hands and gaining first-hand knowledge of how radio equipment works.

What follows is not really a construction article. Rather, it's an account of my experience and is intended as a guideline to kindle ideas in others.



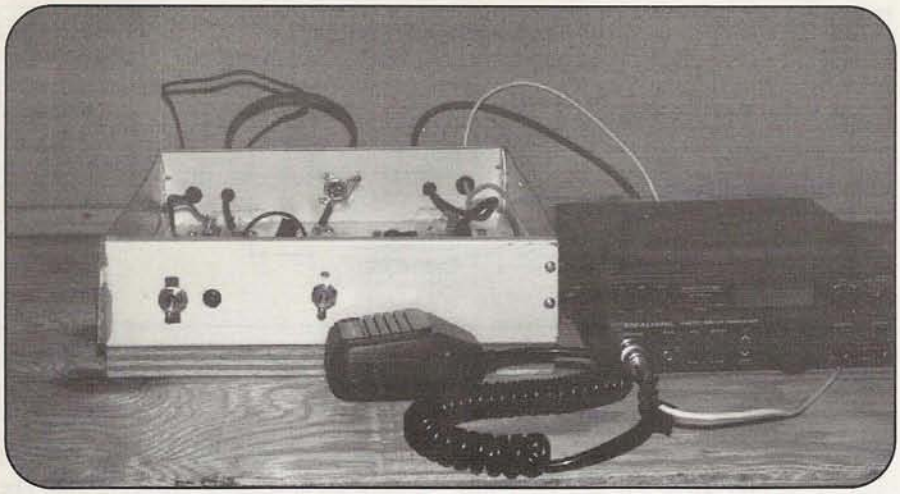
WE2R's transmit and receive converters mounted in a homebrew cabinet. The smaller board, on the left, is the receive converter and the other is the transmit board. The antenna T/R relay is in the center, between the converters. The front panel switches are for power (left), and T/R switching (right).

First Things First: What's a Transverter?

A transverter is a device which takes a signal from a lower frequency radio, in my case 10 meters, and converts it to a higher frequency signal, in this case 2 meters, for transmission. On receive, the higher frequency signal is taken from the antenna, converted to a lower frequency, and fed to the receive side of the lower, or intermediate frequency (IF), radio.

The system is based on the phenomenon of heterodyning; that is, when two radio signals are mixed, the result yields frequencies of both the sum and difference of the original signals. Either one of the resulting frequencies can be used, and the other is filtered out. So in this example, a 145-MHz signal, say, is mixed with 116 MHz of energy in the transverter, producing a 29-MHz signal for reception by the 10-meter radio. In transmit, a 29-

Charlie Zusman, WE2R, was first licensed in the 1960s and was active on 6-meter AM. Today, Charlie works as a newspaper editor, and, while he's active mostly on HF CW, he's looking forward to exploring the higher frequencies, starting with 2 meters.



The author's completed 2-meter CW/SSB station. The transverter is on the left, and the 10-meter transceiver used as the IF is to its right.

MHz signal is mixed with the 116-MHz signal in the transverter, and the resulting 145-MHz signal is then sent to the antenna for transmission.

Frequency of operation is generally set by the IF radio. In the example here, 28.000 MHz on the 10-meter radio gives an operating frequency of 144.000 MHz. A reading of 28.100 MHz gives a frequency of 144.100 MHz, and so on up the dial. It tracks in a linear fashion.

I've Only Just Begun

I consider my setup a work-in progress. It's low power—about 2 watts— but I plan to add a transmit amplifier and perhaps a receive preamp. By keeping the rig modular, I can use either the receive or transmit converters separately for satellite work later on (see "Phase 3D and Me," October 1996 *CQ VHF*). Also, when the sunspot cycle begins its upturn, I'll still have the 10-meter transceiver for low-band DXing. The key is flexibility.

As I noted earlier, my transverter is built from separate receive and transmit converter kits. These kits are also available wired and tested, but they cost more that way, and I believe that putting the pieces together is part of the fun and the learning experience.

"Using the transceiver that I already owned, and separate receive and transmit converter kits from Hamtronics, Inc., I put together a 2-meter SSB and CW system for under $200."

The basic building block of my system is a RadioShack HTX-100 10-meter SSB and CW transceiver. The radio is rated at 25 watts output with a low power setting of 5 watts. You can turn down the power even more by making some simple adjustments inside the radio. A way of lowering the power is essential, because even the low power output is too much for the transverter (more on this later). Although I used the RadioShack, any other HF transceiver is suitable as long as it covers the IF frequency of the transverter, 28 MHz, in this case. For power, I used my station's 13.6-volt, 25-amp DC supply. It provides much more current than needed, but that doesn't hurt.

Starting on Receive

My first purchase was the receive converter, for $49. I had some homebrewing and kit-building experience, but I'm strictly an amateur at it and there's always a tinge of doubt when I launch a project. Happily, though, construction went smoothly and this turned out to be a good starter project for me. The converter uses a pc board measuring 1-1/2 by 4 inches and consists of four transistors, a crystal, eight slug-tuned coils, and associated parts. It represented about two evenings work for me. I'm sure it could be built more quickly, and certainly it could be done in a more leisurely timeframe. But nobody's watching the clock, so you set your own pace.

The instructions consist of five pages, including a schematic and pictorial diagram showing parts layout. They're nononsense, clear, and concise, and I had no problem following them. Parts are packaged in a plastic bag, so some knowledge is needed to pick out the pieces and read resistor color codes. Prior building experience is helpful, of course, but if you've never done it before, a more experienced ham could help you over the unfamiliar spots.

"[This] is not really a construction article. Rather, it's an account of my experience and is intended as a guideline to kindle ideas in others."

The converter worked fine the first time. Alignment consisted of adjusting the slug-tuned coils and step-by-step instructions were given. Hamtronics sells a special square-headed tool to adjust the slugs in the coils. It's essential, but luckily inexpensive. Also required were a voltmeter (I used my old standby, an inexpensive RadioShack multimeter), and a signal source. An on-the-air signal would work, if you could tune in a steady enough one, but I used a 2-meter handheld on low power, and it did the trick. The instructions note that a frequency counter, if available, can be used to put the oscillator frequency right on the money. I didn't have one, but found the receiver frequency readout, combined with the known frequency of the HT, worked fine. This is spelled out in the instructions.

At this point, I was halfway there. I had the receive half of my 2-meter rig complete. I had a functioning 2-meter SSB and CW receiver, so I could do some listening while the work continued.

Separating the Antenna Lines

But before proceeding, an important matter had to be addressed. The output of the receive converter, which delivers the 10-meter signal, is connected to the IF radio's antenna jack. With the IF radio in receive, the system functions as a receiver and all's well. But the radio's antenna connector is a two-way street, and, if you transmit, RF energy will be sent into the output of the receive converter and damage it. A way must be found to make sure this doesn't happen. For now, you could just not transmit, but that's risky. Forget and accidentally key the mic or hit the code key, and the damage is done. A one-way route must be

found to feed the receive signal into the radio, both for now and for when the transmit converter is added.

Some HF transceivers, such as my veteran Drake TR-7, have provisions for a separate receive input. The RadioShack transceiver doesn't, but with the help of a friend experienced in these things, I made a slight modification. We took a short length of coaxial cable and soldered it to the receiver input on the circuit board, bypassing the radio's regular antenna jack and T/R switching. We led the coax out of the radio through a carefully drilled hole and soldered an inline connector on the end.

Now the radio had two antenna connections, and the receive converter could be connected directly to the radio's receiver section without any danger of wrong-way RF doing damage. The regular antenna jack would later be attached to the transmit converter's input (think of it as two one-way streets, each going in opposite directions). For regular 10-meter use, the add-on receiver wire was left unused and the radio seemed to function absolutely normally.

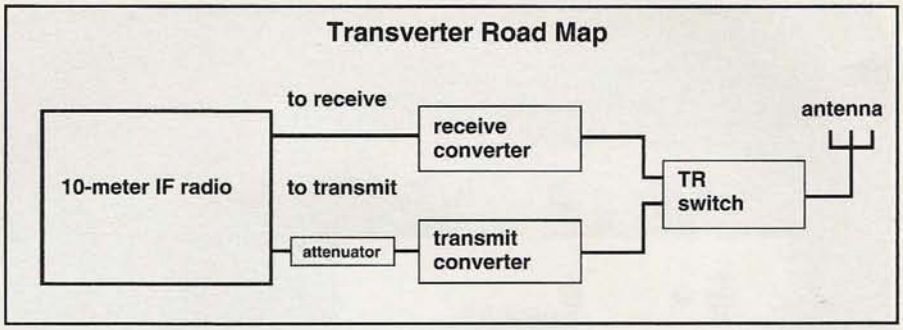
This was the only tricky part of the operation, and the exact attachment point will vary from radio to radio. A schematic is vital, and unless you've done this sort of thing before, I'd be very cautious about tampering with the innards of an expensive radio. If you're new to this, find a more experienced ham to help.

By the way, if you're uncomfortable with this, there are other approaches. If you're going to use the converter for receive only, as in a satellite station, you can buy an inexpensive, used rig, giving you separate IF radios for receive and transmit. Also, Down East Microwave (see "Resources") offers a T/R switch designed just for this, with a built-in attenuator. Connect it to the IF radio's antenna jack, the receive converter and the transmit converter, and according to the company's literature, it will do the rest. According to the specifications, this would need a bit more attenuation to use with the Hamtronics converter, but this is simple to do. See the attenuator description later in the article.

We'll revisit T/R switching later, but the rest of it is more straightforward.

On to the Transmit Side

With the confidence that came with the success of the receive converter, I ordered its big brother for transmit. It's a larger



Block diagram of the author's 2-meter transverter project, showing the different components and how they're connected together.

circuit board, with more parts and a bigger price tag, $89, but it's designed around the same idea. I didn't watch the clock, but with more pieces to stuff in the board, add an evening or two to construction time.

For adjustment, Hamtronics suggests using a 500-milliampere (mA) meter in series with the 13.6-volt power line. My junkbox yielded a hefty old 350-mA meter which served well, except when full power was applied and it pinned. I extended its range with a 10-inch length of hookup wire as an impromptu shunt. Since only relative readings were needed, and not absolute accuracy, this arrangement worked.

You also need a sensitive voltmeter. For one adjustment, my trusty multimeter fell short, and I instead used a homebrew voltmeter using a field effect transistor. Hamtronics says a standard, inexpensive digital voltmeter will do the trick. I also used an SWR-power meter to tell if, and how much, RF was going out the antenna jack. This was very helpful in adjusting the transmitter, and is a handy and inexpensive device to have in the shack. (The meter I use is an MFJ-812B, rated for use on the 2-meter and 220-MHz ham bands. It's very useful for adjusting antennas for mobile and base station repeater use.)

Get the Power Down

The transmit converter requires a 1 milliwatt signal to drive it. More drive could distort the signal and damage the unit, so you must find a way to supply a tiny enough input signal. Measuring 1 milliwatt (that's $^1/_{1000}$th of a watt) is beyond the capabilities of the equipment in my shack. It's like trying to weigh a kitten on a bathroom scale.

Using an HF power meter and a dummy load, with the power adjustment turned down, I was able to measure about 2 watts coming out of the HTX-100. The Hamtronics literature includes instructions, with a table of values, on using composition resistors to construct a power attenuator. This is also covered in the *ARRL Handbook*; I'm using the 1993 edition of the book, but I trust that the information is still there. (*Actually, all I can find in the 1997* Handbook *is a six-paragraph segment on transverters, which mentions the fact that an attenuator may be needed, but doesn't include a project or refer you elsewhere in the book. If I've missed it somewhere, please set me straight.—ed.*)

"Having a piece of equipment you wired yourself is a great confidence builder."

The attenuator is then placed in the coax connecting the RF output from the transceiver to the transmit converter. In my case, 2 watts goes in and a milliwatt comes out. If you're not sure of the values, err on the side of caution and go for more attenuation. It's better to have to turn up the power a notch than to replace a fried part.

Interpolating from the Hamtronics chart, and working with resistors available, I built an attenuator of approximately 35 dB using 2-watt composition resistors. If necessary, use several resistors in parallel. For example, four 200-ohm 1 to 2 watt resistors in parallel will act like one 50-ohm 2-watt resistor. You can mix and match. (*Remember, resistors in parallel divide.—ed.*)

Testing, Testing

Before testing the transmit converter, I connected it to my SWR/power meter and connected the output of the meter to

Learning by Doing

To me, tinkering and learning by doing are a major part of ham radio. Kit building is a good way to go about this because all the parts are obtained from one source, along with instructions on putting them together. Also, if things don't work out, you can often get help from the manufacturer. Kit suppliers want you to succeed. On the other hand, don't bite off more than you can chew. First-time builders may want to start with a simpler project.

Start-Up Hints

Some cautions are in order for beginning builders: Use a proper soldering iron for circuit board work. This means low power. I use a 15-watt model I purchased at RadioShack. Always use rosin-core solder, specifically intended for electronics work. Again, this is available at RadioShack (NEVER ever use acid-core plumber's solder). It's easy to miss a solder bridge on a tight circuit board, so use a magnifying glass and check your work. I have a handheld magnifier with a built-in light that I bought several years ago at RadioShack. It is invaluable.

The best tool a beginner can have, though, both in building and in operating, is one-on-one help from a more experienced ham. The second-best is a fellow "newbie" with whom you can learn and have fun. But the most important thing is to try. Happy soldering!

the dummy load I use on HF. This arrangement let me do my testing and alignment without putting a signal on the air.

When you first apply power to a circuit you built yourself, there's always a certain amount of anticipation and concern. Will it smoke? If it doesn't smoke, will it work? If it doesn't work, will you be able to find the problem?

I put a 1-amp bus fuse in series with the 13.6-volt power supply as a precaution. I applied power and no smoke appeared and the fuse didn't blow. So far, so good. Next, I put my 10-meter radio into CW and closed the key, applying 10-meter drive to the converter. Groan! Nothing read on the power meter.

Keying the transmitter on for short periods, I began the adjustment process, and got the proper voltage readings from the oscillator and multiplier stages. However, the converter did not draw full current as read on the milliamp meter, and I still was not getting an RF output reading on the power meter.

An examination of the circuit board with power off, and some judicious wiggling of parts with my finger, showed that the final output transistor was loose. Oops, my fault: it was not properly soldered to the board. I carefully resoldered the connections, connected the cables back up, and tried again.

Going through the adjustment procedure, a warm feeling came over me as the power supply meter swung toward its higher end and the RF output meter started to register. As I tweaked the adjustments, output came to 2 watts on CW, just like the specifications said.

I switched the 10-meter radio to SSB and said "Hello, test," several times into the microphone. As I did so, both the power supply and RF output meters danced to the peaks of my voice. Success. As a further test, I picked up the signal on an HT, and it was just where it was supposed to be.

Teamwork

Now I had a working receiver, and a working transmitter, and was almost ready to go on the air. The next challenge was to get the two units working together.

Before proceeding, the circuit boards, until now sitting on my workbench linked by assorted wires, needed a permanent mounting and enclosure. Here again, there are options available to you. The transmit and receive units can be put into separate enclosures, or a single larger one. RadioShack sells a variety of cabinets, and Hamtronics, among others, offers an array of enclosures, but I chose to take a homebrew route. I had a large unused rack cabinet available, and I was able to cut it up and fashion the metal into a cabinet to house both converters. I made mine extra large to allow for additions down the line, such as the previously mentioned amplifiers.

Next, I had to devise a means to switch the antenna from the receive input to the transmit input, and vice versa; again, there were options. Hamtronics offers a transmit/receive relay package, as does Down East Microwave, both of which are rated to handle the power and frequencies involved, and then some. In my case, a junkbox search turned up a pc board relay which I wired to switch the antenna connection. I mounted the relay "dead bug style," turning it upside down and gluing the top of it to a piece of scrap plastic using epoxy. I then screwed the plastic to the base of my cabinet. (I've since obtained the Down East Microwave relay, which, for $15, comes with a pc board and required diode, and I plan to wire it into the circuit.)

To work as a transceiver, both the receive and transmit halves must be operating on the same frequency. In my case, each converter uses its own oscillator, and, although they're crystal-controlled, there's some play in the frequency range which can be adjusted slightly. A frequency meter, would be helpful here, but I was able bring the two into line using my HT and on the air tests with a friend for final tweaking.

More T/R Switching

Some radios, such as my Drake TR-7, include an auxiliary PTT output which can be used to activate the relay, making for a smooth PTT operation. My IF radio is not so equipped, so I took a different, but simple approach. I opened the mic case and identified the PTT wire. I then carefully slit the mic cable near the radio connector and cut the PTT wire. I spliced a two-conductor cable, one wire going to the radio side of the PTT wire and the other going to the ground wire in the cable. The PTT wire was severed, but the ground wire was not; it was spliced into. The cable was run to the transverter cabinet, where on the front panel I mounted a double-pole double-throw (DPDT) toggle switch that I bought at RadioShack. (A double-pole single-throw switch will also work. I used what was available.)

This cable was connected to one side of the switch. The other half of the switch was connected to the power supply and to the relay. (I placed a diode across the relay contacts. It's connected in reverse...the cathode, or banded end, is connected to the power supply side of the relay coil, and the anode, the positive side, is connected to the grounded, negative side.

This is protection from a voltage spike when the relay coil de-energizes and the magnetic field collapses. I used a 1N4148 from RadioShack.)

In operation, the PTT button on the mic is bypassed. The switch mounted on the transverter activates the antenna relay and flips the IF radio from receive to transmit. For SSB, I put the switch in transmit and just talk into the mic. When the IF radio is in CW mode, I put the switch in transmit and just press the key. It's straightforward.

A Job Well Done

The kits I used went together easily, and the few problems encountered were traced directly to my lousy soldering. Sure, there are easier ways to get on the air. You can call your favorite ham radio dealer, divulge your credit card number, and buy a very nice plug-and-play rig that will give you wonderful service. There's nothing wrong with that; I've done it several times myself, when money permitted.

But, as I found out, there's more than one way to get on a new band or mode. Although there were some skinned knuckles along the way, the lessons I learned, the boost to my electronic confidence, and the money I saved made the experience a very valuable one.

The feeling of accomplishment and the knowledge gained from doing the wiring myself were worth every second. ■

Resources

The kits described in this article were purchased from Hamtronics, Inc., 65-V Moul Rd., Hilton, NY 14468-9538; Phone: (716) 392-9430; Internet: <jv@hamtronics.com>. Check out their catalogue for a range of interesting projects.

Another supplier of VHF transverter kits and equipment is Down East Microwave, Inc., 954 Rt. 519, Frenchtown, NJ 08825; Phone: (908) 996-3584. They offer a range of kits and wired equipment for VHF and above, including complete transverters. I found them extremely helpful on the phone and they offer a comprehensive list and price list of their products.

Ten-Tec also offers a number of kits, including a 6-meter transverter with either a 20-meter or 2-meter IF. They're at 1185 Dolly Parton Pkwy., Sevierville, TN 37862; Phone: (432) 453-7172.

If you've never built anything before, you might want to try simpler a project first. Ramsey Electronics, Inc., offers a variety of kits for electronic gadgets and ham gear ranging from the very simple to the more complex. They're at 793 Canning Parkway, Victor, NY 14564; Phone: (716) 924-4560. Check out their catalogue.

These are the kit suppliers with which I am familiar who offer projects for VHF. There are others, too, so if you have experience with them that you'd like to share, let's hear from you. I'd be very interested in any comments you might have. I can be reached at <chazwe2r@ aol.com>, or via *CQ VHF*.

Announcing

1997 SMIRK QSO Party

A 6-meter only contest at the peak of the sporadic-E season. Here are the rules.

From Pat Rose, W5OZI

The 1997 SMIRK QSO Party, sponsored by the Six Meter International Radio Klub, will run from 0000 Z June 21 until 2400 Z June 22. Operate six meters only, voice and/or CW. Only DX contacts are permitted between 50.100 and 50.125 MHz. All voice contacts between the 48 contiguous states and lower-tier Canadian stations must be made above 50.125 MHz; CW contacts below 50.100 MHz or above 50.125 MHz. Exchange callsign, SMIRK#, and grid square. No cross-band or partial contacts allowed. Only simplex allowed for FM contacts.

Regular scoring: 2 points for each contact with a SMIRK member and 1 point for each contact with a non-member.

Enhanced scoring: Voice contacts and exchanges between U.S. and lower-tier Canadian stations which are made above 50.200 MHz will qualify for double score; e.g., if you can make your ex-change above 50.200, score 4 points for each SMIRK contact, and 2 points for a non-SMIRK contact. You cannot work a station twice, once below 50.200 and once above 50.200, but you are certainly permitted to solicit the QSO between 50.125 and 50.200, then move above 50.200 to exchange information. The purpose of this is to try to determine if stations have any problems with equipment and/or antennas above 50.200.

Final score is total points x total of grid squares worked. Send a legal-sized SASE for copy of log forms.

Awards: Certificates will be issued to high scorer in each state, province or foreign geographical division. Non-SMIRK members WILL receive awards if no entry is received from a SMIRK member in their geographical division. Send log requests or logs (postmarked no later than July 15) to Pat Rose, W5OZI, P.O. Box 393, Junction, TX 76849-0393. Contest info and official log forms may be downloaded from the SMIRK Six-Shooter Web Page on the Internet at <http://www.cswnet.com/~kaØnno>.

Note that we have deleted the requirement to be a paid-up member to receive an award. We want this to be a fun contest and to encourage everyone to participate and try for an award.

The Family Radio Service: A Threat or an Opportunity?

There's a new personal radio service on the air. Will it help or hinder ham recruitment?

By Gordon West, WB6NOA*

The Federal Communications Commission (FCC) has officially amended Part 95 of its Rules & Regzulations to establish a new personal radio service: the Family Radio Service (FRS). Fourteen low-power UHF channels have been specifically allocated for a no-license, short-range, two-way voice communications service to provide the American public with an affordable and convenient means of direct simplex radio communications. (*See Gordon West's technical sidebar on the Family Radio Service elsewhere in this issue.—ed.*)

The Big Question Mark

Will this new no-license radio service satisfy the requirements of hobby radio users for short-range FM communications without their having to qualify for a ham ticket? Or will it whet the appetite of the hobby radio user who might enjoy the short-range communications but will want the longer-range communications available only on the ham bands? Will the 70-centimeter ham band be flooded with FRS "pirates" who may doctor their radio equipment and start using our 440-MHz repeaters without a license?

And what about the ham radio manufacturers who are now starting to roll out FRS equipment? Will they become preoccupied with this new market, and turn a cold shoulder to newer, higher-tech ham radio handhelds? Let's take a look and see what the initial impact of FRS has been, and what we can do to take advantage of this new Part 95 UHF/FM low-power radio service.

Look familiar? Alinco's DJ-S46 HT for the Family Radio Service is identical in design to its DJ-S41T 70-centimeter ham rig. Sharing development costs let Alinco price the ham HT under $150.

Here's Kenwood's FRS radio. We'd be surprised if there isn't a matching ham-band rig to follow soon. Under FCC rules, FRS rigs may not be modifiable for operation on other frequencies.

To the Negative

"When a husband and wife discover they can stay in touch simplex at close range in a shopping mall or out camping by the lake, they will no longer be inclined to study for their No-Code Tech license and operate on ham frequencies," comments John Palmer, N6OSN, a retired ham instructor. He believes that this new no-license, UHF/FM radio service might steal away ham radio license candidates.

I say, *let them go to FRS.* I don't believe we should recruit Technicians into ham radio to simply satisfy a specific need for two people to stay in touch. Ham radio is

Gordon West, WB6NOA, is Senior Contributing Editor of CQ VHF. Through his licensing classes, Gordon has probably brought more people into amateur radio than any other individual.

What's FRS All About?

The new Family Radio Service was the brainchild of RadioShack's Bob Miller, W3RM. His proposal was supported by radio giants like Motorola and Cobra because they could envision the huge market for small, low-power UHF sets to satisfy the needs of millions of Americans wanting skip-free, palm-sized handheld transceivers that could work throughout a big shopping mall and also span many miles when used out in the open.

Unlike amateur radio, the FRS service can *be legally used to discuss business matters.*

Against the proposal for a FRS were thousands of General Radio Mobile Service (GMRS) licensees, led by the Personal Radio Steering Group (PRSG), which raised valid issues about the potential interference to presently-licensed GMRS users.

But FRS won the argument and equipment is already on the air with thousands of users enjoying the relatively quiet, 3-kHz wide UHF channels. These frequencies are "interstitial," or in between, every GMRS frequency (see Table for a complete list of FRS frequencies and their relationships to GMRS channels). The first seven FRS channels straddle GMRS repeater, base, and mobile outputs on 462 MHz, and FRS channels 8 through 14 straddle GMRS repeater input frequencies at 467 MHz.

Interference Potential

The likelihood of interference between FRS and GMRS depends somewhat on which channels you're using. Operations on FRS channels 8 through 14 really shouldn't cause a problem for either service unless an FRS unit was operated on a mountaintop right next to the repeater station. Very unlikely. However, on the first seven channels, repeater outputs with 5-kHz deviation could very well drown out the little 1/2-watt, 3-kHz wide FRS signals when the FRS radio is operated near a powerful downtown repeater.

And there will also be head-on collisions between FRS transmissions and the more powerful GMRS radios operating on interstitial frequencies because *both* radio services share the *same* interstitial channels 1 through 7! And guess who will win? The 1/2-watt FRS equipment will be no match to the more powerful GMRS units when operating on the same frequencies!

HINT: Tell your friends with FRS equipment they can avoid GMRS interference by using the higher channels. Most FRS handhelds have full 14-channel capabilities, so no problem

a lot more than a personal radio intercom. We need more new hams who will join our ham ranks because they love the excitement of radio and of meeting new friends and who are also willing to help support amateur radio when it comes time for public service. I don't think we're just looking for people who want their own private communication channels. Let them go to FRS and enjoy. If they need further range, let them obtain a no-test GMRS (general mobile radio service) license on a local repeater.

"They will have those cheap FRS radios modified down to our 440-band in minutes," comments a ham on e-mail. Very doubtful. The FCC imposed strict standards on equipment type-acceptance, and there is no magic wire in any of the new FRS radios that could take them from 462/467 MHz down to the 70-centimeter ham band. Even if the synthesizer could be "tricked" into going outside of the 14 FRS channels, the VCO (voltage controlled oscillator) would undoubtedly unlock more than 15 MHz away from its initial 467-MHz TX (transmit) frequencies.

On the Positive Side

FRS equipment operators will divide up into two categories after a few weeks on the air. Some will simply want to use their 1/2-watt FRS sets for personal communications among their family and friends, the exact intent of the FRS. Their main interest is talking only to those people who are part of their little unique radio "system." This is specifically what ham radio is *not* about. The other active FRS users will be excited about establishing contact over longer than the advertised two-mile range. They'll climb to the top of a peak, and try to work a buddy 20 or 30 miles away. Then someone else will break in, and they'll really get caught up in "playing radio." These are our perfect ham radio candidates!

The FRS experimenter who enjoys "playing radio" will be a perfect target for us to show everything that ham radio has to offer, including nearby frequency UHF repeaters, satellites, major power output benefits, external antennas, and the like. If the FRS operator is looking for more thrills on UHF, the switch to a Technician class license will be relatively easy.

And What about the Manufacturers?

And the ham radio manufacturers also benefit by sharing costs of new handheld

(some of the earliest models only covered channels 1 through 7, though, in which case you're out of luck).

They're Not Toys

The little FRS handhelds should not be considered the same as toy 49-MHz walkie-talkies. At over $100 each, they certainly aren't priced like toys. And at 1/2-watt output on UHF, you can be sure that these sets could achieve line-of-sight range of from 10 to 50 miles. So far, I can claim the record of FRS DX by talking from Signal Peak to San Diego's Point Loma, a distance of over 130 miles. Truly, it was no big deal because it was over sea water, and we were experiencing the tropospheric ducting weather that is relatively common here in Southern California.

The palm-sized FRS transceivers are completely synthesized and work off of either AA or AAA alkaline or rechargeable batteries. The receivers are single-conversion superhet, with measured sensitivity greater than 1/4 microvolt, and little ceramic filters that keep the receiver nice and tight at its 3-kHz bandwidth allowances.

The little rubber antenna on these handhelds may not, by law, be replaced. The FCC doesn't want these sets being hooked into an external antenna system. The whole idea of the service is unit to unit, or groups of unit communications.

Similar to Ham Gear, Yet Different

Most handheld FRS transceivers have some interesting features that are similar to amateur radio equipment tone signaling. The common 38 CTCSS tones are included in most FRS sets for full decode capabilities. I found that the approximately $130 units allow for any CTCSS tone on encode and decode, but the tone carries through to all channels until changed. On the more expensive sets, priced around $170 each, the CTCSS tones may be assigned to each channel individually and memorized.

Table. FRS/GMRS Frequencies

Here's the full roster of Family Radio Service frequencies and their relationship to General Mobile Radio Service (GMRS) main frequencies.

FRS Frequencies	GMRS Base Frequencies	GMRS Mobile Input Frequencies
CH 1 - 462.5625	462.550	467.550
CH 2 - 462.5875	462.575	467.575
CH 3 - 462.6125	462.600	467.600
CH 4 - 462.6375	462.625	467.625
CH 5 - 462.6625	462.650	467.650
CH 6 - 462.6875	462.675	467.675
CH 7 - 462.7125	462.700	467.700
CH 8 - 467.5625	462.725	467.725
CH 9 - 467.5875		
CH 10- 467.6125		
CH 11- 467.6375		
CH 12- 467.6625		
CH 13- 467.6875		
CH 14- 467.7125		

Sometimes, it gets better than ham gear: the new Kenwood FRS radio, for example, features digital scrambling. Hundreds of different codes are available, so two Kenwood units can talk with each other in the scrambled mode, including CTCSS decode, and no one else would be able to eavesdrop—at least not easily!

The FRS presents new opportunities in personal wireless communication, along with the challenges of preventing interference with licensed GMRS users. The frequencies and technical restrictions placed on radio design and construction make it unlikely that FRS will suffer the same negatives that have plagued 27-MHz CB.

UHF sets between both services. Look at Alinco's DJ-S46 FRS set and their ham DJ-S41T. Now look at Standard Radio's FRS #620 and the Standard ham C-108A. See any resemblance? Now check out Kenwood's FRS LF-14 and a probable soon-to-be-announced Kenwood micro UHF ham handheld. Get the connection? Sharing costs between two almost identical transceivers may certainly lower the price that we might need to pay for a 440-MHz micro ham set.

At the dealer level, the availability of 1/2-watt FRS handhelds may keep unlicensed operators from buying 70-centimeter ham equipment to satisfy a specific person-to-person communication need. Instead of illegally using ham frequencies for their one-on-one chats, they can *legally* operate on any one of the 14 FRS channels.

And now and then, some of those FRS buyers may come back into the radio store and want more information on how they can talk further through repeaters, and how they can set up a base or mobile station with an outside antenna. If all they're looking for is staying in touch with another person, the dealer can turn them on to GMRS. But if this FRS user sounds like a real "play radio" hobbyist who may have the discipline to study for a ham license, the dealer should have training materials and a local ham "Elmer" available so the FRS enthusiast can take the next step into amateur radio.

Let's Make Friends with FRS

The new FRS can help the growth of ham radio if we can get the word out to FRS "hobbyists" that there is more range, more fun, and certainly many new friends out on the ham radio airwaves with just a little bit of discipline and license examination study. It should be an easy sell.

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.*

Meriden Amateur Radio Club—50 Years of Service

Starting with a handful of hams in 1947, the Meriden ARC today boasts a membership of 100, and a long list of activities.

The Meriden Amateur Radio Club (MARC) of Meriden, Connecticut, is celebrating its 50th anniversary this year. It is a general-interest club with members active on both HF and VHF, and a heavy emphasis on public service. Because the local fire, police, and town departments are on different frequencies and can't communicate with each other, the Meriden club pitches in, providing a common communications link on 2 meters between these services for emergencies, parades, bikathons, marathons, charity functions, etc. Members participate in emergency drills and can be ready at a moment's notice.

The club also supports the area's digital network with four packet nodes at its club station, W1NRG, plus a bulletin board

Steven Waldmann, WV2LKM, is the Meriden Amateur Radio Club's Public Information Officer.

fast FACTS!

Finding a Radio Club

Where can you find experienced hams to help you learn new things or to answer your questions when you're confused? Where can you find used gear at reasonable prices? Or help putting up your new antenna? A magazine like this one can help with the first three, of course, but sorry, we don't do antennas (except our own).

For hands-on, in-person help and education, not to mention interesting activities and the chance to make new friends, you simply can't do better than your local radio club. But clubs can sometimes be hard to find. Here are some suggestions:

1. On the air—if you've got a radio and you've found your local repeater, listen for announcements (many repeaters are sponsored by clubs) or get on and simply ask someone.

2. The ARRL (American Radio Relay League)—many of the most active clubs are affiliated with the ARRL. A list of affiliated clubs in your area is available by calling (860) 594-0200, or via e-mail request on the Internet to <armentan@arrl.org> (ignore the < and > in the address; they're just there to set off the address from what's around it.).

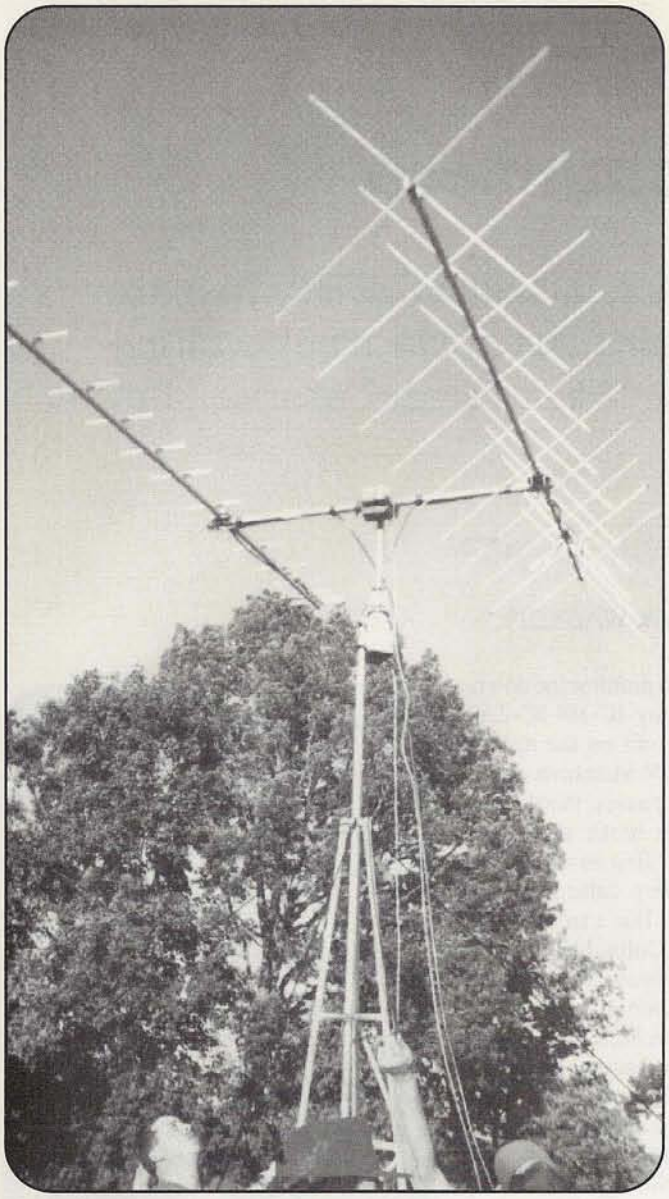
3. Try the phone book—some clubs have their own phone numbers (often hooked to an answering machine) and separate listings in the directory.

4. Your local Radio Shack or ham store—these are often sources of information on area clubs.

5. Online—America Online's Ham Radio Club offers a directory of ARRL-affiliated clubs, broken down by state.

Once you find a club, get in touch with a member or just show up at a meeting. If you do just show up, be prepared to take the initiative to introduce yourself and let people know you're a new ham. Many hams are friendly but shy, and they may not feel comfortable approaching a stranger. (If that description fits you as well, you'll probably do best to contact a member before the meeting so that someone is expecting you and can begin introducing you to other members.) In nearly all cases, you'll be warmly welcomed both to the club and to the worldwide community of ham radio.

By Steven Waldmann, WV2LKM*



Club members erect a satellite antenna system for MARC's Field Day.

(PBBS). In addition, two members operate their own network nodes, and the club is a member of NEDA, the North East Digital Association (*see Club Spotlight, June, 1996,* CQ VHF.*—ed.)* MARC also encourages VHF weak-signal and satellite operating, as well as ATV (amateur television). The club also has a "home page" on the Internet at <http://pages.prodigy.com/marc/marc.htm>.

Back in 1947, as amateur radio was reawakening after being shut down during World War II, a handful of Meriden hams met at the local YMCA to form a radio club. As the group grew, a club station was started. Today, W1NRG is located at the Wallingford Civil Preparedness Building, which is also where the club meets twice a month. Current membership is approximately 100, including one amateur—Frank Darmofalski, W1FD—who's been a member since the club was founded 50 years ago.

Congratulations from CQ VHF *to MARC on a half century of service to amateur radio!*

Close Encounters

They're not little green men from Mars, but hams' ability to make out-of-this-world contacts is becoming one of the most exciting parts of amateur radio. Here are two "First Person" stories of close encounters of the VHF kind....

That Voice from Space!

By George Carr, WA5KBH

Editor's Note: Due to a family emergency, "Orbital Elements" columnist Gould Smith, WA4SXM, was unable to provide his usual column this month. In its place, we offer two "First Person" stories from hams whose operating interests were stimulated by space contacts. George Carr, WA5KBH, reports on "That Voice from Space"; and D.R. Prescott, KE6TTJ, tells us about his New Year's Day contact with Astronaut John Blaha, KC5TZQ, aboard the Russian Mir space station. Gould's regular column will resume next month.

Even though I've been licensed since the spring of 1964, it took until 1983, when Owen Garriott, W5LFL, operated a 2-meter FM rig aboard the space shuttle *Columbia*, to really pique my interest in space operations.

I recall fashioning a small turnstile antenna out of 1 x 2 boards, #12 copper wire, and chicken wire for the reflector. My then five-year-old son helped by painting the wood a bright blue. We ground-mounted the antenna in the back garden, trying to get as much of an unobstructed view of the Missouri sky as possible. (This means I laid it on the ground in the middle of the backyard.)

Another Turkey on the Downlink

Fortunately, I worked only 10 minutes from home, so I was able to plan trips home during the day to monitor the downlink frequency with my ICOM IC-2AT handheld and to transmit on the uplink, using a Yaesu FT-227R Memorizer. As I monitored one of the passes, there was a whale of a signal that broke my lightly adjusted squelch. My first thought was, "Here's another turkey calling on the downlink frequency." But a split second later, I heard "This is Columbia. W5LFL just passing over the snow line over my home state of Oklahoma." I couldn't believe my ears! (As I write this more than a decade later, I still remember that voice very well!)

Owen was as strong as any local on 2-meter FM. What a signal! I heard him on a couple of passes during that 10-day Spacelab-1 mission. But as far as a two-way QSO was concerned, it was not to be. I sent in my SWL log and received a very nice QSL card. (*"Beginner's Corner" in the October, 1996, issue of* CQ VHF *recounts this flight and shows a picture of the QSL card.—ed.*)

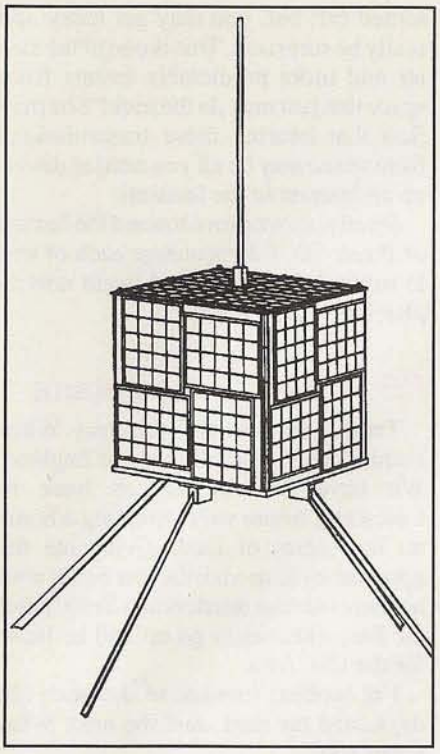
A Latent Interest

On and off over the years, I sent in my annual dues to AMSAT-NA. I didn't have the time or resources to try out the birds for myself, but I did share the belief that we should contribute to the development and operation of such an international resource. I had not as yet actually heard signals from an unmanned hamsat, although I figured that if it was this exciting to hear a "manned satellite," look out!

Hearing signals from space transmitted in 1983 by Astronaut Owen Garriott, W5LFL, inspired the author's interest in satellite communications. (NASA photo).

While in Missouri, I continued to enjoy my lowband DXing, and I even confirmed my 100th country and achieved DXCC in 1983. Then, an employment transfer took me back to my home state

By G. Gould Smith, WA4SXM



Listening for the 2-meter packet signals coming from the DOVE satellite is an easy way to get started in amateur satellites.

of Louisiana, where I continued to operate mostly on HF. But I never forgot that voice from space!

A Move to England

Then, another transfer took me to Luton, England, in the spring of 1990. My wife found *the home* she wanted for us to raise our four children in the English countryside. You guessed it! No external aerials. No 150- by 100-foot back garden. In fact, I think there is an inbred part of a ham wife that does not permit her to choose a home on a remote hilltop.

So I left the tower behind.

For five years, I struggled with 1/8-wave invisible dipoles and wire verticals hidden behind drain downspouts. But finally, I decided I'd had enough. I missed DX. So, if large antennas facing horizontally were not to be; how about small antennas facing vertically, "like hands in prayer," as a way to raise DX?

I saved enough to gather the pieces for my OSCAR setup. I already had the basics: a multimode 145/435 radio and a computer. I even had a satellite tracking program from my AMSAT-UK donation. I managed to collect aerials (the British version of antennas), a preamp and a few other pieces. And, by now, the neighbors had also put up TV aerials and my aerials look "kinda like" theirs.

On the Air at Last!

The big day came in July. I heard a PA3 station in the Netherlands calling "CQ" on sideband. I zeroed in and tried to call him, but I wasn't strong enough. He could hear me trying but couldn't bring me in. [Yes, it was low signal; surely not my crisp, distinct Lutonian accent, developed over the last six years!] What was I to do?

My immediate thought was, "change to CW." Great! No key. My key was plugged into the lowband rig. I pulled it out, only to find that the connector was a phone type and the VHF rig required a mini! Oh, no!

I then realized I was using my DTMF keypad microphone. I keyed the code on the microphone, calling him with modulated tone. The "7" key worked fine! He answered, giving me a 559. Little did he realize the effort I went through for that first contact! No doubt he'll never realize the thrill he gave me by trying so hard to contact me. (In fact, the thrill was comparable to my first QSO back in 1964. I was so nervous that time, contacting Nebraska from Louisiana, that my "Elmer" did most of the keying and copying for me.)

The First 120 Days

In my first 120 days of OSCAR operating, I made 62 contacts, with a variety of experiences. On one occasion, I heard an SSB CQ. That time, I was ready. My key was "on standby." I called him in CW. He came back, "If the CW station is calling me, I don't understand Morse!" That took me completely by surprise. Even though I keep up with the changes in regulations and licensing, this was my first experience with a ham who did not know the code. (This is not a criticism of no-code licensing; just recounting a rude awakening for me!)

"I keyed the code on the microphone, calling him with modulated tone. The '7' key worked fine! He answered, giving me a 559. Little did he realize the effort I went through for that first contact!"

On another occasion, I called a DX SSB station with my CW. Was I surprised when she, yes, a YL, switched modes to QSO me in CW! I had worked cross-mode before on the lowbands and OSCAR, but this was the first time the other station switched to my mode!

I've even been involved in a few satellite pile-ups. Granted, there may not be hundreds of stations calling, but even a dozen operators calling simultaneously can make enough of a pile-up to keep most DXers happy.

Will I Meet You on the Birds?

As I improved my aerial setup, my signal levels to the satellites and back improved as well, and my sideband contacts on OSCAR became more frequent, too.

The future will be great when the Phase 3D satellite goes into orbit, but there's plenty of opportunity right now. OSCAR 10 is still providing a good amount of "grazing territory" out there for fairly long periods, along with the lower-orbit voice (and data) satellites.

"We're building on four acres of land, giving me the opportunity to re-visit the low bands with no more antenna restrictions (Yeah!). But the first antenna to go up will be those for the OSCARs."

What would it take to excite you enough to be ready to operate or to part with "a few bob" as we said in England—a couple of dollars—either to join AMSAT or donate to help support the Phase 3D project?

How about this? Tune your packet station to 145.825 MHz. Leave it there for a few hours. You should be able to read DOVE's health check during any of the passes. At present, the digitized voice is turned off; but, you may get lucky and really be surprised. This is one of the easier and more predictable events from space that just may do the trick! You may find that hearing these transmissions from space may be all you need to develop an interest in the hamsats.

Finally, as we move toward the launch of Phase 3D, I'd encourage each of you to support the effort...and begin now to plan how you'll use it.

P.S.—Back to Louisiana

There is a postscript to this story. When I wrote this, I was still living in England. We have recently moved back to Louisiana, where we're building a home on four acres of land, giving me the opportunity to re-visit the low bands with no more antenna restrictions (Yeah!). But the first antennas to go up will be those for the OSCARs.

I'm looking forward to the next 120 days...and the next...and the next. What about you?

• • •

Happy Mir Year!

By D. R. Prescott, KE6TTJ

I've been trying to make voice contact with the Russian Mir Space Station since 1995—that should be long enough to call it a quest. After trying numerous times, it finally happened on New Year's Day, 1997. I made voice contact with Astronaut John Blaha, KC5TZQ. Fantastic!

Amateur radio has many facets, and satellite communication is only one. But actually my success can be attributed to at least three modes of radio communication (packet, weak signal, and satellite capabilities) and the Internet. Being very lucky also helped!

Helping Hams

A big part of my success was because Jay Flynn, WB9AWX, who transferred a packet message for me to the Mir Space Station, was kind enough to let me know that Mir was no longer using 145.550 MHz. (*Current frequencies are 145.200 uplink, 145.800 downlink, for both voice and packet.—ed.*)

I got up early and fired up my notebook computer running the "WinOrbit" satellite tracking and display program designed by C. D. Gregory, K8CG, that I had downloaded from the Internet. It told me that Mir would be visible at 1701 UTC (9:01 a.m. Pacific Standard Time) on New Year's Day.

The author tracked Mir's progress on his notebook computer while keeping his desktop system on standby for a possible packet contact. His New Year's Day QSO with Mir turned out to be on voice.

I left the computer on, plotting Mir's progress as it rounded Australia and posi-

"The 'WinOrbit' satellite tracking and display program... told me that Mir would be visible at 1701 UTC (9:01 a.m. Pacific Standard Time) on New Year's Day."

tioned itself for a nearly vertical pass over Orange County, California. I turned on my TNC and readied my "HostMaster" communications software to receive packet data on 145.800 MHz—just in case Mir was not on voice mode. Finally, I tuned my Yaesu FT-736R satellite radio to 145.200/.800 MHz.

One thing I forgot to check was whether my antenna switch was on vertical or horizontal polarization. In other circumstances, that mistake could have been critical. As it turned out, that omission was a stroke of luck. I was horizontally polarized on my stacked pair of KB6KQ Miniloop antennas and listening with my preamp on. When Mir poked its head over the horizon some 2,700 miles away, I put out a call to RØMIR, the space station's callsign. When I released the mic key, I heard John Blaha, KC5TZQ, coming back to me and giving me a good 5 by 9 report. After months of trying, one could become tongue-tied when success was at hand. Mustering extraordinary control, I pressed on. John and I exchanged new year greetings, signal reports and signed off. His next contact was a "7 lander," in Nevada, whom I could not hear.

A Good Start

The quest is over except for the exchange of QSL cards. How's that for a way to start the New Year? I wonder if my spouse, Cheri, KF6AGP, can stand this silly grin on my face through all of 1997? So be it. ■

Resources

To learn more about amateur satellite communications, we recommend the following:

"Orbital Elements," every month here in *CQ VHF*.

"Getting Started in Amateur Satellites" video from the CQ Video Library, 76 N. Broadway, Hicksville, NY 11801; Phone: (516) 681-2922; Fax: (516) 681-2926.

The Satellite Experimenter's Handbook, from the ARRL, 225 Main St., Newington, CT 06111; Phone: (860) 594-0200.

"How to Use the Amateur Radio Satellites" and "Getting Started on Amateur Radio Satellites," from AMSAT-NA, 850 Sligo Ave., Silver Spring, MD 20910; Phone: (301) 589-6062.

We also recommend that all amateurs support the amateur satellite program by joining AMSAT and/or by donating to the Phase 3D project.

To learn more about communicating with the Mir space station, see the two-part article, "Hams in Space: A Guide to Working Mir," by G. Miles Mann, WF1F, in the March and April, 1997, issues of *CQ VHF*.

Coming Conventions

• A five-hour workshop on amateur satellite operating will be featured at the SeaPac Convention in Seaside, Oregon, on Friday, June 13. Sponsored by ARRL and AMSAT, it will be hosted by satellite expert Ed Krome, K9EK. Advance registration is required and costs $20 for ARRL members/$25 for non-members. To register, contact Rosalie White at ARRL Headquarters before June 4th: Phone: (860) 594-0237; Fax: (860) 594-0259; e-mail: <rwhite@arrl.org>. (Tnx AMSAT)

• The 1997 Western States Weak Signal Society (WSWSS) Conference will be held on October 3 to 5 at Montecito-Sequoia Lodge, in the Sierra Nevada mountains west of Fresno, California. For more information, see the WSWSS Conference page on the World Wide Web at <http://www.qsl.net/n7stu> or contact Robert Brown, N7STU, at <n7stu@psnw.com>.

• The 1997 ARRL/TAPR Digital Communications Conference will be held in Baltimore, Maryland, on October 10 to 12. This year's conference will offer session "strands," with beginning, intermediate, and advanced presentations on a single topic. Papers for the conference *Proceedings* book (presentation at the conference is optional) must be submitted by August 20 to Maty Weinberg at ARRL HQ. Paper guidelines are available on the TAPR Web site at <http://www.tapr.org/dcc>.

In addition, two Student Paper awards will be given, one on a technical/theory-oriented topic and the other on an educational/community-oriented topic, directly related to wireless digital communications. These manuscripts are due by *June 20.* See the TAPR Web site for more information.

• AMSAT-NA is holding its 1997 annual meeting and space symposium at the Airport Delta Hotel in Toronto, Ontario, on October 17 to 19. There will be presentations on all aspects of amateur satellite design, construction and operation. For more information, see the AMSAT Web site at <http://www.amsat.org>.

APRS and SKYWARN: Perfect Together

Imagine giving forecasters the ability to collect weather data, instantly, from dozens, or even hundreds, of monitoring stations. APRS can do just that, and the National Weather Service is interested.

"APRS is one of the most important innovations to hit Amateur Radio in decades."—Paul Toth, KB2WNZ, ARRL Section Emergency Coordinator, Northern New Jersey.

Amateurs have been involved with the National Weather Service's (NWS) SKYWARN program for more than 20 years. Each year, hundreds of trained spotters report vital information to their local NWS offices, helping forecasters provide accurate information, including watches and warnings of severe weather.

Over the past few years, the NWS has added Doppler radar to its forecast offices, and officials say the new equipment has led to better short- and long-term forecasts. But it does have some limitations, one of which is its inability to tell what is happening on the ground. Most NWS offices continue to rely heavily on volunteer spotters.

Volunteers Gain Value

With federal budget cuts forcing the closing of over 60% of NWS offices nationwide (and staff cuts along with the closings), the need for close cooperation between amateur radio operators and the NWS has never been greater. For example, the NWS office in Mt. Holly, New Jersey, now has responsibility for supplying forecasts for 34 counties in eastern Pennsylvania, New Jersey, Delaware, and Maryland. Several local offices in the coverage area were replaced by automatic weather-sensing equipment. In addition, the number of staffers at Mt. Holly was cut by three. On any given shift, there are three meteorologists on duty. If severe weather is anticipated, more staff is called in. But during one severe weather event recently, the meteorologists took over 100 calls in an hour in addition to their normal duties! This has led officials at Mt. Holly to look for a better way of collecting data from its spotters.

Streamlining SKYWARN

Last summer, the SKYWARN county coordinators who serve the Mt. Holly

"With federal budget cuts forcing the closing of over 60% of NWS offices nationwide (and staff cuts along with the closings), the need for close cooperation between amateur radio operators and the NWS has never been greater."

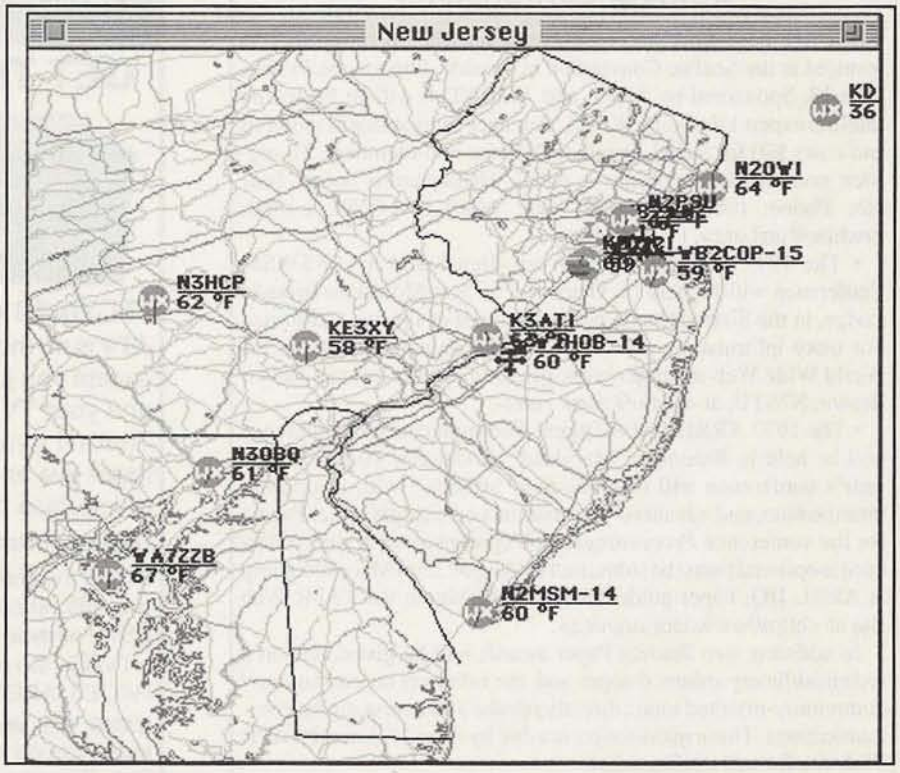


Figure 1. Using APRS in conjunction with SKYWARN lets users view weather conditions at a glance over a wide area. Each station automatically reports conditions at its location. (Graphics courtesy WU2Z)

By Bob Josuweit, WA3PZO

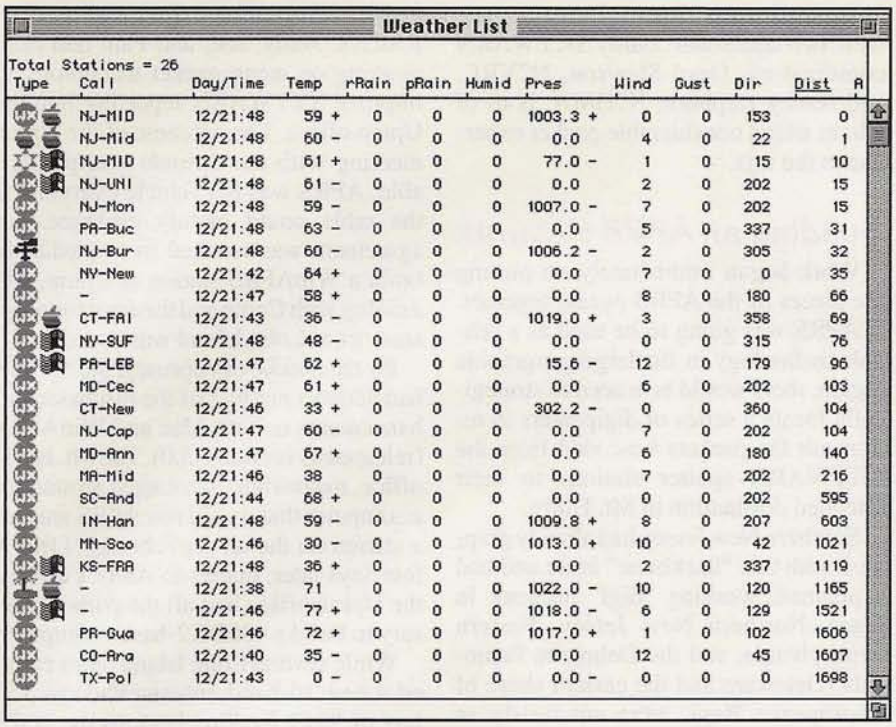


Figure 2. Going out of the map mode, you can also sort reports by state and county to look at weather conditions in a specific area.

NWS office met in an effort to get better organized. One of the outcomes of that meeting was the formation of a SKYWARN Technical Committee, originally comprised of Rob Hill, N3OFZ, Ron Hepburn, N2LCZ, Bill Davis, N2ZSO, Hal Frantz, KA3TWG, Jim Hepburn, W2IIC, and Paul Toth, KB2WNZ. Their agenda was obvious, yet complex: bring new and better technologies and systems to bear to improve the lines of communication between the SKYWARN spotters, the Net Control Operators in the field, and the NWS meteorologists.

Their first task was to seek better ways of calling up the various SKYWARN nets when severe weather threatened. One of those spotter groups, headed by KA3TWG, was using a commercial paging service with a group call. Protocols and procedures had been developed and the system worked. By the end of October, an area-wide paging protocol and service had been adopted.

Next on the agenda was the development of an area-wide voice net that could be used to connect the Net Control Stations to the NWS during watches and warnings. The committee approached the owner of a linked 440-MHz repeater system that covers a substantial part of the area and received his approval to use the network. The system's main 70-centimeter repeater happens to be located within five miles of the Mt. Holly NWS office, making contact with others on the network possible from there with no more than a handheld.

From TCP/IP to APRS

Item three on the list—and probably the most difficult to resolve—was the potential use of packet radio to provide direct digital contact and hard copy to the NWS office. Bill, Jim, Ron, and Paul live in widely scattered parts of New Jersey and regularly used one of two TCP/IP

"The committee members and [the] Meteorologist in Charge of the SKYWARN program at Mt. Holly were so impressed with the demonstration and its potential that work began immediately on adopting APRS as the SKYWARN packet standard."

An Invitation...

Are you active in public service? Do you participate in an ARES/RACES group? Does your group provide communications in times of emergency or for a local race or other event? Do you participate in holiday message events? We'd like to hear about activity in your area. Your information may just lead to a story in this column. Send your information to Bob Josuweit, WA3PZO, c/o *CQ VHF*, 76 N. Broadway, Hicksville, NY 11801, or via e-mail to <Bjosuweit @aol.com>.

packet backbones to communicate with each other *(for an introduction to TCP/IP and packet, see "Digital Data Link" in the February and March, 1997, issues of* CQ VHF*—ed.)*. TCP/IP packet offered some promise to the committee because of the ability to directly address packets to a specific machine. The TCP backbone also provided a direct path, so the "store and forward" nature of AX.25 packet transmission could be avoided.

As the committee searched to identify all the TCP/IP packet players and sysops (system operators) in the Mt. Holly area, they contacted three new potential resources. Boyd Prestwood, W2HOB, the ARRL Section Emergency Coordinator (SEC) for Southern New Jersey, introduced the committee to *Automatic Position Reporting System (APRS)*, a technology he had brought to Southern New Jersey two years earlier. At about the same time, Paul, who also served as SKYWARN District Emergency Coordinator in Northern New Jersey and recently became Section Emergency Coordinator, was introduced to Keith (WU2Z) and Mark (KB2ICI) Sproul, who had developed APRS products for the Macintosh and Windows markets (MacAPRS™ and WinAPRS™). The committee invited Boyd and the Sproul brothers to make an APRS presentation at its January meeting. The committee members and Joe Miketta, Meteorologist in Charge of the SKYWARN program at Mt. Holly, were so impressed with the demonstration and its potential that work began immediately on adopting APRS as the SKYWARN packet standard.

As a result of the meeting, Boyd, Keith, and Mark were asked to join the committee and work with it in planning and implementing APRS throughout the Mt Holly region. Also joining the committee were two additional county SKYWARN coordinators, Dave Slawson, N2VRC, and Nancy Hepburn, N2HMA, both of whom added considerable packet expertise to the mix.

Building an APRS Network

Work began immediately on putting the pieces of the APRS puzzle together. If APRS was going to be used as a reliable technology in the large geographic region, there would be a need to strategically locate a series of digipeaters to retransmit the packets beaconed from the SKYWARN spotter stations to their intended destination in Mt. Holly.

Southern New Jersey had already grappled with this "backbone" issue and had a planned, working "digi" network in place. Northern New Jersey, Eastern Pennsylvania, and the Delmarva Peninsula (Delaware and the eastern shore of Chesapeake Bay), were not nearly as well-planned or developed. At least five new digis would be needed to cover the entire region.

At the same time, Miketta, his staff, and the committee brought a number of enhancements and needs to the Sproul brothers' attention. In order to be most useful to the NWS, the APRS software needed some changes and additions. Chief among these was a facility to more easily identify the reporting stations, by state, county, and town. There was also a need to better identify county names and boundaries on the APRS displays. Finally, a Severe Weather Reporting Dialog needed to be developed to streamline the process of entering reports of hail, high winds, flooding, and tornadoes.

New York Joins in

Shortly after the first APRS-focused meeting at Mt. Holly, Paul and the Sprouls were invited to a less formal meeting at the NWS office at Upton, New York. The staff there is responsible for the forecasts and the severe weather warnings for northeastern New Jersey, New York City, Long Island, the lower Hudson Valley of New York, and southern Connecticut. On hand for this meeting was Gary Conte, Joe Miketta's counterpart at Upton; Andy Feldman, WB2FXN, the RACES Coordinator for Suffolk County, Long Island (who had spearheaded the TWA 800 amateur radio effort just months before); and Joe Tomasone, Jr., AB2M, the digital communications officer for Suffolk Co. RACES. Andy, Joe, and Paul had been working on using packet technology to improve SKYWARN reporting into the Upton office. The outcome of the Upton meeting with the Sprouls was predictable. APRS was the vehicle everyone at the table could openly embrace. An agreement was reached to immediately build a WinAPRS station at Upton, and a dialog with Conte and the amateur operators from Long Island was opened.

By the middle of February, the Sprouls had added a number of the discussed enhancements to both Mac and WinAPRS (released as version 1.3.0). The Mt. Holly office, meanwhile, scrounged around for a computer that would run APRS and got a station on the air on February 11th. A few days later, thanks to Andy's efforts, the Upton office had all the parts necessary to build a 486DX2-based computer.

While several Long Island hams erected a new tri-band antenna and ran 150 feet of 9913 feedline back to the NWS Ops Center, Joe and Paul rebuilt an aging 386SX with the new parts Andy had procured. A few hours later, the NWS-Upton WinAPRS station was on the air.

In the short time APRS has been available at both offices, it has been used to provide direct statistical data on several storms that have hit the area. APRS has also become the centerpiece for the SKYWARN program at both offices.

Getting on APRS

It's relatively easy to get on APRS. All you need is a 2-meter radio, a packet TNC, a computer, and the APRS software. The computer can be a 286, the latest Pentium system, or a MacIntosh. The only difference is which version of APRS will work for you (DOS, Windows, or MacIntosh). You can download the software from the APRS sites on the Internet (see "Resources").

The Mac/WinAPRS software supports many electronic weather systems, including those by Peet Brothers, Davis Instruments, Heathkit, Texas, Maximum, and Capricorn. These systems vary greatly in price, starting at about $400. Occasionally some close-out deals will get you a bargain, and other, smaller weather systems are also available. The Sprouls indicate that their APRS software will support other weather gathering equipment as information is made available to them.

Work on erecting the new, wide-area digis is continuing. The Sprouls are

"In the short time APRS has been available at [the Mt. Holly and Upton, New York, NWS] offices, it has been used to provide direct statistical data on several storms [and has] become the centerpiece for the SKYWARN program at both offices."

readying more enhancements and features for their APRS software, including routines to parse Watch/Warning information into a format that can be beaconed to SKYWARN APRS spotter stations. Those enhancements have also brought Bob Bruniga, WA4APR, author of the original (DOS) APRS product, into the discussion process. Plus, NWS offices in Illinois, Wisconsin, Kansas, Oklahoma, Texas, Pennsylvania, Virginia, and West Virginia are now expressing more than a passing interest in adopting APRS technology for their SKYWARN programs.

Paul Toth, KB2WNZ, explains that even if you don't invest in the weather measuring equipment, you'll still be able to monitor and report weather conditions in your area. And by setting various thresholds in the software, warnings could be set off when conditions warrant.

Beyond SKYWARN

APRS has also caught the eye of emergency management administrators on Long Island, in New Jersey, and in Florida. With input from several officials, the Sprouls are working on additional features to address emergency shelter location and operating requirements, vehicle movement, and tools to plot road closures and other storm/disaster-created transportation obstacles.

This is the tip of the iceberg with APRS. The excitement that this new technology has brought to SKYWARN, the NWS, and the amateur radio community is contagious. As KB2WNZ says, "APRS is one of the most important innovations to hit amateur radio in decades."

Still, there are obstacles to overcome before it can be fully used by the NWS. One of those obstacles is the license requirement. The Mt. Holly office is fortunate to have two (soon to be three) licensed amateur operators on staff. A number of other offices also have one or more hams on staff. The Upton, New York, office is temporarily on the air with Andy, WB2FXN, acting as trustee for the station. Efforts are in progress at both offices to encourage more NWS staff to get their amateur radio licenses.

Public Service at Home

By participating in the SKYWARN program, you have the opportunity to become involved with public service activities without leaving your home. You simply report what you see, based on the spotter guidelines. This is an easy and effective way to help your community and to show others what ham radio is all about!

Thanks to KB2WNZ and WU2Z for their assistance. ■

Resources

For further information on the SKYWARN program, you can contact your local NWS office, your ARES/RACES coordinator, or check out one of these World Wide Web sites:

Mt. Holly, New Jersey, NWS—<http://www.nws.noaa.gov/er/phi>
Skywarn—<http://www.skywarn.org>
APRS—<http://aprs.rutgers.edu> or <http://www.tapr.org/tapr>
E-mail resources:
APRS and NWS—Paul, KB2WNZ, at <ptoth@evertech.net>
WinAPRS—Keith, WU2Z, at <ksproul@noc.rutgers.edu>
MacAPRS—Mark, KB2ICI, at <sproul@ap.org>

Germany's FlexNet: A Packet Network That WORKS!

Tired of packet links that take longer than logging onto AOL? Check out the fast, flexible, and...oh, yes...the world's largest packet network.

I often travel to Europe on business, and, while I'm there, I try to have fun with amateur radio. I've made a number of friends this way, and through these friends, I've come to learn a great deal about the packet situation there. When I have enough advance notice of my trip, I get a reciprocal license, but that isn't always possible. However, my friends can (and do) act as control operators, allowing me to play with the packet network.

This month, I'd like to tell you a little about the German packet network. While it's similar to what we have here in North America, there are some important differences, especially in the network architecture. I'd like to share those differences with you, get into some of the reasons for those differences, and reflect upon what that means for us.

World's Largest Packet Network

By the way, what I call "the German packet network" actually encompasses most of Central Europe. Based upon the number of square miles served, and the number of node sites, it appears to be the largest packet network in the world. Few others can compare to it. One key feature is the network philosophy: an open network, with no restrictions on use or content (within legal limits), totally transparent (a "data pipe"), and extremely fast.

Here in North America, the overwhelming majority of packet switches run *TheNET* software. Almost everyone has used it, or its close cousin, the *G8BPQ* switch. Both of these systems are derived from *Net/Rom*, one of the earliest packet networking programs. Other networking software includes *TexNet*, *ROSE*, and, of course, *TCP/IP*, each of which I'll write about sooner or later.

TheNET and G8BPQ are also used in Europe, along with *Nord><Link* (another Net/Rom derivative), ROSE (and its French clone, *FPAC*), and some others. However, none of these compares with a piece of networking software that few of us have ever heard of, and even fewer have actually used: *FlexNet*.

Introducing FlexNet

FlexNet was written by Gunter Jost, DK7WJ/K7WJ (what a cool callsign combination!), and is available in two versions: one for the IBM-PC and one for RMNC hardware (more on RMNC later). The two versions operate identically, and are very similar in structure. Some of the most important features include:

- *Autorouter*: Automatically routes all connect requests with minimal input required of the user, totally free of static routing loops.
- *Adaptive Parameters*: All network parameters (except TXDelay) are automatically set by the software and adapt to changing channel conditions.
- *Hop-by-hop Acknowledge*: Each packet is "acked" directly by its neighbor, improving data transport reliability.
- *Command Interpreter*: The software interacts directly with the user, and has numerous internal applications providing detailed data concerning the configuration and status of the node.
- *Open and Modular Architecture*: With source code for applications and drivers,

DB0AAA	0-15	38
DB0ABC	0-15	981
DB0ACH	0-10	253
DB0AIM	0-15	533
DB0AMB	0-7	977
DB0ASF	0-15	93
DB0BAL	0-15	633
DB0BCC	0-15	680
DB0BOH	0-12	459
DB0BRO	0-0	427
DB0CPU	0-8	118
DB0DA	0-7	157
DB0DLG	0-3	114
DB0EA	0-10	268
DB0EIN	0-13	295
DB0END	0-9	300
DB0FB	0-7	38
DB0FDX	12-15	523
DB0FN	0-9	274
DB0FRB	0-15	515
DB0FUL	0-15	104
DB0GOS	0-15	327
DB0GV	0-14	87
DB0HBN	15-15	255
DB0HOF	0-15	322
DB0HOT	0-15	436
DB0HSK	3-15	275
DB0II	0-15	348
DB0JES	0-10	597

Figure 1. A typical destinations list. Each callsign represents a node site. The first column of numbers represents the range of possible SSIDs at that site, and the second column represents the round-trip time for a packet to that node (in 100 mSec steps, so 220 means 22.0 seconds). This is just a short sample—Don's original list for this site was six pages long!

By Don Rotolo, N2IRZ

po	id	td	qso	usr	tifr	rifr	tkby	rkby	qty	mode	links	sside	time
1	0	10	11	8	116	29	20	0	98	1200smut!	USER70		
2	7	10	1	1	30	4	6	0	100	9600smut!	USER70		
3	12	10	18	5	140	77	18	4	100	9600ut!	USER23		
4	—	7	42	1	897	530	135	57	92	19200trz!	DBOQT	0-15	15/12
5	—	7	1	1	36	37	2	2	60	19200trz!	DBODA	0-7	(61/95)
6	—	7	69	1	465	993	30	149	97	19200trz!	DBOGV	0-14	16/17
7	—	7	4	1	164	11	39	0	92	19200trz!	DBOORT	0-12	(166/224)
8	—	7	36	1	213	622	12	29	99	19200trz!	DBOSPC	0-10	5/7
9	—	7	94	1	1343	1209	115	144	97	19200trz!	DBOAAI	0-7	19/14
10	—	7	3	3	130	58	20	5	82	19200trz!	DBOEAD	0-12	4/6
11	—	1	3	1	124	103	21	13	100	19200d!	DBOMTV	0-15	2
12	8	1	18	1	85	195	4	33	94	38400yc!	DBOZDF	0-8	4
13	—	1	29	1	596	362	89	57	93	28800t!	DBODAR	0-12	6/5
14	—	7	1	0	0	0	0	0	0	9600t!	DBORPL	0-15	(—-)
15	—	7	18	2	137	207	11	15	99	9600trz!	DBOODW	0-3	33/40

Figure 2. A typical statistics list. Each line represents one port. "QSO" is the number of connections into or through the node, "usr" is the number of users, "tifr/rifr" is the number of <I> frames sent/received, and "tkby/rkby" is the number of kBytes sent/received in the last 10 minutes. This node is carrying over 6 MByte per hour. "qty" is the percentage of frames sent correctly on the first try. "Mode" tells us the baud rate and other operating parameters, while "Time" shows the measured response time to the neighbor node, in 100 mSec units.

and even a developer's kit, freely available, many programmers are writing software for the network.

Measuring Performance

Each FlexNet node site constant monitors the performance of each of its direct links by measuring the round-trip time for a packet.* After storing it, the node site compresses the information and passes it on to each of its neighbors. Each neighbor then takes its measured time with the original neighbor, adds on a 15% "hop penalty," and passes that on in turn to its neighbors. Thus, the link quality information (round-trip turnaround time for a "long" information packet, plus a small percentage penalty for each hop) for each and every destination propagates throughout the network. A sample destination list is shown in Figure 1, and a typical statistics list is shown in Figure 2.

When there's traffic on a given link, the performance is somewhat slower, since the test packet has to compete with all the other traffic. Each link is measured about every five minutes, the time increasing for busy links, to help reduce the overhead created by testing. The numbers displayed are the simple average of the last 16 measurements. Unlike ROSE, which uses a sysop-defined static routing list, the FlexNet autorouter dynamically routes each connection based upon the network's actual performance at that particular moment.

Once the "quality" value for a given path (a series of links to a destination) exceeds a pre-set value, say 240 seconds, the destination disappears from the "reachable nodes" list (Figure 1). This has the desirable effect of limiting the nodes list to only those that are actually reachable and where reasonably good performance is guaranteed. While the numbers are good indicators of relative performance, the actual performance for a real connection is a little better than the times indicated. For example, you might expect a round-trip response time of a little more than four minutes (about 250 seconds) down to OE7XIR, which is a few dozen hops away, instead of the nearly six minutes shown.

"...the FlexNet autorouter dynamically routes each connection based upon the network's actual performance at that moment."

Using the concept that bad news should travel faster than good, whenever a link goes down, the message is passed along immediately, instead of waiting for the next 5-minute test update, so the whole network knows of the problem within a few minutes.

Adaptive Parameters

One very advanced feature is the fully automatic *adaptive parameters*. All of the network parameters, such as *Frack*, *Maxframe*, *Paclen*, and so on, are being constantly adjusted to best deal with the actual network conditions. In fact, the only parameter that can be manually adjusted is *TXDelay*. This makes for a very robust network, which doesn't become overloaded easily, and results in considerably less work for the sysop.

For user ports, a nifty (but optional) feature is an *automatic TXDelay monitor*: TXDelay is the time a station waits after keying up the transmitter and before sending data. Excessive TXDelay wastes

* FlexNet nodes continually monitor link performances by measuring the complete L2 round-trip response time on a "long" test packet (an I-frame with 200 bytes of data). A typical measurement might go like this: The frame is generated and the counter is started. The frame is inserted into the transmit queue, like every other packet to be transmitted on this port. Eventually, it's actually sent to the neighbor node (the wait being influenced by traffic on the link, data rate and link quality). Assuming the neighbor receives the packet correctly (if not, we keep counting the time while a retry occurs), it generates an ACK and inserts it to its transmitting queue. The timer doesn't stop until the ACK is received (correctly!) by the originating node.

channel time and slows network performance. In FlexNet, each user's TXDelay setting is monitored and, if more than 100 mSec of "flags" are sent (the dead time before the data), the network sends the user a polite message informing him that TXDelay is set too high, and then disconnects him. Unless the user sets a more realistic TXDelay, the network prevents him from connecting again.

Another unique and useful feature is FlexNet's "find" feature. If you tell your local node to find a certain callsign, it checks each node in the network to see if it has heard that callsign recently. If it has, it tells you where and how to connect to the station.

This is only a brief overview of some of FlexNet's features. A more detailed accounting can be found at the FlexNet Web site (see "Resources").

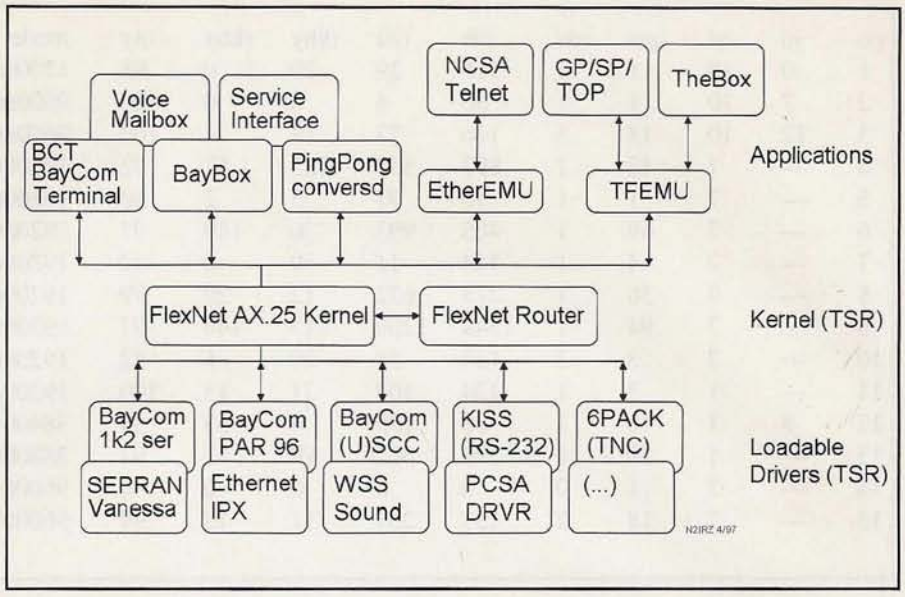


Figure 3. FlexNet modular software architecture. A number of applications and channels drivers are loaded with the FlexNet kernel. Only some of the available applications and drivers are shown, and a developer's kit is available so you can write your own.

Software Architecture

FlexNet is also unique in the amateur world with its *modular architecture*, illustrated in Figure 3. The *FlexNet AX.25 kernel* is the central module. This handles all of the communications protocol, parameters, and so on. Attached to it is the *network module*, which handles the autorouter and link performance functions.

The driver modules shown on top are used to interface with whatever hardware you happen to have. Drivers exist for Ethernet (including Novell and TCP/IP), BayCom modems, TNCs, RS-232 ports, "Sound Blaster" cards, and much more. On the bottom are the modules for the various network applications. Important application modules include *TFEMU*, a universal interface for non-native applications such as a *DXCluster*, BBS, or other server; *ETHEREMU*, which lets you use the packet network as if it were the Internet (via Winsock or Telnet); and RDOS, which lets you control a PC's DOS remotely.

One key point regarding the driver and application modules: A developer's kit is available for the asking, which not only includes the (liberally-commented) source code for each module, but sample modules as well, which allows any reasonably competent "C" programmer to write drivers and applications. Because of this liberal open policy, there are literally dozens of these modules available, with more being written all the time.

"All of the network parameters, such as Frack, Maxframe, Paclen, and so on, are being constantly adjusted to best deal with the actual network conditions."

By the way, FlexNet is not only for networks—a user can also benefit from the adaptive parameters by loading only the AX.25 kernel, and not the network module, along with the appropriate drivers. This, in fact, is one of its most powerful features, allowing user channels to operate at peak performance despite changing channel conditions.

Hardware

The PC/FlexNet program runs on any PC, although a 286 or better is suggested for best performance. The RMNC/FlexNet runs on a piece of TNC-like hardware known as the *Rhein-Main Network Controller (RMNC)*, currently in version 3.

For PC-based systems, it's anticipated that most radio channels would be driven by a TNC running 6-PACK software (freeware), a BayCom SCC card, or perhaps a BayCom modem.

The main disadvantage of the BayCom modems is that they require quite a bit of the PC's computing time, but with a 486DX2/66, you could probably run three or four radio channels on a BayCom modem with no ill effects.

BayCom SCC cards are common in Europe, but hard to find in North America. Each one can control up to four or eight radio channels (depending upon model), and plugs directly into the PC's 16-bit ISA slot. Their main disadvantage, aside from availability, is the high initial cost, about $130 for a four-port version without modems or shipping. You can save some money by buying it as a kit.

Packet with a 6-PACK

6-PACK is a serial port protocol that allows you to hang up to six TNCs off of each RS-232 port. Similar to a TNC running in KISS mode, the 6-PACK software is programmed into the TNC's EPROM, with the driver in the computer handling the details. The main disadvantage to this scheme is the cost of the TNCs, as well as the TNC's limited modem speeds. However, for someone replacing a TNC-based network such as TheNET, the use of TNCs (which you already have) becomes an advantage, as the modems and radio interfaces are all set up and working.

The *RS-232 channel driver*, which operates in KISS mode but is not intended for use with a TNC, is an excellent tool to connect one or more computers together. In fact, if you want to experiment with FlexNet, but don't want to or can't do it on the air, you can build a "virtual network" over RS-232 wire. This is a great way to get familiar with FlexNet, even if

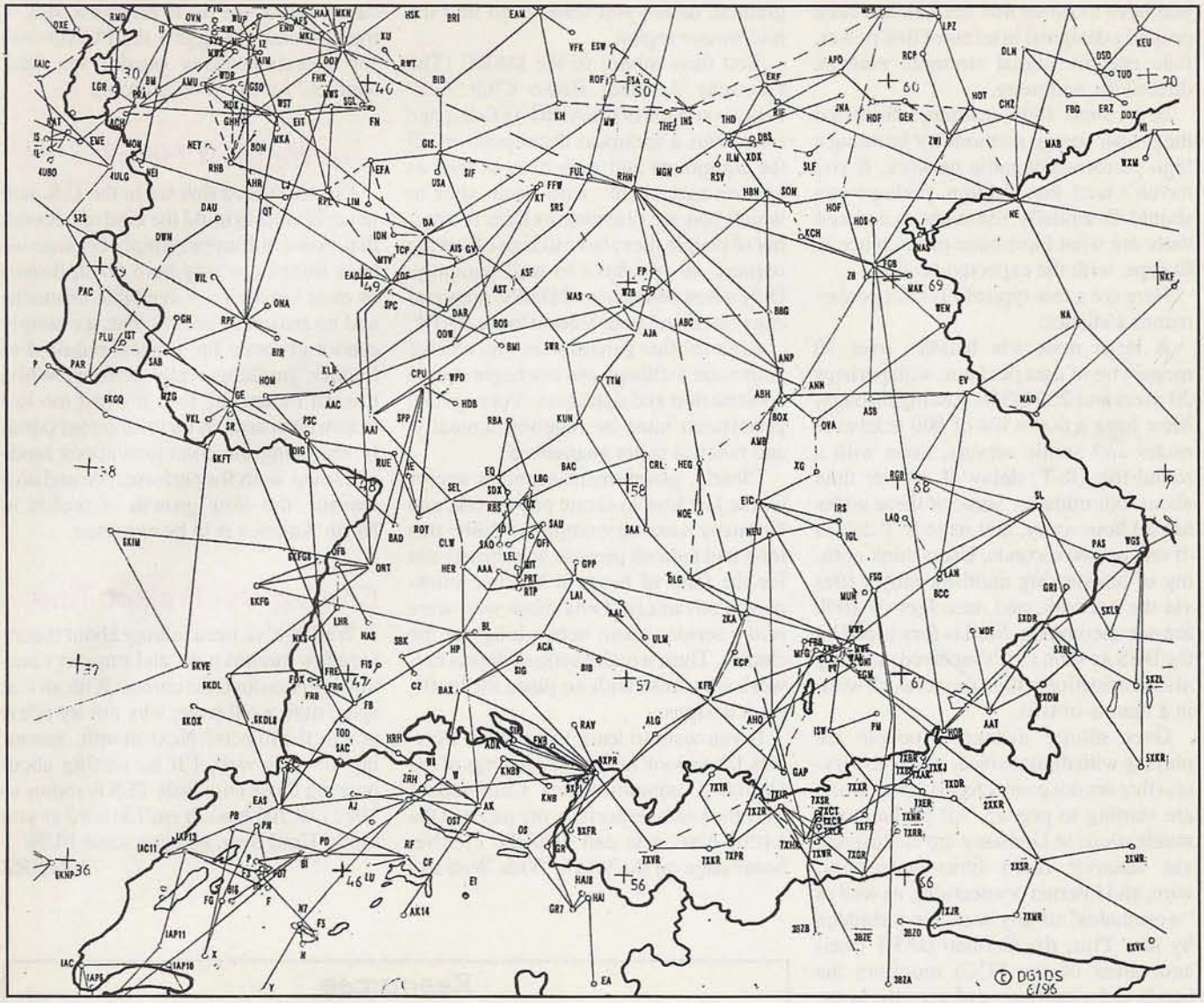


Figure 4. A small piece of the German packet network map. Note Luxembourg in the upper left corner and Austria in the lower right. This map was generated by Germany's national packet coordinator, Fritz Schaumann, DG1DS, and is used with permission.

you're somewhat limited in what you can connect to. The network sysops in Germany also use it for debugging new versions of the software.

Use Your EuroCard

The RMNC hardware consists of a passive *EuroCard backplane* (again, very common in Europe, less so here in the U.S.), into which you plug a *Master card* (no, not the credit card!), a *Bus monitor/reset card*, and up to 15 *channel driver cards*. The Bus monitor/reset card is relatively simple and inexpensive, about $40 as a kit, and the passive backplanes can be found for less than that. The master and channel driver cards are identical, only using different EPROMs. They cost about $125 each, without modems. Available modems include an RS-232 driver, a TCM3105-based 1200-baud AFSK modem, and a G3RUH-type with a software scalable (!) speed range from 4k8 to 38k4 (4,800 to 38,400 bps). All of these items, which were designed by the FlexNet people, are available from Landolt Computer in Germany.

The great advantage of the RMNC hardware is that it is compact, robust and fast. It can survive a much harsher environment than a PC could, and, if you're willing to search for some parts yourself, can be built at a lower cost. With a fast processor, it has more than enough power to drive an output channel at 115k baud. The disadvantage is that, unless you can read German, you'll have a difficult time building everything. Plus, they're not currently available in the U.S. At this time, the only way to get these items is to buy them directly from BayCom in Germany. However, the folks there do take credit cards, do speak English, and don't mind shipping overseas.

Network Architecture

One huge difference between the packet network in Germany and that in North America is that the Germans use *full duplex point-to-point links* (with only two stations on a channel) exclusively throughout the entire network. No channel is shared with a third node, and every single link is coordinated and protected. Before you're allowed to put up a link,

you have to *prove* that the link has been properly designed in terms of link power, fade margin, signal strength, antenna directivity, and more.

In my June, 1996, column, I discussed the proper design methods for building a high-performance radio network. If you haven't read that column, perhaps you should. Essentially, the methods outlined there are what have been put in place in Europe, with the expected results.

Here are a few typical FlexNet performance statistics:

A large node site handles over 10 megabytes of data per hour, with perhaps 20 users and 200 QSOs passing through. Most have a nodes list of 600 reachable nodes and public servers, none with a round-trip (R-T) delay of greater than about four minutes. Some of these nodes are 30 hops away, and have R-T delays of one or two seconds. Users think nothing of transferring multi-megabyte files via the network, and messages of 100k are not uncommon. Mail is forwarded by the BBS as soon as it's received, arriving at its destination within the network within a minute or two.

Over shorter distances, people are playing with digital voice, and Web servers (that are not connected to the Internet) are starting to pop up. All packet communications in Germany are exclusively via amateur radio links—telephone, wire, and Internet connections, as well as "wormholes" of any sort, are forbidden by law. Plus, the German BAPT (their equivalent of the FCC) monitors the bands and vigorously enforces the laws.

Strict Rules and Regs

Just how did the European network get so efficient and fast? Well, some may argue that German culture dictates that everything must be just precisely so, and that efficiency is paramount. But there's a simpler reason: *necessity*, the mother of invention. You see, unattended operations are not permitted under German law, on any band. Something we take for granted here is simply not an option there, unless you're granted special permission, similar to a Special Temporary Authorization (STA) from the FCC.

To put up a packet node, you must first have the *written* sponsorship of an officially recognized amateur radio club. You then request a frequency coordination from the national coordination entity, which—with only 19 duplex channels allocated for packet links—is not always granted, unless you want to go into the microwave region.

You then submit to the DARC (The Deutsche Amateur Radio Club, Germany's version of the ARRL) a four-page form with a technical description of all the equipment and each link, as well as written agreements with some sites to which you are planning to link. A number of people there have to sign off on the request, so you have to wait patiently. Only when you received DARC approval can you submit your request to the BAPT.

After another patient wait, you receive your node's callsign and can begin station construction and operation. Your special permission must be renewed annually, and renewal is not guaranteed.

Clearly, government agencies everywhere just love to create paperwork, and Germany's are no exception. While this long and tedious process was clearly not for the faint of heart, it had one unexpected advantage: Only those who were *really* serious about networking got the chance. Thus, a really serious digital network was built, with no place for inefficient designs.

If you want to learn more about FlexNet, take a look in the *Proceedings* of the Digital Communications Conferences over the years (especially my paper in the 14th). Also, you can visit the FlexNet home page on the World Wide Web and can be put on the list to receive a copy of the software (I suggest the PC version) for experimentation (again, see "Resources" for the Web address).

Can We Do It Here?

I'm convinced that we in the U.S. will never be able to build the kind of network that exists in Europe, simply because we have things too easy here. With dozens or even hundreds of available channels, and no reason to be efficient, we simply cannot generate the interest required to finance anything really serious. While this isn't a terrible fate, it's just too late to turn back now. With the Internet rapidly becoming the communications mode of choice, both for performance and cost reasons, the slow growth of packet in North America is to be expected.

Coming Up: Project Time

Well, we've been talking about theory for a few months now, and summer vacation is just around the corner. With all that spare time we'll have, why not try a few practical projects? Next month, assuming all goes well, I'll be writing about pushing those cute little TEKK radios to 19k2 (19,200 bps). It isn't as hard as you think! Until then, go have some FUN!

73, N2IRZ

Resources

Baycom SCC cards

BayCom Hard and Software GmbH, Massinger Weg 3, D-93107 Weillohe, Germany; Phone: +(49) 9453-9819; Fax: 9453-9829; e-mail: <baycom@baycom.de>; WWW: <http://www.baycom.de>.

RMNC Hardware

Landolt Computer, Robert-Bosch-Strasse 14, D-63477 Maintal, Germany; e-mail: <Landolt-Computer@msn.com>.

FlexNet software

FlexNet Gruppe Darmstadt, c/o Gunter Jost, DK7WJ, Lichtenbergerstr 77, D-64289 Darmstadt, Germany.(please include a few IRCs if you can); WWW: <http://www.home.pages.de/~flexnet/>.

Publications

Digital Communications Conference *Proceedings* are available through TAPR, 8987-309 E. Tanque Verde Rd. #337, Tucson, AZ 85749-9399; Phone: (817) 383-0000; Fax: (817) 566-2544; e-mail: <tapr@tapr.org>; WWW: <http:// www.tapr.org>.

Back issues of *CQ VHF* are available for $3.50 each, postage included, from *CQ VHF*, 76 N. Broadway, Hicksville, NY 11801; Phone: (516) 681-2922; Fax: (516) 681-2926 (we are not set up to take orders via the Internet).

A Day in the Life of a Weak-Signal Op...

So you think it's easy being a weak-signal fanatic? Well, when opportunity knocks, you'd better be ready!

Saturday mornings are my favorite time of all. Sleep in, shower long, put on my "working in the yard" clothes and fix a hearty breakfast. Then I fire up the kilowatt on 2 meters and CQ for a bit, then bang away on 6-meter random rocks (meteor scatter) for awhile... Heaven. But *this* Saturday morning would be different.

Opportunity Comes Calling

At 9:00 a.m., the phone rings. It's Jeff, KE6ILX, looking for advice on a hilltop in grid square DN00. I sense an opportunity here. "Where are you?" I ask. "In town and almost to your exit." "Why don't you stop by and we'll discuss it over breakfast?" We meet at "Curt & Al's Country Diner," where I begin to twist his arm into traveling just a bit farther (100 miles) to DN10 to give me grid #50 on 432—the last one I'd need for 70-centimeter VUCC (the ARRL's VHF-UHF Century Club award)—and the first in Nevada! It takes some doing but he finally gives in. After we finish our meal, it's off to my place to look over a few maps while I load "Map N GO" on my computer and print him a route with travel times and distances.

By 11:00 a.m., he's off and running while I reassemble my "rover" station. The truck got a new clutch last week and I have yet to put any radio gear back where it belongs. Thankfully, the 2-meter and 432-MHz Yagis are still in place! The 432 rig is new to me—a TR851A—and is still in need of a 2-pin Molex plug on the power cord. After 15 minutes of looking through every square inch of the junk box, I find one and warm up the soldering iron. The radios are in place. Now, where are the amplifiers? Short on coax jumpers, I rob a few from my EME station (along with the 432 preamp). My last stop is the Internet VHF reflector to let the California folks in on where and when to expect to hear Jeff.

On the Road

By 12:15 p.m., I'm finally on my way. After a quick stop for bottled water and a few snacks, I start to worry about missing him as I have another hour of driving left before I arrive on the hilltop I'd chosen for the contact attempt.

Why didn't I just point the EME array out his way and wait it out at home? When I'm this close to finishing a major goal, I leave as little to chance as possible! My eastern horizon is +5 to +8 degrees, less than a 1/2 mile away, not the best for terrestrial VHFing (or EME, for that matter).

At 2:00 p.m., I'm looking for a hilltop next to the highway as the best sites are still snowed in. Finally, there it is! A microwave relay station atop a 500-foot knoll about 3/4 of a mile off the highway. Three miles later, I take the first turnoff across the freeway, go down a dirt frontage road, and up the hill, arriving at 2:30. Not bad. No noise from either the radio site or the power line. Out comes the compass to find the true heading to DN10. Set a "way point" in the GPS 38 (Global Positioning System receiver). I'm in DM09ls, 43.1 miles from home, well within the 50-mile radius allowed for VUCC credit.

Where Are You, Jeff?

At 3 p.m., I check in with Jeff. "KE6ILX, K7XC. Where are you at Jeff?" "K7XC, KE6ILX. Hi Tim. I'm still in DN00 and I just ran out of road. Looks like I have to backtrack some and try this other road." "OK, Jeff, not a problem, I'm not going anywhere!"

Jeff Petty, KE6ILX, with his Rover setup. As Tim notes in the text, it's enough to make HIS truck, in the background, look normal!

In the meantime, I work a few folks in CM98, relaying when to expect Jeff from DN10. Signals are up and down, typical for a March afternoon. Very few stations

By Tim Marek, K7XC

"Why didn't I just point the EME array out his way and wait it out at home? When I'm this close to finishing a major goal [VUCC on 432], I leave as little to chance as possible!"

have worked me with the new callsign and a mini pileup ensues. Fun stuff!

Success!

By 3:45 p.m., Jeff is finally in position and starts calling me. "K7XC K7XC KE6ILX KE6ILX DN10 DN10 over over." Wow! He's 20 over nine! "KE6ILX K7XC, Thanks Jeff, you're 59 plus DM09 DM09 over." "QSL QSL, good signals here too." "QSL. Many thanks, Jeff! That's number 50 on 432!"

Over the next half-hour, Jeff works quite a few folks in northern California. Having completed my goal, I feel like celebrating and suggest we meet in Lovelock for dinner. Once Jeff shows up with his antenna trailer in tow, my antenna-covered 4 x 4 seems a lot more normal. During dinner, I agree to show him the way up to Toulone Peak (DN00). It's one of three mountaintops in Nevada where the access road starts at the local dump! Thirty minutes later, we're at 7,300 feet above sea level, with a full moon to the east and the Hale Bopp comet to the west. And people wonder what's so special about mountaintopping!

Still suffering from a nasty cold, I bid Jeff farewell and head home. He plans on installing eight 432 Yagis and working some EME before hitting the hay. Homeward bound, I work several county hunters on 2 and 432 from a couple of the rarer Nevada counties.

Home Sweet Home

10:30 p.m. After 13 hours, 267 miles, and three grid squares, I'm finally back in my driveway. A nice relaxing Saturday. But it's not over...a weekend has *two* days!

Sunday morning, 8:00 a.m. Fully rested, I turn on the 2-meter station only to find Jeff chasing the boys in Oregon and Idaho. He's so loud I work him on 432 with 10 watts and no preamp.

At 11:30 a.m., the phone rings. Dad needs my help dismantling a storage shed built from heavy wall aluminum angle stock that would be perfect for antenna projects. An hour later, I'm almost out the door when Dave, KA7VLL, stops by to help with a software problem. Jeff is due here anytime, I need to be at the folks' to claim the aluminum, and I have yet to have breakfast. Another hour passes. With the computer problems resolved, I finally make it to Curt & Al's, where I quickly wolf down an order of bacon and eggs around 2:00 p.m. As I'm leaving, Jeff is calling on 2 meters. We meet at the house. After returning a few items, his starter refuses to work, leaving him stranded and blocking me in my driveway. By 2:30, he finally gets it started by bypassing the starter solenoid with some jumper cables. By 4:00, Dad and I are done dismantling the shed and I'm surprised at the quantity of aluminum stock I now have for future EME projects. Around 5:00 p.m., I'm home again. Finally, the weekend is over and I didn't get a thing I had planned done. But...I'm not complaining!

Here's Jeff really getting "into" his operating...or is the truck trying to eat him for dinner?

10-GHz EME Record

The following report is from Peter Day, G3PHO, Editor of the RSGB (Radio Society of Great Britain) *Microwave Newsletter*:

On Wednesday, 12 March, 1997, a new world record for EME on 10 GHz was set in a QSO between Joe, DJ7FJ, and Greg, ZL1GSG. The two-way QSO took place at 0830 UTC. DF7FJ operated from Schiltach in southwestern Germany and ZL1GSG from Awhitu Peninsula/Manukau Heads southwest of Auckland, New Zealand. The great circle distance between the stations is approximately 18,340 kilometers or just under 10,000 nautical miles. DF7FJ and his team were using a 4.5-metre parabolic dish and a 50-watt travelling wave tube (TWT) power amplifier, while ZL1GSG used a 3-metre dish and a similar PA. "O" reports were exchanged both ways (*meaning that complete callsigns were heard by both stations—ed.*).

The new world record came after a series of unsuccessful attempts and one semi-successful attempt that saw ZL1GSG using a 1.8-metre dish from Muriwai, on New Zealand's west coast, northwest of Auckland. Prior to the successful QSO, a test run from Awhitu Peninsula confirmed on the weekend before that moon echoes were clearly audible from the receiver's speaker even a few metres away from ZL1GSG's van. Earlier echoes using the 1.8-metre dish had been very faint. The change to a larger dish had clearly made the difference. On the night of the QSO, moon echoes were received well by ZL1GSG starting about an hour before sked time.

A last-minute technical problem, caused by a short in the cable that switched the waveguide TX/RX [transmit/receive] relay, put the whole project in jeopardy just minutes before the QSO began. However, Greg's policy of having a spare bit of next to everything provided a makeshift solution only a few minutes into the sked window, and contact was established almost immediately after ZL1GSG was QRV again. The signals from Germany were clearly audible, as had been the moon echoes.

Congratulations to Greg, ZL1GSG, and Joe, DJ7FJ, from their New Zealand ground support team of the day: Bill, ZL1TTH, Tim ZL3VTV, and Ulrich, ZL1DDL. Thanks go to many amateurs who helped with the provision of equipment, time, and a QTH.

"I'm still in DN00 and I just ran out of road. Looks like I have to backtrack some and try this other road."—KE6ILX

(For more information on microwave distance records, visit Peter's World Wide Web page at <http://members.aol.com/g3pho/ghz.htm>.—ed.)

Activity Reports

More EME News

From Dave Blaschke, W5UN:

March 11, 1997—I am very happy to report that Gus, 5X1D, was worked at 1750 Z today by W5UN, for country #145 on 2-meter EME. Very good signals considering his 300 watts and single 17-element Yagi.

From Doug, WØAH:

Congratulations to Joop, PAØJMV, on working 500 initials with 2 Yagis on 144-MHz EME, one of the outstanding achievements of all time!

From Chuck, W8MQW:

Fellow EMEers, I need your photo for my gallery of EMEers. These should be pictures of you, not your antennas. If you can, digitize the photo and send as an attachment to an e-mail message. If you have the capability, compress to a JPEG file of less than 10 kB if the quality is acceptable. Photos can be seen by visiting <http://www.mth.msu/~maccluer/avocations.html>.

June VHF QSO Party Announcements

From Michael Smith, VE9AA:

CY9AA had to reschedule due to circumstances beyond our control. Likely dates will be June 26th–July 4th (yet to be firmed up due to several factors). Seems Murphy has visited us already!

From Scott, NØEDV:

KB9IQR and I will be activating grid square EN67 again this year. We'll be on 6 meters and, if I get the new transverter built and working, on 2 meters, too.

From Chuck, K3YWY:

The Grid Rangers (Bud, N3LJK/R & Chuck, K3YWY) will start the contest in FN00 at Blue Knob, PA (ele. 3000') near Altoona, PA, and operate until 10 p.m. local time. From there, we'll move to FN10 near Reading, PA (ele. 1600') and operate from early Sunday until mid afternoon. We'll finish in FN20 north of Allentown, PA (ele. 1600'). QRV on all bands 50 through 2304 (50, 144, and 220 when mobile). Check our homepage at <http://www.users.fast.net/~cpearce> for more details.

From W3SE, DM04xi:

QRV from 6300' Roundtop Mtn. Bands 6, 2, 222, & 432. Ops Wes, W3SE, Bob, N6OPR, & Jim, KQ6BS. Our Goal: Beat last Year's 142,800 Score.

From WA1LOU, FN31mp:

Will be on 144 through 1.2 GHz, have fun!

From Jordan, WB2QLP, EL96:

I'm planning a Rover/grid DXpedition on 6, 2, 432, and 1296 through grids EL95, EL96, EL86, EL87, EL88, EL97 & EL98. Ops: WB2QLP & KE4RGH.

From WB2ODH:

The "WB2ODH/6 Contest Group" will once again be operating from DM04 atop Fraizer Mt. (8013'), California. We'll be operating "Limited Multiop" on 6, 2, 220, & 432 with much improved antenna systems. Look for us 20 to 40 kHz above the calling freqs.

From Ted Brattstrom, NH6YK, BL11

QRV on 6, 2, & 432. I'm hoping we have some Tropo/Es, Still looking for my first NA contact on 6 or 2 meters.

From Robert N7STU, DM07:

Single Op. 50 MHz KW 7 el, 144 160W 2m5wl, 432 100W 432-9wl, 902 100W corner reflector, 1296 15W 55 el loop Yagi.

From Don, NL7CO:

NL7CO/R will attempt to activate all 13 Oklahoma grids on 6, 2, and 432 during the contest. We'll use HF liaison for those who need the grids.

From Brian, ND3F:

Plans for ND3F/R: Sat., FN16/17/27; Sun., early FM28/18/19/29 (FM27/28 mobile); Sun., noontime FN20/10/11/ (FM29/FN20 mobile); Sun., late FN00/FM09, maybe FM08 mobile, will have 6 meters through 10 GHz if K6LEW joins me, and 6 meter through 2304 plus 5760 if I go solo.

Other Planned Operations

KF7NP will operate from DM36wj ABCD9E (50–1296 MHz) @ 9200 feet, overlooking the Grand Canyon.

The Packrats will be on Big Pocono FN21hb again operating under W3CCX, on all bands from 50 MHz through 10 GHz. Not sure of the final Op list yet.

Ed, K1TR, plans to run a limited multiop grid-expedition from FN44.

Sean N7LQ DN01fa will be on 6, 2, 432, 1296, and possibly on 2304.

Keith Belongia, N9PBA, will be going to EN55 for the June contest, SMIRK QSO Party, Field Day, and the ARRL September contest. He'll add 222 and 432.

Jeff, KE6ILX/R, will be Rover through some of the rarest Nevada grids: (in order) DM08, DM18, DM17, DM27, DM28, DM29, DN20, DN21, DN10,

"On Wednesday, 12 March, 1997, a new world record for EME on 10 GHz was set in a QSO between Joe, DJ7FJ, and Greg, ZL1GSG."—G3PHO

DN11, DN00, and DM09 with 6, 2, 222, 432, and 1296.

And What about Me?

It's hard to believe the June contest is here again. It seems like last week I was melting (95 degrees) on top of Booker Mountain (DM18) during one of the best Es openings I can remember. This year, our group will operate from 8,600-foot Mt. Moses in DN10 using Dave's new call, W7KK. The list of operators has grown to include veteran contesters Russ, K6KLY (6-land single op record holder), and Al, WB6YIY, who will man 432 and 222 respectively. To keep pace with our increasing energy demands, I am now the proud owner of a new 5-KW Generac gas generator. Dave, W7KK, and I spent a Saturday building eight FO22 antennas for 432 and plan to use four of them with full Az/El rotation and 1000 watts during the contest with emphasis on EME contacts. For those who need Nevada for 432 WAS, here's your chance. Remember to exchange grids, Not "O"s. Tune 3.818, 3.843, and 14.345 for Skeds! And above all...Have fun!

KE6ILX's multiband rover station, in position atop Virginia Peak, Nevada. Jeff worked stations all over the western U.S., and gave K7XC his final grid for 432-MHz VUCC on a roving weekend last winter.

Keep those reports coming, please, to e-mail: <K7XC@VHF.RENO.NV.US; Fax: (702) 972-5011; Phone: (702) 972-4722; Snail Mail: Tim Marek, K7XC, 360 Prestige Ct., Reno, NV 89506. 73 and best of luck!

Tim, K7XC

Is There a Tower in Your Future?

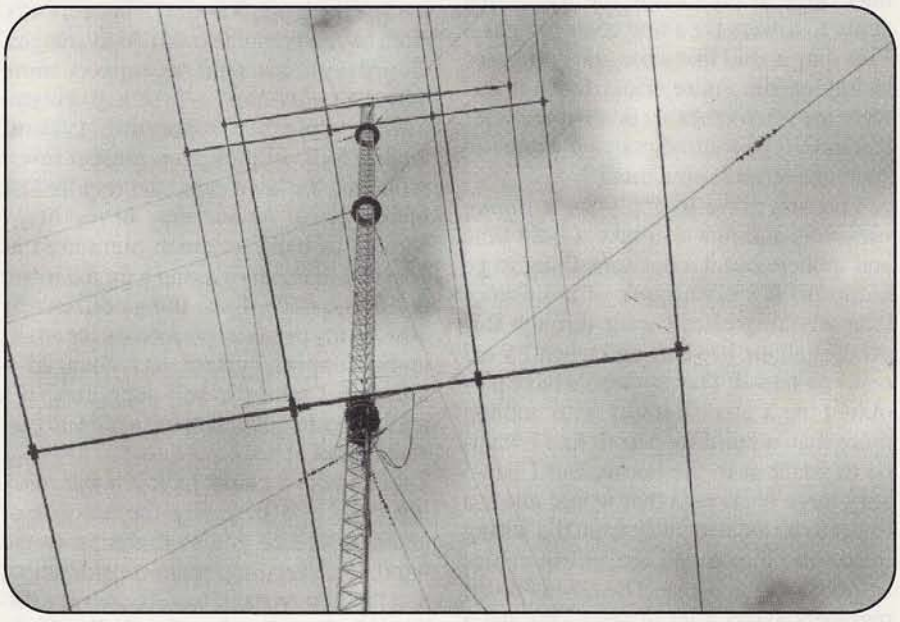
The longer you're a ham and the more involved you get in the hobby, the more likely it is that you'll want to put up a tower. Here are some basic things you should know.

Years ago, I wanted a job with a Motorola repair shop, so I lied. Oh, I had all the credentials that you could get from books, soldering irons, and the FCC. There was no problem there. What I lied about was my experience climbing towers—I had none, but I claimed to have climbed everything. Worse, I had a phobia about heights.

The first day on the job I was sent out with another service tech to replace an antenna on a 150-foot tower. Dan, the other tech, made no bones about it: He did NOT climb towers. It was a long ride out of town to the tower site. Time seemed to pass very slowly as we drove. Once there, I pretended to know what I was doing. Finally, there was nothing left to do but climb.

I got about 50 feet up—it seemed like 10 miles—and then something really interesting happened. I "froze" to the tower. Now, time started to pass really slowly. I continued to breathe and my heart was beating, but nothing else worked. I was totally rigid. You could have suspended me between a couple of chairs and walked on me like they do on the hypnosis stage shows. Finally, Dan noticed that there was something wrong and called up to me "Are you all right?"

"Sure," I said. But inside I knew it was a lie. Here we were 30 miles out of town on a hillside where only the four-legged live. Dan didn't climb, so he couldn't help me. Besides, if I asked for help, I would be admitting that I lied about my experience. And I really needed to keep that job. What could I do?



An example of a guyed tower (this one happens to have HF antennas on it). The higher the tower, the more guy wires it needs. This tower has three sets of guys.

Ahh, Towers...

Towers! Who would want to climb one? Who would want to own one? Hams, that's who! What else can bring so much joy to the heart of the ham and so much terror to the eyes of the spouse, neighbors, and city fathers? Towers epitomize the old saw, "beauty is in the eye of the beholder." Nectar of the gods or concentrated rat poison—there's no in between.

Why do we want to put up towers? What's the big benefit? It's simple: height means increased range and coverage, particularly when talking about VHF/UHF communications. Not only does a tower give an antenna height, it gets the antenna away from objects that might distort its radiation pattern. And for those bands that might be involved in TVI, it gets the antenna farther away from house wiring and other unintentional RF paths. All that said, a tower may or may not be worth the cost and effort. It all depends on your particular circumstances, the first of which is what the rules are where you live.

Know Your Zoning Laws

Most of us live within the limits of some municipality, which means that we have to contend with zoning rules and regulations. You could simply ignore the authorities and their rules, but I wouldn't advise that course of action. What are the zoning rules for your community? It may be that your community has some reasonable rules on the books, then again, maybe not. Regardless, you need to know the rules if you want to put up a tower, or, as it's known in "zoning-speak," an *antenna support structure.*

By Peter O'Dell, WB2D

"I 'froze' to the tower...I continued to breathe and my heart was beating, but nothing else worked. I was totally rigid."

Dale Clift, NA1L, is an attorney and expert on zoning issues. He advises that you should always get a *complete* copy of your town's zoning rules. It will probably cost you $10 to $25, but starting out with the complete book could save you a lot of time and trouble later on. If you simply go into your local city hall, the clerk may offer to photocopy the pages that apply to towers for a few cents per page. This may sound like a bargain compared to buying the entire book, but beware: there are often other sections of the rules that modify or contradict specific rules on "antenna support structures."

You may have to apply for a *zoning variance*, and that will take a little time and money, but it's not something to be afraid of. It's often more of a nuisance than anything else. I went through this process about 10 years ago when I lived on Long Island. The city would have permitted me a modest tower with nothing more than a building permit had I wanted to attach it to the house. But I had a very large back yard that would allow a tower to be located away from the wiring inside the house and the utility cables coming into the house. The zoning board members asked a lot of questions and a couple of neighbors complained, but, a few weeks later, I had my permit. Of course, not everyone is so lucky, and those are the cases we're likely to hear about.

Circumstances vary too much from one situation to another to make any blanket pronouncements. You may or may not need an attorney to help you secure a variance. The best way to start is to contact the ARRL and ask for its information kit on towers and zoning issues (the "PRB-1 kit"). By the way, someone will probably tell you that the FCC, through PRB-1, has preempted local government's ability to deny you a permit. Not so. PRB-1 is a great help to the ham looking to challenge overly restrictive ordinances, but it's not a panacea.* There's no way around it, you're going to have to do your homework. Still interested in putting up a tower? I know—just testing.

* "PRB-1" was a 1985 FCC ruling that local zoning rules must "reasonably accommodate" amateur radio operation. Interpretations of what constitutes "reasonable accommodation" have varied widely. The essence of the ruling was later incorporated into Part 97 of the FCC rules, in section 97.15(e), which states, in part, "State and local regulation of a station antenna structure must not preclude amateur service communications. Rather, it must reasonably accommodate such communications and must constitute the minimum practicable regulation to accomplish the state or local authority's legitimate purpose."

To Guy or Not to Guy?

There are basically two general types of tower: guyed and self-supporting systems. Which one is better? That depends. Both have advantages and disadvantages. Guyed systems tend to support more antenna (*wind-loading*) for a given size tower, while self-supporting systems tend to look a lot cleaner, present fewer problems for lawn care, and require less maintenance. At one time in my life, I wanted to hang as much aluminum as possible in the air making a guyed tower my best choice. I see things differently now, so my personal preference for an antenna support system has changed—today, I'd take the self-supporter. It's really a matter of balancing need and personal taste.

Let's take a closer look at *wind loading,* which is basically the amount of antenna surface you're exposing to the wind. It's a *very* important consideration, and the two types of towers are very different in how they handle windloading.

Take a look at Figure 1. The antenna on top of the tower is functioning like a sail on a ship. If you've never actually been on a sailing vessel, it can surprise you just how much force the wind can develop and how strongly it will blow a boat along. Great for sailing, but lousy for radio towers. Think of the antenna as a sail and the tower as a boat that's anchored down.

What happens to the force of the wind as it blows against the tower and antenna? In a guyed system, the guy wires prevent the tower from moving, which causes the horizontal force of the wind to be converted into a downward pressure passing through the tower into the concrete base of the tower. The net effect is that the wind is literally trying to push the tower down into the ground. (Incidentally, when guyed towers do come down, their sections tend to collapse like an accordion, instead of falling out in a straight line. That's why tower manufacturers specify so many sets of guy wires for a given tower height. The higher the tower you put up, the more sets of guy wires you'll need.)

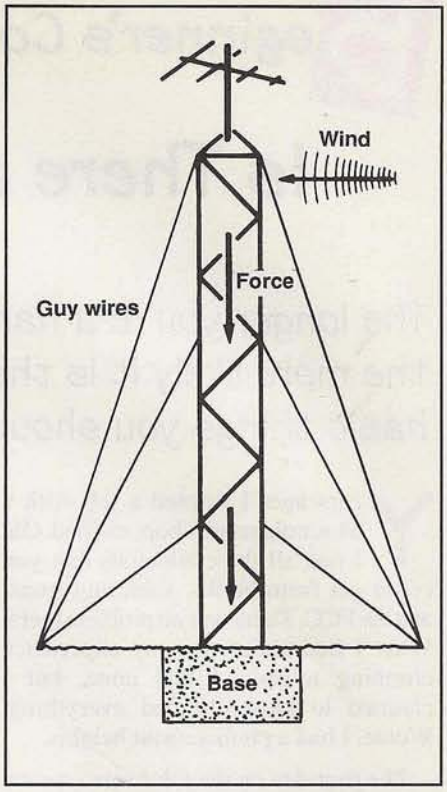


Figure 1. When wind hits a guyed tower, its energy is transformed into a downward force that is trying to push the tower into the ground.

On the other hand, the self-supporter (Figure 2) handles the wind energy in a completely different way. Here the tower is acting more like a lever, with the base being a pivot that doesn't move. The wind is attempting to "rotate" the base around in the ground. The tower is also storing some of the energy of the wind. As it flexes back and forth, it releases the stored energy. Waving back and forth is really a pretty good thing for the self-supporter, unlike its guyed cousin.

In either case, the base is a very important part of the tower. I've known a number of hams who took the attitude of "I'll just throw a couple of bags of ready-mix concrete in a hole and set the base on it."

"What else [but a tower] can bring so much joy to the heart of the ham and so much terror to the eyes of the spouse, neighbors, and city fathers?"

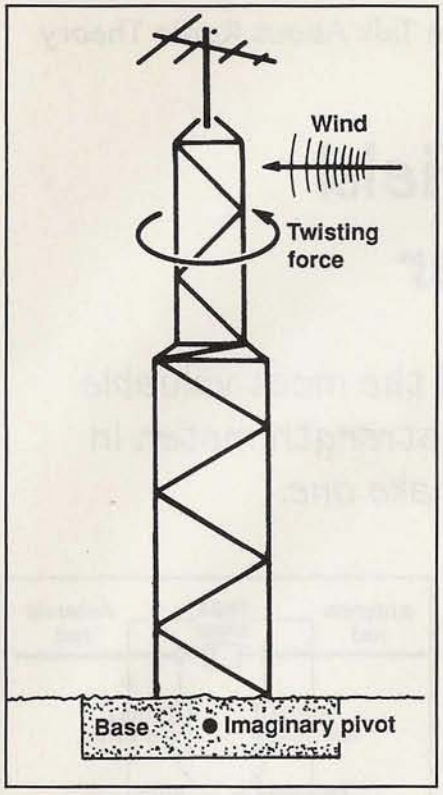


Figure 2. A self-supporting tower will (and should) sway in the wind. In this case, the force of the wind tries to twist the tower out of its concrete base.

Not smart, particularly if your soil is at all loose or sandy. When you buy your tower, the manufacturer provides you with drawings for the size and shape of the base. The taller the tower, the bigger the base, too. There are sound engineering reasons for these specifications, and you'd be wise to follow them closely.

Up on the Roof

There are two other variations of towers that probably should be mentioned here. (Personally, though, I don't care for either one.) First, there's the roof-top mounted tower, which can be either a self-supporting or guyed structure. It's cheaper than a full-blown tower, and some cities will allow you to put one up with few restrictions (I could have done so on Long Island with nothing more than a routine building permit). That's all well and good, but just keep this in mind: your roof has now become your base. Every time the wind blows, your antenna is either trying to shove the tower down through the top of your house or twist your roof off, depending on which style it is. Those thoughts just never appealed to me.

"...someone will probably tell you that the FCC, through PRB-1, has preempted local government's ability to deny you a permit. Not so."

If you're going to go to a roof-top installation, make sure your roof is sturdy and that it's not already overloaded with a second or third layer of roofing material. In fact, at my zoning hearing, one board member suggested I was wasting their time since I could put a roof tower up with only a building permit. The town engineer was there, so I asked him if they had an ordinance prohibiting more than two layers of roofing material on a house. He said they did because they didn't want the roof to collapse from the excess weight of the material, particularly with the potential for heavy snowstorms. I pointed out how a guyed tower worked and asked him if he thought there was a potential for high winds along with a heavy snowstorm. After that, there was no more mention of roof towers.

Getting Cranky

Another compromise form of tower is the crank-up or telescoping tower. This mechanical marvel uses steel cables and pulleys to raise and lower the antenna. In many ways, crank-up towers are a good idea. You can keep the antenna retracted most of the time and only raise it when you're going to use it. It may be a way of getting a tower in a neighborhood that otherwise would not permit one. Those are the good points.

There are two major drawbacks to them, as far as I'm concerned. First, crank-up towers tend to be really expensive. They may cost three or four times as much as a fixed-height tower. But what bothers me more is that from time to time, cables and pulleys have been known to break. Are they likely to break when the tower is retracted? Probably not; it would more likely happen when the tower is fully extended. Frequent inspection and proper maintenance is absolutely essential for these marvels. I wouldn't go near a crank-up except when it is fully retracted, and I especially wouldn't put a hand or foot on one that was at all extended. I'd like to keep all my toes and fingers.

Safety First

If you're going to climb a tower—*any* tower—you need a good safety belt. You can get one from vendors advertising in *CQ VHF* and *CQ*, or you can buy one locally from an industrial supply company. Check the yellow pages. It doesn't really matter all that much what style you buy, but you would be absolutely crazy to climb without one. Same goes for a hard-hat.

And so, there I was, glued to that tower 50 feet up in the air. I was running out of excuses for Dan. He knew something was wrong. It couldn't be taking me that long to catch my breath. Then something happened. I don't know how or why, but my pinkie finger on my left hand twitched. So, I started talking to it, telling it that it could move. And the next one moved, too. And the next one. Then my right hand started to move. So, I climbed on to the top and did the job I was there to do.

Sometimes you just start with the least little success and build on it. I never froze to a tower again. ■

Build a Remote Field Strength Meter

If you want to experiment with antennas, one of the most valuable pieces of test equipment you can own is a field strength meter. In this month's column, W6TNS tells you how to make one.

The SWR meter we discussed last month is a valuable piece of test equipment for adjusting antennas and checking the performance of your antenna system as it relates to your transmitter. But it won't tell you how effectively the antenna is transferring your signal into the air. For this, you need a *field strength meter*, or FSM.

What Does It Do?

As the name implies, this meter indicates the strength of the signal radiated by the antenna. Notice I didn't say "measures." Measuring the actual radiation of an antenna in volts-per-meter, or a fraction thereof (such as microvolts-per-meter), requires a very expensive product. However, you can estimate the performance of an antenna or compare the difference between several antennas with a very inexpensive device. In fact, it's so simple you can make it yourself. And, if you read on, I'll show you exactly how to do it.

Most of the FSMs available at ham stores have a little whip antenna mounted on them to pick up the signal radiated by your antenna. But this product has to be positioned some distance from the antenna, and, more often than not, there's no provision for an external antenna. This means that you have to trot out to the FSM each time you want to see what the meter is reading, and the presence of your body near the FSM antenna will usually affect the meter reading. These FSMs are great for "sniffing out" RF, but they're rather awkward for experimenting with and adjusting antennas.

"[An SWR meter] won't tell you how effectively the antenna is transferring your signal into the air. For this, you need a* field strength meter, *or FSM."

If you're interested in experimenting, the remote FSM shown in the Figure will make your life much easier. I built this signal detector several years ago, but I lost it when I moved to Florida so I don't have any pictures of it. But an ancient Chinese expression says that a good word picture is worth a thousand fuzzy Polaroids. So here's my word picture of how to build this interesting device.

Construction

The remote FSM is constructed in two sections: one is an antenna/detector board that's located some distance in front of the transmitter antenna; the other is the interface to your measuring device. A length of two-conductor shielded audio cable connects the two ends together. Typically, you would use about 100 feet of cable, a common length that you'll find on a spool at your local radio store. The type of cable, conductors, and insulation isn't critical since only direct current flows in the wires.

Each end of the FSM can be assembled on just about anything so long as it's an insulator and you can easily drill holes in it. A 4 x 6-inch piece of 1/4-inch plywood, a similar size piece of "perf-board" (you know, with all the little equally spaced holes), or even an old compact disk (preferably "rap") would work fine.

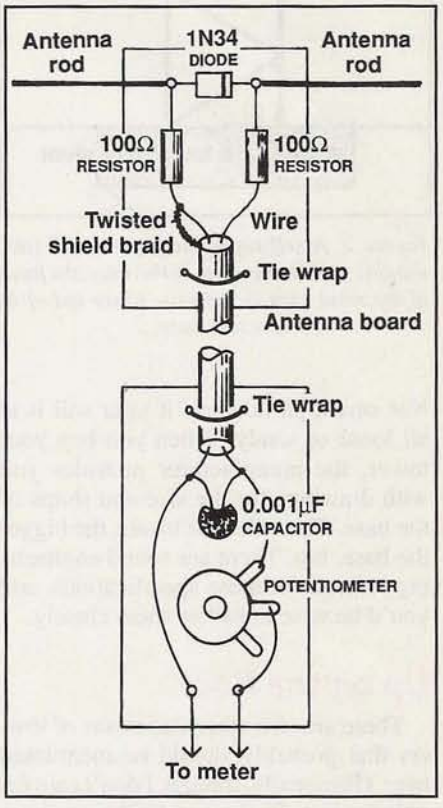


Figure. Circuit diagram of the remote field strength meter. See discussion in text for construction details.

The first step is to drill the mounting holes in the two boards. Drill one in each spot where you see a corresponding black dot on the Figure. These represent screw holes you'll use.

Next come the antenna rods. They can be two telescoping replacement whip an-

By Donald L. Stoner, W6TNS

tennas that are commonly available at your friendly RadioShack store, or, if you want to cheap out, you can use two 20-inch lengths of #12 gauge solid copper house wire with the insulation stripped off. Twist the ends around the mounting screws and use a couple of washers to compensate for the large diameter of the wire. These two rods should be mounted near the top of the mounting plate with screws spaced about an inch apart. Don't tighten them down just yet because you'll be connecting more components to the mounting screws.

On to the Electronics

The diode detector uses germanium material and is a commonly available type called a 1N34. If you can't find one, it's OK to substitute a less sensitive silicon diode, such as the 1N914 or 1N4148. In either case, look carefully at the tiny glass enclosure. You should see a band of paint at one end of the diode. This is the same end as the straight line of the diode symbol in the Figure and is called the cathode. The arrow part of the diode symbol represents the anode.

Mount the diode detector between the screws shown in the Figure by wrapping the last 1/2-inch of wire on the diode under the head of the appropriate screws. Be careful not to stress the glass by bending the wire too near the diode. Again, don't tighten the mounting screws yet.

The next step is to mount the two 100-ohm, 1/4-watt resistors, again, by twisting the last 1/2-inch of wire under the screw heads. At this point, each screw should be securing an antenna rod and two component wires.

Finally, strip back about one inch of insulation from the shielded cable, then strip about 1/2-inch of insulation from each of the two wires inside. Also, be sure to twist the tiny strands of the shield together since this is also a conductor and will be secured under one of the screw heads. The wires inside the cable may be black and white or red and black. The color doesn't matter, but you will need to differentiate between the two wires at the meter end of the cable.

Lay the cable between the two remaining holes and secure it with a tie-wrap. Cinch down on the tie-wrap so that the cable won't pull loose from the board. Next, locate the *anode* end of the diode, and, on the other end of the resistor connected to the anode, wrap the shielded wire under the screw head as before. Under the same screw head, wrap one of the wires from which you previously removed the insulation. Finally, wrap the remaining wire under the screw head that connects to the diode's *cathode* through the 100-ohm resistor. This completes the antenna end of the device.

"As you move your arm around while holding the handheld, the meter should move up and down, indicating varying signal levels."

The Meter Interface

In addition to the screw holes, you'll need to drill a 3/8-inch hole in the board that will be used to interface to the meter. A 100000-ohm *potentiometer*, or *pot* (a variable resistor) will be mounted in this hole. If you don't have a soldering iron, you'll need to install a bolt with a couple of nuts on it that can be used to secure and connect to two of the potentiometer terminals (see Figure).

Just as you did at the other end, use a tie wrap to secure the meter end of the shielded cable. Connect the two wires to the adjacent screws, along with the .001-µF capacitor. Note that the wire from the *minus* meter terminal must be connected to same color wire that connects to the *anode* (arrow) end of the diode at the antenna end of the FSM. Connect short wires from the two potentiometer terminals to the cable and the plus meter terminal. By the way, don't forget to put a knob on the potentiometer shaft.

The Meter Itself

A few special words regarding the meter are in order. The sensitivity of the FSM will be in direct proportion to the sensitivity of the meter you use to indicate radio frequency energy. At a minimum, the meter should be capable of reading 1 milliampere (mA) at full scale. A 100- or 50-microampere (µA) meter would be 10 or 20 times more sensitive.

In the "good old days" of ham radio, one used to be able to buy a meter movement at any ham radio store. Even RadioShack carried several types in its catalog. Today, it's not easy to locate one. Check with your local ham radio store and your friends on the repeater. You can use a VOM (on the milliampere function) if it has a range as sensitive as 1 milliampere full scale. But don't be tempted to use a digital voltmeter (DVM): the reading will jump around a lot and many DVMs don't work well in the presence of an RF field.

Testing the Meter

You can test the FSM right in your home without going outside. Just coil up the cable so that the antenna end and the meter end are within reach. Transmit on your handheld radio (use a simplex channel so you don't QRM a repeater) and turn the potentiometer knob clockwise. You should see the meter indicate that the antenna is receiving energy. As you move your arm around while holding the handheld, the meter should move up and down, indicating varying signal levels.

If there's no meter indication, recheck to see that all the wires are connected as shown in the drawing and that there are no shorted points. One place where trouble can occur is at the antenna end, where the shielded braid of the cable is wrapped under the screw head. The wires that make up the braid are almost as thin as a human hair, and one of them can short to another nearby screw without being obvious. If you don't locate the problem, have a ham friend check your work. Often, another pair of eyes will see something you overlook.

If the FSM works as described, stretch out the cable in a vacant area. Turn the antenna to maximum clockwise (maximum sensitivity) and see if the meter indicates the presence of RF energy. If not, have someone observe the meter while you walk toward the antenna with your radio. Don't forget to maintain the same polarization between your rubber duckie antenna and the antenna rods on the FSM—if they're horizontal, you should hold the handheld radio so the antenna is parallel to the Earth. You'll note a significant difference in the reading between same polarization and cross polarization.

A Caution... and a Look Ahead

One word of warning regarding a problem I remember having: If you try to use the FSM near a commercial radio station or other high-power transmitter, the meter may also read the energy from that station, so be sure to check for any readings *before* you start transmitting.

Next month, I'll describe some of the experiments you can perform with this FSM and how to build and test a Yagi antenna. For now,

73, Don, W6TNS

The Nature of Video—Part 3

If a video signal is an AC signal, where does the DC come from? KB9FO concludes his series on how television works.

It seems the most perplexing aspect of video modulation and transmission is that video has both AC and DC components. The AC portion is easy to see, but the DC portion is a little less obvious. This month, we'll look at where it comes from, and we'll clear up a couple of other ATV mysteries.

When I started writing "The Nature of Video" a couple of issues back, I had to decide if each topic should be brief and concise, a "this is the important stuff," or if I should include a lot of the supporting theory behind each. I opted for the simple explanations so it would fit! So here now is a little more detail on a couple of topics from the previous segments.

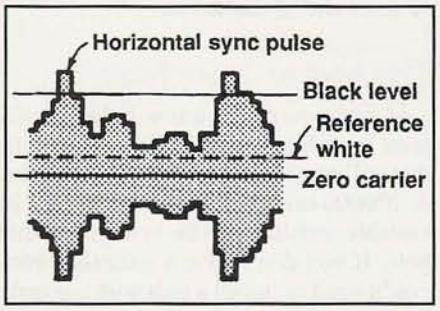


Figure 1. The RF carrier envelope of a typical TV signal. Note that 100% modulation is reached only on the horizontal sync pulses, and that minimum modulation (white) never dips to the zero-carrier point.

Video: A Strange Animal

Video modulation is unlike any other mode in a couple of ways. Besides being composed of higher frequencies (up to 5 MHz, and even more if you use computer graphics or a character generator), the modulation is applied in a different manner, and the modulation itself is a strange animal if you compare it only to analog AM modulation.

Fourier analysis would indicate that any complex waveform can be defined as a combination of sine waves, of various harmonically-related frequencies. Rather than get into a lengthy discussion of the math, here's a practical example.

Start with a simple sine wave. Pick one, any one. Draw it out on paper so you can visualize it. Now, on two more sheets, draw the second and third harmonics of the first sine wave, using the same scale. Now cut the pieces apart so you can lay each over the other and see all three at the same time (by holding them up to a light). Besides three sine waves, you should also be able to trace out the additive function of the shapes, which now begins to look like a worm, or soft rectangle. If you draw a line across the top and the bottom of all of them (the bumps, that is), the rectangle takes on more shape. If you were to add more harmonics, you'd begin to fill in the dips and smooth out the valleys, and the start and stop points would become more vertical. For example, a 20th harmonic would have a very steep beginning and ending waveform.

Squaring Off

What we call a *square wave* is really never square, since you can't instantly go from a zero state to some voltage state, say 1 volt. There is always a *rise time*. Rise time is defined as the time it takes for the signal to go from 10% to 90% of the difference between the two voltage points. For example, going from 0 to 1 volt, the time would be measured from where the signal passes from the .1 volt point to the .9 volt point. Rise time can be defined in either frequency or time domains; that is, it can be said that the waveform has a rise time of 1 microSecond, or it has a rise time of 1 Megahertz. Either defines the slope of the waveform as going from 0 to 1 volt in a particular way.

In video, for the NTSC system (the North American standard), the maximum modulation frequency is defined as 4.5 MHz. So the maximum *sine wave* modulation would be a signal of 4.5 MHz, or roughly .2 microseconds. This is also known as the *aperture limit* or *Nyquist limit* of modulation.

A square wave of 4.5 MHz could not be passed by an NTSC transmitter since, to be a "square" wave, it must—by definition—have frequency components above 4.5 MHz. In fact, the highest practical "square wave" a TV transmitter can pass is about 1 MHz, depending on how round you are willing to have the corners. This is also the defined rise time for all pulses used in transmissible video.

In video, there are also two frequencies generated for each video element. A *video element* is any transition in level. This could be from blanking to sync pulse, or from blanking to white, or from 50% white to 51% white. The amplitude of the transition determines how much *energy* will be in the sideband it generates, which is a separate measurement from the *frequency* of the sideband it generates.

If you modulated a normal carrier wave with a sine wave, you would see three blips on a spectrum analyzer. The carrier wave frequency would be the center blip, and on each side would be a blip representing the original modulating frequency. If you had a 1-kHz modulating signal and a carrier wave of 1 MHz, you would see the blips at 999000 Hz, 1000000 Hz, and 1001000 Hz. This is fine for audio,

"Video modulation is unlike any other mode in a couple of ways."

By Henry Ruh, KB9FO

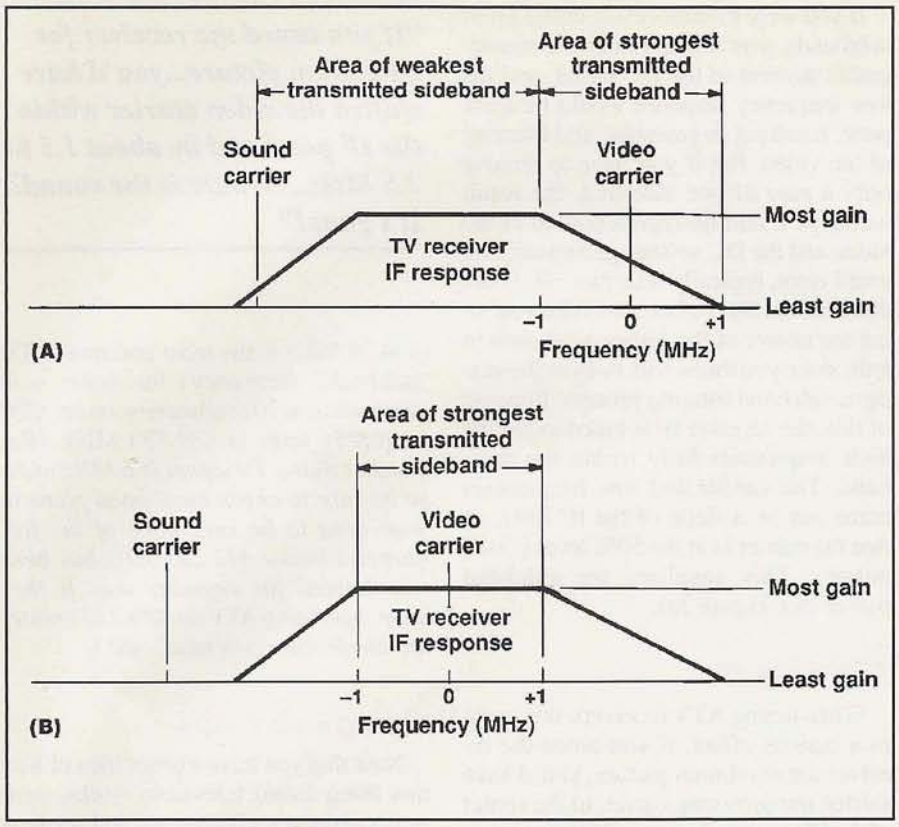


Figure 2a. The IF response of a typical TV receiver tunes both the strongest video signal and the audio signal on the slopes of its gain. Figure 2b. If an ATV operator tunes his/her receiver for the strongest video signal, the sound carrier will fall outside the IF's passband, and no audio will be received.

because there is only a single frequency/time component to the modulation. In video, though, there is second aspect.

Multiple Simultaneous Signals

Since all video is a repetitive waveform, because of the scanning of the image, the same transition will be "seen" each time the scanning gets to that particular location. For simplicity, let's use a picture with a single white, vertical line on the screen. The remainder of the video is black. Each time the scan system bumps into the white line, it will generate the sideband which represents the frequency of the slope of the transition from black to white and back again. Since our white line is vertical, it will be "seen" on every scan line, 262 1/2 times per field (minus the vertical sync period), or about 241 times, which—because we use interlace scanning—is 482 times per frame (two fields) x 30 frames per second, or 14,460 times per second. We add back the vertical interval time, which is just a temporary lapse of video, and we have a time between "bumps" of about 65 mS, or 15,734 Hz. So a second sideband is generated at 15734 Hz, as well as the frequency of the slope (say 4.5 MHz) of the transition. If the transition is large, the energy in the sideband will be large, and if the transition is small, the energy of the sideband will be small.

If you rotate the line so it runs diagonally, you get the exact same results, since the scan rate determines the first sideband component, and the slope of the transition determines the second sideband. Because these sidebands occur instantaneously and simultaneously, your amplifier has to produce a power bandwidth of 4.5 MHz (9 MHz at the amplifier device, part of which will be thrown away later in the sideband filter). If you have a sound subcarrier, it will also exist at the same instant, and if the line is colored, not just white, there will be color sidebands generated as well. So even the simplest video element generates a considerable amount of information in the modulation process.

"A* video element *is any transition in level. This could be from blanking to sync pulse, or from blanking to white, or from 50% white to 51% white."

In audio, the modulation is symmetrical. For the most part, if you were to divide the signal into positive and negative portions, they would cancel out to zero. Not so with video. In order to fix the black and white levels and sync levels to precise values, both the transmitter and receiver have circuits, called *clamp* or *DC restorer* circuits, which force the signal to be at a particular level for various reasons.

First, you want the transmitter to be at maximum power only during sync pulses. Second, you want a constant black level, so the picture contrast ratio stays the same. And, third, you want to limit the white levels so that you never have a zero carrier (over modulation) state. These values are precise voltages. (See Figure 1 for a typical TV signal's "RF Carrier envelope.")

Our 1-volt standard video signal is divided into 140 units, of which 40 are used for sync and 100 are used for video. Another 20 units are used for the level between TV white and absolute minimum carrier. For our 140-unit signal, you have 40/140 volts of sync and 100/140 volts of video, or .286 volts of sync and .714 volts of video. The sync portion is constant. There should be no variation in the level set for sync and blanking. (Blanking is the "zero" reference for video). In the transmitter, the power is held to 100% for the sync pulses and at 75% for the blanking level. The video can be at any level from 75% to 12.5% power.

Because there are two functions, sync and video, and because the sync is constant and the video is variable, the average voltage level over any time period of less than one line may be any value between 100% and 12.5%; and for any time period in excess of one line, the average voltage level will be between 75% and 25%. By keeping the blanking level constant, the two portions of the signal (one above.714 volts and the other below) will almost never cancel out to zero. There will always be a generated average bias voltage, which represents the average picture power in any one line, frame

or field. *This* is the DC component generated by the video signal. The DC level is at its highest during vertical sync, when the transmitter is generating 100% power for the greatest period of time, and it is lowest during an all white picture, where the transmitter is generating 100% power for 5 mS, 75% power for another 6 to 8 mS, and 12.5% power for about 45 mS. During vertical sync, the average power is about 92% and, during video, about 23% average power.

The only time the DC level is zero is when the transmitter rests at 50% power. There is also a time constant involved, so the DC level is actually always changing except under static test-signal conditions.

In the old days, TV receivers lacked the DC restorer circuit (typically just a diode) and it was not uncommon to see the retrace lines during bright scenes, when the picture tube would be biased by the DC component of the video to a point above blanking (extinguishment) and, when the picture was very dark, it was *really* dark. Fortunately, modern technology has eliminated those problems. But we're not done yet!

Vestiges of the Sideband...

Now add to all this the *vestigial sideband filtering*. If receivers centered the carrier in the IF passband, and you transmitted both sets of sidebands equally, (upper and lower) you'd have no differential between the sideband power for low frequency and high frequency modulations. But video, like any AM signal, is redundant between the upper and lower sidebands. The sidebands start out identical, but, when you look at their energy level, you find that the low frequency modulation components are quite strong and the high frequency components are very weak. This means that nearly all the sideband power is very near the carrier frequency and very little is in the areas of the spectrum away from the carrier. In fact, nearly 95% of the video sideband power falls within the first 1 MHz.

"Even the simplest video element generates a considerable amount of information in the modulation process."

If you were to remove one entire set of sidebands, you'd also remove a considerable amount of the DC signal, and the low frequency response would be quite poor, resulting in smearing and blurring of the video. But if you were to remove only a *part* of one sideband, the result would be a faithful representation of the video and the DC voltage generated. The small error, typically less than 3%, is not discernable. But it also means that you've cut the power of the higher sidebands in half, since you threw half away in the vestigial sideband filtering process. Because of this, the receiver IF is tuned to put the high frequencies fully within the passband. The carrier and low frequencies come out on a slope of the IF filter, so that the carrier is at the 50% level (-3 dB power). This equalizes the sideband power (see Figure 2a).

ATV Effects

When tuning ATV receivers, this causes a curious effect. If you tuned the receiver for maximum picture, you'd have shifted the incoming carrier to the center of the IF passband and would fully recover the low frequency sidebands, which would otherwise be 3 dB down. To accomplish this, you shift the video carrier within the IF passband by about 1.5 to 2.5 MHz (remember you're looking at a 6 MHz-wide channel and IF). Where is the sound? It's gone! And that's why, on weak signals, you can tune your ATV receiver and get picture *or* sound, *but not both*! The 4.5-MHz subcarrier is now above the passband of the IF and has been cut off by the IF filter! (see Figure 2b). This is one reason the sound "disappears" long before the video. It's like using the IF shift on an HF SSB receiver to eliminate an interfering signal by shifting it out of the passband.

Commercial TV stations use audio carrier levels of -7 dBc to -15 dBc (5% to 20% of video carrier power)—much stronger than a typical ATV transmitter which uses a subcarrier level of not more than -15 dBc (*dBc* means decibels, or dB, relative to the video carrier). So a commercial station might be transmitting 5 million watts PEP of video and 1 million watts of audio, while we use 100 watts of video and 3 watts of audio, which, after VSB filtering, is actually only 1.5 watts of audio!

So now you know where the audio went! For better audio, use a separate transmitter or a second band, say 2 meters

"If you tuned the receiver for maximum picture...you'd have shifted the video carrier within the IF passband by about 1.5 to 2.5 MHz....Where is the sound? It's gone!"

(144.34 MHz is the most common ATV "talkback" frequency) for audio with your video on 70 centimeters, on an ATV frequency such as 439.250 MHz. (*Remember that a TV signal is 6 MHz wide, so be sure to check local band plans in your area to be sure none of the frequencies below 442.250 MHz has been coordinated for repeater use. If they have, operating ATV on 439.250 creates an interference potential.—ed.*)

Get on the Air!

Now that you have a better idea of *how* this thing called television works, your next step is to try it yourself and see how much fun it can be. See you on the air!

Editor's Note: This series is based on similar articles running concurrently in KB9FO's ATV Quarterly *magazine.* ■

Resources

For more information on ATV theory and operation, we recommend the following:

ATV Secrets for Aspiring ATVers, by Henry Ruh, KB9FO, et. al., ATVQ Publications, 3 North Court St., Ste. B320, Crown Point, IN 46307.

TV Secrets—Volume II, by Henry Ruh, KB9FO, et. al., ATVQ Publications (see above). *ATV Secrets* books are also available from the CQ Bookstore, 76 N. Broadway, Hicksville, NY 11801; Phone: (516) 681-2922; Fax: (516) 681-2926.

If you missed Parts I and II of this series, in the February and April, 1997, issues of CQ VHF, *back issues are available for $3.50 each, postpaid, from the above address.*

Reader Snapshot

Meet CQ VHF Reader...W. D. "Dave" Herbert, N6LW, Riverton, Wyoming

Back in 1957, when I was attending a boarding school in Watsonville, California, a new student was allowed to set up his ham station in our hobby room on the top story of one of the dormitories. Having been interested in ham radio for some time myself, I immediately recognized his equipment as a Heath AR-3 receiver and a DX-20 transmitter. As were virtually all hams in those days, Terry, KN6CNN, was very helpful in my mastery of the code and the technical aspects of our great hobby.

After several weeks and many hours of listening to Terry's AR-3 and practicing with him on a code oscillator, I was ready for the Novice test.

My new license arrived in early 1958. My call was KN6LIW. This license was a more prized possession than my .22-rifle (I grew up on a ranch!) and a greater thrill than hitting my first home run in Little League.

By 1960, I was ready to take the Extra class ham test. I took the Greyhound bus on a 150-mile journey to San Francisco and presented myself to the FCC Examiner at the federal building.

The steely-eyed FCC Examiner lived up to the reputation of his type in almost every detail. However, I was able to copy 100 code characters in sequence sent at 20 words per minute. After three tries on the sending test, Mr. Steely Eyes passed me on that also. Next I was able to correctly draw a dozen or more circuit diagrams and answered enough multiple choice questions correctly on the "written" to pass.

I have faced other challenges since August, 1960, including a tour flying the F-4 Phantom in Vietnam and obtaining professional degrees in medicine and law, but the first great challenge I met was as a teenager on that August day in 1960. Amateur radio has played an important role in my life, instilling in me the belief that I can accomplish just about anything I want to, if I put my mind to it.

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If you'd like to be considered for our "Reader Snapshot" column, please tell us about yourself in 250 words or less and mail, along with a photo, to: CQ VHF *Reader Snapshot, 76 N. Broadway, Hicksville, NY 11801. Entries become our property and cannot be returned. If we publish your "snapshot," we'll give you a one-year gift subscription (or extension) to* CQ VHF.

Q & A

Questions and Answers About Ham Radio Above 50 MHz

Q: I don't know where to turn for information on using my 2-meter handheld radio and my amateur TV station hookup. I want to find someone to tutor me and my friends on how to use these transmitters. Is there anyone in the College Park (Georgia) or Atlanta areas who is willing to do this? Thanks.

Otis Williams, KF4LGX
College Park, Georgia

*A: You won't find any ATV (amateur television) on 2 meters. That's because a standard fast-scan TV signal is 6 MHz wide and the entire 2-meter band is only 4 MHz wide! All fast-scan ATV activity is found on the 70-centimeter and higher bands, including 902 and 1296 MHz. (*Slow-scan TV, *in which single-frame still images are transmitted, uses a much narrower bandwidth and can be found on many amateur bands, including HF.)*

What you might *find on 2 meters, though, is ATV "talk-around" audio on 144.340 MHz. Since (as you'll read in this month's "In Focus" column) it's difficult to get both good video and good audio on low-powered ATV transmissions, it's very common for ATV operators to send their video on one band and talk back and forth to each other on 2-meter simplex. So try listening to 144.340—if you hear people talking, and it sounds like they're talking about what they're seeing —break in and ask if they're ATV operators. If so, tell them you'd like to get started. I'm sure you'll be welcomed with open arms. Meanwhile, if any Atlanta-area ATV operators see this, please drop us a note here at* CQ VHF *and we'll forward it to Otis.*

Q: We are having a problem with white noise when working some, but not all, distant 2-meter repeaters in my area. We don't have this problem when working repeaters that are in close.

We are using a 2-meter mobile transceiver with a power supply, and the antenna is a 9-dB gain fiberglass whip mounted approximately 24 feet off the ground, fed with about 50 feet of RG-81U type coax. Everything is well grounded.

There is a power line approximately 100 feet away from the antenna. Could this possibly be the source of the interference? If so, what would you suggest to remedy the problem? Would using some type of filter help? If so, what type? Would it help if the antenna were raised up higher so it exceeded the height of the power lines? Thanks.

Michael (KC7PJA) & Marjorie (KC7PJB) McVeigh
Ukiah, Oregon

A: Any interference question is difficult to answer since there's rarely one answer that applies to all situations. Tracking and solving interference problems is generally a matter of detective work followed by trial and error. But the first question you need to ask is whether you actually have an interference problem at all. Electrical noise tends to show up on a radio as hum or buzz, and has more AM components than FM, so it would need to be pretty strong in order to affect your FM receiver. My guess is that, if it's that strong, it would also affect the signals from your local repeaters. One easy way to check is to borrow a directional antenna and see if the noise is there only when you're pointing at the power lines. And be sure to check for other pieces of electrical/electronic equipment in your house, such as computers or fax machines, that could have "birdies" on specific frequencies.

If you can't easily track down the noise source, you may just be dealing with signals that aren't strong enough to be received noise-free. If you're not within a repeater's "full quieting" range, you'll have normal band noise mixed in with the repeater signal. One of the characteristics of FM communications is the "capture effect," in which the strongest signal on a frequency "captures" that frequency and blocks out all other signals. When a very strong signal captures the frequency and you hear only the signal and no noise, that signal is said to be "full quieting."

As far as the receiver is concerned, noise is just another signal. And if your desired signal is not significantly stronger than the noise level (which is often the case with distant repeaters), then the repeater signal will not capture the frequency and you'll have noise along with the repeater signal. Your receiver actually listens to a range of frequencies at any given time, and, if there's a high noise level on frequencies adjacent to a given repeater, you'll have more of a noise problem with that repeater than with others. If this is your situation, then the only solution is to improve your antenna system so that you can focus more closely on the signal you want to hear. A directional antenna such as a Yagi (beam) or quad is a typical solution.

But I have a couple of questions about your existing antenna system which might shed some light on your problem as well. I wonder if your "9-dB fiberglass whip" is cut for 2 meters, and whether you have any radials mounted beneath it as a ground plane (unless it's specified by the manufacturer as a no-radials-needed type of antenna). Also, I'm unfamiliar with RG-81U type coax, and it's not listed in any of my reference books as a type of cable commonly used by hams. Is this a 52-ohm cable? If not, you could have a mismatch that will further reduce the efficiency of your antenna system. Finally, you ask if raising your antenna above the level of the power lines will help. Let's put it this way—it couldn't hurt! At VHF/UHF, higher is almost always better.

Q: Would anyone know where to obtain batteries for a military PRC-77 radio? It takes a 15-volt battery with an odd connector. Thank you for your effort.

01810
47 Balmoral
St Andover

Lee Britton, N1WWJ
Andover, Massachusetts

A: Well, we don't have the answer to that one here in the office, but I'll bet some of our readers can help. Anyone out there who can help Lee? If you contact Lee directly (he's good in the Callbook), please send a copy to us so we can share the answer with everyone.

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, 76 N. Broadway, 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."

Basics

What Are "Nets" All About?

Ham radio "nets" have more in common with "safety nets" than "fishing nets," so don't worry if you're caught in one!

Chances are, if you've listened to a repeater (any repeater) for more than a week or two, you've heard some reference to a *net*, or maybe even heard one in operation. Depending on the net, you may or may not have been able to follow what was going on. This introduction to net operation will try to demystify them at least a little bit.

What's a Net?

Simply stated, a net—short for network—is any on-air meeting of hams for a specific purpose. Nets may be formal or informal, "controlled" or "uncontrolled," regularly scheduled or called up to meet a need. Let's take a look at some of the most common types of nets and some basics of net procedures.

Regularly Scheduled Nets

Traffic nets—Most of these have nothing to do with cars on the highway. Their purpose is to relay written messages ("traffic") from one place to another via ham radio. Many traffic nets are part of the American Radio Relay League (ARRL) *National Traffic System,* or *NTS,* which provides for the orderly flow of traffic from wherever it originates to wherever it's heading.

Emergency preparedness nets—These are training nets for hams involved in emergency communications. They may be sponsored by *ARES* (the ARRL's *Amateur Radio Emergency Service*), *RACES* (the *Radio Amateur Civil Emergency Service*), a local club or a "served agency," such as the Red Cross or the National Weather Service's *SKYWARN* program.

Club nets—These may be on-air club meetings, "swap 'n shop" nets, or gatherings of groups within a club who share common interests, such as technical nets, women's nets, kids' nets, and computer nets.

Most of these nets meet on a regular schedule, daily, weekly or monthly, on a specific frequency at a specific time. They're often promoted on the air by club members or recorded announcements from a repeater controller.

As-Needed Nets

Emergencies and public service events generally don't happen on a predictable schedule, so the nets required to respond to these needs are called up on an *ad-hoc* basis. Here are some of the most common types of as-needed nets:

Nets can be regularly scheduled or as-needed, such as the one conducted during this California earthquake drill. (Photo courtesy AC6EN)

Emergency nets—Something *real* has happened—a destructive storm, a chemical spill, a major accident or some other disaster. Hams respond by starting up a net to marshal resources, deploy stations to where they're needed, and provide necessary communications. This is where all the training in the regularly-scheduled emergency preparedness nets is put to the test.

Public service event nets—Your town is having a parade, a bikathon, or perhaps a swimathon. Hams have been asked to help with communications. They form a one-time net (sometimes more than one) in order to keep all the information flowing smoothly and efficiently.

Weather nets—Not quite a preparedness net, but not yet an emergency net, hams in many parts of the country help track changing weather conditions when severe weather is expected. These nets generally function under either *SKYWARN* or *ARES.*

Net Organization

The structure of a net depends in part on its size, its complexity and whether it is linked to other nets. The simplest form of net is the informal, "uncontrolled," or "non-directed" net. If your club is helping out at a small event in which only three or four stations are participating, there's not too much traffic. Then all participants monitor the same frequen-

Oops!

We've let a couple of errors slip by once again. So, to set the record straight:

• Wrong number—In May's "VHF News," we reported on the FCC's new toll-free consumer assistance number, but got the area code wrong. The correct number is (888) 225-5322. Expect to sit on hold for a while.

• Wrong "amateurs"—In April's "VHF News," we reported on a speech by Robert Marsh, Chairman of the President's Commission on Critical Infrastructure Protection, in which he said "even amateurs have access to the technological tools needed to penetrate (computer) systems and cause trouble." Upon a closer reading of Mr. Marsh's full comments and the texts of more recent speeches on the same topic, it's clear to us that he was referring to computer amateurs (a.k.a., hackers), not radio amateurs. We apologize for any misunderstanding that may have resulted (see "VHF News").

• In April's "Hams in Space: A Guide to Working Mir—Part 2," we said "If you see any 'UI' packets going from Mir to any other station, then Mir is connected to that station and is BUSY." This is incorrect. A UI packet means Mir is open and ready for the next log in. However, a *numbered* information frame, or "I Index" packet (such as <<I2>> or <<I7>>), *does* mean Mir is BUSY and you should wait before trying to make contact. (Tnx WF1F)

• Also in April ("Moving Off Repeaters When You're on the Move"), we gave you an outdated address for the Olde Antenna Lab of Denver. It's no longer in Denver! The correct address is 6224 S. Prince St., Littleton, CO 80120. Owner Dave Clingerman, W6OAL, also advises us that the facility will be moving again in the fall (to larger quarters), this time to Parker, Colorado. (Tnx W6OAL)

• Finally, in our March issue, in Gordon West's article on free frequency charts, we incorrectly identified the 15-meter Advanced class phone band (under the heading, "Alinco: A Novel Approach") as 21.300 to 21.450 MHz. The correct frequencies are 21.225 to 21.450 MHz. Please note that the Alinco chart has the correct information; it was only our example that was wrong. (Tnx KE4TIE)

cy and call a specific station or location whenever necessary.

If the event is any larger than this, the communication organizers will probably opt for a "directed" or "controlled" net. In a directed net, there is a *Net Control Station (NCS)* who's in charge. All other stations must follow the NCS's procedures and directions (more on this later).

Most "event" nets and many emergency nets allow unstructured, or *tactical,* messages. An example of this would be: "Checkpoint 6 needs more water." Other nets, such as traffic nets and RACES nets, require that messages follow a specific format. These are known as *formal* messages, as they often become part of the written/printed record of an event. Formats vary slightly, depending on what organization is in charge of the activity. Becoming familiar with these message formats is part of your training, along with instruction in net procedures.

Net Procedures

If you're operating in a controlled net, you must follow net procedure. While that procedure may vary slightly from net to net (again, depending on its purpose, size, and complexity), there is one basic rule that covers them all, regardless of type: *Always listen to Net Control.*

In general, all transmissions should be directed to Net Control. If you need to talk with another station, you should get permission from the NCS before calling.

Another basic rule of net operation is to transmit only when necessary and to keep all transmissions brief and concise. If Checkpoint 6 needs more water, just say so. There's no need to explain that one of the big vats that had been filled earlier by the wonderful volunteers from the local fire department had been knocked over by an out-of-control rollerblader, creating a mud pond behind the checkpoint, etc., etc. Nets are also not the place for idle chit-chat with your friends. The net is there for a *purpose* and all communications should pertain to that specific purpose.

Finally, don't leave your post or leave the net without getting permission from the NCS. If you're not there when you're needed, and no one knows where you went, an important message may not get through, and you'll harm ham radio's reputation for dependable, professional-quality communications.

Again, specific procedures may vary with different types of nets, but you'll always be in good shape if you remember the basics: Always listen to NCS, address all transmissions to NCS, wait patiently until you're recognized (unless you have a *true* emergency), transmit only when necessary, be concise, and be sure to tell the net control if you have to check out.

Give It a Try!

While some of this may sound intimidating, it's really just a matter of "learning the ropes," and most experienced hams will be happy to help you out and answer your questions. The NCS is a good person to start with. But unless you're in a training net and questions have been invited, it's usually best to hold your questions until after the net ends.

So, if you want to learn more about the world of ham radio public service and emergency communications—or just to meet some of the hams who live near you—find some of the nets in your area. Listen for a while, then check in. After you get the butterflies out of your stomach, you'll find yourself learning a lot and (hopefully) having fun. ■

Resources

The American Radio Relay League (ARRL) offers several publications that can help you learn more about nets, net operating, and public service/emergency communications. They include: *The ARRL Operating Manual*; *Public Service Communications Manual*; *Special Events Communications Manual*; and the *ARES Field Resources Manual.*

All are available from ARRL, 225 Main St., Newington, CT 06111; Phone: (860) 594-0200; Fax: (860) 594-0259; Internet: <http://www.arrl.org>

In addition, *CQ VHF* regularly covers events and activities in which net operations take center stage.

CQ Books, Calendars, Videos

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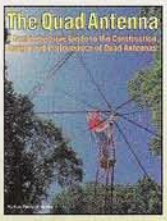

by Bob Haviland, W4MB

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by Buck Rogers, K4ABT

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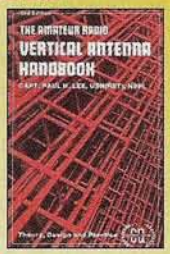

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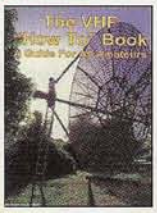

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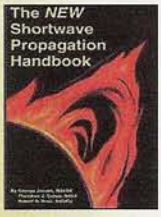

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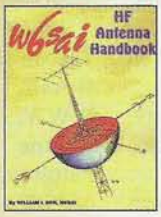

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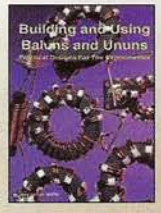

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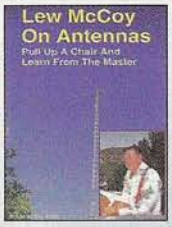

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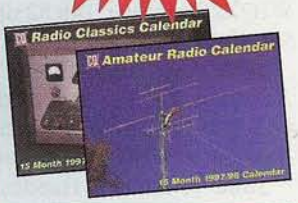

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Hamfest Calendar

The following hamfests are scheduled for June, 1997:

June 1, Newington ARRL Fleamarket, Newington High School, Newington, CT. Talk-in: 146.980 Chelsea Repeater. For information, call Fred Jarvis, N1KWJ, (860) 666-1952. (exams)

June 1, 20th Annual Chelsea Swap'N'Shop, Chelsea Fairgrounds, Chelsea, MI. For information, call Alan Robbins at (313) 878-0363 or write to: 3800 Hooker Rd., Pinckeny, MI 48169.

June 1, Hamfest and Amateur Radio Computer Show, Prince William County Fairgrounds, Manassas, VA. Talk-in: Manassas repeaters 146.37/146.97 & 223.06/224.66. For information, contact Mary Lu, KB4EFP (703) 369-2877.

June 1, Princeton Hamfest/Computer Show, Bureau County Fairgrounds, Princeton, IL. Talk-in: 146.55 -600, PL 103.5. For information, contact Bruce Burton, KU9A, 1153 Union St., Marseilles, IL 61341-1710, or call (815) 795-2201; or e-mail to: <brburton@mtco.com>.

June 1, Hall of Science Semi-Annual Hamfest, Flushing Meadow Park, Corona (Queens County), NY. Talk-in: 444.200 WB2ZZO repeater, 146.52 simplex. For information, contact Arnie Schiffman, WB2YXB (718) 343-0172, evenings only.

June 6–8, HAM-COM '97, Arlington Convention Center, Arlington, TX. For incormation, call (972) 442-1721 or fax (972) 442-3609; e-mail to: <hamcom@iamerica.net> or visit our Web site: <http://www.hamcom.org>.

June 7, Annual Hamfest, Fairleigh Dickinson University, Teaneck, NJ. Talk-in: 146.790 -600. For information, contact Jim Joyce, K2ZO (201) 664-6725. (exams)

June 7, 23rd Annual Central Ontario Fleamarket, Bingeman Park, Kitchener Ontario, Canada. Talk-in: 146.97 or 145.21-. For information, contact Bill Smith, VE3WHS, 32 McElderry Rd., Guelph, ON. Canada N1G 4K6; Internet: <eeaton@sentex.net>.

June 7, 7th Annual Hamfest, Goshen-Lempster Coop. School, Lempster, NH. Talk-in: 146.76. For information, contact Conrad Ekstrom, WB1GXM, P.O. Box 1076, Claremont, NH 03743 or call (603) 543-1389; e-mail to: goshlem@srnet.com>. (exams)

June 7, 17th Annual IRA Hamfestival, Hudsonville Fairgrounds, Grand Rapids, MI. For information, contact IRA voice mail/info line at (616) 534-6803 or Kathy Werkema, KB8KZH, at (616) 698-6627.

June 8, 20th Annual Swapfest/Auction, Junction City Village Park, Junction City, WI. Talk-in: WB9QFW/R 146.07/67. For information, contact John Feltz, WA9LWJ 973 E. First St., Junction City, WI 54443, or call (715) 457-2506; e-mail: <ifwa9lwj@tznet.com>. (exams)

June 8, Annual Egyptian Fest/Hamfest/Computer Fair/ Fleamarket, Granite City Campus, 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 Dusenbery, N9OQK, (618) 398-1456. (exams)

June 8, Ham-O-Rama '97, Erlanger 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 8, 40th Annual Hamfest, DuPage County Fairgrounds, Wheaton, IL. Talk-in: K9ONA 146.52; K9ONA/R 146.37/97 (107.2). For information, call (708) 442-4961 (24 hours). (exams)

June 8, 5th Annual Charlotte ARC Hamfest/Computer Fair, Roll-A-Round Skating Center, Charlotte, NC. Talk-in: 147.06 (-600) repeater. For information, contact Daryl Sampson, KM4GO, (704) 522-4971 ext. 3330 or e-mail to: <w4cq@callsign.net>.

June 13–14, 15th Annual Albany Hamfest/Computer Fair, Albany James H. Gray, Sr. Civic Center, Albany, GA. For information, contact Arthur Shipley, N4GPJ, (912) 439-7055; or e-mail to: <n4gpj@isoa.net>.

June 14, 1997 "Dukefest," Executive Inn Convention Center, Paducah, KY. For information, contact Craig Martindale, WA4WBU, 2509 Trimble St., Paducah, KY 42001; or call (502) 444-6822 or e-mail to:<KC4ENA@APEX.Net>. (exams)

June 14, Bangor Hamfest, Hermon High School, Bangor, Maine. Talk-in: 146.34/94, 146.52. For information, contact Roger Dole, RR#2, Box 730, Bangor, Maine 04401; (207) 848-3846. (exams)

June 14, 22nd Annual Hamfest, Midland County Fairgrounds, Midland, MI. Talk-in: 147.00+. For information, write to MARC Hamfest, P.O. Box 1049, Midland, MI 48641. Send SASE, or call evenings or weekends (517) 839-9371 or (517) 496-2999. (exams)

June 15, Monroe Hamfest, Monroe County Fairgrounds, Monroe, MI. Talk-in: 146.72/12. For information, contact Fred VanDaele, 4 Carl Dr., Monroe, MI 48162 or call (313) 242-9487.

June 15, Bluefield Hamfest, Brushfork Armory, Bluefield, WV. Talk-in: 145.49 (BR549). For information, contact Don Williams, WA4K, (540) 326-3338; e-mail: <cna00188@mail.wnet.edu>; or WWW: <http://www.inetone.net/erarc/hamfest.html>. (exams)

June 15, Annual "Dad's Day" Hamfest, Lake County Fairgrounds, Crown Point, IN. Talk-in: on 147.00, 146.52, 442.075. For information, contact Malcolm Lunsford, WN9L, callbook address or <72202.230@compuserve.com>.

June 15, Tailgate Fleamarket, Albany and Main St., Cambridge, MA. Talk-in: 146.52 & 449.725/444.725 -PL2A - W1XM/R. For information, call (617) 253-3776.

June 21, Eastern Ontario Hamfest/Computer Fleamarket, Marmora Area Curling Club, Marmora, ON. Talk-in: on VE3KFR repeater, 145.330 MHz -600 kHz and 146.520 simplex. For information, call Pete, VE3PGB (613) 473-1171 or Richard, VE3BZY (613) 473-2665; or e-mail to: <rhobson@blvl.igs.net>.

June 21, Hamfest, Columbia Park, Dunellen, NJ. Talk-in: 146.625(r), 447.250(r) tone 141.3, 146.520(s). For information, call Bob Pearson, WB2CVL, (908) 846-2056; or e-mail to: <RWPEARSONWB2CVL@WORLDNET.ATT.NET>.

Operating Notes

For June, 1997:

7	Arietids Meteor Shower peak
14–15	ARRL June VHF QSO Party (see rules, May *CQ VHF* p. 59)
21–22	SMIRK (6-meter) QSO Party (see rules this issue)
21–22	UKSMG (6-meter) Contest/Europe
25	Moon Perigee (closest to Earth)
28–29	ARRL Field Day

Line of Sight *(from page 4)*

people who participate do so to have fun, to see how far they can talk without repeaters, or to pass out a few points to those operators who are making serious efforts. Plus, it's a great way to make new friends on the air.

• *Learning*—Contest operating teaches you all sorts of things about yourself, your station, and the propagation characteristics of the band you're operating on.

So, before you write off contesting, even casual contesting, as something *other* hams do, I encourage you to give it a second look...better yet, give it a try, even if 2-meter FM is the only band/mode you have. Don't expect to win—after all, you're not in it for the competition—but do expect to get something useful out of the experience, if you've gone into it with an open mind.

Contest Proposals

Elsewhere in this issue, you'll find a preliminary list of competitions that might be sponsored by *CQ VHF*. These include both traditional and non-traditional ideas, and are certainly open to discussion and comment. Nothing will be started before 1998, and we'll need volunteer help in the form of a contest committee to set the dates, write the rules, and administer each event. We already have a panel of prominent VHF operators (both contesters and non-contesters) reviewing the proposals, but we'll need more help for long-term contest administration. If this is something that interests you, please let us know and tell us your qualifications. And, again, we're still open to suggestions.

Contesting Special

In case you haven't figured it out already, this month's issue is our "Contesting Special" for the year. June is the month of the ARRL June VHF QSO Party as well as the SMIRK 6-meter contest and the ARRL's Field Day (which includes VHF activity). In addition to our own contest proposals mentioned above, this issue includes our first annual "Annual VHF Contest Calendar," which we suggest you clip or copy for reference (it's also posted on our Web site); "A Tale of Two Rovers," in which we hear from a "big gun" and a "little pistol" about their recent roving experiences; and K7XC's compilation of who's planning to operate where in the June VHF contest (in "Weak Signal News."). Finally, you'll find the complete rules for the SMIRK 6-Meter QSO Party and the CQ World Wide VHF Contest...plus, of course, all of our usual good stuff that *doesn't* happen to be about contesting. Enjoy!

— • • • —

Introducing...WA3PZO

As of this issue, Bob Josuweit, WA3PZO, joins our contributing staff as *CQ VHF*'s new public service and emergency communications editor, and will be conducting the "In the Public Interest" column each month. I say "conducting" rather than "writing" because both Bob and I hope that he'll get regular contributions from readers, describing public service and emergency activities with which they're involved, or passing along training and operating tips from their parts of the country.

Bob's involvement in public service and emergency communications—often on a national scale—goes back to about the mid-1970s. Bob is a longtime member of the ARRL's Public Service (formerly known as Emergency Communications) Advisory Committee, and also served as chairman in 1987; he's a former Section Emergency Coordinator for Eastern Pennsylvania, and was last year's winner of the ARRL's Philip J. Mcgan Silver Antenna Award for outstanding work in public relations on behalf of amateur radio. Bob has also served as a consultant to the Federal Emergency Management Agency (FEMA), the National Disaster Medical System (NDMS), the National Weather Service, the Veterans' Administration, the American Red Cross, and the Pennsylvania Emergency Management Agency. He's spoken at NDMS conferences and has authored or co-authored a half dozen articles in *QST* and *Worldradio* since 1979.

We welcome Bob to our staff and feel honored to have someone with his background and experience as part of the *CQ VHF* "family." We'd also like to thank the other highly-qualified amateurs who also applied for the position. The choice was difficult because virtually any of the applicants would have done well, and we hope that they'll become regular contributors in the future.

73 de W2VU

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 76 N. Broadway, 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.

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Looking Ahead in

CQ VHF Ham Radio Above 50 MHz

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

- "Project Corner," a new bi-monthly column by Dave Ingram, K4TWJ
- "Converting to *Very* Narrow Band," by Rod Wheeler, WA6ITC
- "So You Think You Can't Use 75-Ohm Cable," by Arnie Coro, CO2KK
- "NiMH Batteries: A Close Look," by Gordon West, WB6NOA

Plus...

- "Is Anyone Out There? Hams and Project Argus," by Denis Jakac, VE3ZXN
- "Father Lonc and the Beacons of Sable Island," by Gil McElroy, VE1PKD
- "An Outboard Noise Blanker for 6 Meters," by Bob Witmer, W3RW

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Radio Astronomy Projects, a book by William Lonc, $23 shipped in USA. Other radio astronomy books and software from Radio-Sky Publishing, P.O. Box 3552, Louisville, KY 40201-3552. <http://www.win.net/~radiosky> or e-mail to: <radiosky@radiosky.win.net>.

HAM Location, beautiful all brick rancher, 4700 sq. ft. home includes home office, HAM shack (radio room), antennas, 3 tiled full baths, 3 or more bedrooms, 3 dens. The 3 car garage and smoking room are not included in the 4700 sq. ft. Sturdy quality construction. Type of heat is great for sinuses and very warm. Acre lot, back fully fenced and very quiet and private, secure gates, separate dog kennel, Olympic size well kept swimming pool. Located on mountain ridge, quiet prestigious neighborhood, nice homes all around, great schools. Located 55 miles from Baltimore and Washington, DC. Ideal location to work in DC, with easy accessibility by train. House and property will be inspected, one year warranty. Pictures, property plan, layout, amenities list, and features in a booklet available to serious buyers for $5.00 cash, check, or money order. Contact: W3BAG, Box 609, Braddock Heights, MD 21714, or call (301) 473-5825.

Space Saver Desk Stand—Converts regular sized handheld ham radios, scanners, C.B. into base units. Allows perfect viewing of LCD displays. Keeps antennas upright. Difficult to knock over. Invaluable for ham radio store sales displays for handhelds. Sorry no credit cards. Money orders, U.S. funds only. $5.95 each or two for $11.50 plus S/H 1st class mail USA $2.50, Canada $4.50. Send to **T.M.C. Enterprises**, 385 S. Lemon Avenue, E. 132, Walnut, CA 91789.

Join the **LAMBDA AMATEUR RADIO CLUB** (Larc) 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. Write LARC, P.O. Box 24810, Phila., PA 19130-2405 or e-mail: <LARC@net-quest.com>.

FOR SALE OR TRADE: 126' spool of RG-225 teflon coax (high-power, high-temperature, good for ***indoor*** use up to 450 MHz). Will sell for $200 + shipping (or you pick up in Metro NYC/NJ area). Prefer to trade for 6/2-meter transverter of similar value. Rich Moseson, W2VU, c/o *CQ VHF*, 76 N. Broadway, Hicksville, NY 11801.

Connect-O-Clean Not hearing weak signals anymore? Clean your antenna's SO-239 connector with our custom sized bronze brush. $4.95 pp. 189 County Road 674, Valley Head, AL 35989.

WANTED: Older model bugs, unusual bugs, and miniature hand keys. State price, condition. Dave Ingram, K4TWJ, 4941 Scenic View Drive, Birmingham, AL 35210

Learn Code by Hypnosis-- http://www.qth.com/cweasy/ or 1-800-425-2552.

If you have a product or service to offer, join us and get your classified message out to all the hams who ply their craft on VHF with *CQ VHF*'s Ham Shop.

Contact: *CQ VHF* Ham Shop
Attn: Bernadette Schimmel, 76 N. Broadway, Hicksville, NY 11801. Call today
(516) 681-2922 or Fax: (516) 681-2926.

"The quick-release remote front panel gives you so many installation options ."

"And with dual receive you can talk on one band, and listen on another!"

"Plus, the high-tech Enhanced Smart Search™ is great for finding repeaters --and you can watch it all on the dual display."

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Now a dual-bander that remotes and is easy-to-use, without sacrificing the features you want!

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Don't sacrifice high-performance features in your dual-band mobile installation Get the easy-to-use FT-8100R at your Yaesu dealer now!

Features

- Frequency Coverage
  - RX: 110~550 MHz
  - 750~1300 MHz*
  - TX: 144~148 MHz
  - 430~450 MHz
- Detachable Front Panel (remotable w/optional YSK-8100)
- 3 Power Output Levels
  - 2m 50/20/5 Watt
  - 70cm 35/20/5 Watt
- 208 Memory Channels
- Enhanced Smart Search™
- CTCSS Encode
- Built-in Duplexer
- S-Meter Squelch
- Dual Receive (V+V,U+U,V+U)
- Crossband Repeat (bidirectional or one-way)
- PC Programmable w/optional ADMS-2D
- Digital Battery Voltage Display
- Auto Power Off (APO)
- Omni-Glow™ Display
- 1200/9600 bps Packet Compatible
- Alternating-Band Memory Selection (ABMS)
- DTMF Autodialer (6 Memories)
- Time Out Timer (TOT)
- Accessories: Consult your local Yaesu dealer.

*Cellular & 900 MHz Cordless Phone frequencies blocked.

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- **Alphanumeric memory capability allows you to recall up to 180 memory channels by name. Frequency, memory channel number, and name (up to 7 characters) are displayed simultaneously. Store call signs, repeater names, cities, etc.**

TM-V7A

FM Dual Bander

Performance, quality, and innovation briefly describe the new TM-V7A dual-band mobile. Look at the easy-to-read large blue LCD display! Storing all of your favorite frequencies is a snap with 280 memory channel capacity (alphanumeric to 180). Unique programmable memory function allows you to store virtually all operating data such as frequency, offset, DTSS code, display setting, and beep function in 5 special channels. Visual scan allows you to graphically see band activity near the current operating frequency. Other features include a user-friendly menu and guidance system, 1200/9600 bps packet, AM aircraft band receive, CTCSS, DTSS, paging, backlit DTMF microphone, detachable control panel (with cable option), and voice synthesizer (VS-3 option). The TM-V7A is truly in a class by itself.

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KENWOOD ELECTRONICS CANADA INC.
6070 Kestrel Road, Mississauga, Ontario, Canada L5T 1S8