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CQ VHF Ham Radio Above 50 MHz

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December 1999

- Y2K: The REAL Need for Hams
- A $10 Packet Station
- Truly Portable Packet

FINAL ISSUE!

Plus . . .

- Winter *E*-Skip on Six
- Sneak Peek: Kenwood's Mystery Rig
- Results: 1999 *CQ VHF* National Foxhunting Weekend

On the Cover: Ed Krome, K9EK, of Columbus, Indiana, with his home-built microwave amplifier. Details on page 56.

U.S. $3.99/ Canada $4.50

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■ Repeaters & FM ■ Packet Radio ■ VHF/UHF Weak-Signal ■ Microwaves ■ Amateur Satellites ■ Amateur TV ■ Plus...Reviews, Product News, VHF Basics, and much more!

GET OUT. HAVE FUN.

ICOM MOBILES

Plenty of Power, PC Programmable, and Ready for FUN!

QST says:
"Those shopping for a wide variety of advanced features in an economically priced 2-meter mobile will find the ICOM IC-2100H worthy of serious consideration."
– QST, 1/99

IC-2100H ▶ 2 meters has never been easier or more fun! 55 watts of power; PC programmable*; 113 memory channels; die cast aluminum chassis; full control mic; CTCSS; highly intermod resistant; and a cool DUAL color display.

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Select which color you want the display to show. The large alphanumerics and soft key controls are easy to see

ONLY 4.3" WIDE
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IC-2800H ▶ Audio excellence, video excitement. 2M/440MHz dual bander with: remote control head; independent tuning & control knobs; cross band repeat; TFT color LCD display; NTSC video port; 118 - 174, 440 - 450 MHz wide band receive**; band scope; 9600 bps data port; CTCSS encode/decode; 232 memory channels; PC programmable*; die-cast aluminum chassis; full control mic; and MUCH more.

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OPTIONAL WIRELESS MIC
Available for each mobile radio shown. Enjoy cable-free control and operation.

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WE'VE REINVENTED THE POWER SUPPLY!

Alinco introduces the Communications Grade Switching Power Supply

DM-330MV

The Alinco DM-330MV is a breakthrough design in compact, lightweight power supply technology. This Communications Grade unit provides up to 30 amps continuous, (32 amps peak), 5 to 15 volts variable output through front and rear panel terminals and weighs less than 5 pounds! There's also a user-selectable "memory" pre-set voltage, a lighted meter that displays volts or current and a triple internal protection system.

Forget what you may know about other switching power supplies; the Alinco DM-330MV is filtered for quiet operation. However, if you should find pulse-noise present, Alinco has created a Noise Offset Circuit (patent pending) so that you can move the noise to a different frequency!

The multiple outlet terminals (binding post, auto-lighter and snap in terminals) make the DM-330MV perfect for fixed, portable and test bench operations. Perhaps the best news is that it's available at a very attractive Alinco price!

- 5 ~ 15 VDC Variable output
- Noise Offset Circuit™
- Ripple less than 15mV p-p
- Rear panel binding posts (32 A)
- Two sets of snap-in terminals (5 A each)
- Customer-defined output "memory"
- Up to 30 amps continuous, 32 amps peak
- Large illuminated Volt/Amp meter
- Weighs less than 5 pounds (2 kg approx.)
- Front panel cigar outlet (10 A)
- Front panel voltage adjust
- Memory, power and protection indicators
- Triple circuit protection: Short circuit, over temperature, current limiting

For reliable station power, come to the experts!

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Be sure to check out the DM-340MV Full-Sized Regulated Power supply!

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- 3 sets of output terminals
- Volt & Amp meters
- Reliable circuit protection
- Front panel fuse

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CQ VHF Ham Radio Above 50 MHz

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BASICS

DEPARTMENTS

Next Month: Join Us in the New CQ (plus CQ VHF)!

MIRAGE ...160 Watts on 2 Meters!

Turn your mobile, base or handheld into 160 Watt powerhouses and talk further, longer, clearer . . . All modes: FM, SSB, CW . . . Superb GaAsFET preamp . . . Overdrive, high SWR, Over-temperature protection . . . Remote controllable . . .

B-5016-G
$299
Suggested Retail

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.

B-5016-G has legendary ruggedness. *We know of one that has been in constant use since 1979!*

Heavy-duty heatsink spans entire length of cabinet -- prevents overheating. Power transistors protected by MIRAGE's *Therm-O-Guard*™.

Fully protected from high SWR and excessive input power. Has warning LED.

Has smooth adjustable Transmit/Receive switching with remote external keying.

RC-1B, $45, Remote Control. On/Off, preamp On/Off, selects SSB/FM. With 18-ft cable.

Draws 17-22 amps at 13.8 VDC. 12x3x5½ in.

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*

More 160 Watt, 2 Meter Amplifiers . . .

B-2516-G, $299. For 10 to 35 watt mobile or base stations. 160 watts out for 25 watts in.

B-1016-G, $379. MIRAGE's most popular *dual purpose* HT *or* mobile/base amplifier. 160 watts out/10 W in. For 0.2-15 watt transceivers.

B-1016-G Great for ICOM IC-706!

B-215-G, $379. MIRAGE's most popular *handheld* amp. 150 watts out/2 watts in; 160 watts out/3½ W in. For 0.25 to 5 watt handhelds.

100 Watts for 2 Meter HTs

B-310-G
$199
Suggested Retail

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

- ***100 Watts out with all handhelds up to 8 watts***
- ***All modes: FM, SSB, CW***
- ***Great for ICOM IC-706***
- ***15 dB low noise GaAsFET preamp***
- ***Reverse polarity protection/SWR Protection***
- ***FREE mobile bracket*** • ***Auto T/R switch***
- ***FREE handheld BNC to B-310-G cable***
- ***Ultra-compact 4¾x1¾x7¾ inches, 2½ pounds***
- ***One year MIRAGE warranty***

Boost *your 2 Meter handheld to 100 Watts!* Ultra-compact all mode B-310-G amp is perfect for all handhelds up to 8 watts and multimode SSB/CW FM 2 Meter rigs. *Great for ICOM IC-706!*

35 Watts for 2 Meter HTs

B-34-G
$89.95
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***
- ***Includes mobile bracket***
- ***Auto RF sense T/R switch***
- ***Custom heatsink, runs cool***
- ***Works with handhelds up to 8 watts***
- ***One year MIRAGE warranty***

MIRAGE RUGGED!

35 watts, FM only . . . $69.95

B-34, $69.95. 35 watts out for 2 watts in. Like B-34-G, FM only, less preamp, mobile bracket. 3⅛x1¾x4¼ inches.

MIRAGE Dual Band 144/440 MHz Amp

BD-35
$159.95
Suggested Retail

MIRAGE RUGGED!

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*

- ***45 Watts on 2 Meters/35W on 440 MHz***
- ***Auto Band Selection*** • ***Auto T/R switch***
- ***Full Duplex Operation*** • ***5x1¾x5 inches***
- ***FREE mobile bracket*** • ***"On Air" LEDs***
- ***Single Connector for dual band radios and antennas***
- ***Reverse polarity protection***
- ***Works with all FM handhelds to 7 watts***
- ***One year MIRAGE warranty***

Add this Mirage *dual band* amp and boost your handheld to a *powerful* mobile or base -- 45 watts on 2 Meters or 35 watts on 440 MHz! **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).

6 Meter Amplifier

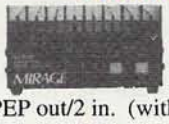
FCC Type Accepted

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

70cm Amplifiers (420-450 MHz)

D-3010-N, $365, -- 100 W out/30 in. For 5 to 45 watt *mobile/base*. **D-1010-N, $395**, 100 W out/10 in. *Dual purpose* -- for handhelds or mobile/base. **D-26-N, $269**, 60 W out/2 in, for *handhelds*.

Amateur TV Amps



Industry standard ATV amps -- **D-1010-ATVN, $414**, 82 watts PEP out / 10 in. **D-100-ATVN, $414**, 82 watts PEP out/2 in. (without sync compression).

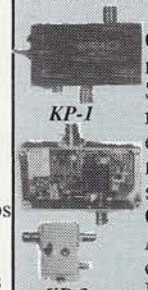
Remote Control Head for Amps

RC-1, $45, remote controls most MIRAGE amps. Power On/Off, preamp On/Off, switch for SSB/FM. 18 foot cable (longer available). 1¾x3¾x2½ inches.

Repeater Amps

11 models -- continuous duty all modeFM/SSB/CW repeater amps for 6, 2, 1 1/4 Meters, 70cm, 450 MHz ATV.

Low noise GaAsFET preamps



High gain *ultra low noise* GaAsFET preamps for receiving weak signals. Selectable gain prevents receiver intermod. 15 to 22 dB gain. Less than 0.8 dB noise figure. Automatic RF switching up to 160 Watts. **Choose** In-*Shack* model or *Mast-Mount* (includes remote control) model to reduce loss. Rugged die-cast enclosure.

Frequency (MHz)	*In Shack $139*	*Mast Mount $195*
28-30	KP-1/10M	KP-2/10M
50-54	KP-1/6M	KP-2/6M
144-148	KP-1/2M	KP-2/2M
220-225	KP-1/220	KP-2/220
430-450	KP-1/440	KP-2/440

1¼ Meter Amps (223-225 MHz)

Choose from 10 models -- 20 to 220 watts out for 2 to 50 watts in, $129 to $655.

Commercial Amps ($199 to $395)

FCC Type Accepted

Commercial amps for 150 - 174, 450-470 MHz and VHF marine bands, 70 -130 watts out.

Accurate SWR/Wattmeters

Read SWR directly andForward/ Reverse, Peak/Average power. Remote Coupler. 1.8-30, 50-200, 420-450, 1260-1300 MHz band models.

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An End...and a Beginning

All good things must end sometime, it is said. Years...centuries... millennia...magazines. But every ending is also a new beginning.

December is traditionally a month of transitions—of endings, and of new beginnings. Our planet's annual journey around the sun brings us each December to the point where the northern hemisphere sees its shortest daylight of the year; but the days immediately begin to lengthen again, and many of us push back the darkness with homes and yards ablaze with light. December ushers out the old year and welcomes the new one, and we focus on new beginnings. This December, of course, brings us not only a new year but the beginning of a year-long transition to a new century and a new millennium.

This December also brings us to the final issue of *CQ VHF* as a distinct publication. But in keeping with December's lesson that every ending is a new beginning, it will not be going away completely. Beginning in January, 2000, *CQ VHF* will be merged into its parent magazine, *CQ*, which will be expanded by 32 pages to accommodate additional VHF/UHF coverage. I will be the editor of the combined magazine.

Some Background

This decision is the result of several factors, but in order to fully understand why we decided to merge *CQ VHF* into *CQ*, it helps to understand why we decided in late 1995 to *create* a separate magazine devoted to "Ham Radio Above 50 MHz." It all started with a phenomenon that began to become evident in 1993–94. Tens of thousands of new hams had entered the hobby since the code requirement was dropped from the Technician class license in 1991. Curiously, though, there was no comparable increase in the number of hams who were joining the hobby's mainstream, by joining radio clubs and/or the ARRL, buying new radios, or, for that matter, buying ham magazines. Clearly, the ham radio "establishment" was not connecting with these new hams.

"This December also brings us to the final issue of* CQ VHF *as a distinct publication. But in keeping with December's lesson that every ending is a new beginning, it will not be going away completely."

One reason, we felt at CQ, was that the "establishment" was not reaching out to new hams, and that the mainstream organizations and magazines, our own included, were not offering activities and information that appealed to these newcomers. The perception was that the "old-timers" were closing ranks around Morse code and "the old ways," and weren't interested in new people with new ideas. We felt that a new magazine, with a new focus, and with a lot of introductory material, might reach these new hams and help bring more of them into the mainstream ham radio community.

Before we started, though, we decided to invest in a professional survey of recently licensed hams to see if what they *really* wanted matched up with what we *thought* they wanted. It didn't. What these new hams wanted, the survey clearly showed, was *not* a "new ham" magazine, but a *VHF* magazine—one that focused on the broad spectrum of activities above 50 MHz, one that said "Here's how you can have tons of ham radio fun without needing to upgrade your license," and, most importantly, one that took them seriously and respected them as hams—"real hams"—whether or not they'd passed a code exam. Thus was born *CQ VHF*.

The Times, They Are a-Changing

CQ VHF was the right magazine in the right place at the right time. It was welcomed enthusiastically, not only by new hams but also by longtime VHF enthusiasts who'd gone too long without having their activities recognized and encouraged by a national ham magazine. Of course, the other magazines responded to the presence of *CQ VHF* by increasing their coverage of VHF topics and activities. And apparently, their readers like it, because that higher level of VHF coverage continues, even after four years.

At the same time that we launched *CQ VHF*, the ham manufacturers were beginning to extend the range of HF transceivers above 30 MHz. Several rigs appeared with HF + 6 meters, and then ICOM introduced its IC-706, a mobile rig that included all-mode operation on HF, 6, and 2 meters. It was immensely popular, and remains so today. Over the four years since this radio was introduced, ICOM and Yaesu in particular have competed fiercely in this segment of the ham radio market, continually upping the ante with more bands and more power.

Today, you no longer need to buy separate radios for the different parts of the ham spectrum. These radios, and the choice of several models in several price ranges (see WB6NOA's chart in this month's "Beginner's Corner" column), gave HF operators VHF multimode capability and put the HF bands within a push-button's reach of VHFers. The line between HF and VHF has been forever blurred, if not erased.

This blending of HF and VHF—something we encourage—is also evident

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

among our own readers. If you looked in last month's issue at the results of our August survey, you may have noticed that 62% of *CQ VHF* readers have at least some HF operating privileges, and, of that group, more than two-thirds (69%) are active on *both* HF and VHF. In addition, 46% said HF operating is an important part of their overall ham operating, and that doesn't include the 23% who said they'd never operated on HF but would like to.

On top of all this, sooner or later (sooner, we hope), the FCC will announce its license restructuring decision. While we have no advance information on the details of that decision, it is clear that some of the current barriers to broad HF access will be significantly lowered. This will accelerate the trend toward a majority of hams who enjoy operating both HF and VHF, and whose choice of band is more a matter of operating preference than license restriction.

Clearly, the time for a separate VHF magazine is past. VHF has become firmly established in the mainstream of ham radio. Perhaps we're the victims of our own success, but I'd rather look at it in terms of "the revolution is over and we've won." Now it's time to move ahead toward our larger goal of creating one community of hams—all hams—without regard to where you operate or how well you copy code.

Into the Future

One unanticipated, and painful, part of this whole equation, was the untimely passing last summer of *CQ* Editor Alan Dorhoffer, K2EEK. My appointment as Alan's successor set the stage for Publisher Dick Ross's eventual decision to merge the two magazines. So...here's what happens next:

Starting next month, there will be a new *CQ*, with significantly greater VHF coverage, and with 32 more pages each month to carry this additional material. Several of *CQ VHF*'s columns and other features will be moved into *CQ*. We also hope to bring over the concept of a magazine as a two-way communication medium. *CQ VHF* has essentially been a four-year-long QSO, with its readers as active participants, both as authors and as correspondents in our monthly surveys and in our "Letters," "Reader Feedback," "Q&A," and "Op-Ed" columns. We want to bring that feeling of "magazine as conversation" to *CQ* as well.

If you are currently a *CQ VHF* subscriber, you'll receive the new *CQ* for the remainder of your subscription term (and we certainly hope you'll decide to renew when your subscription expires). If you currently subscribe to *both* magazines, your *CQ* subscription will be extended by the number of issues remaining on your *CQ VHF* subscription. Finally, your article proposals will be as welcome at *CQ* as they have been at *CQ VHF*.

I would like to personally thank each and every one of you for your enthusiastic support of *CQ VHF* over the past four years, and for telling us what we've been doing right and doing wrong. I look forward to your continued guidance as we move ahead, into a new year, a new century, a new millennium, and a new *CQ* (plus *CQ VHF*) magazine.

73 for a happy and healthy new year.

—W2VU

VHF News

CQ VHF to Merge With CQ

CQ VHF magazine will be merged into an expanded *CQ* magazine, effective with the January, 2000, issue. Factors in the decision included the fact that a majority of *CQ VHF* readers are also active on HF, according to a recent reader survey; the inclusion of one or more VHF/UHF bands in many new HF radios; and the forthcoming FCC restructuring decision that is widely expected to make broad HF privileges more easily accessible to current Technician class hams.

"The line between HF and VHF has been forever blurred, if not erased," according to Rich Moseson, W2VU, Editor of both magazines, who added, "Clearly, the time for a separate VHF magazine is past. VHF has become firmly established in the mainstream of ham radio."

Starting next month, *CQ* will be expanded by 32 pages to accommodate increased VHF coverage, including features and some columns from *CQ VHF*. Current subscribers to *CQ VHF* will have their subscriptions transferred to *CQ*, while those who subscribe to both magazines will have their *CQ* subscription terms extended by the number of issues remaining on their *CQ VHF* subscriptions. For more information, see the "Line of Sight" editorial on page 4 of this issue.

AMSAT, Arianespace, Agree on P3D Launch

It's back to the starting line for the international Phase 3D satellite. AMSAT-DL (Germany) President and Phase 3D Project Leader Dr. Karl Meinzer, DJ4ZC, said in early October that AMSAT-DL and Arianespace, which books flights for the European Space Agency, have agreed to launch P3D as a secondary payload aboard the "first suitable" Ariane 5 flight.

P3D—the biggest, most sophisticated, and most expensive amateur satellite ever built—was originally scheduled to fly aboard a qualification flight of the then-new Ariane 5 launcher back in 1997. But the first Ariane 5 flight failed on launch, and AMSAT couldn't complete the structural modifications required as a result of that crash in time for a hastily scheduled second test launch. As a result, it was "bumped" from the manifest and left in launch limbo for the past two years.

The new agreement puts the satellite back in line for launch, although Meinzer warns that the "first suitable" flight may be a while coming.

Final tests and upgrades to the satellite were completed during the "limbo" period. The now flight-ready satellite was scheduled to be transported to the European Space Agency's South American launch facility in Korou, French Guiana, by the end of October. This would make it immediately available for "integration" into any mission on which space was available.

Quartet of Ham Satellites Set for Launch

If all has gone according to plan, four new ham satellites should be in orbit by the time you read this, including two of the smallest satellites ever launched. JAWSAT, ASUSat1, OPAL, and StenSat were scheduled to be launched together aboard an Air Force rocket on October 15. All of the amateur radio payloads will operate in Mode J (also known as Mode VU), with uplinks on 2 meters and downlinks on 70 centimeters, except for OPAL, whose digital transponder will have both uplink and downlink on 70 centimeters.

JAWSAT is a joint project between the U.S. Air Force Academy and Weber State University in Utah. According to *The AMSAT Journal*, it is an integral part of a "Multi Payload Adapter" which will carry several satellites into space. Then, while still attached to the final stage of its booster rocket, each satellite will be released at separate times. The JAWSAT platform will then remain in orbit as a research and communications satellite. It will have a ham radio transponder offering both voice and high-speed digital communications.

ASUSat1 was designed and built by students at Arizona State University. At 12.9 pounds, it will be the first-ever "nano satellite" ever put into orbit. It will operate as a technology demonstrator, and will include both digital and FM voice capabilities on its amateur transponder.

OPAL is a Stanford University project, and it will not only contain its own experiments and ham transponder, but will also serve as a launch platform for "picosatellites," including StenSat, which may be the smallest satellites ever built, at 12 cubic inches and just 8.2 pounds! OPAL's ham station will provide 9600-baud packet communications on 70 centimeters only; StenSat will operate as a single-channel Mode J FM repeater. It was designed and built by a team of eight people (including three hams) in the Washington, DC, area in response to a challenge from Stanford Professor Bob Twiggs, KE6QMD, the OPAL project leader, to come up with a ham payload that would fit in the tiny space available.

SUNSAT Available for Ham Use

SO-35, South Africa's SUNSAT satellite, has been opened for amateur use. According to the *ARRL Letter*, it is operating on weekends only, with an FM voice uplink on 436.291 MHz (± 9 kHz for Doppler shift) and downlink on 145.825 MHz. Passes are about 15 minutes long, and there are from one to three passes each day over the U.S. For more information, see the AMSAT Web site at <http://www.amsat.org> and look for information on SO-35.

Palm to Leave ARRL

The man who always offered a friendly voice and a helping hand to thousands of ARRL volunteers over the past 20 years is leaving the ARRL staff. Field Services Manager Rick Palm, K1CE, said the decision was made because he and his wife, Joanne, W1GUN, wanted to move closer to her family in Florida. Palm told the *ARRL Letter* he's leaving "with nothing but good feelings and memories," and looks forward to continuing to serve the League as a volunteer.

In addition to being the main headquarters contact for ARRL Field Organization volunteers across the country, Palm has been the League's National Emergency Coordinator, heading up the Amateur Radio Emergency Service and dealing with a variety of federal and volunteer agencies with which the ARRL has official working relationships.

There's no word yet on who, if anyone, will replace Palm, who was scheduled to leave the League staff on November 10. In a headquarters reorganization earlier this year, the Field Services Department was merged with

Compiled by the CQ VHF Staff

the Educational Services Department, with Educational Services Manager Rosalie White, WA1STO, named to head the joint department. White has been the League's primary representative in ham-radio-in-space projects, such as SAREX (Space Amateur Radio EXperiment) and ARISS (Amateur Radio on the International Space Station).

FCC Creates New Enforcement Bureau

An internal reorganization of the Federal Communications Commission will result in the creation of a new Enforcement Bureau, along with a separate Public Information Bureau. The two functions are currently under the umbrella of the Compliance and Information Bureau. Amateur enforcement chief Riley Hollingsworth, K4ZDH, told the *ARRL Letter* his work on ham enforcement will not be harmed by the change. "If anything," he said, "it will enhance it," noting that his additional responsibilities for the Land Mobile Service may be reassigned as a result, giving him more time to devote to the Amateur Service.

FCC Cracks Down on Repeater Interference

Interference on VHF repeaters was a major focus of the FCC's enforcement efforts in September and October, including one case with international implications. In an October 12 letter, FCC Legal Adviser Riley Hollingsworth, K4ZDH, alleged that Angos Winke, KC6OKA, of Los Angeles, was misidentifying his 2-meter repeater as K6PYP, and that Winke, as owner and control operator, was causing deliberate interference to a repeater system in Mexico.

"The United States and Mexico work closely together in radio communications matters and have enjoyed a long and effective relationship," Hollingsworth wrote. "We will not tolerate that relationship being jeopardized and we will not tolerate deliberate interference from Amateur licensees." Winke was asked to respond within 30 days and to answer 12 very specific questions about his system's operation.

In another action related to repeater interference, the FCC modified the license of Danny Kenwood, WA6CNQ, of San Francisco, to prohibit operation above 30 MHz for 90 days. Kenwood had been cited for allegedly transmitting profanity and obscenity, interfering with the K7IJ repeater and failing to properly identify. In seven other cases in widely scattered locations, the Commission issued warning notices that threatened formal enforcement actions if alleged interference continued.

Finally on the repeater front, Hollingsworth asked Glenn Wood, WB2MAZ, of Clifton, New Jersey, to explain why his 6-meter repeater was identifying as W2JEZ when that callsign had been deleted from the FCC's database in June, 1996.

Multiple Club Callsigns, Pirate Station Get the Ax

In other FCC enforcement actions, several people who held multiple club callsigns found most or all of them canceled after providing insufficient evidence to the Commission that there were legitimate clubs behind the callsigns. Three people who had been ordered to appear for retests—but didn't—had their licenses canceled, but one was then given a 60-day extension after explaining why he hadn't been able to schedule an exam. Another ham who'd previously had his license canceled for failure to show up for a retest was reinstated for a one-year term after talking with Hollingsworth; and one other ham, who did show up for the retest but didn't do too well, had his license modified from Extra class to Technician Plus.

Finally, the FCC said a ham in Texas, Leland Bahr, WØVT, who'd been cited in April for operating a pirate FM station on 95.3 MHz, had surrendered an exciter and amplifier, both "nice commercial-quality units," to Commission personnel during an inspection.

ARRL Opposes Video Service on 2.4 GHz

The ARRL has filed in opposition to an FCC petition filed by Los Angeles County, California, to establish a public safety video system on 2.4 GHz. The League said the proposed frequencies could potentially interfere with amateur terrestrial and satellite communications, and it called on the FCC to authorize only one 10-MHz-wide video channel for a single helicopter-mounted transmitter, for the purpose of conducting interference studies.

FCC Gettysburg Office Gets New Antenna

So you're the FCC and you need to have an antenna installed...who do you call? The Army Corps of Engineers, of course! In October, the Corps was installing an all-band delta loop antenna at 75 feet at the Commission's licensing office in Gettysburg, Pennsylvania. "The system will be used for several purposes," said chief amateur enforcer Riley Hollingsworth, K4ZDH, whose office is in the Gettysburg facility, "one of which is to assist in real-time monitoring of the Amateur Radio Service and as a 'force multiplier' for the High Frequency Direction Finding Center in Laurel, Maryland."

Guess whose desk the radio connected to that antenna is likely to be sitting on?

A Transceiver the Size of Two Postage Stamps?

Texas Instruments has introduced the first chipset combining RF data transmission and a microcontroller unit—the TRF6900/MSP430—that it says will enable the design of complete systems as small as two postage stamps.

The TRF6900 is a single-chip transceiver that will operate between 850 and 950 MHz and will support several modes, including FM and FSK (frequency-shift keying, or RTTY) at data speeds of up to 200 kilobits per second. The MSP430 is a 16-bit, RISC (reduced instruction set computing) microcontroller.

TI anticipates the tiny transceivers will find a variety of uses in such areas as utility monitoring, security systems, consumer electronics, and wireless data transmission. Hams should take note of the frequency range, which includes the 902- to 928-MHz ham band, and the cost of these chipsets: $7.95 each in lots of 10,000. No pricing was given for smaller orders.

Give a Hoot!

Finally, hams in the central U.S. who can receive signals on 172 MHz are again being asked to help wildlife researchers track the migration of endangered burrowing owls. Scientists think the owls fly to southern Texas and northern Mexico from their summer ranges in Saskatchewan and Alberta, but they're hard to track and accurate data is difficult to gather, according to ARRL Amateur Radio Direction Finding Coordinator Joe Moell, KØOV. Some owls have been tagged with 172-MHz transmitters, and hams with direction-finding gear are being recruited for the second year to help track them. For more information, check out KØOV's burrowing owl page on the World Wide Web at <http://members.aol.com/homingin. ■

CQ VHF Ham Radio Above 50 MHz

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Letters

Your Spot to Speak Out

Dear *CQ VHF*:

I have been a radio ham since 1969 and have been a Technician for all those good years. I have enjoyed the time as a ham. I still enjoy doing Hamfests, Field Day, parades, and Christmas in April activities, foxhunts, antenna work, etc.

In all those years, I have only wished once that I could copy code. I assisted in providing radio communications in Monticello, Indiana, in 1974 after tornadoes tore up much of the state and, in particular, White County. I worked the emergency station that was set up at the Sheriff's building. And I was only a Tech, handling Health and Welfare traffic. Several times I had to get someone to copy those who insisted on using CW on the SSB net. I would have been more efficient if I had known more code.

I read with much interest the article in the February issue about Tech Plus hams and the FCC saying we are only interested in VHF and FM. For the record, I have been an active member of the Navy Marine Corps MARS since December 23, 1976, and have served several staff office positions in that time. In all that time, about 99.45% of my activity in Navy MARS has been on HF frequencies. Yes, there has been some VHF-FM activity. And no CW on MARS. And all that time, I was just a Tech.

For the past eight years, I have been treasurer of the Porter County Amateur Radio Club and served one year as President before that. Our club has had a repeater on the air for most of its 20-odd years. For most of that time, I could care less if it was even working since I seldom used the repeater. I have helped maintain it over the years, including climbing the tower (200 feet) to replace coax, antennas, etc., however, it is the club's equipment.

My argument about the proposed new guidelines is simple. Have an entry code test for all. This would satisfy the International agreement that code be some part of the entrance test. Then, those that enjoy code would be free to increase their speed and proficiency as they wish. Just don't force it on the rest of us.

An example of my argument: a state driver's license does not specify what vehicle you can drive after the initial driving test unless you want to handle the big 18-wheelers. Even then, that license is not just for Peterbuilt rigs, is it? You drive whatever you want and wherever you want—you are licensed. After you get your amateur license, if you want to continue with code, packet, TV, satellites, etc. then GO FOR IT.

I'm not so sure that I would use many of the HF amateur frequencies even if I had the right. So many times, I have heard the most ridiculous things said and done on HF that I am ashamed to be a part of the fraternity. When I hear someone tune up and ask if the frequency is in use, then someone comes on and says he's "holding the frequency for a net" *an hour from now*. I get disgusted. There is much more I could relate, but not for now.

Thanks for the editorial.

Levi B. Mayes,
WB9CAO/NNNØAKT
Chesterton, Indiana

Dear *CQ VHF*:

What a disappointment it was to hear of the last shuttle flight using amateur radio (October issue). Amateur radio is a way of life for most of us and we like the challenges it brings. As a satellite operator from northern Canada, it was great to talk with the astronauts in space. I enjoy talking on the frequencies using the satellites. This article was informative and really an eye opener to what amateur radio can accomplish and has accomplished. Thanks again for a great article.

Neil Sutherland, VE8CQ
Via e-mail

Neil—Glad you liked the article. Be sure to check out the follow-up from Bill Tynan, W3XO, in this month's "Orbital Elements" column.

Dear *CQ VHF*:

I have really enjoyed some of the info that you guys give on 6-meter operations, and I particularly liked the August '99 issue with the article on simplex operations. I wish more hams would come back to it in my area instead of wearing out the repeaters. Good job!

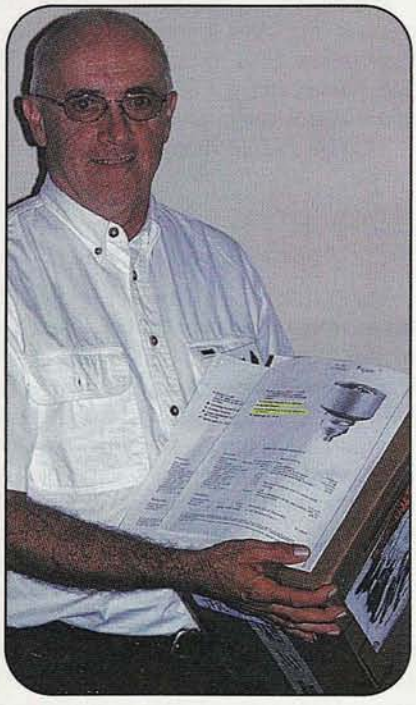
Nathaniel Johnson, KC5GGN
Via e-mail

Picture This!

"Phun Photos"

A Pizza the Action

The DX on 6 meters must've been really hot during last summer's Lighthouse/Lightship Activity Weekend. The Peconic Amateur Radio Club on Long Island, New York, operated a special event station at the Horton Point Lighthouse in Southold, New York. According to Warren Melhado, KG2BI, who took this photo, an unidentified *CQ VHF* contributing editor was operating both 6 meters (the station seen here) and 2 meters, from a setup in his car. Just as lunch arrived, he "moved" a contact from six to two. Rather than lose the contact, he plopped the pizza on top of the 6-meter rig to keep it warm while he ran to the car for the contact on two. This is not recommended for rigs that are still under warranty! QSL, and hold the anchovies. (KG2BI Photo)



Tu-be or Not Tu-be?

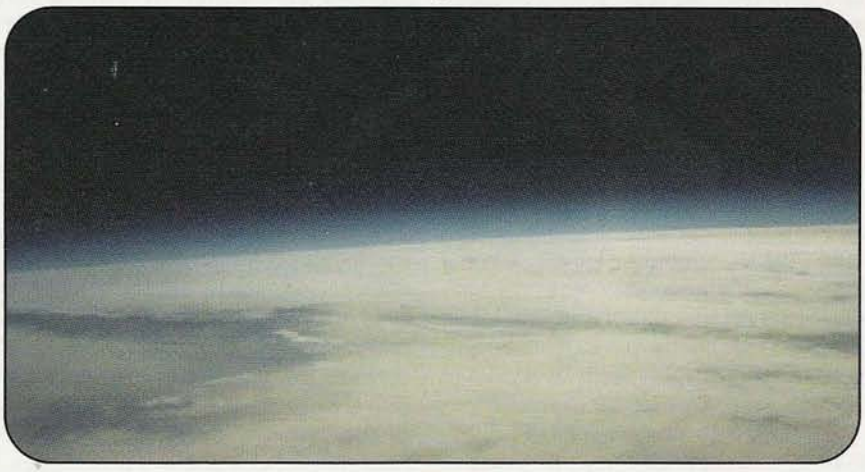
Stan Hilinski, KA1ZE, poses with his new Thompson TH-347 tetrode. Stan won the big tube, valued at around $4,000, as a banquet prize at the Eastern VHF-UHF Conference last summer in Connecticut. The tube will produce 4.5 kilowatts up to 1000 MHz, and slightly less power up at 1296 MHz. Already a potent VHF/UHF signal from New England, Stan says he'll use the new tube in an amplifier for either 1296 or 432 MHz. (W2VU Photo)

Webserver on a Chip

Believe it or not, the tiny circuit board that Steve Bible, N7HPR, is holding in his hand is a complete Webserver. Steve showed this off at the 1999 ARRL/TAPR Digital Communications Conference in Phoenix this fall, along with a bunch of other tiny projects he's working on. Steve says a board like this could be installed inside a radio and connected to the Internet with an Ethernet connection. This would let you remotely access and control the radio via the Internet, something that could open up new windows of opportunity for people living in antenna-restricted neighborhoods. (W2VU Photo)

How's the Weather Down There?

A view of Earth from the edge of space, taken at 83,500 feet on a ham radio balloon flight. This shot, from way above the weather, was taken last February 6 on Flight 99A of the Kansas Near Space Project. *CQ VHF* was one of several sponsors of the balloon launch. (Photo courtesy KNSP)



Product Update

Triband HT Antenna

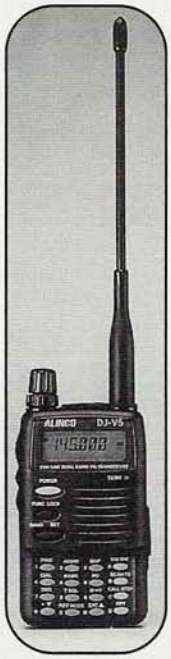
NCG Company has developed an upgrade antenna for the popular Yaesu VX-5R and ICOM IC-T8A multiband handheld radios. Marketed under the new "NATCOMM" brand, the MH-510 produces an excellent signal on 6 and 2 meters and 70 centimeters. Electrically, it is a top-loaded 1/4-wave on 6 meters, a 1/4-wave on 2 meters, and a 5/8-wave on 70 centimeters. It comes with an SMA connector, eliminating the need for an SMA-BNC adaptor.

The MH-510 is 20.75 inches long, providing a improved signal on all three bands when compared with the stock antennas. Most dealers now have the MH-510 in stock. List price is $37.95.

For more information, contact Mick Stwertnik, at (714) 630-4541; send an e-mail to <micks@cometantenna.com>; or contact NCG directly at 1275 North Grove St., Anaheim, CA 92806; Fax: (714) 630-7024.

Circle 100 on reader service card.

New DJ-V5T VHF/UHF HT



Alinco USA has introduced the DJ-V5T, a compact HT designed to operate on the 2-meter and 70-centimeter bands. It features an alphanumeric display, 5 watts power output, 200 memories, an expanded receive capability offering coverage from 76~999.995 MHz (cellular blocked), narrow and wide FM receive modes and CTCSS encode and decode.

Other features include four scan modes, five programmable scan banks, automatic, internal temperature protection, cable cloning, SMA antenna connector, 13.8-VDC direct input, four European tone bursts, autodial memories, input voltage display with overvoltage warning, and MARS/CAP capability.

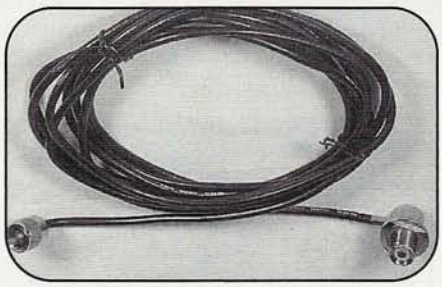
The DJ-V5T's suggested retail price is $349.95; "street prices" may be lower.

For more information, contact your favorite dealer or Alinco directly at 438 Amapola Ave., Ste. 130, Torrance, CA 90501; Phone: (310) 618-8616; Fax: (310) 618-8616.

Circle 101 on reader service card.

Hard-mount Coaxial Line

MFJ now offers hard-mount coaxial line with connectors for installing permanent mobile operation VHF/UHF systems. The line is comprised of top-quality PL-259 connectors with 17 feet of tough RG-58A/U coaxial cable.



Order the MFJ-341S for a SO-239 connector or the MFJ-341M for an NMO connector; both are $19.95.

For your nearest dealer or to order, call toll-free (800) 647-1800, or contact MFJ Enterprises, P.O. Box 494, Mississippi State, MS 39762; Phone: (601) 323-5869; Fax: (601) 323-6551; Web: <http://www.mfjenterprises.com>.

Circle 102 on reader service card.

FT-90R Travel Case and Power Supply

PowerPort TransPorter™, the latest carrying case design by Cutting Edge Enterprises, is specially designed to carry and operate your Yaesu FT-90R mini-mobile transceiver as a stand-alone unit in the field. The case is sturdy and weather resistant, made of laminated, heavy-duty black nylon with 1/4-inch foam padding and a comfortable carrying strap. The radio fits neatly into the case next to the 9-Ah rechargeable powercell that comes standard with the TransPorter. The fully automatic charger gives worry-free recharging via AC, DC, or with the optional roll-up solar cell recharger. Removable accessory pockets on the sides of the case are great for holding your microphone, charger, and accessories.

For more information, pricing, or distributor inquiries, contact Cutting Edge Enterprises, 1803 Mission St., Ste. PMB-546, Santa Cruz, CA 95060; Phone: (800) 206-0115; E-mail: <cee@cruzio.com>.

Circle 103 on reader service card.

Power Bridge Rectifier with "MOV" Protection

The CT300 series of power bridge rectifiers from CKE is available with ratings of 400 to 1200 volts at 300 amps in 55° C ambient temperature and 400 amps with forced air. They offer a high surge rating of 3000 amps. The units are used primarily in motor drive systems and radio transmitters and are uniquely MOV (Metal Oxide Varistor) compensated for overvoltage stress reduction. The design can be customized to provide higher and lower voltages, forward currents, surge currents, and other configurations and parameters. The CT300K3AA100 (300 amps, 1000 volts VRRM) is available in quantities of 10 for $485 each with delivery from stock to 3 weeks.

For additional information contact CKE, P.O. Box 211, Lucernemines, PA 15754; Phone: (724) 479-3533; Fax: (724) 479-3537; E-mail: <info@cke.com>, Web: <www.cke.com>.

Circle 104 on reader service card.

Vishay Intertechnology Releases Dual-MOSMICs

Three new Vishay Telefunken Dual-MOSMICs (MOS monolithic integrated

circuits) are the industry's first monolithic transistor devices to combine two automatic gain controlled (AGC) amplifiers on a single chip. The Dual-MOSMICs will serve as low-noise input stages for UHF and VHF tuners, allowing designers to combine two bands on a single device, eliminating the need for separate transistors to handle VHF and UHF bandwidths.

They offer designers a choice of typical transadmittance specifications: 24 mS for the TSDF52424, 30 mS for the TSDF53030, and 40 mS for the TSDF54040. All three of these high-gain devices feature integrated gate protection diodes and resistors and an on-chip biasing network, eliminating the need for a number of external passive components. AGC range is a high 45 dB at 800 MHz for the TSDF54040, TSDF53030, and TSDF52424, while all three devices feature a low noise figure up to 800 MHz. Combining a high level of integration with surface-mount packaging in a 6-pin SOT 363 with a footprint measuring just 2.05 mm x 2.00 mm with a 1.00 mm height profile, the new Dual-MOSMICs will enable a new generation of miniaturized TV tuners for home entertainment, VCR, satellite, set-top box, and multimedia applications.

For more information, visit the Vishay Intertechnology Web site at <http://www.vishay.com>.

Circle 105 on reader service card.

Svetlana Y644 Tetrode

The Svetlana Y644 tetrode is a version of the venerable 4CX250B. It is identical mechanically, but is substantially different electrically to meet the needs of the British Defense Ministry for its Cossor CGR1020 VHF/UHF ground/air communications system. The Svetlana tube is now being used extensively by the British MoD and is exactly plug-compatible with the Y644 manufactured in the U.S. The Y644 is available from Svetlana distributors throughout the world.

For more information, contact Svetlana Headquarters, 8200 South Memorial Parkway, Huntsville, AL 35802; Phone: (256) 882-1344; Fax: (256) 880-8077; Marketing & Engineering, 300 Alpine Rd., Portola Valley, CA 94028; Phone: (650) 233-0429; Fax: (650) 233-0439; E-mail: <info@svetlana.com>; Web: <www.svetlana.com>.

Circle 106 on reader service card.

"Exploring RF Circuits," by Joseph J. Carr

This book will teach you about the basics of RF construction and RF circuit design and will help you gain an understanding of radio frequency circuits. Chapters cover varactor diodes, direct conversion receivers, RF signal generator circuits, RF grounding, RF bridges, radio transmission lines, microwave integrated circuits, and more. With a practical approach, Carr presents up-to-date information and "user tested" projects that can be used by the hobbyist, student, or technician. Prompt Publications, a Division of Howard W. Sams; 256 pages, $34.95.

For more information, contact Customer Service at (800) 428-SAMS; E-mail: <rwhite@hwsams.com>

Sneak Peek: Kenwood's Mystery Rig

If you liked Kenwood's TH-D7A, check out this new APRS-ready mobile dual-bander...whatever they decide to call it!

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

It was the hit of the show at the 1999 ARRL/TAPR Digital Communications Conference (DCC) in Phoenix at the end of September—Kenwood's next step in designing radios with a built-in TNC for packet plus pre-installed software for APRS, the Automatic Position Reporting System. Conference attendees got a demonstration of its capabilities from APRS author Bob Bruninga, WB4APR (Photo A), and we got a rundown of what the rig will do from Kenwood Amateur Sales Manager Paul Middleton, KD6NUH, who said he hopes the new rig will be available by the end of December.

Built on the chassis of the popular Kenwood TM-V7A, the new rig (Photo B) is a dual-band mobile with up to 50 watts out on 2 meters and 35 watts out on 70 centimeters, and wideband receive from 118 MHz to 1.2 GHz (repeat after me...*minus cellular, of course*). It operates FM voice and 1200/9600-baud packet out of the box, using the same built-in TNC that's in Kenwood's TH-D7A APRS handheld. The multifunction LCD display also serves as a screen for directly reading received packet data (Photo C)—no computer needed! In fact, for packet operations that don't require a lot of typing, such as sending brief APRS or DX Cluster messages, you'll be able to key in text directly from a new microphone that will include letter keys as well as number keys (the mic shown in Photo D is *not* the one that will come with this radio).

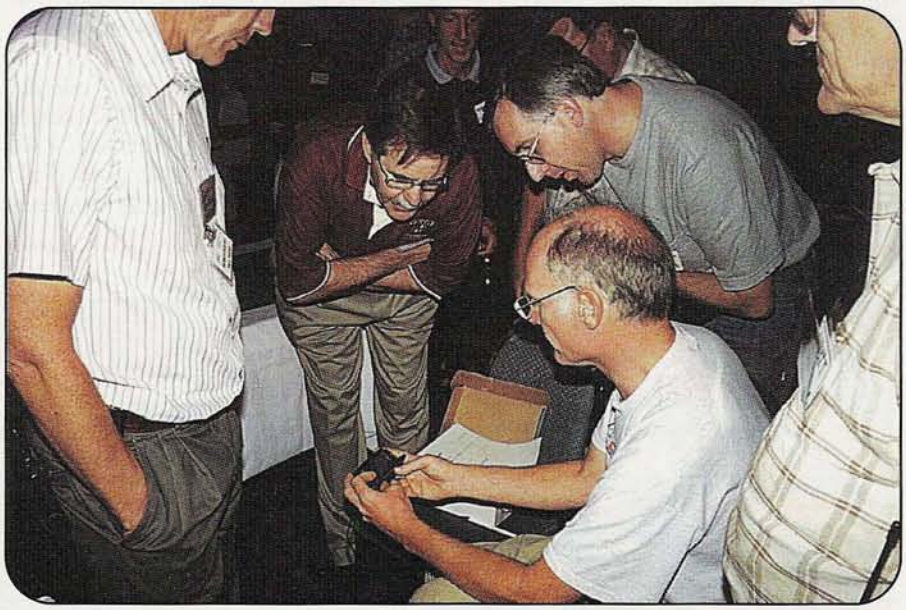


Photo A. A crowd gathers around APRS "guru" Bob Bruninga, WB4APR, as he demonstrates Kenwood's new APRS-ready dual-band mobile rig at the ARRL/TAPR Digital Communications Conference in Phoenix. (W2VU photos)

Photo B. It has no name yet, but Kenwood's new FM/packet mobile rig comes with a built-in 1200/9600-baud TNC, and puts out 50 watts on 2 meters and 35 watts on 70 centimeters.

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

Photo C. The multifunction LCD screen also serves as a terminal unit for displaying received packet data. In addition, it will display a list (seen here) of the last 40 stations heard.

Speaking of Photo D, you can see there that this rig has three basic components: a microphone, a remote-*only* control head (remote cable kit is included standard) with an adhesive-backed stand for dashboard mounting, and the main transceiver unit. Note that it has an RS-232 computer port, making this the only FM ham rig on the market with a built-in RS-232 connector. It's also Kenwood's first radio to include digital PL (DPL) capabilities. Note also that the mic plugs into the radio body only; there is no provision for plugging the mic (or an external speaker) into the control head.

Unlike the tiny screen on the handheld TH-D7A, this screen is wide enough to let you see the full details of an APRS message on a single screen (with a few button-pushes); it includes "position memory," which allows you to manually input the coordinates of up to five fixed locations (such as your home), without needing a GPS (Global Positioning System) receiver on hand. The rig also has transmit message memory, which lets you input and store "canned" transmit messages; and it will list the last 40 stations heard (Photo C shows the list function in operation).

Photo D. The control head of this radio cannot be attached to the body, and a remoting kit is standard, as is an adhesive-backed clip that can mount the head to your car's dashboard or wherever else you'd like to put it. Note that the mic plugs into the radio body, not the control head.

"Note that it has an RS-232 computer port, making this the only FM ham rig on the market with a built-in RS-232 connector."

When we saw this radio in late September, it did not yet have a model number or a list price. So, if you're interested, watch for Kenwood's ads—perhaps even in this issue (the ads come in later than the editorial copy)—for a model number, then contact your favorite Kenwood dealer for details on price and availability. ■

Results of the 1999 CQ VHF National Foxhunting Weekend

Whether you call it foxhunting, bunny-chasing, T-hunting, radio-orienteering, or ARDF, there was plenty of it during the third weekend of April. Here's our wrap-up...

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

What ham radio activity combines technology, education, mystery, suspense, intrigue, camaraderie, and excitement? Sometimes there's even good physical exercise as a bonus. I can think of only one: hidden transmitter hunting. There was more of it than ever during the second *CQ VHF* National Foxhunting Weekend (NFW-99). From coast to coast, participants drove along highways, tromped through parks, and puzzled over their radio direction finding (RDF) bearings.

This year, it was more than a national weekend of foxhunting, it was international. Besides receiving a report on a fine radio-orienteering event in Montreal from Jacques Brodeur, VE2EMM, I learned from Peter Fraser, VK3ZPF, that the Wireless Institute of Australia's chapter in Melbourne held its April hunt in honor of CQ VHF's NFW. Melbourne's Friday hunts are always well-planned mobile-plus-sniff events (more on this later) with many transmitters, often on more than one ham band.

The compilation of NFW-99 reports is in the Table. This year, I posted a form on my Web site with a dozen questions designed to get uniform data from all clubs. Most answered all the questions, but a few reporters sent only narratives or links to their own write-ups on Web sites, leaving out some details. That explains the question marks in a few places.

Photo A. Winners of the Valdosta ARC foxhunt stand behind the transmitter (yes, it's in the sign!). They are John Waldron, KF4GSY; Dan Muntz, KF4AJQ; and John Young, W7OPT. (Photo by Steve Adams, KF4NAT)

On the Road with RDF

Vehicular T-hunts with on-foot "sniffing" at the end were most popular again this year. For best success in these hunts, it takes both mobile-mounted bearing-taking gear plus on-foot RDF capability. About half of these hunts were won by individuals and the rest by two-ham teams. The more gear in and on the car (rotating beam, computer, GPS, and so forth), the more important the second person.

Charles Scharlau, NZØI, writes,

For the second year in a row, Joe Moell chose a beautiful weekend in the Pacific Northwest for National Foxhunting Weekend. It was warm and sunny, a perfect day for a stroll in the woods. Our hunt featured an on-foot segment within the boundaries of Battle Point Park on Bainbridge Island, and a drive-to segment that had the fox transmitter located about 3.5 miles from the starting point. Ten participants and one observer attended. Five were first-time foxhunters. Going at their own pace, all ultimately found all the foxes that they hunted.

Clay Melhorn, N9IO, in Illinois also acclaimed the weather. "After three days of continuous rain, we got a great gift when that Saturday was dry as a bone. It was a beautiful day for a foxhunt, and everyone had a great time. All went out for pizza afterward."

Mid-April is often rainy in Ohio. That's why the Dayton Hamvention was moved to later in the spring, right? So it was no surprise when Ernie Howard, W8EH, of the Dial Radio Club wrote: "We knew the hunt was in trouble when the rain started. Since we are fair weather hunters, the on-foot portion of the hunt was canceled.

W8EH continued,

Bob Frey, WA6EZV, of Cincinnati preselected what he thought was a good spot to hide. Little did he know, he chose the best RF hole in the Miami Valley. Only one team was able to hear the signal at the start. Bob chose to relocate, but the area he was in didn't have any other good public places to hide, as he was out in the country. Once he gained some elevation, we started to hunt him.

After we got closer, we noticed the signal plots were always moving north. Team One

**Joe Moell, KØOV, has been tracking hidden transmitters and writing about it for almost 25 years. He serves as ARDF Coordinator for both ARRL (USA) and IARU Region 2 (North and South America) and is co-author of the book* Transmitter Hunting—Radio Direction Finding Simplified *(TAB/McGraw-Hill #2701). For more foxhunting information, see Joe's Web site at <http://www.homingin.com>.*

spotted what they thought was the fox vehicle driving 3/4 mile ahead on a long straight road. Speeds increased and, sure enough, the fox was moving. Bob made a couple of quick turns, but was caught by Team One. Team Two was right behind and Team Three showed up a few minutes later. One of the kids who rode along on Team Three commented, 'This is a lot like playing tag, only with cars.'

If One Is Good...

With the attitude that transmitter hunting is more fun the longer you do it, more groups are enjoying multiple-fox events. One half of this year's reported hunts had more than one fox to find, either at the same time or in a series (for example, finding one fox reveals the frequency of the next one). The Silver Creek ARA hunt in Ohio had a two-transmitter series event, with the foxes on adjacent channels to add to the challenge. "We had a husband and wife in separate cars who were having a competition of their own to see who was the better hunter," wrote Del LaBo, N8OFP, of SCARA. "As it turned out, Carol Miller, N8SIN, had lower mileage than her husband Gary, N8OGK."

At five NFW-99 events, there were six or more foxes in locations carefully selected in advance. As an alternative, some clubs have done "progressive" or "leapfrog" hunts, where the first person to find the first fox takes it and re-hides it somewhere else. First to arrive at the second fox location hides it a third time, and so forth.

Deception and suspense added spice to several NFW hunts. The most elaborate technical trickery was reported by Steve Adams, KF4NAT, of the Valdosta ARC. The club had a full day of foxhunting, starting with KA2TED's coffee and donuts before the warm-up hunt at 9 a.m. There were plenty of lessons learned on that one, which lasted almost until lunch time. It would seem that an ammunition box chained to a handicapped parking sign would be easy to find, but lots of signal reflections (multipath) confused the hunters.

After lunch, the main VARC event began, with a four-hour time limit. Boundaries included all of Lowndes County, over 500 square miles. "The instructions were to read the black lettering when you find the fox," KF4NAT wrote. "But what were they looking for?"

KF4NAT's second fox was disguised as a FOR SALE sign, with the words "Call Steve 146-7600" at the bottom in large black letters (Photo A). The hunters, weary from a long day, had to think twice to realize that this was a frequency, not a phone number. "Inside the sign was a single-element commercial dual-band quad-driven element," Steve explained (Photo B). "The HT was attached to the smaller UHF loop and operated at 2 watts. The sign was one wavelength in front of an aluminum-sided marine service store, in hopes that the building would interact with the antenna."

At about the three-hour mark, the first team came within 100 yards of the fox, but another half hour would go by before it was identified. KF4NAT continued, "Knowing the hider's evil hunts of the past, everyone investigated every boat on the property. There were 30 or so, each with radios and antennas on them. The last 50 feet was the hardest. The signal was strong in front of the building, but where could that crazy fox be?"

Most clubs scored their NFW-99 mobile hunts by time. The first to find the transmitter was the winner (Photo C). That's good practice for tracking jammers and responding to aircraft rescue beacons, but some say that it encourages reckless driving. Long-time hunters in several places, including southern California and the Hudson Valley of New Jersey, prefer mileage scoring. Lowest elapsed miles wins. This encourages careful RDF work and safety. Of course everyone must start from the same location on a mileage-scored hunt, and some sort of odometer calibration scheme is desirable.

Speaking of aircraft beacons, the NFW-99 hunt in Berkeley Township, New Jersey, was unique because it wasn't on the ham bands. Paul Rollman, KB2RUZ, of the local Civil Air Patrol used Emergency Locator Transmitters (ELTs) on an official practice frequency. "I am hoping to get the cadets interested in foxhunting," he wrote. "The ELTs were set were set out unattended in wooded areas approximately a quarter mile apart. The cadets used L-Tronics L-Pers and RadioShack Jetstream radios to locate them. I would like to hold such foxhunts at least quarterly." In keeping with the need for cooperation among hunters on such searches, no winning individual or team was declared.

Ready to Take on the World

On-foot foxhunting (also called radio-orienteering and ARDF) was more prominent this year, as hams around the U.S. prepared for the IARU (Internation-al Amateur Radio Union) Region 2 ARDF Championships in August. Three NFW-99 hunts were based on standard IARU rules for multi-nation events. Charlie Shelden, KC5NBH, reported on such a hunt at the Oklahoma City fairgrounds, a one-square mile area. He estimated that each hunter walked about two and a half miles, looking for four foxes. The winner, Bill Badon, KK5XC, took slightly over two hours to find them all.

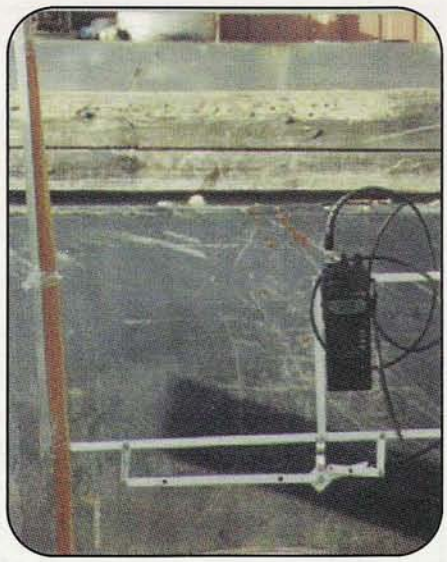


Photo B. Tucked behind the "For Sale" sign was this dual-band quad driven-element antenna. (Photo by Steve Adams, KF4NAT)

Photo C. Trophies awaited best scorers in the Xerox ARC NFW-99 foxhunt. (Photo by Jon Dickason, N2JAC)

Table.

S/P	Reporter	Club(s)	Date	Start city	Freq(s)	Type	#	Scoring	Hider(s)	Winner(s)
AL	KC4QUE	Montgomery ARC	17-Apr	Montgomery	?	Mobile w/sniff	1	Time	KS4UO	K1AZE/KA1BYP
AR	KD5GDA	North Arkansas ARA	3-Apr	Harrison	?	Mobile	1	Time	KD5GDA	KC5JGV
CA	KQ6XA	USA Radio-O Group	17-Apr	Foster City	146.565	ROCA	7	Time	KQ6XA	KD6DX
CA	KØOV	Fullerton RC	8-May	Placentia	146.565	IARU	6	#/Time	KØOV	KE6DKF
CA	KØOV	Fullerton RC	17-Apr	Fullerton	146.565	Mobile w/sniff	1	Mileage	N6AIN/N6EKS	N6XFC/N6MJN
GA	KF4NAT	Valdosta ARC	17-Apr	Valdosta	?	Mobile w/sniff	2	Time	KF4NAT	KF4AJQ, KF4GSY
IL	N9IO	Kankakee Area RS	17-Apr	Kankakee	146.340	Mobile	1	Time	N9IO/N9IOQ/ W9IOU	WB9STR
IN	NI9Y	Michiana ARC	24-Apr	South Bend	144.930	Mobile w/sniff	1	Time	WD9BMR	N9TJC
LA	N5LWG	Piney Hills ARC	17-Apr	Ruston	146.565					
					146.615	Mobilew/sniff	6	Time	N5LWG	KB5TJN
MO	N7LRI	Suburban RC	18-Apr	Fenton	146.565	?	1	Time	W4MWX	WA5VJF/KBØMWG
NC	W4KMA	Stanly County ARC	17-Apr	Albemarle	146.565	Mobilew/sniff	1	Time	KD4OZI, KF4NJF	W4KMA/N4KVP
ND	NØDGW	Forx ARC	18-Apr	Grand Forks	146.550	Mobilew/sniff	1	Time	KBØYRK/ KCØCRU	KAØCAF/KAØHDN
NJ	KB2RUZ	Civil Air Patrol	17-Apr	Berkley Township	121.775	Mobilew/sniff	2	None	KB2RUZ	None
NY	W2KI	Hudson Valley DFA	17-Apr	Newburgh	?	Mobilew/sniff	6	Mileage	N2KI	N2JTI/N2LKV
NY	N2JAC	Xerox ARC	25-Apr	Fairport	146.565	Mobilew/sniff	1	Time	N2JAC	K2AS
OH	N8OFP	Silver Creek ARA	17-Apr	Wadsworth	146.525					
					146.51	Mobile	2	Mileage	KC8DKF, N8OFP	KI8BS
OH	N8NBC	LCARA & WRECS	18-Apr	Kirtland	147.455	Foot	1	Time	KC8EVR's son	KC8EVR
OH	W8EH	Dial Radio Club	17-Apr	Middletown	?	Moving T	2	Mileage	WA6EZV	W8EH/KC8ECK/N8PFV
OH	N8DRD	Buckeye TH Assn	1-May	Sandusky	146.565	Mobile w/sniff	1	Time	KA8CAS	N8DRD/KA8IAE, K8KHH
OK	KC5NBH	Better OK Radio Group	17-Apr	Oklahoma City	147.470	IARU	4	#/Time	KB5ZWQ	KK5XC
QC	VE2EMM	Union Des Sans-Filistes	25-Apr	Montreal	146.565	IARU	3	#/Time	VE2EMM	VE2HLD & non-hams
VC	VK3ZPF	WIA of Melbourne	16-Apr	Melbourne	144.25					
					145.30	Mobile w/sniff	6	Time	VK3OW	VK3VR/VK3JMD
WA	NZØI	North Kitsap & Burley ARCs	17-Apr	Bainbridge Island	146.565					
					146.50	Mobile w/sniff	3	None	NZØI, KB7BLM	All!

Table. Tabulation of all NFW-99 hunt reports received by the author, listed alphabetically by states and provinces. The # column indicates number of transmitters to be found. Question marks indicate that information was not provided by the reporter.

Photo D. The traditional National Foxhunting Weekend cake by April Moell, WA6OPS, was part of the refreshments at "Antennas in the Park" in Placentia, California. (KØFO Photo)

The hunt I put on at "Antennas in the Park" (AITP), a mini-hamfest and potluck in Placentia, California, followed most IARU rules. However, the transmission sequence was speeded up to aid new hunters and the park was only 60 acres (Photo D). There was a good mix of beginners and experienced radio-orienteers among the 23 participants. Most went out alone, but there were two groups of four that had their own rivalry and came in within seconds of each other. Also, a couple of hunters took family members along. Such teaming is not permitted in formal events, but was allowed here because it is an excellent way to teach the sport.

Rick Barrett, KE6DKF, blazed through the AITP course to find all six foxes in under 49 minutes. All but two competitors found all six foxes. The longest time was an hour and 55 minutes.

The most elaborate on-foot event was concocted by Bonnie Crystal, KQ6XA (Photo E). She put out seven transmitters in a one-square-mile section of Sea Cloud Park in Foster City, California. Each of them briefly transmitted unique sounds on the same frequency. Hunters had 90 minutes to find as many as they could. Within six feet of each transmitter was a "control mark" (tag) with a unique number, which competitors were to write onto the "control log" they carried. To add to the intrigue and encourage hunters to do careful RDF, there was at least one dummy control mark in the vicinity of each fox. Each correct control mark in the log earned the competitor a point. Each incorrect one was minus one point.

"Not one person found every transmitter in the 90-minute time limit," Bonnie wrote. "Jim Sakane, KD6DX, found six and got within 10 feet of the seventh before heading back to the finish line to take first place in 86 minutes. That's an amazing 12.2 minutes per transmitter!"

KD6DX added, "We all had a pleasant surprise when Jiao, BD1AYL, visiting from China, and her cousin, Elaine Levitt, KE6EGP, came to foxhunt with us. Jiao showed us some photos of the transmitter hunts she coordinates back in China. She said that about 700 hunters participate in these Chinese transmitter hunts."

ARDF events with large numbers of hidden transmitters and control marks like this were first proposed a few years ago by Chinese hams. They call it the Technical Session, because the outcome is more dependent on RDF skill than on running prowess, as compared to traditional IARU-rules on-foot foxhunting. KQ6XA prefers to call it Radio Orienteering in a Compact Area (ROCA). This was the third Bay Area ROCA she put together in a one-year period. Other ROCAs this year include ones by WB4SUV, WA6EZV, and KC8FQY at the 1999 Dayton Hamvention and by the author at the 1999 ARRL Southwestern Division Convention.

Interested?

Have all these reports convinced you to try foxhunting fun in your hometown? I've posted some suggestions for transmitters and controllers at my Web site to help you have a safe and successful hunt.

For instance, when you try your own chase, use care when you hide unattended foxes. In his report from the Buckeye Transmitter Hunters, Doug Davis, N8DRD, wrote,

> The fox and controller were in a black metal box about half the size of a tackle box. Erv Remaley, KA8CAS, had placed it on the ground with a magnetic-mount omni-antenna on the side of a dumpster. When we arrived, we found that we had been beaten to it by a sergeant from the Sandusky Police Department. Unbeknownst to us, the proprietor of the nearby museum building had found the fox while taking out the trash. Thinking it might be a bomb, he phoned it in to the police.

Once the situation was explained, everyone had a good laugh and the sergeant gave instructions to let the Police Department know of future hunts in advance. They were lucky, because the authorities can't take chances with unidentified packages in sensitive places.

Photo E. Bonnie Crystal, KQ6XA, put on a seven-fox "ROCA" (see text) in the San Francisco Bay Area on the National Foxhunting Weekend. Three weeks later, she traveled to Orange County to run in the author's IARU-rules foxhunt, part of "Antennas in the Park." (KØFO Photo)

One of my coworkers accidentally left his briefcase in a parking lot. When the police retrieved it, they couldn't identify it, so they blew it up. He got it back in many pieces. To avoid this happening to your prized handie-talkie, be sure your foxboxes are suitably marked. I use a prominent label stating that it's a radio beacon for training and I include my pager number.

Get Started Now!

It's not too early to have some practice hunts to prepare for next year's NFW. Now would be a good time to start building some automatic foxboxes with transmitter, controller, and battery. They make a hunt more challenging than a simple search-for-the-car event.

If winter weather permits, start having some practice hunts this month. Afterwards, talk them up at the local club meeting to capture the interest of members. If the stories (and food) are good, they won't want to miss the next hunt. Remember, everyone is eligible to participate, licensed or not. Dig out those old scanner receivers and put them to use by loaning them to young people for the next hunt! Note that non-hams were among the NFW-99 winners in Montreal. And be sure to involve hams that lead school and Scout groups, encouraging them to involve the young people.

See you on the hunt!

Y2K: The REAL Need for Hams

Even if the civilized world DOESN'T collapse when the clock strikes midnight on New Year's Eve, says KF6FGB, hams can still provide valuable public service to their communities.

By Brent Walton, KF6FGB*
(kf6fgb@pacbell.net)

I think everyone, not just hams, is wondering what is going to happen when the clock turns from 12/31/1999 23:59:59 to 1/1/2000 00:00:00. It has been a question that the media has hyped for several months now.

Unplanned Obsolescence

For years, I worked writing computer programs. My programs were used in building hydroelectric plants; dispatching police, fire, and ambulance services; controlling air conditioning units and refrigeration units in supermarkets; security systems for banks; and many other applications. I've long since left the companies where I wrote those programs.

Back in 1987, I would have bet that none of my code written then would be in use come January, 2000. I had discussions with other programmers and we all agreed: because technology was advancing so quickly, we reasoned, our code would be obsolete along with the equipment it was on. We were only half right. The equipment has long since been replaced. But much of the code we wrote has been added to or modified to run on newer hardware.

So I did the moral thing and contacted my former employers. I told them they should check any module I wrote and see if I treated the date as a 2-digit value. I let them know that "back then" we had no idea the code would hang around that long. They, in reply, let me know they were on top of the Y2K issues at their company.

* *Brent Walton, KF6FGB, lives in Pittsburg, California. He wrote a three part series on "Portable Power" for* CQ VHF *earlier this year.*

"I don't think there is going to be any disaster the night of December 31, 1999, which will be the result of failing technology. I've got too much trust in our technical skills and abilities."

I mention this because the fact of the clock roll-over from 1999 to 2000 is known. We know it is going to happen. We know to check our VCRs. We know to check our computers. We know to check microwave ovens. We know what things are going to be affected by the change. What we *don't* know is what we need to prepare for.

So, What's the Big Deal about Y2K?

I don't think there's going to be any disaster the night of December 31, 1999, which will be the result of failing technology. I've got too much trust in our technical skills and abilities. I just do not believe that we'll see a lot of system failures, power failures, and communications failures that will affect us in a drastic way.

There isn't really as big a deal about going from 1999 to 2000 as many people are making it out to be. You see, the millennium actually ends on 12/31/2000 and the new one starts 1/1/2001. But, something intrigues people about those 9s rolling over to 0s. It intrigues them so much, The Artist Formerly Known as Prince sang, that "We're going to party like it's nineteen-ninety-nine."

Yup, that's it. No one can predict the type of parties that will take place on New Year's Eve this year. Radio stations are already bringing back the song while listeners sing, "We're going to party like it's nineteen-ninety-nine."

How Can We Help?

As hams, we can help local law enforcement and emergency services in a several ways. We have a vast network of operators and repeaters in most metropolitan areas. Here's our chance to make

"Yup, that's it. No one can predict the type of parties that will take place on New Year's Eve this year."

our services shine in a way we might not have had the chance to do before.

Although we don't know for sure *what* is going to happen on New Year's Eve, we can be ready. We don't know what type of unrest, if any, will take place, but in areas like New York City, San Francisco, Los Angeles, Chicago, etc., I'm sure the police, fire, and ambulance services will have their hands full.

• First, get acquainted with and trained by your local ARES/RACES groups (see "Resources"). By the time this goes to print, I will have completed my RACES training, and I already have my post selected for New Year's Eve (more about this later). Volunteer to help local law enforcement and emergency services for the night. They will appreciate your assistance.

• Second, if you suspect your neighborhood will have problems with out-of-control parties and unrest, work with concerned neighbors to form a communications plan. Work with your neighborhood watch group. Work with local law enforcement agencies.

• Third, be responsible. Do not form vigilante groups. Do not take it upon yourself to police your neighborhood.

• Fourth, work with other hams to form a New Year's Eve net. Select a frequency in your area and let people check in and chat during the evening. Let the net control take reports of problems for the sake of letting others know what is happening in the community.

• Fifth, and finally, stay sober. If something *does* happen, regardless of the nature or cause, you will be better able to handle things if your mind is clear.

"Finally, stay sober. If something does happen, regardless of the nature or cause, you will be better able to handle things if your mind is clear."

In the Middle of the Action

My post this New Year's Eve is going to be at the local hospital. When I first volunteered for the post, I thought I would be locked away in a closet with some radios. There I would sit, waiting to see if a knock would ever come upon the door along with a request to make a contact.

But when I asked when I could see the radio room at the hospital, I was told it was being remodeled and that the new radio room would be in the emergency room. Reality struck when I realized I would be immersed in the midst of any excitement that happens in my community...at least, the type of excitement that lands people in the hospital.

So, when midnight finally arrives on December 31, don't be surprised when the lights *don't* go out. *Don't* pick up the telephone to see if you have dial tone. *Don't* call your 24-hour banking services, expecting the phone to ring and ring and ring. But, *do* be aware that there are a few people out there who will find it a time to make a ruckus and cause havoc. To what extent they will cause problems for others, we don't know. We can only prepare ourselves to help out if they do. ■

Resources

The two main ham groups that provide emergency communications nationwide are ARES and RACES. Here's how to get more information:

ARES (Amateur Radio Emergency Service) is the emergency communications arm of the American Radio Relay League (ARRL). Contact your Section Manager or Section Emergency Coordinator for local information. Or write to Field & Educational Services Dept., ARRL, 225 Main St., Newington, CT 06111; Phone: (860) 594-0200; Web site: <http://www.arrl.org/field/pscm/sec1-ch1.html>. There is also an unofficial ARES web site, with links to various ARES groups around the U.S., at <http://www.ares.org>.

RACES (Radio Amateur Civil Emergency Service) operates through state and local offices of emergency management. Contact your local OEM to see if there's a RACES group where you live. You may also check out the unofficial RACES Web site, <http://www.races.net>, which has links to individual RACES groups around the country.

Truly Portable Packet

Imagine a complete packet station you can hold in your hand. Imagine how useful it could be. Imagine that you didn't have to imagine...

By Ray Rischpater, KF6GPE*
(kf6gpe@arrl.net)

Have you ever wished you could send a packet message from the palm of your hand? Believe it or not, you can—using a 3Com PalmPilot® organizer (Photo A)! And the possibilities are endless. ARES participants can bring packet stations with them, ready at a moment's notice. During public service events, operators on their feet at the scene can send packet messages for automatic logging by the net control station. Packet frequencies can be monitored for at-a-glance updates with low-cost mobile hardware. Finally, if you're using APRS (Automatic Position Reporting System), never fear—you can have one of the smallest packet stations in town (Photo B)!

The 3Com PalmPilot organizer, which I'll just call "PalmPilot" for short, is one of the most successful palm computers to date. Departing from traditional designs which incorporate a keyboard, the PalmPilot is nearly all screen, taking user input with a stylus and allowing the user to write using a special alphabet. Although it takes some getting used to, most users are comfortable with the alphabet within only a few hours. Also unlike many handheld devices, its internals are austere, bringing consumers an astoundingly powerful device for very little cost. New units range between $300 and $500; used units can cost as little as $100. All are up to the task of basic packet radio, although only the most recent devices (the Palm III, Palm V, and Palm VII) are able to run *pocketAPRS* (Photo C), a special version of APRS written specifically for palmtop computers.

*Ray Rischpater, KF6GPE, is Assistant Emergency Coordinator for Training for the San Lorenzo Valley ARES. He lives in Boulder Creek, California, with his wife, Rachel.

Photo A. An operator using his PalmPilot for packet. Look closely—you might think he's only using a note pad! (Photos by the author, except as noted)

Unlike most handheld computers, the PalmPilot is considered a "PC companion," or organizer, and its users are expected to use the device in concert with a desktop computer. The device was designed for data viewing and simple data entry while you're away from your PC, with the ability to quickly synchronize data with the desktop on demand. However, a robust operating system, innovative software developers, and a little work brings the PalmPilot to packet radio.

Packet Basics

In case you're new to packet radio, a little explanation may be in order. Using packet, messages between operators are sent by computer via special hardware that turns computer text into signals transmitted over the air. Generally, a packet station requires a PC, terminal node controller (TNC) or modem, and your radio, along with some software on your PC which allows it to talk to the TNC. The TNC converts the messages into standard formats (called protocols; the AX.25 protocol being the most common) and then into signals which can be exchanged by radio. Some operators may use simple terminals rather than PCs, and other operators may use modems such as BayCom's, which requires additional software on a PC, but no separate TNC. Regardless of how you get there, packet radio is common on 2 meters, where it's used to carry a great deal of printed traffic. In a large-scale emergency, packet radio shines, allowing amateur radio operators to quickly and accurately exchange long lists between points.

Introducing APRS

The Automatic Position Reporting System, or APRS, is the brainchild of Bob Bruniga, WB4APR. One of the fastest growing uses of packet radio, APRS

allows users to exchange messages with GPS (Global Positioning System) data and other telemetry automatically inserted in each packet, allowing operators to share not only their data, but their position as well. It's been well received in the public service arena, where amateurs can locate moving targets such as marathon runners, parades, or emergency vehicles on maps for served agencies. Its general nature and specific customizations lend themselves well to radio direction finding and Skywarn, in which a combination of telemetry and positioning is essential.

Portable APRS operation is not new. APRS has long been used by operators in the field with laptops or handhelds like the HP100LX series of palmtop computers. These use DOSaprs, or occasionally the Windows or Macintosh versions on newer portables, depending on the operator in question. Operating APRS on a PalmPilot requires a special variety of APRS software called "pocketAPRS," which we'll discuss later. Now, let's get to the nuts and bolts of setting up your palmtop packet station.

Getting Started with the PalmPilot

If you've already got an HT and a TNC, you're halfway there. If not, you can still operate from a palmtop, although you might ask why you've worked so hard for a handheld packet station when you're carrying your mobile rig in a backpack! Regardless, you'll need a TNC, HT radio, and PalmPilot organizer.

Which PalmPilot you choose is largely a personal choice based on features and budget. All units will work with simple serial programs letting you do basic packet with other hams and use packet bulletin boards, DX Clusters, and the like. As noted above, if you're eyeing APRS operation, you'll want to invest in a PalmIII, PalmV, or PalmVII (as of this writing, PocketAPRS has not been tested on the PalmV or PalmVII series devices), as the older hardware simply doesn't have the "oomph" needed to support such a complex application (upgrading an older device is worth considering, but can cost almost what a new device might if you shop around).

Similarly, any TNC should work. I've used my two Kantronics KPC 3+ TNCs with no problem, and would expect that any TNC-2 compatible TNC would behave the same. As you'll see, there are no obvious dependencies between the TNC and PalmPilot. If you can, however, take the time to test your TNC-radio combination before getting started with the PalmPilot, so if you have problems, you'll be able to isolate the source.

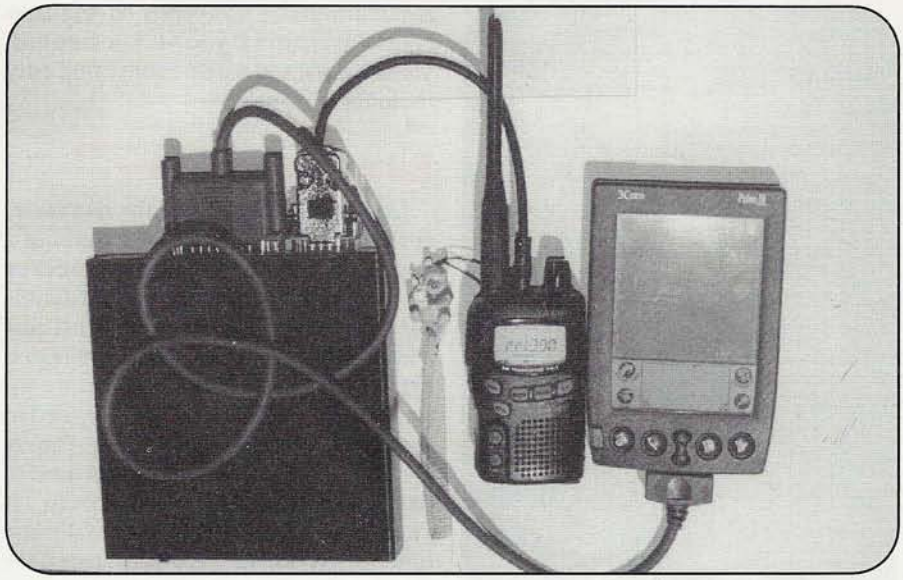


Photo B. The author's portable packet station. The TNC is the largest component. In the field, I'll often wear the TNC in a hip pouch, where I'm carrying the radio and extra batteries. For extra power, I can easily change to a 5-watt HT, or digipeat through my mobile with another TNC.

Making the Connection

Using a PalmPilot for packet is much like using a PC. Before you set out, you'll need to arrange a connection between the PalmPilot and your TNC. This connection has a physical component (the cable) and a software component (the terminal program). Note that I explicitly said "TNC"—there's currently no software available that will work with a BayCom or other modem. *(Any brave programmers out there? Please contact the author.—ed.)*

All PalmPilots have a serial port, intended for use when synchronizing the PC. This port uses a special 10-pin connector, readily available from most dealers and by mail order. The signals (see Table) are EIA-232D (formerly RS-232C, the standard which governs PC serial ports) compliant, so they'll operate with any TNC that can be used with a PC.

There are several ways to get a cable which connects your PalmPilot and TNC. The easiest way is to purchase a PalmPilot modem cable, which was intended to connect your PalmPilot to any external telephone modem.

These cables can be hard to come by, however, and making your own is not difficult (Photo D). For those with little desire to attack their toys with a soldering iron (I'll admit to being one many times!), the same cable can be had with the device's cradle or external serial cable, followed by a null modem and a DB-9-to-DB-25 converter (Photo E). Make sure you've selected converters which match the genders of your cables, null modem, and TNC, or you'll find yourself with extra converters for your junk box. (A null modem simply swaps the transmit and receive pins, along with the appropriate hardware flow control pins.)

Rolling Your Own

The truly ambitious should make their own cable. Frankly, it's not that difficult, and just a little ambition, soldering iron, and patience is more than enough. The information you need is the pin assignments on the PalmPilot port (see the Table), along with the information in your TNC manual about how to make a custom cable. You'll want to get a serial cable or replacement cradle (I prefer using the serial cable, because I can easily hold the device with one hand while standing up. The cradle makes an ideal companion packet station for those seated while operating.), along with a matching connector for your TNC. Then, make the cable using the following steps:

1. Cut the cable close to the DB-9 connector (that's the one that would connect

Photo C. The "pocketAPRS" screen as seen on a 3Com PalmPilot organizer. (Photo courtesy Mike Musick, NØQBF)

to your PC). Now you know why you ordered the spare!

2. Strip back the insulation on the outer portion of the cable, and then carefully strip the insulation 1/8 inch or so from each of the individual wires. I find it's worth the time it takes to tin each wire with a bit of solder, as soldering to the connector goes more quickly and there's less chance of a stray wire bridging two pins.

3. Using a voltmeter, "ring out" each of the pins on the cable, checking continuity from the edge connector on the PalmPilot side of the cable to the wires. Note which pin is connected to which color. In my experience, I've observed that the colors do not appear to vary from lot to lot of cable manufactured, but it's worth doing this because it's faster to test this now than troubleshoot a cable that doesn't work.

4. Match each of the wires you've identified with the appropriate pin on the TNC connector, using the Table and your TNC manual as a guide, and solder it in place.

5. Assemble the connector shell and label the connector (so you don't try to use it as a synchronization cable or with a different TNC by mistake.)

Some operators have reported excess battery drain by connecting all of the PalmPilot pins to the TNC, and they recommend connecting only the TX, RX, and SG pins. I've personally not seen much difference and prefer having flow control available. If you've observed this, you may want to wire a cable using only those three signals.

PalmPilot Software

Once the cable is made, the remainder is easy—software. With the PalmPilot's popularity, there are literally hundreds of programs, and at least five or six terminal programs to choose from. Most cost a little money as "shareware," where you get to try the application, and if you continue using it you're morally obligated to send the developers some money. Others are "freeware," in that there's no need to pay for them even if you do use them. (If you do use shareware, please take the time to pay for it. Very few shareware authors make what they deserve from their creations.) These applications are available from the Web or fellow Palm users. A good Web site to start with is PalmCentral, at <http://www.palmcentral.com>; another good place to look is <http://www.palm.com>, 3Com's Palm support site, which graciously links to a number of excellent software archives.

After some searching around I chose "Online," a commercial program from Mark/Space Softworks (<http://www.markspace.com>, or send e-mail to <info@markspace.com>). Frankly, the choice was arbitrary; several applications worked fine for me, but this one had a nice look to it and had some additional features I'd use at the office. A useful feature is that it supports rudimentary file uploads by letting you choose a memo from the PalmPilot's Memo Pad application, so you're able to compose your messages offline and send them when you're connected to your TNC.

The actual details of installing, configuring, and connecting with your terminal program vary from program to program. However, the steps between programs have common elements; check your program's instructions for the specifics of each of these steps:

1. Begin by getting and unpacking the application. You'll need to download or get a release of the program, usually as a **.PRC** file. Many PalmPilot applications are delivered on the Web uncompressed, so what you download is what you need. Other times they're compressed and you'll need a tool such as PKZip to uncompress the file and find the .PRC files.

2. Install the application on the PalmPilot. To do this, run the **Install Tool** program provided with the PalmPilot on your PC (Macintosh users will need to select the **HotSync Manager** menu item from their Palm menu and chose the **Install** option from the **HotSync** menu) and select the .PRC file you want to install.

3. HotSync your PalmPilot with the original, unmodified, serial cable or cra-

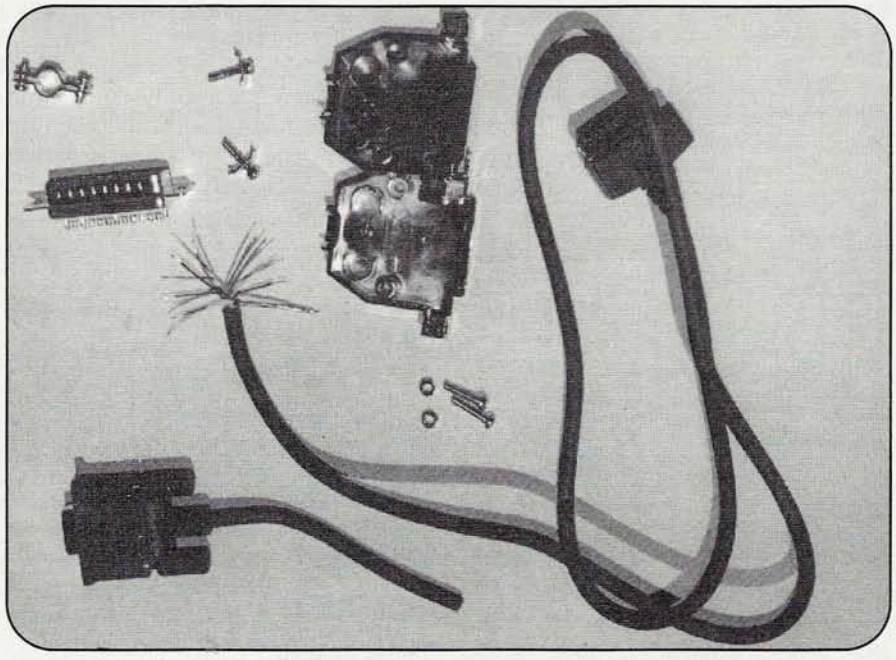


Photo D. The parts required for a build-it-yourself Palm serial cable, used to connect the PalmPilot to your TNC. There's really not much to it, and we provide step-by-step instructions.

dle (no null modems, special connectors, or other goodies present, please!). This causes your PC to download the application you've selected.

4. Disconnect the PalmPilot from the PC, and connect it to your TNC with your new packet cable. If you haven't used your TNC with a radio before, take a minute and be sure it all works using your PC, or have an "Elmer" check it out with you.

5. Go into the Applications screen on your PalmPilot by tapping **Applications** and launch your terminal program.

6. Configure your serial program. You'll need to know the baud rate your TNC is using, and whether or not you're using hardware or software flow control. These can be obtained by consulting the program you were using on your PC to talk with your TNC, or by checking your TNC manual. (*Most TNCs "talk" to their host computers at a minimum of 9600 baud, even though their on-air baud rate is generally 1200 baud.—ed.*)

7. Open a connection with the terminal program and turn on the TNC. You should see the TNC's output appear on the PalmPilot.

8. Start using your new packet station like you'd use your TNC with your PC!

Table. PalmPilot Serial Pins

Pin #	Purpose	Direction	Notes
1	DTR	out	Nonstandard.
2	Vcc	out	3.3VDC @ 10ma max. 3Com does not suggest powering devices with this.
3	RD	in	Receive Data from external source into organizer.
4	RTS	out	Request to Send for hardware flow control.
5	TD	out	Transmit Data from organizer to external source.
6	CTS	in	Clear to Send for hardware flow control.
7	GPI1	in	Interrupt line to indicate HotSync start; asserted high (greater than 0.7V)
8	GPI2	in	When high, indicates modem is attached for synchronization.
9	UNUSED	n/a	Reserved by 3Com, Inc.
10	SG		Signal ground.

Notes:
The pins are numbered 1 to ten from right to left when looking at the back of the device.
The HotSync button on the cradle asserts GPI1, while the modem keeps GPI2 asserted through a 20K resistor and asserts GPI1 when its HotSync button is pressed.
The DTR pin uses a voltage doubler to provide a 6VDC high signal when the serial port is in operation.

Table. Pinouts for PalmPilot serial connector, courtesy of 3Com. Adapted from a table on their Web site.

Troubleshooting

If you have problems, you should troubleshoot each part of the system individually. Start by testing the TNC and radio combination with a computer; if it has problems, you'll want to go back and look at your TNC and radio manuals. If that's working, question the terminal program and the cable you've made. A thing to look out for is flow control, used by the TNC and PalmPilot to make sure nothing gets missed when a lot of data is exchanged. If you're using hardware flow control, make sure you've wired the cable appropriately and that both the TNC and program know about it; similarly, if you're using soft flow control, make sure both sides of the cable "know" that it's activated. An easy way to check this is to turn flow control off completely and set the baud rate to 1200 on both TNC and terminal program. Finally, if nothing else works, try a different terminal program and check your cable with a voltmeter.

Using pocketAPRS

Mike Musick, NØQBF, has accomplished the impossible by bringing the amateur community a palmtop APRS application in the form of pocketAPRS. Not a port of existing APRS applications, pocketAPRS is a ground-up implementation of APRS for the PalmPilot. It shares many of the features of its more traditional kin, and has been carefully tuned to make the most of the PalmPilot's meager resources. As of this writing, it's available in a beta state; a final version is expected to be available by the time this appears in print. This is a shareware program (as are all APRS applications), with the expected cost about $40.

Installing and configuring pocketAPRS is similar to installing other applications, except that the application will ask for information regarding your TNC, position, and other details as it is launched. You'll need to install both the application and a map for your area (if you want to use the map display).

Finding a map for your region will likely take some work. The application stores maps in a PalmOS database, and the data format is slightly different than that of the maps used by the desktop applications. At present, there are only a few maps available; as time goes on, I'd expect to see both more maps and more translator programs become available to help bring additional maps to the PalmPilot.

The application itself covers the basics of APRS functionality in four screens. Each of these screens can be selected by choosing the appropriate item from the **View** menu, or by pressing one of the four buttons along the bottom of the unit while pocketAPRS is running.

The **Map** display, available by touching the **Dates** button, is much like the traditional APRS map, showing station icons for stations within range. You're able to modify your position, add objects, get the coordinates of a point or an object, as well as scroll around the map or zoom. The program's panning ability is amazing; the map is smooth-scrolled around as you drag the stylus. The zoom function, on the other hand, is not one you're likely to want to use often, as the PalmPilot will have to stop what it's doing and redraw the map.

When adding an object, you can select an icon by its name as well as its position and a short comment. These objects can be transmitted to other APRS stations, just as they could be from other APRS

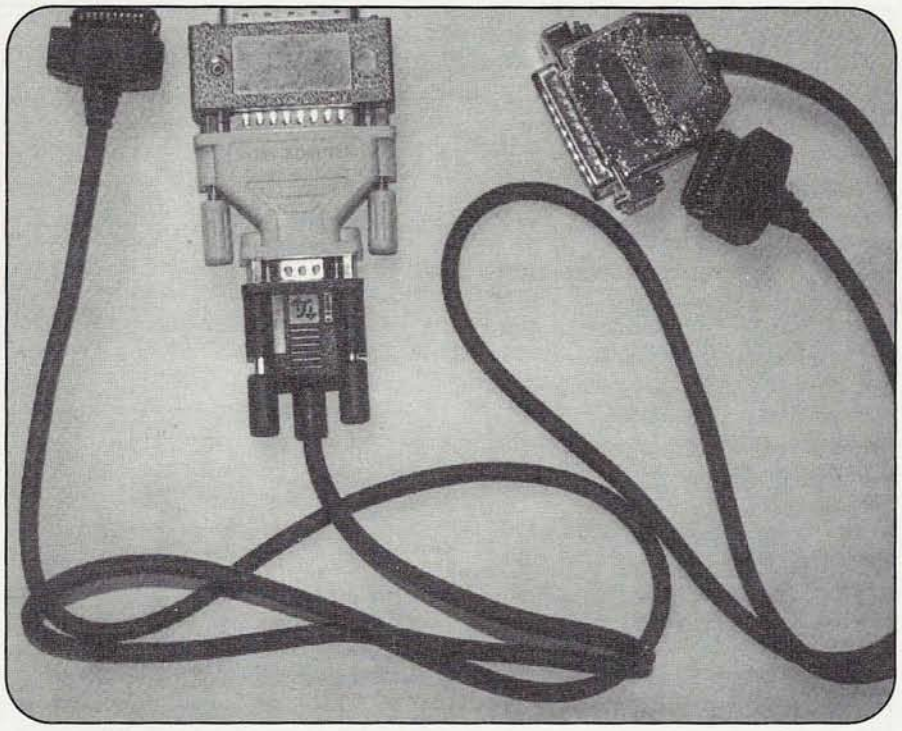


Photo E. A PalmPilot-to-TNC cable, built up from a null modem and DB-9-to-DB-25 adapter (left), and the completed homebrew cable (right) shown in pieces in Photo D.

applications, allowing operators with pocketAPRS to originate reports for other objects.

The **Stations** display provides a list of stations and information about each station. When the **Contacts** button is pressed, the **Stations** display appears; each press of the **Contacts** button scrolls through one of the kinds of information tracked. From this screen, you can determine a station's path to you, the last data sent by the station, the time the station was last heard, and the status data last sent by the station.

The **Messages** display provides a list of the messages received. This display, assigned to the **Tasks** button, sorts messages into categories for normal messages, bulletins, announcements, weather, and special buttons. A touch of the **Tasks** button selects the next category from the list. Of course, at any time, you can send a message by selecting the **Send Message** item from the menu bar and entering the destination callsign and message.

The expert APRS user can also view the contents of each packet by pressing the **Notes** button. I've found this helpful when debugging other people's APRS stations, especially when I don't have my laptop with me.

The application is strikingly well-featured, given its small size. Although there are still many things you can only do with the traditional versions of APRS, such as direction finding or transmitting weather data, pocketAPRS will have many uses for public service and messaging.

Oops...

We forgot to give proper credit for the photos in Pete Ostapchuk, N9SFX's, article, "Discover the RF Attenuator," in our October issue. The first photo, of Pete holding a handheld and direction-finding antenna with his attenuator attached, was taken by his wife Linda, KB9RUC. The remaining photographs, showing various details of the attenuator's construction, were shot by Ritch Williams, KA9DVL.

Due to circumstances beyond our control, the results of the 1999 CQ VHF Spring Activity Weekends were still not available by the time this issue went to press. We will post them on our Web site whenever they do become available. Our sincere apologies to all who took part in these events.

"In my mind, emergency responders for ARES would do well to have PalmPilot-based packet stations...."

Looking Ahead

There's a lot that can be done with the PalmPilot and packet. In my mind, emergency responders for ARES would do well to have PalmPilot-based packet stations, which could be used to carry local operations handbooks, emergency rosters and phone numbers, and could be used during the initial setup of ARES stations until more permanent packet stations can be provided. (In fact, while I was writing this article, a local ARES packet operator with technical problems salvaged his station by using his PalmPilot for packet during an exercise until a new cable was brought!).

For the electronically inclined, there's more to be done on the interface side. Although I haven't tried this, you could easily add a pushbutton between VCC and GPI1, and a jumper between the VCC and GPI2. By doing this, you could go into the **Prefs** application and instruct the PalmPilot to launch your terminal program when it sees a request for a modem HotSync. If you have a Kenwood radio with an integrated TNC (the TH-D7), you should be able to make a cable between the PalmPilot and radio, removing the need for an external TNC altogether.

On the software side, there's much that can be done with additional development. A more advanced terminal program could be used for store-and-forward messaging, letting users enter messages and then "synchronizing" with remote TNCs, sending all the messages unattended. This could let hams use the PalmPilot for packet messages, much as can already be done with electronic mail, authoring and reading messages while away from the radio and requiring only a short time on the air for the exchange of messages.

Regardless of the application you find for a PalmPilot and packet radio, you'll get a kick out of using it. There's nothing quite like having your packet station in the palm of your hand, and it beats the heck out of carrying a laptop! ■

A "Flame Thrower," a Fold-up Beam and an "RF Sniffer"

Just in time for the holidays, WB6NOA takes a look at a 1296-MHz loop Yagi from Directive Systems, and two cool new products from NCG/Comet.

By Gordon West, WB6NOA*
(wb6noa@cq-vhf.com)

It's said that "accessories make the man," and the same applies to ham shacks, too. Every shack has at least one radio, but it's the accessories, antennas included, that personalize the station, that make it "yours." This month, we're going to look at two specialized Yagi antennas—one for the increasingly popular 1296-MHz band and the other a 2-meter beam that folds up(!)—plus a $15 gadget that can find plenty of uses around your ham shack (even if it's a "shack on a belt"). Let's get started.

Directive Systems 1.2-GHz "Flame Thrower" Yagi

More and more amateur radio manufacturers are coming out with equipment capable of 1.2-GHz (23-centimeter) operation. If you live close to any big city, chances are you're near numerous repeaters found between 1282 and 1295 MHz. There are also three amateur television (ATV) slots on the band: 1240-1246 MHz (ATV Channel 1), 1252-1258 MHz (ATV Channel 2), and 1276-1282 MHz (ATV Channel 3). There's also a satellite uplink segment from 1260 to 1270 MHz, and plenty of weak-signal (SSB and CW) activity from 1295 MHz to 1297 MHz, where FM operation *should be avoided* at all times. In addition, there's digital communications from 1297 MHz to 1300 MHz, so be assured that any new rig with the 1200-MHz band included has plenty of potential!

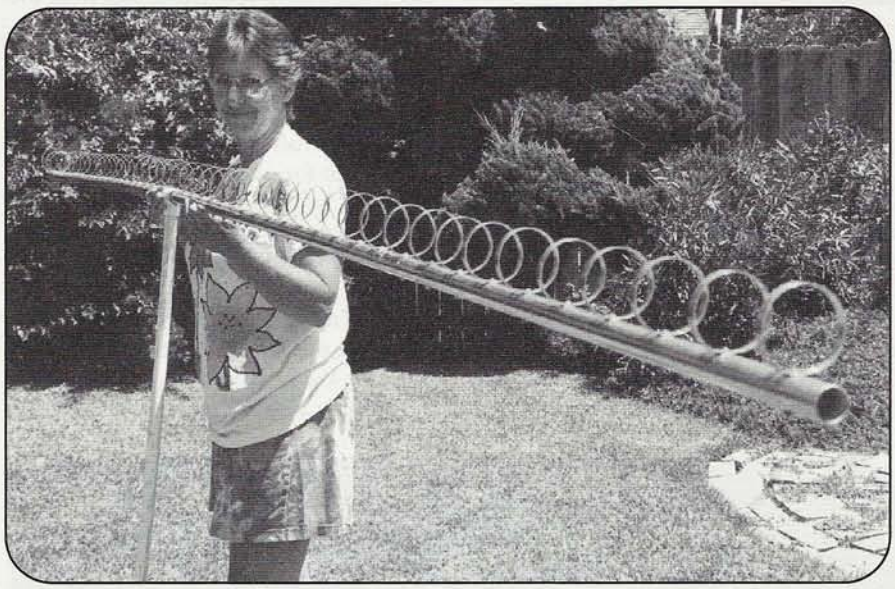


Photo A. The 55-element loop Yagi from Directive Systems looks kind of like a flame thrower when you hold it—and that's where its name comes from! (Photos by the author, who'd better watch out where his wife Suzy, N6GLF, is pointing that thing!)

But first, you need an antenna! Most major manufacturers offer omnidirectional, vertically polarized, collinear antennas for 1.2 GHz. But sometimes you need more than omnidirectional gain, especially if you're considering weak-signal or satellite work. For example, here in Southern California, we often have tropospheric ducting conditions between here and Hawaii—a 2,500 mile path. While it's possible to "work the duct" on 2 meters with a handheld and a "rubber duck" antenna, up on 1.2 GHz, we need as much gain as possible. Omnidirectional antennas just won't do.

One of the most popular designs for this band is the loop Yagi, developed by G8AZM, G3JVL, and others. They are more compact than traditional beams (they can be shipped pre-assembled), and if the elements accidentally get tweaked, they're easily realigned. These high-gain, lightweight loop Yagis also offer low wind loads. And the greatest variety of

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

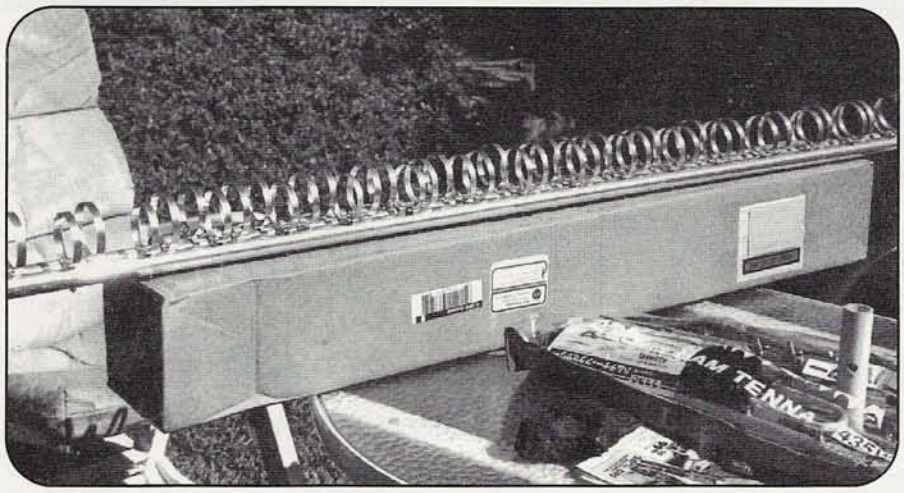


Photo B. The Directive Systems "Flame Thrower" ships in three pre-assembled sections that go together quickly and easily. And yes, it comes in a bigger box than the one it's sitting on!

loop Yagis, from 800 MHz to 3500 MHz, is available from Directive Systems in Lebanon, Maine.

The Flame Thrower

I ordered the Directive Systems 23-centimeter "Flame Thrower," Model 2355LY. Take a look at Photo A and you'll see where the name comes from. This is a 55-element, 21 dBi, 15-foot boom length loop Yagi. It comes in three pieces, with all of the little tiny loops already attached (Photo B). The unit assembles in less than 5 minutes, and there is absolutely no way you can stick the antenna together backwards.

But you *can* get it polarized *wrong*. If you look at the driven element (Photo C), you'll see a brass rod that comes from the boom feed to the top of the driven loop. If you position this brass rod *vertically*, as shown in the photo, the radiated plane will be *horizontal*. If you accidentally put the copper rod in the horizontal plane (parallel to the ground), your signal will come out *vertically polarized*! Don't get mixed up on this one—a cross-polarized loop Yagi could result in as much as 10 dB loss!

If you're planning on working distant repeaters, put the brass element horizontal to the Earth, which makes it vertical. If you plan to do weak-signal SSB and CW work, run the brass rod vertical, which will give you horizontal polarization. It comes from the factory set up for simple mast-mounting in the *horizontal* plane, intended for weak-signal work.

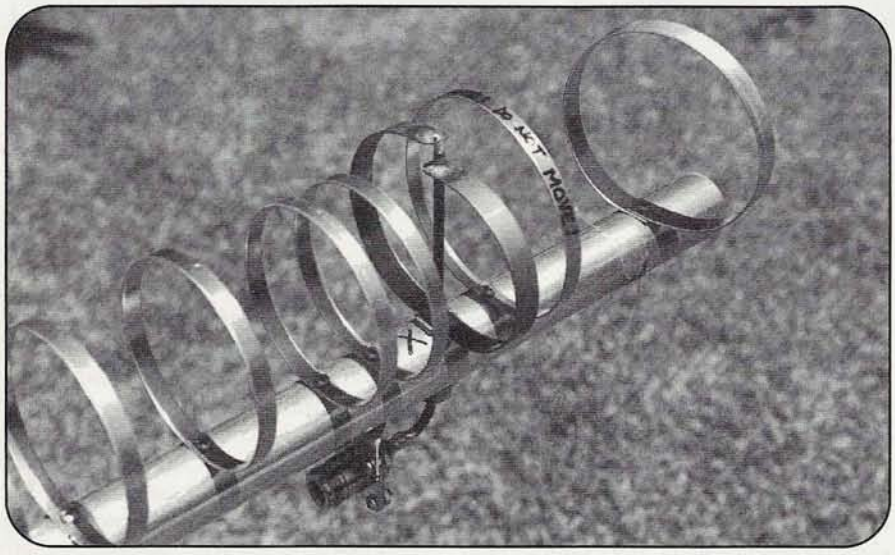


Photo C. The polarization of the "Flame Thrower" antenna is determined by the direction of the brass rod in the driven element (third from end, on right). But it's not logical: if the rod is vertical, as it is in this photo, then the polarization is horizontal. Likewise, for vertical polarization, mount the driven element with the brass rod sideways.

Most weak-signal activity is upper sideband, centered on 1296 MHz and 1296.1 MHz (1296.100 is the national SSB calling frequency). If you're running FM, look for vertically polarized repeaters throughout the repeater subband, or look for stations on the national FM simplex calling frequency, 1294.5 MHz.

When the band finally opened up between here and Hawaii, the Directive Systems Yagi pulled in the constantly transmitting 1296.0-MHz beacon with an S5 signal, and a much shorter conventional wire Yagi didn't hear the beacon at all! Polarization was also important: the S5 beacon would completely disappear when I rotated the antenna 90 degrees cross-polarized.

I calculated a 14-degree "window" for pointing the antenna, but found in actual use that this giant loop Yagi would begin to show signs of signal dropout when it was 5 degrees one way or the other from the direct signal. This means that it's critical to walk the antenna back and forth in order to maximize its very sharp gain.

The 1-inch boom on the "Flame Thrower" does *not* require non-conducting guy rope. It's strong enough not to sag appreciably. But if you *do* run a guy line, make sure you don't accidentally squish the reflector element or the most forward director loop. I tried it with the loops going straight up and then straight down, and either way was perfect for maximum horizontal signal.

If you're looking for a loop Yagi that's professionally constructed and almost entirely assembled when it comes out of the box, call Directive Systems for their latest antenna catalog, and be assured you are dealing with hams who really know what it's like to squeeze out the last dB of gain. Dave Olean, K1WHS, indicates he can design and manufacture antennas for custom commercial/industrial applications, too, from VHF through 18 GHz. He suggests that another great Web site to look up microwave equipment is Down East Microwave's at <http://www.downeastmicrowave.com>.

And if you really want to get serious, Directive Systems offers two-way and four-way power dividers and phase-matched cable assemblies, plus the necessary hardware to stack or box your microwave antenna system. For me, the

one 15-foot "Flame Thrower" was plenty for the 2,500-mile hop between here and Hawaii on 1296 MHz!

Fold-Up Beams from NCG/Comet

Here's a great idea for contest rovers and hams who enjoy "hilltopping" on VHF or UHF: moderate-gain weak-signal beams that fold up in seconds! They're from a Japanese amateur radio antenna manufacturer named Maspro, and they're sold here in the U.S. by NCG/Comet.

You probably haven't heard much about Maspro—they've never really hit it big here in the States. I got my first set of folding Maspro beams from D & L Antenna Supply, and recently learned that Mick and his dad at NCG/Comet Antenna Company also had access to this product line. They're not regular stock items at the moment, but as I'll explain later, demand could help change that. Back to the antenna...

Run It Up the Flagpole...

I have both the Maspro 144 MHz 2-meter beam, as well as the Model 435WH15 70-centimeter beam. Both antennas easily stay put on the push-up aluminum flagpole antenna mast on my van (Photo D). I use the mast and the Maspro antennas when doing weak-signal work on the road as well as for ham-fest demonstrations.

The beauty of the Maspro antennas is how quickly they assemble without having to use tools or remove nuts and bolts. The elements simply rotate into position (Photo E), align by colored marks in the middle of each element, and secure by spinning down the wing nut. The aluminum elements are relatively sturdy, and their hollow design makes this an extremely lightweight performer. The 15-element 432-MHz antenna weighs under three pounds, and the 2-meter antenna weighs in at just over three pounds.

To tear down the antenna after use, simply loosen the elements, rotate them along the boom and then fold them into place (Photo F). The booms come apart by loosening screws, rather than having to back them all the way out. And same thing with those folding elements; you're never taking the wing nuts all the way out.

The Maspro 2-meter beam gives me about 12 dB of forward gain, and the single 15-element 432-MHz antenna is rated at 14 dB gain. This is very respectable when you consider that the antennas come packaged in a four-foot vinyl sleeve and swing into place in about two minutes or less. No instructions necessary!

The feed system is a folded dipole with a little bit of coax matching inside a black plastic can. The SWR on both the 2-meter as well as the 432 antennas was below 1:1.5 to 1 in the weak-signal portion of the bands, and this was great...until I "poured the suds to it"—when my transmit power went up above 100 watts, I saw the SWR begin to change. This told me something mysterious was happening inside that black chamber where the feedline attaches to the driven element.

To my surprise, the cap simply unscrewed, and I quickly discovered why the SWR was changing under high power: the matching network uses micro-coax (Photo G), and this can't handle much power beyond 100 watts. No problem. I swapped out the micro-coax with some RG-58A/U coax, got it all squashed into the black can, and now I can run several hundred watts of power without any change of SWR. The velocity factor was slightly different on the larger coax, so I had to do some pruning until my MFJ SWR analyzer showed me the right match. On the 2-meter beam, I ended up with a coax substitution that was one inch

Photo D. WB6NOA uses the Maspro fold-up Yagis on top of the telescoping flagpole mast on his van. He says they're ideal for quick setup and tear-down.

Photo E. To assemble the Maspro Yagi, just line up the colored dot on each element with the hole in the holder, rotate into position, and hand tighten the wing-nut underneath.

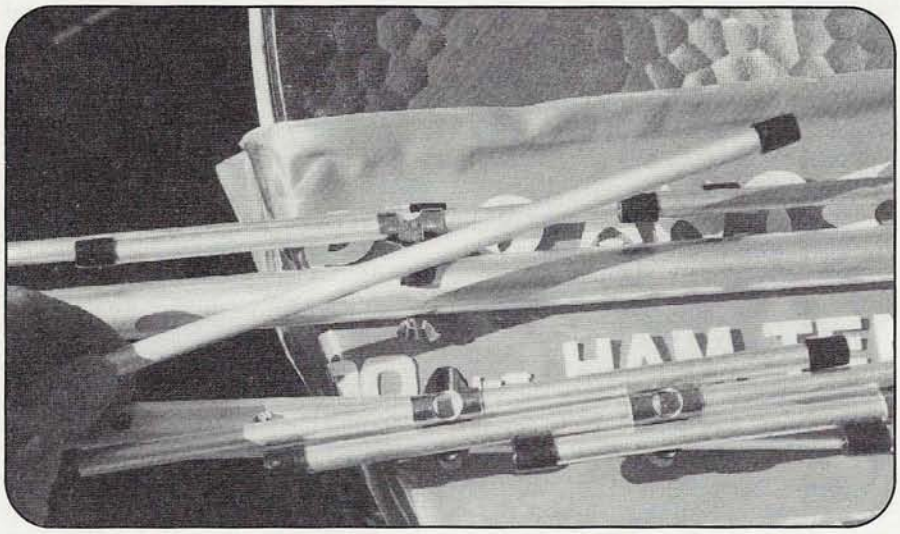


Photo F. When it's time to take down the Maspro Yagi, just fold it up and store it in the vinyl bag supplied with the antenna.

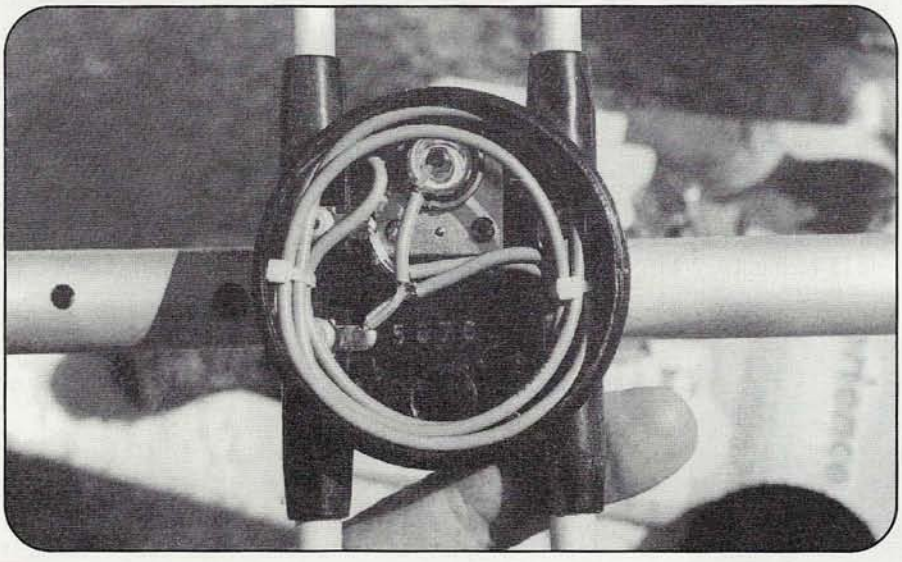


Photo G. The only weak point in the Maspro antennas is the mini-coax used in the matching section. It won't handle high power, and needs to be replaced by something like RG-58 A/U if you're going to run more than 100 watts on 2 meters or 25 watts on 70 centimeters.

shorter than the original supplied micro-coax (which, frankly, looks more like shielded mic cable than coax!). On the 440 antenna, about one inch of coax will do the trick, nicely.

Safety Considerations

There are also some important safety concerns that these antennas meet, namely, no sharp rod ends. Each element is tubular and is capped with a black rubber tip. This makes the antenna ideal for Field Day or for transmitter-hunting.

These Maspro collapsible beams can also be stacked, and their instructions give you full details on how to cut your matching harnesses. But I hope you have a friend nearby who reads Japanese, because almost all of the instructions are *not* printed in English.

And how well do these antennas actually work? Well, let's see, how about numerous AO-27 satellite contacts, plus long-haul tropo from here to Hawaii running 5 watts, horizontally polarized? If you're into long-haul FM work, by the way, simply change the mount so the elements are vertical.

NCG/Comet may soon carry these antennas as regular stock items...if there's enough interest by weak-signal enthusiasts. If you can catch up with us and our communications demo van at a hamfest, look up the telescoping flagpole to see these antennas in action. But to really appreciate them, wait until you see how fast I can put them up or take them down without having to do anything more than finger-loosen wing nuts, rotate the elements along the boom, separate the boom pieces, and then stuff everything into the vinyl bag.

SVHFS Call for Papers

The Southeastern VHF Society will host its fourth annual conference on April 14–15, 2000, at the Atlanta Marriott Northwest, I-75 and Windy Hill Rd., Marietta, Georgia (same location as the first three conferences). This is the FIRST CALL for presentations to be made at the 2000 conference and papers to be published in the conference proceedings. Submissions are due by February 18, 2000. Contact program chairman Bob Lear, K4SZ, at P.O. Box 1269, Dahlonega, GA 30533; Phone: (706) 864-6229; E-mail: <k4sz@arrl.net>.

In addition to the technical program, there will be preamp noise figure testing, antenna gain measurements, a flea market, banquet, and door prizes. Further details will be announced on the SVHFS Web site, <http://www.svhfs.org/svhfs/>.

NCG/Comet RF Detector

Did you ever wish you had a cheap and easy way to know if a radio in your shack is actually transmitting? Or if some other piece of electronic equipment is putting out RF that may be causing interference? Then you've got to check out NCG/Comet's new RF sensing "bug" (Photo H), available—when it's not all sold out—for a mere $15 through all Ham Radio Outlet stores.

This tiny RF monitor is designed for nearfield response to any RF signal between 2 MHz and 2000 GHz. As soon as the RF sniffer bug senses an on-the-air signal, it jumps to life with a spinning LED

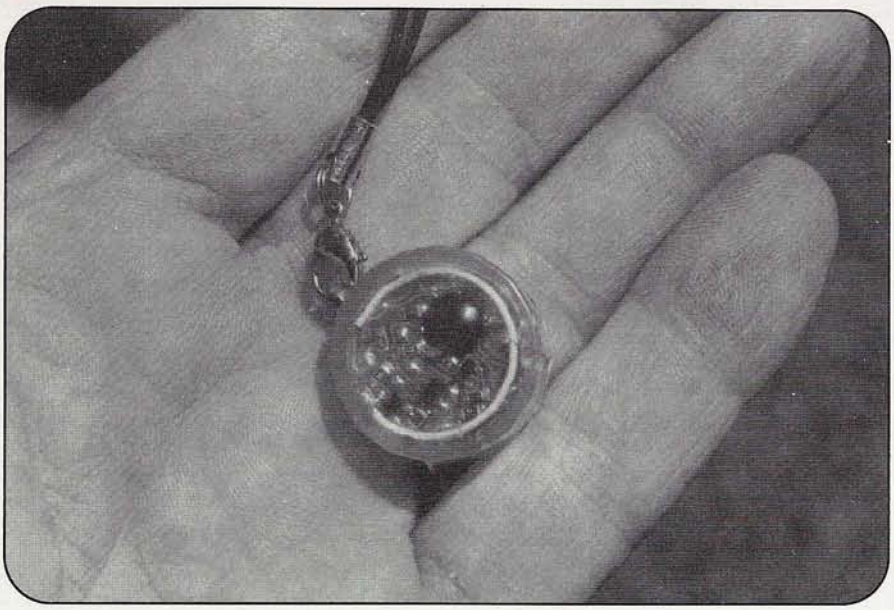


Photo H. LEDs in the palm-sized RF sniffer start flashing in the presence of nearfield RF energy. You can use it to see if a transmitter is working, to help track down interference, or even to check for leaks in your microwave oven.

activation that's sure to grab your attention. It automatically cycles down after a few seconds of alert. The device runs for months on a little hearing aid battery.

During our tests, I could get it to turn on within a couple of feet of a 2-meter handheld transmitting on its rubber duck antenna. On bigger 2-meter base stations, it would go off within 20 feet of the antenna. And on UHF and higher frequencies, the range gets even further because of the very small antenna encapsulated within the plastic see-through cover. It can even work as a microwave oven leak detector!

They're relatively cheap (under $15) and come with a fresh battery which is good for several months of use. I use mine on the test bench when I need to do a quick check on whether or not a little radio is indeed transmitting.

Gadget or Tool?

Is this more a gadget than a useful RF tool? I think it's a *valuable tool*. For instance, the other day I was working with my neighbor who just bought a new weather station that was somehow giving me interference on 433 MHz. When my little NCG/Comet RF sniffer kept going off near the weather monitor readout, it alerted me that this was not a wired sensor station, but one that transmits on 433 MHz—and it was clobbering my weak-signal SSB reception. What I thought were hard wires to the sensors was actually a pair of wires going to an auxiliary rain gauge. Without that sniffer, I probably would have gone on assuming that it was a wired unit.

So, for under $15 through all Ham Radio Outlet stores, I think it's a neat gadget that every ham should have to really see what RF is all about! ■

Resources

For additional information on the "Flame Thrower" loop Yagi, contact Directive Systems, Inc., Rural Route 1, Box 282, Lebanon, ME 04027; Phone: (207) 658-7758; Web: <http:// www.directivesystems.com>.

For additional information on and availability of the Maspro fold-up beams, contact Mick at NCG/Comet, Anaheim, CA; Phone: (714) 630-4541; or D & L Antenna Supply, Kansas City, MO; Phone: (913) 677-8674. Or...the next time you go to Japan, just look around and see all of the Maspro antennas in action!

The RF sniffer from NCG/Comet is available from all Ham Radio Outlet stores. For the location nearest you, or to place an order, call (800) 854-6046, (800) 444-9476, or (800) 444-4799; Web: <http://www.hamradio.com>.

Don't Wait for Restructuring

The FCC may or may not have announced its license restructuring decision by the time you read this, but KF4VQT says that—with a little help from your friends—you don't have to wait for restructuring to make friends on HF...even with a Tech license. (And it's legal, too).

By David H. Alden, KF4VQT*
(DHAMCA1@juno.com)

I talk legally with hams on HF, even though I have a Technician class license—and you can, too. This article will explain how I do it, and how I make satellite contacts, too, with just a 2-meter transceiver, an HF receiver, and a cheap computer or two (Photo A).

Like many hams, I wanted to get the most out of my license class, money, and equipment. A good example of doing this is the *CQ VHF* article, "An Indoor OSCAR Station," in the January, 1999 issue. In my case, being retired, I needed flexibility for winters with my wife in Florida, living in a 25-foot travel trailer, balanced with a three-bedroom house in Burlington, Massachusetts. Here's how I approached each step to meet the above goals.

First I bought the ARRL's *The Radio Amateur's Satellite Handbook* to learn what frequencies and modes are used for satellite QSOs. I found this book more useful than I anticipated. With just an FM transceiver, though, I was limited to those satellites, such as AO-27, that offer a 2-meter FM uplink and a 70-centimeter FM downlink (we'll get to the receiver part soon).

Photo A. The author's shack is clean and simple, yet it allows him to operate both VHF and HF—legally—with a Technician class license. (KF4VQT photo)

Assembling a Station

For the 2-meter uplink, I chose a Kenwood TM-261A transceiver, which I can use as a mobile for our Florida trip, as well as a base station with a 12-volt power supply. I found that the 10-watt setting on the TM-261A, drawing about 5 to 6 amps, was all I really needed. I added an external speaker, which I find to be a big help in getting the sound more directly into my ears.

My research for a receiver with wide frequency coverage and all-mode receive led me to ICOM'S IC-PCR1000. This "black box" HF/VHF/UHF receiver is nice and compact, yet it gives me frequencies from 500 kHz to 1300 MHz (minus cellular, of course), with all-mode FM (wide and narrow), AM, USB, LSB, and CW capability. It requires a computer to operate it, but at $500, I was able to buy a two-year old notebook computer to run it and still be within the same price range of a comparable non-computer receiver.

"When it's my turn to speak, Ed transmits on 20 meters: 'Here is KF4VQT as a third party at my station by way of a 2-meter link.' Ed then puts his HF microphone next to his 2-meter speaker, I lower my HF receiver volume, and transmit."

**David H. Alden, KF4VQT, is a 64-year-old retired R&D engineer. Dave and his wife Marie have four daughters, eight grandsons, and one granddaughter. He also enjoys building and flying radio-controlled airplanes.*

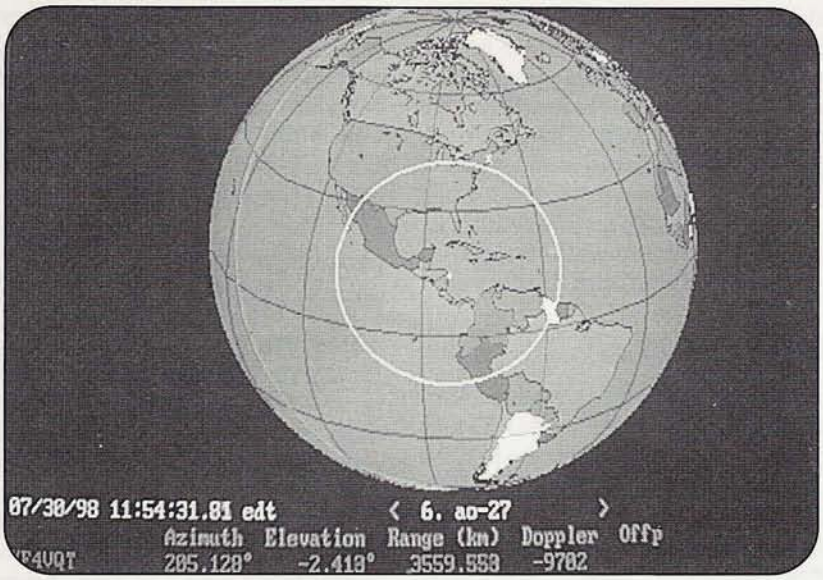


Photo B. The world map display on the author's Instant Track software shows AO-27 (at the center of the white circle) as it passes over Central America. The satellite has just moved out of range of the author's home station in Massachusetts, the X just outside the white circle. (KF4VQT photo)

This also worked out by letting me put both my receiver software and my satellite-tracking program on a computer that I can travel with. The computer software needed for tracking satellites also had to be able to run on my old 486 DX2 computer. I chose "Instant Track" by Franklin Antonio, N6NKF (Photo B), that can run in DOS. For satellite antennas, I use a pair of M^2 "Eggbeaters": the EB-432 to receive and EB-144 to send, both with the reflector kits.

The HF Connection

Now the big plus! Having made new friends through ham clubs in both Massachusetts and Florida, with whom I wanted to communicate, I did the following: I bought a RadioShack "long wire antenna kit" (#278-758) for $10; a 1.8- to 30-MHz "random wire" MFJ antenna tuner (MFJ-16010) second hand for another $10 (it sells new for about $50); plus an old Heathkit model HD-1234 four-position antenna switch for $10 more.

Here's how I make the connection: Ed Papski, W1UKC, a neighbor of mine in Massachusetts (about three miles away), can hear me on 2-meter simplex from my Kenwood 261-A. With my PCR-1000, I can listen to another friend, Joe Santangelo, N1JS, about 10 miles away, on 20 meters, as well as hams from Florida, Ohio, etc. Ed and Joe regularly talk with these folks, and I've been able to join them.

When it's my turn to speak, Ed transmits on 20 meters: "Here is KF4VQT as a third party at my station by way of a 2-

"How far you want to go on your Technician license will depend a lot on your willingness to get involved in ham clubs, ask questions, and set goals for yourself."

meter link." Ed then puts his HF microphone next to his 2-meter speaker, I lower my HF receiver volume, and transmit.** When I go to Florida in the winter, Ed and his wife go to Puerto Rico while Joe stays in Massachusetts. So, from Lake Placid, Florida, my local 2-meter link to HF is with Paul Dove, W9CIY. Every Wednesday morning around 9:00 a.m., I get to talk with Paul, Ed, Joe, and other hams across the U.S. and Puerto Rico using the above method.

I can't say enough about the importance of antennas. For listening only, not transmitting, you can experiment with different lengths of copper wire, known as a Marconi antenna. Also try different heights and orientations while noting which signal is best for the frequency you're monitoring. An example is with my four-position antenna switch. With the antenna tuner between the PCR-1000 receiver and the antenna switch, I can experiment with four different lengths of wires. I was surprised that during certain weather conditions, my 70-centimeter eggbeater antenna brought in cleaner HF signals then the long wire antennas did.

On to AO-27

It would be hard to find any better information for working satellite AO-27 than the two articles by Dave Ingram, K4TWJ in the November and December, 1998 issues of *CQ VHF*. In Florida, with the help of "Instant Track" software, I found certain weekends at around 10:30 a.m. to be the best times for signals coming from the north. I found it interesting that south of me, which is over the Everglades, was dead. (*AO-27 generally operates only on weekends, as it shares its transponder with a commercial satellite, EYESAT, which operates during the week.—ed.*)

I can run both Instant Track and the PCR-1000 receiver from just the notebook computer, but using both computers (see Photo A) allows me to monitor on the PC the picture you see of the Earth in Photo B. Note that the AO-27 satellite is in the center of the white footprint. This information tells me the best time to start listening for signals from AO-27 on the PCR-1000.

How Far Do YOU Want to Go?

How far you want to go on your Technician license will depend a lot on your willingness to get involved in ham clubs, ask questions, and set goals for yourself. In the short time since I got my Technician license in January, 1998, I've done the following to meet my goals: I reviewed all the ham magazines I could locate, then chose *CQ VHF*. I went to meetings at every ham club in my area and then joined the one I felt would help me the most. I talked with hams, during coffee hours and at local restaurants. I helped a friend become a ham (which Don Gumble, KB8SHN, did for me). And I make the very most of the on-air opportunities permitted to me by my license class and equipment budget. Are you up for the challenge of challenging yourself?

**The type of VHF-to-HF operation described in this article is perfectly legal, provided that the control operator of the HF transmitter is authorized to transmit on the selected frequency and that the QSO meets all other conditions of section 97.115 (a) and (b) of the FCC's amateur rules.

Resources

For information on the equipment described in this article, contact the respective manufacturers as instructed in their ads.

To learn more about satellite operating, contact AMSAT-NA, P.O. Box 27, Washington, DC 20044; Phone: (301) 589-6062; Fax: (301) 608-3410; Web: <http://www.amsat.org>.

The Radio Amateur's Satellite Handbook is available from the ARRL, 225 Main St., Newington, CT 06111; Phone: (860) 594-0200; Web: <http://www.arrl.org>.

For information on "Instant Track" satellite tracking software, contact AMSAT (see above) or Franklin Antonio, N6NKF, 2765 Cordoba Cove, Del Mar, CA 92014.

Announcing

The 2000 Roadrunners Microwave Group Cumulative Competition

The recently formed Roadrunners Microwave Group (RMG) has announced a competition to foster increased activity on the bands above 220 MHz.* The RMG Cumulative Competition is designed to reward constant activity on the higher bands and is inspired by the old adage, "Use 'em or lose 'em."

The 2000 RMG Cumulative Competition begins January 1, 2000, and ends December 31, 2000. Points can be earned for daily contacts with any station or stations on all authorized amateur bands above 220 MHz. Multipliers are applied for distance and band. Any licensed amateur in the world is eligible to participate. There is no need to be an RMG member.

The Roadrunners Microwave Group is composed of hams, mostly in south Texas and nearby areas, dedicated to promoting the use of the higher amateur bands.

For complete rules, tally sheets, and multiplier sheet, send a self-addressed stamped envelope (SASE) to: RMG Cumulative Competition, c/o Bill Tynan, W3XO, HCR5 Box 574-334, Kerrville, TX 78028 USA.

*Only the U.S. has lost the use of 220 to 222 MHz. In Canada and many other Region 2 countries the band is still 5 MHz wide. Preventing further erosions of our bands is what has convinced the RMG membership to sponsor this competition.

Reader FEEDBACK!

The following letter was sent to "How It Works" columnist Dave Ingram, K4TWJ:

Hi Dave—I enjoy reading your column in *CQ VHF*. I am especially interested in your series that started in the August issue, "A Mini Study of Voltage, Current, and Resistance." I think this is a great way to help new and not so new hams understand the basic principles that make our equipment work. However, I do feel compelled to clarify several items.

The caption under photo B indicated that electricity is normally produced at dams near lakes or waterfalls. Based on figures from the North Electric American Reliability Council (NERC), Hydro and Pumped Storage Hydro only account for approximately 11.6% of the electricity produced in the U.S. The remainder in descending order is from Coal, Nuclear, Oil, Gas, Geothermal, Other. This information is based on a somewhat dated brochure (1995) with projected 1999 figures for the U.S. and Canada. I apologize, but it was the only data that I had handy while writing this note. The actual figures for 1999 should not vary more then a few tenths of a percentage point from the brochure that I used.

Also, in the article you referred to Photo B saying some rural power lines carry 14,000 to 17,000 volts. I cannot say for certain, but judging from the insulators being used, the tower lines are, at a minimum, 138,000 volts. The one on the left is most likely 230,000 volts or 345,000 volts. Due to the perspective, it is difficult to judge the insulator size of the tower on the right. These are the three-phase line-to-line voltage levels. The electric lines that are normally used to deliver electricity to our homes are typically 12,500 volts three phase, line to line, or 7,200 volts single phase, line to ground.

I hope this helps to clarify these items. I look forward to your continuing series.

73, Mike Fisher, WT9W
via e-mail

K4TWJ Replies:

Hi Mike—Thanks for rounding out our discussion with that insight and words of wisdom. You apparently work with a local power company and probably have a couple of real-life tales that folks would really enjoy hearing. How about briefly sharing one—like hair-raising experiences when standing near power lines, or lightning riding lines and jumping damp insulators, etc.? 73 and may the force of good signals always be with you

Dave, K4TWJ

ICOM T-8 Feedback

Reader Bob Caldwell, N3VAP, called to ask about WB6NOA's comment in his ICOM IC-T8A review (July CQ VHF*) that "the display has a little back light, and you can turn it off, up, or dim on." Bob wondered how to set it for "dim," since the ICOM techs couldn't tell him and his only complaint with the radio was short battery life. Gordon West, WB6NOA, replies:*

There is only one "on" setting for the back light, and I found it to be quite dim at that setting, which is what I was trying to indicate in the review. I, for one, would like to be able to make it brighter.

Reader Bill Thim, N1QVQ, writes:

I read with great interest the T-8 review by Gordon West. It is a great little radio. There was one statement I found possibly in error: In the second paragraph, he mentioned getting extended receive with a set of keystrokes, then in the main body of the article there was a section called "Wide-Band Receive Mod," which went into the explanation of how to open the case (no easy feat in itself), and clip some diodes. This latter mod is for extended *transmit* only; you do not have to crack the case to get the extended *receive* coverage listed in the chart in the article. The explanation of opening the case might frighten some away from attempting to do the *receive* mod.

Gordon West, WB6NOA, replies:

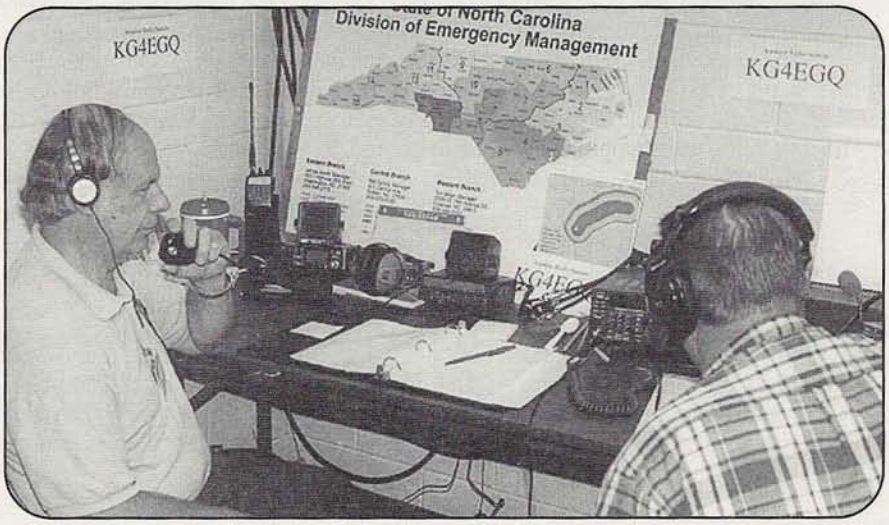
You are correct, Bill, that the receive mod may be done by following the keystroke instructions at the beginning of the article. Performing the "diodectomy" will open up both the transmit and receive coverage, making the "keystroke mod" unnecessary if you choose to go the hardware route. Always keep in mind that you must be extra-careful when transmitting to assure that you are on authorized frequencies, and remember my warning in the article about not using the T8 to transmit on 222 MHz.

Dennis, Floyd, and Ham Radio

The double-punch thrown by Hurricanes Dennis and Floyd on the U.S. East Coast provided a potent reminder that ham radio emergency communications is NOT a thing of the past.

"This is what we train for folks, so it is time to put our efforts to work...." The words came from Terry McCrickard, W4TLM, Old Dominion (VA) Emergency Net Manager. But they applied to hams providing emergency communications up and down the East Coast of the U.S., as Hurricanes Dennis and Floyd left their marks on the region in late August and mid-September.

From virtually no damage in some areas to some of the worst damage of the century in others, Floyd in particular left a path of death, destruction, and *no communications*! Virginia emergency management officials described Hurricane Floyd as "a significant event for Virginia." And New Jersey Governor Christie Whitman, touring flooded regions of her state in the aftermath of then Tropical Storm Floyd, said, "We've never seen anything like this." Yet, as bad as things were in New Jersey and Virginia, they were worse yet—and for a longer time—in North Carolina. Our coverage of ham radio operators responding in the public interest begins this month in the Tarheel State.



Ham operations at the LSA (Logistics Staging Area) in Kinston, North Carolina. At left is Assistant Section Emergency Coordinator Bernie Nobles, WA4MOK, working VHF and UHF radios, while Area 3 District Emergency Coordinator Ron Knapp, W9EF, works HF at the right-hand station. (Photo via Gary Pearce, KN4AQ)

North Carolina Hams Respond Twice to Double Trouble

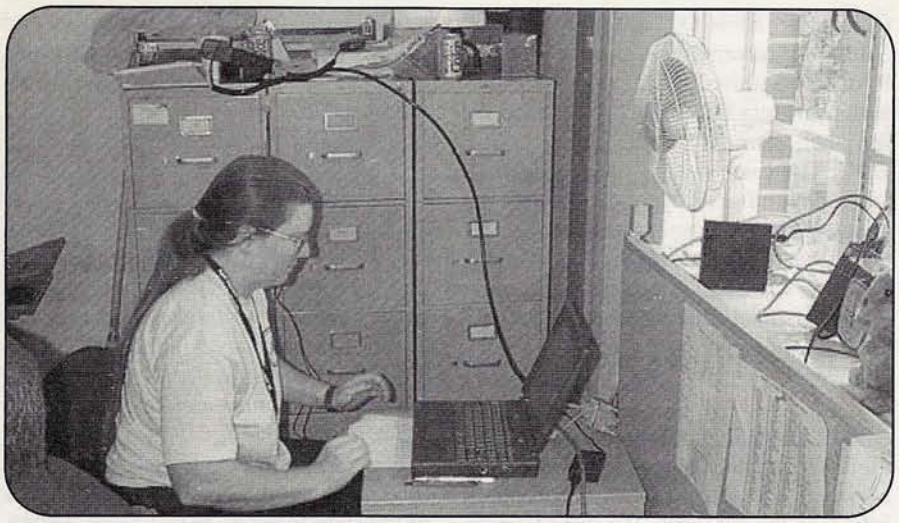
Hurricanes Dennis and Floyd landed a one-two punch on North Carolina, often leaving ham radio as the only means of communications to beleaguered counties. According to the state's ARRL Public Information Coordinator, Gary Pearce, KN4AQ, "Dennis became known as 'the hurricane that wouldn't leave,' as it dithered for days in the Atlantic, pounding the state's Outer Banks islands, before reversing course and finally making landfall, tracking across eastern North Carolina as a tropical storm."

As Dennis approached during the last week of August, amateurs began activating stations at county EOCs (Emergency Operating Centers), the state EOC in Raleigh, and at the Logistics Staging Area (LSA) in Kinston. The LSA was to be the hub of the state's emergency response activity, with operations on multiple HF and VHF frequencies. Operators here were able to communicate through regional repeaters, the Tarheel Net (North Carolina's ARES net, on 3923 kHz), and the Hurricane Watch Net on 14.325 MHz. Meanwhile, additional hams were lined up to staff the state EOC in Raleigh for 24 hour-per-day duty.

Dennis skirted the North Carolina coastline beginning Monday, August 30. Skywarn nets were activated on the Wilmington (146.82) and Trenton (145.21) repeaters. Damage in the southern coastal counties around Wilmington was only moderate. But, as the hurricane paralleled the Outer Banks islands, its movement stalled. For three long days, it barely moved, all the time lashing the Outer Banks with hurricane or tropical storm force winds.

An evacuation had been ordered, but, as usual, hundreds of people remained behind to "ride out the storm" on Hatteras and Ocracoke islands. These islands are long, narrow strips of sand, stretching as much as 30 miles off the mainland. The people who didn't evacuate became trapped for days, as high winds and storm

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



Cindy Rohrer, AE4EF, District Emergency Coordinator for RACES District 9 in Virginia, sends a request for state aid from the Southampton Sheriff's Office to the Virginia Department of Emergency Services in Richmond. Southampton and Franklin had to rely exclusively on amateur radio as there were no telephone communications whatsoever for nine days, not even 911. (Photo by Thomas Rutter, KF4HJX)

surges closed the only bridge and road through Hatteras and kept ferries from running to Ocracoke. Power, water, and telephone communications all failed. Amateur radio, and one solitary cellphone, became the only communications between the mainland and the people trapped on the islands.

Dare County Emergency Coordinator (EC) Harry Bridges, K4UOR, reported that several hundred messages were passed by amateurs around the Outer Banks and mainland areas for more than a dozen agencies. All this was done with only about 15 amateurs in this rural part of North Carolina. The hams on the islands used a linked repeater system, augmented by a series of crossband repeaters. The linked repeaters reached far enough inland to permit direct communications with the LSA in Kinston and the state EOC in Raleigh.

Report from Hatteras

Lou Browning K4USB, assistant EC for Dare County, was one of the hams operating from Hatteras. He gives this report of some of the communications:

The day after the storm hit here, I got up and went to the EOC to check in (I am on the advisory board as a ham radio operator). Our first priority was to find out how bad the situation was and why we didn't have any water pressure. I drove a fire department M715 (*a specialized offroad Jeep—ed.*) down to the water plant to see how deep the water was on the access road and to check the power lines going to the plant and to the well field.

Our 800-MHz EOC trunking system wasn't working (unfortunately the power company uses the same system). But I was able to communicate by ham radio with Randy Jordan, W4HAT, who runs the power generating plant here on the island and on Ocracoke. By being on the repeater with W4HAT, I was able to tell the local power company exactly what the condition of the lines and fuses to the water plant and pumping stations was in real time.

The next task was to drive down to Hatteras village and check the power line south about four miles to where it turns into a submarine cable under Hatteras Inlet. This is the power feed line for Ocracoke. There is no paved road and there was about three to four feet of water on the sand road. When I got to the end where the submarine cable pops up, I couldn't talk with anyone except Randy via 2 meters. Standing on the cab of the truck at the edge of Hatteras Inlet, I was giving power line conditions—through Randy—directly to the power company that feeds Ocracoke and to the Raleigh, North Carolina power office.

My wife, Linda, is the disaster team coordinator for lower Hatteras Island and had many third party conversations with the Red Cross representatives in the Dare County EOC in Manteo via a 440 crossbander here on Hatteras and the Columbia 146.835 repeater.

A few helicopters were able to slip in and out of Hatteras during quieter moments of the storm. Hams helped coordinate the helicopter evacuation of a pregnant woman who was flown to the mainland and gave birth to a healthy baby.

Browning also says the hams on Hatteras are "communications nuts." They carry radios for multiple emergency communications organizations, giving them more flexibility than the operators in any one organization. Still, he says, ham radio is their most reliable form of communications at any time. And since there are no broadcast stations on the Outer Banks, most of the public gets its emergency information by listening to the hams on scanners.

On the Mainland

Elsewhere along the coast, Edward Napoleon, KC4JKW, of Jacksonville, North Carolina, reported that Onslow County got a brand-new EOC building just a few days before Dennis hit. They didn't have their amateur radio antennas up yet, so a temporary VHF station was set up, while the HF link to the state EOC in Raleigh was maintained by a station operating at home.

The Kinston LSA was kept on the air by hams from the Brightleaf Amateur Radio Club in Greenville and the Kinston Amateur Radio Society. The station at the state EOC in Raleigh was manned 24 hours per day with help from hams from many area clubs, including the Raleigh Amateur Radio Society, the Cary Amateur Radio Club, the Johnston Amateur Radio Society, and students from the NC State University club. Most of the operators reported light traffic. Glenn Bloodworth, KO4TV, said that during one shift in the state EOC, he helped dispel rumors of mass starvation on Ocracoke that the media had somehow picked up.

Getting "Floyded"

Two weeks later, Hurricane Floyd crossed the Atlantic as a huge, ferocious storm that threatened tremendous devastation. Although Floyd weakened considerably before making landfall and veered east of the course that would have taken it through the state's capital in Raleigh, it dropped an incredible amount of rain as it passed quickly through North Carolina and left behind record flooding across the eastern third of the state.

The next day, under sunny, blue skies, emergency management officials realized they had a tremendous flooding problem on their hands. They had a communications problem too, as, one by one, county EOCs and public service agencies lost power and communications to floodwaters. Once again, hams filled in to provide local communications and the link to the LSAs and the state EOC.

Three days after Floyd crossed North Carolina, hams were being helicoptered

into Edgecombe County to provide relief for other operators who had been on duty in Tarboro, a town that was completely flooded. Once again, hams provided the only communication links after floodwaters knocked out the county communication system. Shelters opened as far west as Winston-Salem, 250 miles inland, and hams headed once again to the EOCs. Some 6,400 evacuees stayed in 63 Red Cross shelters, including 3,000 at Tarboro High School, which had no running water, no electricity, and ran out of food after Sunday breakfast.

Federal Emergency Management Agency Director James Lee Witt was quoted by the Associated Press as saying initial reports indicated that damage in North Carolina would likely exceed that inflicted by the state's previous worst-ever disaster, Hurricane Fran, which left behind a $6 billion cleanup bill in 1996.

Next Stop: Virginia

After dumping tremendous amounts of water on North Carolina, Floyd—now a tropical storm—moved north to Virginia. By the evening of September 16, after Floyd had gone out to sea off the New Jersey coast, floodwaters ruled over areas from North Carolina to New York.

In Virginia, Frank MacKey, K4EC, ARRL Section Emergency Coordinator (SEC) and State RACES Officer, said: "All hell broke loose in Area A (the coastal areas of Virginia) At one point, Interstate 64 in Hampton, Virginia, and Interstate 95 between the North Carolina border and Prince George County (Virginia) were closed in both directions because of severe flooding."

Although the storm had quickly headed north, Assistant SEC Tony Amato, KR4UQ, advised radio amateurs in his area that "it ain't over—we are now handling traffic from cities and counties who have not a shred of telephone service. More traffic now than anytime before. MEDFLIGHT, pumps, ARC feeding requests, beds, blankets."

Little did they know that it wouldn't be over for almost a week.

The worst flooding in Virginia occurred in the City of Franklin, with the downtown area and 182 businesses under more than 12 feet of water. According to MacKey, the flood washed away the GTE telephone switch serving the area and all telephone service was disrupted for as long as three weeks. Cellphones have been useless. Assistant SEC KR4UQ and ARRL Virginia Section Manager Lynn Gahagan, AF4CD, operating under extremely adverse conditions, supplied RACES communications out of the area to the Virginia EOC. The flooding forced the abandonment of the Franklin City EOC. The river was still rising slightly, three days after Floyd ran through the area. As MacKey explained it, "one problem is that the extensive flooding in North Carolina leaves no place for the flooding waters to travel and relieve the problem."

Digital Joins Voice

RACES members provided voice and digital communications around the clock between the state EOC, the Wakefield office of the National Weather Service (NWS), and the affected area, which MacKey described as being rural. Many hams were mobilized from other areas of the state.

Digital modes played in large role in the communications between the affected EOCs and the State EOC and Red Cross. One station handled almost 600 messages. The Internet may have reduced the popularity of packet," said MacKey, "but for emergency communications, it still has a very important role."

Keith Rushing of the (Franklin) *Daily Press* reported that hams in Franklin stayed in contact with firefighters, police officers, the National Guard, State Police, the Virginia Forestry Department, and the NWS. They reported which roads were passable and monitored the floodwater levels.

According to state officials, RACES was expected to remain operational for 10 days. Amateurs supporting Red Cross operations were expected to remain in service well past then. Approximately 150 Virginia ARES/RACES members participated in the largest operation the organization has ever undertaken, providing over 6,400 hours of service to the Emergency Management community of the Commonwealth.

One Fire/EMS official, who had brought in mutual aid from many areas of the state to assist, asked Tony Amato, the Assistant SEC, "How are you able to get everything covered by hams when we are stretching our resources to the max?"

Amato replied, "We have a lot of good people who did what needed to be done."

Ten days after the worst storm to hit Virginia since 1954, the Virginia ARES Web page announced, "Virginia ARES/RACES Area A activation level is NORMAL as of 9/26/99 @ 2200 hours."

Not Much Better to the North

As Floyd continued its torrential path northward, Skywarn spotters in New

Darrell Moore, KR4MA, RACES District Digital Coordinator and Bruce Powell, KD4GFM, pass critical traffic from the City of Franklin EOC in storm-stricken Virginia. Bruce, a resident of Franklin, worked the EOC before it was finally overcome by floodwaters and abandoned, and was the first to report, "Richmond, we have a problem." Darrell's packet BBS handled over 500 pieces of mission-critical traffic during the emergency. (KF4HJX Photo)

Jersey and Pennsylvania provided valuable information to the NWS, which helped that organization post watches and warnings. Flash flooding activated hams in New Jersey to provide communications assistance for county EOCs and the Red Cross. According to Deborah McKay, WX2DEB, Sussex County, New Jersey, Skywarn Coordinator, "This is what ham radio is all about. Disaster relief and public service."

While only the hardest-hit areas of New Jersey lost electrical power for any length of time, floodwaters in the northern New Jersey town of Rochelle Park took out a Bell Atlantic/AT&T switching station, cutting off or limiting phone service to over *one million* people. According to a report in the Newark *Star Ledger*, 35,000 people lost phone service completely, tens of thousands lost cellphone and beeper service, and as many as one million people were limited to local calls only. "To make matters worse," the newspaper reported, "no one seemed to have much of a clue when service would be restored."

While most service was rerouted to alternate switching stations within a few days, this outage and all of the others we've reported on here should serve as a reminder to emergency management officials that cellphones aren't always the answer to their communication needs, and that when all else fails, it is ham radio—and ham radio operators—who will come through.

Y2K: T Minus 30 and Counting...

Many hams in the east would agree that, after providing communications during the hurricanes, anything that comes up over New Year's weekend will be a breeze to handle. Our original topic for this month was supposed to be a look at amateur radio Y2K plans around the world. Elsewhere in this issue, KF6FGB suggests one way all of us can help usher in the year 2000. Instead, in this short space, here's a brief look at what hams in other parts of the world will be doing at midnight on December 31:

Down Under

Australia will be one of the first places to greet the new year, and hams "down under" will be in the middle of getting ready for the 2000 Summer Olympics in Sydney. At the same time, they are being asked to provide national and regional communications for Y2K. According to information posted on the Wireless Institute Civil Emergency Network's (WICEN) Web page, "For years we have been ignored by many agencies and councils, etc. during emergency planning, but suddenly, when communications may become difficult, these organizations have said 'We will use WICEN.' This, of course, far exceeds our capabilities, especially as some of our operators may have to work themselves."

On the Greenwich Meridian...

In England, David Whiteman, G1ADW, Zone 6 Coordinator for the London area of The Radio Amateurs' Emergency Network (RAYNET) says:

During the Millennium period, RAYNET Groups will, as usual, be prepared to provide additional emergency communications for the "User Services" including the Emergency Services, Government Departments, and local authorities. Wherever possible, RAYNET Groups have avoided taking on "pre-booked" events, in order to have sufficient members available should they be needed in earnest.

Should RAYNET be called out by any of the User Services, we shall, of course be using frequencies in the amateur radio bands, particularly 2 meters and 70 centimeters, and to a lesser extent 23 centimeters, 4 meters (70 MHz) and 6 meters. I am not aware of any RAYNET groups making any anticipatory deployments of their resources.

African Arrangements

Sean Inggs, ZR5BBL, of HAMNET, the South African Radio League's public service group, commented, "Like everybody else, we just don't know whether 12/31/1999 to 1/1/2000 will be little more than a damp squib or something approaching Armageddon."

I asked Sean about activity in other African countries active in emergency communications. He said, "Well, I know that in the neighboring countries there are hams out there in Zimbabwe, Mozambique, Namibia, etc. And it is a duty for hams to provide emergency comms, so I take it they do provide when it is needed. But countries like the Congo, Angola, etc., I don't know." It is widely predicted that Third World coun-

tries are much more likely to suffer Y2K-related computer problems than developed countries.

A Final Note...

First of all, a big thank you to the hams in the path of Hurricane Floyd for providing us with information while providing disaster communications. This article highlights the need for preparing and drilling for that "storm of the century." Training and preparation pay off.

The world of public service communications has changed. We are now being taught how to deal with terrorist incidents, and we're expanding our skill sets as trained communicators.

For the past few years, I have had the opportunity to bring you some of the most interesting stories of hams going the extra mile to serve in the public interest. In some cases, we were the first to cover the event. None of this could have been done without your help.

City of Franklin EOC Commander Shawn Booth and another unidentified Emergency Coordinator pose questions to the National Weather Service (NWS) through the KB4ZIN RACES Tactical repeater at Williamsburg, Virginia. The NWS office at Wakefield was also without telephone service, and the only way critical river flood data could be passed to the flooded locals was via 2 meters. NOAA weather radio was also out. The Skywarn 2-meter station at NWS was very busy during the entire emergency. Control operators are not shown. (KF4HJX Photo)

For me, the most interesting story—which is still going on—has been our coverage of ham radio in the Balkans. A September report said, "Radio amateurs reported that one Serb was killed, and several wounded during the mortar attack on the [Kosovo] areas of Donja Budriga and Partes villages." What the story did show is that we still have the skills of extending "friendship via amateur radio." My coverage began with a simple response to a ham who left a note on his Web page to "drop him a line." The friendship continues.

Next month, we start a brand new adventure in *CQ* magazine by covering all public service and emergency communications, not just those on 50 MHz and above. I look forward to seeing your comments on the various national list servers or to hearing from you directly. One e-mail address where you will be able to reach me is <WA3PZO@aol.com> (*<wa3pzo@cq-vhf.com> will also continue to work for the foreseeable future—ed.*).

Happy Holidays and Happy New Year! Until next time...

—73 de WA3PZO

A $10 Packet Station!

Yes, it's for real! Of course, it doesn't include the cost of a computer and a radio. And you need to be able to do some soldering. But overall, it's a pretty good deal.

Packet for under $10? It may sound impossible, but it's true. In the past two months, we had a look at the traditional way to get on packet. This month, John Hansen, W2FS (ex-WAØPTV), will show us how to harness the power of FlexNet and get on the air for a mere pittance. Over to John...

—N2IRZ

This month, I'm going to show you how to put a packet radio station on the air for less than $10. Now I'm sure you're saying, what's the catch? And, of course, there is one. In order to work this miracle, you must have a computer with a sound card, a 486 or better processor, and either DOS or Windows 95. If you have the computer, lack of a sound card should be no barrier. I've seen sound cards offered new for less than $25. The basic thrust of this project is to use your sound card as a cheap modem and use the processing power of the CPU to encode/decode the data stream.

First, the Software

The first part of getting your station up and running is to install and configure the software. This will allow you to monitor packet activity on the air. The second part involves the construction of a simple interface circuit, allowing you to key the transmitter.

If you have Web access, visit the *CQ VHF* Web site (see "Resources") and download the PC/FlexNet kernel, Windows95 interface, sound card driver, and the BayCom Terminal user interface. The four files you'll need are PCF.ZIP, FLEX95.ZIP, SM.ZIP, and BCT.ZIP.

Alternatively, you can visit the official FlexNet Web site (again, see "Resources") and download the latest versions yourself. The only difference is that the files on the FlexNet site are compressed using a program popular in Europe called LHA. For your convenience, I've also placed a copy of LHA213.EXE, a self-extracting compressed file, on the *CQ VHF* Web site.

If you don't have Web access, you can send a dollar to cover the cost of diskette and postage (and your return address!) to Don, N2IRZ, c/o *CQ VHF*, and he'll send you an IBM-formatted floppy with the files on it.

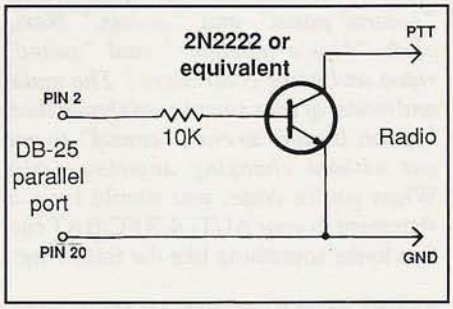


Figure 1. The schematic diagram for the PTT driver using your computer's parallel printer (LPT) port. One transistor and one resistor—what could be simpler! Refer to the text for assembly details.

What's in the Programs?

PCF contains the main kernel of PC/FlexNet, described in the June, 1997 edition of "Digital Data Link." For this project, you really aren't going to be using the networking capabilities of FlexNet, and virtually none of the description in that column sheds any light on the application described here. But if you want to know how it's being used for networking in Germany, look up that column, as it contains an excellent description.

This software runs under both DOS and Windows95. *FLEX95* contains the additional files you need to run the software under Win95. Be forewarned, though, that this software will *not* run well under Windows 3.x., NT, or 98.

SM contains the sound card drivers that allow you to use your sound card for sending and receiving packet radio signals. The only real problem with this system is that it does not use the standard Win95 sound card drivers. The documentation that comes with the new driver explains that this is because of timing problems with the Win95 drivers that cannot be overcome. What this means is that if you run this system under Win95, you will have to reboot your computer before you can use your sound card for other applications. This is an annoying drawback, which in theory could be overcome by installing a second sound card dedicated to packet only.

BCT is a special version of the "BayCom" packet radio user software that has been written to work with FlexNet. It runs under DOS or in a DOS box in Win95. As yet there are no native

"In order to work this miracle, you must have a computer with a sound card, a 486 or better processor, and either DOS or Windows95."

By Don Rotolo, N2IRZ (n2irz@cq-vhf.com)

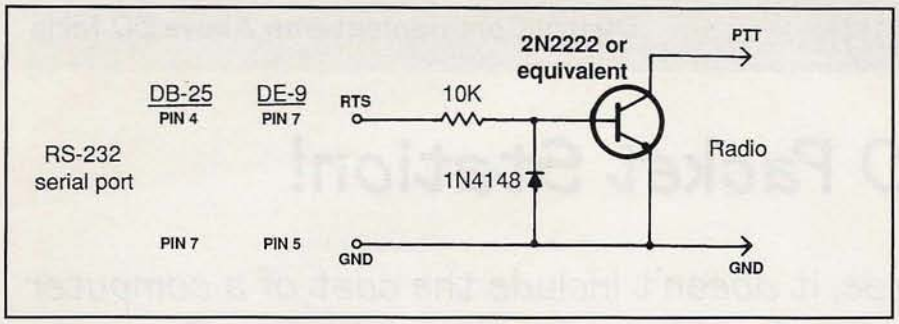


Figure 2. The schematic diagram for the serial (COM) port PTT driver. Note that the pin assignments change depending upon your RS-232 port's connector (DE-9 or DB-25). Although this circuit should work just fine, the author has not tested it.

Win95 terminal programs that run with FlexNet, though some are reportedly under development.

Step-by-Step

After you've obtained the software as instructed above, follow the step-by-step procedure outlined below to complete the project. I suggest you check off each step as you complete it. If you're old enough to remember, think of this as a Heathkit construction manual.

Step 1: Create a subdirectory on your hard disk named FLEXNET. Copy the file you downloaded into that subdirectory and self-extract it.

Step 2: Make sure your sound card is installed correctly under DOS. If you installed your sound card under Win95, you may not have installed any of the DOS drivers, since you don't need them. You *will* need them in order to run the FlexNet system, however. The easiest way to determine whether they were installed is to boot up in DOS (not Windows) and run some software that requires a sound card. If you hear something, your sound card DOS drivers have been installed. There is generally a program that comes with sound cards that will play .WAV files that you can use for testing.

If you do not have sound card drivers installed under DOS, haul out the disks that came with your sound card and install the drivers. Usually this process is automated and pretty easy to accomplish. (*If your soundcard and drivers came preinstalled, the DOS drivers may be on your hard drive but not yet be installed; check for them. If you don't have the DOS drivers at all, check your sound card manufacturer's Web site. And if you don't know who made your sound card, follow these steps: Click the Windows "Start" button, then click "settings," followed by "control panel" and "system." Next, click "device manager" and "sound, video and game controllers." The make and model of your sound card should then appear. Be sure to click "cancel" to get out without changing anything.—ed.*) When you're done, you should have a statement in your AUTOEXEC.BAT file that looks something like the following:

SET BLASTER=A220 I5 D1 H5 P330 T6

The parameters for your system may be different, but the statement should start with SET BLASTER.

Step 3: Configure Win95 to allow you to access the sound card (skip this step if you're not running Win95. If you are running Win95, you need to perform this step even if you're planning to run the program by booting to a command prompt).

Boot into Win95. Go to your control panel and double click on "system" (*refer again to the Editor's note above if you don't know how to do this—ed.*). Pick the "Hardware Profiles" tab. It will probably just say "Original Configuration." Push the "Copy" button to create a new configuration. You will be asked to specify a name for the new configuration; call it anything you want. I called mine "SoundBlaster Packet." Click OK and then go to the "Device Manager" tab. Select your sound card from the list and pick the "Remove" button. You will then be presented with a dialog box that will ask you if you want to remove it from all configurations or just one. Pick *just one*.

Next, remove the sound card from the *new* configuration. You may have to remove the parallel port from this configuration as well. While you are in the device manager, double click on the parallel port you'll use to key your transmitter. Then pick the resources tab and make a note of the first number in the Input/Output range. It is likely to be either 0378 or 0278. You'll need this later. Then reboot your computer.

Step 4: Make sure your path statement (SET path = ...) includes the directory that has the Flexnet files in them. You'll need to edit your AUTOEXEC.BAT file to make this change.

Step 5: Add the following statements to your AUTOEXEC.BAT file (these go at the bottom of the file, but before any command you may have in there to start Windows). You should use Notepad or some other text editor to open the file, located in the root directory of the C: drive.

CD\FLEXNET (Assuming that you've called your Flexnet subdirectory "FLEXNET." Use whatever directory name you chose in Step 1A)
LH FLEXNET
LH SMSBC /tl:0x378 (Where 0378 is the Input/Output range number you noted above in Step 3)
FLEX
LH SMAFSK12
FSET MODE 0 1200
FSET TXDELAY 0 30
SMMIXER /s:line /o:-24 (If you have a SoundBlaster card. For other cards, see text below)

Step 6: Reboot your computer, looking for error messages. If you see any errors, check your work to see what you may have done wrong.

Receive Testing

Step 7: Get your radio audio into your PC. You'll need a patch cable for this. Run the audio from the speaker output of your radio to the line input on your sound card.

Step 8: Turn up the audio from your radio to a moderate level, tune to a channel that has some packet activity. Then from the DOS command line in your FlexNet directory, type SMDIAG to run the diagnostics program included with the sound modem driver. You'll see an oscilloscope-type display of the incoming signal. You want to adjust the volume so the signal fills about two thirds of the screen.

Step 9: If all has gone well so far, you're now ready to receive packet. At the command line, type:

BCT/*yourcall* (where *yourcall* is really your own callsign)

BCT is essentially the popular BayCom program that has been tailored to FlexNet, so if you're familiar with that

"If you're old enough to remember, think of this as a Heathkit construction manual."

program, this will now be a piece of cake. If you're not familiar with *BayCom Terminal*, you may wish to obtain documentation on it (visit the BayCom site, <http://www.baycom.de>, or you may just want to play with it until you get the hang of it. User input is taken in the top window of the screen. Commands are preceded with a colon. So to turn on monitoring, type:

:MON on

You should begin to see packets in the bottom window.

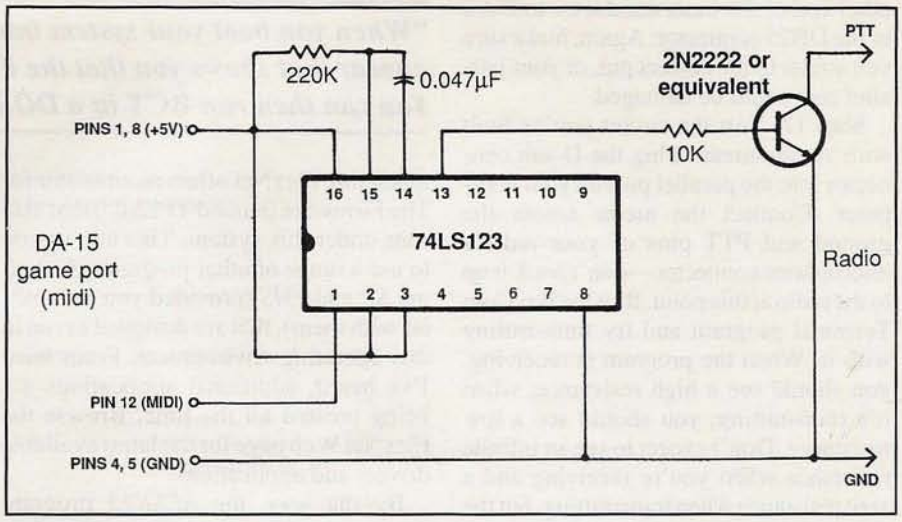


Figure 3. The schematic diagram for the game port PTT driver. Although a little bit more complex than the parallel and serial port circuits, many people don't use the game port, so it's usually the most available. Again, the author has not tested this circuit, but it should work just fine.

The Transmit Side

Step 10: Connect the transmit side of the system. You need to connect an audio line from your sound card to the microphone input on your radio, allowing you to transmit. You'll also need a way to key the transmitter, which presents a minor problem: Sound cards don't have PTT (push-to-talk) outputs.

The solution is simple enough: just use one of the computer's interface ports. Thomas Sailer, HB9JNX, who developed the sound card drivers, provided three ways to key the transmitter, using either a serial port, parallel port, or the game port. I suspect these all work, but the only one that I've actually tried myself, shown in Figure 1, uses the printer port. All of the parts are available at RadioShack (see "Parts List"), so heat up your soldering iron! Figures 2 and 3 show the serial and game port versions, respectively, in case you prefer these options.

You'll also need a suitable microphone plug for your radio. This could drive the cost above $10 if you have to buy everything new at RadioShack.

Building the Interface

Proceed as follows:

Step 11: Cut off a length of shielded audio cable long enough to run between your computer and your radio. At one end of the cable, solder the two inner conductor wires to the microphone connector; one to the microphone audio input pin, and the other to the PTT input. Solder the shield to the Ground pin.

Step 12: On the other end of the audio cable, split the shield into two strands. One strand of the shield, and the wire from the microphone audio input pin, should be extended about a foot with another piece of audio cable. Connect the microphone audio input wire to the tip of a 3.5-mm (^{1}/8-inch) stereo plug, and connect the shield to the shield of the plug. Leave the center ring unconnected. This plug will go to the speaker jack on your sound card.

Step 13: Solder the other strand of the shield to the emitter of the transistor (see Figures). The back of the transistor package will have a diagram showing which lead is the emitter. Remember that transistors cannot take much heat, so use a heat sink (such as an alligator clip) on the transistor lead between the transistor case and the soldering point.

Step 14: Solder the line from the transmitter push to talk line to the collector of the transistor, again referring to the back of the package.

Step 15: Now take another short piece of the audio cable. Solder the shield of one end of this wire to the transistor emitter, again using a heat sink (there will now be three wires connected here: two shields and the transistor lead). Solder the other end of the shield to Pin 20 of the DB25 connector. If you look very closely, you can see the pin numbers on the D-Sub connector itself. Make sure you don't solder to the wrong pin, as this could damage your computer.

Step 16: Solder one end of the resistor to the base of the transistor (the only lead left). Solder the other end of the resistor to one of the inner conductors of the cable we soldered in Step 15 above. Solder the

"Thomas Sailer, HB9JNX, who developed the sound card drivers, provided three ways to key the transmitter, using either a serial port, parallel port, or the game port."

Parts List

To construct the parallel port PTT driver, scrounge your junkbox, contact your favorite parts supplier, or visit RadioShack, for the following components:

RS Part #	Description	Price
276-1547	25 pin male DB25 D-sub plug	$1.49
276-1549	Hood for above	$1.19
271-1335	10K resistors (pack of 5)	$ .49
276-2009	MPS2222A transistor	$ .59
274-284	Pair of 1/8-inch stereo plugs	$2.49
278-514	20 feet 2-conductor shielded audio cable	$3.89

other end of the inner conductor to Pin 2 of the DB25 connector. Again, make sure you solder to the correct pin, or your parallel port could be damaged.

Step 17: Test the circuit you've built with an ohmmeter. Plug the D-sub connector into the parallel port on your computer. Connect the meter across the ground and PTT pins of your radio's microphone connector—don't hook it up to the radio at this point. Run the BayCom Terminal program and try transmitting with it. When the program is receiving, you should see a high resistance; when it's transmitting, you should see a low resistance. Don't expect to see an infinite resistance when you're receiving and a zero resistance when transmitting, but the change of resistance should be obvious. All that's left is to ensure that your audio is adjusted properly.

Step 18: Connect the radio microphone connector and run BCT. Transmit some packets while monitoring them on another radio (such as an HT). If it sounds like packet to you, it will probably work fine. If not, you can increase or decrease the transmitted audio level as needed using the following command:

SMMIXER /o:-24

You can change the transmit level by adjusting the value at the end of the command line. Note that it is a negative number, so making its absolute value larger will lower the level while making the absolute values smaller will raise the level. Also note that *SMMIXER* may not work with sound cards other than genuine SoundBlasters. I have one computer with a SoundBlaster and one with a Pro Audio Spectrum card. The *SMMIXER* program does not work with the Pro Audio card. However, the card came with a DOS-based mixer program, called *PAS*, which can be used to turn up or down the gain on the sound card, and it works fine. Consult your sound card manual for further directions.

Ta-Dah!

You now have a working packet system under DOS. You should also be able to run the system under Windows95. When you boot your system into Windows, a splash screen will appear that shows you that the Flex drivers have been loaded. You can then run *BCT* in a DOS Window.

But there's more: *BayCom Terminal* is not the only program you can run using this setup. FlexNet offers an emulator for The Firmware (named TFEMU) that also runs under this system. This allows you to use a range of other programs, including *SP* and *THS* (provided you're familiar with them), that are designed to run in this operating environment. From what I've heard, additional applications are being created all the time. Browse the FlexNet Web page for the latest available drivers and applications.

"When you boot your system into Windows, a splash screen will appear that shows you that the Flex drivers have been loaded. You can then run* BCT *in a DOS Window."

By the way, the *AFSK12* program allows you to run 1200-baud packet. There is another program included with the package, called *SMFSK96*, which is supposed to run 9600-baud packet using the same setup. Of course, you need a radio that's capable of 9600 baud. I've tried this package and, as yet, had only limited success. I can connect at the higher rate, but I'm having trouble pushing data through. But it should work. (*Some sound cards don't have the 16- to 20-kHz audio bandwidth required for 9600 baud FSK.—ed.*) By the way, FlexNet is the work of Gunter Jost, DK7WJ. The sound card drivers for Flexnet were written by Thomas Sailer, HB9JNX.

N2IRZ de W2FS, Over...

N2IRZ here again. I want to thank John for his kind permission to reproduce his article, a similar version of which first appeared in the Northern Chautauqua Amateur Radio Club's *Static Sheet* newsletter. It was then picked up by the TAPR *Packet Status Register* earlier in 1999, where I saw it.

Although I have always known that FlexNet is just as powerful for use at a home station as within a network, I guess I never really explained it that way. Although it forms a high-performance network, I Now see it as much more useful as a user station as well, where its wide variety of channel drivers and applications make it flexible enough to meet everyone's needs. I suppose that's why they named it FlexNet!

Now that money isn't standing in your way to operating packet, no more excuses! You know, I also see this as an excellent alternative to traditional packet when traveling—my laptop has a sound card installed, so all I need is my HT! Write to me and let me know how it turns out.

Changes

Once again, another year comes to a close. This time, all of the digits will change, and even though the millennium isn't over for another year, I sure plan on celebrating "like it's 1999." When the year comes to a close, so will another chapter in amateur radio: As I'm sure you know by now, *CQ VHF* will be merging with *CQ* magazine as of the next issue. While I hope to be an occasional contributor, there's only room in *CQ* for one packet column, and that's "Packet User's Notebook," by Buck Rogers, K4ABT. Buck has taught me much of what I know today about packet.

As is my tradition at the end of each year, I want to once again send you and yours all the very best wishes of the season, for happiness, health, and maybe some wealth. We should all work toward keeping that warm fuzzy feeling alive throughout the whole year. Until we meet on the air, 73 & SK,

—N2IRZ

Resources

Visit the *CQ VHF* Web site to download the software mentioned in this article. When you reach the *CQ VHF* home page, <http://www.cq-vhf.com>, a link from the December issue's Table of Contents will lead you to the download page.

Alternatively, visit the FlexNet home page at <http://home.pages.de/~flexnet>, where all of the files mentioned, and many more, are kept up to date. There is even a page devoted to the SoundModem driver, with hints and wiring diagrams: <http://home.pages.de/~flexnet/sm.html>.

For a PC-formatted diskette with the files on it, send $1 to cover the cost of diskette and postage, along with your return address, to $10 Packet Software, c/o *CQ VHF*, 25 Newbridge Rd., Hicksville, NY 11801.

All about Indoor Antennas

Effective indoor antennas are becoming a topic of great interest, as more hams find themselves faced with restrictions on outdoor antennas. This month, WA5VJB looks at the "cost" and "value" of keeping antennas inside the house.

I can certainly tell that some of you read my articles in tremendous detail. One little comment on how I place many of my antennas inside my attic brought quite a large response from readers, mainly from those having problems with building or neighborhood restrictions about antennas.

Photo A. Some, but not all, of the author's coax runs. WA5VJB currently has 31 antennas: 20 outside and 11 inside. That's a lot of cable!

Attic = Antenna Farm

I currently have 11 antennas mounted inside my attic, mainly to keep the coax runs short and to keep the antennas out of the weather. I certainly have enough antennas outside to catch the eye of passersby, so I don't need to hide them; but the lower visibility is certainly a plus. I have also been doing quite a bit of work on indoor TV antennas where we have been looking at different attenuation factors for frequency and building materials.

The big negative, of course, is that a signal transmitted from inside your attic won't go as far as one sent from an outdoor antenna on a mast or tower. But how much signal do you *really* lose? (For those of you who regularly work with Rician Propagation models, bear with me, I'm going to average a lot of loss factors.)

Loss through the roof of the house varies between 3 and 10 dB (see Figure 1). Plywood and composition singles have the lowest loss (uh, haven't looked at thatch roofs yet), as long as you don't have a ridiculous number of roofing layers on an older house. Tile roofs seem to have the highest loss, and wood shingles vary tremendously, depending on how long it has been since it last rained. The aluminum tile roofs that simulate wood shingles have a surprisingly low loss. The metal squares are too small to affect 6 or 2 meters, and they seem to re-radiate signals at 450 MHz. But 3 to 4 dB is a typical loss for VHF signals though a roof.

A side note about aluminum siding: those long strips of aluminum act like a polarizing grid. Vertical polarization goes through it pretty well while horizontal polarization is blocked. So if you like to sit in the living room and chat with buddies on the local repeaters, aluminum siding on your home has little effect on signal strength. On the other hand, if you're into SSB work, where everyone uses horizontal antennas on VHF, you've got a problem.

How High Is High Enough?

Height is the other big factor in signal strength (see Figure 2). Raising a VHF antenna from 10 feet to 20 feet typically picks up about 6 dB in gain. Raising the antenna from 20 feet to 30 feet picks up another 3 dB.

So an antenna mounted inside the attic of a single-story home will be about 10

By Kent Britain, WA5VJB (wa5vjb@cq-vhf.com)

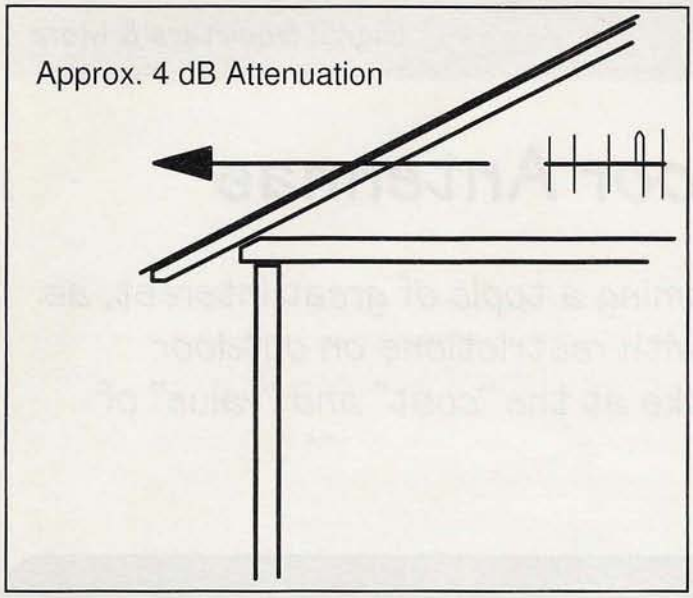


Figure 1. Loss through the roof of a home varies between about 3 dB and 10 dB, depending mostly on the type of shingles that cover the roof.

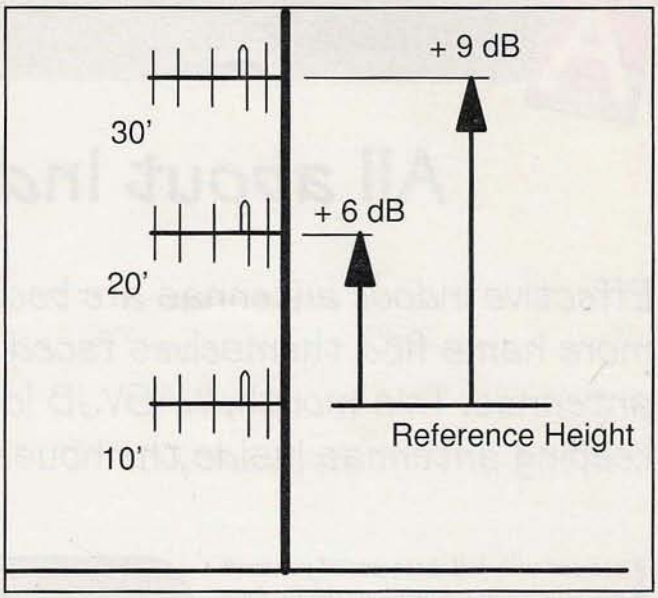


Figure 2. Height gain is an important consideration on VHF and is another factor affecting signal strength from an indoor antenna.

dB, or nearly 2 S units, weaker than if the antenna was mounted outside at 30 feet (before someone splits too many hairs/dBs, with real installations, the outside antenna usually has a longer run of coax and I'm compensating for that a bit). Height gain also varies depending on how far away the receive station is. For this exercise I was assuming a repeater on a modest building or tower about 25 miles away.

But don't forget the gain of the antenna. For example, a Cheap Yagi inside the attic works almost as well as a quarter-wave ground plane antenna outside, at 30 feet. And you don't have to worry about getting water in the coax. If you've got water in the coax, you've got much bigger problems!

Mounting an Attic Antenna

There are several ways to mount an antenna inside an attic. One of the easiest is to drive a few nails into the rafters then tie the antenna to the nails with string, or—my personal favorite—Weedeater® line. I have also had good luck just putting a large cardboard box between the rafters and placing the antenna on the cardboard box!

Currently I have 31 antennas at the house: 20 outside, and 11 inside the attic. This makes for quite a few runs of coax (Photo A) and even a couple of runs of waveguide, not to mention power, switching, and rotor control lines. For 20 years now, I have been using electrical service weather-heads to route lines down and into the house (Photo B). These are the weather heads that electrical power lines are routed through for a home's electrical service and are commonly available in the electrical departments of most building supply stores.

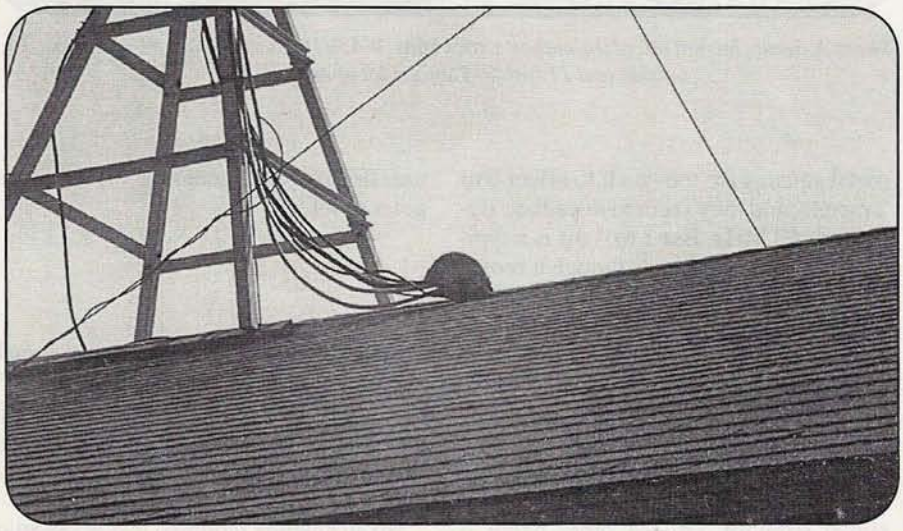


Photo B. An electrical weather head is used at WA5VJB to route coax through the roof. Actually, there are three of these in use! See text for tips on keeping your feedline and your attic dry and free of unwanted animals.

My roof feedthrough (Figure 3) is made from an electrical weather head with the plastic insert removed, about 5 inches of 3-inch O.D. (outside diameter) plastic pipe (use whatever fits!), and a coupling fitting for the same plastic pipe. Throw in a liberal supply of construction adhesive such as Liquid Nails®, and roofing sealant, and you're all set. The idea is to attach the coupler just below the roof sheathing, which will give the feedthrough considerably more strength as cables pull and tug at it.

In addition, you'll want the roof feedthrough pointing down along the slope of the roof to help keep water out. And always bend the coax so there is a low point when it enters the feedthrough. This forms a "drip loop." Water surface tension will allow water to practically run around a curve if you're not careful. I usu-

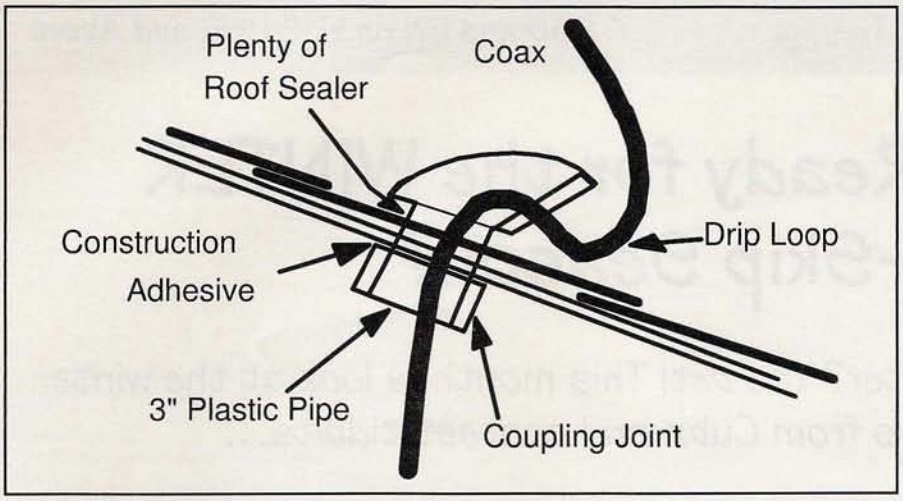


Figure 3. Detail of a rooftop cable feedthrough. Be sure to use plenty of construction adhesive on the inside, lots of roof sealer on the outside, and put a "driploop" in the cables so water will drip out the roof instead of coming inside.

"Loss through the roof of the house varies between 3 and 10 dB....Plywood and composition singles have the lowest loss....Tile roofs seem to have the highest loss, and wood shingles vary tremendously, depending on how long it has been since it last rained."

ally stick an old rag in from the attic side to keep out small birds, insects, wind, and wind blown water. A few beads of construction adhesive holds everything in place and a liberal blob of roofing sealant will keep water out. I have installed five of these feedthroughs over the years and have three on my current house. One-half-inch Heliax®, RG-8, RG-214, and 1/2-inch Aluminafoam lines all pass though these with ease. But I had to run the 7/8-inch Heliax for the 144-MHz EME array out the eave of the house, it's just too rigid to make the sharp turn.

Reciprocity

Reciprocity is a fancy word that simply means, "It works the same way in both directions." Quite often you'll hear someone say, "That antenna hears good but it don't get out!" or "That antenna's an alligator. All mouth and no ears." It's a common misperception that some types of antennas work differently on transmit than they do on receive. Except as noted below, this is wrong. Virtually all antennas have *reciprocity*, which simply means that an antenna with 10.2-dB gain on transmit also has a 10.2-dB gain on receive. If the antenna has a good front-to-back ratio on transmit, it also has a good front-to-back ratio on receive. There is no difference in the gain of the antenna or the shape of its pattern based on whether you use it as either a transmit or a receive antenna.

Now for the caveat: below 10 MHz, there are some specialized receive antennas that only catch 1% of the signal, but, at the same time, they only pick up .1% (that's 1/10 of 1 percent) of the atmospheric noise. So these loop antennas are pretty good receive antennas but horrible transmit antennas. These low noise designs work best below 1 MHz where both signal levels and noise levels are quite high. But the advantages are pretty well gone by 10 MHz, so this family of low noise receive antennas won't help us on VHF.

Dig In!

I hope you've had as much fun reading this column as I've had producing it. Unlike frequency synthesizers, PLL circuits, etc., antennas are one of the few technical areas where most hams can still homebrew. And the homebrew antennas often work just as well as, if not better than, many of the commercial products. As *CQ VHF* magazine merges next month with *CQ*, antennas—including VHF/UHF antennas—will remain a central topic of interest.—73 all, Kent Britain, WA5VJB

Are You Ready for the WINTER E-Skip Season?

Six-meter DX in the winter? You bet! This month: a look at the winter E-skip season, plus news from Cuba and contest tidbits...

Do you have Christmas Day, New Year's Day, and the six days between them off work? If you do, be sure to have your 6-meter rig on and your hand on the mic.

There's no doubt that summer is the time for the most exciting *E*-skip, but how many of us overlook the minor *E*-skip season that takes place in winter? Did you know that there even *was* one? And just what can you expect from a "minor" *E*-skip season?

The seasoned VHF operator knows that the period from late December into January offers opportunities that can drag even the most dedicated couch potato out of his recliner and into the shack. While others are bemoaning the quiet bands, carrying on rhetorical debates on Internet reflectors, and reveling in the DX victories of last summer, committed grid square chasers and DXers are standing by to break through the boredom of cabin fever.

A review of the N8NQS log shows that *E*-skip occurs reliably every year at this mid-point of the "off" season (at least for the last six years we've been watching for it). The season is short, lasting only three to six weeks, but the characteristics are identical to the summer *E*-skip season we all look forward to. There is single-hop, ranging from the typical 1,200 miles to 1,600 miles, and double-hop, reaching out nearly twice that distance. This year's minor *E*-skip season should be more exciting than usual, because it is likely that it will be mingled with F_2 propagation.

For instance, one winter evening, from the N8NQS shack in Michigan (EN72), the cornucopia of 6-meter winter *E*-skip contacts included logging QSOs with friends in grid squares FN42, FN66, FN85, EL79, EL83, EM73, DM82, and DN70 (see Figure).

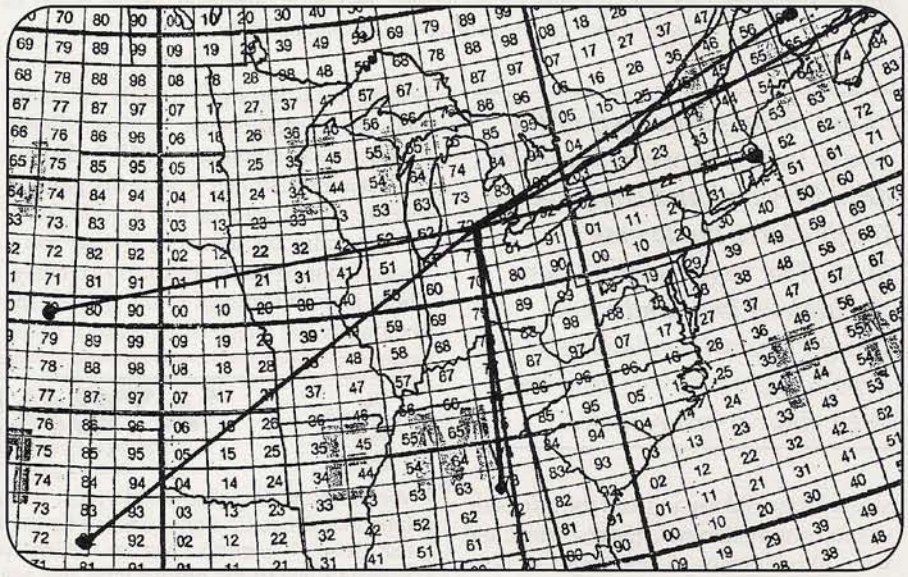


Figure. Map of grid squares worked from N8NQS via winter E-skip. You can get results like this, too, if you keep your 6-meter rig turned on and you listen for brief openings.

All of these contacts were on 6 meters, and, while I have not personally experienced "winter *E*" on 2 meters, that doesn't mean that there is none. If you've worked *E*-skip on 2 meters in the winter, I want to hear from you.

News from Cuba

Arnie Coro, CO2KK (EL83) tells us,

I am trying hard to get a CM5 ready to go on the air on 6 meters! He has the rig there, a nice brand new multiband ICOM with 50 MHz. He is about 90 miles *east* of Havana in EL93, a different grid square! I have sent detailed information for him to build an antenna—a "half square" made of wire. With 100 watts, if the band opens, he is going to be *heard*! CM5JP or CM5CN will be the callsigns used.

The rig is owned by my good friend, 87-year-old Juan Bautista Perez, whose nickname for some odd reason is "Carlos Perez," and will probably be operated most of the time on six by CM5CN, who is now in the process of upgrading to CO5CN. When he gets on the air on 6 meters, *talk slowly in English to him.* He will understand enough to complete a QSO. I am working out the QSL path. So you see...*good news*!

Hope to talk to you soon with my *Bobtail Curtain* wire gain antenna, as per W4RNL, L.B. Cebik's, design. No less than 7 dB gain to the north and south!

By Dave Bostedor Jr., N8NQS (n8nqs@cq-vhf.com)

Photo. Well-known VHFer Dave Clingerman, W6OAL, at his shack in Colorado. (Photo by Marjorie Clingerman, KBØLRI)

By the way, my QSL info for contacts from 1 Jan 1995 to date is via Dave, W5WP, and we are up to date. Sorry, but I cannot QSL before that date, as log books are not complete after a move and because King Coro (my dog) destroyed parts of them when he was a puppy. Now he is a very mature, gentle, dog, eight years old and second master of this residence HI HI. He will not dare damage any more logbooks, but he is the only Cuban *dog* heard frequently around the world, as he loves to bark when I am working SSB!

ARRL UHF Contest Wrap-up

Bruce Richardson, W9FZ EN43, offered this interesting insight in his report on how he did in last August's ARRL UHF Contest:

What a fun contest, where I think activity levels were good and conditions pretty darn good—just short of a no-kidding opening. Rovers were a wonderful help—I'm glad that they are out there.

I noticed something interesting in my log and I hope you will find it interesting as well. Through my participation in several VHF/UHF organizations, this hobby has become much more personalized than it would have been without them. By making the effort to be "in" the Northern Lights Radio Society, Badger Contesters, Central States VHF Society, and Society of Midwest Contesters, I've met some great hams, learned more about my hobby, and now "know" the person on the other end of many of my contacts. In the ARRL UHF Contest last August, I worked 54 unique callsigns, broken down as follows: Badger Contesters (8), Northern Lights RS (18), Central States VHFS (6), Society of Midwest Contesters (3), and the guys I have yet to meet (19). In all of these, I had met and knew 35 of the operators (65%), and this is with a radio radius out to EN81 (about 750 miles).

I view my hobby as richer than it would have been had I not participated in the groups (or if the groups did not exist). What a fun contest!

You're right on the money Bruce. One of the reasons many choose to go with weak signal VHF after becoming a ham is the close association of like-minded people. I enjoy DXing, but when I attend a hamfest, and run into one of my fellow weak-signal operators, the enjoyment of ham radio is multiplied.

September VHF Contest Soapbox Snippets

Remarks from this year's ARRL September VHF contest ranged from "no propagation" to "F_2 reported." There was no lack of frustration for the things that didn't go as well as planned, and no end to the praise for the rovers who activated many grid squares that ordinarily would have been quiet. So, grab another drumstick, kick back, and read of the tales of the last ARRL VHF/UHF contest of the 20th Century…

From Al Bailey, Jr., KB8O EN82:

Thanks to all those that made a sked with me, and sorry that the bands didn't cooperate enough to make them all. I *was* there but the bands weren't. Also thanks to KA1ZE as he is number 50 on 432. That was one of the skeds that worked. Hope to see all of you again in January on 2, 6, and 432 and—if I'm able to find a module for my 736—either 220 or 1.2 GHz. I'll be ready in June for one or two more bands.

From Ken Harker, KM5FA/University of Texas Amateur Radio Club, N5XU EM10:

This is the first time that I recall operating a VHF contest from N5XU and breaking 10K points without a big opening on 6 meters. This was also our first outing on 1296 MHz, where we did much better than I had expected. We made eight contacts with six different grid squares, getting us in one weekend almost 25% of the way to VUCC. For this contest, it looked like 144 MHz was the most important band, followed by 50 MHz, 432 MHz, 222 MHz, and 1296 MHz, in that order. This is a little unusual, as 50 MHz typically is more important in south Texas than 144 MHz, but we felt conditions locally on 6 meters were down from previous contests.

Conditions on 222 and 432 MHz, though, were great! We worked more stations and multipliers on those two bands than we ever have before. Having 1.2 GHz was a lot of fun. We made at least three contacts in the 150+ mile range, with K5IUA and K5DDD, both near Houston, and AB5SS/R as he was traveling way out to our northwest. On 432, the best DX was KC5FP in EL16. On 222 MHz, we worked numerous all-time new grids, mostly thanks to rovers. On 144 MHz, we worked XE2OR in northern Mexico. On all of the bands, we missed out on some contacts because the other station either didn't know Morse code, or didn't have a key with which to send it.

From John C. Wilke, WB9UAI/The E Team, NI9E EN63:

The gang set up from the QTH of Fred Helmstetter, N9FH, in Mequon, Wisconsin—15 miles north of Milwaukee—who was gracious enough to let us take over his HF-only station for a weekend. In August, we wedged a five-element, homebrew 6-meter Yagi in between his HF aluminum at 80 feet. We also managed to talk him into flipping his 13-element, 2-meter beam horizontal (the "correct" way) at 85 feet, and borrowed an old silo, to which we bolted 30 feet of Rohn 25 for 222 and 432.

Our first QSO was with Murphy, who smoked our 222 brick amplifier right at the gun. We worked all the locals on 6 meters, but never a lick of *E*-skip or long meteor burns. Two meters was a blast, over 100 Qs under perhaps slightly better than average conditions; 222 was tough with 10 watts (our first adventure on that band); and 432 a challenge as well with too much feedline loss (hardline next time!). We shut down early Sunday and missed the aurora (bummer!), but our objective was to do a shakedown run and troubleshoot for June. See y'all in January!

From Paul Womble, AJ4Y EL97:

Only was able to get on for the last four or so hours. Nice *E*s (sporadic-*E*) opening on 6 meters really helped the score. Heard K8GP up in FN08 on 2 meters, but they were not able to hear me! Hopefully the new long boom, 2-meter Yagi out in the back yard will find its way to the top of the tower soon. Also need a Yagi for 432. The FM vertical just doesn't make the cut!

From Garie Halstead, K8KFJ EM98:

It appeared EM98 was a VHF black hole this past weekend. It sure enabled me to get in a lot of bird-watching from the mountaintop location, though. My thanks to those that pulled my pipsqueak signal through and gave me a Q. Strongest signal heard here without a doubt was W8ZH on CW during the aurora Sunday afternoon on six. He owes me an external speaker. He had a nice pileup to work, which had to be fun.

From Mike Smith, VE9AA FN65:

I had planned to spend a nice weekend on a new mountaintop in FN65mj, but as I arrived

(running late), it was pouring rain and fairly windy. After setup (1830 Z), I found ZILCH propagation on 2 meters, intermittent troubles with the 6-meter beam and a computer screen that was having weird contrast trouble. After three hours of this (and much more trouble), I actually packed it up and came home (first time I have given up so easily on a portable mission). From home, things weren't much better. Good deal there was Au (aurora) on 6 meters for a little action. This was the first contest since 1991 in which I remember hearing a U.S. station on in June or September that was more consistently heard than W2SZ/1. Notably, NC1I was worked on 432 MHz with 20 W and 15 elements @ 8 feet (still mounted on the roof of my car sitting in the driveway). Best overall 6-meter signal was K1WHS (K1TOL manning that spot).

From Jim Aguirre, WB7DHC/R Pacific Northwest:

Someday, we're gonna get some propagation on a contest weekend here in the Pacific Northwest and it will probably scare us half to death! Another contest with little or no enhanced propagation! Despite adding a band this year (903) and activating one more grid (six vs. five last year), we couldn't beat last year's score, but sure had fun trying. We activated six grid squares...CN86/87/88/96/97/98...logged 400+ miles on the truck (much of it on unpaved Forest Service roads), saw lots of great scenery, had terrific weather, and worked some very dedicated VHF contesters. Special thanks to the WB7FJG group for letting us set up the 903 and 1296 antennas adjacent to their operation on Mt. Pilchuck in CN98. Nice guys!

As always, the VE7 connection was much in evidence...VE7XF, VE7DXG, VE7SKA, VE7X0, VE7SL, VE7IHL, VE7AGG, and others. We appreciated their contacts in each grid activated, and especially the arrival of VE7XO late in the contest. He was the only CN79 operator we heard all weekend, and his three bands sure helped boost the multipliers! One final comment: VHF contesters are a special breed, and the ones on the Pacific Northwest are at the top of the list! Thanks to everyone we worked.

From Dave Clingerman W6OAL DM79:

Well gang, seemed like just another Sept. contest except for the MS (meteor scatter) on Sunday morning. I have never heard so much scatter. I must have worked about two dozen stations on 6 meters during that phenomenon. I didn't check 2 meters as I was too busy on six. Had hoped to work all bands this time from 50 MHz through 10 GHz, but I may have done something bad to my 3456-MHz transverter, so KØRZ and I weren't able to complete on that band and no one was around with 5760 MHz. My wife (KBØLRI)—who usually runs out in the field with a waveguide transition, mixer, L.O. and an I.F. to give me a couple of points on the sparse bands—was away (*but she was around long enough to take Dave's picture. See photo—ed.*). My logging program's counter seemed to be screwed up at first so I never knew where I was in score.

Thanks to all who participated and especially the rovers for their valiant effort, braving the perils of WX , road, and geological obstacles. Our spirits here in the West were dampened as we learned of the passing of Frank Jackson, WØNRI, in Evergreen, Colorado. Many of us here in the Denver metro area had just worked him on 6, 2 and 432 at around 5:30 Saturday evening; and at around 11 p.m., he suffered a massive heart attack and died. He was a dear friend and fellow veteran. He will be sorely missed as he'd been on 6 meters for over 40 years. I'm sure many of you had the pleasure of working him throughout the years; his gravelly ol' voice was hard to miss.

From Jim Mitzlaff, WB9SNR/R Wisconsin:

This year I tried starting out farther north than usual, which turned out to be a good move. Activity from WI on Saturday was tremendous, even though band conditions were pretty much flat. There was a strong "opening" on Saturday night, but it only covered about 100 miles or so on either side of Lake Michigan. Not good for much DX, but it did keep the activity going until the wee hours of Sunday morning. The Au on Sunday night was a mixed blessing. I got a few extra multipliers, but missed many more because of low power, low antenna, and lots of QRM.

One other new thing I tried was to set up several skeds. Too many, in fact. While I consistently made contact with K2YAZ, contacts on the other skeds were few and far between. Next time I plan to be more selective. Only set up skeds that can be made under normal band conditions, and allow more time for running bands with stations who can go above 1296.

From Len Gwinn, WA6KLK/7 Portable DN12:

A few comments and notes about the recent contest. I went to DN 12nr in southwest Idaho for a single op try. This was a roundtrip of some 1,400 miles with a fifth wheel (camper), my wife, and three dogs for company. First and foremost was the *lack* of participants on the bands, and then some not too good propagation. I will admit that lower power and small antennas had something to do with it, but I was heard regularly at 300 miles.

Thanks go to KE6ILX/R, who accounted for a bunch of contacts and grids. Nice going Jeff. VE7NUT was most consistent on 6 meters other than WD6HDY (CN 91). On 2 meters it was KD6OSV and WD6HDY. On 432 it was KE6ILX/R. Nothing much was heard from Portland or Seattle, little from Boise, and nothing to the east except some meteors on Sunday morning. KE6BZY in CM 89 was strong at times on 144, and was probably the most consistent farther-out station on

"On all of the bands, we missed out on some contacts because the other station either didn't know Morse code, or didn't have a key with which to send it."—Ken Harker, KM5FA

that band. W6IZU has a beautiful CW fist. Others heard were N9JIM, WB6OMF, and a few unidentifiable weak ones on CW (144). On six, the propagation was not too good but thanks to those that tried.

One thing I noticed was the almost *complete* lack of stations moving off the calling frequencies. You think that it is hard when they are close, try it when you are several hundred miles out and you cannot get through. Even moving to a pre-noted frequency drew little or no attention, so back to the calling frequency. Anyway, it was a fun trip and I was glad to work those that I did.

From John Butrovich, III, W5UWB EL17:

First day of the VHF contest provided some fireworks on 6 meters from this southern location! (EL17ax). Between 2055 and 2250 UTC, I had F_2 and F_2 B/S (backscatter) to South America and the lower 48 states. F_2 remained in at this location for another 30 minutes (until 2320), but no new stations were available to work. Solar flux this day was 120, I believe. The second day of the VHF contest again provided fireworks with an hour plus (2142–2330 UTC) of F_2 backscatter and a few direct F_2 contacts into South America. A total of 26 QSOs and 19 grids.

Call for News

The best source of weak-signal VHF/UHF news is those who are creating it. That is you. We can see it changed or diminished if we don't all do our part. Do you want to hear what's happening in your geographical area? So do the rest of us. One of the most common complaints I hear is that there "...is not enough news about what is going on in my area." The reason is that news items are not received from folks in your area. Tell us what you're doing!

You've probably read by now that, as of next month, *CQ VHF* will be merged into an expanded *CQ* magazine. *CQ*'s "VHF-Plus" columnist, Joe Lynch, N6CL, needs your news as badly as I've needed it. Please send your reports and other news to Joe at P.O. Box 73, Oklahoma City, OK 73101; by e-mail to <n6cl@fuller.edu>, by phone to (918) 627-6625, or by fax to (918) 835-9785.

73, Dave Bostedor, Jr., N8NQS

Subscribe Now and Save Big Bucks! Get *CQ* at the *CQ VHF* Rate!

Well, you've probably figured out by now that this is the final issue of *CQ VHF* as a standalone publication. Starting next month, we'll be merged into *CQ* magazine. But as a *CQ VHF* reader, *have we got a deal for you!*

Take a look at the subscription envelope on your left. It's a *CQ VHF* subscription envelope. "Kinda dumb," you're probably saying, "to sign up for a magazine that's going away." Wrong-o! It's your ticket to a great deal on a subscription to *CQ*. Because if you sign up right now, using this very envelope, you can get 1, 2, or even 3 years of *CQ* at the *CQ VHF* price! And that can save you up to $5!

Here's the deal: A 1-year subscription to *CQ VHF* is $24.95. A year of *CQ* costs $27.95. Savings: $3. On a 2-year subscription, you save $4, and you get to keep an extra picture of Abe Lincoln in your pocket if you sign up now for a 3-year deal. (The savings are even greater if you live outside the United States!)

So here's your chance to beat the system - sign up for your choice of a 1, 2, or 3-year term, pay the *CQ VHF* rate, and get a great bargain on the new, expanded *CQ*! Of course, the best bargain of all is that you'll be sure of getting the two best magazines in ham radio today - squeezed into one - delivered to your doorstep every month. But this is a one-shot deal. Don't miss your chance. Sign up today!

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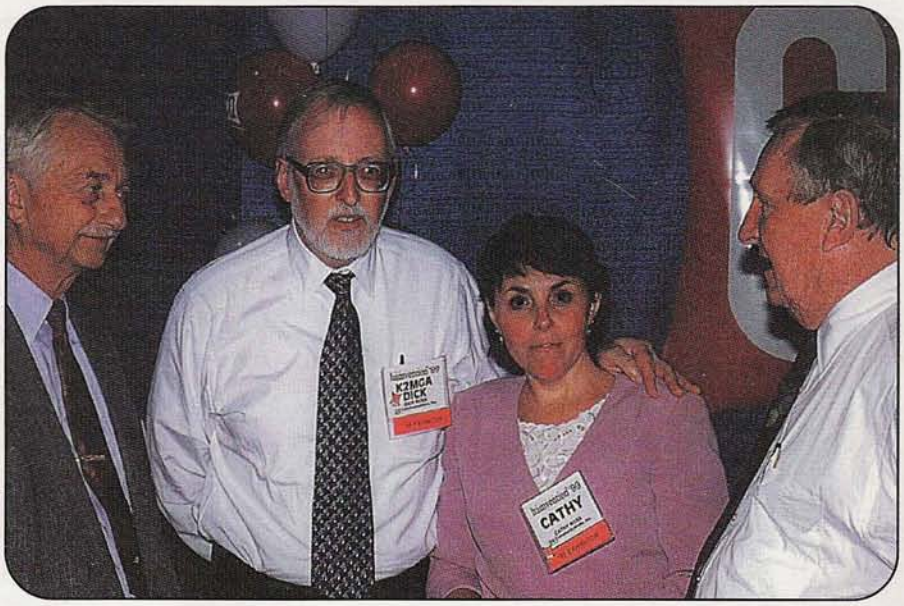
Ham Radio and Manned Space Flight

One of the central players in the amateur radio space program over the last two decades tells us "the story behind the story" of how ham radio made its way onto the space shuttle, and how it will be a permanent fixture on the International Space Station.

We hand over the keys to the column this month to Bill Tynan, W3XO, Past President of AMSAT-NA, and a key player in putting ham radio aboard manned space flights. Bill's comments came in the form of letter to W2VU, adding background information to October's Orbital Elements column on "Ham Radio's Last Shuttle Flight." Bill, over to you...



Former astronaut Owen Garriott, W5LFL (far left) and retired NBC News Correspondent-Producer Roy Neal, K6DUE (far right)—two of the key players in getting ham radio into space in 1983—talk with CQ Publisher Dick Ross, K2MGA, and his wife, Cathy, at the 1999 Dayton Hamvention. (W2VU photos)

I read your "Ham Radio's Last Shuttle Flight" piece on page 12 of the October *CQ VHF* with interest. Generally it was a good synopsis of a proud chapter in amateur radio. In particular, the educational aspect of SAREX, which was the principal interest of Roy Neal, K6DUE, was especially important. I know you did not have space to name all the people and initiatives which cooperated to make SAREX happen, but a few names and events should not be ignored.

First, There Was Skylab

Efforts to put ham radio on board manned space flights began in the earliest days of the space program. Once top NASA brass approved the idea in concept (see "Breaking the Bureaucracy Barrier"), we had to find the right "first flight." We started out by trying to put amateur radio on Skylab. Owen Garriott, W5LFL, was to be a crew member and wanted to do it. With help from Dick Fenner, W5AVI, at Johnson Space Center (JSC), and some of us from AMSAT, we tried. But we were going to use 10 meters, which required an outside antenna, and NASA said it was too late to get a cable penetration in the hull to support an antenna.

Then, when it became known that Owen was to fly on the shuttle a few years later, AMSAT began its campaign again. I wrote a draft of a proposal to be submitted to NASA Headquarters. Early on, we enlisted the support of the ARRL, which welcomed the idea. The proposal I wrote was finally submitted to NASA as a joint AMSAT/ARRL document.

Swinging into Action

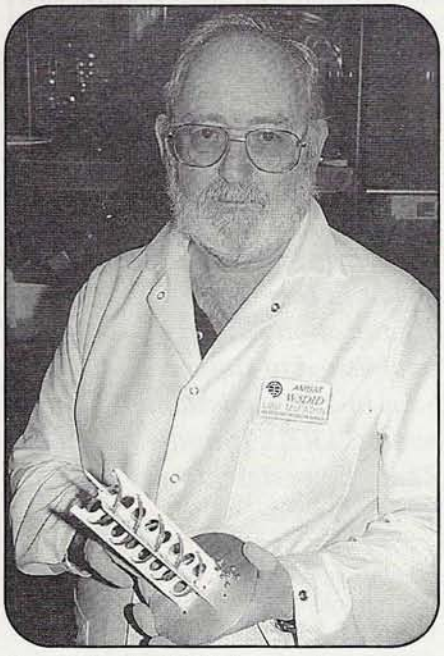
When it was accepted, the project swung into action. As an acknowledgment of my participation, then AMSAT-NA

Bill Tynan, W3XO, is a past president of AMSAT-NA, a very active VHF weak-signal operator, and a frequent contributor to CQ VHF *magazine. He lives in Kerrville, Texas.*

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

As an astronaut in the 1980s, Owen Garriott, W5LFL, became the first ham to operate from space. This article by W3XO details the history behind that first flight.

Bill Tynan, W3XO, wrote the initial proposal to NASA for putting ham radio aboard the space shuttle. That led to his appointment as AMSAT-NA's first Vice President for Manned Space Flight, followed several years later by his election as the organization's president.



Lou McFadin, W5DID, seen here with an antenna for the Phase 3D amateur satellite, first became involved with AMSAT by doing most of the technical work necessary to make Owen Garriott's Motorola 2-meter handheld ready to face the rigors of space flight—and of getting approval to go on board the shuttle.

President Vern Riportella, WA2LQQ, named me Vice President for Manned Space Programs. The amateur radio club at Motorola in Fort Lauderdale, Florida, offered several commercial-grade 2-meter handi-talkies to the project. It was concluded that it was important to use commercial-grade equipment as it would be easier to "sell" to NASA safety people.

At that point, a NASA ham who would play a key role in SAREX—and still does in ARISS (the amateur station for the International Space Station)—Lou McFadin, W5DID, entered the picture. Lou did much of the technical work of preparing the Motorola unit for flight acceptance. The result of all this activity was the trailblazing amateur radio operation of W5LFL on STS-9. In light of my participation, my wife and I were invited to witness the launch from the VIP stands at Cape Canaveral, about three miles from the pad. I need not tell you, it was an awesome experience.

The Birth of SAREX

Following STS-9, it was apparent that a more formal organization should be established to support additional ham-in-space missions. The name SAREX (Shuttle Amateur Radio EXperiment) was coined and accepted. A SAREX Committee was established, consisting of representatives from the ARRL, AMSAT, and NASA. Roy Neal, who was then NBC News's chief space correspondent, was named Chairman, and John Nickel, WD5EEV, who worked at JSC but not directly for NASA, was named as the liaison between the Committee and the technical and administrative people at JSC. As VP for Manned Space, I became AMSAT's representative on that Committee. When I became AMSAT-NA President in November 1991, I appointed Frank Bauer, KA3HDO, to succeed me. Frank has been doing a marvelous job ever since. Another marvelous job has been done by Rosalie White, WA1STO, who has been the ARRL's representative on the SAREX Committee for some years now.

After the *Challenger* accident, shuttle flights were suspended for over a year. In the interim, it became doubtful whether amateur radio would ever again fly on the shuttle. But, thanks to the perseverance and skill of Roy Neal and several others, SAREX flights resumed and went on to include such additions as SSTV (slow-scan TV), fast-scan TV uplink, packet radio, and other innovations.

The school connection was most important. This was supported by something called a "telebridge network," which permitted stations in various parts of the world to relay signals to and from the Shuttle ham station so that longer sessions could be scheduled and times could be arranged that were more convenient to the participating school children. Often, children in the U.S. would have their exchanges with the astronauts when the shuttle was over Australia. This let us avoid scheduling school contacts in the middle of the night. These hook-ups were made possible by many cooperating hams and the kind donation of facilities by a company called Darome Telecommunications, now a part of MCI Worldcom.

Many more SAREX flights followed, so many in fact that Lou McFadin informed us that SAREX had become shuttle's "most frequent flyer," going up on 25 missions, more than any other NASA "experiment."

Looking Ahead

The Shuttle Amateur Radio Experiment was just the beginning. SAREX is still SAREX, but now it stands for "*Space* Amateur Radio EXperiment, and its next goal is to put amateur radio aboard the International Space Station (ISS). An international team of hams is now busily at work to make this happen. Stay tuned.

If I have any regrets regarding the SAREX project, number one is that we were never able to get an outside antenna on the shuttle. The cable for that is already installed on the Space Station module which has been constructed by the Russians. My other regret was that we never employed SSB (single sideband). I believe its use would have alleviated some of the frequency coordination problem which SAREX faced. I hope the ISS amateur station will make significant use of 10 meters to bring the hams-in-space

Breaking the Bureaucracy Barrier

Retired NBC News Correspondent-Producer Roy Neal, K6DUE, another key player in the efforts to get ham radio into space, offers his first-person perspective on breaking through the NASA bureaucracy to get the blessing of the shuttle program's top man:

I had tried unsuccessfully to get NASA to accept amateur radio dating back to the days of the Mercury program. One day, while interviewing Air Force Lt. General James Abrahamson, who headed the Space Shuttle program in the early '80s, I had a few moments between "takes." I used them to make pitch number one thousand, pleading for ham radio to fly.

To my delighted surprise, he responded, "I like the idea. Have your people put together a presentation and I'll approve it."

When the head man says go, you run. I did, immediately consulting with Doug Ward, W9DCQ, and Chuck Biggs, KC5RG. We called ARRL Executive Vice President Dave Sumner, K1ZZ, who got an immediate approval from Vic Clark, W4KFC, then President of the League. We then called AMSAT President Vern Riportella, WA2LQQ, and got a sanction from AMSAT to go ahead.

A letter was sent by the two organizations...and approved. Doug Ward set up a meeting with NASA brass at the Johnson Space Center. With Owen Garriott spearheading our pitch, Dick Fenner and Lou McFadin telling how it could be done, and Vic Clark and "Rippie" lending credence, we were given approval. And that's where Bill's story of finding a "first flight" for ham radio in space really begins.

—Roy Neal, K6DUE

Frank Bauer, KA3HDO, is AMSAT's current Vice President for Manned Space, and is leading the program to put a permanent ham station on the International Space Station.

in closer touch with more amateurs the world over.

Two meters and 70 centimeters will be used again, of course, but few if any frequencies are available on 2 meters which are satisfactory everywhere in the world. The higher microwave bands offer a greater choice of frequencies, but are not as accessible to amateurs in many countries. In addition, Doppler shift becomes a real problem above 70 centimeters. Unfortunately, 6 meters cannot be used because there is no Amateur Satellite Service allocation in that band. The International Telecommunications Union (ITU) rules mandate that for amateur

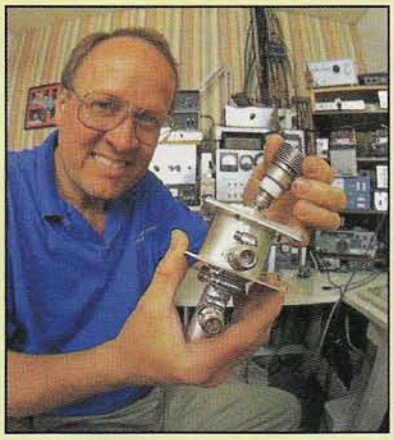
"Following STS-9, it was apparent that a more formal organization should be established to support additional ham-in-space missions. The name SAREX (Shuttle Amateur Radio EXperiment) was coined and accepted."

communication involving spacecraft, both uplinks and downlinks must be within Amateur Satellite Service bands. (*The FCC's rules for the Amateur Satellite Service are contained within the overall amateur service rules, specifically in sections 97.207, .209, and .211.—ed.*)

This has become a little longer than I had intended, but there is a lot to be said concerning SAREX. And I haven't even addressed the wonderful contributions of the hams on Mir who made life more interesting for all of us. 73,

—Bill, W3XO/5

Thank you, Bill, for filling us in on the behind-the-scenes activities and people responsible for creating and sustaining ham radio operations from manned spacecraft, and for your own work in bringing about the excitement these operations offer hams and non-hams alike, all over the world.—W2VU



On the Cover

"My thing is tinkering and building," says Ed Krome, K9EK, of Columbus, Indiana. "That's what I like, the build-and-experiment-and-develop part of [ham radio]." In our cover photo, Ed's holding one of the many products of his home workshop, a cavity amplifier for 3456 MHz that he designed himself. Made from silver-plated copper and using a 7289 planar triode tube, Ed's amp produces about 20 watts out—pretty serious power on 3.4 GHz!

Everything in Ed's shack is homebrew, he says, "except for a couple of old HF rigs that serve as IFs for my transverters." How many transverters? Nine, at last count, ranging from 2 meters to 10 GHz, including two designed specifically for the satellite subbands of two microwave bands.

Professionally, Ed is a mechanical engineer and MBA with nine patents to his credit and works as Engineering Manager for a company that makes mechanical drives. "No RF there," he says, but adds that his interest in radio was "kind of built in."

"I remember taking apart tube radios when I was five or six," Ed says, "and asking my father how they work." Ed was first licensed in 1962, then let his license lapse and rejoined the hobby in 1980 as KA9LNV. He got K9EK as a vanity call. Ed has been very active in AMSAT and became interested in building microwave amplifiers about 10 years ago, after reading an article on the topic by a fellow satellite operator. One project led to another until, today, he has a lathe and a milling machine in his garage! Even so, says Ed, "my amps look like fugitives from plumbing stores." But they sure do work!

What's Ed's advice to beginning builders? "Start easy, start small, start on HF," which is more forgiving than microwaves. (Cover photo by Larry Mulvehill, WB2ZPI)

Old vs. New 6-Meter Radios

Are there advantages in buying an old 6-meter radio at a flea market over one of the many new choices now on the market? WB2AMU takes a close look.

Ameco, Clegg, Gonset, Hallicrafters, Polytronics, Whippany Laboratories...all names of American radio companies in the past that made 6-meter rigs for AM, SSB, and CW operation. They're all gone now, yet these vintage radios can be found often in ham radio flea markets. While there may be a certain nostalgia that we associate with these rigs, what are the practical issues you face in buying one of these "boat anchors" from the past?

Replacement Parts

The main disadvantage of restoring and owning a vintage 6-meter rig is parts replacement. Tube replacement can be difficult, as it generally will also require scrounging around at flea markets. Some big items that go due to age are the high-voltage paper capacitors in which the inside material may dry up and render it inoperative. Corrosion in the wrong spot can also be a problem, so thorough inspection is required before turning on that old-timer.

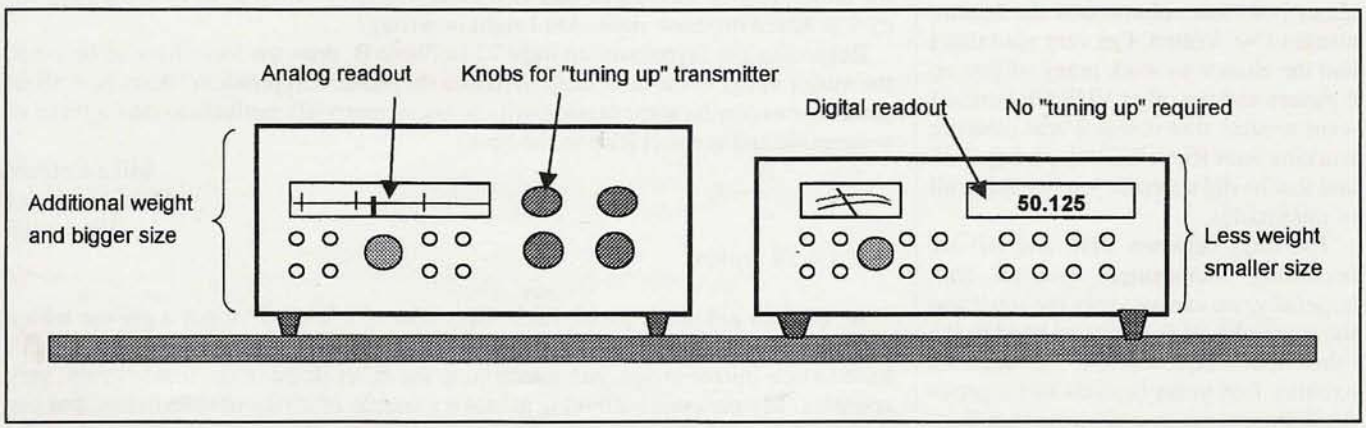
Most of these older tube rigs have a tuning procedure where the plate current and loading are tuned for optimal performance. If you don't have a manual which shows the proper sequence for tuning the rig, you may be in a bad situation. Fortunately, there are sources in the 6-meter community that can help with some of the mainline models, such as the Swan 250. Rigs without manuals are known as orphans and are not recommended as beginner rigs for the Magic Band. I've had some mail from people looking to purchase some of these for younger members in the family. Please don't.

On the Road...

Mobile or portable operation is very difficult with many of the older model radios, particularly if you're planning to run off of a 12-volt battery. Some of the rigs, such as the Swan 250, have an accessory known as an *inverter* which is an interface between a 12-volt power supply and the rig. However, these inverters are hard to find on the flea market circuit these days.

"The main disadvantage of restoring and owning a vintage 6-meter rig is parts replacement."

Also, older tube rigs are more likely to cause TVI (television interference) and RFI (RF interference) because of the way they were built. Even dropping the power on these rigs will not solve interference problems because the RF energy still leaks from the various stages of the rigs. In comparison, the new rigs generally have better filtering and fewer interference problems. In addition, the receivers on most of these rigs are satisfactory, but are not in the same league as



How can you tell at a glance if the 6-meter rig on a flea market table is a "golden oldie" or of relatively recent vintage? Here's a quick guide to major features, with the older tube-type radio on the left and a modern solid-state rig on the right.

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

"The lines between VHF and HF are becoming increasingly blurred and, hopefully, we can all apply the spirit and the principles of the 6-meter band to the other ham frequencies."

the newer rigs and may not cut it during marginal conditions.

Are There ANY Advantages?

So what *are* the advantages of owning a vintage rig? Well, many of them have high power for the AM mode. Many new rigs, on the other hand, have only 4 or 5 watts AM output capabilities and there aren't many current linear amplifiers that are equipped for AM operation. Also, the vintage rig can usually be purchased for a good price at flea markets, often under $200, plus it can be fun to restore an older rig into operating condition. But eventually the novelty may wear off, especially for those who monitor the band on a regular basis.

The bottom line: If your goal is to restore and operate a piece of ham radio history, or to run high power on 6-meter AM, then go for it. Otherwise, you'll do much better with today's modern solid-state radios.

A Closing Note

As this is the last issue of *CQ VHF*, I want to express my sincere thanks to the many VHF operators who took the time to write to me with ideas and comments about both this column and the feature articles I've written. I'm very glad that I had the chance to work many of you on 6 meters and the other VHF/HF bands. I want to state that it was a real pleasure working with Rich, W2VU, on *CQ VHF* and that he did a terrific job in editing all of our articles.

The lines between VHF and HF are becoming increasingly blurred and, hopefully, we can all apply the spirit and the principles of the 6-meter band to the other ham frequencies. It has been an exciting four years (sounds like a presidential term) for us and I hope that there will be continued opportunities with the new, combined magazine.

73,

—Ken, WB2AMU

Q & A

Q: I would like to know if anyone out there has any information on indoor 6-meter antennas. I live in an apartment. I have a dipole now.

Thanks and 73,

Dale N2YJU
Via e-mail

A: Dale—You're in luck! WA5VJB's "Antennas, etc." column this month is all about indoor antennas. Check it out!

Q: I always hear a lot of activity on my scanner at 29.6200 MHz. A friend of mine who is a ham said he thought it was a repeater down in the Caribbean somewhere. I, however, was unable to locate any 10-meter repeaters in that region in my *ARRL North American Repeater Atlas* 98/99 edition. If one can pick up on this frequency every 15 minutes, there is a computer-generated voice that says "Kilo/Papa/4/Alpha/India repeater" then every hour the Alpha and India are flip flopped in the transmission. Maybe you could enlighten me on this a little. Most of the voices I hear on this frequency sound Spanish, but I hear a lot from Virginia, Kentucky, Georgia, Alabama, and Tennessee. Thank you.

Jesse Stephens
Via e-mail

A: Jesse—You're listening to the KP4IA repeater (what you're hearing are phonetics of the station ID); the KP4 prefix means that it's in Puerto Rico. According to the ARRL Repeater Directory, *it's located in Aguas Buenas. With 10 meters being open quite a bit these days, it's very easy for hams all over the southeastern U.S. (and beyond) to access that repeater. Happy listening.*

The following question was directed to Contributing Editor Kent Britain, WA5VJB:

Q: Hi Kent—Loved your article in *CQ VHF* October issue. I don't subscribe to the mag but pick it up from time to time. Now I wish I had looked a little closer after seeing your article. Good job. My question—or better yet, suggestion—is how about an article explaining *unknown* microwave parts, i.e., waveguide, horns, etc. that someone might have in their possession and can't identify. What I did was measure the various sides of the waveguide and then went to the *Engineering Manual*, examined the table sizes for waveguide and then made a determination as to what the frequency was based on those sizes. Am I right or wrong?

Regarding the Styrofoam on page 72 in Photo B, does the foam have to be cut to the mirror image of the cone itself to reduce the phase shift problem? Also, how about some discussion on some home-built (pc board material) methods to take a piece of waveguide and connect it up to the horn?

Mike Couture
MG Electronics
Via e-mail

WA5VJB replies:

A: Explain unknown parts? Interesting concept! Well, I've got a garage with a bunch I haven't figured out myself as yet. On your Styrofoam question, no, it doesn't have to be a mirror image, but determining the exact shape of the foam is very, very complex. My personal method is to make a couple of different thicknesses and use the one that works best. A wide horn tends to have a lot of phase error and would need a longer lens or one made from a denser material. A long horn wouldn't need much of a lens at all.

73, Kent WA5VJB

An Introduction to Oscillators—Part 2

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As you will recall, last month's column introduced the broad area of signal-generating oscillators and explained circuit operations of such popular self-excited types as the Armstrong, Hartley, and the Tuned Grid Tuned Plate (TGTP). We also added a brief "memory tweaker" on the difference between direct and indirect heated tubes, plus instructions on homebrewing a one-tube 1936-style transceiver as a fun project.

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Since this is our Christmas issue, we'll also include a special (and related) quick-brew project you can make as a holiday gift for friends. Now answer truthfully, gang—where else could you find so much homebrewing fun and also learn as much about electronics at the same time? We have some very interesting ground to cover, so let's get started!

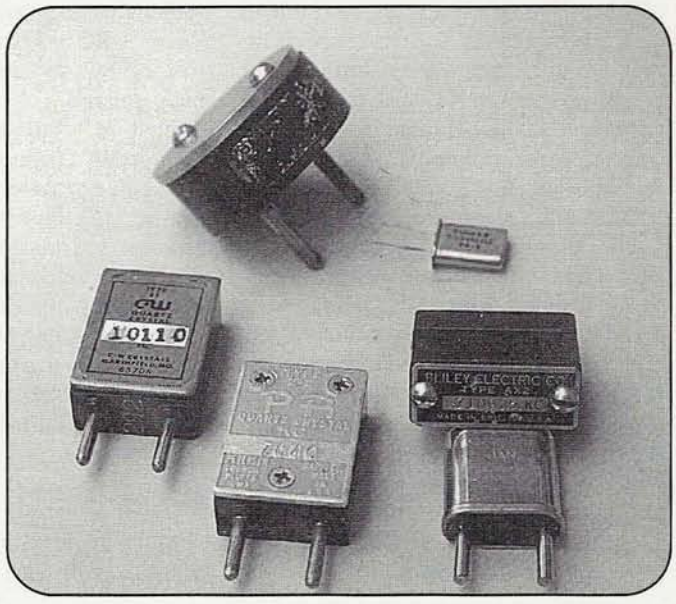

Photo A. A collection of quartz crystals from different eras (and all still working great). Shown here are (clockwise from 11 o'clock) a rare round-cased Bliley, a miniature HC-6 cased Bomar with wire leads, a square Bliley, a metal "tin can" Jan, an FT-243-type Petersen Radio (PR), and a still-available FT-243-type CW crystal.

Crystal Oscillators

Remember the Tuned Grid Tuned Plate oscillator briefly highlighted in last month's column (and shown for review purposes in Figure 1)? It's an ideal "ground floor" circuit for studying as it can also become a crystal oscillator, a buffer or a frequency multiplier stage, or even an RF amplifier with only minor component or bias voltage changes. Yes, and it also serves as a convenient "stepping stone" for understanding the circuits we'll cover next. As an example, let's take a closer look at the basic crystal oscillator shown in Figure 2. This circuit utilizes a TGTP configuration just like we discussed last month, except a frequency-determining quartz crystal is used in place of the grid's tuned circuit and a pentode tube is used in lieu of our previously shown triode.

Quartz crystals are quite interesting components to study, and some of the older types are even genuine pieces of radio history (Photo A). A crystal contains a small wafer of precision-ground quartz sandwiched between two pieces of metal with raised corners, as illustrated in Figure 3. Small springs inside the crystal's case or holder press the metal electrodes against the quartz. When a small amount of AC voltage is applied to the electrodes, the quartz vibrates and generates a precise-frequency signal.

Action of a quartz crystal might be summarized as follows: First, brief pulses of AC caused by the tube's grid drawing current on positive cycles of a sine wave electrically "tap" at the crystal and produce oscillations at its resonant frequency. This frequency is determined by the quartz wafer's thickness. The thinner the quartz, the higher the frequency, and vice versa. Second, the crystal exhibits properties of both inductance and capacitance to the tube and thus electrically "looks like" a tuned circuit to its grid.

By Dave Ingram, K4TWJ (k4twj@cq-vhf.com)

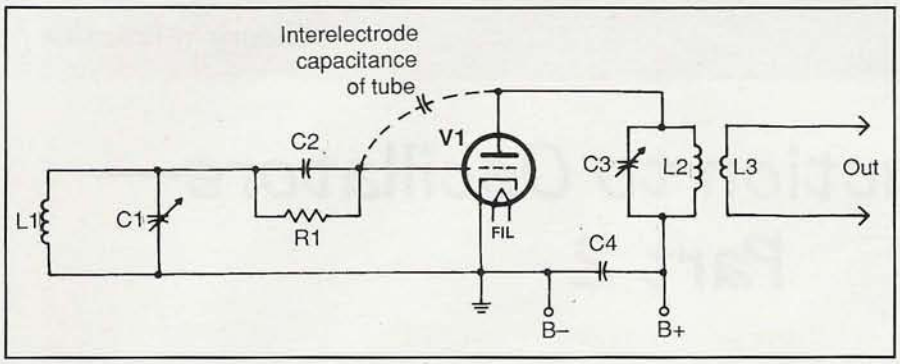

Figure 1. Circuit diagram of a basic Tune Grid Tuned Plate oscillator, as described in last month's column. This circuit is ideal for ground-floor study of oscillators, buffers, and RF amplifiers, as discussed in the text.

Crystals are somewhat fragile items, so grid current must be kept small to avoid damage (we want to "tickle" the quartz wafer, not break it). That's the purpose of R1 in Figure 2. It serves as a shunt, or parallel circuit path, to divert excess current around (rather than through) the crystal (remember our discussion of series and parallel circuits in the August and September columns?). It also influences biasing, as we will discuss later, but let's keep this story simple for now.

The output signal from a crystal oscillator is usually low, mainly because control grid current must be held low to avoid crystal damage. By adding a second grid between the tube's control grid and plate, and applying a positive voltage to that second grid, we can accelerate electron flow within the tube. This will give the electrons more force when hitting the plate and thus produce a stronger output signal—without increasing control grid current and/or damaging the crystal. This second or "screen" grid must not be as positive as the tube's plate, or electrons will simply collect or output on it (and burn up its fine screen or mesh) rather than continuing on to the plate. Resistor R2 in Figure 2 thus drops positive voltage to between $^1/_3$ and $^1/_2$ the plate voltage.

A third, "suppressor" grid is also included in a pentode tube. Its purpose is acting like a one-way barrier or "collection net" to minimize undesired effects of secondary emissions knocked off the plate by accelerated electrons. This grid is internally connected to a tube's most negative element, or cathode, and does its own thing so-to-speak without our intervention. It is mentioned here mainly for your general knowledge.

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Most modern crystal oscillators use transistors instead of tubes, though, so let's shift our focus of study to Figure 4. Why does this circuit look different, you ask? First, and as mentioned in our October column, transistors operate at a lower level of voltage and thus require both "hold back" or reverse bias (provided by R1) and "conducting assistance" or forward bias (provided by R2). Technically speaking, the ratio between R1 and R3 sets the amount of reverse bias "felt" on the transistor's base and C2 bypasses signals (which are AC) around R3 so they do not oppose DC bias—but, again, let's keep this explanation simple.

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What is the significance? In a series-fed tank circuit (Figure 2), both "sides" of the tuning capacitor(s) and coil are hot with DC and must be isolated from ground (and their tuning shafts insulated from fingers!). In a parallel or shunt-fed tank circuit (Figure 4) one side of the tuning capacitors (the frame, which usually has threaded screw holes) can be bolted directly to a metal chassis for grounding and mounting. Link coupled and Pi-network output circuits exhibit additional differences in impedance matching ranges, etc., but that is another subject we can discuss further at a later date. Meanwhile, let's continue moving forward with a quick discussion of some additional circuits similar to the TGTP.

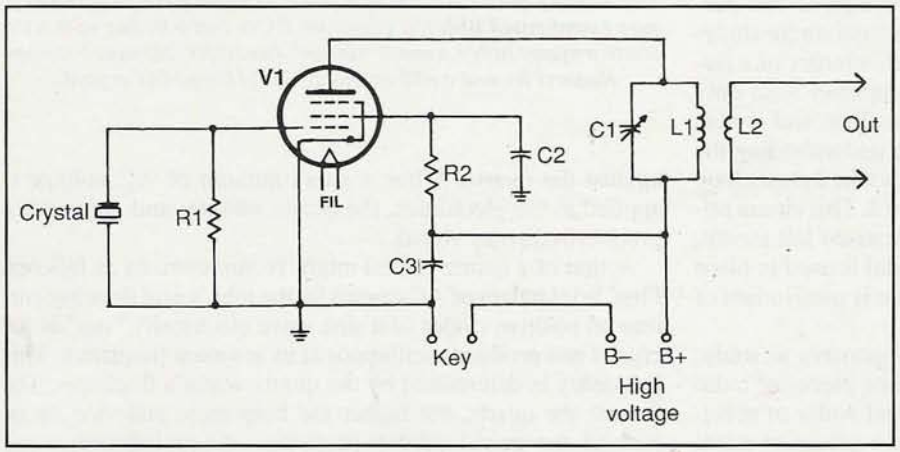

Figure 2. Circuit diagram of a traditional vacuum tube-type crystal oscillator. Three grid or pentode tubes are particularly attractive for oscillators, as they can produce a stronger output signal than a triode or transistor without subjecting the crystal to abuse.

Buffers and Frequency Multipliers

As mentioned earlier, oscillators typically produce a low amplitude output signal that should be isolated from its load and amplified to a higher level for driving additional stages in equipment. The oscillator's output signal may also be lower in frequency than desired and thus require multiplying up to a final, or target, frequency of operation. These functions are addressed by *buffers* and *frequency mul-*

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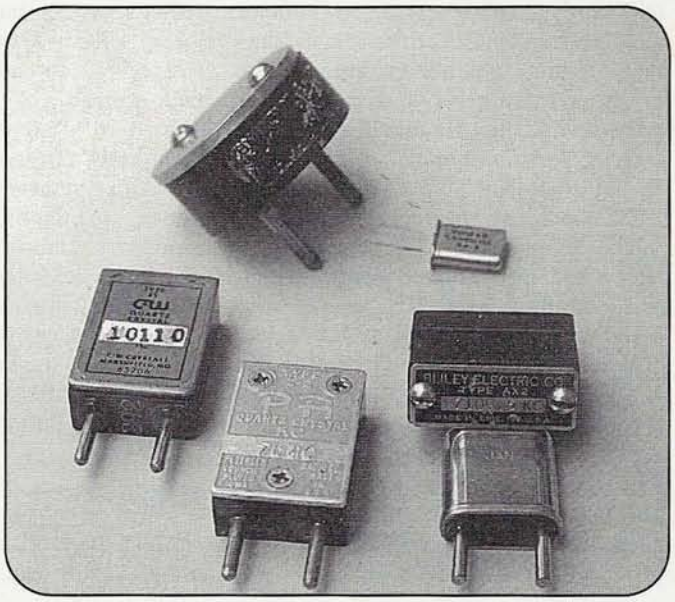

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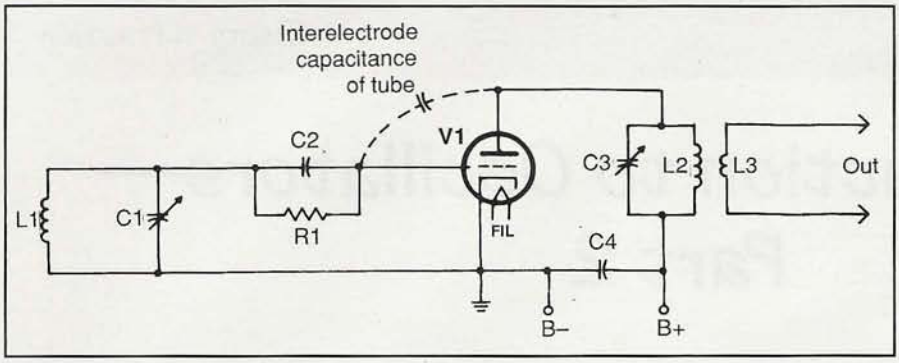

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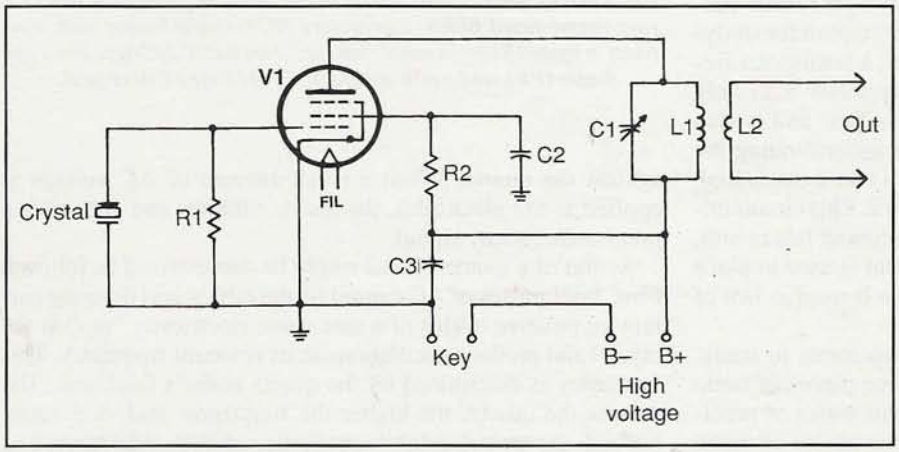

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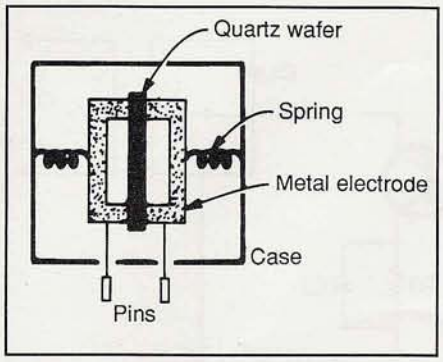


Figure 3. Internal construction of a quartz crystal, showing general location of parts. Thickness of the quartz wafer determines frequency of operation. See discussion in text.

tiplier stages, as illustrated in Figure 5. Column space has now become tight, so read closely as we present a brief description of each.

TGTP oscillators, buffers, and frequency multipliers look strikingly similar in circuit design. Their main differences are in biasing and input/output frequencies. An oscillator inputs DC and outputs a signal at the primary, or fundamental, frequency of its quartz crystal. A *buffer's* input and output circuits are physically separated from each other but tuned to the same (fundamental of crystal oscillator) frequency. It is biased for linear mode operation, however, to avoid drawing grid current. It thus interfaces an oscillator with other stages or the outside world while isolating it from changes due to loading, keying; etc.

A *frequency multiplier* is typically biased class "C," like an oscillator, which means it draws grid current and its plate current flows in short bursts rather than flowing continuously. A buffer stage is thus used between an oscillator and a frequency multiplier. The input circuit of a multiplier is tuned to an oscillator's fundamental frequency and its output is tuned to a second, third, or possibly fourth multiple (harmonic) of that frequency. Related to last month's "child in swing" analogy, it is equivalent to pushing a swing every second, third, or fourth time.

Let's say, for example, we wish to generate a 50.400-MHz signal. Crystals for that frequency will be ultra-thin and very fragile, so we use an 8.40-MHz type, then multiply its oscillator's output by 3 (8.40 x 3 = 25.2), and then double that frequency (25.2 x 2 = 50.4 MHz). Bingo: 6-meter fun is ready. Get the idea? Let's now add some final circuit notes to Figure 5. In "A," input and output coils are tapped down from their top/high impedance points to match the low input/output impedance of transistors. In "B," I substituted a shunt-fed tank circuit so you can visualize how it looks. RFC1 "chokes out" AC (the signal) so it doesn't affect the power supply, and C5 blocks DC from reaching the tank circuit. We will delve into more technical details another time. Now let's jump to our promised fun project!

Flip Flop Freddie

As many amateurs are aware, integrated circuits (ICs) are increasingly being used to make oscillators and/or frequency synthesizers. The heart of

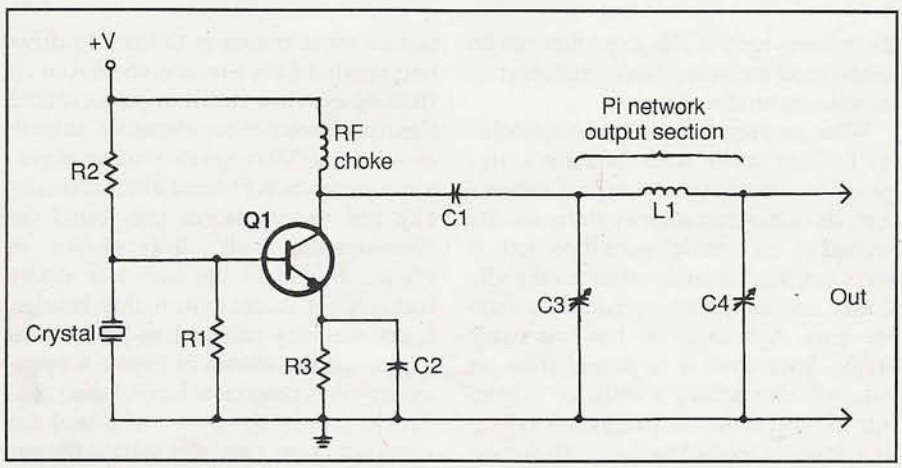


Figure 4. This crystal oscillator circuit is similar to that of Figure 2, except an NPN transistor replaces the vacuum tube and a shunt-fed Pi-network output filter replaces the vacuum tube's link coupled output section. Can you visualize the purpose of the various components in this circuit?

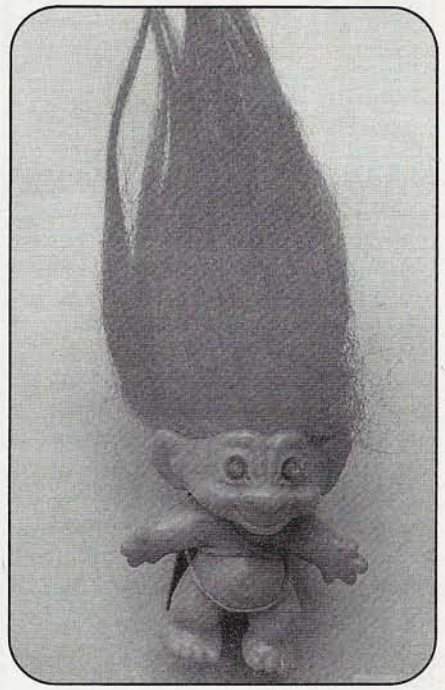


Photo B. This stubby little character with a big head of hair is called a troll. He has resistors inside each arm, an NE555 oscillator IC in his tummy, and blinking green LEDs for eyes. Homebrew/assembly details for similar little critters are in the text.

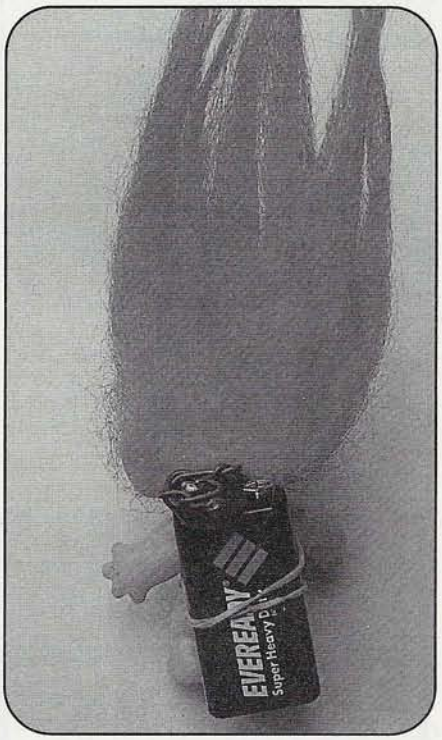


Photo C. Rear view of blinking eyes troll showing 9-volt battery rubber banded to his back. Some folks may see this little guy as an electronic toy or novelty, but radio amateurs will see it as an ultra-low frequency oscillator with LEDs as readouts.

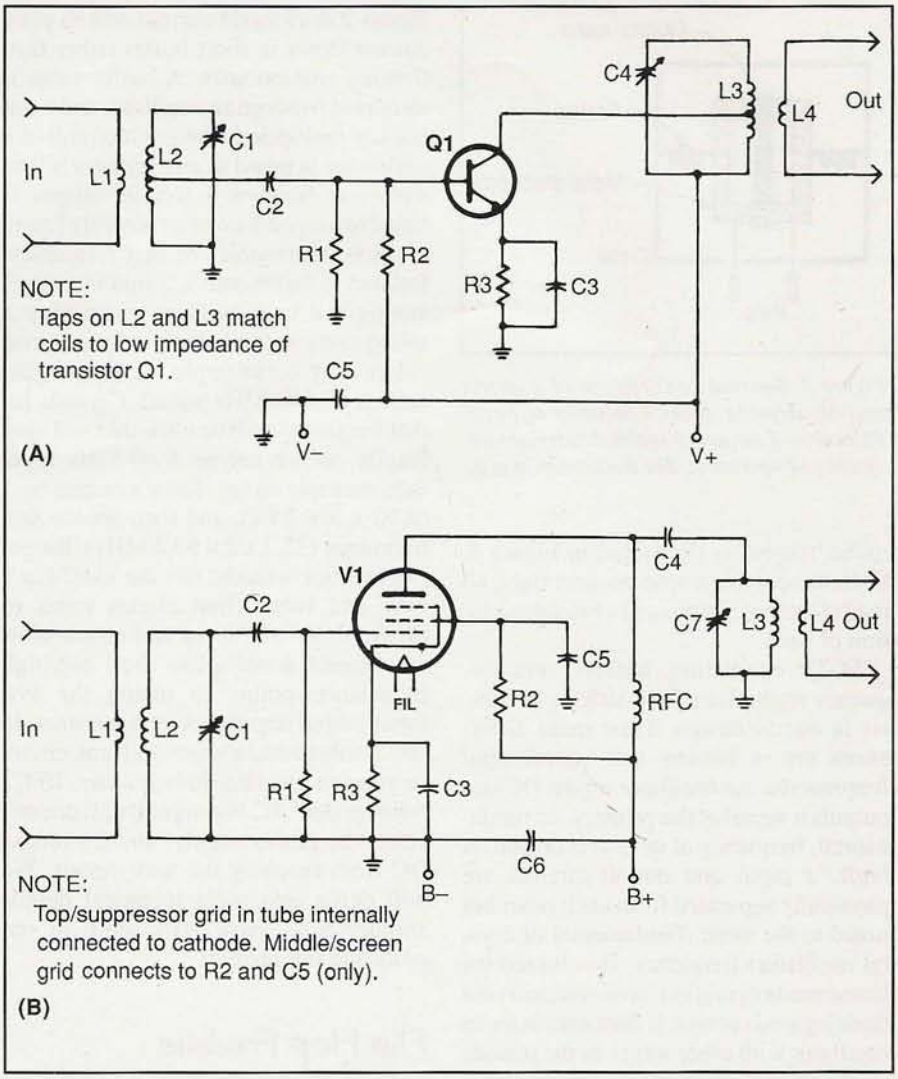


Figure 5. Two examples of frequency multiplier and buffer stages. The same circuit configuration applies to each type, so I elected to show you a solid-state or transistor stage with series collector feed in "A" and an equivalent vacuum tube stage with shunt plate feed in "B." Again, see discussion in text.

these items are *J-K flip-flops* that can be configured as *monostable*, *bistable*, or *astable multivibrators*.

What are they, you ask? A *monostable mv* has one stable state. When it's triggered or pulsed by an external connection, its output temporarily shifts into its second or "not stable" state (how long it stays that way depends on its circuit's R-C time constant), then it returns to its stable state. A *bistable mv* has two stable states. Each time it is pulsed from an external connection, it shifts or toggles into its other state—where it stays as long as voltage is applied to the mv (a one-bit memory). An *astable mv* free runs: it continuously toggles between its two states.

This last type, the astable, is the multivibrator used in our fun project, and its square wave output is utilized to drive two small LEDs that are employed as flashing eyes in a plastic or papier mâché figurine. Choice of toy character, animal, or—err—critter is strictly a matter of personal preference. I scanned the local novelty and variety stores and found the "one-size-too-small" troll shown in Photos B and C. Its hair was easily removed for access to its hollow insides. Space was very cramped, so I assembled the mv circuit shown in Figure 6 open-air-style by component leads. I then confirmed proper operation, insulated the wires with tape, carefully stuffed the circuit into the little troll's body. (It's a tedious challenge. Start with a larger size figurine and build the circuit on a 1-1/2 inch square perfboard. It's much easier.)

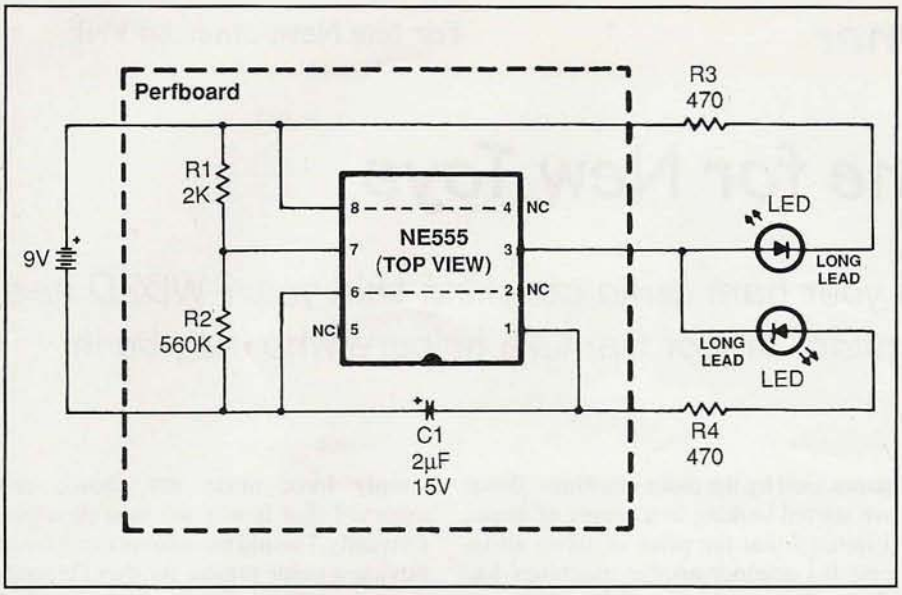


Figure 6. Circuit diagram of the astable or "free running" multivibrator circuit with dual LEDs to make the blinking eyes animal or figurine. The circuit is drawn with components located where they would be placed on a small pc board (inside dashed line).

Now let's take a closer look at this project's circuit and consider some of its fine points of assembly (Figure 6). A popular NE555 oscillator or timer IC is powered by a regular 9-volt battery, and its output (pin 3) drives the LEDs. Their blink rate (the IC's frequency) is set by C1 and R2. Using 2 mfd and 560K ohms, respectively, the eyes blink four times a second (4 Hz). A lower value capacitor or resistor will increase that blink rate. Use short pieces of insulated wire as extensions, and connect opposite ends or sides of the LEDs to pin 3 of the IC. Usually, an LED's longest lead corresponds to its minus or cathode end. If you wire up an LED backwards, it will not illuminate. Remember that tip if only one eye blinks.

After confirming that your circuit works, slowly and carefully drill out the eyes and mount/glue the LEDs in place. The values of R3 and R4 can be decreased from 470 to 270 ohms if greater brightness is desired. The top of a discarded 9-volt battery can be used as a battery clip for this project. You can also snap on just one terminal and turn the clip 90 degrees to produce a no-cost on/off switch. During normal operation, the circuit will draw 10ma (with 470-ohm resistors in use). Output from pin 3 will also be approximately ±5 volts, and will make the pointer on an analog VOM quiver at about 4 Hz, or go back and forth four times a second. Additional notes and tips on this project, incidentally, can be found in my *33 Simple Weekend Projects* book, available from CQ (and it makes a nice Christmas gift for any radio amateur or electronics enthusiast!).

You may not be able to get on the air or work anyone with these electronic toys, but they're still fun items. Build several of them. Put them on a shelf in a dark room and watch them blink. Give them to friends as personalized gifts. Who knows—you could even become known as the "multivibrator kid." Enjoy! 73 and Happy Holidays!

—Dave, K4TWJ

Hamfest Calendar

The following hamfests are scheduled for December, 1999:

Dec. 5, Hancock ARC Hamfest '99, Greenfield Central High School Pavilion, North Broadway St., **Greenfield, IN**. Talk-in: 145.330 or 444.725. For information, contact Tom Donaldson, N9LFU, 6214 N. 400 East, Greenfield, IN 46140; Phone: (317) 326-3168.

Dec. 17–18, Columbia County Hamfest & Computer Show, American Legion Hall, 4306 S. Highway 41, **Lake City, FL**. For information, contact Colen Boutwell, WA5RKR, at (904) 755-7969 or (800) 752-7969; E-mail: <wa5rkr@isgroup.net>; or Joe Aymond, WD4EOJ, at (904) 935-2405 after 5 p.m. or fax (904) 935-2876; E-mail: <wd4eoj@isgroup.net>.

Operating Notes

For late November and December :

November	
27–28	ARRL International EME Competition, 2nd wknd (see Rules, Oct. issue)
28	*Excellent* EME conditions
December	
12	Geminids meteor shower peak
23	Ursids meteor shower peak
26	*Excellent* EME conditions

EME data courtesy W5LUU.

Time for New Toys

What will Santa leave in your ham radio stocking this year? WB2D has some tips to help you "guide" any of Santa's helpers who may be in your family.

It's that time of year again when our attention turns to new toys. Maybe you're dropping hints to your spouse about a new rig. Or maybe you're planning to buy a gift for yourself—I've done that when my significant other didn't or wouldn't pick up on the hints that I dropped. It's sort of like the TV commercial where the lady purchases some cosmetic product "because I'm worth it." I've always felt that way about ham equipment and other electronic toys—and I have the credit card statements to prove it!

I've been thinking about a new rig for the house for a few months now. Like a lot of other hams, I've chosen to live in a place where outside antennas are impossible. For HF, this is a real limit. But for VHF/UHF, the "limit" is not nearly so *limiting*. Most of my operation is confined to repeaters and FM, but I still have a lot of interest in other modes. Also, the physical space that I can devote to a "ham shack" is limited. On the other hand, I have a fairly large attic that I have access to. It's a good place for VHF/UHF antennas. So, for several months now, I've been pondering that age-old question: what kind of rig to buy?

Just the Fax, Ma'am?

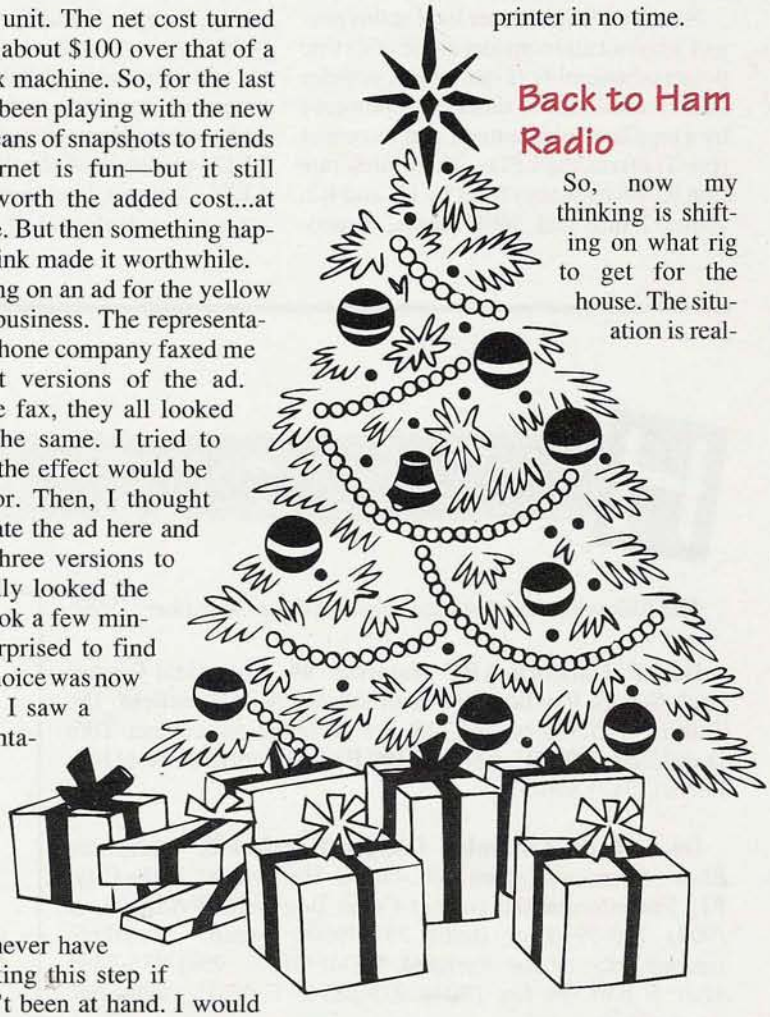
Last week, I got some insight into the situation from a different area of my life. Because of the nature of my business and Wendy's, we have a fax machine at home as well as in my office. The home fax machine, a unit that was probably 10 years old or so, died an untimely death last week. It was time for a new machine. But which one?

Early on, my intention was to just get a simple plain-paper fax machine—I've had enough frustration with the thermal paper used by the older machines. But as we started looking in a couple of stores, I noticed that the price of those all-in-one fax-scanner-printer machines had dropped quite a bit from when they were introduced a few years ago. Now, it was only going to be about $170 more for one of them instead of a straight fax machine.

What pushed me over the edge was a sale and $100 mail-in rebate offered on one particular unit. The net cost turned out to be only about $100 over that of a plain-paper fax machine. So, for the last few days, I've been playing with the new toy. Sending scans of snapshots to friends over the Internet is fun—but it still wouldn't be worth the added cost...at least, not to me. But then something happened that I think made it worthwhile.

I was working on an ad for the yellow pages for my business. The representative from the phone company faxed me three different versions of the ad. Looking at the fax, they all looked pretty much the same. I tried to imagine what the effect would be with spot color. Then, I thought why not recreate the ad here and print out the three versions to see which really looked the best. It only took a few minutes. I was surprised to find that my third choice was now my first when I saw a close representation of what the ad would really look like with the spot color.

The point is this: I would never have considered taking this step if the tools hadn't been at hand. I would simply have made my choice and assumed that it was the best possible. Certainly, I would have never considered buying a color printer for this purpose; my "normal" printing needs are handled by my old LaserJet III, which does just fine and probably will for the next 50 years. Yet, from a business point of view, this simple change in my ad could pay for the cost of the new printer in no time.



Back to Ham Radio

So, now my thinking is shifting on what rig to get for the house. The situation is real-

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

ly pretty similar, in a lot of ways. If your equipment doesn't have the capability, then you'll probably talk yourself out of making the extra effort to try a new facet of the hobby. And if the capability is there, you may suddenly find yourself involved in something that you would have dismissed before. Admittedly, there's not much chance that having a rig with more capability is going to turn out to be "cost effective" in the strictest sense of the word—this is a hobby, not a business. But if you think in terms of some ratio of "units of satisfaction and enjoyment" to "dollars invested," then this reasoning probably makes sense.

In short, what I had been debating about myself was whether to get a dual-band FM-only rig for the house or to step up to a multimode unit. Of course, the multimode will do FM, but an FM rig will never work on CW or SSB or any other narrow-band mode. Modifying an FM rig to handle narrow-band modes is out of the question. But in this situation, the cost difference is more—a lot more—than the $100 difference between fax and multipurpose fax. If you focus on new equipment, you're looking at something like $500 to $700 for a dual-band FM transceiver, while a multimode VHF rig is going to run somewhere around $1,500 at a minimum. That is because the multimode rig is a more like an HF transceiver than an FM-only box. In fact, most new multimode VHF rigs today *are* HF rigs as well.

How 'bout Used? What Features?

That's the new market. But if price is a major concern for you, take a look at the used market. Recently, I've seen ads for used multimode rigs in the range of $500 to $800, about the same as a new FM only box. This makes things a lot more interesting for a lot of us. So, maybe I have you thinking about selecting a multimode rig next time you want something new for your station? What are the features that are important?

The first thing to keep in mind is that for all the other modes, you're going to want "analog" tuning as opposed to the channelized tuning that's standard with FM units. True VFOs disappeared years ago, so even in the used market you're not likely to find a rig offering a true VFO. But digital VFOs approximate the "feel" of the analog kind by making the steps very small. Smoothness counts. How do you know if the VFO is smooth? The only way I know is to actually play with one and test it on the air. When you're buying used equipment, that's not always possible. For new equipment, find a dealer within driving distance (if possible), and take the time to go there and try out as many rigs as you can.

"If your equipment doesn't have the capability, then you'll probably talk yourself out of making the extra effort to try a new facet of the hobby. And if the capability is there, you may suddenly find yourself involved in something that you would have dismissed before."

Sometimes you can do the same for used equipment, but other times the seller lives halfway across the country. If possible, try to get the right to return the rig within a week of receiving it. If not, think of it this way: you're buying used equipment that has already taken a big hit from its new price. In a worst-case scenario, you can turn around and sell it for about the same amount that you paid for it. You'll be out some shipping charges and the cost of an ad, but that's about all you stand to lose.

You can find single-band rigs for less than multiband units. Not surprisingly, the cost is considerably lower. This is not as bad as it may seem. Most multimode rigs have jacks on the back panel for auxiliary receiver input and low-level signal output. What this means to the VHFer is that your rig may only cover a single band, but with the help of outboard converters, you can have a decent performer on two or more bands.

Recently, more rigs have come on the market that offer a slightly different and more formal approach to adding extra bands. These units come with one or two bands built in and provisions for installing "modules" for other bands. Such a system makes a lot of sense for the serious ham on a budget. Buy the basic unit now, and then get on one or more other bands later on.

Adding Accessories

In addition to TX/RX converters, there are other peripherals you might want to add outboard. For instance, an external GaAsFET preamp is frequently beneficial for weak-signal modes. Often, it's desirable to remotely mount the preamp up at the antenna. And you may need to control the speed with which the preamp is switched in and out of the circuit, with respect to the speed at which the transmitter actually turns on (we're talking milliseconds here, but that may be all it takes to blow up a sensitive preamp). Having provisions that allow these sorts of outboard add-ons is a big plus in a rig.

Earlier, I mentioned the need for smooth "analog" tuning when operating any of the weak-signal modes. It's also very useful to have at least two "VFOs" per band. This will enable you to operate "split." That means transmitting and receiving on decidedly different parts of a band—and for some modes like satellites, you will be transmitting and receiving on different bands! You could never do this sort of thing with a standard RIT (receiver incremental tuning) circuit that allows the operator to shift the receive frequency of a few Hz to maybe a few hundred Hz. At least one top-of-the-line rig offers what amounts to a second receiver built into the unit. Such designs allow the operator to monitor two frequencies simultaneously. This can be a good thing.

For the satellite enthusiast, Doppler shift can be a major headache. Circuitry that automatically compensates for Doppler is extremely useful in a satellite rig. If it's not built in, but the rig allows control from an external computer, you may be able to handle it with your PC. These are things to keep in mind as you shop for the ideal rig.

Assuming that you intend to use the multimode rig for some (maybe a lot of) FM operation, be sure that it has the capability for FM-related circuitry that you need; for instance, CTCSS, paging, and DTMF squelch circuits are the most common "FM" accessory features.

A good receiver is critical to truly enjoying weak-signal operation. One measure of a receiver's usefulness is its ability to separate wanted signals from unwanted adjacent signals. A crystal lattice filter network in the IF chain is a good

"I've been dropping hints like crazy, too. Every day I check under the tree, but there's no box there big enough."

choice. The ability to install more than one filter and switch between them can be very important, particularly as you switch from one mode to another. Digital signal processing (DSP) is doing wonders on the newest generation of receivers.

Receiver sensitivity is another area of importance—to some extent, though, weaknesses in this department can be countered with a good preamp. The standard for measuring the sensitivity of a VHF/UHF receiver is the "signal to noise" (s/n) ratio. Like a golf scorecard, the better receiver will be the one that has the smaller value. For example, if two radios are respectively 0.18 µV for 12 dB SINAD and 0.16 µV for 12 dB SINAD, the second unit would have the superior receiver for this particular specification. In short, it can "hear" weaker signals than the other unit can. (Don't worry right now about the "12 dB SINAD" terminology; just remember that the smaller the uV number, the more sensitive the receiver.)

With respect to the transmitter, there isn't too much to watch out for. If you anticipate some mode of operation that requires extended periods of transmitting, pay close attention to the rated duty cycle of the transmitter. Suppose a rig were rated at 100 W output at a 50% duty cycle. That means that you should not transmit key down more than 50% of the time. This usually isn't an issue.

Also, in days past, some of the manufacturers offered two versions of the same rig, differing only in the output power—usually 10 W and 100 W or 25 W and 100 W. If you're buying a used rig of this type, make sure you know which version you're getting. You can always add an outboard amplifier, but still you wouldn't want to pay for something that you're not getting.

There are just too many things that I've been missing out on. My next rig is going to be a multimode rig. I've been dropping hints like crazy, too. Every day I check under the tree, but there's no box there big enough. Well, there is always Plan B—I've got to check to see which of my credit cards has the lowest interest rate.

Multimode Rigs: What's Out There

Now that Peter's made up his mind to buy a multimode VHF rig for himself this holiday season, we thought we'd help him decide which one to choose by bringing you this handy comparison guide to multimode VHF rigs (most of which also include HF, by the way), prepared by Senior Contributing Editor Gordon West, WB6NOA, for the upcoming Fifth Edition of the CQ Amateur Radio Almanac. *Of course, if Peter's convinced you to do the same, feel free to circle the rig of your choice and "accidentally" leave this issue—open to this page—where one of Santa's helpers might "accidentally" notice it (her pillow might be good for starters).*
—W2VU

Table. Brief comparison of major features of the currently available rigs that offer multimode VHF coverage. Courtesy WB6NOA and the CQ Amateur Radio Almanac.

VHF/UHF MULTI-MODE COMPARISONS

Feature	ICOM 706 MKIIG	YAESU FT-100	KENWOOD TS-790	KENWOOD TM-255	YAESU FT-847	ICOM IC-821H	YAESU FT-736R	YAESU FT-290R	YAESU FT-790R	ICOM IC-746
Bands TX RX	All HF + 6m + 2m + 70cm	All HF + 6m + 2m + 70cm	2m + 70cm plus opt. 1200 MHz	2m	All HF + 6m + 2m + 70cm	2m + 70cm	2m + 70cm + choice 6m, 222 or 1200 MHz	2m	70cm	HF + 6m + 2m
Modes	AM, FM, WFM, CW, SSB, DATA	AM, FM, WFM, CW, SSB, DATA	FM, CW, SSB, DATA	FM, CW, SSB, DATA	FM, CW, SSB, DATA	FM, CW, SSB, DATA	FM, AM, CW, SSB, DATA	FM, SSB, CW	FM, SSB, CW	AM, FM, CW, DATA, SSB
Power Output	100w on HF, 100w on 6m, 50w on 2m, 20w on 70cm	100w on HF, 100w on 6m, 50w on 2m, 20w on 70 cm	45w on 2m, 40w on 70cm, 10w on 1200MHz	40 Watts	100w on HF, 100w on 6m, 50w on 2m 20w on 70cm	40w on 2m, 30w on 70cm	25 Watts	25 Watts	25 Watts	100 Watts on all bands
Antenna Ports	1@HF/6m + 1@2m/70cm	1@HF + 1@ 2m/ 70cm	3	1	2	2	3	1	1	2 HF/6m + 1 2m
Receiver System	Double + triple on FM	Double conversion	Double + triple conversion	Single + double conversion	Double conversion	Double conversion	Double + triple conversion	Double conversion	Double conversion	Double + triple conversion
Audio Output	2 Watts	1.5 Watts	2 Watts	2 Watts	2 Watts	2 Watts	2 Watts	1 Watt	1 Watt	2 Watts
Voltage	13.8 VDC	13.8 VDC	13.8 VDC	13.8 VDC	13.8 VDC	13.8 VDC	13.8 VDC	13.8 VDC	13.8 VDC	13.8 VDC
Auto Repeater	Yes	Yes	Yes	No	Yes	No	Yes	No	No	Yes
DSP/NR	Yes	Yes	No	No	Yes	No	No	No	No	Yes
DSP Notch Filter	Yes	Yes	No	No	Yes	No	No	No	No	Yes
IF Shift	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes
Noise Blanker	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Band Scope	Yes	Yes	No	No	Yes	No	No	No	No	Yes
Alpha Numerics	Yes	Yes	No	No	Yes	No	No	No	No	Yes
Electronic Keyer	Yes	Yes	No	No	Yes	Yes	Yes	No	No	Yes
Backlit Keys	Yes	Yes	No	No	Yes	No	No	No	No	Yes
V/U Packet Rate	1200/9600	1200/9600	1200	1200/9600	1200/19600	1200/9600	1200/9600	1200	1200	1200
HeadPhone Jack	On Head	On Body	Front	On Rear	On Rear	Front	Front	Yes	Yes	Yes
CW Key Jack	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Special Features	Remote Head, HF + V/U	Remote Head, HF + V/U	Satellite tracking VFO	Compact Mobile, Remote Head	Remote Head, HF +V/U	Satellite tracking VFO	Satellite tracking VFO	Compact Mobile	Compact Mobile	Antenna, tuner built-in
Memory Chs	100	300	59	100	300+	160	100	--	--	102

A Suction Cup Dipole for 2 Meters

Isn't this TOO simple for a magazine article? Nope...because besides being a very practical project, it contains a very complex formula—for organizing a club construction project!

Have you ever needed a simple antenna that would enable good 2-meter FM communications into and out of modern brick, concrete, and steel buildings? Here's one design that originally appeared in *Keyed-Up*, the newsletter of the London (Ontario) Amateur Radio Club and was reprinted by the Amateur Radio News Service. Members of the Holmesburg Amateur Radio Club in Philadelphia, Pennsylvania, built it (Photo A). This article is as much about the process as the project.

Unique Challenges

Living in a metropolitan area presents some unique challenges for getting a good signal out of a modern office building—which is where most served agencies which hams help are located. At times it's just impractical to stand by the window in order to get into a local repeater; at other times, you may need to sit down and copy a message. (I've also found this to work quite well from my easy chair while I'm watching TV.)

So follow along as members of the Holmesburg ARC build this easy-to-use antenna at a club meeting. Not only did the antenna work well for emergency communications, but the project introduced newly licensed hams to dipole antennas which, after all, are the basis of virtually all amateur antennas. With many members not having the room to string a dipole outside for HF bands, this was one of the first opportunities they had to actually use dipole calculations. In case *you* haven't yet had that opportunity, and don't remember back to your license exam, the basic formula is that a dipole's length in feet is equal to 468 divided by the frequency in MHz, or [Ant (ft) = 468/f (MHz)].

HF dipoles can be over 100 feet long; however on 2 meters, a dipole is approximately 38 inches long. An HF antenna requires string or rope to hold it in place. This project uses rub-

Bob Josuweit, WA3PZO, is CQ VHF's Public Service and Emergency Communications Editor.

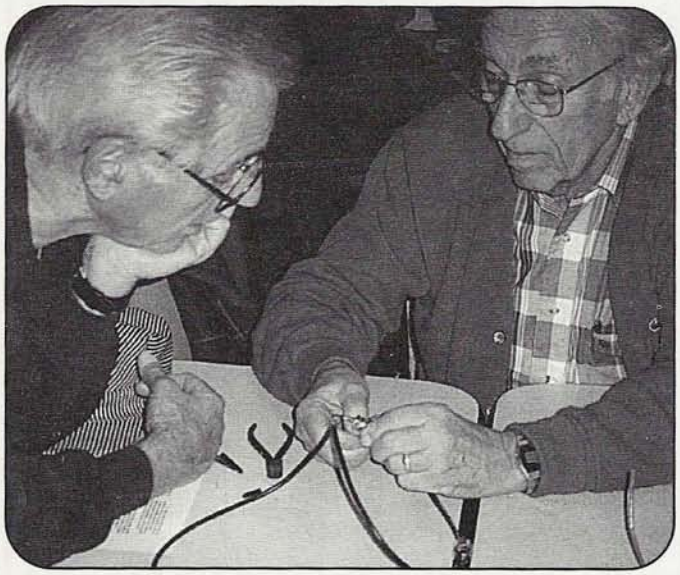


Photo A. Ham helpfulness in action. At the Holmesburg Amateur Radio Club in Pennsylvania, Sid Kalos, W3KZA, works with a coax connector as Fred Madrigale, N3TAJ, looks on. (Photos by the author)

Photo B. One of the first steps in preparing the coax is to pull the braid back.

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

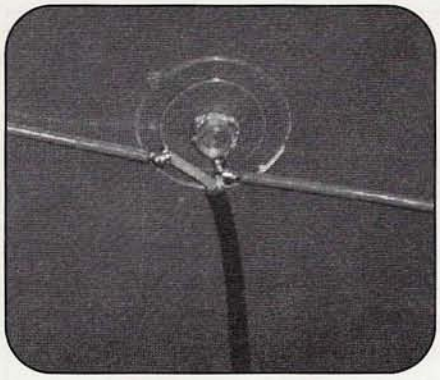


Photo C. The coax center conductor attaches to one antenna wire and the coax shield connects to the other. The suction cup can support the whole assembly.

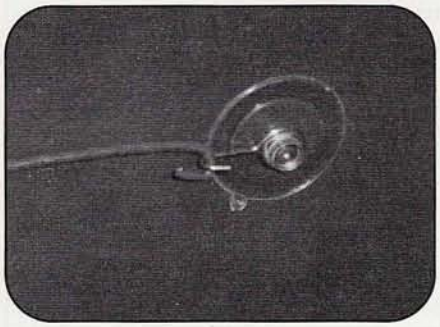


Photo D. The outer end of each dipole wire may simply be looped around a hook on the suction cup. If more flexible wire is used, you might want to cut it a little long and wrap some of the wire back on itself after looping through the suction cup hook.

ber or plastic suction cups, the type typically used to hold small window displays. They can be found in most dollar stores. I found 12 1.5-inch diameter suction cups for 99 cents. You'll need three for each of these antennas.

The antenna can be mounted to any window in any position or polarization. Our experiments showed that even though repeaters use vertical polarization, the antenna was best placed at a 45-degree angle to compensate for the large amount of metal off of which we were reflecting. By attaching a short run of coax, you can set up a comfortable and effective communications center.

The wire can be of almost any quality. Since these antennas are designed to be used inside, thoughts of withstanding the weather elements are not important. Antennas were made using picture frame wire and other wire sitting in the junk box. In the pictures, we used a heavy duty wire so it could be seen clearly.

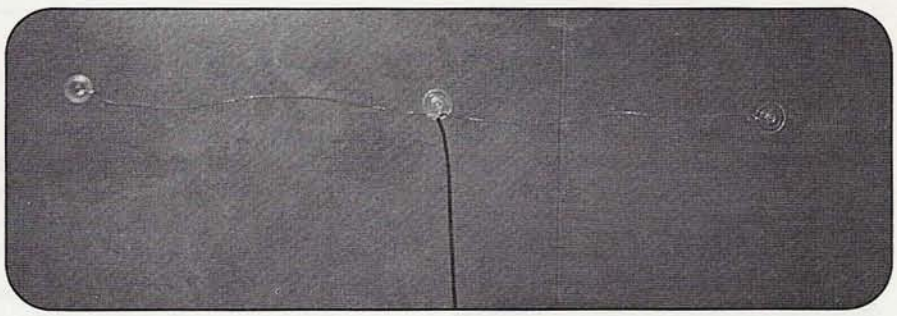


Photo E. The completed dipole is only 38 inches long and can be stuck up most anywhere. A window will work much better than this radiator, of course, but it's easier to see the antenna against the dark background of the radiator than against outside light.

The dipole doesn't give you any gain, but remember that most rubber duck antennas are less than 10% efficient. Vertical antennas need an effective ground plane to perform well, but a dipole has its own. The whole antenna can be coiled and stored inside a plastic bag, making it easy to carry around.

Here We Go

To build this project, you attach a suction cup to the end of each leg of the dipole and one to the center coax feedline connection. When deciding how long the coax should be, you should consider how you might use it. If you want the coax to reach from the window to a table, you might want up to 10 feet of coax. Another solution would be to put a 2- to 3-foot section of coax on the antenna and then use a jumper or extension cable to meet your operating needs.

The same holds true for deciding what type of connector to put on the end of the coax. We used a PL-259 with the thought of running through an SWR bridge and using a jumper cable to reach the table. If

Photo F. Once the antenna is assembled, the final step in construction is to solder on a connector to the end of the coax cable that's not already attached to the antenna. In this photo, a PL-259 is being used. You may use any other coax connector that suits your needs.

you're going directly to your HT, you may want to use a BNC connector instead of a PL-259 and an adapter.

This is a great club meeting project, especially for public service-minded groups (if you're not sure how to organize a club construction project, see the appropriately titled "Organizing a Club Construction Project"!). It's also an ideal starter project for those hams who want to learn about dipoles, soldering connectors, etc. Best of all, it brings out the spirit of "Elmering" and helping other hams. Refer to the photos and the "Step-By-Step" guide for the specifics of assembling this project. And most importantly, have fun building.

Parts and Tools List

Here's everything you'll need to build the suction-cup dipole described in this article. If you're new to building stuff, see the step-by-step guide for an easy-to-follow plan.

Parts List:

40 inches of wire
1 Short run of coax (RG-58u or RG-8; see text)
1 Coax connector (PL-259, SO-239 or BNC)
3 Suction cups

Tools needed:

Wire cutters and strippers
Tape measure or Yard stick
Soldering iron, solder
Pliers

Step by Step...

If this is the first time you've tried to build something, you might find this step-by-step guide helpful. Before you get started, clear yourself some uncluttered workspace with access to electricity for your soldering iron (if you're using an extension cord, make sure it's a heavy-duty one). Then gather up all your parts and tools (see Parts and Tools List), and follow these steps to start building:

1. Figure out how long the dipole should be. You remember the formula 468/frequency (MHz) = length in feet of the antenna. So for resonance at, say, 147.000 MHz, you'd do 468 /147 = 3.18 feet (approximately 38 inches or 19 inches for each half; see Figure).

(Allow 20 inches on each side and trim the ends of the antenna when you're ready to install the ends.)

2. If you're using insulated wire, take off approximately 1.5 inches of the insulation at one end (Photo B) so that you can solder the coax to it.

3. Prepare one end of the coax by stripping enough of the outside covering to be able to pull the wire shielding back; then strip the insulation off the center conductor, being careful that the two wires do not touch. Don't strip back all of the exposed inner insulation. This will allow the inner conductor to cross the shield wires without shorting. Next, separate the shield wires to let the center conductor pass through, then twist the shield wires together to form a single, thicker, wire.

4. Attach the outside wire shield of the coax to one end of the dipole and the center conductor to the other end (Photo C). The three wires should form a triangle-like shape. You should be able to slide the "triangle" over the center knob of the suction cup.

5. The outer ends of the dipole can be wrapped around the suction cups or, if the wire is stiff enough, the suction cups can be used as a support (Photos D and E).

6. Install a coax connector on the opposite end of the coax (Photo F). This could be a PL-259, SO-239, or BNC connector, depending upon what you want to connect it to.

7. Check all your connections with an ohmmeter to make sure everything's solid and there are no shorts. If everything's OK, you're all done!

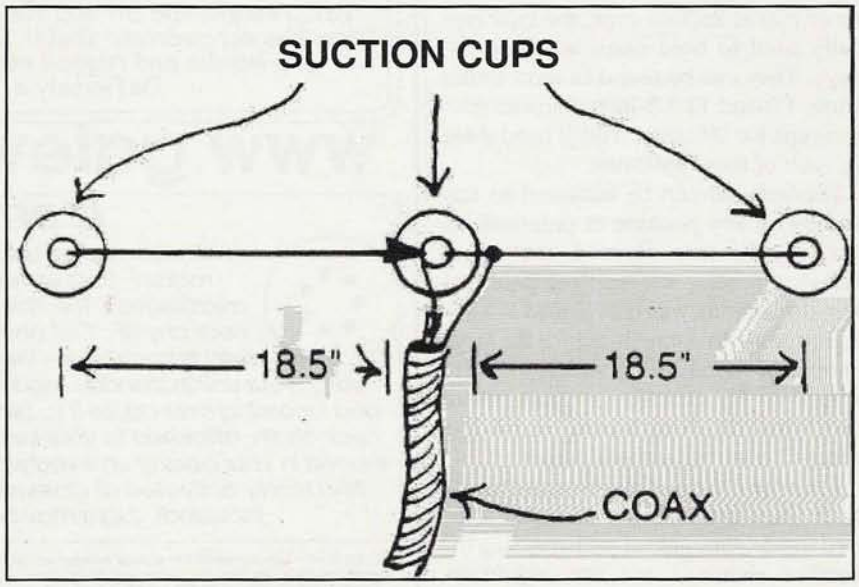


Figure. Schematic of the suction-cup dipole. This simple project can be a great way to introduce hams of all ages to project-building, and it can ignite an interest that may result in all sorts of more complex projects in the future. (Courtesy Keyed-Up, newsletter of the London, Ontario, Amateur Radio Club)

Organizing a Club Construction Project

When deciding on any club project, the program chairman or the club's Board of Directors needs to find something that will interest a majority of members in attendance, that can be built during the course of the club meeting, and that will involve everyone.

Identify Areas of Interest

For example, the Holmesburg ARC has a lot of members whose primary area of interest is VHF operating. Of those, many are involved with public service activities, yet don't have the room to put up long dipoles to get on the 75-meter traffic nets. Others had not yet tried chasing DX on HF or getting involved with HF contesting. So the goals were to make something useful, to introduce VHF operators to a part of the hobby with which they may not be familiar, and to find a project that would not break the bank on the club treasury.

This dipole fit the bill. By talking to various members, we came up with all of the parts necessary to build several dipoles and only had to buy the suction cups. Some other antennas could be built as well, such as a J-pole or a direction-finding antenna. Another simple project might be to make common power connectors for all club members' radios.

Advance Publicity

For openers, we included the schematic of the dipole (see Figure) with a brief explanation of the project in the club's newsletter, the *HARC SPARK*, so that everyone could get an idea of what we would be doing and to hopefully generate some enthusiasm on the air prior to the club meeting.

Surprisingly, one of the comments that came in was that the picture shown was for a horizontal dipole and that all repeaters use vertical polarization. While the comment was very accurate for antennas in free space, we showed at the club meeting that the dipole received a local repeater better when mounted horizontally than vertically, and that the best results of all came when the antenna was at a 45-degree angle! So to the organizers: Be sure you're on solid technical ground and be ready for the critics!

Setting Up Shop

Inside the meeting room, we determined that we would need about 10 work stations. This would allow groups of three or four people to build the antenna together, create an assembly line type of operation, and allow different skill levels to work together. This is not necessarily broken down by the number of years a person has been licensed. I've never been a big builder. That's why you find me writing the article and taking the pictures!

We also made sure that there were enough parts to go around and that each group had some wire cutters, a soldering iron, and a tape measure. As everyone started to work, the sounds of friendly competition began to fill the air. "My dipole works. First time. Every time!"..."Mine's more colorful than that one" (this referred to the different color wire that we used out of different scrap boxes; white, red, black, it was all there).

Something to Take Home

Everyone had the opportunity to walk away from the meeting with a working dipole. The project generated a lot of favorable comments and we all had the opportunity to chat, learn, and have fun. And isn't that one of the main goals of any club meeting?

Future projects are being discussed. Some want to do another project at a club meeting, others want to get a little more complicated project that will take more than one evening to complete. Others are ready to build their own special project. And all it took to get the ball rolling was one simple project!

Giving Something Back

What does actress Danica McKellar have to do with ham radio? Nothing...and everything...says Bill Pasternak, WA6ITF.

If your children are having problems with mathematics, write down this Web address and give it to them: <http://www.celebritysightings.com/mz-danica_index.cfm>. It's a Web site operated by a Hollywood celebrity who has decided to "give something back" to the community that has given her so much.

The young woman who is providing this service is Danica McKellar. Never heard of her, you say? Well, you were probably far too busy in your hamshack chasing rare DX to take the time to watch one of my favorite television series of all time: *The Wonder Years*. Starting when she was only 12 years old, Danica McKellar appeared in the supporting role of Gwendolyn "Winnie" Cooper, who was lead character Kevin Arnold's first girlfriend.

When the show went off the air, Ms. McKellar did something rather unusual for a show-business youngster. Still in her teens, she basically quit "the biz" and went to school. Danica McKellar enrolled at UCLA and spent five years out of the limelight studying mathematics, graduating *summa cum laude* in June of 1998. Her research project was titled "Percolation and Gibbs-States Multiplicity for Ferromagnetic Ashkin-Teller Models in Two Dimensions." (Do any of you Extra class hams know what this means? I, for one, haven't a clue!)

While she has since returned to performing, Danica McKellar has not forgotten the people who brought her fame —the people in the audience who, week after week and year after year, tuned in *The Wonder Years* to watch her and the other cast members take a trip back a couple of decades in time. In the current day, she has concerns about our educational system, and particularly the way in which young people are taught mathematics.

Making Math More Fun

In a September, 1998, fan magazine interview, she is quoted as saying, "My main concern with the condition of mathematics in high school is that there's a lot of fear involved! Math is not, generally speaking, presented in a fun way. The concepts, as I see them, are fun, and that's the way I'd like to convey them myself."

And that is exactly what Danica McKellar is doing. She is making room in a very busy schedule to help tutor math—on the Internet. She has created the Web site noted above that permits youngsters and college-age young adults to click a "button" and post questions to her regarding complex mathematical problems. She then does her best to present the answers in a way that makes learning, well, exciting!

Another "button" on her Web site lets young people quiz her regarding growing up and life itself. In both cases, she answers as many questions as she can by posting to a reply area on the site.

So you say, "...very interesting. But what does this have to do with ham radio?" In a very few words it has *a lot* to do with our favorite radiosport and even more to do with *you*.

A Deep Secret?

Let me ask what you have done using your collected wisdom and knowledge to interest the nation's youth, or even your own kids, into joining the hobby/service you profess to support? Do your children even know that dad or mom is a ham operator? Have you taken the time to explain the hobby to them? Have you offered to help them to get their own licenses and to get on the air? Have you told them of the career opportunities that holding an amateur radio license might bring their way?

Actress Danica McKellar, best known as Winnie Cooper on "The Wonder Years," uses her personal Web site to answer kids' questions about her favorite subject: math. If you have your own Web site, does it help promote ham radio?

Or, have you done what far too many ham radio dads, and some ham radio moms, tend to do? Have you kept amateur radio a deep secret surrounded by the unexplainable mystery of "radio waves" that are only accessible to those who understand a secret language of dots and dashes? If you are part of that crowd, I will use the words of my friend's five year old: "Get real!"

There are many people who, like Danica McKellar, have their own sites on the World Wide Web. I have two of them: my personal site and the better known

By Bill Pasternak, WA6ITF* (Billwa6itf@aol.com)

Bill Pasternak, WA6ITF, is co-founder and Managing Editor of the "Amateur Radio Newsline" bulletin service and creator/administrator of the annual "Newsline Young Ham of the Year Award." He is also a frequent contributor to CQ VHF.

<http://www.arnewsline.org>. Until I passed by Danica McKellar's site, it never occurred to me that I also was sitting on a way of getting the word out to the nation's young people regarding how much fun "learning" about ham radio might be. Her message has hit me like a ton of bricks and I, for one, intend to emulate in the "new world of amateur radio" what she is doing with mathematics and everyday life.

Your Turn...

How about you? Do you have a personal Web site? Possibly you are thinking of putting one into cyberspace. How about devoting a bit of Web space and maybe a half-hour a week to answering questions about ham radio from the young and the young at heart?

Danica McKellar decided that education would be more attractive to today's young people if getting an education was more fun. As a result, all of us will eventually benefit. Likewise, you are the only people who can guarantee that amateur radio has a bright and youthful future. That can only happen if you are willing to do what Ms. McKellar has done—make the time in your busy life to make it so.

A final note: For those of you wondering how I came across Danica McKellar's fascinating Web site, here is the story in a nutshell. I was not searching for information having to do with Hollywood stars. Rather I was looking for information on the best ways to teach very young people, like my five-year-old grandson, the topics of science and math. I started on a search engine known as "Dogpile" <http://www.dogpile.com>. One "link" led to another and onto another. Suddenly I found myself in Ms. McKellar's cyberspace backyard, enjoying reading the questions posed to her and the care and thoughtfulness in her replies.

As far as I know, Danica McKellar is not an amateur radio operator and she may not even know that our sub-culture of society exists. We would be very lucky if she were. No matter. What she is doing is volunteerism at its best. It is the very essence of giving something back to society as a way of saying "thank you."

We ham operators we are supposed to be the ultimate volunteers. Are we? Are we sharing our knowledge with the next generation of radio amateurs in a way that is fun and exciting? Or, can we learn a lot about ourselves and our relationships with our kids from "the TV girl next door" who brought so many of us so much joy?

One thing is certain: Danica McKellar knows what "giving back" is all about. Do you? ■

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.*

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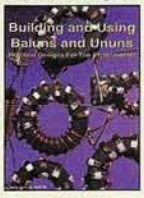

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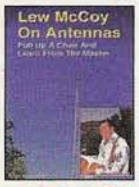

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Introduction

"Basics" is a special section of *CQ VHF* that will appear each month as a service to our readers who are unfamiliar with some or all of the various topics we cover. Everyone is new at *something* sometime, so this section is *not* only for new hams. There are many "old timers," for example, who may have spent years on the HF bands but are only now discovering packet radio or amateur satellites. So whatever you're new at, don't feel that you're alone...even if what you're new at is everything (at last count, there were about 4,000 new licensees entering our hobby every *month*).

The "Basics" section includes short introductory articles on various VHF/UHF activities, along with charts and additional information. Some topics will repeat from month to month for the benefit of new readers or for review; others will vary so we can cover more material over the course of several months. But if you decide to skip an article elsewhere in the magazine because you don't think you know enough about the topic to understand it, check back here to see if we've included a "Basics" article on that subject.

We'll try to cover all the bases, but with so many different things to try in the world of VHF ham radio, we're bound to miss something. So if you have any questions—about the "Basics" or about any article in *CQ VHF*—just drop us a note by e-mail to CQVHF@aol.com or by letter to *CQ VHF* Basics, 25 Newbridge Road, Hicksville, NY 11801.

Ham Radio Glossary

222 MHz: The ham band (see "frequency band") between 222 and 225 MHz.

2-Meter Band: The ham band between 144 and 148 MHz.

6-Meter Band: 50-54 MHz, the lowest frequency VHF band.

70-cm Band: Also known as "440," the amateur band extending from 420-450 MHz.

AM (Amplitude Modulation): A radio transmission mode; except for some AM activity on 6 meters, you'll generally find only a *type* of AM, called Single Sideband, used on VHF.

Amateur Satellites: An international fleet of communications satellites carrying amateur radio stations (see OSCAR).

Autopatch: A component which allows telephone calls to be placed through a repeater.

Az/El (*Az*imuth and *El*evation): When you are aiming an antenna at a satellite or other object in the sky, you need to set the azimuth heading (compass bearing) as well as the angle of elevation above the horizon. An *az/el* rotator will perform both functions.

BFO (Beat Frequency Oscillator): A variable pitch tone oscillator, used mostly on older style radios, to permit reception of single sideband and Morse code signals on an AM receiver.

Band Opening: A condition that results in greater-than-normal communication range on VHF and UHF amateur bands.

Band Plan: A voluntary system of frequency allocations for each amateur radio band.

Bandwidth: The width of a signal on the radio spectrum. The greater a signal's bandwidth, the more frequency space it occupies.

CTCSS (Continuous Tone-Coded Squelch System): Also called sub-audible tones or "PL" tones (trademarked name by Motorola). This is a tone which is transmitted by your radio in addition to your voice signal. When it is equipped with a CTCSS decoder, a repeater will not function unless it hears both the CTCSS tone and the "carrier" signal from your radio.

CW (Continuous Wave): commonly used as an abbreviation for Morse code.

Controller: The "brain" of a repeater. Among its many possible functions are turning the repeater on and off, timing transmissions, sending the repeater's identification signal, and controlling the autopatch and CTCSS encoder/decoder.

Courtesy Tone: An audible signal transmitted by a repeater which lets users know that the repeater has reset at the end of one person's transmission and is available for use by the next person.

Crossband Repeater: A repeater whose input and output frequencies are on two different bands. For example, a signal received on 70 centimeters would be retransmitted on 2 meters, and vice versa. Many dual-band FM rigs include this feature.

DTMF (Dual Tone Multi Frequency): A tone signaling system used in push-button telephones and many ham rigs. Commonly known by AT&T's trade name, "Touch-Tone."

Duplexer: Highly selectable, tunable filters which allow a repeater's transmitter and receiver to use one common antenna.

FM (Frequency Modulation): The radio transmission mode used for most VHF amateur communications.

Full Duplex: Simultaneously receiving and transmitting on one radio. Normally, the receiver is muted during transmit to avoid feedback. In full-duplex operation, the receiver stays active, but is generally tuned to a different frequency or, most often, a different band.

Frequency Band: A group of frequencies designated by government regulation for a specific purpose. Bands reserved for use by amateurs are called "amateur bands" or "ham bands."

Gateway: A a link, or bridge, from one type of communication network to another.

GHz (GigaHertz): A unit of frequency measurement (1 GHz = 1,000 MHz).

Handheld: An amateur radio transceiver that's

small enough to be carried in your hand (often abbreviated "HT"). Typically, amateur handhelds are for VHF/UHF use.

HF (High Frequency): The region of the radio spectrum between 3 and 30 MHz.

Hz (Hertz): The basic unit of frequency measurement (cycles per second).

Impedance: a measure of resistance to the flow of RF energy (see below) based on a combination of actual electrical resistance in the wire of a feedline or antenna (resistance) and losses due to inefficiency in the feedline or antenna wire or a mismatch between the two (reactance). Just to confuse matters, resistance, reactance, and impedance are all measured in ohms. Most ham transmitters work best into an antenna system with an impedance of 52 ohms. Ideally, you'll use a 52-ohm feedline (such as RG-8) to an antenna with an impedance of 52 ohms at its "feedpoint," the point where you feed in the signal through the feedline.

Input Frequency: The frequency on which a repeater receives and the one on which you transmit to the repeater.

Intermod: Short for "Intermodulation Distortion" (IMD); interference that results when strong signals from a nearby transmitter mix with the desired signal in a radio receiver.

kHz (kiloHertz): A unit of frequency measurement (1kHz = 1,000 Hz).

Keplerian Elements (Keps): A collection of data relating to the position of a satellite in its orbit at any given time. This information is interpreted by satellite tracking programs to predict time and duration of satellite "passes" and directions in which to point antennas. Named for the 19th century scientist Johannes Kepler.

LCD (Liquid Crystal Display): A type of display used on many radios and other electronic devices. Characteristics include dark (usually black) numbers and letters on a lighter background.

MHz (MegaHertz): A unit of frequency measurement (1 MHz = 1,000 kHz).

Memory Effect: The tendency of rechargeable nickel-cadmium (NiCd) batteries that are repeatedly recharged without being fully discharged to "remember" the point at which they're normally recharged and indicate a discharged condition. There is debate over the causes of memory effect, but it's always best to fully discharge a NiCd battery before recharging.

NOAA (National Oceanic and Atmospheric Administration): Parent agency of the National Weather Service. (NOAA Weather Radio is a 24-hour-a-day weather reporting service, using several frequencies in the 162 MHz range.)

OSCAR (Orbiting Satellite Carrying Amateur Radio): Acronym describing amateur satellites generally; with a number attached (e.g., AMSAT-OSCAR-16, or AO-16), the name of a specific ham radio satellite.

Offset: The difference between a repeater's input and output frequencies. The offset on 2 meters is generally 600 kHz.

Output Frequency: The frequency on which a repeater transmits, and the frequency to which you tune your radio.

Packet: Common short form of "packet radio," also the actual information package sent in a packet radio transmission.

PL: A trademarked name by Motorola. Has the same meaning as CTCSS.

Packet Radio: The most popular form of amateur radio digital communications, in which computers hooked to radios exchange data in packets.

PACSAT (PACket SATellite): Amateur satellite used to store and forward digital (packet radio) messages.

Propagation: The means by which radio signals are carried from one location to another.

RF (Radio Frequency):the radio waves generated by your transmitter (as well as your computer, your cordless phone, etc.) are, not surprisingly, within the "radio" portion of the electromagnetic spectrum. Energy produced at these "radio frequencies" is called "RF" or "RF energy."

Repeater: An automatic relay station, generally in a high location, which is used to increase the range of handheld and mobile FM transmitters.

Repeater Control Operator: A licensed amateur designated by a repeater trustee who offers assistance with autopatch and listens for inappropriate use of the repeater. (This is different from the FCC's definition of a control operator, which is anyone in control of an amateur transmitter.)

Repeater Directory: A listing of repeaters in a given area. Typically,a repeater directory shows a repeater's location, the output frequency, the offset, and whether or not a CTCSS code is required.

Repeater Pair: Each repeater requires two frequencies: an input frequency and an output frequency

Rubber Duck: Common term for the flexible rubber-covered antenna generally supplied with handheld radios.

S-Meter: A meter that provides a rough indication of received signal strength. (Actually, an s-unit is a rather precise measure, determined by mathematical formula. But it's the rare radio that's calibrated accurately enough for the numbers to be anything more than a rough measure.).

Signal Report: A report given in numerical values of signal strength and quality.

Simplex: Generally used among FM operators to refer to making direct contacts without the use of repeaters. Frequencies set aside for simplex contacts (such as 146.52 MHz) are often referred to as "simplex frequencies."

Single-Sideband (SSB): A type of AM transmission which occupies less bandwidth than a standard AM signal.

Squelch: A control on a radio that keeps the speaker silenced (squelched) until the signal level exceeds a certain point. Normally, you set the squelch to block out noise and allow signals to pass.

Sub-Audible Tone: Another term for CTCSS.

TNC (Terminal Node Controller): The "box" that goes between the computer and the radio in a packet station.

Tail: Most repeaters continue to transmit for a brief period after someone stops talking. This extra transmission is called a repeater's "tail."

Timer: A component in a repeater system that measures transmission length. The timer is set to a pre-determined length.

UHF (Ultra High Frequency): The region of the radio spectrum between 300 and 3,000 MHz (3 GHz).

USB (Upper Sideband): Every AM signal has two sidebands, upper and lower. In single sideband (SSB), only one is transmitted. USB is used on VHF (see AM and SSB).

VFO (Variable Frequency Oscillator): A general term used to describe the device on a radio that lets you move progressively higher or lower in frequency by turning a dial or pressing a key. Today's digitally-synthesized radios usually use a tunable phase-locked loop (PLL) instead of a true VFO.

VHF (Very High Frequency): The region of the radio spectrum between 30 and 300 MHz.

VHF Contest: An on-air competition in which activity is encouraged on VHF and UHF ham bands.

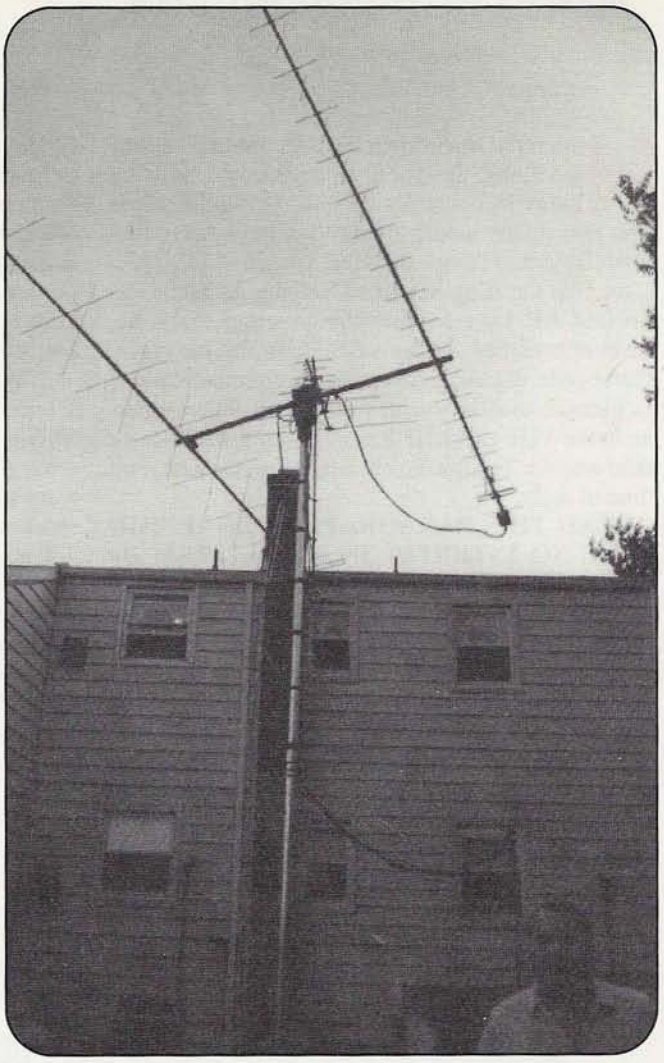
"passes" that are near your horizon, but you'll quickly want to add the flexibility offered by the az-el rotator to work passes that are higher in the sky.

5) In order to make contacts through a satellite, you need to know where it is. And while you can calculate positions manually, most satellite operators use readily-available computer tracking programs. These programs must be periodically updated with current "Keplerian elements," or "Keps," which give the programs the numbers needed to make their calculations. These figures are updated weekly and are widely available on packet and the Internet.

6) Packet satellites also require specialized equipment, and their orbits virtually require that you use your computer to tune your radio and point your antennas. They don't use standard packet coding (for many of the same reasons that FM isn't commonly used), and you need special software to make contact and upload or download messages.

7) Once you get your station set up, you'll have to learn some new vocabulary that's specific to satellites, their orbits, and their movements in orbit. But once you do, you'll be able to sound like a rocket scientist and impress your friends and family.

8) Even with all the equipment and vocabulary, it takes special skills to make satellite contacts. On the SSB voice satellites, for example, you start out by trying to find your own signal on the "downlink." This involves picking a clear frequency on which to listen, figuring out (using charts) approximately where to transmit in order to come down on your chosen frequency, and then adjusting your transmit frequency until you start to hear yourself. You'll need to tune around—both before making contacts and during contacts—because the motion of the satellite relative to the motion of the Earth results in "Doppler Shift," which moves your actual frequency by several kHz between transmit and receive. This shift continues as the satellite moves toward your location, then away from it.



Satellite operating is great for limited real estate. This is N2AAM's basic but complete satellite antenna installation outside his New Jersey home. The antenna on the left is for 2 meters, the one on the right is for 70 centimeters. They are "circularly polarized" so as not to lose contact with the satellite as it rotates in orbit.

Why Bother?

Now you may be asking yourself, "Is getting on the satellites worth all this trouble?" If your goal is just to "see what it's like," then no, it's probably not. You'll do better to find and visit someone who's already active on the "birds" before you invest in equipment. On the other hand, if you want to literally expand your VHF horizons, if you have limited antenna space, if you enjoy the challenge of communicating through a moving dot 100 miles or more above your head, and if you think space in general is "really cool," then yes, it probably is worth all the time, trouble, and expense. You'll fall in love with it the first time you hear your own signal bouncing back to you from outer space. ■

CQ VHF Hamlink

Club Listings

CA, Catalina Amateur Repeater Association: Meets 2nd Saturday of even-numbered months, 8 a.m. at Country Harvest Buffet, 6731 Westminster Ave., Westminster, CA. Visitors welcome. Club repeater (AA6DP) located on Catalina Island serves Southern California from Santa Barbara to the Mexican border: 147.090(+), no PL and 224.420(-) PL 110.9. Two-meter net every Monday, 7:30 p.m. followed by Swap Net, 8:15 p.m. Young People's (age 19 and under) 2-meter net every Wednesday 7 p.m. (3rd party traffic welcome). Trivia net Thursdays 8 p.m., as announced. For more information, send SASE to CARA, P.O. Box 425, Garden Grove, CA 92842-0425 or visit: <www.cara.nu>.

CA, El Cajon, Amateur Radio Club: Meets 2nd Thursday of each month at 7 p.m., La Mesa Church of Christ, 5150 Jackson Dr., La Mesa, CA. Visitors welcome. Repeater 147.420(output), 146.474 (input) 107.2 PL. Nets: WAMO/YL/Young Persons (<16). For further information, visit: <www.qsl.net/wa6bgs> or e-mail: <kf6ila@arrl.net>.

CA, San Clemente, Beach Cities Wireless Society: Meets 2nd Thursday of each month at 7 p.m. Ole Hanson Beach Club at beach end of Ave Pico and PCH, San Clemente, CA. Visitors welcome. Open repeater 146.025(+) PL 110.9), net Wed. eves. 8 p.m. For more info, visit club Web site at <http:// www.qsl.net/bcws> or contact Tom at (949) 661-4307, e-mail: <prmercury@earthlink.net>, or write to BCWS, P.O. Box 4016, San Clemente, CA 92674-4016.

CA, Santa Barbara Amateur Radio Club: Meets 3rd Friday of month September–May at 7:30 p.m., County Schools Auditorium, 4400 Cathedral Oaks Rd., Santa Barbara. For more info, see <http:// www. sbarc.org>, or call (805) 569-5700.

CO, Bicycle Mobile Hams of America: National non-profit club of bicyclists who use VHF radios for emergencies, lost riders, route information, chatting, etc. 450 members in 46 states, 6 countries. Annual Forum at HamVention. Net: 14.253, 1st & 3rd Sundays, 2000 UTC. E-mail: <hartleyal@aol.com>. For info, sample newsletter, send SASE to BMHA, Box 4009-CV, Boulder, CO 80306-4009.

CO, Rocky Mountain VHF+ Contest Group (RMVHF+): Contests, information and exchange of ideas related to VHF+ weak signal operations, design and construction. Members and participants in Colorado and the surrounding states. Monthly newsletter. Weekly net on 144.220 USB, Mondays at 20:00 Mountain Time. Membership info: Wayne, NØPOH, e-mail: <Nrclog@aol.com>; Fax: (707) 220-1820. Info also available via our Web site: <http://www.qsl.net/rmvhf>; Web Site info: Phil, K6LS, e-mail: <rmvhf@qsl.net>; E-mail: <k6ls@amsat.org>.

FL, Clearwater Amateur Radio Society: Meets 7:30 p.m. 2nd Thursday of every month, Clearwater Red Cross, 624 Court Street. Linked repeaters on 146.970 (103.5), 224.940, 444.15 (103.5) and 444.575 (131.8) with weekly club net on Wednesday at 8 p.m. Web: <wwwfgcarc.org/cars>. For more information contact Paul Toth, K2SEC (club Secretary) at (727) 415-1657 or <k2sec@arrl.net>.

FL, Highlands County Amateur Radio Club: Meetings held 3rd Monday of each month, 7 p.m. Agri-Civic Center Conference Room 3, South US 27, Sebring, FL. Visitors are welcome. Repeaters at 147.045 +.6, 442.350 +5.0, with packet on 144.970. Web page: <http://www.strato.net/~hamradio>; E-mail: <hamradio@strato.net>.

FL, St. Lucie Repeater Association: Meetings held the 1st Tuesday of all months except July and August, 7:30 p.m. at Lakewood Park Branch Library, 7605 Santa Barbara Dr., Ft. Pierce, FL. Visitors are welcome. Repeater at 146.775. Area-wide repeater serving the Treasure Coast. Autopatch and NWS severe WX alert. Ragchew and trader's Net, Sunday at 8 p.m. Also YL Net Sunday at 6:30 p.m. and Weather net at 9 p.m. Sunday. SKYWARN severe weather nets as situation requires. E-mail: <KD4SPW@arrl.net>.

MA, Franklin County Amateur Radio Club: Meets second Monday of every month at Greenfield High School small auditorium, Silver Street in Greenfield, MA at 7:15 p.m. Repeaters 146.985 - PL 136.5 and 448.875-PL 136.5. For information, send e-mail to <fcarc@shaysnet.com>.

MB, Canada, Winnipeg Amateur Radio Emergency Service (WARES): Callsigns VE4YWG (Public Service Communications), VE4EOC (City Emergency Operations Centre). Meetings 3rd Tuesday of month, 1930h at Sir Wm. Stephenson Library, 765 Keewatin St. Membership open to all licensed amateurs at least 18 years of age and living in or near Winnipeg and interested in emergency amateur communications. E-mail Jeff Dovyak, VE4MBQ, Emergency Coordinator at: <ve4mbq@ve4umr.ampr.org>; Web: <http://www.geocities.com/CapeCanaveral/Hanger/1632/wares.html>.

MD, Baltimore Radio Amateur Television Society: Meets 3 p.m. 1st Saturday of the month at the Pikesville Public Library, 1301 Reisterstown Rd., Pikesville, MD. BRATS sponsored FM repeaters are 147.030/224.960/447.325 MHz linked system (main), 145.130,224.800, and 443.350 MHz. Also sponsors second oldest ATV repeater in the country, the W3WCQ repeater, input 426.250/1253.250-output 439.250/911.250. Holds nets in the 147.03 system, Sunday at 8 p.m. Listening Post, Monday 7:30 p.m. Horsetraders, 9 p.m. Traffic and information, Wednesday at 8 p.m. Newsline, Thursday 9 p.m. ATV, Saturday 1 p.m. News Bulletin, 1:20 p.m. Answer Men. Club activities include public service events, field day, hamfests, ATV repeater linking, amateur classes. Membership open to all. For more info, write, BRATS, P.O. Box 5915, Baltimore, MD 21282-5915, call (410) 461-0086; E-mail: <brats@smart.net>; Web: <www.smart.net/~brats>.

MI, South East Michigan Amateur Radio Association (SEMARA): Meets the 1st Friday of the month. September through June at 7:30 p.m., at Grosse Pointe North High School, in Grosse Pointe Woods, MI. Repeater 146.740-. For further information, contact <n8fgk@amsat.org>.

MO, St. Louis, Gateway to Ham Radio Club (KBØUAB): A youth-focused club, meetings are held each month on Saturdays. Get on our new repeater at 443.225 (146.2 pl). For more information, visit our Web site at <http://www.iidbs.com/gateway/>.

OH, Cleveland Area, Cuyahoga Amateur Radio Society: Meets 3rd Wednesday of every month except December at 8 p.m. at Busch Funeral Home community room, 7501 Ridge Rd., Parma, OH. June, July, and August, "Picnic Meetings" are held at the Cuyahoga County Metropolitan Park. Repeaters on 146.82(-), 443.825 & 444.75 (+), 53.83 & 53.01 (+), plus digipeater 145.07, club simplex frequency of 146.475 MHz. For more info, contact club president, Tom Wayne, WB8N, at (440) 232-4193 or at <wb8n@en.com>.

OH, Triple States Radio Amateur Club: Operates over a wide area with members in 50 states & 3 foreign countries. Meets 2nd Saturday of the month at 1 p.m. at Citizens Saving Bank, Colerain, OH, on Rte 250. Features Web page: http://www.qsl.net/tsrac>, major Wheeling/Martins Ferry Hamfest Aug. 8; all-mode SSB/FM/AM/CW 6-m net Wed. 9 p.m. EST/EDST on 50.150/50.151; very popular club bulletin; send for sample copy; ARRL/VEC exam sessions, meeting room, last Monday of the month at 6 p.m. at club's meeting room, phone notice required (740) 546-3930; E-mail: <k8an@aol.com>; Fax: (740) 546-3685.

PA, Lambda Amateur Radio Club (LARC), Philadelphia: Since 1975, the only open and visible public service-oriented ham club for gay and lesbian hams. Monthly newsletter, HF skeds, Internet listserv and IRC, hamfest meetings, chapters, DX-peditions. Lambda Amateur Radio Club (ALRC), P.O. Box 56069, Philadelphia, PA 19130-6069; E-mail: lambda-arc@geocities.com.

TX, Hurst Amateur Radio Club (HARC): Meets 3rd Monday of every month (except Dec.), 7:30 p.m., Hurst Public Library, 901 Precinct Line Rd., Hurst, TX. Visitors are encouraged and welcome. HARC is a family-oriented club, active in community service. All levels of ARRL and W5YI exams given; see Web site for schedule. Repeaters: 147.100+ (110.9 pl) W5KXC and 442.850+ K5KKS. Net every Sunday evening at 7:30 p.m. local on 147.100+, everyone welcome. Web: <http://www.geocities.com/area51/Orion/5663/index.html>.

UT, Rocky Mountain Radio Association (RMRA): Offers Utah, Wasatch Front, unique UHF to 6, UHF to 2, and UHF to HF remote gateways. Net Thursday at 9 p.m. on 447.900 PL 114.8 UHF/6-meter gateway open 24 hours on 448.700 PL 114.8. Visit Web site at <www.inconnect.com/~rmra>; or e-mail: <rmra@inconnect.com> for more info.

UT, West Desert Amateur Radio Club: Meets the 1st Tuesday of each month (except July & August) 7 pm. The Tooele County Courthouse, 47 S. Main St. 84074. Meeting room is in Tooele County Emergency Management Conference Room, in the basement of the Courthouse. Access via the Public Safety Entrance at the Sheriffs Department off Vine St. next to Clairís Auto Repair, 64 E Vine St. A net is conducted on the 3rd Tuesday of each month at 7 p.m. on the 146.980/145.390 linked repeater system. WDARC supports four repeaters: 146.980/145.390 linked system (Delle; I-80 & Vernon, UT Rt. 36); 147.300 Tooele City PL 100.0 Hz; and Wendover Peak, Wendover, UT. 147.200. Contact person is Gene May, KC7MBF (Public Relations), (435) 882-1222, or David Haag, KC7PVD Secretary at P.O. Box 208 Tooele, UT 84074-0208.

Advertisers' Index

VA, Alexandria, Mt. Vernon ARC (K4US, MVARC): Meets the 2nd Thursday of every month (except Dec.), 7:30 p.m. at Mt. Vernon Governmental Center, 2511 Parkers Ln., Alexandria, VA. Repeater frequency is 146.655. If interested, write to P.O. Box 7234, Alexandria, VA 22307, or contact Bob, KT4KS, at (703) 765-2313.

WV, Charleston, Kanawha Amateur Radio Club (KARC): Meetings held 1st Friday of each month at 7 p.m. at the South Charleston City Hall Annex, 4th Avenue and D Street in South Charleston. Weekly Sunday net at 8:30 p.m. local on 145.35 W8GK club repeater. Mail to KARC, P.O. Box 1694, Charleston, WV 25326. For more information, contact N8TMW, Jim Damron, Publicity Director, at: <n8tmw@arrl.net>.

WV, Oak Hill, Plateau Amateur Radio Association (PARA): Meetings held 1st Tuesday of every month, 7:30 p.m. New River Pawn Shop basement, 328 Main Street, Oak Hill, WV. Mailing address: PARA, P.O. Box 96, Fayetteville, WV 25840. Repeaters are 146.790-; 147.075- and 443.300+. For more info, contact Juddie Burgess, KC8CON, Secretary, at <kc8con@usa.net>.

Exam Sessions

CA, Santa Ana: FCC Amateur Radio Testing every Wed. of each month at Orange County Chapter of the American Red Cross. Open to the public (walk-in). All levels of testing. Begins at 6:30 p.m. upstairs in the Blood Center, Room 206. Address: 601 North Golden Circle Drive, Santa Ana, CA. Call (714) 835-5381, ext. 140, and ask for Amateur Radio Testing information.

FL, Casselberry, Lake Monroe Amateur Radio Society (Greater Orlando): 4th Saturday of every odd month at Casselberry Public Library on Oxford Rd., Casselberry, FL. For information, contact Al LaPetrer, W2IL, at (407) 671-1056.

FL, Clearwater: Exams held 2nd Monday of each month (except December) at the Clearwater Salvation Army, 1625 North Belcher Road at 7 p.m. For more information, contact John Townsely, AE4GB at (727) 376-6705 or e-mail <ae4gb@arrl.net> or Mike Branda, K4HN, at <k4hn@amsat.org>.

FL, Highlands County: Exams held 4th Tuesday of each month at 7 p.m. Agri-Civic Center Conference Room 3, South US 27, Sebring, FL. Walk-ins are welcome. Web page: <http://www.strato.net/~hamradio>; E-mail: <hamradio @strato.net>.

IN, Evansville: Exams held once a month on a Saturday morning starting at 9 a.m., local time at Evansville Red Cross, 111 Diamond Ave., Evansville, IN. No pre-registration for sessions. For more info, call Terry Brooks, AA9MM, at (812) 421-9135. (Exam dates: 9/25 (ARRL Nat'l Exam Day), 10/30, and 12/04).

MA, Greenfield: Franklin County Amateur Radio Club Volunteer Exam session are held 4th Mondays of Janauary, April, July, and October at the North Greenfield EOC, Severence St. in Greenfield, MA starting at 7 p.m. sharp. Two miles north of Rt. 91 Exit 27. Walk-ins welcome. For information, contact Richard, KD1XP, at <kd1xp@arrl.net> or at 413-665-2211.

OK, Oklahoma City: VE exams held at 9 a.m. on the 3rd Saturday of each month at the Southern Temple Baptist Church, 1821 So. High St. Tune in on 146.76 MHz. For more information, contact Audie, NG5B, at (405) 799-9916.

PA, Monessen Amateur Radio Club: Test session 1st Sat. of even months (Feb, Apr, Jun, etc.) 10 a.m. at New Eagle Boro Bldg. Main St., New Eagle, PA. Walk-ins welcome but pre-registration preferred. For more info, contact Allan, N3UML, at (724) 852-6449, P.O. Box 26, Sycamore, PA 15364.

PA, Philadelphia: The Philmont Mobile Radio Club sponsors exams on 1st non-holiday Thursday of each month at Franklin Institute, 20th and Ben Franklin Pkwy, Philadelphia, PA. Walk-ins welcome. Exams start at 6:30 p.m. For more info, contact, Dusty Rhoades, ND3Q, at (215) 879-0505.

Personal Web Site Listings

"The Radio Picture Archive," URL: <http://www.e-etc.com/rpa> (corrected). Speciality collection of pictures of radios.

"Telegraph Key/Museum/Collector's Guide" URL: <http://w1tp.com>. Collector of telegraph keys, old radios, microphones & apparatus history, appraisals, buying, trading.

Commercial Web Site Listings

ABTRONIX: Ride the airwaves with ALFA & ZULU *cartoon* Novice/Technician license manual ($14.95), 304 pages, 100% illustrated, easy lessons, for ages 8 to 80. Web site: <http://home.earthlink.net/~abtronix>. Contact: <abtronix@earthlink.net> for quantity discounts. John Abbott, K6YB.

Byers Chassis Kits: Aluminum chassis and cabinet kits, VHF & UHF antennas and parts. Catalog: Callbook address. E-mail: <k3iwk@flash.net>; Web: <http://www.flash.net/~bckits>.

Communications Specialists, Inc.: Manufacturers of Tone Signaling Equipment including CTCSS encoders and decoders, Morse Station IDers, Repeater Tone Panels and much more. Please see our ad in this issue: <http://www.com-spec.com>.

HamMall.Com: Largest Web site dedicated to the sale of all types of amateur radio equipment. Check out the QSL Manager's Listing, add your call to the Call Wall, or get technical assistance. Find us at: <www.hammall.com>.

KMA Antennas: VHF, UHF, HF log periodics, Yagis, and unique 6-meter antennas. Custom designs for commercial and private use also available. Please mention *CQ VHF* when you visit <www.qsl. net/w4kma>.

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This 70W high-powered 2M FM Mobile provides extended UHF receiver coverage, AM Aircraft RX, and is MIL-STD approved. The FT-3000M features 81 memory channels, Smart Search,™ CTCSS/DCS, optional ADMS-2E programming software, and is 1200/9600 Baud Packet compatible.

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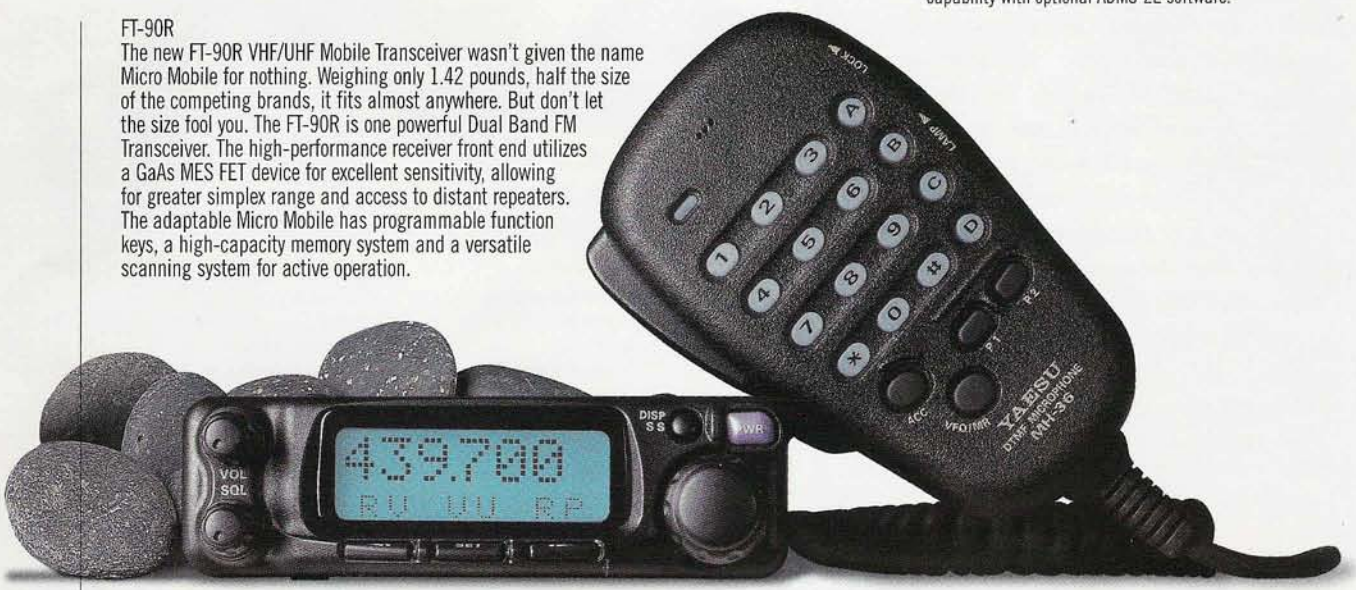

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